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Prospects for the Reorientation of Investment Flows for Sustainable Development under the Influence of the COVID-19 Pandemic

Perspektywy reorientacji przepływów inwestycyjnych na rzecz zrównoważonego rozwoju w warunkach pandemii COVID-19

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Abstract

The article is devoted to substantiating the expediency of reorienting international investment flows, under the influence of the COVID-19 pandemic, from traditional directions to projects related to social transformation. It is proved that such transformations should be expressed first of all in qualitative changes in education, medicine and employment. Particular attention is paid to the modernization of the paradigm of sustainable development, the components of which should be ranked from social to environmental. The necessity of interpretation of investment strategies implemented in the countries following their common problems is substantiated. Also, attention is paid to the substantiation of the cyclical component, its role in the redistribution of investment flows at the state level. The article proposed cluster investment to solve this problem.

Key words: investments, international investments, international investment projects, sustainable development, clustering, cluster investing, economic cycles

Streszczenie

Artykuł poświęcony jest uzasadnieniu celowości przeorientowania międzynarodowych przepływów inwestycyjnych pod wpływem pandemii COVID-19 z tradycyjnych kierunków na projekty związane z transformacją społeczną. Udowodniono, że takie przemiany powinny wyrażać się przede wszystkim w jakościowych zmianach w

edukacji, medycynie i zatrudnieniu. Szczególną uwagę zwraca się na unowocześnienie paradygmatu zrównoważonego rozwoju, którego elementy należy uszeregować od społecznych do środowiskowych. Uzasadniono konieczność interpretacji strategii inwestycyjnych realizowanych w krajach podążających za wspólnymi problemami. Zwrócono również uwagę na uzasadnienie składowego, jego rolę w redystrybucji przepływów inwestycyjnych na poziomie państwa. W celu rozwiązania tego problemu w artykule zaproponowano inwestycje w klastry.

Słowa kluczowe: inwestycje, inwestycje międzynarodowe, międzynarodowe projekty inwestycyjne, zrównoważony rozwój, klastrowanie, inwestowanie w klastry, cykle koniunkturalne

Introduction

International investment flows are the most important driving force of humanity's economic, social, scientific, and cultural progress (Chen et al., 2020). Today, none of the public economy sectors can be considered self-sufficient and free from the need to attract temporarily free funds (Dzwigol & Dzwigol-Barosz, 2020; Filipova & Yuleva-Chuchulayna, 2020). International investment has increased from year to year, and the goals for which it has been directed have diversified and expanded exponentially (Bashynska et al., 2019; Kwilinski et al., 2020). Smart gadgets, nanotechnologies, environmental projects, alternative energy, the space industry have been the landmarks of humanity and directions for further progress (Miskiewicz, 2020). The COVID-19 pandemic has shown a shocking reality – humanity has often tried to bring the future closer by leveling those more urgent problems and those that, unfortunately, are not solved today (Strilets et al., 2020).

A defining event marked the last decade of the 20th century for humanity – the concept of sustainable development began to enter into the everyday life of supranational institutions, states, local governments, enterprises as well even ordinary citizens (Prokopenko, 2011; Chortok et al., 2018). It raised such questions, the answers to which humanity did not even think. Several acute problems (energy prospects, use of fossil fuels, conservation of species and ecosystems and others) brought the highest priority to solve problems (Prokopenko & Miśkiewicz, 2020).

Until mid-March 2020, it was impossible to imagine a developed country or a country with an economy in transition, all groups of stakeholders which in one way or another would not be involved in addressing individual issues under the concept of sustainable development (Kharazishvili et al., 2020). From buying children's toys and clothes under the WWF or Greenpeace brands to investing surplus funds in socially significant projects and protecting cultural heritage, all this confirmed the understanding of global challenges and, most importantly, humanity's desire to participate in solving them.

An illustrative case was the accumulation of almost 1 billion euros to restore the world-famous Notre-Dame de Paris after a fire that broke out in mid-April

2019 (a year before the pandemic) and caused significant damage to the building (Notre Dame, 2019).

This illustrative case of unprecedented social cohesion demonstrated the desire to preserve the cultural heritage of descendants and an example of a high level of personal identification of people in society. Modern man has become a citizen of the world.

The period from January to May 2020 raised another rather acute issue – in order to preserve the cultural heritage, equal access to natural resources, to ensure a clean environment for future generations, past efforts are not enough. The fundamental problem that underlies the preservation of future generations and the protection of their interests is preserving the present generation, for the solution of which humanity has not been ready.

It exacerbates the fact that sustainable development's basic postulates must be adjusted following new (non-trivial) threats. Therefore, the implementation of investment programs within this paradigm must also change.

The purpose of the article

The article aims to formalize new approaches to understanding the concept of sustainable development and identify promising areas of investment flows within the adjusted paradigm.

Results and discussion

A) Sustainable development and its place in ensuring modern society's economic, social and environmental well-being

The concept of sustainable development proclaimed by the UN in 1987 was indeed a real breakthrough in the chronology of human development. It became a fundamental milestone that gave a clear understanding that modern human's economic thinking has crossed the stages of irresponsible consumption of natural resources, total extensive industrial capacity, ecosystems as a given, unlimited source of resources in the direction of quality development. For the first time, questions have been raised about: what our planet will be like after us; that our generation will leave people who will live in 50-100 years; which animals will adapt and survive by then; what will be the environmental situation at the end of at least the 21st century.

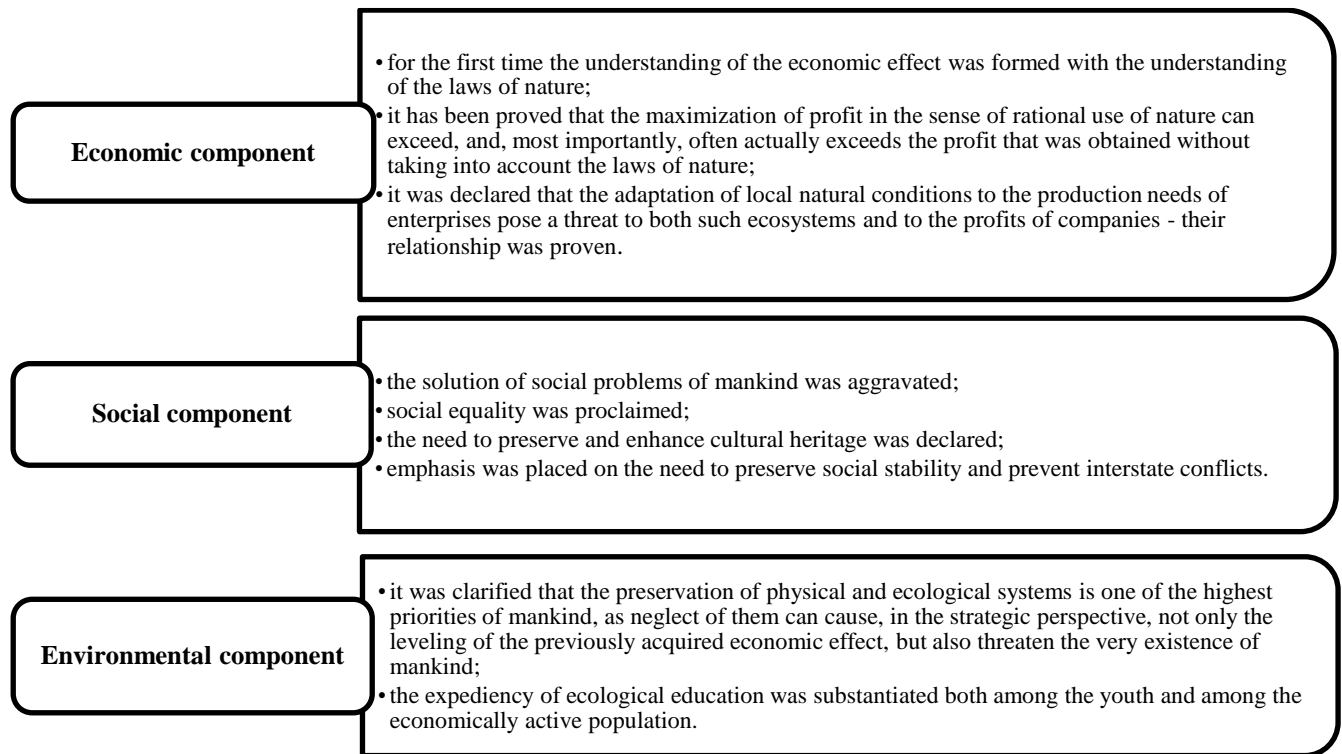


Figure 1. The main components of the classical model of sustainable development (authors' own study)

To this day, 33 years after the proclamation of the concept of sustainable development and in the conditions of unprecedented development of the technological potential of humanity, these questions often remain rhetorical because the goals are set and clear; economic, social and environmental policy developed; financial resources are received and used; the paradigm has gone to the masses, but there is no clear understanding of sufficiency and the result (Zijiang & Xiong, 2020).

In the most general sense, the concept of sustainable development involves the construction and organization of all aspects of human activity, as well as meeting its needs, without neglecting the rights of future generations to protect their rights and interests at a level not lower than the current generation (Kostetska et al., 2020). For the first time, the concept of sustainable development equated the human rights of people living on Earth with those who do not yet exist. We focus on the last thesis below.

The classical approach to explaining sustainable development's essence is based on three main components (Figure 1).

Establishing a strategic balance between each of the three main components is the way to achieve sustainable development goals.

The concept, proclaimed by the UN General Assembly in 1987 and adopted in 1992 at the UN Conference on Environmental Protection and Development in Rio de Janeiro, includes, among other provisions, a rather interesting fact. Given the components on which the concept of sustainable development is

built, the United Nations understands that in order to achieve the goals of the concept, it is necessary to preserve and improve the quality of life of modern generations, as this is the basis for caring for the people of the future. In 2015, the UN General Assembly approved 17 sustainable development goals. However, given the impact of the COVID-19 pandemic, they need to be re-adjusted. Today, especially at the time of the proclamation of the COVID-19 pandemic by the World Health Organization (WHO), there is every reason to believe that the protection of health and life of the current generation, within the classical concept of sustainable development, was realized only indirectly. These significant, fundamental issues were secondary until March 11, 2020 (when the WHO recognized the epidemic as a pandemic). In the classical interpretation, it is the rights of people who do not yet exist were placed higher than the interests of the current generation.

B) Application of cluster analysis methods in grouping countries by evaluating their effectiveness in responding to the COVID-19 pandemic

Statistics on the spread of coronavirus infection give every reason to believe that this approach no longer meets modern challenges and needs to be diversified. Moreover, the problem is exacerbated by the fact that even developed countries – countries with access to the latest advances in science and technology, are not ready to overcome the pandemic (Table 1).

Table 1. Incidence statistics for COVID -19 by country (countries taken are the largest in the area on the continent/region) as of 05.05.2020 (System, 2020; Countries, 2020)

No	Country	Population, million people	Factor 1 The share of detected cases in the total population, %	Factor 2 The proportion of deaths from the total percentage of infected, %	Factor 3 The share of those who recovered from the total number of infected, %
North America					
1	USA	328,9	0,33	6,27	16,36
2	Canada	37,6	0,16	6,56	42,62
3	Mexican United States	133,1	0,02	8,33	62,50
South America					
4	Federal Republic of Brazil	207,3	0,05	6,48	41,67
5	Argentine Republic	43,4	0,01	5,00	35,00
6	Republic of Colombia	48,4	0,01	4,29	25,71
Western Europe					
7	French Republic	65,1	0,26	14,79	30,18
8	Kingdom of Spain	46,7	0,47	11,47	55,50
9	Kingdom of Sweden	10,3	0,22	12,17	17,39
Asia					
10	PRC	1404,3	0,01	5,54	93,98
11	Republic of India	1360,4	0,00	3,26	26,09
12	Republic of Kazakhstan	18,6	0,02	0,71	29,27
Africa					
13	Algerian People's Democratic Republic	38,07	0,0023	0,01	9,79
14	The Democratic Republic of the Congo	77,4	0,00002	0,00	4,24
15	Republic of Sudan	39,5	0,00007	0,00	5,78
Australia					
16	Australia	25,1	0,0058	0,03	1,43

Table 2. Clustering of the countries presented in Table 1 by Factor 1 and Factor 2 (authors' own work)

No countries	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0	0,37	0,69	0,61	0,7	0,7	0,6	0,45	0,46	0,71	0,74	0,77	0,73	0,73	0,71	0,74
2	0,37	0	0,33	0,24	0,34	0,35	0,59	0,73	0,4	0,34	0,41	0,5	0,39	0,38	0,35	0,45
3	0,69	0,33	0	0,14	0,23	0,27	0,68	0,98	0,51	0,19	0,34	0,52	0,1	0,28	0,18	0,47
4	0,61	0,24	0,14	0	0,14	0,17	0,72	0,95	0,53	0,12	0,24	0,40	0,24	0,19	0,12	0,35
5	0,70	0,34	0,23	0,14	0	0,05	0,85	1,07	0,67	0,04	0,12	0,29	0,32	0,05	0,06	0,24
6	0,70	0,35	0,27	0,17	0,05	0	0,88	1,08	0,7	0,09	0,07	0,24	0,37	0,03	0,1	0,2
7	0,60	0,59	0,68	0,72	0,85	0,88	0	0,50	0,19	0,83	0,95	1,08	0,63	0,90	0,82	1,03
8	0,45	0,73	0,98	0,95	1,07	1,08	0,5	0	0,52	1,07	1,14	1,20	0,98	1,11	1,07	1,16
9	0,46	0,40	0,51	0,53	0,67	0,7	0,19	0,52	0	0,65	0,76	0,89	0,48	0,72	0,64	0,84
10	0,71	0,34	0,19	0,12	0,04	0,09	0,83	1,07	0,65	0	0,15	0,33	0,29	0,09	0,02	0,28
11	0,74	0,41	0,34	0,24	0,12	0,07	0,95	1,14	0,76	0,15	0	0,18	0,44	0,07	0,17	0,13
12	0,77	0,5	0,52	0,4	0,29	0,24	1,08	1,20	0,89	0,33	0,18	0	0,61	0,24	0,35	0,05
13	0,73	0,39	0,10	0,24	0,32	0,37	0,63	0,98	0,48	0,29	0,44	0,61	0	0,38	0,27	0,57
14	0,73	0,38	0,28	0,19	0,05	0,03	0,90	1,11	0,72	0,09	0,07	0,24	0,38	0	0,1	0,2
15	0,71	0,35	0,18	0,12	0,06	0,1	0,82	1,07	0,64	0,02	0,17	0,35	0,27	0,1	0	0,3
16	0,74	0,45	0,47	0,35	0,24	0,2	1,03	1,16	0,84	0,28	0,13	0,05	0,57	0,2	0,3	0

Table 1 is quite illustrative, as it includes both developed countries and countries with economies in transition and developing countries.

We will carry out clustering of systematized data to determine certain similarities between the presented countries (Table 2).

Table 3. Grouping of countries by the results of cluster analysis (in the cells of the table, the names of countries are abbreviated, authors' own work)

No groups	Base country	Countries included in the group						
1.	USA	Does not belong to any of the groups						
2.	Canada	Does not belong to any of the groups						
3.	Mexico	Brazil	Algeria	–	–	–	–	–
4.	Brazil	Mexico	Argentina	Colombia	PRC	India	Congo	Sudan
5.	Argentina	Brazil	Colombia	PRC	India	Congo	Sudan	–
6.	Colombia	Brazil	Argentina	PRC	India	Congo	Sudan	Australia
7.	France	Sweden	–	–	–	–	–	–
8.	Spain	Does not belong to any of the groups						
9.	Sweden	France	–	–	–	–	–	–
10.	PRC	Мексика	Brazil	Argentina	Colombia	India	Congo	Sudan
11.	India	Argentina	Colombia	PRC	Kazakhstan	Algeria	Sudan	Australia
12.	Kazakhstan	India	Australia	–	–	–	–	–
13.	Algeria	Mexico	–	–	–	–	–	–
14.	Congo	Brazil	Argentina	Colombia	PRC	India	Sudan	Australia
15.	Sudan	Mexico	Brazil	Argentina	Colombia	PRC	India	Congo
16.	Australia	Colombia	India	Kazakhstan	Congo	–	–	–

The number in the clustering table (Table 2) corresponds to the country number in Table 1.

Due to the mismatch of the input data scales (the values of Factor 1 and 2 differ in times), for the calculations presented in Table 2, they were first normalized to the range [0; 1]. After that, the clusters were determined by the distance between two points in two-dimensional space Euclidean metric:

$$d(x, y) = \sqrt{\sum_{i=1}^n (x_a - x_b)^2 + (y_a - y_b)^2}, \quad (1)$$

where:

$d(x, y)$ – Euclidean distance between two points, represented by individual countries;

x_a and x_b – coordinates of two points on Factor 1;

y_a and y_b – coordinates of two points on Factor 2.

We chose the Pareto rule for the criterion of similarity: ≤ 0.2 (values of distances in Table 2 more than 1 can be neglected because these values can be considered noise or anomalous values) (Dizdaroglu, 2019). To identify clusters, we chose to compare Factor 1 and Factor 2 because:

- Factor 1 in some way demonstrates the general trend with a pandemic in the country;
- Factor 2 demonstrates the situation with the readiness of the health care system for such a situation;
- Factor 3 was taken as a control.

Any analysis based on published data is not without its drawbacks:

- First, the quality of the data directly depends on the efficiency, timeliness, honesty and responsibility when testing for antibodies to COVID-19;
- Second, countries with relatively more developed economies face significant migration levels associated with hundreds of types of economic, scientific, technological cooperation and tourism. We should not rule out close and extensive family ties of these countries' citizens and citizens temporarily residing in these countries.

Accordingly, the load on them is incomparably greater than on others;

- Thirdly, it is the financial capacity to conduct a sufficient centralized procurement of all necessary materials and testing tools.

In principle, in this case, other factors can be considered, but, in contrast, it can be noted that these are statistics, respectively, for analysis. We can choose only the available data.

In this case, we do not have to cluster all countries, but only to check the possibility of applying cluster analysis methods for our purposes.

After analyzing the data obtained, the following groups of countries were identified, cluster analysis results showing signs of similarity (Table 3).

Based on the results of grouping based on statistics, we can draw somewhat non-trivial conclusions:

1. Developed countries in North America and Western Europe do not belong to any of the groups: to countries with economies in transition and developing countries and among themselves. There are some similarities between the French Republic and the Kingdom of Sweden. But this connection, given that there are only two countries in the group and a cross-border connection by our criterion of 0.19, cannot be considered a full-fledged cluster;
2. Australia is the only developed country on the list that falls into a certain group – in a group with countries with economies in transition and developing countries. However, such opposed economies in one cluster are incorrect and will take it as a statistical anomaly.
3. The most relevant group, in this case, are groups 5, 6 and 15, which, except for those excluded from consideration by Australia, are identical. These groups include countries with economies in transition and developing countries. A natural question may arise – whether it is possible to

equate the economies of Brazil, Argentina, India, China - in the vast majority of powerful economies and space powers and, for example, the Congo. We believe that, in this case, it is possible. These countries are characterized by significant stratification of the population, in some places – impressive, respectively, the lion's share of the population has no access to the results of STP or quality medicine. That is why we propose to consider the countries representing groups 5, 6 and 15 as a full-fledged cluster.

We can conclude that international organizations, international financial agencies, investment funds, and multinational corporations can use the approach we have chosen to identify the most acute needs in individual clusters of countries and areas of investment projects.

Nevertheless, developed countries are of more significant concern. We see that since they are not included in groups with other countries or among themselves, their response and depth of the situation depend on other factors' influence. Most importantly, the factors inherent in each of them separately, which exacerbate the relevance of research. Moreover, Factor 3 shows that countries with economies in transition and developing countries show even higher rates of coping with coronavirus disease than developed countries. Therefore, the level of development and capacity of medicine, to date, cannot be considered a decisive factor.

C) Reorientation of international investment projects to the principles of cluster investment and modification of postulates and sustainable development tools under the influence of the COVID-19 pandemic.

Even when we have not singled out a cluster for developed countries, they are a kind of counterbalance to the group we have identified. Therefore, we will still consider developed countries as a separate association by the level of development.

Developed countries, given their investment traditions, have so far been able to solve or at least get closer to solving problems related to sustainable development:

- economic growth in them is guaranteed by high-quality development of management methods, without neglecting social interests and ensuring its reduction of impact on the environment;
- the social component is characterized by a high level of social equality when every citizen has equal rights and equal access to opportunities;
- the environmental component is characterized by extraordinary costs in bioenergy and other renewable energy sources, closed production cycle, replacement of fossil fuels with clean energy and recycling instead of disposal.

Countries that, according to our study, are included in a separate cluster can be characterized as follows:

- extensive management methods characterize economic growth; intensification of efforts in the direction of industrial development, often using not the best, but the cheapest solutions; the impossibility of abandoning fossil fuels, like access to equipment, in general, is limited, and to environmentally-friendly equipment, given its cost, such access does not exist at all;
- social component – a significant population stratification level does not provide equal rights and opportunities for all citizens. Therefore, certain groups of the population either actively migrate to developed countries or live below the poverty line. Limited access to quality medicine, education and jobs only exacerbates these problems (especially in Africa and Southeast Asia);
- environmental component – trade in natural resources with developed countries, animal hunting, and outdated management methods significantly impact ecosystems. On the other hand, especially for African countries, due to the lack of an extensive industrial enterprise network, such an impact may not be significant.

From these positions, neither the predominant solution of problems within each of the three components (which is typical for developed countries) nor the existence of significant problems with them (existing in the countries included in the similarity cluster) does not mean approximation or distance from achieving sustainable development.

In turn, it means the components themselves need to be rethought, taking into account current challenges and the results of their impact.

Of course, it cannot be said that the past world practice, focused on achieving sustainable development goals and which existed until March 11, 2020, was wrong. It only means that it was insufficient, and the emphasis is placed more on ensuring the protection of future generations' interests than the present.

The sustainable development paradigm needs to be adjusted in the direction of a particular shift of emphasis, guidelines and appropriate tools. In our opinion, it is no longer possible to equate the three components of sustainable development and consider them equivalent (Figure 2).

This approach to the systematization of instruments in no way cancels or excludes the efforts aimed at achieving sustainable development goals by March 2020. It only allows for prioritizing those sectors of the economy that are not classic for investors. However, timely, fundamentally qualitative development of which Given today's realities, it could avoid the aggravation of crises and save billions of dollars. Today this money is spent not on economic development but to combat the effects of the pandemic.

It is also necessary to comment on another issue. The tools we show in Figure 2 are more relevant for countries with economies in transition and developing countries. Nevertheless, today it must be under-

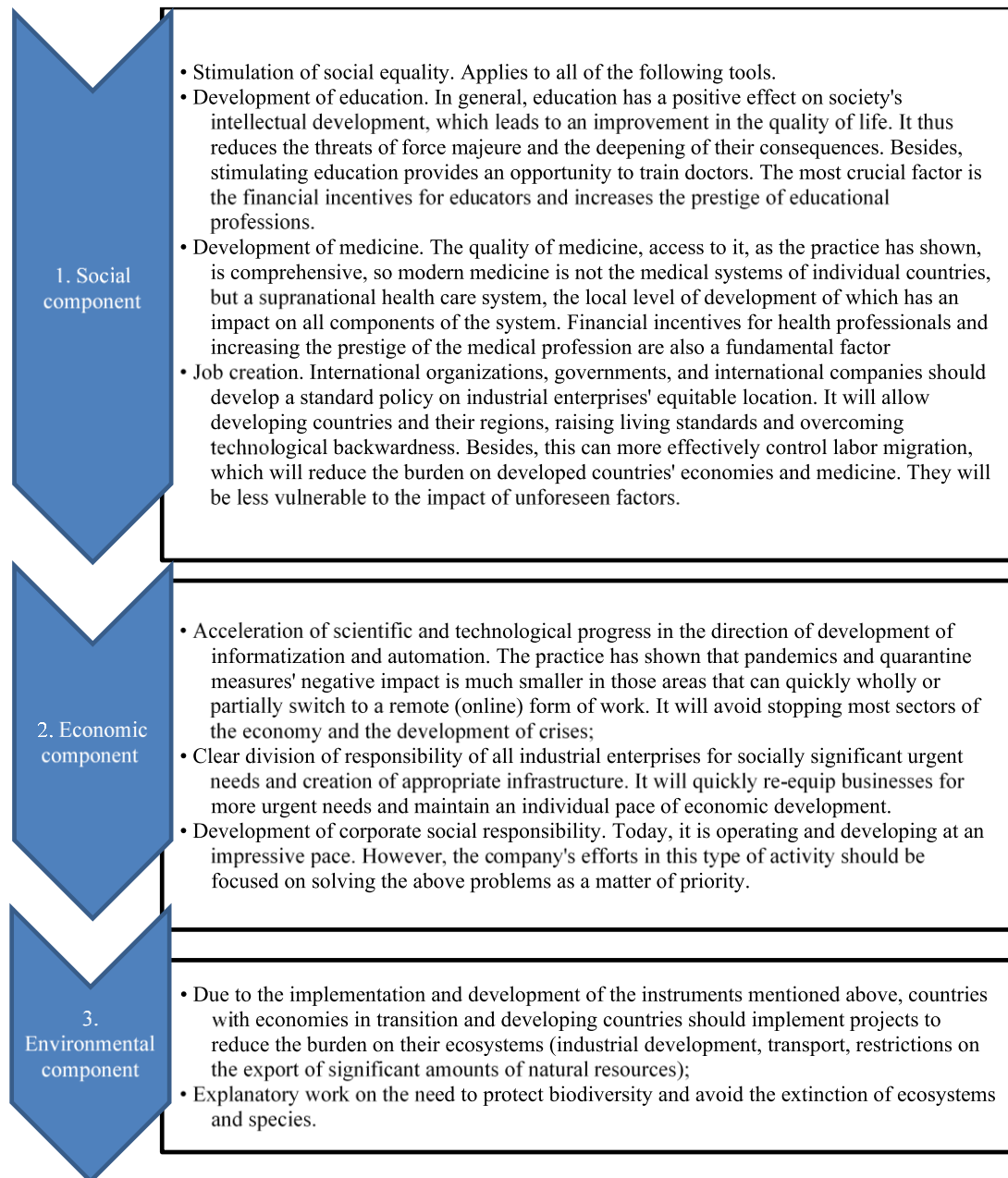


Figure 2. Ranking of sustainable development components by the level of importance (items provided in each of the components are placed in descending order of priority) (authors' own work)

stood that the consequences of increasing internationalization and gradual globalization of society are that due to insufficient funding for education, research, science in some countries (including countries from the cluster we studied) leads to the fact that countries with traditionally weaker economies can make a quite powerful impact on the economies of developed countries. From this statement, we can conclude that developed countries are interested in the enhanced and balanced development of all countries and regions, perhaps in the first place.

In other words, the implementation of the sustainable development instruments listed in Figure 2 by economically weaker countries will give a new impetus

to the further growth of developed countries. Therefore, for the latter, it is also relevant.

It is also worth explaining our logic in placing the economic component in second place and the third's environmental component. The situation here is that most countries (with certain exceptions and limitations) already have a basis for implementing each of the three components. It is no longer necessary to create economies from scratch. It means that today, establishing a sufficient balance between these components must be shifted from their simultaneous absolutization in the direction of multilevel structuring. The above theses give grounds to believe that the economic component results from the effective im-

plementation of the social component. The environmental component will be implemented at a qualitatively different level if the first two components' problems are solved. In our view, the economic component is derived from social. Furthermore, the environmental component is derived from the social and economic.

In support of this thesis about the position of the environmental component in a modified approach to understanding the concept of sustainable development is the gradual restoration of ecosystems, animal habitats, reducing greenhouse gases in the atmosphere (by reducing production and limiting traffic), cleaning the hydrosphere (cleaning European rivers, Venice canals) and other.

In this context, the question may arise about how to organize the reorientation of investment projects to the new challenges of modern internationalized society. We believe that an effective solution to the outlined range of issues can be achieved through cluster investment.

Under cluster investment, we propose to understand the implementation of the targeted (territorial, regional) implementation of investment initiatives by separating countries into clusters. These clusters should be identified by the criteria of shared or joint problems. Cluster investment finances those areas of their social development that will stimulate the quality development of their economies and serve the good of humanity. By humanity, in this case, we mean both present and future generations.

Within the framework of this concept, the basic idea is that developed countries, having excessive financial reversals, often invested them in other countries in the implementation of projects that they considered important from their positions. As a result, renewable energy projects could be implemented with neglected or almost no medicine, electric traction development in the absence of road infrastructure. It means that recipient countries should attract and donor countries should invest in implementing priority, urgent and relevant to the selected area projects.

Simultaneously, developing unique approaches to forming investment strategies for each country is a challenging and unnecessary task. It is enough to identify factors of similarity between countries, separate them into appropriate groups, and form an international investment policy based on such zoning. That is why we chose the cluster analysis method to form our conclusions and build the above concept of cluster investment.

It means that countries' development and attraction of investment initiatives cannot follow the same scenario. Emphasis should be placed on those issues that are the narrowest places in the clusters of states. In our opinion, the dependence of the dynamics of the distribution of financial flows in the country on the global economic climate can be quite significant. Unfortunately, the actual annual macroeconomic data for the period covering the exacerbation of the

COVID-19 pandemic are not currently presented by statistical agencies, especially since the lag between the crisis and real feedback from the economy can reach 2-3 years. At the same time, we have the opportunity to predict the situation with the economy of an individual country after the end of the pandemic, based on retrospective analysis (Halkiv et al., 2020). Furthermore, we can analyze the economic cyclicity and the relationship between cyclicity and investment dynamics.

The work (Kotenko et al., 2018) presents the characteristics of the cyclical nature of crisis phenomena in enterprises, highlights the main phases of crisis phenomena and lists the economic cycle methods. To modify this concept for macroeconomic needs. To this end, we will analyze the actual macroeconomic data to establish the financial and economic response of the Ukrainian economy to the development and consequences of the global financial and economic crisis of 2007-2010. As factual material, we chose data from the State Statistics Service, namely: data (Figure 3) on fixed capital investment (Fixed, 2011; Capital, 2019), construction data (Construction, 2020).

Data on fixed capital investment in Ukraine are taken from two different links, as the approach to the publication of data on the website of the State Statistics Service of Ukraine has changed since 2011. Therefore the mode of access to them has changed.

As a modification of the cyclical model of crisis development, we, on the one hand, chose not indicators of efficiency of the enterprise, but fundamental macroeconomic indicators, and on the other hand, we will try to compare them with generally accepted periods of financial and economic recessions (Roy & Kemme, 2020). Consider the most significant of them:

- Recession of the early 90's – the general global financial and economic downturn (point 1 in Figure 3);
- Dotcom bubble (1995-2001 culminating in 2000) – this crisis is associated with the rapid rise in shares of the first Internet companies, the intensification of competition with the subsequent collapse of the NASDAQ index in 2001 (point 2 in Figure 3);
- Energy crisis in 2000 (point 2 in Figure 3);
- Financial bubble in the US mortgage market (2001-2002) - the collapse of capital investment by almost 600% (point 2 in Figure 3);
- The crisis in Ukraine in 2004-2005 (point 3 in Figure 3);
- The global financial and economic crisis of 2007-2010 (point 4 in Figure 3);
- The conflict in eastern Ukraine (point 5 in Figure 3).

From the presented dynamics and selected for review milestones of financial and economic imbalances, we can state that the economy of such a coun-

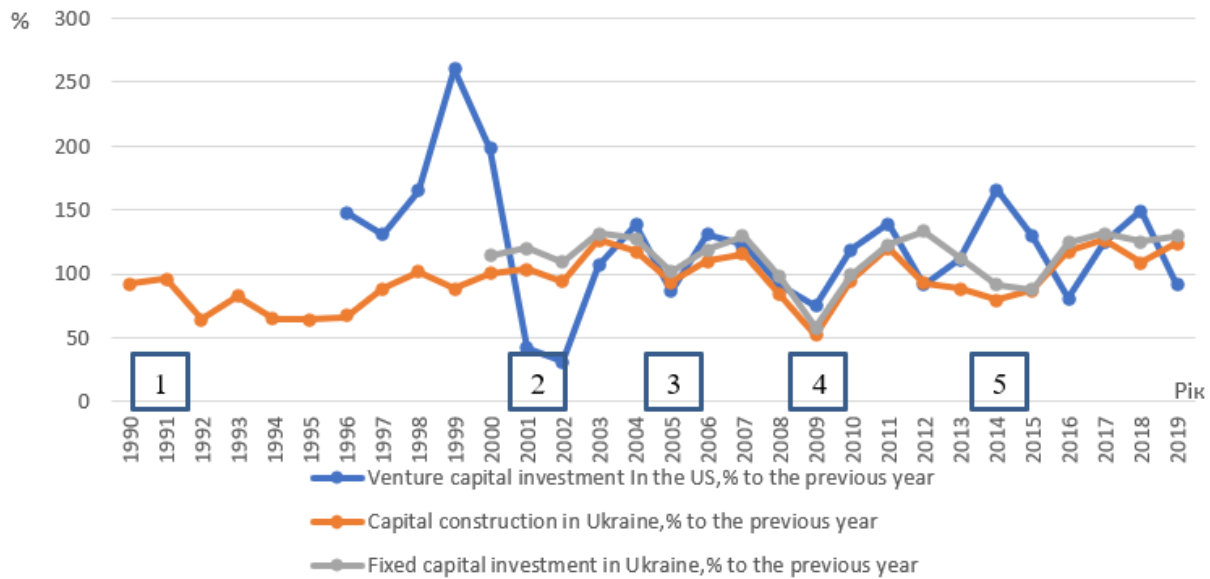


Figure 3. Data on the dynamics of capital construction investments and fixed capital investments in Ukraine (Fixed, 2011; Capital, 2019; Value, 2019; Construction, 2020)

try as Ukraine tends to react to both internal and external manifestations of the crisis. This indicates the coincidence of investment cycles in Ukraine and cycles of financial and economic crises.

For comparison, we chose the dynamics of investment in US venture capital because this indicator, in some way, reflects the business expectations of the country, as the construction index reflects business activity and expectations in Ukraine. Simultaneously, the US economy is more vulnerable to endogenous factors - the crisis of the early 2000s had a more significant impact on the US economy than on the Ukrainian one. The situation with venture financing in 2015-2016 can be explained by fluctuations in business expectations caused by the change of political course in the United States.

Taking into account the presented data, we can conclude that the economy of Ukraine is prone to respond to crises with a lag of 2-3 years. After that, the pre-crisis pace of development is restored. In the current financial and economic situation, we can say to consider two scenarios of further developments:

- Optimistic: if the pandemic gradually subsides and the normal functioning of enterprises resumes by the end of mid-2022 (2-2.5 years of recession during the global financial and economic crisis of 2007-2010), the pace of economic development, including the Ukrainian, which existed in the period before the pandemic, should be restored in 2023.
- Pessimistic: if the pandemic lasts longer than 2-2.5 and if lockdowns are introduced, the further course of events will depend on the impact of numerous economic, financial, social, political factors and the depth of such impact.

All this means that the cyclical component in assessing the need for investment, the direction of their

direction and the time when such investments should be made is a significant factor in the efficient use of limited financial resources.

From these positions and given the physical insufficiency of its financial resources for the rapid recovery of all sectors of the economy in the post-crisis period, we proposed the concept of cluster investment.

Based on this, we can say that the current financial, economic and social situation, exacerbated by the COVID-19 pandemic, shows us the extreme urgency of the problems associated with sustainable development, its fundamental importance and relevance. At the same time, it gives an understanding that the concept proclaimed to be significant for a whole century must be adaptable to the negative impact of global factors and the problems that exist and are relevant on the ground.

That is why cluster investment, designed to protect the lives, rights and interests of the current generation and within the concept of sustainable development, is the basis for ensuring future generations' existence, preserving, maintaining and increasing their opportunities for further development.

Conclusions prospects for further research

The significance and relevance of sustainable development, especially in modern conditions, is quite difficult to overestimate. At the same time, the practice has shown that the postulates proclaimed by the UN General Assembly in 1987 put future generations' interests higher than the current ones. The WHO-declared COVID-19 pandemic has reminded humanity that the foundation of future generations' existence and well-being is the quality of life and well-being of modern society.

Official statistics on infection and mortality from the virus suggest that none of the countries, despite its economic and scientific and technological development, have been prepared for such challenges. In turn, it exacerbates the issue of reorienting international investment flows in the framework of the concept of sustainable development.

The analysis showed that in current conditions, the country could be clustered by mediated, relative to the level of economic development, factors – the proportion of detected cases of coronavirus infection from the total population and the proportion of deaths in the proportion of patients. According to the level of priority, the selected factors gave grounds to rank the main components of sustainable development and the tools that are expected to be implemented within them.

Such an approach allowed to formulate the idea of cluster investment, which is to cluster countries on common problems and further direct investment resources in those areas that need it most. It means that arbitrators' role in this process falls on international organizations, governments of developed countries, and multinational corporations' leadership.

Of course, the method of clustering; factors that may be taken into account in its implementation; formation of targeted cluster investment strategies and programs; the tools used in this case are the subject of separate scientific works. Furthermore, strategic rethinking of the concept of sustainable development, given the current realities, is a promising area of our research.

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Impact of Coronavirus Pandemic on Financial Market Stability in Africa

Wpływ pandemii koronawirusa na stabilność rynków finansowych w Afryce

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Abstract

The outbreak of the coronavirus in December 2019, with its accompanying declaration as a pandemic by the World Health Organisation in March 2020, resulted in lockdown of the global financial markets. This paper uses data from pre-coronavirus, coronavirus endemic and coronavirus pandemic periods to evaluate the impact of coronavirus pandemic on stability of Africa stock markets, sovereign bond markets and U.S. dollar exchange rates in Kenya, Morocco, Nigeria and South Africa as well as Africa Sharia equity and Sukuk indices. Findings from study suggest that Africa financial markets became very unstable during the coronavirus pandemic than during the endemic and pre-coronavirus periods. Results from bivariate regression model show evidence of negative impact of coronavirus pandemic on financial market returns. The results further show that Africa financial markets return volatility increases as the number of coronavirus cases increases. Overall, the findings suggest that coronavirus has negative impact on financial markets' returns and exacerbated financial markets instability thus retarding sustainable economic development in the continent.

JEL Classification Numbers: G10, I12, O55

Key words: Coronavirus, COVID-19, stock market, sovereign bond market, exchange rates, volatility, skewness, market stability, Africa

Streszczenie

Pojawienie się w grudniu 2019 r. koronawirusa, wraz z ogłoszeniem przez Światową Organizację Zdrowia w marcu 2020 r. pandemii, spowodowało zablokowanie światowych rynków finansowych. W niniejszym artykule wykorzystano dane z okresów przed koronawirusem, koronawirusa endemicznego i pandemii koronawirusa do oceny wpływu pandemii koronawirusa na stabilność afrykańskich giełd papierów wartościowych, rynków obligacji skarbowych i kursów dolara amerykańskiego w Kenii, Maroku, Nigerii i RPA, w powiązaniu z zasadami szariatu i indeksu Sukuk. Wyniki badań sugerują, że rynki finansowe w Afryce podczas pandemii koronawirusa stały się bardzo niestabilne, o wiele bardziej niż w okresie endemicznym i przed koronawirusem. Wyniki dwuwymiarowego modelu regresji wskazują na negatywny wpływ pandemii koronawirusa na zwroty z rynków finansowych. Wyniki pokazują ponadto, że zmienność zwrotów na afrykańskich rynkach finansowych rośnie wraz ze wzrostem liczby przypadków koronawirusa. Ogólnie rzecz biorąc, wyniki sugerują, że koronawirus ma negatywny wpływ na zyski na rynkach finansowych i zaostrza niestabilność rynków finansowych, opóźniając tym samym zrównoważony rozwój gospodarczy na kontynencie.

Słowa kluczowe: koronawirus, COVID-19, giełda, rynek obligacji skarbowych, kursy walut, zmienność, skłonność, stabilność rynku, Afryka

Introduction

Financial market stability is indispensable to sustainable economic development, especially in Africa developing economies. Financial market is crucial in promoting economic sustainability, by facilitating the flow of funds from the surplus to the deficit units of an economy. It provides access to a neutral reference price, reduces transaction costs through easy access to buyers and sellers in a centralized market place, and manage transaction risks, thus facilitate conservation of wealth and smooth functioning of economic activities (Stiglitz, 2010; Emenike, 2017; Kremen, Shkolnyk, Semenog & Kremen, 2019). Each of these functions can be inconvenient for certain market participants, without stable financial market. Batuo, Mlambo, and Asongu (2017) conclude amongst others, that economic growth reduces financial instability. Indeed, stable financial markets are not only resilient but also a key factor in producing high economic growth. Financial market instability, on the other hand, retards conservation of financial resources, impedes economic activity and weakens sustainable economic development as prices for key financial assets deviate significantly from their intrinsic values. The financial market in such a situation, is not capable to absorb real economic shocks and to conserve financial resources on long-term scale.

The outbreak of coronavirus in December 2019, with its accompanying declaration as a pandemic by the World Health Organisation (WHO) on March 11, 2020 resulted in lockdown¹ of the global economy. The lock-down of all businesses and organisations disrupted production, supply chain, and financial market activities. This resulted in huge decline in African governments' revenues and exacerbated vulnerability to coronavirus crisis. More so, there has been intensive pressure on governments to increase expenditure on palliatives and health equipment in order to mitigate impact of the pandemic (Ito, 2020; Goodell, 2020). The resulting liquidity pressure has become a threat to sustainable economic development and financial stability in the continent, as the fiscal capacity of African countries to respond to such crisis situations was low even before the pandemic. While the number of coronavirus cases and deaths appear comparatively low in Africa than in other world regions², the economic damage inflicted on the continent is unprecedented. Indeed, the rapid global spread of Covid-19 and the high infection

rates raised fears of a global financial market crash in the endemic stage of the virus outbreak.

In response to the coronavirus threat, Africa governments unveiled different countermeasures to mitigate its impact on economic sustainability and financial stability in the continent. The Nigeria central bank in March 2020, amongst other measures, place a one-year extension of a moratorium on principal repayments on the bank's intervention facilities, and reduced interest rate on intervention loans from 9% to 5%. Between April and May 2020, South African reserved bank reduced its main lending rate by 50 basis points to 3.75%, and purchased government bonds worth 11.4 billion rand. In the same vein, the central bank of Kenya, amongst other measures, eliminated bank charges for transactions between a bank account and a mobile wallet, and increased the maximum limit for money transfers by mobile phone for small and medium enterprises. The government of Morocco established a pandemic management fund to support the national economy, including the suspension of social charges and repayment of bank loans by companies (MFW4A tracker, 2020). The announcement of these significant policy stimulus package enhanced the upside potential for financial market prices, even though market risks remained elevated (Topcu & Gulal, 2020).

The importance of financial markets in mobilising resources, reducing information asymmetry, pricing risk and stimulating sustainable economic development is well established in literature (see for example, Colombage, 2009; Murinde, 2012; Wu, et al., 2020). But COVID-19 pandemic has significantly threatened financial markets stability (Ali, Alam & Rizvi, 2020). African currencies, for example, came under pressure, with sharp exchange rate depreciations in more than half of the countries (Armah, 2020). Borrowers across sectors and scales of businesses have been affected by lock-down, as decline in their income and revenue has negatively impacted their loan obligations. The banking industry in Africa is threatened by the likelihood that there will be a sharp increase in non-performing loans, from the already high levels of 11% in 2019 (Tyson, 2020). Obeid and Ismail (2020) reports that stock markets around the world suffered trillions of US dollars losses in a single week in what was the markets' worst week since the financial crisis of 2008. Stock markets in the Euro area and the United States lost around 35% of their value between their peak on 19 February and their trough on 23 March (Ampudia,

¹ While there is enough evidence in history to show that diseases do affect the trajectories of nations, Africa has not witnessed a plague that resulted in simultaneous lockdown of almost all countries in the continent. COVID-19 is unprecedented in scale. The outbreak of Ebola, for example, did not result in shutting down the regional economies. There have been so many other outbreaks, including Asian bird flu, Spanish flu, SARS, HIV-Aids, etc., but none of them resulted in global lockdown.

² By 31st August 2020, Kenya, morocco, Nigeria, and South Africa, for example, have 34057, 61,399, 53,865, and 625056 total number of COVID-19 cases respectively. It is only South Africa that has comparable figure to high cases countries such as the USA (5,997,163), Brazil (3,862,311), and Russia (990,326) and Peru (647,166) as at the same date.

Baumann & Fornari, 2020). Budget deficits have equally widened across the globe, thus increasing the need for sovereign bond financing. Giving the negative reports across the global financial markets, understanding the impact of coronavirus on Africa financial markets stability is relevant for entrenching and sustaining measures to reduce vulnerability to global shocks, guiding against future health crisis, and building economic sustainability and resilience. The purpose of this paper is to analyse the impact coronavirus on financial markets stability in Africa. The paper provides evidence on the behaviour of African financial markets during the pre-coronavirus era, coronavirus endemic era and coronavirus pandemic era using skewness, minimum and maximum returns as well as volatility of returns analysis. The comparative analysis deepens our understanding on the impact of the pandemic on financial market stability in Africa and provides basis for formulating policies that will minimise vulnerability to the current pandemic shocks as well as guide against future health crisis. The rest of this paper is structured as follows. Section 2 presents literature review. Section 3 focuses on method of analysis and data. Section 4 discusses the results, and Section 5 concludes the paper with few policy implications.

Literature review

While numerous studies are currently being conducted on the COVID pandemic, the available literature is nascent and growing. A few of the available literature assessed reaction of global financial markets return and volatility to Coronavirus pandemic. Ali, Alam and Rizvi (2020), for example, reported that returns of most of the financial securities are negatively and significantly related to the COVID-19 deaths, but the volatility of most of the securities are positively related to the deaths. Similarly, Benzid and Chebbi (2020) reported that an increase of the number of cases and the deaths in the US has a positive impact on the USD/EUR, USD/Yuan and USD/LivreSterling. The findings of these studies suggest that financial assets become more volatile as the number of COVID-19 deaths increases.

Ito (2020) showed that, during the pandemic crisis, the stress in the financial system was connected in Germany, France, Italy, Portugal, and Spain. Akhtaruzzaman, Boubaker, and Sensoy (2020) showed that returns of listed financial and non-financial firms across China and G7 countries experience significant increase in conditional correlations during the COVID-19 period, but that the magnitude of increase is considerably higher for financial firms, indicating their importance in volatility transmission. In an emerging stock markets analysis, Topcu and Gulal (2020) reported that the COVID-19 pandemic has a negative impact on emerging stock markets but

that the negative impact has gradually fallen and started to narrow by mid-April. The finding of this study brought an element of good news to financial market participants when it evince that the negative impact of the pandemic has started to taper.

Several studies have also been conducted to identify safe haven investment in the financial markets during the COVID-19 pandemic. Mirza, Naqvi, Rahat and Rizvi (2020) demonstrated that while most of the investment funds in Europe exhibit stressed performance, social entrepreneurship funds endured resilience during the various stages of evolution of the coronavirus pandemic. Conlon, Corbet and McGee (2020) reported that Bitcoin and Ethereum are not a safe haven for the majority of international equity markets examined, but that Tether acted as a safe haven investment by successfully maintaining its peg to the US dollar during the COVID-19 turmoil. Lahmiri and Bekiros (2020) evinced that cryptocurrencies were unstable and more irregular during the COVID-19 pandemic compared to international stock markets. Similar findings were reported by Conlon and McGee (2020). These analyses suggest that investing in digital assets during COVID-19 pandemic could be riskier than investing in equities. A number of studies have examined the interaction between media reportage and financial markets behaviour, especially during crisis periods. Tetlock (2007), for example, reported, amongst others, that high media pessimism predicts downward pressure on financial market prices followed by a reversion to fundamentals. Engelberg and Parsons (2011) evinced that local media coverage strongly predicts local trading. Similarly, Peress (2014) demonstrated that the media contributes to the efficiency of stock market by improving the dissemination of information among investors and its incorporation into stock prices. These findings on the linkage between media and financial market behaviour have largely shown that prices and market volatility respond to news reportage. Again in the pandemic era, sentiment generated by coronavirus-related news may have contributed to the rapid spread of fears of a global financial market crash, which heightened volatility of financial market prices. This statement is supported in a recent study by Haroon and Rizvi (2020), who found that overwhelming panic generated by the news outlets are associated with increasing volatility in the equity markets.

Research methodology

To analyse the impact of coronavirus on stability of Africa financial markets, descriptive statistics, EGARCH (1,1) model and bivariate regression model were estimated. Specifically, financial asset return skewness and volatility were adopted as

measures for financial market stability³. The skewness coefficients for the financial markets return series were compared in the three sub-periods of the study – pre-coronavirus, coronavirus endemic and pandemic periods. The exponential GARCH (1,1) model introduced in Nelson (1991), were adopted to estimate volatility of African financial markets return, and bivariate regression model was employed to estimate the impact of total number of coronavirus cases on returns and volatility of African financial markets. The E-GARCH (1,1) model introduced asymmetric parameter, which responds to positive and negative shocks, as a modification to the symmetric GARCH (1,1) model. The EGARCH (1,1) model was estimated using the following equation:

$$\log \sigma_t^2 = \omega + \alpha_1 \left(\left| \frac{\varepsilon_t - 1}{\sqrt{\sigma_{t-1}^2}} \right| - \sqrt{\frac{2}{\pi}} \right) + \beta \log \sigma_{t-1}^2 + \gamma \left| \frac{\varepsilon_{t-1}}{\sqrt{\sigma_{t-1}^2}} \right| \quad (1)$$

The $\log \sigma_t^2$ is the volatility at time t , ω is constant variance, α_1 is first order ARCH term, β_1 is first order GARCH term, and γ is asymmetric parameter that measures the nature of impact of shock on financial markets' return volatility. The bivariate regression model to estimate the impact of total number of coronavirus cases on returns and volatility of African financial markets was specified as follows:

$$Pr_{i,t} = \alpha + \beta TCC_{c,t} + \varepsilon_{i,t} \quad (2)$$

where $Pr_{i,t}$ is as defined in equation 3, $\beta TCC_{c,t}$ is the parameter for change in total coronavirus cases for country c at time t , and $\varepsilon_{i,t}$ is the residual term. Statistically significant $\beta TCC_{c,t}$ coefficient would indicate evidence against absence of coronavirus impact on African financial markets return or volatility. Statistically insignificant $\beta TCC_{c,t}$ coefficient, on the other hand, would indicate support for absence of coronavirus impact on African financial markets return or volatility.

To estimate the models outlined above, we collected daily observations of Africa stock indices⁴, sovereign bond indices⁵, and Africa currencies/US dollar exchange rates⁶ as well as Sharia and Sukuk indices. In addition, we selected four African countries to represent each of the regions in Africa. The selected countries are Kenya, Morocco, Nigeria and South Africa. The total number of coronavirus cases during the pandemic era were used as a proxy for coronavirus⁷. The dataset ranged from 02 January 2019 to

31 August 2020, and were divided into three sub-periods. The first sub-period, ranged from 02/01/2019–30/12/2019, captures the pre-coronavirus period. The second sub-period (02/01/2020 – 10/03/2020) captures the coronavirus endemic period. The third sub-period (11/03/2020 – 31/08/2020) captures the coronavirus pandemic period. The division of the study period was to enable analysis of the behaviour of Africa financial markets before coronavirus, the effect of coronavirus endemic and pandemic periods on Africa financial market returns and volatility. All the dataset were transformed to percentage daily return as first difference of natural logarithm series thus:

$$Pr_{i,t} = \left(\ln(Fmp_{i,t}) - \ln(Fmp_{i,t-1}) \right) * 100 \quad (3)$$

Where Pr_i is the daily percentage return for financial market asset i , $Fmp_{i,t}$ is daily closing price of the financial market asset i at time t , $Fmp_{i,t-1}$ is previous day closing price of the financial market asset i , and \ln is natural log.

Results and discussion

Descriptive Statistics

Tables 1a, 1b and 1c display descriptive statistics of the percentage return series for Africa stock markets, sovereign bond markets, and African currencies/dollar exchange rates for pre-coronavirus period, coronavirus endemic period, and coronavirus pandemic period. Notice from Table 1a that African daily average stock return for the pre-coronavirus period is positive and not skewed but became negative and negatively skewed during the endemic and pandemic periods. The skewness of a normal distribution is zero. Liu, Zhang, and Wen (2014) observe that negatively skewed return distribution will increase the loss probability, whereas positively skewed one will increase the possibility of gaining. During the coronavirus pandemic, the return distribution of all Africa stocks including Sharia stock prices were negatively skewed, implying that there were higher probability of large negative returns than positive returns. This finding is similar those from sovereign bonds and exchange rates.

Notice also the very wide gap between percentage minimum return in the three periods studied. In pre-

³ World Bank identified skewness and volatility as common proxies for measuring of financial market stability, hence their choice as measures of financial market stability in this study (see: <https://www.worldbank.org/en/publication/gfdr/gfdr-2016/background/financial-stability>).

⁴ The Africa stock market data were obtained from investing.com database. Information on the stock data is available online: <https://www.investing.com/indices/african-indices>.

⁵ The sovereign bond data were collected from S&P Dow Jones Africa sovereign bond index, which tracks the performance of local currency-denominated sovereign bonds from African countries (see more data description at:

<https://www.spglobal.com/spdji/en/index-family/fixed-income/>).

⁶ The South Africa rand and Kenya shilling/US dollar exchange rates were collected from their respective central banks. The Nigerian naira and Moroccan dirham/ US dollar exchange rates were collected from African Markets database, which provides financial market data, news, analysis and research with a focus on Africa (available online: <https://www.african-markets.com/en/tools/currencies>).

⁷ The coronavirus data were collected from Our World in Data database available online: <https://ourworldindata.org/coronavirus>.

Table 1a: Descriptive statistics for Africa Stock markets

	Mean %	Minimum	Maximum	Standard dev.	Skewness
pre-coronavirus period					
Africa	0.0167	-3.0579	3.3541	0.9653	-0.0786
Kenya	-0.0248	-1.4385	3.3612	0.6520	1.2327*
Morocco	0.0236	-1.7263	2.0273	0.5677	0.2559***
Nigeria	-0.0695	-2.1630	4.2571	0.8529	0.7406*
South Africa	0.0462	-2.8302	2.1976	0.8491	-0.3575**
Sharia	0.0441	-2.6108	6.5100	1.0864	0.8152*
Coronavirus endemic period					
Africa	-0.4564**	-6.1779	2.2992	1.4850	-2.0672*
Kenya	-0.3034	-3.0550	1.3219	0.7878	-0.8137**
Morocco	-0.1477	-7.0565	6.6438	1.6761	-0.2020
Nigeria	-0.2313	-5.6982	3.9280	1.4391	-0.4874
South Africa	-0.3134	-6.7967	3.8914	1.7477	-1.4794*
Sharia	-0.5676**	-7.0159	3.5472	2.0495	-1.1866*
Coronavirus pandemic period					
Africa	0.0838	-12.1005	6.6378	2.5712	-1.3494*
Kenya	-0.2180**	-5.1382	1.8894	1.1555	-1.4474*
Morocco	-0.0851	-9.7900	3.9038	1.6793	-2.2448*
Nigeria	0.0472	-4.4642	3.4206	1.1075	-0.5811*
South Africa	0.1320	-10.4504	7.9071	2.4206	-0.8663*
Sharia	0.0381	-12.4327	5.3450	2.5925	-1.5472*

Note: *, ** and *** are 1%, 5% and 10% significance levels respectively

Table 1b: Descriptive statistics for Africa sovereign bond markets

	Mean %	Minimum	Maximum	Standard dev.	Skewness
pre-coronavirus period					
Africa	0.0672*	-0.8732	1.5050	0.3583	0.4280*
Kenya	0.0518*	-0.6351	0.8467	0.1963	-0.0037
Morocco	0.0237**	-0.5430	0.7483	0.2140	0.2874**
Nigeria	0.1175*	-1.6711	1.7560	0.4156	0.6644*
South Africa	0.0499	-4.3012	3.4363	1.0892	-0.0934
Sukuk	0.0368*	-0.3914	0.3947	0.1142	0.0131
Coronavirus endemic period					
Africa	-0.1302	-3.219	1.0711	0.7838	-2.6679*
Kenya	0.0308	-0.6562	1.0802	0.2969	0.6463***
Morocco	0.0373	-0.3865	0.7052	0.2448	1.1287*
Nigeria	0.0544	-2.3103	2.0442	0.6478	-0.6121***
South Africa	-0.2775	-3.5849	2.6584	1.2091	-0.3610
Sukuk	0.0455**	-0.5678	0.3310	0.1716	-1.5973*
Coronavirus pandemic period					
Africa	0.0627	-7.2343	3.2798	1.3416	-2.1594*
Kenya	0.0135	-1.2092	0.9782	0.2995	-0.5820*
Morocco	0.0600	-1.2770	2.1706	0.4763	0.1360
Nigeria	0.1175	-7.4847	3.1229	1.0973	-3.1938*
South Africa	-0.0266	-6.2113	5.9438	2.0181	-0.3287
Sukuk	0.0304	-1.2907	0.5929	0.2417	-2.3413*

Table 1c: Descriptive statistics for Africa currencies/dollar exchange rates

	Mean %	Minimum	Maximum	Standard dev.	Skewness
pre-coronavirus period					
Kenya	-0.0026	-0.9055	0.9714	0.2022	-0.1513
Morocco	0.0010	-0.8248	0.9525	0.2370	-0.0985
Nigeria	-0.0011	-10.0563	16.2212	1.5847	3.1333*
South Africa	-0.0111	-2.3176	3.0563	0.8513	0.2617***
Coronavirus endemic period					
Kenya	0.0316	-0.4048	0.9835	0.2201	1.5545*
Morocco	-0.0376	-0.5521	0.3207	0.2283	-0.8300**
Nigeria	0.0180	-0.5068	0.5374	0.2144	0.2719
South Africa	0.2673***	-1.7033	3.7405	1.0194	0.6611***
Coronavirus pandemic period					
Kenya	0.0446***	-1.0234	0.8712	0.2708	-0.5404**
Morocco	-0.0281	-1.6152	1.5556	0.4168	0.9700*
Nigeria	0.0457	-4.4703	3.9624	0.8425	-0.5765**
South Africa	0.0318	-4.0441	3.7640	1.2739	0.3946**

coronavirus period, the minimum daily return for African stock price was -3.06%. But during the coronavirus endemic and pandemic periods, the minimum daily returns were -6.17% and -12.10% respectively. These highlights the magnitude of the negative skewness reported above. Apart from the African stock prices, the countries' stock prices exhibited very wide gap between the pre-coronavirus period and endemic and pandemic periods. Sharia index, for example, recorded -2.661%, -7.01% and -12.43% minimum daily returns for pre-coronavirus period and endemic and pandemic periods respectively. Similar wide minimum returns were observed for sovereign bonds and exchange rates return series. The percentage minimum return for Africa sovereign bond index for the pre-coronavirus period and endemic and pandemic periods are -0.87%, -3.22%, and -7.23%, respectively. But percentage minimum return for Sukuk was narrower than the Africa, Nigeria and South Africa sovereign bond indices. The average daily volatility of sukuk prices for the pre-coronavirus period, endemic and pandemic periods were also smaller than those of Africa, Kenya, Morocco, Nigeria and South Africa sovereign bonds. This relates to Hassan et al. (2018) findings that sukuk offers a diversification benefit due to its lower volatility in returns in comparison to conventional bonds, but that the benefits decreases during periods of high volatility. The African currencies/US dollar exchange rate estimates show that the unconditional volatility is higher in the pandemic period, than in the endemic and pre-coronavirus periods. Similarly, the unconditional volatility of Africa stock returns are wider during the coronavirus pandemic period than in the other periods. In the same vein, the variability in stock returns is wider during the endemic period than in the pre-coronavirus period. These results are similar to Ampudia, Baumann and Fornari (2020) who noted that the standard deviation of daily equity returns of major indices in the euro area, the United States, the United Kingdom and Japan is at levels comparable to the peaks associated with the October 1987 stock market crash and the default of Lehman Brothers in September 2008. The decline in financial assets prices may have led to a large spike in the volatility of their returns.

Impact of coronavirus on Africa financial markets returns and volatility

Table 2 displays the results of bivariate regression model estimated to evaluate the impact coronavirus cases on selected Africa financial markets' return and volatility. The dependent variable is the Africa financial market return/volatility and the independent variable is the total number of coronavirus cases. Notice from *panel A* of *table 2* that COVID-19 pandemic has negative and statistically significant impact on stock market returns for Morocco, Nigeria and South Africa. The Kenyan stock market return is

also negatively impacted by the pandemic but the coefficient is not significant. These estimates suggest that increase in coronavirus cases results in negative stock returns in the African markets. Converse evidence is observed for Africa stock market returns volatility. COVID-19 pandemic has positive and significant impact on all the African stock markets' return volatility at the 1% significance level. The volatility results indicate that as number of coronavirus cases increases, volatility of Kenya, Morocco, Nigeria and South Africa stock returns also increases. This finding is related to Ali et al. (2020), who reported that returns of most of the global financial securities are negatively and significantly related to COVID-19 deaths. The finding is also similar to Topcu and Gulal (2020), who found that the coronavirus pandemic has a negative impact on emerging stock markets. Increasing volatility makes investors clamour for a higher risk premium in order to protect against increased uncertainty, which increases the cost of capital. Although Africa governments have unveiled different countermeasures to mitigate such negative impacts on the continent's stock returns volatility, it would be worthwhile to continually monitor the policies to ensure that they are effective in engendering financial stability in the region.

Notice also from *panel B* of *Table 2* that the returns on Africa sovereign bonds are all negative and significant at conventional levels, except for Kenya. Similar to the stock markets return, COVID-19 pandemic has negative and significant impact on African sovereign bonds return. The impact of COVID-19 pandemic on all the African sovereign bonds' return volatility is positive and significant at the 1% level. These results also imply that as number of coronavirus cases increases volatility of Kenya, Morocco, Nigeria and South Africa sovereign bond returns also increases. Notice also that South Africa sovereign bond appears more volatile than the other African countries. This may be attributed to the number of coronavirus cases in the country, which is the highest in the continent as well as the level of development of her financial market, which is considered as the most efficient in the continent. This explanation is in line with Peress (2014) finding that information disseminated among investors are incorporated into stock prices. The sentiment generated by coronavirus-related information and the associated fear of financial market crash may have contributed to the heightened volatility of Africa sovereign bonds. To reduce vulnerability to future health crisis, African countries should adequately fund the strengthening of their health-care system.

Panel C of *table 2* displays the impact of COVID-19 pandemic on the Kenyan Shilling, Moroccan Dirham, Nigerian Naira, and South African Rand versus US Dollar exchange rates. Notice that African exchange rate return series are all positive and significant, except for Kenyan Shilling. Positive impact of

Table 2. Results of bivariate regression of coronavirus cases on African financial markets

	Returns		Volatility	
	Coefficients	t-statistics	Coefficients	t-statistics
Panel A: Stock market				
Kenya	-0.1763	-0.3062	4.7188*	7.1481
Morocco	-4.4636*	-4.9703	51.9531*	10.6297
Nigeria	-1.3898***	-1.8568	6.2137*	10.0655
South Africa	-3.3901***	-1.7747	47.6017*	16.1806
Panel B: Sovereign bond				
Kenya	-0.0012	-0.7364	0.0041*	6.5398
Morocco	-0.0110*	-4.1931	0.0094*	6.0747
Nigeria	-0.0113*	-2.1628	0.0364*	10.3137
South Africa	-0.0364*	-2.6560	0.2952*	14.1315
Panel C: Exchange rates				
Kenya	0.0017	1.1120	0.0049*	4.7896
Morocco	0.0087*	3.7881	0.0077*	8.4660
Nigeria	0.0126**	2.4071	0.0675*	6.3074
South Africa	0.0178**	1.995	0.0964*	9.1734

Note: *, ** and *** refers to 1%, 5% and 10% statistical significance levels respectively.

COVID-19 on African currencies/US dollar exchange rate indicate that African currencies depreciated in value during the pandemic. An increase in number of coronavirus cases, for example, resulted in an increase in Naira/US dollar exchange rate. It thus requires more Naira to buy dollar. This is the element of depreciation of African currencies resulting from coronavirus pandemic. Currency depreciation hurts most African economies who have significant foreign-currency sovereign debt, as inflation and rising debt service increases the burdens and places downward pressure on their exchange rates. Panel C of table 2 also shows that COVID-19 pandemic impacted positively on volatility of African currencies/US dollar exchange rate. As the coronavirus cases increases, volatility of African currencies/US dollar exchange rate was equally increasing. This finding is similar to Benzid and Chebbi (2020), who reported that an increase in the number of cases and deaths in the US, has a positive impact on the USD/EUR, USD/Yuan and USD/LivreSterling. Although, it is conspicuous that coronavirus pandemic impacted negatively on Africa financial markets, the findings of this study calls for sober reflection on the weak structure of African economies, which reinforces vulnerability to external shocks. Africans pay the highest cost of fund in the sovereign bond market. African currencies fell freely during the pandemic. There is an urgent need for Africa to build a solid structure that will sustain migration from primary-commodity-exporting continent to value-addition and knowledge-intensive continent. Such effort will not only minimise external financial vulnerability but also conserve foreign exchange as some of the imported finished products would be manufactured in the continent. What economic sense does it make for Nigeria, for example, to export crude oil, use most of the export earnings to import refined petroleum, and then use the remaining earnings to intervene in the foreign exchange market to defend naira from depreciation?

Conclusion

This paper evaluates the impact of coronavirus on financial markets stability in Africa using descriptive statistics, EGARCH (1,1) model and bivariate regression model during the January 02 2019 to August 31 2020 period. The study period was divided into three sub-period: pre-coronavirus, coronavirus endemic and coronavirus pandemic periods. The results evince negative impact of coronavirus pandemic on Africa financial markets stability, as the stock markets and sovereign bonds returns from Kenya, Morocco, Nigeria and South Africa faced southward, with significant depreciation in the African currencies/US dollar exchange rate. The results further show that Africa financial markets return volatility increases as the number of coronavirus cases increase. Hence, coronavirus has negative impact on financial markets' returns and exacerbated financial markets return volatility in the continent. This conclusion highlights the overriding role of functional health-care system in achieving sustainable economic development. African countries should adequately finance the strengthening of Africa health-care system to reduce vulnerability to future health crisis. Beyond future pandemic risks, a quality health-care infrastructure is very important in building a resilient economic system. A situation where some African leader seek medical attention outside the continent cast doubt on the effectiveness of regional health-care system as well as on the implementation of priority policies.

Another major policy implication of this conclusion is the urgent need for Africa to build a solid structure that will sustain migration from primary-commodity-exporting continent to value-addition and knowledge-intensive continent. This effort will not only minimise external vulnerability but will also conserve foreign exchange as some of the imported products, such as coronavirus vaccine, would be manufactured in the continent. More so, there is need

for African financial market authorities to continually monitor the countermeasures implemented to mitigate the impact of coronavirus on the continent's financial market to ensure that they are effective in engendering stability in the region. Such endeavour will not only unearth ineffective countermeasures but will also enable review of implementation quality.

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Comparison and Assessment of Factors Affecting the COVID-19 Vaccination in European Countries

Porównanie i ocena czynników wpływających na szczepienia przeciw COVID-19 w krajach europejskich

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Abstract

The Covid-19 spread has become a major challenge for humanity in the last decade. It was believed that the Covid-19 vaccine development would have to end the pandemic. On the contrary, society has faced a new challenge which is that there are both countries that cannot afford to purchase the Covid-19 vaccine and inhabitants who do not trust new vaccine. Without adequate Covid-19 vaccination level, the global pandemic is not going to end. The object of this study is factors affecting the vaccination Covid-19 in European countries. The subject of the study is the statistical analysis methods to compare and assess of factors affecting the vaccination Covid-19 in European countries. The aim of the study is to find out which concerns about vaccination are more important and have an impact on the Covid-19 vaccination level in European countries. It is examined six factors; three of them relate to the government vaccine administration, the other three are about a public opinion on Covid-19 vaccination. The analysis is carried out in 22 European countries. The result of the study allows to state that public opinions factors are more important in pandemic and have more impact on the vaccination rate.

Key words: Covid-19 (Coronavirus) pandemic, government vaccine administration, public opinions, regression data analysis

Streszczenie

Rozprzestrzenianie się Covid-19 stało się głównym wyzwaniem dla ludzkości. Wydawało się, że opracowanie szczepionki przeciw Covid-19 zakończy pandemię. Tymczasem społeczeństwa stanęły przed nowym wyzwaniem polegającym na tym, że są zarówno kraje, których nie stać na zakup szczepionki Covid-19, jak i mieszkańcy krajów, które na nią stać, a którzy nie ufają nowym szczepionkom. Bez odpowiedniego poziomu szczepień przeciwko

Covid-19 globalna pandemia szybko się nie skończy. Przedmiotem badań są czynniki wpływające na szczepienia Covid-19 w krajach europejskich. Wykorzystano metody analizy statystycznej w celu porównania i oceny czynników wpływających na szczepienie Covid-19 w krajach europejskich. Celem badania jest ustalenie, które obawy dotyczące szczepień są ważniejsze i mają wpływ na poziom szczepień Covid-19. Bada się sześć czynników; trzy z nich dotyczą rządowego systemu podawania szczepionek, pozostałe trzy dotyczą opinii publicznej na temat szczepień przeciwko Covid-19. Analiza prowadzona jest w 22 krajach europejskich. Wynik badania pozwala stwierdzić, że czynniki opinii publicznej w przypadku pandemii odgrywają największą rolę i mają większy wpływ na wskaźnik szczepień.

Słowa kluczowe: Pandemia Covid-19 (koronawirusa), rządowy system podawania szczepionek, opinie publiczne, analiza danych regresyjnych

Introduction

The Covid-19 pandemic has had a major effect not only on people's life but also on countries' development. In new pandemic conditions researchers focused on studying all aspects of the Covid-19 impact both on human health and on the countries' future development. For the whole world this is a time of great uncertainty. A year ago, everyone thought that emergence of a Covid-19 vaccine would reduce the uncertainty degree. The vaccination is seemed to be the only way to end the pandemic.

Today there are some vaccines that are authorized and recommended in the world to prevent Covid-19. However, the desired effect has not been obtained. On the one hand, there are countries that have no opportunity to purchase vaccines; on the other hand, there are people who do not trust the new vaccine. It leads to the fact that the pandemic is not going to end in the near future and to the continuation of the Covid-19 recession in many countries. Public health correlate and connect with sustainable development strongly. Health of population contributes to economic development through high productive employment and low expenditure on illness care. It is fundamental for sustainable development.

While the Covid-19 vaccination has just begun and it is too early to make conclusion, certain trends in the factors impact are already visible. For example, among European countries Luxemburg with the highest health expenditures has the rate of Covid-19 vaccination four times less than in United Kingdom. Serbia is in the second place after United Kingdom in the number of vaccinated population and spends four times less than United Kingdom on medicine. These contradictions make it necessary to compare and assess factors affecting the vaccination Covid-19.

Literature Review

Different countries have adopted different containment strategies for Covid-19 spread. Learning from each country's experience and applying the best strategies is important. Some researches propose methods to allow direct between-country comparisons. Its results clearly show that comparing num-

bers of cases or deaths per 100,000 inhabitants suggests huge differences between countries (Middelburg, Rosendaal, 2020).

Other researchers focus on factor analysis. Most of the papers analyze lifestyle risk factors (smoking, physical inactivity, obesity, and excessive alcohol intake) and their impact on the Covid-19 spread (Hamer et al, 2020).

The next step was to study not only medical side of Covid-19 spread, but also a social. In paper (Vera-Valdés, 2021) 23 explanatory variables on health, political, and economic factors for 94 countries are considered. It is found out that the higher of trust in medical personnel and in the government a lower number of Covid-19 cases per million inhabitants.

With the Covid-19 vaccine invention researchers began to analyze the issues associated with its adoption.

On the one side, vaccine deployment plans and rollout of vaccination has been developed. The main role is assigned to the government (Strategic considerations in preparing for deployment of COVID19 vaccine and vaccination in the WHO European Region, 2021). There are concerns that level of development of the country and patterns of vaccine administration may not be at enough level to stop pandemic.

On the other side, there is an understanding of the fact that vaccination rate also depends on the population's acceptance. There are Covid-19 vaccination studies that prove correlation between belief and attitudes (Fisher et al, 2020), safety concerns (Gadoth et al, 2020) and Covid-19 vaccine acceptance. In paper (Clarke Ph. et al, 2021) study involved 15,536 people from 13 countries. Realizing the importance of public opinion European Commission requested a survey (Public opinion on Covid 19 vaccination in the EU, 2021). Almost the same surveys have been done in many countries (Report to the Orange County COVID-19, 2020).

From here there are two concerns about vaccination come to the fore. The first concern relates to a government vaccine administration, the other one to society rejection.

Aim is to find out which concerns about vaccination are more important and have an impact on the Covid-19 vaccination level in European countries.

Research methodology

The research measured 2 concerns that have been shown to affect the Covid-19 vaccination level in European countries.

While the one concern is about a government vaccine administration, the other is about a public opinion on Covid-19 vaccination. Each concern includes several factors.

A government vaccine administration depends on economic wealth, progress, and wellbeing. The standard measure of economic wellbeing is gross domestic product (GDP). For today GDP is the world's most powerful statistical indicator of national development and progress (Lepenies, 2016). There are different types of GDP. To compare and assess factors affecting the Covid-19 vaccination level in European countries is better to use GDP for capita, because it takes into account the population of a country without the cost of living that provides reliable statistics for every country.

Obviously, the costs expenditures to Covid-19 vaccination are determined not only by economic, but also by social factors. The other component of vaccine administration is the financial resources that a government devotes to health care. Since the Covid-19 vaccine cannot be purchased by private buyers, government health expenditure is of interest to compare and assess. For data to be more comparable, it is better to use indicator of government health expenditure for capita.

The last factor of the government vaccine administration is the organizational structure of a country's health system which one of the components is immunization. Immunization is a shared responsibility of both government and population (World Health Organization Scientific Advisory Group of Experts, 1998). A country's routine immunization system starts when vaccine is supplied by the manufacturer and ends when it reaches people. To compare and assess the level of the immunization system in European countries it is worth to analyze the childhood vaccines administration.

The other concern of the vaccination level in European countries is about a public opinion on Covid-19 vaccination (Kozlovskiy et al., 2021). On the one hand, people want to protect themselves from Covid-19, on the other hand, there is no confidence in the vaccine safety for health. From here factors can be divided into negative and positive factors affecting the Covid-19 vaccination level in European countries.

According to Survey requested by European Commission (Public opinion on Covid 19 vaccination in the EU, 2021) factors that forms negative attitude can be combined into such groups:

- public authorities are not sufficiently transparent about Covid-19 vaccine;
- Covid-19 vaccine are being developed, tested and authorized too quickly to be safe;

- people can avoid being infected by Covid-19 without being vaccinated.

Positive attitude to Covid-19 vaccination suggests that vaccination is the only way to end the pandemic. Both negative and positive attitude to vaccination resulted in responses according which close to one quarter would like to get vaccinated as soon as possible, slightly less than a third of Europeans would like to do it *sometimes in 2021 or later* (18%). About the same number of Europeans are not going to get vaccinated at all (17%), the rest do not know (13%). Here the mortality rate for Covid-19 can be added. Covid-19 has spread to approximately 215 countries and territories, in each of which people had died. A high mortality rate for Covid-19 should psychologically influence people to get vaccinated.

A previous analysis of the concerns affecting the vaccination level in European countries can be resulted in the following assumption:

- the higher the GDP for capita, the more opportunities the government has to ensure the high standard of living, including affordable access to quality healthcare;
- the higher the government health expenditure for capita, the more financial resources can be spent on the Covid-19 vaccine purchase;
- the higher the percent of immunized children, the better the immunization system is organized;
- the more who are ready to be vaccinated as soon as possible, the higher the vaccination rate;
- the more who are not ready to be vaccinated at all, the lower the vaccination rate;
- the higher the mortality rate for Covid-19, the higher the vaccination rate.

To test these assumptions statistical methods should be used. Comparison and assessment of factors affecting the Covid-19 vaccination level in European countries assumes to measure the degree to which data move in relation to each other. Regression analysis best suits this goal.

To specify the regression model dependent and independent variables should be defined. As it can be seen from assumptions dependent variable is the vaccination rate in European countries. Independent variables are the GDP for capita, the government health expenditure for capita, the percent of immunized children, DPT (government vaccine administration), the percent of population who are ready to get vaccinated as soon as possible, the percent of population who are not going to get vaccinated, the mortality rate for Covid-19 (public opinion on Covid-19 vaccination).

The impact of independent variables on the vaccination level in European countries should be considered in dynamics, since different countries show different increase in the vaccinated population from week to week.

Thus, the method of regression analysis is used for the assessment of factors affecting the vaccination Covid-19 level in European countries.

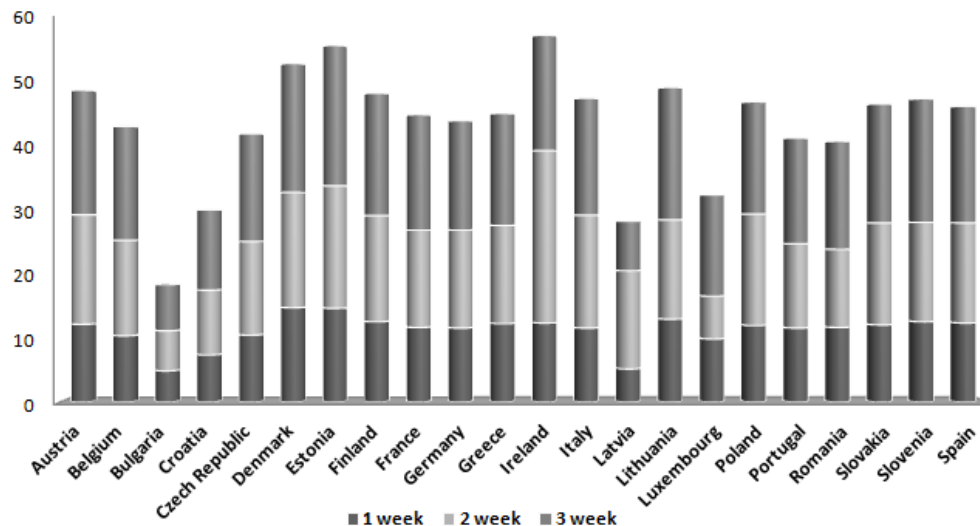


Figure 1. Weekly rate of Covid-19 vaccination, by country (per 100 people), (Statista, 021)

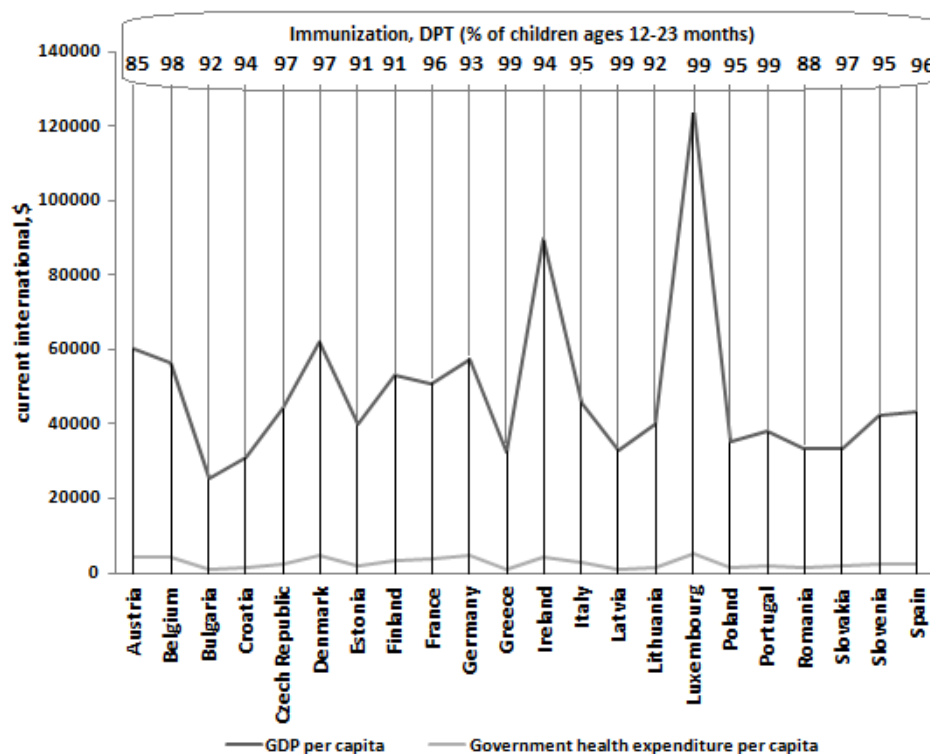


Figure 2. Data for comparison and assessment government vaccine administration factors (Worldometers, 2021)

Results

For the comparison and assessment of factors affecting the Covid-19 vaccination level were chosen 22 in European countries that took part in the Desk Research *Public opinion on Covid-19 vaccination in the EU* (2021).

The data for dependent variable consists of the historical weekly number of Covid-19 vaccination doses administrated in Europe as of March 17, March 28, April 4, 2021 per 100 populations (fig.1). Population who had been vaccinated from Covid-19 peaked in Ireland, a little less vaccinated in Estonia and Denmark. Bulgaria, Latvia, and Croatia have the

lowest vaccination rates among the countries analyzed.

Data for comparison the government vaccine administration factors were taken from Worldometers databases (fig.2).

The highest GDP for capita is in Denmark, Ireland, and Luxembourg. However, only Denmark is in the top five vaccination's country among European countries. Bulgaria and Croatia have the lowest GDP for capita as well as vaccination rate.

Compared with the other European countries, Denmark, Germany, and Luxembourg have the highest government health expenditure for capita, spending approximately four times more than in Latvia,

Table 1. A regression analysis result for government vaccine administration factors

	R-square	Significance F	t-statistics	Coefficient
<i>GDP per capita</i>				
1 week	0.1795	0.4242	0.8159	0.0000204
2 week	0.1882	0.4015	0.8571	0.0000272
3 week	0.2154	0.3355	0.9868	0.0000353
<i>Government health expenditure per capita</i>				
1 week	0.3276	0.1365	1.5509	0.0005
2 week	0.3531	0.1069	1.6880	0.0008
3 week	0.3605	0.099	1.7287	0.0009
<i>Immunization, DPT (% children ages 12-23 months)</i>				
1 week	0.1718	0.4445	-0.78	-0.1164
2 week	0.2045	0.3586	-0.9395	-0.1771
3 week	0.2045	0.3611	-0.9344	-0.2002

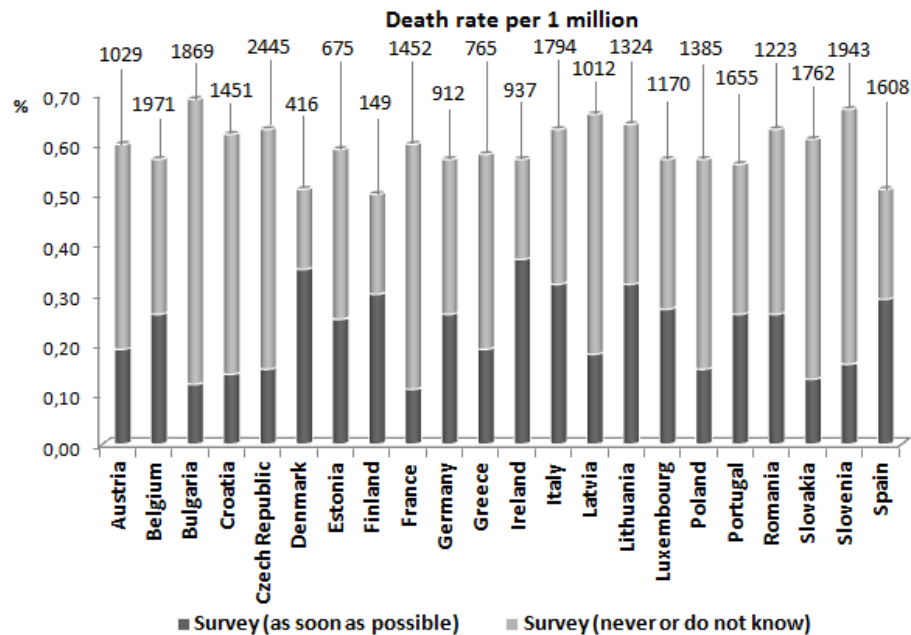


Figure 3. Data for comparison and assessment public opinions factors (World Bank, 2021)

Greece, and Bulgaria that are the lowest spenders. Both Latvia and Bulgaria vaccinate less than 7% of population based on latest information.

In every European country immunizations to protect against diphtheria, whooping cough and tetanus (DPT immunization) are given to children. DPT vaccine is compulsory, and the number of vaccinated children may indicate the organization of the immunization system. Despite this, the percent of immunized children ages 12-23 months varies significantly from 85% in Austria to 99% in Greece, Latvia, Luxembourg, and Portugal. At the same time Latvia and Luxembourg are among the five countries with the lowest Covid-19 vaccination rates.

To run a regression analysis the data for comparison and assessment government vaccine administration factors were tested with a Chi-square test and heteroskedasticity test. The data are truly independent.

A regression analysis was done in Excel using the Regression data analysis tool. The result is displayed in Table 1.

The coefficient of determination (the R-square value in table 1) measures the proportion of variation in the vaccination rate explained by the government vaccine administration factors. The higher correlation's strength is preferred (Kozlovskiy et al., 2020). At first 17.95% of the vaccination rate variation is explained by the GDP per capita, 32.76% is explained by the government health expenditure per capita, and 17.18% is explained by organization of immunization's system. Every week the impact of the government vaccine administration factors increases.

The value of significance F in table 1 shows if the regression analysis results are reliable. It should be less than 0.05. For every factor of the government vaccine administration significance F is more than 0.05. It means that the impact of the government vaccine administration factors should be rejected.

Also, none of the factors of the government vaccine administration have a significant effect on the vaccination rate. To reach this conclusion the value of t-statistics in table 1 was compared with critical value of the student's test of freedom 21 and 5% significance level.

Table 2. A regression analysis result for public opinions factors

	R-square	Significance F	t-statistics	Coefficient
<i>Positive public opinion</i>				
1 week	0.4767	0.0248	2.4251	15.103
2 week	0.4521	0.0346	2.2668	18.208
3 week	0.4301	0.0456	2.1310	19.684
<i>Negative public opinion</i>				
1 week	0.5731	0.0052	-3.1282	-12.596
2 week	0.5561	0.0072	-2.9914	-15.53
3 week	0.5108	0.0151	-2.6575	-16.213
<i>Death rate per 1 million</i>				
1 week	0.3369	0.1251	-1.6006	-0.0015
2 week	0.2877	0.1940	-1.3438	-0.00147
3 week	0.2221	0.3205	-1.0187	-0.00145

The mean change of the vaccination rate for one unit of change in the government vaccine administration factors also increase. It can be seen from the regression coefficient in table 1. The trend in the regression coefficients change is fully consistent with the trend in the R-square value change. So the government vaccine administration factors are becoming to inspire confidence for population.

Comparison and assessment of factors affecting the Covid-19 vaccination level in European countries allows concluding that government vaccine administration factors do not significantly affect vaccination rates.

Data for comparison the public opinions factors were taken from World Bank databases and Survey *Public opinion on Covid-19 vaccination in the EU* (fig. 3). In Ireland, Italy, and Lithuania approximately a third of the population want to get vaccinated as soon as possible. In Bulgaria, France, and Slovenia approximately a half of the population are not going to vaccinate or do not have any opinion. The mortality rate for Covid-19 differs and may have an impact on public opinion about vaccination. For example, while in Czech Republic it has reached 2445 death per 1 million, in Finland it is 149 deaths per 1 million.

For assessing factors of the public opinions affecting the vaccination level in European countries regression analysis are run in Excel. The result is displayed in Table 2.

A measure of the correlation's strength (R-square in table 2) between negative public opinion and vaccination rate in European countries is the highest. For the first week it means that 57.31% of the variation in vaccinated rate can be explained by variations in negative public opinion. R-square is lowest for the factor *Death rate per 1 million*, but still higher than for government vaccine administration factors. Further the R-square decrease for all public opinions factors.

Since significance F is less than 0.05 for both negative and positive public opinion factors, results are reliable.

According to t-statistics in table 2 the factors of the negative and positive public opinion have a signifi-

cant effect on the vaccination rate in contrast to factor *Death rate per 1 million*.

The trend in the regression coefficients change is the opposite of the R-square in table 2. It means that despite of the vaccination's result, the population is not apt to change its first opinion.

Comparison and assessment of public opinion factors affecting the Covid-19 vaccination level in European countries allows concluding that negative public opinion affect vaccination rates the most.

Discussion

While a regression analysis result for government vaccine administration factors shows that none of the factors have a significant effect on the vaccinated rate in European countries, a regression analysis result for public opinions factors, especially for negative public opinion, have an effect.

In the current context of the Covid-19 pandemic, public opinion on this issue has a more significant impact on the vaccination process itself. We can observe such a situation in Israel, where more than 50% of the population (as of 01.04.2021) received the Pfizer vaccine, but as soon as the question of the quality of this vaccine arose, public opinion began to prevail and the State of Israel suspended the purchase of this vaccine and even the payment for previous supplies. This problem has become unique from the point of view. We have witnessed such a situation when the opinion of society has become more important than the opinion of the state with its health policy, state guarantees and financial instruments and opportunities. A unique situation with vaccination has developed in Ukraine. To stimulate the vaccination process, the state of Ukraine adopted a law that is unique from the economic point of view, which removes liability from vaccine manufacturers in the event of negative consequences of vaccination (Law of Ukraine No.1353-IX, 19.03.2021). Ukraine took responsibility for the negative consequences on itself, but the process of vaccination against this in the country did not accelerate. Ukraine ranks one of the last places in Europe for vaccination against

Covid-19. All these factors indicate that society needs to be influenced through new instruments. These tools can be both compulsory vaccination and information policy that can guarantee high quality vaccines. Individualistic society is less prone to risk getting vaccination that may be needed to control the pandemic.

On the other hand, as it can be seen the correlation's strength between the factors of government vaccine administration and vaccination rate increases and the factors of public opinion and vaccination rate decreases. Over the time it is likely that factors of government vaccine administration come out on the top. The main criterion by which comparison and assessment of factors affecting the Covid-19 vaccination level is carried out is correlation's strength (R-square in table 1, 2) between factors. Despite the fact that R-square do not show a high correlation, in new pandemic condition it can be used to determine the value of the assumptions being tested and results can become part of any policy discussion.

Conclusion

As a result of studying the problem of vaccination and the factors that influence this process in European countries, the following conclusions can be drawn (results of regression analysis):

- the GDP for capita has a negligible correlation with the vaccinated rate, its values increases, the reliability of the model is low but it improves;
- the government health expenditure for capita has a low positive correlation with the vaccinated rate, its values increases, the reliability of the model is likely to be high in a few time;
- the immunization system has a lowest correlation with the vaccinated rate, the reliability of the model shows no significant tendency to improve;
- the part of the population who are ready to be vaccinated as soon as possible has a low positive correlation with the vaccinated rate, its values decreases, the reliability of the model is likely to deteriorate;
- the part of the population who are not ready to be vaccinated at all has a moderate negative correlation with the vaccinated rate, its values decreases, the reliability of the model is high;
- the mortality rate for Covid-19 has a negligible correlation with the vaccinated rate, its values decreases, the reliability of the model is not enough.

Comparison and assessment of factors affecting the Covid-19 vaccination level allows concluding that public opinions factors are more important in pandemic and have more impact on the vaccination rate. Regardless of vaccination results public opinions factors are not easy to change. In a few time the government health expenditure for capita is likely to have the greatest impact on the vaccination level in

European countries. Other factors do not have a significant impact.

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Legal Regulation and Reflection of Public Health Emergencies in China on the Example of Coronavirus Pandemic

Regulacje prawne w kontekście sytuacji kryzysowych związanych ze zdrowiem publicznym w Chinach na przykładzie pandemii koronawirusa

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Abstract

At the moment, the shortcomings in the system of responding to crises in the health sector lie in the imperfection of the response order and management mechanisms. The purpose of the paper is to investigate the legal regulation and reflection of public health emergencies in China, as exemplified by the case of 2019 coronavirus. The paper discusses the legal framework for the regulation of emergency situations in public health in China for the period from the end of 2019. The importance of preventing and controlling the epidemic is substantiated, and shortcomings in the work to combat the epidemic are analysed. Particular attention is paid to issues of informing the public and the rule of law in emergency situations in public health. The provisions of the legislation of the People's Republic of China in public health emergencies were also examined. The paper is of practical importance not only for China, but for the entire world in the prevention and control of coronavirus.

Key words: emergency management, infectious diseases, new coronavirus, epidemic

Streszczenie

Niedociągnięcia systemu reagowania na kryzysy w sektorze zdrowia tkwią w niedoskonałości kolejności reagowania i mechanizmów zarządzania. Celem artykułu jest zbadanie regulacji prawnych i odzwierciedlenie sytuacji kryzysowych w zakresie zdrowia publicznego w Chinach, na przykładzie epidemii koronawirusa z 2019 r. W artykule omówiono ramy prawne regulowania sytuacji nadzwyczajnych w zdrowiu publicznym w Chinach. Udokumentowano znaczenie zapobiegania i kontrolowania epidemii oraz przeanalizowano niedociągnięcia podczas zwalczania epidemii. Szczególną uwagę zwrócono na kwestie informowania opinii publicznej i praworządności w sytuacjach nagłych zdarzeń odnoszących się do zdrowia publicznego. Przeanalizowano również przepisy Chińskiej Republiki Ludowej dotyczące sytuacji kryzysowych związanych ze zdrowiem publicznym. Artykuł ma praktyczne znaczenie w zapobieganiu i kontroli koronawirusa nie tylko dla Chin, ale dla całego świata.

Słowa kluczowe: zarządzanie kryzysowe, choroby zakaźne, nowy koronawirus, epidemia

Introduction

In the history of humankind, infectious diseases have always been a major threat to human health. The spread of infectious diseases has had a major impact on human civilisation. That is why the

countries of the world are taking appropriate measures and creating tools to strengthen legislation in health, to control the spread of infectious diseases, environmental health, and health education (Tongda, 2004). At present, the legislative provisions in healthcare in many countries, from the standpoint of

the laws of regulation themselves and other areas, vary widely from state to state. However, ensuring the health and prosperity of citizens has always been one of the priority tasks of the state. Based on the interests of strengthening the legislative framework in public health, establishing unified fundamental principles of legislation in healthcare, the legislative model of each state includes: the economic model (Havighurst, 1988), the model of trust (Hall, 2002), the salvation model (Bloche, 2003), the model of international health right (Mariner, 2009), a model of social justice Rosenblatt, 1988), and a model of healthy justice (Wiley, 2016).

Prior to the SARS outbreak, Chinese health legislation was rather backward. The results of studies of that time indicate that the scientific community approached the study of emergency legislation, state laws on a state of emergency, and legislation on emergency situations (Jihong, 1994). After the outbreak of SARS, academics began hard work on research in public health. However, scientists investigated the system of legislation on public health crises within the legal system of emergency situations, did not separate the two systems (Huaide, 2004). It is the lack of order in the Chinese public health system that is its biggest problem. In this regard, a significant part of the Chinese healthcare system is incapable of functioning properly (Chi-Man Yip, 2012). In recent years, Chinese health legislation has been constantly improved, and the government is making efforts to provide basic healthcare (Yunliang, 2014). As health laws and their enforcement remain unresolved, this leads to the need to continue to work on improvement of the public health crisis response system (Jianyang, 2003). Despite the use of the organisation form of the US Centres for Disease Control and Prevention (CDC), the similar Chinese Centre for Disease Control and Prevention (CCDC) cannot get rid of the functions of a research institution. Such a distribution of powers is insufficient, and this leads to the fact that mechanisms for controlling the spread of diseases in China cannot respond well to the emergence of new infectious diseases (Weikang, 2003). At the same time, with a lack of an authoritative coordinating body, ambiguity appears in the job functions of other departments. When resolving large-scale public health crises due to the impossibility of creating effective mechanisms, it is possible to miss the right moment of response to an emergency situation in healthcare, thereby aggravating the problem (Peng, 2007). Furthermore, the right to information is one of the fundamental rights of citizens, and timely and accessible reporting by the authorities ensures that this right is respected. Protecting citizens' right to information is a core value of government transparency (Ji, 2013).

Specific features of emergency legislation in public health

From the end of December 2019, patients with a diagnosis of pneumonia of unknown origin began to continuously turn to hospitals in Wuhan. In Wuhan, the influenza epidemic continued to spread, with 27 patients diagnosed with viral pneumonia. On December 31, 2019, the National Health Commission of the PRC (NHC) sent the first group of specialists to Wuhan to conduct research (Wei, 2019). On January 1, 2020, 8 people were prosecuted for misinformation about the so-called Wuhan virus (Jun, 2020). On January 5, 2020, the Wuhan Health Commission (WHC) stated that people with previously unknown pneumonia are sellers in the Huanan seafood market. The initial investigation did not reveal any transmission of the virus from person to person, as no cases of infection of medical workers were detected. Infection with influenza, bird flu, adenovirus, SARS, and Middle Eastern respiratory syndrome (MERS) were also ruled out (Changzheng, 2020). On January 18, a second group of specialists from the Health Commission arrived in Wuhan, confirming the transmission of the virus from person to person, and recommended quarantining the city (Nanshan, 2020). On January 20, 2020, NHC issued Order No. 1 of 2020 on the inclusion of a new type of coronavirus in category B of the *Law on the Prevention and Treatment of Infectious Diseases of the PRC* with the recommendation of preventive measures for category A viruses (Jianhua, 2020). On January 23, 2020, Wuhan's public transport was suspended, airfields and stations were closed (Tintin, 2020). On January 30, by decision of the World Health Organization, a new type of coronavirus was included in the list of global health problems. After an outbreak of SARS 17 years ago, this epidemic disturbed both the people of China and the entire world.

Currently, the PRC legislation on public health emergencies includes the following provisions:

- Two laws: *The Law on the Prevention and Treatment of Infectious Diseases of the PRC* (came into force on December 1, 2004, amendments of June 29, 2013); *The PRC Emergency Response Act* (came into force on November 1, 2007).
- Administrative rule: *Rules for responding to emergency situations in public health* (came into force on May 9, 2003, amendments of January 8, 2011).
- Two regulations: *General Emergency Response Plan* (came into force on January 8, 2006); *Public Health Emergency Response Plan* (came into force on February 26, 2006).

According to Section 3 of the *PRC Emergency Response Act* (hereinafter: *the Response Act*), an emergency is a natural disaster, a sudden catastrophe, a

public health problem, or a public safety incident that suddenly arises and constitutes a public threat security. In the *General Emergency Response Plan* (hereinafter: the *General Response Plan*), the definition of an emergency is approximately the same as in the *Response Act*. Based on Article 2 of the *Public Health Emergency Response Rules* (hereinafter: the *Response Rules*), public health emergencies are called epidemics of infectious diseases that create or can cause serious harm to public health, mass diseases for unknown reasons, large-scale food poisoning, and other massive health problems. The *Public Health Emergency Response Plan* (hereinafter: the *Response Plan*) was approved based on the *Law on Prevention and Treatment of Infectious Diseases of the PRC* (hereinafter: the *Law on Prevention*). The *Health Action Plan* uses roughly the same wording as the definition of a public health emergency *Response Rules*.

The *Response Act*, the *General Response Plan*, the *Response Rules* and the *Response Plan* provide precise definitions of an emergency and an emergency in public health. They suggest that emergencies are described by urgency and the presence of a threat to public health. The epidemic of the new coronavirus corresponds to the legally defined features of a public health emergency.

Public health emergency information survey

On December 31, 2019, the first group of NHC specialists arrived in Wuhan. On January 3-5, WHC continued to publish information on the outbreak of the disease, the number of people with SARS by January 5 reached 59 people. The report said that *there were no cases of transmission of the disease from person to person, there were no cases of infection of medical personnel*. The report of January 5 also indicated the time of the emergence of the virus – the period from December 12 to 29. On the same day, the Fudan University Clinical Centre for Public Health published a study of the genome of the new Wuhan virus, found its similarity to SARS equating to 89.11%, suggested that the virus is transmitted through the respiratory tract. The Centre also recommended *taking appropriate preventive measures in public places*. On January 6, the Control Centre included the Wuhan outbreak in the second category of response to public health problems. On January 18, the second group of NHC specialists arrived in Wuhan, confirming the possibility of transmission of the disease from person to person.

On January 22, the Hubei Provincial Administration included the outbreak in a second category of health problems. On January 24, the level of response was increased to the first level. On January 27 afternoon, during an interview with the mayor of Wuhan, Zhou Xianwan, said that the outbreak of the epidemiological situation was not timely. Since this is an infectious and contagious disease, information about it

must be made public in accordance with the *Law on Prevention and Treatment of Infectious Diseases: As a representative of the local administration, after I get permission to make the information public, I will* (Ting, 2020). According to Section 4, Chapter 1 of the *Prevention Act*, for infectious atypical pneumonia of class B, anthrax pneumonia, highly pathogenic avian influenza transmitted between people, it is necessary to take control and prevention measures as for class A diseases.

Other infectious class B diseases and outbreaks of viruses of unknown origin also require control and prevention measures as a class A disease, but publishing information about them or taking any real action is allowed only after the approval of the administrative departments of the Department of Health Management of the State Council of the PRC. Thus, the authorities of provinces, special autonomous regions, cities of central subordination have the right to publish information and take measures in respect of class B or C infectious diseases that are common in this region, and must also inform the services of the public health department of the State Council of the PRC. Based on paragraph 3 of Article 1 of the *Response Rules*, depending on the nature, degree of danger and coverage, health emergencies are divided into especially serious (1st category), serious (2nd category), fairly serious (3rd category), and ordinary (4th category).

Clause 1 of Article 4 determines that at the time of an emergency in public health, local governments of different levels, in accordance with the principles of a phased response, develop a response plan of different levels. Article 3 states that emergency situations in public health below a particularly serious level should be decided by local authorities under their responsibility.

In reality, the Hubei provincial government could declare the second level of a public emergency on January 6, however, until January 22, after the NHC specialists confirmed the contagiousness of the virus, the second level of a public health problem was announced. However, the head of the local administration in Wuhan, during an interview with the media, confirmed that the knowledge of local authorities on emergency response laws in healthcare was weak, there were separate problems of bureaucracy and red tape.

Description of the rule of law principle in emergencies

On December 30, 2019, at 5 p.m., an ophthalmologist at the Wuhan Central Hospital, Li Wenliang, in a Wechat chat of the 4 clinical group of the University of Wuhan, published a message *There are 7 cases of SARS registered in the Huanan seafood market* and urged his colleagues to *take action*. To confirm his words, Li Wenliang published in the chat about a *positive SARS test result with a high level of*

analysis accuracy in the patient, an attached a scan of his chest. An hour after that, he wrote in the chat that the information about the coronavirus was confirmed and is in the process of typing. On January 3, 2020, Li Wenliang was officially reprimanded by the police for *spreading false rumours on social networks*.

On January 8, 2020, Li Wenliang, during a patient examination, became infected with a new coronavirus of unknown origin. On January 10, 2020, Li Wenliang showed symptoms of fever and cough – the disease progressed. On February 1, at 10 hours 41 minutes, Li Wenliang posted information on his Wechat account, claiming that he was tested positive for coronavirus. On February 7, 2020 at 2 58 a.m., an ophthalmologist at the Wuhan Central Hospital died after fighting a new type of coronavirus. On February 7, 2020, having received the Central Committee's approval, the Central Commission for Discipline Inspection decided to go to Wuhan to conduct a thorough investigation in response to the public reaction to the history of Dr. Li Wenliang (Baiké, 2020). However, Dr. Li Wenliang, who was the first to sound the alarm about the outbreak of the virus, received no apology either from the Wuhan City Police or senior officials from Hubei Province regarding his censure. After the death of Li Wenliang, he was popularly called the *whistle-blower of the virus*. According to Article 19 of the *Response Rules*, the state establishes a warning system in case of emergency. The Main Department of Health of the State Council of the PRC established a reporting standard for emergency response and defined an alert system in case of an epidemic. In the presence of one of the following circumstances, the governments of the provinces, autonomous regions, and cities of central subordination must submit a report to the Head Department of Health of the State Council of the PRC within an hour after the emergency:

- on detection and spread of infectious diseases;
- on mass disease with an unexplained cause;
- on the emergence or possibility of the emergence of a previously disappeared strain of an infectious disease;
- on mass food poisoning, poisoning or disease in the workplace. The Main Department of Health of the State Council of China shall be obliged to report to the State Council on incidents that pose a threat to human health.

Based on Article 20 of the *Response Plan*, emergency control bodies, healthcare institutions and other relevant bodies, upon detection of an incident described in Article 19 of the said document, must report to the health department of the local county administration within 2 hours; the health department of the local administration must send a report to the local administration within 2 hours, as well as prepare a report for the higher department of health and for the department of health of the State Council of

the PRC. After receiving the report, the county administration must submit the report to the higher municipal government or other higher administration within 2 hours; after receiving the report, the municipal administration must within 2 hours submit a report to the provincial government, autonomous region, city of central subordination.

According to paragraph 1 of Article 291 of the *Criminal Code of the PRC* (adopted on October 1, 1997, amended on November 4, 2017) (hereinafter referred to as *the Criminal Code*), the dissemination of fabricated information and misinformation on emergencies, epidemics, disasters, incidents in social networks and other media, or deliberate dissemination of information that violates the peace of citizens in social networks and other media shall be punishable by imprisonment for up to three years, short-term imprisonment, or supervision. With serious consequences – for a period of 3 to 7 years. According to Article 25 of the PRC Law *On Penalties for Violations of Public Order* (adopted on March 1, 2006, amendments of January 1, 2013) (hereinafter *On Penalties for Violations*), rumours, dubious reports of disasters, epidemics, incidents, and other methods of disturbing public peace shall be punishable by arrest for a period of 5 to 10 days or a fine of up to 100 yuan; either by arrest up to five days or a fine of up to 500 yuan, depending on the gravity of the crime.

In the case of 8 Internet users fined by Wuhan police for spreading rumours of Wuhan Pneumonia, the law was taken literally. Indeed, the reported cases of pneumonia were not related to SARS, and, therefore, the dissemination of information about the detection of SARS in Wuhan fell under the article on the dissemination of misinformation that violates public peace, and accordingly, administrative or criminal penalties for such actions were legitimate. However, in reality, although the new pneumonia is not SARS, disease information has not been completely fabricated. If the *rumour* had spread, preventive measures would have been taken in time – wearing masks, strict disinfection, avoiding wildlife markets, which would help to contain and control the spread of the virus. Therefore, law enforcement agencies must take into consideration the presence of malicious intent and the degree of awareness in the issue of those publishing and disseminating information. If, nevertheless, the information at large is reliable, and the publishers and disseminators of it do not have malicious intent, and their actions do not cause obvious harm, such *misinformation* should be treated more tolerantly and gently.

Misinformation arises from untimely publication of information that is difficult for the public to understand. A natural consequence of emergencies is the concern of citizens about their health. With timely notification and proper informing of the population about the current situation, panic naturally decreases. Otherwise, the population turns to social networks

for information, listens to rumours. Thus, the solution to the problem of spreading rumours lies not in punishing the perpetrators after the fact, but in correctly informing the population. If the government does the job of publishing information, the masses will begin to compare open information and false rumours received, and over time they will find that information from the government is timely and accurate, and false rumours will lose massive support. And vice versa, if false rumours get confirmation over and over again, in a critical situation the masses will naturally choose to believe the rumours. Based on this logic, if there is a threat to public health, governments of different levels are required not only to be responsible for informing at the local level, but also to think about national security.

It is undeniable that the modern media climate has radically changed since SARS. In the days of SARS, there was no alternative media (WeMedia), official information channels were the only source. At that time, although there were unconventional ways of disseminating information, namely forums, blogs, messengers, their influence was limited, and they did not claim to be the main source of information. To date, the situation has changed significantly. Along with the development of commercial media, a number of social networks have also appeared such as Weibo, Wechat, acting both as alternative sources of information and as a platform for expressing personal opinion. People in the epidemic zone communicate through voice messages, short videos, and using other formats, establishing direct and reliable contact and undermining the leadership of conventional media in disseminating information. It is obvious that with a large amount of information, any attempt to conceal the facts is in vain; conventional measures to control information are very difficult to implement. On the one hand, it is an indicator that Chinese society has become even more mature, free, and open. On the other hand, this freedom provided the media basis for the dissemination of false information. This is the first time that the free media climate has faced a major public health problem. This subject is complex and relevant, and should be addressed in the context of modern government of a state.

Specifics of pressure on public opinion in public health emergencies

An important detail of the *Li Wenliang Case* is the official *censure* expressed by the police department on Zhongnanlu Street, Wuhan District, Wuhan City. In the document of the *Zhongnanlu Wuhan Police Department (20200103)*, the word *censure* is used twice – once in the title of the published *censure* verdict, the second time – in the text of the document: *based on current legislation, you are censured for posting information on social networks that does not*

correspond to reality. The *Modern Chinese Dictionary* defines the word *censure* as *a measure of public punishment by criticism, defined by the people's court as a punishment for a light crime or misconduct*. This word can also serve as a verb with the meaning – *instruct and warn* (Dictionary of Modern..., 2005).

From the standpoint legal science, *the excess of powers prescribed by law is not allowed, the actions of state bodies should be regulated by law*. The current law on *Administrative Offenses* (adopted on October 1, 1996, amendments of September 1, 2017) does not mention *censure* as a preventive measure that law enforcement bodies can take. From the standpoint of administrative law, this measure actually emerged in Article 9 of the *Rules of Punishment in the Control of Public Order of the People's Republic of China*, which were no longer in force since 2006 (came into force on January 1, 1987, and lost legislative force on March 1, 2006). However, this Article was applied to minors over 14 years old. The said Article stipulates a milder sentence for persons under the age of majority: *persons under the age of 14 who have committed an offense are exempted from punishment, but may receive public censure, and their guardians should educate them in strictness*. Accordingly, *censure* as a measure of administrative punishment of the district police station on Zhongnanlu Street, Wuhan City, Wuhan City, regarding the doctor, contradicts the essence of the legislative power and the power of amendments to Article 7 of the *Law on the Legislative Power of the People's Republic of China* (came into force on July 1, 2000, amendments of 15 March 2015).

In the modern Chinese legislative system, whether substantive or procedural, *censure* constitutes a preventive measure that a people's court can choose. Article 37 of the *Criminal Code* states that for minor offenses, a sentence is not required, criminal penalties can be dispensed with, however, based on various circumstances of the case, public censure or a written remorse, apology, compensation for damages, as well as an administrative punishment or a penalty can be imposed. Section 2 of Article 193 of the *Code of Criminal Procedure of the People's Republic of China* (came into force on January 1, 1980, amendments of October 26, 2018) states that witnesses who refuse to attend the court without good reason or who refuse to speak after being present in the court may receive public censure, under aggravating circumstances, the judge may sentence them to 10 days of arrest. Clause 2 of Article 65 of the *Code of Civil Procedure of the People's Republic of China* (came into force on April 9, 1991, amended on June 27, 2017) states that the people's court determines the certificates that must be provided in accordance with the statements of the parties, as well as the deadlines for submission.

In case of untimely provision of evidence, the court may require an explanation of the reasons for the delay; in the absence of grounds or inability to establish the reasons for being late, the court may not accept the evidence or accept it, but express a censure or impose a fine. Clause 2 of Article 110 states that a people's court may express a censure, remove them from the courtroom, or impose a fine on individuals who violate the rules of the court. Article 59 of the *Code of Administrative Procedure of the PRC* (adopted on October 1, 1990, amended on June 27, 2017) states that in case of a series of actions by the parties to the proceedings or by other persons, the people's court may, depending on extenuating and aggravating circumstances, apply the following sanctions to them – express public censure, order written repentance, impose a fine of up to 10 thousand yuan, or arrest for up to 10 days. If there is a *corpus delicti*, criminal prosecution is also possible. Thus, the powers of the people's court include both the imposition of criminal penalties for people with minor violations of the rules and the application of sanctions against violators of the judicial procedure. Furthermore, the censure of the doctors was justified as follows: *In connection with your violation of the provisions of the 'Rules of Punishment in the Control of Public Order of the PRC' and a serious violation of public peace, your actions were regarded as criminal*". It is unclear from the cited text, the violation of which law is referred to, only mysterious *provisions* are mentioned, without a specific reference to the article of legislation. In this case, the principle of the legality of administrative actions was violated. However, despite the fact that the police officers performed their duties in accordance with the legislation, it later turned out that the warnings of Li Wenliang and his fellow doctors were well-founded, which provoked a wave of public outrage. Thus, the Wuhan government should openly admit its mistakes, paying tribute to Li Wenliang and his 8 colleagues. Article 2 of the *PRC Constitution* (adopted on December 4, 1982, amended on March 11, 2018) states that all power in the PRC belongs to the people. The people are the starting point for all politics, economics, social activities in China. However, citizens do not learn information from legal acts or political propaganda. They learn about state affairs through major and minor incidents in their own lives, this is the way they learn the connection between the people and political power (Xijin, 2020). Article 35 of the *PRC Constitution* states that the Chinese people have the right to freedom of speech, press, assembly, and movement. Article 51 states that citizens of the PRC in the exercise of their rights and freedoms must not interfere with state, public, and collective interests, as well as the legal rights and freedoms of other citizens. The publication of public censure by Li Wenliang caused a significant public outcry. It is important to note that there was no *corpus delicti* in the doctor's

actions – he only warned people of his professional circle about the danger of infection. When the epidemic spread from Wuhan to Hubei, and then throughout China, it was acknowledged that Li Wenliang was right and that he was unjustly treated. However, the Wuhan government did not take public opinion into consideration and did not withdraw the *censure*, avoiding this issue until the media boiled with indignation and more and more moved away from the people. On February 5, 2020, Chairman Xi Jinping, during a speech at the third meeting of the commission on ensuring the rule of law in public administration, emphasised that at the time, in conditions of a significant threat to sanitary and epidemiological well-being, it was necessary to create a favourable legal environment for organising preventive measures and combating the spread of the virus (Jinping, 2020). 76 days after Li Wenliang's *censure*, on March 19, 2020, the Wuhan City Public Security Authority decided to cancel the censure verdict and solemnly apologised to the doctor's family and brought the perpetrators to administrative responsibility.

Conclusions

Proceeding from the foregoing, it can be argued that among the legitimate ways to respond to a sudden outbreak of infection are:

- Strict implementation of the prevention and control of the epidemic, as well as compliance with emergency laws. It is necessary to take strict measures for prevention and control in accordance with the law, to inexorably prevent the spread of the epidemic.
- Strict implementation of the articles of the *Law on Prevention*, in accordance with the law, taking measures to control and prevent the epidemic.
- In accordance with the law, raise public awareness of the epidemic. Provision of information about the epidemic in accordance with law-approved content, order, format, time frame, and accuracy.
- Tightening judicial control in key areas for epidemic control, and ensure justice.
- Ensuring the rule of law in matters of prevention and control of the epidemic, informing the public.
- Ensuring the resolution of legal issues during the fight against the epidemic, providing legal aid to citizens in need.

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Transformational Leadership: An Approach of Business Sustainability during the COVID-19 Pandemic with Special Reflection to India

Przywództwo w czasie transformacji: podejście do zrównoważonego biznesu podczas pandemii COVID-19 z perspektywy Indii

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Abstract

The whole world is in the crisis of monumental proportions because of the effects of COVID 19. It is the most deadly pandemic not only in India but globally. The cost of the pandemic as concerning the loss of human lives is painful, but the effects on the global economy and the prospects for sustainable development are also worrying. How to sustain the business organization in this time of pandemic is one of the most crucial questions raised in this time.

The present paper investigates the role of business leaders in this time of COVID 19 and their concerns towards business sustainability with special reflection to Indian business organisations. This paper basically deals with two questions the first one is what is COVID 19 and its effects, the second one is the role of transformational leaders towards business sustainability in this time of the pandemic.

Key words: COVID-19, organisations, supply chain, sustainability, transformational leadership

Streszczenie

Z powodu skutków COVID-19 cały świat przeżywa kryzys o ogromnych rozmiarach. Jest to najbardziej śmiertelna pandemia nie tylko w Indiach, ale i na całym świecie. Koszt pandemii związany ze śmiercią ludzi jest bolesny, ale niepokojące są również skutki dla światowej gospodarki i perspektywy zrównoważonego rozwoju. Jak utrzymać organizację biznesową w dobie pandemii, to jedno z najważniejszych obecnie pytań.

Niniejszy artykuł bada rolę liderów biznesu w czasach COVID-19 i ich obawy dotyczące zrównoważonego rozwoju biznesu, ze szczególnym uwzględnieniem indyjskich organizacji biznesowych. Niniejszy artykuł dotyczy zasadniczo dwóch pytań: pierwsze dotyczy tego, czym jest COVID-19 i jakie są jego skutki, a drugie dotyczy roli liderów transformacji w kierunku zrównoważonego rozwoju biznesu w dobie pandemii.

Słowa kluczowe: COVID-19, organizacje, łańcuchy dostaw, zrównoważoność, przywództwo w czasie transformacji

1. Introduction

COVID-19 is an unembellished problem not only for India but globally. All individuals exist in time without any precedent. This horrible pandemic not only affects human health but also affects the society, environment, and the business world. The impact of the

coronavirus pandemic in the Indian economy has been substantially disruptive. Indian GDP has plummeted in the quarter ending in June by -23.9 percent on a year-over-year constant price basis, as attempts by the country to eradicate coronavirus have created economic havoc. The GDP rate of India has collapse to face the pandemic (Statista.com, 2021). The

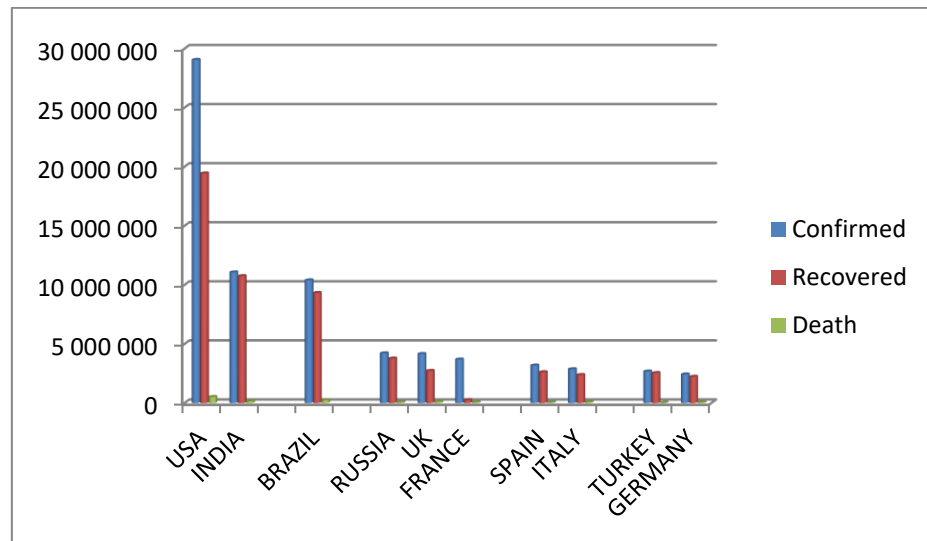


Figure 1. Top ten affected country in worldwide, sources: WHO, CDC, ECDC, NHC of the PRC, JHU CSSE, DXY, QQ, and various international media Note: This figure shows the top ten country affected by COVID -19 by the corona tracker (coronatracker.com, 2021)

World Bank and rating agencies downgraded India's fiscal year 2021 performance, with India's lowest figure, in the first three decades since India's economic liberalization in the 1990s (Mallya, D'Silva, 2020, p. 197). India's unemployment ratio increased in a month from 6.7 percent on March 15 to 26 percent on April 19 (See figure -2). An estimated 14 crore people lost their jobs during the period of lockdown. More than 15 percent of households across the nation reported lower incomes compared with the previous year. The Indian economy was estimated to lose more than 32,000 crores daily in the first 21 days of complete lock-down declared after the coronavirus outbreak (Eduindexnews.com, 2020). Less than a quarter of India's 2.8 million dollars economic activity was usable under full lockdown. Up to five percent of companies were expected to be greatly affected. *The COVID-19 pandemic outbreak has forced many businesses to close, leading to an unprecedented disruption of commerce in most industry sectors* (Donthu, Gustafsson, 2020). Major business organizations in India such as Tata Motors, Bharat forge, Larsen & Turbo, Ultra tech cement, Aditya Birla groups, BHEL have temporarily suspended due to the effect of COVID-19. This pandemic not only affects the major business organization but also affects the new start-up small organizations. Young start-ups were affected by a fall in funding. The rapid movement of consumer goods firms in the country has substantially reduced their operations. The stock market in India on 23 March 2020 posted its worst losses in history (Indianexpress.com, 2020).

Present-day the epidemic has significant economic effects worldwide, and it does not appear that any nation has not affected. After a long dreadful period, now India moves towards work. Business organizations are trying to stabilize in this pandemic. The

leaders have played a major responsibility to sustain the business organizations in this situation. The leaders need to come back to work with proper strategy and plan to tackle the current pandemic situations because the leaders and their decisions might be the only way to make the organization stable. It is in this sense that business leaders should respond to the effects of the crisis with coronavirus.

2. COVID 19 as a Pandemic: An analysis

COVID-19 marks the return of a threat which is very old – and familiar. Throughout human history, nothing was more devastating than the disease-causing viruses, bacteria, and parasites. Worldwide billions of deaths were reported due to these pandemics. The COVID-19 pandemic is first and foremost a humanitarian crisis. It is a severe acute respiratory syndrome caused by an infection. It was first identified in Wuhan, China in December 2019 and has since spread worldwide, leading to a continuing pandemic. It emerges as the largest pandemic experienced globally as it has affected more than 200 countries. World Health Organisation has declared the COVID 19 pandemic as a global health emergency (WHO, 2020). In addition, it has a wide range of Clinical signs of common colds, fever, and respiratory problems that are found in infected people and can contribute to the seriousness of the disease to die. The disease morbidity rate is found to be very high in elderly patients, as well as those with co-morbidity as asthma, diabetes, heart disease, and cancer (Chu et al., 2004; Zhou et al., 2020). More than 5.59 million cases in 188 countries and territories were reported as of last May 2020, resulting in more than 350,000 deaths. More than 2.28 million recovered. The interesting thing is that worldwide India has second place in COVID-19 cases after the USA

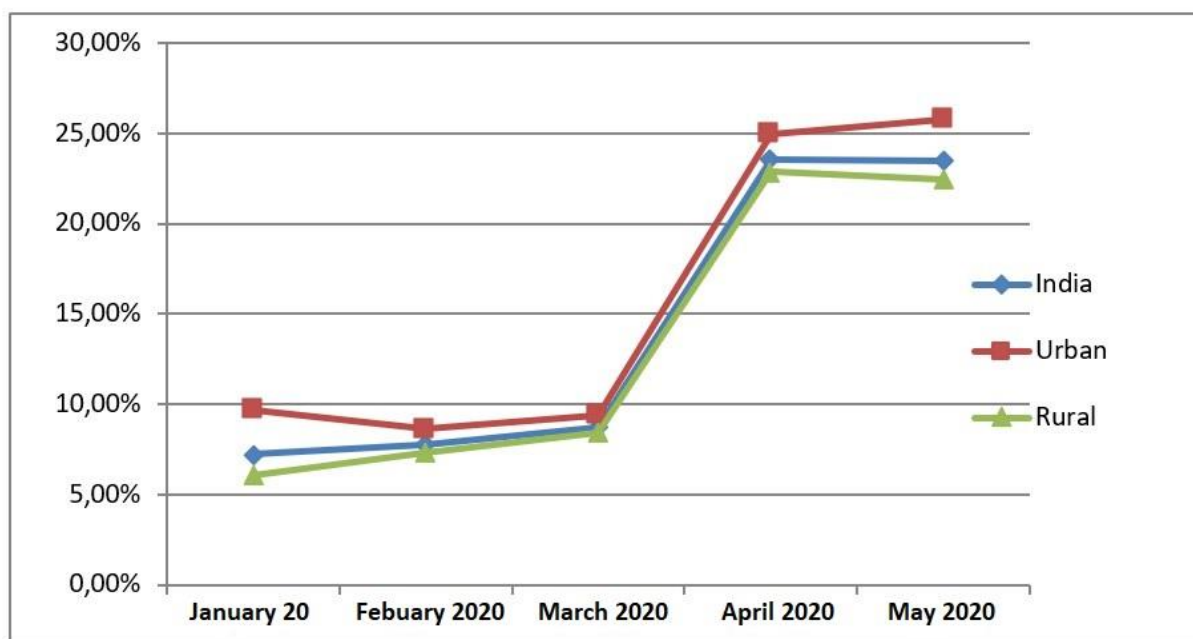


Figure 2. Unemployment rate in India, Source: centre for Monitoring Indian Economy Pvt. Ltd, unemployment rate in India
 Note: unemployment rate in India from January 2020 to May 2020 by centre for Monitoring Indian Economy Pvt. Ltd.

and Brazil has a third-place after India. The cases number of USA has 28261619, the India has 11030176 cases and Brazil has 10257875 cases. The case numbers between India and Brazil is almost the same but in mortality rate the India has the third position after the USA and Brazil. Wherever the USA has 502681 cases, Brazil has 248529 cases and India has 156567 mortality cases (See figure 1). The pattern seems puzzling. In population, wise India has the second positions after China. India's high population opens the door for viruses. Executing social distancing is a challenge for 1.3 million people who are living in close quarters with joint families. Especially the slum areas people, where the whole family live in a small room where social distancing is well near unthinkable. No doubt it is difficult to point out a particular reason why India's mortality rate is fewer than the USA and Brazil. Some researchers say that the COVID-19 had a relatively late arrival in India, thus giving it a chance to learn from experience (Theprint.in, 2021). Different research has shown that younger COVID-19 patients are less likely to die from the infection maybe this is also one of the reasons for India's fewer mortality rate. The normal age of the Indian populace is 26.8 years, while that of the US and Brazil is 38.5 years and 33.2 years. A research carried out by top genetic experts has shown that Indians can be grateful to their genes for battling with the COVID pandemic with a comparatively lower mortality rate as compared to the US and European nations (see figure 1). The international team analyzed complete ACE2 gene DNA data from different continental populations and

found that some gene mutations are helping populations in South Asia and East Asia to battle the virus effectively and reduce the mortality rate relative to the US and Europe (Nationalherald-india.com, 2021).

The pandemic is becoming an on-going international epidemic, with significant effects on the health and economic activities of citizens. Efforts to contain the virus and support those directly affected are paramount. The actual expense of the coronavirus pandemic won't be counted for a while. But one casualty now necessarily follows: sustained growth. The pandemic has revealed the inability of the world to meet basic human needs, especially with regard to health. Still, it is threatening to erase the recent social, economic and environmental advances, particularly among the most vulnerable populations in the world.

3. Impact of Covid-19 on Business organization: An overview

All socially necessary financial actions that are persuaded for-profit purposes can be defined as a business. It is a part of living, one of the important pillars of our society. It is the backbone of our economy. In addition, a market is not just a company; it is a network of performers that operates according to a set of principles. These processes are also called value-generating complex ecosystems (Vargo & Lusch, 2011). It indirectly helps the individual to live their own life according to their need and greed. But in this situation, the scenario is something different. Business organizations are badly affected by the effects of COVID-19. *The COVID-19 outbreak is*

likely to cause bankruptcy for many well-known brands in many industries as consumers stay at home and economies are shut down (Tucker, 2020). No one has any idea about how long the crises will last but everyone can see how this pandemic destroys the business world. Maximum business organizations have temporarily closed from March end to now. The ratios of unemployment in India rose day by day (see figure 2). The point is who will sustain the business organization and preserve the unemployment ratio. Literature shows that how decision-making capacity makes the situation worst, at the same time; it also helps to sustain the organization in the worst situation. (Power, 2002, p-47; Daft & Marcic, 2010, p-188; Fleisher & Bensoussan, 2015, p-17). The concept of business sustainability depends on the decision-making capacity of business leaders. Leaders should come back to the organization with proper planning, which will help to sustain the business organization. The leaders should be more cautious to find out the way to sustain the organisation and to invest the money in a proper way for future growth and stability. Sustainability is not only concerned with protecting and sustaining our world, it is also concerned with good and responsible corporate governance and social responsibility. The main thing is the future of business organisation after COVID-19. Due to the pandemic, the unemployment rate rose so high, As compared to the previous year, more than 45 % of households across the nation have recorded an income decline.

India's enthusiasm for a constructive approach to achieving the Sustainable Development Goals (SDGs) seems to have taken a back seat in this time of pandemic crisis. A crucial question to pose at such a time is how to prioritize our long-term priorities in light of the current situation? Will we be more concerned about climate change threats instead? How do we achieve resource productivity while maintaining safe communities and implementing methods for conserving nature and its resources from our past? During the current situation these issues may not seem of utmost importance but are equally relevant and need to be addressed on a forum of its own.

At this time business organizations are somehow play an important role to tackle the terrible situation. The pandemic has affected all sectors of the economy, among them, MSMEs are the worst affected. It means the business leaders should be more cautious to stabilize the home grounds of MSMEs. This sector also has major contributes to Indian GDP, countries have about 25% GDP from service operations and more than 33% to India's manufacturing production (Economietimes.indiatimes.com, 2021). The leaders need to focus on MSMEs to stable the GDP and at the same time it also helps to control over the increasing unemployment ratio. Small organizations are like the backbone of the Indian economy. This sector is like the engine of growing

India, that's why the government of India has implemented many policies and influence the MSMEs to strengthen their sector. The MSMEs development act was enhanced in the year 2006. The main aim of this act is fascinating the promotion, development, and enhancing the competitiveness of MSMEs and for matter connected therewith. After that, the Indian government was set up in 1954 as an apex body for MSME's sustained and coordinated growth, providing some policies for the creation of MSMEs; they are like a small industry development organization. In 2020 the COVID-19 has threatened the Indian economy, resulting in the possibility of a breakdown of the MSME sector. In connection with this very sudden closing down, there are an infinite amount of questions we might ask ourselves. In such cases, for example, how are we taking care of employees? Why don't businesses get more organised to treat cases like this? Since the post-pandemic world will wake up to a new trade society with governments around the world enforcing the lockdown and making social isolation the new standard. Countries across the globe have taken very different approaches to deal with the existing work shortages and infrastructure pressures. This pandemic creates a different set of circumstances that make countries more nationalistic and less globalized. This nationalistic circumstance opens the opportunity door to MSMEs.

3.1. Supply Chain and COVID-19: An Overview

The supply chain is the whole production and delivery system for a product or service from the very first phase of the raw materials up to the final product delivery. The supply chain is an essential point for complete and successive business organisations. It is the process of making and selling goods. COVID-19 pandemic has hit the business organisations from the root level around the world. This pandemic situation creates a challenge for business leaders to sustain the organisation in front of COVID-19 crises. Business leaders are face lots of challenges to sustain the business organisation; supply chain is one of the important challenges for leaders because the whole process depends on the supply chain system. In a post-COVID-19 world, supply chain stress tests will become a new norm. The distributed global business model, optimized for minimum cost, is finished. The rule and procedure of the supply chain after a pandemic is totally changing. The modern supply chains face unprecedented pressure and are drawing an increased level of inquiry. Many supply chains were broken after the lockdown as a result many business organisations suffered a lot. One fact is clear: many organizations, especially those that rely on China to meet their requirements of raw materials or finished products, have already been vulnerable to this situation. This includes pharmaceuticals, automobiles and chemicals, and textiles. This

change will hit the small and poor business organisations; maybe some organisation will withdraw or quit the business sector because before the COVID-19 the rule for supply chains was so cheap which don't make any financial burden on small and medium organisation but after lockdown, the thing has changed. COVID-19 is the black swan event that eventually forces numerous business organisations, to reconsider and transform the global model of their supply chain. COVID-19 teaches business leaders to stress new performance measures including resilience, responsiveness, and adaptability when drawing up future supply chain designs, apart from cost, quality, and delivery. The model of tomorrow calls for new optimization priorities and a stable way will be preferred. The supply chain has become a leading player in all areas, from playing an organizational role behind the scenes to being the prime conductor of the company. It is understandable that most companies now focus on the short-term with their strategies that deal with the situation of COVID-19 is a temporary problem. But if companies strategically look at and cleverly align their current situation, it certainly will help drive future growth and competitive advantage over the next few years. This will increase organizations' end-to-end visibility of the supply chain. They could build new products, services, and innovations to provide their customers with greater value through collaboration with their suppliers. Enterprises can develop better digital capabilities to better obtain, cooperate and manage their suppliers. Finally, this could make e-commerce more efficient and provide an Omni-channel approach in combination with more traditional operations and online channels. In order to lower the supply-side risks of any country, companies would also try to broaden supply chains from a geographic perspective. There will be identified multiple sources of key commodities or strategic components and protocols to activate alternative supply sources in the short term. Domestic companies have to develop their own local procurement units and adopt alternative strategies to decrease China's dependency. This kind of strategy will help the organisation to face the uncertain challenges in future.

4. Transformational Leadership: Revisiting leadership theory

The leadership concept has become increasingly one of the most prominent subjects in the field of business over the last decade. Globally it has increased the attention of different organizations in the 21st century. There are different varieties of leadership styles that are available in the full range of leadership models (FRLM). The FRLM is a Base's leadership theories which center of attention is to analyse and examine the behaviour of leaders in a different predicament in the business domain. B.M Bass and Avolio in their co-authored article *Transactional*

leadership and organisational culture explain the concept of three distinct leadership styles such as transactional, laissez-faire, and transformational leadership. Among the three leadership styles one is appropriate for this challenging situation, that one is transformational leadership.

Transactional leadership style:

This style is an essential and integral part of the full range leadership model which encompasses on the performance of leaders in the business domain. This style of leadership is based on open reward and punishment for this it is able to keep followers motivated for the short term. Buns in his notable work *leadership* explain transactional leadership occurs when a person takes the initiative in making contact with others for the purpose of valued things. It means this style has some limitation because this kind of style in an organisation is based on reward and punishment, that it is not applicable in the time of the pandemic.

Laissez-faire leadership style:

Laissez faire leadership style comes from French means let it to be or leave it alone. In a practical sense it means leaders leave it up to their subordinates to complete responsibilities in a manner they choose, without requiring strict policy and procedure. This style is also not applicable in the time of pandemic because this time needs teamwork. In this challenging period, the organizations can't leave everything on the leaders and the business leaders can't leave everything on the shoulder of subordinate. The above two leadership styles are necessary for organizations but at this time this style is not sufficient to tackle the pandemic situations.

Transformational leadership:

It is a style of full-range leadership model; it is defined as a leadership approach that causes a change in the individual and social structures. It produces, in its ideal form, a valuable and beneficial change in the followers, with the ultimate purpose of turning followers into being good leaders. It has been described as key issues in getting more creative and empowering workers to solve different kinds of challenges through their organizational citizenship behaviors. Leaders have the capacity to manage the socio-economic balance in the business organization; social status also affects the growth of the business. Leadership has been paid increasing attention in the social work profession in the 21st century (Rank & Hutchison, 2000, p-08; Zhang, Liu & Wang, 2020, p-467). The business world should maintain social work and integrity to show their responsibility towards society and the environment, which will help the leaders to attract the customers towards organisation. Different literature shows that leaders with outstanding ability could help the organization to achieve more remarkable success in day to day developing market. (Prentice, 2004; Businessnews-daily, 2021). Because today's market requires integrity and ethics (Abela & Murphy, 2008, Hbr.org,

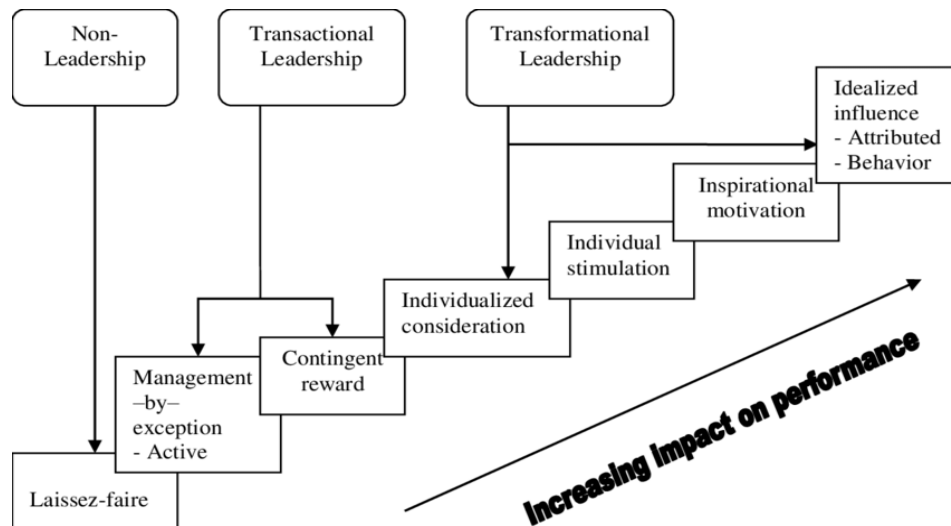


Figure 3. The full range leadership model, source: Kirkbride, 2006; Bass & Avolio, 2000, 2003; Graham, 2008

2021). Over the past three decades, transformational leadership (TFL) has emerged as one of the predominant leadership approaches to understanding individual, group, and organizational effectiveness (Avolio, Walumbwa, & Weber, 2008; Rumsey, 2013, Mayr, 2017).

In today's critical systems, the speed and complexity of the coronavirus epidemic present exceptional challenges for leaders. In this time of pandemic, the organisations situations are something different than the previous time. The whole world is ready to work with new normal situations. It is easy to say that, why business leaders have overlooked the opportunities and fair communications to tackle pandemic situations. But it is a mistake to assume that in these bleak times, leadership failures are all that we can expect. The pandemic is an unexpected challenge for the whole world, within the challenging period now the leaders should act in an immediate, truthful, and iterative manner, understanding the errors are inevitable and correcting the course is the way to deal with them when they happen, not assigning blame. To tackle the effect of the pandemic situations in an organisation the business leaders should take some leadership model. Different kinds of leadership models are able to make the leaders effective to tackle the worst situations *Effective leaders are considered one of the most pivotal resources for organizations both in times of normalcy and crisis, yet international criticism has flared pertaining to national, state, local, corporate, and policy leadership in this COVID-19 environment of discontinuous change* (Shututinsky, DePorres, Long & Sibel, 2020). The concept and model of transformational leadership help those leaders to reframe adversity. It is a chance to establish the positive transformational change in organisations. Through decades of interaction with leaders in high-impact environments, the transformational leadership structure and practice methodology at the root of the curriculum has developed. In

order to bring the ideas to use, each principle is combined with pragmatic instruments and techniques. It helps the leaders to take the right decision in the time of the pandemic, which will be in the favour of organisations and society.

4.1. Models on Transformational Leadership Characters

Literature shows various leadership styles, which help managers to develop leadership qualities in organisations. Even there are lots of models on transformational leadership has developed by many researchers. (Bass and Avolio, 1994; Kirkbride, 2006; Winfrey, 2016). All researchers are trying to illustrate the character and responsibility of transformational leadership in an organization towards the followers, society, and customers. Some of them as discuss, which will be appropriate model for leaders to tackle the worst situations.

4.1.1. The full range leadership model

The full-range leadership model was developed by Kirkbride, 2006; Bass & Avolio, 2000, 2003, the focus of this model is on the increasing impact on performance. This model asserts that there exists an appropriate strategy to convert transactional leaders to transformational leaders. However, we find the strategy on how to develop the transaction leader into full range leaders (see figure 3) the full range leaders represent the steps through which a non-leader can able to be a full range of leaders and increasing the impact on performance. At the same time, this figure shows how transformational leaders overcome transactional leaders. High-performance workplace development has become even more critical and company leaders must be able to motivate team participants to move beyond their mission requirements. As a result, a new leadership concept emerged-one of them is transformational leadership. This model can be used to develop transformative leadership within organizations.

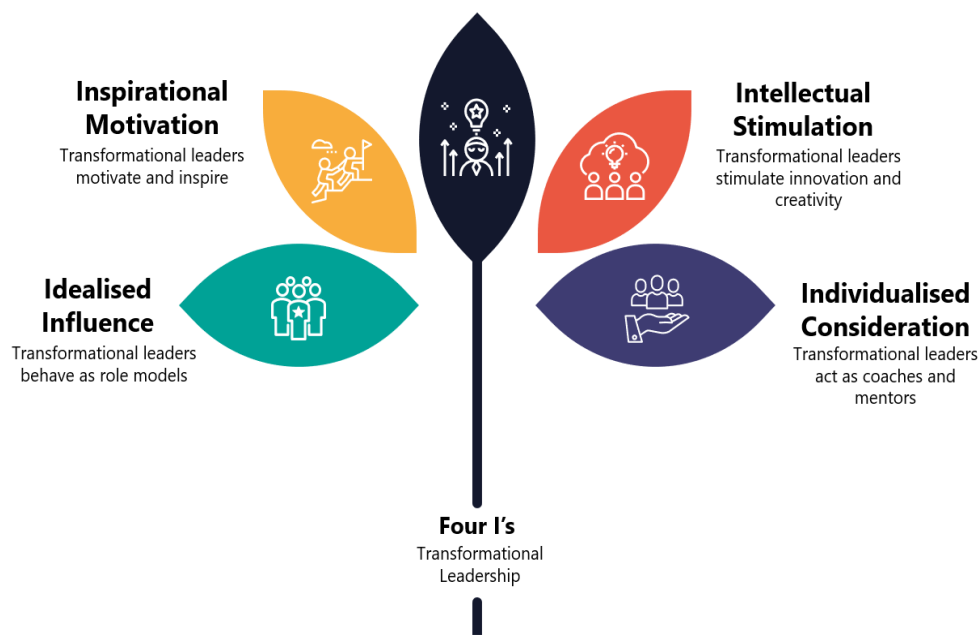


Figure 4. I'S model, source: Bass and Avolio, 1994

4.1.2. Four I's model

This four I's model (figure 4) was developed by Bass and Avolio (1994), the main focus of this model is on the characteristics of transformational leaders. This model asserts that there exists an appropriate balance on the leader's behavior and responsibility with idealized motivation, idealized influences, intellectual stimulation, and individualized consideration. However, we find that only the transformational leaders maintain the balance among the four I's (see figure 4), the four I's represents the role and responsibility of transformational leaders in an organization. Hence this model ultimately leads to helps the leaders to take stable decisions which are useful for the organisation on undergoing environmental turbulence and an ever-changing situation. So that, the four 'I' will help the business leaders to face the pandemic and take the right decisions to tackle the worst situations.

Individualized consideration: The first point of the *transformational* leadership style is individualized consideration (IC). The leader of the IC shows consideration for their followers respects them as individuals, gets to know them well, and listens to their concerns and their ideas. (Kirkbride, 2006, p-26). Individual consideration is the most important point to engage the employees in work because at this time of pandemic situations many feel mental pressure to lose their jobs or work in close proximity to people who are potentially infected. It means to influence the employees to achieve the common goal individualized consideration should take the prior seat. Transformational leaders behave in ways that lead them to be role models of their followers that they have been admired, respected, and trusted and followers wish to emulate.

Intellectual stimulation: The second theme of the transformational style is intellectual stimulation as shown in figure 3. It is one of the important pillars of a leader's character; leaders with this style stimulate and encourage creativity in their followers, which will help the leaders to influence their followers to be creative. Self-reliance is one of the results of creativity. Looking at the current situations, the whole country realizes that Self-reliance is also a way to sustain the GDP of India. Intellectual stimulation (IS) essentially involves the leader encouraging followers to think for themselves through questions and problems and thus develop their own abilities. It helps the employees to get a ride from this horrible pandemic situation and able to fight against the situation. Maybe this is the reason that the Indian government announced the Atmanirbhara Bharat scheme, which is the best opportunity for individuals as well as employees of MSMEs. Transformational leadership encourages the efforts of its followers to be inventive and imaginative through challenging, hypothesizing, avoiding issues, and addressing old circumstances in new ways. New ideas and innovative problem-solving approaches are sought from followers interested in the problem-solving and solution-finding process. Leaders should be encouraged their followers to seek different approaches and not dismiss their ideas because they vary from their members. This kind of style must be needed to tackle the pandemic.

Inspirational motivation: The third kind of transformational style is inspirational motivation. It is one of the important styles the leaders should follow to achieve the goal. The inspirationally motivating leader (IM) has the potential to inspire followers to achieve superior results. Those leaders tend to be

able to express a vision of the future in an exciting and convincing way that the followers can embrace and aspire to. (Kirkbride, 2006, p-26). TFL should act in ways that empower and encourage those around them by presenting their followers with meaning and challenges. The leaders include followers in envisioning the potential desirable Country. That will be also helping the leaders to face the pandemic and sustain the organisations.

Idealized influence: The final transformational style refers to the leader who has become for those around them an idealized influence (II) or *role model*. These leaders are seen as role models either because they possess certain personality traits or *charisma* or because they possess certain moral behaviours' (Kirkbride, 2006, p-27). TFL should behave in ways that lead to their followers becoming role models. The leader can be counted on doing the right thing, displaying high ethical and moral standards of behaviours. Leaders should avoid using power for personal gain, and only use it when it is necessary. In all fields of western societies, including public organisations, transformational leadership has already spread as a development tool. As an example, as a fundamental solution to its leadership training and development, the Finnish defense force uses a very deep lead model. The deep lead model is basically based on the theory of transformational leadership. This style helps business leaders to transform plans and criteria according to their ever-changing situation.

5. Transformational leadership at the time of Pandemic

This situation requires such leaders that have the ability to respond to challenging markets, continuous changes in resources, lack of manpower, and lots of issues in supply chain systems. So that, the organisation can able to sustain its position in this time of the pandemic. This is the challenging time where leaders and followers go together to face pandemic situations. Transformational leadership is a kind of leadership theory, which will be appropriate to sustain the organization in this situation. J.M Burns in his article *leadership* defined transformational leadership is a process in which leaders and followers lift one another to a higher level of morality and motivation (Burns, 1978). A transformational leader increases follower awareness and understanding of moral values and inspiring visions and encourages followers to transcend their own personal goals and interests for the collective good (Bass, 1985). The above two definition shows, how business leaders should supports people, communities, and economies around the globe by doing what it does best with the support of the whole organization and at the same time motivate the followers for collective goods. To be a leader, the leaders have some duty towards the followers, the leaders should concern about how to help followers to reach their complete potentiality, which

motivates followers to follow the leaders and obey the rule and regulations provided by the leaders. Such a leader is attentive to the needs and motives of followers and tries to help followers to reach their fullest potential (Schmid, 2006).

In this situation business organization basically focuses on transparency and openness on the economic market and fragile situation, where customers are free to analyze the market situation. Leaders' support and positive attitude helps the followers to achieve a high level of goal in the worst situation. Successful businesses always stand on teamwork. The followers show honesty and perform effectively under such team leadership. A transformational leader's behavior in terms of *visioning* and *inspiring* is of much importance in bringing about employee engagement (Densten, 2005). The leader also has some qualities to face the ever-changing situations they are like inspirational motivation, intellectual stimulation, idealized influence, and individualized consideration, what Bas and Avalio trying to explain in their full range leadership model and the model of four I's (Figure 2, figure 3). Experience is one of the important characters of business leaders. In this pandemic situation, experienced leaders play a vital role to tackle the ever-changing circumstances. Even the prominent philosopher Aristotle also gives importance to experience; he also explains how experience affects the character of a leader in his writings. In *the Nicomachean Ethics*, he mentioned: *one who has experience is qualified to judge* (Aristotle, Ross, & Brown, 2009, p. 5). Previous experience helps the leaders to invest the money with the proper ideas because money investment is also a vital point for organisational leaders. Because in this time customers are very cautious about the investment, they believe in investment rather than spending. *Leaders who spend money on the right things promote effectiveness because they are helping the general good of their organization* (Nelson, 2015, p-02). Profit, health, and environment are three pillars of sustainable business. The leaders should maintain the three pillars of sustainable business with strategic planning to tackle the pandemic; every pillar plays an equal role to run the business organization effectively. For this transformational leadership style is appropriate because this style guide the leaders to take right decisions according to the demand of time, at the same time it also helps the leaders to transform their goal, criteria, rules, and situations to face the uncertain challenges. Atmanirbhar Bharat is one of the examples set by transformational leaders according to the demand of situations.

5.1. Atmanirbhar Bharat: (Self-reliant India)

The impact of this pandemic on the economy is huge and has hit the business sectors in a big way effects across the length and breadth of economic activities. To achieve the goal of 2021 sustainable development seems to not happen due to the effects of COVID-

19. This has emerged as one of the most horrific health care crises of the century with no instantaneous care in the sights. At the same time destroy the economics of India as a result the country faces lots of issues. Unemployment is one among them; the unemployment crisis is a global fact but pandemic increases the ratio of unemployment. It has been a threat to the economic and social well-being of India. Literature reveals that unemployment is one of the key causes of our poverty, backwardness, crime, and people's dissatisfaction. The chronic unemployment problem is not limited to any particular class, section, or community. It is a dilemma that presents challenges in front of our leaders, thinkers, planners, economists, educationalists, policymakers, and industrialists. The point is how to control the ratio of unemployment in India. To tackle the current situation Prime Minister of India announced to be self-dependent, which will somehow help to sustain the Indian economy once again. The government of India is taking many steps to ensure that we are well prepared to face the COVID-19 challenges and threats. *Atmanirbhar Bharat* is one among them, to consist of five phases they are such as business including MSMEs, poor including migrants and farmers, agriculture, new horizons of growth, and the last one is government reforms and enablers. The first phase of *Atmanirbhara Bharat* is helping the economy; to recover the backbone of India. This concept helps the entire nation to fight against the crises; there are some examples that explain the effects of *Atamanirbhar Bharat*. India has confronted the COVID-19 situation with intensity and a spirit of self-reliance, as is evident from the fact that, from zero production of Personal Protection Equipment (PPE) before March 2020, India has today developed the capacity to manufacture 2 lakh PPE kits per day, which is also steadily growing (Timesofindia, 2021). Business organisations are the way through which individuals are to be self-reliant. In this time of the pandemic, the business organization has some responsibility towards the employees and society. The circumstances are something different and the consumer's behaviours' are also changed, maximum peoples are under pressure due to their job loss. At that time, major businesses have a social mission and values set that represent how their clients, workers, and stakeholders matter. This is the time to make good on your promise to these firms. Some organisations are working to provide great examples are such as Alibaba's co-founder Jack Ma donated coronavirus test kits and other medical supplies through the Jack Ma Foundation and the Alibaba Foundation to many countries around the world. Business organizations need proper planning to fight against the economic crises in the time of COVID-19 because business organizations are like the engine of the Indian economy and the employees are the fuel of an organization. It means to influence the employee's organizations to need someone who has the

ability to influence the followers and engage them to achieve a common goal. That's why business organizations need the support of leaders. Business leaders have some responsibility towards the nation. The business leader's priority will be working towards the sustainable livelihood and economic empowerment of our nation. Mainstream theorizing leadership takes primarily the right of business leaders to fulfill whatever intent they completely for granted have in mind. The role of leading research is to build theories that allow them to do this in the most productive and successful way possible. There are lots of leadership styles are available in leadership theories but transformational leadership (TFL) is one among them, appropriate for ever-changing business organizations.

6. Conclusion

To stable the GDP of India business organisation plays a crucial role. Decision capacity also helps to tackle the recent pandemic situation. That's why this paper illustrates full-range leadership theory and Four I's theory which helps the leaders to take the right decision in the time of the pandemic. The leaders have the important pillar in an organisation, they have the capacity to influence the employees at the same time they have the responsibility to take the organisational decisions. It means they should plan something unique to tackle the pandemic and engage the employees once again in work, flatten the curve of the unemployment ratio, and to balance the GDP of the Indian economy.

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Bhopal Disaster Gas Victims': Trauma Before & During the COVID-19 Pandemic

Ofiary katastrofy gazowej w Bhopalu: trauma przed i podczas pandemii COVID-19

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Abstract

Many studies, reports, books, narratives, and surveys have focused on the disputable picture of the sustainable development of victims of the Bhopal Gas Disaster to understand the trauma, faced by the victims and survivors before and during the COVID-19 period. Traumatic accidents fundamentally shatter the time-based experience of humans between the present and the past. The poisonous night not only had an intense effect on their way of life, but also had an acute impact on their understanding of how to deal with problems. However, another whammy COVID-19 makes their lives more traumatized, unsustainable, and also the victims of another catastrophe. The researchers of the present study have attempted to focus on the traumatic conditions and lessons faced by the Bhopal Gas Victims. In short, the present study puts the focus on the disputable record of sustainable development of the Bhopal Gas Victims in duration, from 1984 to the COVID-19 period, through an analysis of different studies.

Key words: disputable, sustainable development, Bhopal gas victims, COVID-19, trauma

Streszczenie

Wiele badań, raportów, książek, narracji i ankiet skupiało się na kontrowersyjnym obrazie ofiar katastrofy gazowej w Bhopalu, aby zrozumieć traumę, z jaką borykają się ofiary i osoby, które przeżyły, przed i w trakcie okresu COVID-19. Traumatyczne wypadki zasadniczo niszczą doświadczenie ludzi między teraźniejszością a przeszłością. Trująca noc nie tylko wywarła ogromny wpływ na ich styl życia, ale także znacząco wpłynęła na ich zrozumienie, jak radzić sobie z problemami. Jednak kolejna katastrofa w postaci COVID-19 sprawia, że ich życie staje się jeszcze bardziej traumatyczne i niezrównoważone. Naukowcy biorący udział w niniejszym badaniu podjęli próbę skupienia się na traumatycznych stanach i lekcjach, z jakimi borykają się ofiary katastrofy gazowej z Bhopalu. Analizujemy kontrowersyjny zapis rozwoju ofiar katastrofy gazowej z Bhopalu w okresie od 1984 do epidemii COVID-19.

Słowa kluczowe: niepewność, zrównoważony rozwój, ofiary katastrofy gazowej w Bhopalu, COVID-19, trauma

Introduction

The 1984 Bhopal Gas Disaster not only depicts the pictures of the failure of the system and justice, but also gives a picture of the disputable sustainable development of the victims' of the World's Worst Industrial Disaster. The thirty-five years of struggle of the victims include a large number of lessons for the coming days of their troubles. But, now it is time

for assessment. Once again the survivors have to lose their lives due to the irresponsible attitude of the system. Despite being aware of the fact that health of the victims' of the Bhopal Disaster is much more vulnerable than others during the COVID-19, the system abandoned them by withholding the treatment. As a consequence, the people who died in Bhopal during the COVID-19 were mainly the victims of the Bhopal Gas Disaster. The tragic and unsustainable

condition of the survivors of the Bhopal Gas Disaster intensely touched and affected a great number of analytical and right-thinking people. Whereas, most of the surveys, books, articles, reports, and analyses on the Bhopal Disaster have focused mainly on the decisions and justice leading up to the disaster on 2/3 December 1984. This paper depicts the tragic circumstances, uncertain development, and lessons learned of the victims of Bhopal, with a view to their struggles during both the catastrophe, the Bhopal Disaster, and the COVID-19. The researchers also attempt to affect the thinking of a large number of people for a better future and sustainable development of Bhopal Gas Victims'. The study is based mainly on the news reports, articles and in references to Indra Sinha's *Animal's People* that focus on the conditions and struggle of gas victims during the COVID-19 and the Bhopal Gas Disaster.

History and Life Lessons of Bhopal Gas Victims: Before and During the COVID-19 Period

The print media and writers played an important role in fabricating the memory of the disaster and in presenting the picture of the disputable sustainable development of the Bhopal Gas Disaster victims in the period from 1984 to the COVID-19 period. They not only evoke question mark on the response of the system towards the traumatized condition, but also on the certainty of the sustainable development of the victims and survivors of the World's Worst Industrial Disaster before and during the COVID-19 period.

The Bhopal Gas Disaster which took place on the mid-night of 2/3 December 1984, to date is considered to be the World's Worst Industrial Disaster. It not only resulted in a large number of loss of lives, but also makes the lives of the survivors poisonous. The actual figure of dead and injured victims of the day of the gas leak accident remains a matter of debate. The government estimates put the number of deaths in 3800 while other sources estimate that the number of deaths is higher than 15,000. On the data of estimated deaths and injured people that burst out of the day of the Gas Disaster, Dutta reported in *India Today* that, *as per official records, the Bhopal gas tragedy killed 3,787 people. The figures were updated by the Madhya Pradesh government later as the immediate official estimate had put the death toll due to gas leak from Union Carbide factory at 2,259. However, activists fighting for justice for Bhopal gas tragedy victims put the figures of death between 8,000 and 10,000* (Dutta, 2017).

A single night of the incident not only snatched the loved ones of the survivors of the disaster, but also seized their right of normal livelihood. It not only affects the lives and the environment, but also resulted in the loss of economic as well as social well-being. Apart from the loss of physical and mental well-being, the Bhopal Disaster also divides the victims' lives between *before* and *after* from that poisonous

night, *when something big like that night happens, time divides into before and after, the before time breaks up into dreams, the dreams dissolve to darkness. That's how it is here. All the world knows the name of Khaufpur, but no one knows how things were before that night* (Sinha, 2007, p. 14).

In short, the 1984 gas leak incident changed the scenario of Bhopal with its poisonous effects. After that poisoned night, the struggle as well as the sufferings of the victims continues over a relatively long period. Even after several decades, the cause of the disaster, their struggle for justice, their struggle for proper medical facilities, proper compensation, and their inhabitable or sustainable development remain under debate. The survivors still have had to continue their struggle not only for proper compensation, inhabitable sustainability, but also for the basic rights of humans. Although, during all these years the poisoned and traumatized victims learn to survive under the catastrophic consequences of the disaster. But meanwhile, on being attacked by another catastrophe, the COVID-19, the feelings of helplessness, uncertainty, and the fear of death badly affects their minds and lives again. The fact behind their fear is rational, as the toxic materials remain in the environment and make their conditions more vulnerable than others during this second whammy. The account of the aftermath of the disaster, the poisonous environment, and its catastrophic consequences are present in the narratives and reports of many news articles, surveys, and in the narrative of Indira Sinha also.

Sinha's *Animal's People* (2007) is a fictionalized account of the aftermath of the Bhopal Gas Tragedy. It focuses on the problems of the Bhopal Gas Victims, caused by the 1984 Gas Disaster. In short, to a large extent, the novel revolves around the reappraisal and the redefinition of the victimization, toxic environment, uncertainty, and injustice on a communistic level. Sinha's protagonist mentions the toxic environment in this way, *ever since that night the Kampani's factory has been locked up and abandoned ... how quiet it's. No bird song... No bee hum. Insects can't survive here. Wonderful poisons the Kampani made, so good it's impossible to get rid of them, after all these years* (Sinha, 2007, p. 29).

Animal's People also portrayed the tale of the disputable struggle of the victims, who are still suffering from various health problems and psychological issues due to the toxic environment, *we're told to appoint a new judge in the case, the hearing's again been postponed... There is still sickness all over the Khaufpur... the factory is still there, blackened by fire it's...* (Sinha, 2007, p. 364-365).

Also, in a report by Alan Taylor, it is shown how even after 30 years of the incident, the poisonous environment of Bhopal is constantly ruining and damaging the lives of the survivors. Simultaneously, it also puts a question mark on the system's response towards the sustainable development of the victims'.

Taylor reported that, *Toxic material remains, and 30 years later, many of those who were exposed to the gas have given birth to physically and mentally disabled children. For decades, survivors have been fighting to have the site cleaned up, but they say the efforts were slowed when Michigan-based Dow Chemical took over Union Carbide in 2001. Human rights groups say that thousands of tons of hazardous waste remain buried underground, and the government has conceded the area is contaminated. There has, however, been no long-term epidemiological research which conclusively proves that birth defects are directly related to the drinking of the contaminated water* (Taylor, 2014).

The poisoned environment, contaminated water, and polluted sky, which arose out of the first whammy in Bhopal resulted in the concern of sustainability and social justice for the victims. In addition, concern for justice and sustainability arose the question that who is responsible for this catastrophe and in actual what happened on the night of the disaster? And, bearing in mind, the deprived condition of the victims of the Bhopal Gas Disaster from the poisoned night to the COVID-19 also raises a question mark on the justice of the system. Because during the crisis of the COVID-19, survivors of the Gas Disaster whose conditions are already vulnerable due to the contaminated environment and the negligence of the system, are living under the threats of death. And as a result, the condition of the survivors, especially those who suffer from respiratory problems and heart diseases are more exposed to the possibility of being attacked by the COVID-19 in comparison to others. In a report on the tragic condition of the victims' of Bhopal Disaster during Coronavirus, Angana Chakrabarti and Soniya Agarwal reported that, *by 26 April, the city's COVID-19 toll stood at 12, of whom at least 10 had also been victims of the gas tragedy. The leak of the poisonous methyl isocyanate from the pesticide plant in 1984 had reportedly left the 10 people suffering from medical conditions such as chronic pulmonary and cardiovascular ailments, the comorbidities that made them more vulnerable to COVID-19, which attacks the respiratory system. However, families allege this wasn't the only reason their loved ones died. Speaking to The Print, they also blamed lack of medical treatment for the deaths. According to them, the patients were turned away by many hospitals, including state-run facilities earmarked to cater to the victims of the 1984 tragedy, which deprived them of timely medical attention* (Chakrabarti and Agarwal, 2020).

Hemani Sheth's report also puts the focus on the troublous, unprotected, and worrying conditions of the victims. Sheth reports observing that, *Bhopal gas tragedy survivors and their children account for nearly 80 per cent of the COVID-19 deaths in the city, according to reports. An analysis by NGOs working for the survivors of the Bhopal Gas Tragedy of 1984, said 48 of the 60 patients who had died due*

to COVID-19 in the state capital till June 11 were victims of the gas leak tragedy. Of these deaths, 74 percent were survivors of the incident, while 5 per cent were children of survivors. The Hindu reported (Sheth, 2020).

Additionally, Ashutosh Shukla's notes show the deprived and uncertain condition of the survivors of the Bhopal Disaster. Shukla reported that, *the coronavirus pandemic is turning out to be hellish for survivors of the 1984 Bhopal gas tragedy, the world's worst industrial accident. Ten of them have been killed by the virus now, sparking panic in the community that is bound by tragedy rather than caste or religion. All of Bhopal's 10 dead COVID-19 patients are gas victims* (Shukla, 2020a).

Discourses and talking points present in a report of Sharma and Manve also share the facts that how these victims' have always been abandoned by the system. In the report of Sanjay Sharma and Vishal Manve, it is reported that, *Victims of a horrifying 1984 gas leak in the Indian city of Bhopal, who have long suffered the debilitating fallout of the world's worst industrial disaster, are now dying from coronavirus, with relatives and activists accusing the government of abandoning them and withholding treatment... Now its victims make up a significant proportion of coronavirus fatalities in Bhopal – at least 20 out of 45, according to government data, while activists say 37 of the dead suffered illnesses related to the leak* (Sharma and Manve, 2020).

Anurag Dwary's report also shares the facts that how the Bhopal Gas victims' have always been neglected by the system which causes tragic, unpredictable, and unstable situations before them. In the report, Dwary reported that, *organisations working with the survivors of the 1984 Union Carbide disaster have alleged Bhopal Memorial Hospital and Research Centre is guilty of criminal negligence and mismanagement as six gas victims suffering from COVID-19 have died in the hospital's isolation ward in the last 15 days. In a letter to the Supreme Court-appointed monitoring committee, the survivors' group shared details of six Bhopal gas tragedy victims who died in the isolation ward as there was no full-time doctor posted to treat COVID-19 patients. BMHRC is a super-specialty hospital built to cater to the medical needs of Bhopal gas tragedy victims and is currently being run by Indian Council of Medical Research (ICMR)* (Dwary, 2020).

Additionally to these news reports, in *Animal's People*, Sinha while presenting the tragic health condition of the victims' lives after twenty-three years of the disaster unveils their deprived condition, uncertainty, and the negligence of the system also. Sinha's protagonist reveals that, *there is still sickness all over Khaufpur, hundreds come daily to Elli doctor's clinic... the factory is still there, blackened by fire it's, but the grass is growing again, and the charred jungle is pushing out green shoots. Moons play hide and seek in the pipework of the poison*

Khana, still the foreign journalist come (Sinha, 2007, p. 365).

In this way, these reports, narratives, and discourses justified the rationality of the psychological fear, disputable state of sustainable development, and physical risk of the survivors of the Bhopal Disaster. These reports also focus on the system's now and then irresponsible and careless attitude towards the tragedy of the victims of the World's Worst Gas Disaster.

Points of discussion and debating points regarding the tragic and uncertain condition of Bhopal victims, also present the facts that how activists have always been taking a stand for these victims' well-being and sustainable development. For the victims who are being abandoned by the system again and again, from the 1984 Gas Disaster to the COVID-19 pandemic. The system has always been questioned by the activists with hope for the well-being and certain development of these victims. However, their struggles failed to bring indisputable development and complete improvement in the tragic condition of the victims of the Gas Disaster but they have continued their struggle. Pieces of evidence of these talking points are present in Sinha's narrative. In Sinha's *Animal's People*, even after twenty-three years of the disaster, a campaign is launched by activists for the good health and compensation of the victims against the justice system. However, being unable to reach any proper conclusion, instead of losing hope, the activists continue their struggle for a better future and certain development of the Bhopal victims. Activist Somraj who is also one of the victims of that poisoned night. He lost his wife, son, and his voice that night. But, instead of losing hope, he decides to stand for justice of the victims' of the disaster, *Like every Khaufpuri, Somraj hated the Kampani, he ran a poison-relief committee, which did what it could for the locals who were still coughing their lungs up so many years after that night. The people he helped were among the poorest in the city, which is why no politician gave a shit about them and hardly a lawyer would take up their claims for compensation* (Sinha, 2007, p. 33).

In addition to Somraj, in Sinha's novel, activists Nisha and Zafar also protest for victims' health problems, certain development, and compensation. Sinha also portrayed the way of struggle that is accomplished by activist Zafar, his group members, and Nisha to collect money for the victims and survivors. The protagonist narrates that Zafar, his group members, and Nisha collect, *money to help the sick. All these years after that night, he tells me, there's still no real help for those whose eyes and lungs and wombs were fucked. Of course there are government hospitals but people won't set foot in them unless they're desperate... You know what it's like in those places. You queue all day to be seen, the doctor doesn't examine you because to touch a poor person would pollute him. Barely looks at you, then writes a*

chit, tells you, take this to so-and-so's shop and say I sent you. The medicines are supposed to be given free, this is how they make money out of misery (Sinha, 2007, p. 24).

The protagonist narrates that he also stands in the queue of activists, without caring for his physical barriers. The protagonist gives the slogan that: *If we want justice, we'll have to fight for it* (Sinha, 2007, p. 34). Animal narrates the readers that how even after many attempts of their struggle for sustainable development, they are unable to reach any conclusion, but do not give up and continue their struggle, *Eyes, what else can I tell you? Life goes on. It will take time, so we're told, to appoint a new judge in the case, the hearing's again been postponed, the Kampani's still trying to find ways to avoid appearing, but Zafar is confident we'll get them in the end. There is still sickness all over Khaufpur* (Sinha, 2007, p. 364-365).

Thus, the activists continue their journey for decades, even after facing lots of hopeless and disputable situations. They have been continuously raising their voice for the victim's well-being and indisputable development, whether it is for the loss of the victims of the Bhopal Disaster or for the immorality that is happening to them during the COVID-19. According to a report published in *Economictimes.com* on the COVID-19 and the Bhopal Gas Victims', it is noted that, *all five persons who died due to coronavirus in Bhopal were victims of the 1984 gas tragedy in the Madhya Pradesh capital, an official said on Wednesday. On March 21, some organisations working for the survivors of the Bhopal gas tragedy had written to the authorities concerned, saying such people were five times more vulnerable to the coronavirus infection* (All 5 who died..., 2020).

A report by Vivek Trivedi also put the focus on the struggle of activists regarding the vulnerable and uncertain condition of the victims of the Bhopal Gas Disaster during the COVID-19. In the report, Trivedi reported that, *survivors of the 1984 gas leak tragedy have claimed that they were disproportionately falling victim to the coronavirus and comprised 75% of Bhopal's COVID-19 deaths. In a letter to Madhya Pradesh Chief Minister Shivraj Singh Chouhan, they said that those exposed to the toxic methyl isocyanate (MIC) that had spilt out of the Union Carbide's pesticide factory years ago are now bearing the brunt of the epidemic in a severe way. Deaths among the gas leak survivors caused by the novel coronavirus establishes the fact that even after 35 years of the world's worst industrial disaster, their medical condition is as fragile, having suffered permanent damage due to the exposure, the letter said* (Trivedi, 2020).

Thus, the pieces of evidence of negligence of the system and the efforts of activists regarding the justice for the victims of the Bhopal Gas Disaster are illustrated in articles, print media and narratives. The discourses focus the limelight on the bitter truth also

that from the day of the disaster to the COVID-19 pandemic, the victims' have always struggled to solve their problems and to drive the attention of the justice system towards their tragedy and disputable sustainable development. In short, then the victims died due to lack of proper medical care, and even now also the survivors or victims continue to face similar problems. The victims suffer from various health problems after that poisoned night, but no proper medical facilities are provided to them by the system. And, during Coronavirus the death rate of Bhopal as reported by news articles also stands as its evidence. People who died in Bhopal during Coronavirus were victims of the Bhopal Gas Disaster. There is no doubt in the saying as it is evident in the above-mentioned reports and narratives that their poor health condition makes them more unsafe than others during this period of the COVID-19. But the system pays no proper attention to the gas victims and hence they die due to medical negligence. According to a report on the negligence of the system towards the lack of medical care, it is reported that, *in March, the state converted Bhopal Memorial Hospital and Research Centre into a facility for COVID-19, leaving the disaster patients with no medical care. All five patients who died of the coronavirus in Bhopal, Madhya Pradesh, were survivors of the city's 1984 gas tragedy and so more vulnerable to the infection than normal individuals, PTI reported on Wednesday. On March 23, the Madhya Pradesh government had converted the Bhopal Memorial Hospital and Research Centre into a dedicated facility for the coronavirus patients, leaving survivors of the chemical disaster with no medical care. Reports said that several patients, including critical ones, were discharged to make way for the special hospital (COVID-19: Five patients..., 2020).*

Next to, Sidharth Yadav's report focuses on the negligence of the medical facilities towards the Bhopal Gas Victims during the pandemic. In the report, Yadav noted that, *After the Madhya Pradesh government designated the ICMR- run Bhopal Memorial Hospital and Research Centre (BMHRC) as the State-level COVID-19 treatment facility and stopped all other services there, anxiety gripped the Bhopal gas tragedy survivors who depend on it for super speciality care (Yadav, 2020).*

In a report published on *Economictimes.com*, the negligence of the system regarding the lack of proper medical care for the victims of the Bhopal Gas Disaster during the COVID-19 is also evident and noticeable. In the report of the *Economictimes.com*, it is noted that, *a hospital in the city dedicated for the treatment of gas mishap survivors has been turned into a facility for coronavirus patients, causing hardship to these people, Rachna Dhingra, member of the NGO Bhopal Group for Information and Action, told PTI. The first coronavirus victim in Bhopal, a 55-year-old man, died at a hospital on April 5 due to*

negligence of authorities, she alleged (All 5 who died..., 2020).

Likewise, in a report of Shukla, lack of proper medical care, the negligence of the system towards the survivors of the Bhopal Gas Tragedy during COVID-19, and the concern of activists are noted. Shukla thus puts the focus on these talking points that, *on March 21 – a day before the first coronavirus patient was detected in Bhopal – four activist groups had written to everyone concerned, from the Union health minister to the Bhopal district collector, pleading for special attention to gas victims as they are more vulnerable to the virus... the hospital meant exclusively for gas victims – on March 23, converted it into a COVID-19 facility, and shut the doors on gas victims... COVID-19 has since killed 10 of their own in a span of 18 days... All 10 COVID-19 deaths in Bhopal are gas victims (Shukla, 2020b).*

Besides, the depictions of the tragedy and uncertainty of the victims of the Bhopal Gas Disaster during the COVID-19, descriptions, and evidence present in news reports as well as in *Animal's People* also bear witness to their distressing lives and struggles before this pandemic. In 2015, in a news article regarding the victims' poor health and systems' negligence regarding lack of proper medical care, it is reported by the reporter that, *The Supreme Court has directed the Centre and the Madhya Pradesh government to immediately act to improve the dismal healthcare facilities provided to the survivors of the 1984 gas leak in Bhopal. Disposing a 14-year-old writ petition, the court brought to the fore a neglected aspect of the gas disaster, the continuing ill effects of which have been passed on from one generation to the next. The petition filed by Bhopal Group for Information and Action and Bhopal Gas Peedit Mahila Udyog Sangathan in 1998 had said that the survivors were entitled to free and proper medical assistance from the Union of India and state of Madhya Pradesh (Moyna, 2015).*

The same picture of medical negligence towards the victims and the survivors is also evident by Sinha's protagonist in the novel. The protagonist narrates that activists, *collects money to help the sick. All these years after that night, he tells me, there's still no real help for those whose eyes and lungs and wombs were fucked. Of course there are government hospitals but... Barely looks at you (Sinha, 2007, p. 25).*

These scenarios present by Sinha's protagonist and by the reporters thus puts the focus on the physical suffering, mental trauma, and uncertainty of the victims of the Bhopal Disaster due to improper medical facilities. It focuses on the activities of the activists and non-governmental organizations who work seriously in comparison to the governmental organizations to upgrade the minimum standard of medical care for the victims.

The above-mentioned discourses point out the distressing and traumatic lives of the victims who have

always been neglected by the system without caring about their poor health condition and sustainable development, from the poisoned night of the 1984 Gas Disaster and even during the COVID-19 pandemic. In addition, it also emphasizes the fact that the Bhopal Disaster has undoubtedly been one of the World's Worst Industrial Disaster, to date. The Bhopal Gas Disaster has not only lessons to prevent other industrial disasters in the future, but also has lessons to protect sustainable development of humanity from the negligent attitude of the system. Moreover, it also puts the focus on the fact that developments requiring nuclear and chemical manufacturing can never be positively safe for humanity.

Despite that, while seeing the demand of modern times and modern production, if these industries need to be developed, extreme safety measures should be taken by the system in the interest of humanity and the environment. As the dreadful and the rapidly regulated growth of industries remain a major threat to sustainable development of humanity and resulted in adverse physical and emotional health consequences of humans continue to happen in India. So, positive changes and safety measures are important because only these approaches can save humanity and can result indisputable sustainable development in the coming times from catastrophes and environmental degradation. Safety measures should also be taken to prevent history from being repeated so that the situation of victims of any future disaster has not been similar to that of the Bhopal Gas Disaster victims. The way the victims of Bhopal, from the 1984 Gas Disaster to the COVID-19 pandemic, have been facing similar tragic situations for decades due to the lack of proper monitoring and safety measures. Far more, the present paper seeks to present the fact in the context of poor industrialization that how the thousands of deaths in the Bhopal Gas Disaster and their struggle for decades have been proved to be a lesson for humanity as well as also for their sustainable development.

Conclusion

The Bhopal Gas Disaster and the COVID-19 pandemic cause the Bhopal Gas Victims to experience a series of horrific images and disputable situations. From the day of the disaster to the COVID-19 pandemic, the survivors of the Bhopal Gas Tragedy have to face the triple whammy. First, due to the gas leak on 2/3 December 1984, next when they have to live under the daily threats of the COVID-19 because of their ravaged health condition, and the third devastating situation is the result of the inattention of the system. From 1984 to 2020, nothing satisfactory has been changing for the victims' of the Bhopal Disaster. Still, the lives of the poisoned survivors witness lots of changes. They witness lots of changes in dates of the court cases, changes in their health status

which are getting more vulnerable day by day. And, the most important change is that then also the victims' are deprived of proper medical care and sustainable development, and now also they have to face the same tragic and uncertain situation. After the 1984 Gas Disaster, the people of Bhopal lost their loved ones and in 2020 the history repeats itself for the survivors of the World's Worst Industrial Disaster and they have to face the same sorrowful game of death. The clouds of death have always hovered over their head since the toxic incident of 1984 in different forms. These deteriorates and deprived conditions of the Bhopal Gas Victims' unveils the negligence of the system towards their toxic health to date. It also unveils the tragic, disputable, and traumatic conditions of the Bhopal victims' during the period of the triple whammy.

The 35th anniversary of the Bhopal gas catastrophe completed on December 2/3, 2019 but to date, the victims have been grappling with toxic effects, disputable sustainable development, and tragic situations. Studies, discourses, narratives and reports focus on the fact that the lives of the victims of the World's Worst Industrial Disaster have worsened due to irresponsible monitoring and the careless attitude of the system. Even after 35 years, the condition of Bhopal Gas Victims has not recovered and they have had to continue their struggle for justice and sustainable development. Victims are still deprived of proper compensation and proper medical facilities. Even in the time of the COVID-19 pandemic, they are being deprived by the system despite knowing the fact that they are much more vulnerable in comparison to others. In the present study, the researcher putting the focus on these above-discussed facts by analyzing the lessons that present by the news reports, articles and the protagonist of Sinha's *Animal's People*. The study also presents the lessons learned and the collective experiences of a poisoned community from the poisoned night and during the pandemic. In short, the present study doesn't only focus on the alarming and deprived condition of the Bhopal Gas Victims from the day of the 1984 Gas Disaster to the COVID-19 pandemic. It also presents what lessons can be learned at this tragic cost of sustainable development of humanity.

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Post-COVID Sustainable Economic Development

Post-Covidowy Zrównoważony Rozwój Ekonomiczny

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Abstract

Crises show all the vulnerability and unsustainability of modern economic systems, imposing the need to ask ourselves what really is important, what wealth actually is. At the same time, they are an opportunity to critically review economic systems, ideologies, economic indicators of *quality of life* and dogmatically set ideas which have negative impacts on society, culture and the environment. In this sense, the current pandemic is an opportunity to take action and make a change, to shift the focus to socio-economic models focused on people, environment and strengthening of global partnership for sustainable development.

Key words: pandemic, economy, sustainability

Streszczenie

Kryzysy ukazują wszystkie wady i niezrównoważoność współczesnych systemów ekonomicznych, narzucając potrzebę zadawania pytań o to, co jest naprawdę ważne, czym właściwie jest bogactwo. Jednocześnie kryzysy są okazją do krytycznego przeglądu systemów ekonomicznych, ideologii, ekonomicznych wskaźników *jakości życia* oraz dogmatycznie ustalonych idei, które mają negatywny wpływ na społeczeństwo, kulturę i środowisko. W tym kontekście obecna pandemia jest okazją do podjęcia działań i wprowadzenia zmian, przesunięcia punktu ciężkości na modele społeczno-gospodarcze skupione na ludziach, środowisku i wzmocnieniu globalnego partnerstwa na rzecz zrównoważonego rozwoju.

Słowa kluczowe: pandemia, ekonomia, zrównoważoność

Introduction

Planet Earth has entered a new geological epoch that has been defined by geologists as the Anthropocene. This epoch, which from the geological aspect began in the 1950's when the intensive development of industry began after the World War Two, is characterized by man's domination over the environment in a negative context, which results, among other things, in the increasing frequency of pandemics (Chin et al., 2020)

Preserving human lives as the highest value during pandemics is the primary task of the mankind, but if man is seen as a workable individual, caring for him becomes a struggle to preserve the global economy.

In the modern economy, it is insisted on individualism, private property, expropriation and extractivism of public goods, productivism and consumerism that maintain it, while crises show the vulnerability and unsustainability of such a system.

It is obvious that things will have to change since the essence of much of globalization is not in transporting manufactured goods around the world, but also in transporting people, ideas and information.

Alex King on behalf of the Club of Rome suggests that in order to ensure the future of our grandchildren, it is necessary to stop getting rich! Only then will there be the resources and unpolluted world that they will need to survive (Fairytale of Growth, 2019).

1. (Un)sustainability of Economic Systems

Mythologically set ideas of modern economy lead to the perception that their status is fundamental, axiomatic and unquestionable. The author Raworth explains this phenomenon with the metaphor of the cuckoo's nest, where questionable ideas have entered the economy, as well as all social patterns, monopolizing them and presenting them as the only ones. (Raworth, 2017) The economic crisis caused by the COVID-19 pandemic, however, imposes the need to demystify the basic ideas and postulates of modern economic systems, primarily the idea of *infinite* economic growth, measured by GDP growth, based on public debt and foreign direct investment. In the Limits to Growth report, it is pointed out that there are four basic common characteristics that appear in all societies: technical, social, economic and political elements; and more importantly these elements are in permanent interaction (Meadows et al., 1972). The report points to the harmfulness of productivism and consumerism, and in the late 60's and 70's, there emerged a *radical current* saying that we, as civilization are at the end of development and that we have reached the level of prosperity that carries the germs of disorder and the need to refresh and rethink social and political issues at the global level. In practice, the mostly developed and capital-strong ones grow at the highest rate, while the smaller and weak ones stagnate, which leads to a deeper social gap. The author Sachs (2010) states that economic development has a cannibalistic nature, since it feeds on nature and the community, reimbursing them for unpaid expenses. The practical outcomes of seemingly theoretically decent ideas of sustainable development are very unbalanced therefore other pillars of sustainable growth are very frequently placed to support the economic pillar and the idea of economic growth. In the name of sustainable development arguments, there are projects related to the appropriation of public and common resources, which abolish fundamental human rights – the right to access water, the right to work worthy of man, the right to culture, the right to a healthy environment and the like. Public debt is a support to the mythological idea of an infinite growth, which also justifies further growth of public debt, and the logic of debt is incorporated at every level of society. With the support of a financial system that imposes and enables families and individuals to spend more than they earn. In this way the state interventions, after the banking crisis hit Europe in 2008-2009, were aimed at rescuing the financial system institutions. In practical and proprietary terms, this meant that public money saved private capital. Moreover, the blame for the slowdown in the economy has been shifted to people's negligent behavior in terms of using credits/loans (Kocovic De Santo, 2020). The logic of public debt, aimed at achieving social goals and promoting a self-sustaining and sovereign economy, would be good.

What is happening in practice is that instead of the inflow of resources, public debt becomes a mechanism for plundering countries (Fattorelli, 2016).

Economic growth can be measured and this is done by GDP indicators. However, the logic of GDP growth is based on the idea that everything that is produced must be sold, even if it is not necessary, which points to the conclusion that the basic meaning of humans is to buy. This is a complete vulgarization of meaning of humans, since GDP per capita, as a measure of living standards, does not support essential issues for society – access to quality health care, education, peace, security, safety, shelter, leisure, fair working conditions, happiness, satisfaction, etc. (Kocovic De Santo, 2020).

The myth of foreign direct investment, in the narrative of modern economic policy, is set almost exclusively in a positive context, supporting growth. In reality, there is theoretical and practical evidence that FDI does not necessarily help the economic environment in the exclusively desired and socially beneficial way, because through it the overflow of created values from the countries of the Global South to the countries of the Global North is established which changes the structure of work, processes and effects both locally and internationally. For instance, foreign investors in Serbia can do business with polluting and outdated industries, have cheap labor, which works for a minimum wage in conditions in which they could not even dream that a worker can be treated at home. Serbia subsidizes foreign investors, and frequently when the subsidized period ends, they leave Serbia.

It can be concluded that development focused on economic growth is an unhealthy category, which, supported by an unethical approach to business and FDI, as well as growing public debt, leads to deeper problems related to the broader fact – that consumerism and productivism do not respond to needs but are the reflection of efforts to revive economy (through imposing of non-existing needs) (Kocovic De Santo, 2020).

2. Economic implications of the pandemic

When the World Health Organization declared a coronavirus pandemic (COVID-19) in March 2020, the problem, initially seen as *Chinese* and then *Italian*, soon became *everyone's* problem (Baldwin and di Mauro, 2020). In a very short time, the pandemic has completely changed the economic, political and social aspect of human civilization, leading to the conclusion that *in sequence of incredible and unpredictable events, human history does not follow a pattern* (Taleb, 2007).

The way in which the pandemic affects the financial system is reflected primarily in the huge economic costs. In the case of COVID-19, the S&P 500 (Standard and Pur) index reached the *bear* market in just 16 days, which is a record and a significant difference

compared to the global economic crisis, which took 188 days.

According to the report *A World in Disorder*, the current amount of costs for mitigating the consequences of the pandemic is over 11 trillion US dollars (which is not the final amount), while it is estimated that the expected loss will be more than 10 trillion dollars, when it comes to investments.

In April 2020, for the first time in history, it happened that the price of oil went into the red due to the collapse of the demand for energy, so it amounted to an incredible -37.63 US dollars. Due to the COVID-19 pandemic, the price of gold also reached the maximum of 1.944 USD per ounce in July 2020 which surpassed the previous record of 1.920 USD per ounce from September 2011.

In mid-February 2020, the S&P 500 registered daily fluctuations of more than $\pm 4\%$. Following the 23% crash of the Dow Jones Industrial Average on Black Monday in 1987, stock exchanges introduced a 15-minute Circuit-breakers instrument to *cool the market*. This measure has been used only once so far, in 1997, when there was a drop of 7.2% within the Dow Jones Industrial Average, while during March 2020, the same measure was activated as many as 4 times – on 9th, 12th, 16th and 18th.

According to the data of the International Labor Organization for the second quarter of 2020, the loss of 14% of working hours has been estimated at the global level, i.e. 400 million jobs, with the biggest losses on American soil. This impact of the disease on human capital led some authors to wonder at the beginning of the pandemic whether the current huge economic costs and losses caused by measures to combat the pandemic were justified for the sake of prolonging the life of only a few years of the oldest and economically dominantly unproductive population. One of the arguments of this cold-blooded calculation is that *the decline of the economy kills people as much as pandemics*, and that the application of restrictive and financially expensive measures would lead to greater losses in the long run, measured by years of life, than it would save.

However, the question that is frequently asked is why the global economy has been *stopped* so quickly. One answer certainly lies in the fact that the center of the epidemic was in Wuhan where over 200 Fortune Global 500 companies have a direct presence (Deloitte, 2020). Therefore, it is concluded that there was an interruption in the global supply chain, because when the *world factory*, which China is, finds itself in trouble, then the world is in trouble, as well.

And the problem is not small, since the pandemic, contrary to optimistic forecasts, continued in 2021. According to data from EUROSTAT, the IMF, the OECD, the International Labor Organization (ILO), the Institute of International Finance (IIF) and the EU Information Research Service EUROFOUND the loss of gross domestic product in the world dur-

ing the first two months amounted to 6.3 thousand billion dollars. This is the most realistic estimate of international organizations based on the global recession of 4.5 percent in 2020, and considering that the world GDP in 2019 was 86 thousand billion dollars. Global debt – public and private – reached 281 trillion dollars at the end of February, which is 355 percent of world GDP. Half of the increase in total debt in the world of 24 thousand billion dollars during the pandemic, is the consequence of measures taken by countries, while the other half is new debt of companies (increased for 5.4 thousand billion dollars), banks (for 3.9 thousand billion dollars) and households (for 2.6 billion dollars). Due to the expenditures caused by the pandemic, the budget deficit of the countries of the world reached 11.8 percent of the world GDP, and in 2019 it was 3.8 percent. The absolute record is held by the USA, where the budget deficit reached 17.8 percent last year (in 2019 it was 6.4 percent), while in the Eurozone, where balanced budgets are mandatory, the deficit jumped from 0.6 percent in 2019 to 8.4 percent of GDP 2020. The income of employees in the world decreased for 3.7 thousand billion dollars in 2020. This is equal to a drop in average wages of 8.7 percent, or 4.5 percent of world GDP.

It is estimated that the total volume of world trade (imports and exports) decreased for 9.2 percent in 2020, which is 4.5 percent of world GDP. The largest foreign trade blow in 2020 was suffered by Latin America (with a loss of 7.5 percent of GDP) and Europe (with a loss of 7.3 percent), and the smallest loss was suffered by Asia (only 2.5 percent) due to rapid growth in exports by China.

Stock market vultures applied the old saying to the maximum: *When you see blood, buy, buy, buy!*, which led the stock market to *wild growth*. In the year of the pandemic (March 2020-March 2021), the most popular stock market index, New York's Dow Jones, with a growth of 65 percent, set an all-time record (over 33,000 points). The Nasdaq Wall Street Technology Index earned 81 percent, and the shares of digital giants rose from 60 to 110 percent.

The specificity of COVID-19 is that it is not exclusively a health phenomenon – it is also an economic and social phenomenon for which we should have been better prepared (Gans, 2020). The report *A World at risk* (2019) states that during 2011-2018, the World Health Organization registered as many as 1.483 epidemics in 172 countries. Therefore, the appearance of an epidemic as a health situation is not a surprise because it has frequently happened before. Such an attitude is also confirmed by Goodell (2020) stating that *when you have a series of academic articles suggesting the possibility of a pandemic and predict huge economic losses as a result of a pandemic, as well as numerous real-world epidemics and health crises that could become a global pandemic, this should be understood as something other than completely unexpected*. The author of *The Black*

Swan, Taleb, observes the following: We warned on January 26th (2020) and had the opportunity to kill the virus at an early stage. But governments did not want to spend a penny on it in January. They will now spend trillions. This pandemic is a white swan! They cannot use it as an excuse that they were unprepared, either companies, or corporations, or the governments!

3. Impact on the Environment

In his evolution, the Homo sapiens destroy his external and internal environment proportionally to the progress of civilization, knowledge, technology, and population growth. (Sztumski, 2021). The environment is endangered by anthropogenic activities in various ways: overpopulation, chemical and biological pollution, burning of fossil fuels, deforestation and extinction of certain animal species. All this leads to changes in the *great circle of life*. DesJardins (2006) points out that environmental problems raise fundamental questions about what we as human beings value, what our place is in nature, and in what kind of world we might experience flourishing. The COVID-19 pandemic has been characterized as a systemic crisis of human development that arose as a result of inadequate interaction of the individual with nature and its ecosystem, strong inequality among people and uneven economic activity (UNDP, 2020).

The first effects of the pandemic were seen very quickly, particularly in the reduced harmful gas emissions in highly industrialized countries. Photos of crystal clear water in canals of Venice and a large reduction in CO₂ emissions in the case of China, where about 25 million people die each year due to health problems caused by polluted air, have toured the world. Authors Wang and Su (2020) state that in the months of lockdown, there was a reduction in the use of coal and crude oil, thus reducing CO₂ emissions by 25% or more. In practice, this means that China reduced its carbon emissions by 1 million tons during the quarantine period (equivalent to 6% of global carbon emissions).

A similar study was conducted in the region of Southeast Asia with a focus on Malaysia where Devi Kanniah et al., (2020) found a significant reduction in the concentration of aerosols and other harmful substances by 40-70% within a month (March-April 2020) compared to the same period of 2019. Power plants and industry facilities have stopped their production, and the use of vehicles has significantly decreased. All this led to a strong decrease in the concentrations of nitrogen dioxide PM_{2.5} particles. Furthermore, due to the measure of social distancing, a large number of beaches around the world is much cleaner, as the number of tourists visiting beaches has drastically decreased, and in most countries there is a significant reduction in noise levels caused by reduced use of private and public transport (Zam-

brano-Monserrate, 2020). Much of the industry has shut down, transport systems have relaxed and a large number of companies is shutting down which has caused a sharp drop in greenhouse gas emissions (Saadat et al., 2020).

However, all these changes are, above all, short-term ones and have a number of unexpected consequences.

Additional amounts of waste are generated because the masks are made of plastic-based materials that are resistant to liquid and are long-lasting even after disposal, and end up most frequently in landfills, but in the oceans, as well. Surgical masks should not be worn for more than one day, and empty bottles of hand sanitizers, gloves, and other medical waste are disposed of in the environment (Saadat et al., 2020). In the U.S., some cities have suspended recycling programs because authorities are concerned about the risk of the virus spreading in recycling centers. On the other hand, sustainable waste management is limited in particularly affected European countries. Ordering food via the Internet has also increased, resulting in an increase in local waste - organic and inorganic (Zambrano-Monserrate, 2020). The pandemic also affected the migration of the population in terms of settling in rural areas in relation to urban ones, which increases the possibility of spreading the infection to those areas, disrupting the habits of the local population.

The COVID-19 pandemic continues to inflict heavy casualties, primarily in lives, and then increasing poverty and hunger, reducing the growth prospects of those most in need.

Due to large economic losses and uncertainty in world markets, the environmental issue has been put *on hold*, which has been particularly felt in the field of sustainable investments. The current situation has particularly affected renewable energy sources, primarily through reduced investment.

At the beginning of the pandemic, it was thought that the Green Agreement would be postponed due to the economic consequences of resolving the crisis. However, it has happened that a large number of member states actually believe that the Green Agreement should be the basis for combating the consequences of the COVID-19 pandemic. In this context, in May 2020, the European Commission adopted a new program called the EU Next Generation worth 750 billion euros, and a targeted increase in the long-term EU budget for 2021-2027 is planned. The basis of this program is to be sustainable, even, inclusive and fair for all member states since, basically, the aspiration of modern society is a sustainable economic system based on the harmonization of relations with nature (Suceska and Hanic, 2012).

In terms of structure, COVID-19 has definitely changed the attitude towards pandemics in the future. This refers to the incorporation of the costs of the pandemic aimed at a more adequate reaction and readiness not only of the health system, but also of

the entire society. This crisis also provides some insight into how to manage the climate crisis we might expect (Manzanedo and Manning, 2020) since there are parallels between them, and the concept of sustainable development as a long-term solution for environmental protection should play a major role in this process.

4. The impact of the pandemic on society

The covid 19 pandemic has perhaps had the greatest impact on society, producing multiple consequences on people's lives, significantly affecting health, education, culture, which is why numerous global and European studies warn of long-term effects for the *quarantine generation* (De Lima et al. 2020; Tang et al. 2021; Ammar et al. 2021).

New ways of work during the pandemic, the most common of which is *work from home*, require different and new methods of communication, and *distancing* in business requires both managers and employees to adapt quickly and efficiently. This is a special challenge for managers since they must have the necessary knowledge and skills to point out to employees the necessity of the measures taken, for which it is important to know the characteristics of national cultures of their own country or the country in which they work, since the values of the attitudes of employees, which are a product of national culture can be of great importance in adapting to the changes caused by the pandemic. Hofstede's cultural research can help them a lot in this (Hofstede, Bond, 1984; Hofstede, 2003; Hofstede, 2009; Hofstede, 2011).

When it comes to the work environment, managers are expected to primarily protect the health of employees, but also to motivate them, help them reduce stress, and provide organizational support to achieve a family-work balance (Carnevale, Hatak, 2020; Opatha, 2020; Dirani et al. 2020). Generally speaking, it is necessary to create a new organizational culture by holding online meetings, organizing virtual lunches and coffee breaks, and creating digital office spaces (Vnoučková, 2020; Gigauri, 2020; Carnevale, Hatak, 2020). So, both in companies and in society in general, it is necessary to have a different view of the world, a different perception of reality, as well as the adoption of new, different lifestyles.

A study published in The Lancet Planetary Health suggests that the key factor influencing mortality (number of deaths per 100.000 people) may be cultural (Gelfand et al. 2021). Since social contacts are a crucial factor in the spread of the disease, it is expected that the greatest benefit from the introduction of strict rules of social exclusion and reduction of mobility will be in societies that are accustomed to close interactions, i.e. in societies characterized by a high degree of collectivism.

The pandemic does not choose gender, age or field of action. In addition to the consequences it leaves

on the physical health of people who have been in contact with the virus, there are significant consequences on the mental health of those who have been in contact with the virus, as well as those who have not, since the so-called *social distancing* and loneliness lead to depression, panic and mental disorders. Young people, as a special social category, were particularly affected during the pandemic, as evidenced by the numerous reports and interventions at the global level. According to the United Nations Department of Economic and Social Affairs, a document published on March 27, section *Youth Response to the Pandemic* states that COVID-19 affects all sections of the population, and that young people can play a key role both in crisis management and in post-crisis recovery (UN, 2020).

At the global level, young people are invited to participate in the fight against the pandemic, as well as to participate in public health and social awareness campaigns in all communities (Verma, Prakash, 2020). Young people have the opportunity to help, but they are required to behave appropriately and take responsibility for what, unfortunately, a part of that population is not used to, which is why they are increasingly considered a critical factor in limiting the spread of the virus and its impact on public health, society and economy at all.

In addition, when it comes to young people, statistical data show an enormous decline in birth rates in developed countries, because young couples decide to wait or, in many cases, give up starting a family. On the other hand, in underdeveloped countries, there is a large increase in newborn children, primarily due to difficult access to counseling and birth control facilities. The United Nations Agency for Sexual and Reproductive Health says the pandemic has caused nearly 12 million women in 115 countries to lose access to family planning services, which could lead to 1.4 million unplanned pregnancies. This trend, if continued, could have a significant impact on the labor market and the economy in general in the future – if there are fewer *workable* people, less income will be generated from pension taxes and health insurance for the elderly, who in turn live longer.

The COVID-19 pandemic also affected gender equality. Researches have shown that women make up 39% of global employment, but when it comes to job loss during a pandemic, globally, 54% of them have lost their jobs (Madgavkar et al. 2020), and their jobs are 1.8 times more vulnerable than men's jobs. For example, of the 49 million nurses in the EU who were most exposed to the virus, about 76% are women. The largest imbalance in the EU was in Latvia, where women make up 88% of health care workers, compared to 53% in Malta (Europarl.europa.eu, 2021).

If only Germany is taken as an example, according to the report of the World Bank, 2.38 million women and only 1.23 million men are employed in retail in

this country. In the same country, almost 2 million women work in pharmacies, as opposed to 500,000 men (de Paz et al. 2020).

Therefore, women are more exposed to infection in the workplace, but the pandemic has affected them in other ways as well, since they are, in most cultures, responsible for caring for children and the household, and the pandemic has caused an increase in this responsibility and work on a daily basis, which de facto has a negative impact on both mental and physical health of women, i.e. their quality of life and well-being.

During the pandemic and *lock-down* a number of factors such as financial insecurity, stress and uncertainty, contributed to the increased aggressiveness. There is an increase in family violence, the most common victims are women, and the most vulnerable are the ones from the poorer strata of society. Fisher and Ryan warn of new forms of control and manipulation where bullies can use *quarantine rules* to control their partners (Fisher & Ryan, 2021). In such cases, in a pandemic, victims have less support, while visits to health facilities are also reduced, which means that restrictions aimed at fighting the infection have made it more difficult for victims to seek help.

Education systems worldwide are also under threat. The pandemic has led to the almost complete closure of schools, universities and other educational institutions and the transition to online teaching, which affects children from the poorest and most marginalized groups the most, because learning from home requires the necessary IT resources. There is also the question of the quality of education during pandemics, which can have far-reaching economic and social consequences, because a pandemic, above all, poses a threat to research and development. Verma and Prakas warn of the possibility of reduced quality and quantity of basic and experimental research (Verma and Prakas, 2020), since by learning *from home* it is not possible to gain enough practical experience as laboratory work can provide.

When it comes to social problems and the impact of the pandemic, the problem of migrants and refugees cannot be avoided, because people fleeing war and violence or looking for an opportunity for a better life are part of our everyday life, and their reality during the pandemic is very harsh. The World Health Organization states that migrants are generally excluded from national health care and assistance treatment programs (World Health Organization, 2020). While hundreds of millions of people around the world sit in their homes and regularly practice physical distancing measures, such a luxury is not possible for many refugees, states Forbes magazine neurosurgeon Jacquelyn Corley, who researches global health topics. More than 80 percent of the world's refugee population (it is estimated that there are more than 70 million refugees in the world) live in low- to middle-income countries and many live in

miserable conditions in overcrowded camps or settlements, Korli points out and adds that millions of refugees have no protection against the deadly virus, which is why they are currently the most vulnerable people in the world.

5. Conclusion

Denial is much cheaper than dealing with the problem (Ale et al., 2020). But the longer the adjustment to the changed situation and circumstances is delayed, the more expensive the consequences are. This may be an opportunity because, historically, pandemics have so far shaped the future directions of human civilization development in various ways (Davis, 2020).

An economy based on growth, i.e. debt, initiates the so-called *perpetum mobile* effect in terms that the growth rate must be constantly higher than the interest rate of the debt, in order for the debt to be serviced. At any cost. It is clear that energy and environmental transition has become a necessity. Programs, projects, ideas and alternatives (such as the Citizens' Audit of Public Debt, Growing Up, the ReCommonEurope Handbook, the Welfare Economics Alliance, etc.) are numerous and available. And they can serve as guiding ideas for formulating practical solutions.

The fact is that due to *lock-down*, reduced consumption of resources has been recorded. This supports the thesis that their consumption can be limited, and confirms the opinion of a large number of sustainable development theorists that people's need for survival is very small, and excessive consumption and waste is actually the result of excessive desire for better status in society, although this status does not imply prosperity in the true sense of the word.

The need for people to stay at home and work from home has contributed to connecting family members, which shows that family life can and should be different.

Working from home, in addition to the already listed disadvantages, can have its advantages, primarily in terms of saving time, effort and travel costs to work, but also the possibility of personal progress, upgrading and learning, due to the need to master the necessary technical skills and improve organizational skills of an individual.

It can be concluded that the circumstances caused by the pandemic affected the achievement of the goals of sustainable development, almost equally affecting all aspects of sustainability. Barbier and Burgess point to the need to adopt post-pandemic strategies that would involve the synergy of several goals simultaneously, such as: encouraging new job creation, poverty reduction, environmental protection, economic activity, and preservation of health (Barbier & Burgess, 2020).

A new reality has been created, which brings with it a lot of dangers and challenges, but also chances and

opportunities. The question is whether we will use the opportunity to change something.

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The Concept of Inclusion in the Context of Sustainable Development

Pojęcie inkluzji w kontekście zrównoważonego rozwoju

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Abstract

The article presents a semantic analysis of the concept of inclusion, which – treated as the central category for Goal 16 of the 2030 Agenda for Sustainable Development (United Nations) – requires further definition. Initially, I outline the history and etymology of the word *inclusion*, provide various contexts of its use in Polish common language and in the academic area, take a closer look at the word family as well as synonyms and antonyms of the term *inclusion* (especially *exclusion*). Next, I explore functions of the concept of inclusion (descriptive, explanatory, normative) and problems regarding the concept. The conclusion contains four types of referents of the term *inclusion*.

Key words: inclusion, exclusion, concept, semantic analysis

Streszczenie

Przedmiotem artykułu jest pojęcie inkluzji, centralne dla celu 16 Agendy na Rzecz Zrównoważonego Rozwoju 2030 Organizacji Narodów Zjednoczonych. Termin *inkluzja* jest jednak wieloznaczny i jego znaczenie wymaga doprecyzowania. Przeprowadzam w tekście analizę semiotyczną tego terminu, poczynając od rysu historyczno-etymologicznego, poprzez sposoby użycia terminu *inkluzja* w języku polskim i w różnych dziedzinach wiedzy, oraz przyglądam się rodzinie wyrazowej tego terminu, jego synonimom, bliskoznacznikom i antynomom, a wśród tych ostatnich przede wszystkim terminowi *ekskluzja*. Analizuję następnie funkcje pojęcia inkluzji (opisowo-wyjaśniającą i normatywną) oraz referuję spory wokół pojęcia inkluzji. W części końcowej proponuję typologię de-sygnatów terminu *inkluzja*.

Słowa kluczowe: inkluzja, ekskluzja, pojęcie, analiza semiotyczna

1. Introduction

The article presents a concept¹ of inclusion referred to twice in the Goal 16 of the 2030 Agenda for Sustainable Development of the United Nations: for the first time in the phrase *promote peaceful and inclusive societies*, and then *provide access to justice for all and build effective, accountable and inclusive institutions at all levels*. This concept – next to peace and justice – seems to be the central category for understanding sustainable development in the context

of social life, hence the need to provide a deeper insight into it appears entirely justified.

The concept of inclusion, highlighted nowadays in some social sciences (such as sociology, political sciences, special education, resocialisation and penitentiary science) as well as in public discourse (especially pertaining to minority groups and their relationship to the majority of the society) seems to be a self-explanatory notion, and its Latin origin suggests that it has most likely been known and applied for a long time. Yet the term *inclusion* appeared in the

¹ I use the word *concept* for the meaning of the term. Following the tradition of the Lublin school of methodology (Stanisław Kamiński, Andrzej Bronk, Stanisław Maj-

dański). I make a distinction between a term/name (*a parte linguae*), a concept (*a parte mentis*) and a phenomenon/object (*a parte rei*).

Polish literature as late as in the 1960s (earlier, in 1959, its antonym in French, *l'exclusion*, was used), and the concept of inclusion is only apparently self-explanatory.

The term *inclusion* has become immensely popular and, surprisingly, it has behaved like certain plant species which conquered and colonised new territories, flourished there and replaced indigenous species over time. Inclusion is now mentioned everywhere: in official documents, political statements, in the mass media and in programs regulating the activities of various institutions. Forms of address in conversation or book illustrations can be inclusive (or non-inclusive). Moreover, the word *inclusion* seems to act as a magic wand – it is sufficient to touch a given object with it and it makes the object more beautiful, thanks to the powerful evaluative (positive) content of the word. Should one strive for inclusion? Apparently so (why?). Since the answer is yes, how to achieve inclusion?

Due to the significance of the phenomenon, it seems necessary to understand it better. One of the routes to better understanding is to look closely at the meaning of terms which define it; this is in line with the thesis that a language is a medium and the world of primary meanings is anchored in its memory (Martin Heidegger). This text aims to establish an initial semantic characteristic of the term *inclusion* in order to clarify its scope and content. Referring to etymology and archaic usage of the term in the Polish language, I present an overview of contemporary usage in various sciences and propose a typology of its meanings (referents), sharing some intuitions which may be useful in understanding the term within the context of resocialisation.

2.

There can be two approaches to the etymology of the term *inclusion* (in Polish *inkluzja*): a) since the term itself, just like its counterparts in Romance and Germanic languages², originates from Latin, its Indo-European-Greek-Latin etymology can be pointed out; b) other linguistic intuitions are evoked if the Polish word *włączenie* is used (synonymous with *inclusion* but of different etymology).

a) The Greek word κλείς is derived from the Proto-Indo-European *kleh*, which, according to Aleksander Brückner, means *flexion*, *bend* or, secondarily, an object with such properties (like a nail, a peg, a hook, a rod or a bolt), which may be used to close a door. Hence, the Latin name *clavis* and the Old Church Slavonic *ключъ* signifying this object.

The Latin verb *claudio* has the same origin; it has many meanings such as *I close* (the noun *clausum* meaning *closure* comes from this); *I conclude*/*I bring something to a close*; *I go (around) something*;

I cut something off, I separate, I limit, I make something unavailable, I imprison (someone), I surround, besiege, block; or rhetorically: *I round up*.

The word *inclusio*, meaning *closure* (but also *imprisonment*, *house arrest*, as in Cicero's speech against Vatinius (10, 24): *Bibulum, cujus inclusione contentus non eras, interficere volueras*), is a deverbative noun, derived from *includo* (*I close*). *Includo* has two main meanings: *I close something in something else* (*I insert, embed, put something in something else*, also in the sense *I include something in something else*) as well as *I stop, I plug, I inhibit*. It gives rise to two participles: *inclusor* (*the one who besieges, imprisons, encircles*) and *inclusus* (*closed, imprisoned, tied, included, incorporated*, but also *aloof*).

I note the first paradox of the term inclusion here: the word meaning *containing* has its roots in phrases referring to closing, in the sense of hampering the access, limiting, blocking, restricting, then imprisoning (these words have rather negative connotations) – but also in protecting valuables against intruders (in medieval Latin there is the term *inclusorium* for a reliquary as a place to keep objects considered sacred).

Medieval Latin brought new meanings of the term *inclusio*, although these were based on the existing ones: from enclosing a territory (e.g. pasture) and cramming, condensing (*compressio*, *densitas*), to closing also figuratively (*conclusio*), connecting, linking (*coniunctio*), embodying, counting in (*computatio*, *adnumeratio*), to even assuming the existence of something (*sumptio*) or as a legal reservation, condition (*exceptio*, *condicio*). These meanings, less and less literal, more and more metaphorical, will be gradually applied and used in various fields of science, just like the adverb *inclusively* from the same semantic family, meaning *together with, counting in, encompassing* (*includendo*, *computando*, *adnumerando*), the adjective *inclusivus*, especially in the context related to logic: *comprising, encompassing* and the participle *inclusus* used in medieval logic and grammar to signify *the implicit, not clearly stated, complicated, intricate*. b) The Polish equivalent of *inclusion*, that is *włączenie*, is etymologically derived from the protoword *lęk* (English *saddlebow*; both the English and the Polish word refers to a horse saddle as well as a bow). If something is bowed, certain parts of the object are further away from each other, whereas others are closer: this ambiguity of meaning can be found in various terms with the same etymology. Originally the verbs derived from *lęk* – *łączyć/łączyć* – meant *to separate, to depart*; then it started to mean just the opposite – *to combine, to unite*. Interestingly, initial linguistic intuitions were preserved in the terms of opposite meaning, *inclusion* and *exclusion*, where it is the pre-

² E.g. English *inclusion* (appeared in literature around 1600 or even earlier (15th century), in the sense of *act of*

making a part of; since 1839 also *that which is included*), French *inclusion*, Italian *inclusione*, Spanish *inclusión*.

fix that determines their sense. The Slavic root *klucz* (key) appears in only one of the antonyms of *inclusion*, that is *wykluczenie*.

3.

In contemporary dictionaries of the Polish language the term *inclusion* (*inkluzja*) primarily refers to the activity of including something and to the result of that activity (what is included). Secondly, it defines the relation between two sets, one of which is included in the other. The deverbative adjective *inclusive* has a slightly different meaning. It refers to something *connecting or containing a certain whole*, but also *intended for everyone*.

The Polish word *włączenie*, the closest in meaning to *inclusion*, can be understood in three ways: as adding a new member to the group (co-opting, enlisting, accepting, joining, recruiting, conscripting, involving), accepting someone to a group (incorporating, hiring, engaging) and as creating a whole with something or someone (annexation, joining, integration, incorporating, absorbing). In the semantic field of the term *inclusion* there are also categories of a group/subgroup, a system/subsystem and a set/subset.

If we analyse the meanings of the main antonym of inclusion, the term *exclusion* (*ekskluzja*), it may shed interesting light on our understanding of inclusion itself. The Latin root of *exclusion* is the same as that of *inclusion* – the prefix *ex-* lends it the opposite meaning though. *Excludo* means *exclude, prevent; shut out, hinder; remove, separate; cut off, rule out* (in the sense of cutting off and protecting at the same time; it also means *hatch*).

In contemporary Polish *ruling out, separating, rejecting* are defined as the obsolete meanings of *exclusion*, there is an emphasis on its logical connotations (*exclusive disjunction*) as well as social/sociological connotations (*marginalisation, preventing from participation in social life; isolation from others*). The adjective *exclusive* has also evolved to some extent: it signifies something *separating itself from the environment, shutting out people who do not belong to a certain milieu, demanding exclusivity for itself*; the additional meaning, which was added with a value-laden (positive? ambiguous?) undertone, was *exclusive as limited to a closed group of people, luxurious, elegant, but also available only to a certain group* (e.g. an exclusive interview).

The basic element of the term *exclusion* is *counting out*, understood as isolating (isolation, quarantine, separation, removing, disconnecting, seclusion, retreat, abandoning, alienation, loneliness, solitude, extracting, closing); eliminating unnecessary elements (choice, elimination, selection, sieve, removal, removing, option, disqualification); dividing into better and worse (selection, choice, screening, browsing through, segregation, selecting, sort, sorting, selecting, singling out); separating someone

from someone else (isolation, separation, disconnecting, detachment, dissociation, removing, parting, confining); rejecting someone by a group (alienation/alienating, marginalisation, rejection, estrangement, elimination); shutting someone out from an activity (disqualifying, rejecting); undertaking an action that prevents something (avoiding, averting, precluding).

4.

It seems that at this stage of deliberations, when we talk about inclusion, we refer to spatial relations: something is inside and something else is outside; something is incorporated and something is rejected; something is surrounded, closed, and something remains outside of these confines. A given element can be a part of a certain whole as a result of a process (of becoming part) or it is not a part and it has never been, or it has been a part but due to another process it ceased to be a part of the whole. It is an interesting dialectic: inclusion as incorporating in a certain whole makes the object excluded (subject to exclusion) from another whole, and vice versa. Moreover, under certain circumstances, inclusion and exclusion are value-laden, when exclusion is tantamount to selecting elements which are assessed as more valuable and *de facto* it means including the said elements in the new whole (different to the pre-existing one). The status of the elements which are subject to inclusion is not determined: whether they maintain or lose their separateness; the latter would mean they *melt away* in the whole.

5.

The term *inclusion* is present in different fields of science, ranging from formal sciences (especially in set theory) to natural science, religious studies, humanities and social science.

In mathematics inclusion is a relation of including sets (perceived distributively). The set A is included in the set B, or in other words: there is a relation of inclusion between set A and set B, or: set A is a subset (part) of set B, when and only when every element of set A is an element of set B, whereas set B may include elements which do not belong to set A (not every element of set B must be an element of set A). If set A is included in set B and set B is included in set A, we have sets with equal scopes (MEL 1970, 242). This relation would be the supremum of inclusion: there is no longer a superior or subordinate set because all the elements of set A are at the same time the elements of set B.

In this context a complement of a set should be mentioned; the complement of a set A to a universe I is a set \bar{A} , including those and only those elements, which do not belong to the set A. If we define a set of all people as a full set and a set of poets as set A, then the complement of set A will be the set of all

the people who are not poets (MEL 1970, 243). In my opinion this has some intuitive implications for understanding inclusion in the social context. What is the supremum of inclusion: a relation of identity for two sets (all elements of set A belong to set B and vice versa), or a complement to a universe?

Basic intuitions connected with the terms *inclusion* and *exclusion* are also reflected in formal logic while characterising some truth-functional operators. Exclusive disjunction is a complex sentence with the *either...or* conjunction understood as *exactly one of the two*. This alternative is correct if one and only one of the clauses is correct. Inclusive disjunction is a complex sentence in which either or both of its clauses are true (negation of the conjunction: not true that both p and q). The disjunction is false if both clauses are false.

In chemistry inclusion is understood as a process of retaining a crystal structure in empty spaces or closing the atoms, ions or molecules of a substance in the molecular cavities of another substance. Inclusive compounds result from this process; they are created when molecules of one substance (called a guest) are closed within the molecular cavities of molecular receptors or the empty spaces of a crystal structure of the other substance (called a host). Inclusive compounds may arise only when the size and shape of the guest's molecule are compatible with the size and shape of the molecular cavities or empty spaces in the host's crystal structure. There are no chemical bonds between molecules of both constituents, there are only weak intermolecular forces, which is why an inclusive compound can be easily decomposed into its constituents by dissolving in the right solvent or by heating. Therefore, inclusion cannot take place between any two substances, they have to be compatible in a way. The metaphor of a host and a guest is used here – one substance lets the other in, allows it to enter its territory. Moreover, inclusive compounds are not durable and are prone to disintegration.

In biology inclusion is like a cellular insert, called an inclusion body: it is a metabolically inactive (which means biologically dead) constituent of pro- and eukaryotic cells, which is a consequence of normal metabolic processes (e.g. the result of storing reserves or products of the metabolism, like drops of fat and glycogen in the liver and muscles, or crystals,

pigments in skin and hair) or the result of degenerative changes or the changes connected with a disease or a viral infection. Inclusion is understood here as something comprised in something else – a product of other processes and in a way *a foreign body* to the cell, even though it is located inside the cell and does not do any harm to it³. So, there are two separate elements: the including and the included; what is superior and what is subordinate. The question is whether the included always remains separate within the whole or whether it – sooner or later – melts away, disappears, is absorbed by the superior whole. Inclusion is perceived similarly in mineralogy, where it is a synonym for a foreign body embedded in a mineral. As a rule these are fine crystals of various minerals which crystallised earlier than *the host*, droplets of enamel absorbed by a large crystal of another mineral, drops of water, grains of sand, etc. What also can be called inclusion is a fissility, crack or any other natural internal defect that disrupts the course of a beam of light in the mineral. The presence of inclusion in a gemstone can be perceived as something negative (as happens with diamonds) or positive (e.g. animal and plant remains embedded in amber, which is the only gemstone that can have organic inclusions). So, in this case it is ambiguous.

The root of the word *inclusion* appears in the term *inclusivism* in religious sciences. It means a view voiced within one religious denomination, which states that salvation can also be achieved by followers of other religions (this view, just like exclusivism which states the opposite, is treated as part of the Christian discourse). More infrequently, inclusivism is defined as syncretism and the bringing together of opposing religious views. Inclusivism can take two different forms: the traditional one – where it is claimed that a chosen religion is the only true religion and believers of other denominations are not wrong only to the extent to which their opinions are consistent with the only true religion. In relativistic inclusivism it is claimed that all people have partial access to the absolute truth, and no denomination has a monopoly on the truth⁴.

6.

In humanities and social sciences the term *inclusion* with its antonym *exclusion* may take on different

³The term *inclusion* is also used in taxonomy to describe a situation when two species, considered to be distinct, turn out to be the same (inclusion in such a sense appears more frequently in paleontology). In its adjective form, *inclusive*, it is used by William Donald Hamilton in his concept of *inclusive fitness*, which is one of the pillars of modern evolutionary biology.

⁴For instance, the pedagogy of religion refers to such an understanding of inclusion and exclusion, hidden in the concepts of inclusivism and exclusivism. *What kind of religious education should be the subject of a dispute? The education that in uncertain (post)modernity will equip*

people with reflection, knowledge, skills and competences connected with consolidating a local religious identity, acquiring apologetic tools and rather exclusive than inclusive thinking about one's own religious group? Or inclusive education, treating one's own view of reality as one of many possible views, but not the only one, respecting the differences and rights of others, non-believers included, to their own world view and way of life, opposing ideologisation of sacrum or any dominance and oppression, emphasising self-knowledge, critical reflection, emancipatory competences and social responsibility? (Humeniuk, Paszenda 2017, 11).

meanings and perform various functions. *Exclusion* was used for the first time in the social context in Philibert Secrétan's article *Sens et non-sens de la pauvreté*, published in the *Esprit* magazine (1959). The text was about poverty and included the following sentence: *C'est donc par l'exclusion que je tenterai de définir la pauvreté, par une exclusion qui atteint l'homme jusque dans ses moyens de subsistance*, in which poverty is defined as exclusion/rejection afflicting a person in the context of their means of support. The article is actually not sociological, but rather philosophical and theological. The author formulates a thesis that all people, due to their sinfulness, experience poverty and exclusion (in a sense of their own accord, which is why it is more like self-exclusion), but thanks to God's forgiveness they attain inclusion, that is salvation.

The term *exclusion* – or perhaps the idea of exclusion? – appeared in René Lenoir's publication *Les exclus: un français sur dix* (1974). The phrase *les exclus* (the excluded) was applied to people who did not have the rights to social guarantees in France back then, so these were *social groups identified on the basis of their place or lack thereof in the system of social insurance* (Broda-Wysocki 2012, 53); *physically and mentally disabled, elderly invalids, abused children, drug addicts, criminals, single parents, low-lives*. Later it was also used to define the people whose qualifications did not match the demands of the labour market and immigrants; now the word *excluded* is used for groups burdened with social disapproval owing to their conflict with the law or due to their otherness in relation to the cultural code which is dominant in a society (Grotowska-Leder, Faliszek 2005, 10 and 26).

Since the mid-1990s the term *exclusion* replaced *poverty* and gradually became the key term in social and political programmes of the European Union, and now also in the United Nations. Why has this term become so attractive in a discourse of social sciences and public practice/public policies? Some researchers (J. Grotowska-Leder, P. Broda-Wysocki) point out that the new term shed a new light on phenomena which were actually quite well-known: poverty, unemployment, injustice and harm, slavery, exile, banishment, ghettoisation, excommunication, apostasy and other forms of rejection by the general public – it gave rise to studies from a new, fresh perspective. Its usage allowed the description and explanation of various phenomena, not researched so far; they all had a common denominator: being situated outside the dominant social mainstream. This was caused by the narrower content of the term *exclusion* as compared to *poverty* or *unemployment*: its content can be boiled down to *excluding, being outside*. If the content of the word is narrower, its scope gets broader (the word has more referents), so more objects – including the ones omitted so far, since they did not fit the previous conceptual framework –

are incorporated in the scope. Thanks to such an approach, the scope of the explored phenomena gets broader and their new aspects come to the fore.

The application of the term *exclusion* allowed to study adequately the phenomena of *being outside*, which were not connected (at least not directly) with poverty, unemployment, lack of social guarantees, addiction to psychoactive substances, etc. An example of such exclusion is the exclusion connected with one's level of consumer competence: what someone can afford defines their status in a social hierarchy and their overall life project (products from high-end brands, private education, etc.) People can be thus excluded even if they have sufficient financial means, but have decided not to participate in the race of consumerism. One can be also excluded on moral grounds (Broda-Wysocki, 2012).

With such a broad definition, the term *exclusion* is not distinctive (it is impossible to distinguish which object belongs to its scope and which does not), so it is difficult to come up with an adequate definition of the term (a nominal definition) or a definition of the phenomenon itself (a real definition). This may pose problems in conducting empirical studies on the phenomenon of exclusion (we are not sure what we are really studying), especially in measuring its scale and even more in organising actions and addressing specific help.

The words close in meaning – in some contexts treated like synonyms – to the term *exclusion* are *banishment, marginality/marginalisation, isolation, rejection* (Faliszek 2005, 45). The term *exclusion* is not associated with any new intuitions (*in general it is identified as a problem with functioning and participating in the life of a given community according to the standards considered »normal« by the said community* (Broda-Wysocki 2012, 12)) – as opposed to the concept of marginalisation. It suggests the image of a book: there is the main part of the page that attracts the most attention and there is a margin – be it narrower or broader, but frequently disregarded. The terms *marginal/margin* appeared in the French language at the beginning of the 1970s, describing the young people participating in the protests of 1968, that is people who made a voluntary decision to be on the margins: *they left the centre of the society, that is the mainstream of its life, but they remained its members at the same time* (Broda-Wysocki 2012, 29). In time these terms were applied to other phenomena – of a different origin and structure – and the common denominator for them was being on the fringe. For instance, in South America they were used to depict inhabitants of favelas, who moved from villages to cities and became the majority there, yet did not choose their social position, did not belong to a formal economic system nor to any groups shaping the mainstream economy or culture. The term *inclusion* appears here to describe a certain antidote (or perhaps a panacea?) to (ubiquitous) ex-

clusion. P. Broda-Wysocki (2012, 29 and 144) compares it to the Trojan horse *by means of which politicians try to refresh the discourse on social issues which they were not able to solve properly*, a discourse that turns out to be useful when they try to get rid of an unfavourable social phenomenon.

The content of the term *inclusion* is actually quite narrow – it comprises the basic intuition of *encompassing, being (for the first time? once again?) on the inside*. As one can easily note, different notions/concepts/theories of inclusion are determined by the earlier notions/concepts/theories of exclusion. And because exclusion and inclusion *pertain to basic aspects of the functioning of individuals and groups in society: their cultural rootedness, participation and access to important goods and social resources* (Grotowska-Leder, Faliszek 2005, 9), we are faced with a multitude of concepts of exclusion and inclusion, situated additionally in theories both sociological and those related to the political science of society and the relationship between society and the individual. The particulars of the theories combined with the social situation *in illo tempore* make our understanding of exclusion and inclusion more specific, which is already conspicuous at the level of a definition⁵.

I mention different definitions of inclusion (source: P. Broda-Wysocki (2012, 66, 71 and 139): a) *integration of people or groups into the structures of the market and/or the state while maintaining their previous inequalities*; b) *adequate access to resources and equal access to participation in individual and collective life opportunities*; c) *a possibility to pursue a good life*; d) *participation in social relations (being a member of a community, with a number of rights and obligations ensuing from this)*; e) *combating exclusion*. The definitions show what is perceived as valuable in an individual-society relationship; as to their wording, they include terms potentially synonymous or belonging to the same semantic family as the term *inclusion*, while also carrying their own meanings: *integration, participation and partnership* (Faliszek 2005, 45; Broda-Wysocki 2012, 179).

A certain ideal of social life is also presented in the catalogues of goals of inclusion: they mention social cohesion, equality, prosperity, providing the necessary financial means for life, restoring dignity of the excluded, creating and providing equal opportunities, equal rights, fighting discrimination; there is even inclusion as its own goal. A different approach

to the goal – defined as something to be achieved by inclusion – is an *inclusive society*, which is the opposite of an *exclusive society*. There is no common opinion as to the meaning of the term, and the priorities of such a society are not defined either; usually general statements have to suffice, referring to *the idea of participatory citizenship, but also social justice and diversity understood in an egalitarian way*; sometimes *inclusive democracy* is mentioned (Broda-Wysocki 2012, 64, 68, 175 and 212). And just as with *exclusion*, we have a term which is neither distinctive (one cannot unambiguously distinguish which object belongs to its scope and which does not), nor operative, which makes it rather difficult to study the phenomenon of inclusion and projects of inclusive action. If we decide that, for instance, prosperity is the goal of inclusion (or appropriate social position or a subjective treatment), it is still unknown what level would be just, adequate or satisfactory enough to decide that inclusion has been reached.

I am willing to agree with Krzysztof Frysztański (2005, 19), who states that “*whatever is said about inclusion, it is (...) in its various options first and foremost a certain worldview and a theoretical and ideological structure ensuing from it: it is an attempt to construct a desired image of the social world, of something better than what was known so far, worthy of various endeavours or even serious costs if they need to be incurred*”. It should be emphasized that the majority of researchers of social life are aware that the concept of inclusion is closely connected with idealisation: this is why it plays a function parallel to idealisations applied in natural sciences. Its utopian nature is highlighted to avoid the risk of undertaking inefficient action on an excessive scale: *it is necessary to modify expectations as to their results (...): one should be content with success understood ‘as engaging the marginalised people in the principles and rhythm of an organised human activity and/or rooting them in an intermediary structure between them and an open society’* (K. Frieske, source: Faliszek 2005, 49).

What is interesting is the use of the term *universalisation* in this context, or the use of other words from the same semantic family: *the concept of inclusion is probably connected with the theory and practice of generalisation, universalisation, creating certain holistic variants of social life, overcoming what is socially discriminative, or contrary, and as a result – segregating; what is universalising and inclusive*

⁵ This is how P. Broda-Wysocki (2012, 12-13) describes a process of creating definitions of exclusion and inclusion: *noticing the phenomenon of exclusion (...) creating a definition of the observed phenomenon of exclusion, programming inclusive activities – as far as possible, not necessarily in direct response to the observed and defined phenomena of exclusion (...) deriving a definition of inclusion from a possibility of inclusive activities (...). Definitions of exclusion (if they are not created to match specific activi-*

ties) are usually relative and are related to specific phenomena observed by researchers. Typically, they are rooted in the social reality yet have no universal features, therefore they are so numerous and become outdated very fast. Definitions of inclusion, on the other hand, are rooted in possibilities of activities planned on a bureaucratic level (be it public – the state or social – local governments and social organisations using public means), therefore their ad hoc nature or instrumentalism.

is perceived as 'good', fair, useful, hence worthy of certain endeavours in order to attain such a state of affairs (Frysztański 2005, 18).

Equating inclusion with universalisation brings to mind – not in the strict sense, but analogically – the definition of inclusion as a relation between sets. Perhaps *universalisation* pertains to the fact that two sets will be identical in their scope (so a certain *peak* of inclusion will be achieved). Maybe it is the relation of complement to a universe. Or perhaps it is difficult to apply categories from set calculus because it is not about the sets in a distributive sense, but in a collective sense (the elements are not understood as homogeneous entities but as aggregates/conglomerates of features/elements).

7.

The term *inclusion* is sometimes replaced with the phrase *inclusive actions*. In this context *inclusive challenges* and *inclusive projects* may occur as (proposed) goals of inclusion when it is defined as an action (Broda-Wysocki 2012, 65 and 223); *strategies of inclusion* with measures such as *inclusive language*⁶ and *inclusive communication*⁷ – when inclusion is defined as a method. On the other hand, *inclusion* itself appears with various specifying phrases, for instance: *social inclusion*, *political inclusion*, *inclusion in education* (other expressions focus on inclusion as the goal of an activity: *inclusive teaching*, *inclusive education*). In a similar vein, *social exclusion* or *legal exclusion* are discussed.

The terms *exclusion* and *inclusion* (antagonistic towards each other) and their synonyms provide attractive wording, used in the titles of conferences and academic papers, suggesting a multitude of presented positions and the topicality of a subject under discussion – whatever it may be. It is quite typical in pedagogy – perhaps more frequent than in other disciplines, but also in social work, the sociology of medicine, even in cultural studies and literary theory. There is a discernible trend: these two terms are used in literally every context that allows for it.

8.

In order to present the ambiguity of the concept of inclusion, I would like to discuss several problems related to it.

a) The first area of discussion pertains to the attribution of a certain value to the phenomena – inclusion is presented as something positive, whereas exclusion as something negative. *The more exclusion is perceived as something negative, the more inclusion becomes good and necessary; the ideas of inclusion evoke half-intuitive sympathy* (Frysztański 2005, 19 and 23); exclusion is misery, inclusion is happiness (P. Declerk, source: Broda-Wysocki 2012, 53). Yet, provocatively, one may reverse this equation.

Starting from a general level, it is exclusion that can be treated as a natural and elemental phenomenon: *in the social world, what takes a distinguishing or even excluding form, may be treated as a manifestation of some real, unavoidable, influential processes and phenomena* (Frysztański 2005, 19), and inclusion has an artificial, imposed character. Theoretical assumptions concerning the essence of social life may also be significant: *from the perspective of structural orientation, diversity may become a source of social problems; from the perspective of the concept of deviation, (...) the dominant unifying tendencies and the lack (...) of space for diversity may make otherness and nonconformity unacceptable and consequently problematic* (Frysztański 2005, 23).

At the level of individual social phenomena, the dialectic *exclusion-inclusion* may also be reversed. The groups of the excluded, due to their exclusion, may avoid some other forms of oppression from society, oppression more dangerous than what they experienced so far. Moreover, inclusion undertaken in one aspect may lead to unfavourable consequences in another aspect, e.g. inclusion understood as integration is harmful to immigrants because it leads to assimilation and the loss of their cultural resources. The very fact of belonging to a group of people who are subject to inclusion may make a person susceptible to exclusion in other fields, to passivity (it is difficult to act together without a sense of common identity, and then – no-one is proud of being excluded) and to a constant sense of being insufficiently respected, or even to stigmatisation (Marek Rymysza's thesis), whereas groups of the excluded from a certain sphere

⁶ In Polish the term is a word-for-word translation of *inclusive language*. According to the Collins Online Dictionary it is a *language that avoids the use of certain expressions or words that might be considered to exclude particular groups of people, esp. gender-specific words, such as 'man', 'mankind', and masculine pronouns, the use of which might be considered to exclude women*. The relevant document of the General Secretariat of the Council of the European Union of 2018 (2019, 7) defines inclusive language thus: *inclusive, bias-free language avoids stereotypes and references to irrelevant details. It acknowledges positive qualities in people of all genders*

and sexual orientations, persons with disabilities, people of all ages, from all backgrounds and of any or no religion or belief.

⁷ The same document, in order to explain inclusive communication, introduces a few directives specifying how to communicate in an inclusive way: If you – even unintentionally – use inappropriate expressions or biased language, you exclude people and thereby create barriers to communication. To make the language you use bias-free, avoid expressions that demean or exclude people because of age, gender, sexual orientation, race, religious or other beliefs, ethnicity, social class, or physical or mental traits.

may create an alternative culture and develop a strategy of *everyday resistance*, integrating with each other within a niche which is conducive to their functioning.

b) Another strand of the discussion focuses on the adequacy of the category of exclusion and inclusion to describe and explain social phenomena. When the *exclusive-inclusive paradigm* is questioned, it is based on the following observation: the division into *exclusive* and *inclusive* is just arbitrary; what is more, every inclusion contains, metaphorically speaking, seeds of exclusion (and the other way round). The point is that exclusion and inclusion may take place at the same time within a single society, pertaining to different groups. Every culture has great inclusive potential (for its representatives) as well as exclusive potential (for all the others). Inclusive activities themselves may embrace exclusive elements (e.g. paternalism). Exclusion seems to be an unavoidable side effect – or perhaps an immanent element – of social systems which aim at achieving inclusion, and inclusion understood as cohesion *would have a very great exclusive potential (the groups which excluded all 'the others' may seem the most cohesive)* (Broda-Wysocki 2012, 242).

c) The third, most hotly debated area of the discussion focuses strictly on inclusion as actions / strategies, because it deals with their efficiency. I do not have sufficient expert knowledge to present and assess various positions in the debate about the efficiency of inclusive actions. Let me just say that the efficiency of inclusion is gradable (for instance, incomplete inclusion, partial inclusion and unsatisfactory inclusion are mentioned), and inclusive actions may be undertaken by various entities; then the fact who the agent of this inclusion is (a state, social organisations, enterprises, etc.) may be decisive for their efficiency (Broda-Wysocki 2012, 23, 175 and 195). The tone of the discussion is usually pessimistic: one can sense an awareness of discord between *a noble discourse about inclusion* and the nature of actions that were finally accepted – in practice it is difficult to translate ideals into specific actions.

9.

Theoretical and practical problems with the concept of inclusion ultimately have their source in social human nature (*homo animal sociale*). Exclusion as a phenomenon has always existed and will exist for ever – just like inclusion. Belonging to a social group is something primary, in a way decisive for an individual's identity. Thanks to other people a little person enters the world of culture, absorbs a certain hierarchy of values, finds his or her place in society. Moving between different groups / structures, even though possible to some extent, has its limitations: family, cultural, political, economic, religious, sometimes moral ones. As long as people differ be-

tween one another in any respect, they will be situated differently in society due to these differences. This concerns everyone who belongs (or who does not belong) to a given community and influences the rights that they have in the community and the consequences of these differences.

Additionally, deliberations about inclusion and exclusion have an axiological background. If someone should be included in a group, then who? For what reason? On what grounds? Are there any indications or contraindications for including x rather than y? A pragmatic justification is not sufficient here: values are indispensable in order to provide a mandate for initiating and conducting actions which will aim at making a change, both on a social and individual scale, for the person *involved* in inclusion. But what does it mean to share common values in an axiologically varied society?

On the other hand, academics agree that some social phenomena defined as exclusion are just wrong and need to be eradicated, without a necessary reference to the considerations about the nature of good and evil, without any ethical justifications for certain actions. *There are exclusive phenomena which cannot be and should not be ignored, and they cannot be underestimated by saying that they are just natural, inevitable and perhaps even beneficial in the long run (...) Some manifestations of poverty (...) may and should raise concern. As a result, the variants of social policy, theoretically informed and justified, which are to prevent these phenomena and modify their severe consequences, are feasible* (Frysztański 2005, 21).

In this context I would like to mention the conflict between an individualist and collectivist approach, regarding the relation between a person/an individual and society. In places where the emphasis is placed *on a person's right to be himself or herself, to enjoy personal freedom, to pursue one's own ambitions (...) [then] the circumstances that disturb these rights and opportunities for individuals or possibly small groups, are perceived as problems*, whereas *collectivist orientation places far more emphasis on the collective, on the superior value of a community, on the need to subordinate individuals to what defines and protects social entities* (Frysztański 2005, 23). For representatives of the extreme individualist approach, inclusion would be desired only when a person himself or herself wants to be included in a group, in a way in their own right; for representatives of the extreme collectivist approach, even enforced inclusion is a positive phenomenon for the whole society. Between the two extreme approaches there is an entire rich *continuum* of moderate positions, with plenty of nuances.

10. Conclusions

In order to summarise the considerations presented so far, I suggest the following typology of meanings

(typology of referents) of the term *inclusion*; each of them accompanied by some remarks, more heuristic than systematising.

a) inclusion as an activity/action

It seems that inclusion is not a spontaneous process in the social world; in a way it must be provoked externally and its course must be controlled and corrected.

Perhaps the praxeological toolbox introduced by N. Rescher (1966, 215) could be useful in analysing inclusion as an action: (1) agent (who did the activity?), (2) kind of action (what did he do?), (3) modality of action (how did he do it?): (a) modality of manner (in what manner did he do it?), (b) modality of means (by what means did he do it?), (4) setting of action (in what context did he do it?): (a) temporal aspect (when did he do it?), (b) spatial aspect (where did he do it?), (c) circumstantial aspect (under what circumstances did he do it?), (5) rationale of action (why did he do it?): (a) causality (what caused him to do it?), (b) finality (with what aim did he do it?), (c) intentionality (in what state of mind did he do?). Yet such an analysis would require a separate study.

b) inclusion as a product/result of an action

I make a distinction between a goal (at the starting point) and a result (at the endpoint), because, undeniably, not every plan is fully implemented. Moreover, it is a paradox of praxeology that a person is never aware of all the consequences of their action because, among other things, the action frequently has side effects that the agent is not able to foresee (Pszczółowski 1982, 28 and 173).

Inclusion as a result may be quite ambiguous: it may be the result of a non-inclusive action (even exclusion), and inclusion as an action may lead to a result other than inclusion. A question arises: to what extent is inclusion as a result similar to inclusion in a mineral – a foreign body from the perspective of the whole, and to what extent is a kind of incorporation taking place?

c) inclusion as a relation

The word inclusion may be used to describe the very relation between two sets – in a collective sense (an aggregate of elements) or in a distributive sense (a set of objects with a common feature). For instance, such a relation may take place between an excluded group and the entire society or between the excluded and the excluding. Once again, an issue of the supremum of inclusion comes into play: is it a relation of identity for two sets when all the elements of set A belong to set B and vice versa? Or is it perhaps a complement to a universe?

d) inclusion as an idea

This is the result of idealisation which is about *amplifying* certain features in order to create a name (and a concept) of an object which fully possesses these features. Hence, inclusion in this context does not refer directly to actual actions, their products and relations, but it is a leading idea, a motto on the banner. It seems that this meaning of the term *inclusion*

is the dominant one in the context of sustainable development. In this sense inclusion always remains unattainable in the real world; it is a postulated, desired, yet unreachable goal of various endeavours.

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Factors of Quality of Life in a Group of Selected European Union and OECD Countries

Czynniki jakości życia w grupie wybranych krajów Unii Europejskiej i OECD

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Abstract

This work focuses on the evaluation of the factors of quality of life in a sample of 26 countries. Quality of life is a complex, multidimensional concept, which includes various social, cultural, economic, political, demographic and environmental aspects. Regarding this, principal component analysis and regression analysis were chosen as relevant methods to analyse relationships among twenty-five variables related to quality of life, and their relationships with three composite indices reflecting crucial aspects of quality of life, wellbeing and sustainability. These indices, applied as the response variables in the regression analysis, include the inequality-adjusted alternative of the Human Development Index (IHDI), the Happy Planet Index (HPI), and Healthy Life Years (HLY). The IHDI represents an objective indicator of human development and wellbeing. HLY reflects quality of life in terms of health. The HPI combines the ecological efficiency with which human wellbeing is delivered, while it also includes a subjective measure of wellbeing. Since each of these indices represent different aspects of quality of life to a certain extent, some of the factors (represented by selected indicators) affected them in different ways. After applying a Lasso regression, nine of the 25 indicators – representing crucial factors of quality of life – were identified. Homicide rate (representing the factor of safety) affected all three indices in a negative way, whereas Years in education (representing the factor of education) and Life satisfaction – a subjective indicator of wellbeing representing the dimension of the same name, affected them positively.

Key words: health, human development, quality of life, sustainable development, regression analysis, principal component analysis. JEL Classification: I10, I13, I15, I18, Q01.

Streszczenie

Niniejsza praca koncentruje się na ocenie czynników jakości życia na próbie 26 krajów. Jakość życia to złożone, wielowymiarowe pojęcie, które obejmuje różne aspekty społeczne, kulturowe, ekonomiczne, polityczne, demograficzne i środowiskowe. W związku z tym wybrano analizę głównych składowych i analizę regresji jako odpowiednie metody analizy relacji między 25 zmiennymi odnoszącymi się do jakości życia oraz ich związków z trzema złożonymi wskaźnikami odzwierciedlającymi kluczowe aspekty jakości życia, dobrostanu i zrównoważonego rozwoju. Wskaźniki te, stosowane jako zmienne odpowiedzi w analizie regresji, obejmują skorygowaną o nierówności alternatywę wskaźnika rozwoju społecznego (IHDI), wskaźnika szczęśliwej planety (HPI) i wskaźnika lat zdrowego życia (HLY). IHDI stanowi obiektywny wskaźnik rozwoju człowieka i dobrobytu. HLY odzwierciedla jakość życia w kategoriach zdrowia. HPI łączy w sobie efektywność ekologiczną, z jaką zapewnia dobrostan człowieka, a także subiektywną miarę dobrostanu. Ponieważ każdy z tych wskaźników w pewnym stopniu reprezentuje różne aspekty jakości życia, niektóre czynniki (reprezentowane przez wybrane wskaźniki) wpływały na nie w różny sposób. Po zastosowaniu regresji Lasso zidentyfikowano dziewięć z 25 wskaźników – reprezentujących kluczowe czynniki jakości życia. Wskaźnik zabójstw (będący czynnikiem bezpieczeństwa) wpłynął negatywnie na wszystkie trzy wskaźniki, natomiast lata nauki (będące czynnikiem wykształcenia) i zadowolenie z życia – subiektywny wskaźnik dobrostanu reprezentujący wymiar o tej samej nazwie – wpłynęły na nie pozytywnie.

Słowa kluczowe: zdrowie, rozwój człowieka, jakość życia, zrównoważony rozwój, analiza regresji, analiza głównych składowych

1. Introduction

Improving the quality of life for individuals around the world is a crucial goal. However, the means to achieve it, or even to accurately measure it, remain elusive. Quality of life may be considered on various geographic scales. Nevertheless, it is the individual that truly matters, and each person has the right to their share of wellbeing (at the lowest analytical level, which is the individual) (Cusack, 2019). Quality of life needs to be put into the context of sustainable development (SD). Most generally, improving the quality of life of the current generation should not impose a burden on future generations and limit their quality of life and wellbeing. This complies with the basic philosophy of SD. The SD paradigm emerged to provide a framework by which economic growth, social welfare, and environmental protection can be harmonized (Asara et al., 2015). According to its essential definition, by which SD was conceptualized, it is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987). Later on, its definition was explicated as a development that generates economic growth, distributes benefits equitably, regenerates the environment, and promotes people (Mosteanu et al., 2014). Based on this, the concept of SD addresses the issue of inequity, and complements desires for economic and environmental vitality. Since this definition was accepted, many further definitions, methods of measurement, and parameters have been developed. The concept of SD can then be interpreted as a balance between its pillars, i.e. the economic, social and environmental pillar (see more also in Drastichová (2018); Drastichová and Filzmoser, 2019). Moreover, the fourth, institutional dimension is emphasized as the fourth pillar of SD because of its necessity in supporting progress in the previous three pillars and in SD generally (United Nations et al., 2003). The relationship to quality of life is obvious. The concept of SD concerns environmental protection, economic vitality, as well as social equity (by assimilating individual concerns into collective ones). This balance between the three E's of sustainability, as well as between the collective and the individual, have made SD one of the great challenges. It also reflects the fact that the quality of life of future generations will depend on our current decisions. Transferring our attention to quality of life in the context of SD, hundreds of definitions of SD have been presented over recent decades (deVries and Petersen, 2009). In an effort to summarize these definitions, and to emphasise the interdisciplinary nature of sustainability, they themselves define SD as *a quest for developing and sustaining qualities of life*. According to Cusack (2019), awareness of the need for SD is increasing throughout the world. The goals of SD, oriented around the *three E's*, namely: economic growth, environmental protection, and social equity, also correlate with quality of life considerations.

The concepts of quality of life and SD are significantly interconnected, and in an analysis of quality

of life not only SD but additional (related) concepts should be taken into account. Recently there has been a focus on the concept of human development (HD) together with several alternative (transformation) concepts, which should also be considered in relation to quality of life. As regards the human development approach, the current focus on the economic, environmental and social dimensions of SD must be expanded so as to include a human dimension. This focuses on people and their opportunities and choices and is therefore a crucial part of the overall concept of SD, and must be considered when analysing quality of life. The concept of HD is considered in this work and therefore it is necessary to explain it in more detail. Ideas of HD have become strongly associated with the work of the United Nations Development Programme (UNDP), and the publication of their annual reports (UNDP, 1990). The HD paradigm supports a need for understanding development as being *development of the people by the people, for the people* (UNDP, 2020). The contribution of HD can be understood in a consideration of development that has moved away from a purely economic-based understanding measured in GDP, and from a purely state-centred understanding, to one where the people become the main agents of development. A number of transformation discourses, such as the concepts of degrowth or Buen Vivir, have arisen (Beling et al., 2017). Practical application of the principles of these concepts can significantly affect quality of life. Primarily, the rationale behind this research lies in a consideration of the concept of SD (and related concepts) and its adoption as a basic philosophy. The growing importance of alternatives to SD is also considered.

The term *quality of life* (similarly to the concept of SD) is difficult to define, identify, categorize and analyse. It is a complex, multidimensional concept and includes various social, cultural, economic, political, demographic and environmental aspects. Based on this conception, further consideration should be given to what determines quality of life, with respect to the basic philosophy of SD (more in section 2.1). The WHO Quality of Life (WHOQOL) Group defines quality of life as the perceptions of individuals with regard to their own personal goals and expectations, their standards, and their concerns (Feng and Hsieh 2009). An emphasis on the individual is included in this definition. An emphasis on the individual is included in this definition. As inequities persist, individual wellbeing remains elusive for many. Although quality of life at a national level is the main area of interest in this work, the importance of individuals is not neglected.

Quality of life, which should result, ultimately, from SD, is, like SD, a global challenge. The main philosophy of SD, according to its most commonly quoted definition, is considered. The quality of people's lives at a national level is the main area of interest in this work, which considers the basic philosophy of SD. The aim of this work is to identify the crucial factors affecting quality of life, and to discover the relationships between these factors in a sample of 26

developed OECD countries. The sample includes the EU countries (apart from Malta, Croatia, Cyprus, Bulgaria, and Romania) along with several non-EU countries, which are OECD members, including Iceland, Norway, Switzerland, and the UK. Regarding statistical methods, principal component analysis and regression analysis are applied. We posed two main research questions. Firstly, if there are many factors of quality of life, are some of them more significant than the others? Is health and subjective indicators among the most important factors of quality of life and SD?

Since the main philosophy being considered is SD, the variables applied were chosen to reflect aspects of sustainability, SD, wellbeing and quality of life, taking the human development approach into account. To this end, several composite indices reflecting crucial aspects of sustainability, SD, and quality of life, are selected for the analysis. These variables reflect quality of life in conjunction with SD. Namely, the Inequality-adjusted Human Development Index (IHDI), the Happy Planet Index and Healthy Life Years were chosen for this purpose. The selection of the main factors of quality of life to be used as explanatory variables in the regression analysis is determined by a detailed analysis of a number of works by other authors. Next, the relationships between these factors and the composite indices are analysed in order to determine the essential factors of quality of life and SD at a national level. To sum up, in the selection of all variables, the essential aspects and factors of both quality of life and SD are taken into account, based on detailed studies and analysis of relevant research works.

The structure of the remainder of this paper is as follows: Section 2 discusses more background to the topic and provides information to the data and to the statistical methods; Section 3 provides the results and discusses the findings; Section 4 contains overall discussions in the context, and Section 5 finalizes the paper with conclusions.

2. Materials and Methods

In this section, the works most relevant to the performed analysis are briefly introduced. Subsequently, the data and methods applied are described.

2.1. Literature Review

At the beginning, important studies focusing on the history of the concept of quality of life are introduced. Philosophers have been debating the merits of measuring the quality of human life in terms of utility, whether understood as happiness or as the satisfaction of desires or preferences. Some philosophers continue to defend this general approach albeit usually with considerable qualifications, adopting utilitarian stances with complex and subtle restrictions on the nature of the preferences that may be considered. Others have concluded that the whole utilitarian approach should be rejected and replaced, perhaps, by an account of the many different kinds of activity that actually make up a *thriving* human

life. According to Sinha (2019), the concept of the quality of life is multidisciplinary and as such, it is holistic, since it incorporates every aspect of a human's daily life in its compass. It is not exclusively economic; rather, it has social, political, cultural, and recreational underpinnings. Contributors of the chapters of that work have attempted to elucidate the meaning of the quality of life in their respective countries through their valued contributions.

The work of Seth (1889) was probably the first in the history of development of the concept of quality of life. While discussing the nature of ethical end or standard as social welfare, the author stated that *in order to an ethical theory, we must not regard the mere quantity, but also the quality, of the 'life' which forms the moral end* (Seth, 1889). He postulated that both the *quantity* and *quality* of life should be considered from the perspective of promoting welfare activities to enhance happiness or quality of life of individual members. After integrating the literature concerning the definition and measurement of quality of life, Elyse (1992) found that the concept of quality of life was newer in comparison to the concept of public happiness which was popularly used as a measurable quantity by the political economists in the past. The author indicated that the wider use of quality of life started from 1961. Initially, the term was used most often in conjunction with such concerns as environmental pollution or urban deterioration. This is the context which is now considered on a much broader scale and has received greater attention by scholars and researchers of different disciplines at the global level. The idea of Meeberg (1993) is similar to the ideas of the previous author. He also considered quality of life as a phrase which was first used shortly after the Second World War and has been overused and infrequently defined since then. Most of the attempts to deal with quality of life took place in the 1960s. Besides that explained above, Farquhar (1995) emphasised the fact that from the mid-1970s the term *clinical interventions* concerning health was also used in the area of medical science along with the increasing importance and use of quality of life in social science. However, medicine and nursing science predominantly focused on quality of life related to health to examine only one domain of quality of life, i.e. physical functioning.

The concept of quality of life is broad, crossing three major branches of science: economics, medicine and the social sciences, with each branch providing different views on the conceptualisation of quality of life (Cummins, 2005). From the social science perspective, quality of life has, in particular, been conceptualised firstly as multidimensional (that is influenced by personal and environmental factors and their interactions), secondly, as having the same components for all people, thirdly, as having both subjective and objective components, and, finally, as being enhanced by self-determination, resources, purpose in life, and a sense of belongingness (Cummins, 2005). Such conceptualization has made quality of life an elusive and diverse concept approached

with varying levels of generality – from the assessment of societal or community wellbeing, to the evaluation of the wellbeing of specific groups and individuals. This also makes the quality of life a multidimensional concept that needs to be carefully defined by using different attributes or indicators, and in which the inclusion of indicators should be based on the context in which quality of life is being used. Several taxonomies of quality of life have been developed. Ferrans (1996), and Felce and Perry (1995, 1996) were the first to endorse the search for suitable indicators to conceptualise the idea. Felce (1997) stated that quality of life is influenced by six main elements, including material, physical, emotional, social, productive, and rights/civic wellbeing. On the other hand, the World Health Organisation (WHO) categorised quality of life into six components, which are physical wellbeing, environmental wellbeing, psychological wellbeing, social relations, level of independence and spiritual wellbeing. In this context, wellbeing is defined as the state of being happy, healthy and comfortable with life (WHO, 1997; Galloway 2006). However, from the point of view of Social Science, quality of life generally implies the overall satisfaction of person's living. This satisfaction may arise from economic attributes (related more to material goods), social attributes (linked to psychological satisfaction) and environmental attributes (connected with accessibility to desired natural and physical conditions). It results from these attributes that quality of life has different dimensions which are either objective or subjective. The objective dimensions of quality of life are usually physical attributes that may be in the form of quantities and frequencies of an entity, for example, access to good housing, infrastructure and services, healthy food, etc. (Cummins, 2005). The subjective dimensions are within the private consciousness of each individual and can be verified only through repeated responses provided by the person concerned. The subjective dimensions are within the private consciousness of each individual and can be verified only through repeated responses provided by the person concerned. These objective and subjective dimensions have further been widely discussed in different works, such as Felce (1997), Haas (1999), Moons et al. (2006), Testa and Simonson (1996), or Sirgy (1998). Sirgy (1998) indicated that the subjective dimension of person's quality of life can arise from either need-based-expectations (materialist) or cognitive-based expectations (non-materialist), or both. The need-based-expectation tends to be influenced by social comparisons, such as wealth and material possession of family and friends, while the cognitive-based-expectations arise via predictive-, past- and ability-based comparisons. With the emergence of postmodernism thought there has been a growing concern that quality of life is purely a subjective experience (Haas et al., 2006; Haas, 1999). Thus, it is socially constructed. The other common view is that quality of life should not be primarily defined with regard to either its objective or subjective components but

should rather include both aspects (Cummins, 2005) as they both affect the quality of an individual's life. This is particularly true when the quality of life is identified as a measure of collectivises, such as assessing the quality of life at a community level, local level or at a regional or national level.

As mentioned above, the concept of quality of life is difficult to define and analyse. The quality of life of people of an area can be studied at any spatial level such as the local, regional, national and international level. It can also be studied across social structures. The quality of life of any person living in a defined region at a particular point in time is a composite picture of several objective and subjective or quantitative and qualitative variables. Nevertheless, quality of life does not remain the same throughout a person's life, but it varies from one stage of life to another, and from one type of spatial unit to another, because every aspect of the life of a person is influenced by the environment (Sinha, 2019). Prutkin (2002) explained some constraints on the measurement of quality of life. He stated that assessment of quality of life is a difficult task due to the involvement of several elements/factors of a varied nature, role and importance, and the selection and applicability of indicators. Saxena et al. (1998) also expressed some limitations concerning the measurement of quality of life. According to them, the idiom *quality of life* is frequently used as a concept but it is very vague, because it involves diverse social, cultural, economic, regional and other aspects and thus, the measurement of quality of life in a precise form remains elusive.

Rodrigues et al. (2020) presented the reference framework for multidisciplinary research at the Life Quality Research Centre (LQRC). The research paradigm about the people's quality of life in society imposes a multifaceted and complex analysis. At the LQRC it is thematically divided into six scientific areas: education and training; physical activity and healthy lifestyles; food production and technology on food behaviors; organizational dynamics; motor behavior; and individual and community health. According to them, research on people's quality of life is a cross-cutting, multidisciplinary, and fundamental issue concerning current society. Contemporary societies focus on the physical, psychological, and social wellbeing of the population. This should be translated into relevant policies. The idea of quality of life is closely related to SD (Rodrigues et al., 2020).

Jones and John (1977) applied some criteria in measuring quality of life, such as per capita and household income, unemployment rate, housing cost, infant mortality, suicide rate, robbery, traffic rate, voting in presidential election, etc. According to Ginsberg (1980) the variation in qualitative features of the inhabitants in a given area significantly determines the variation in the pattern of economic growth in this area. This results from the fact that the qualitative attributes of people in a given area play a great role in the process of increasing the level of peace, progress, prosperity and, in turn, quality of life. Mittal (1993)

and Ghosh (1993) dealt with the role of literacy, education, and equitable distribution of resources in raising people's quality of life. Rajesh (1993) and Ramaswami and Ram (1985) discovered the importance and role of the quality of human resource (knowledge, skills, attitudes, vigour, attitude, capacity, etc.) and the development of human resources through formal and non-formal education, training, food and nutrition, etc. in maintaining and increasing the quality of life of the people. They also included indicators of habits, culture, environment, standard of living, number of children, expenditure towards children's education and health awareness, etc. to reflect destitution and condition of life. Qasim (1993) stated that in fact, GNP or per person income do not truly help in meeting the basic needs of people. Moreover, maintenance of ecological balance and human rights are as important as the other basic needs. A real improvement in quality of life will be hard to achieve unless the question of population control is aggressively pursued and some degree of stability is ensured (with regard to various aspects of human needs and quality of life issues). There is the highest urgency for the implementation of two components, i.e. literacy and availability of energy from the point of view of improvement of quality of life. According to Park (2009), standard of living and quality of life are fundamentally different concepts. Standard of living basically results from material-based resources and opportunities measured by objective indicators, whereas quality of life is the result of a persons' subjective assessment about their life. Then, the measurement of quality of life is based solely on personal opinion and evaluation about satisfaction in their life. The most appropriate approach for measuring quality of life is the application of a composite index, which is calculated on the basis of the sum of values of a variety of physical and mental health and other aspect-related indicators. The basic objective of this is to form a picture of the peace, comfort, and happiness of a life.

Singh (1993) considered income, employment, health, education, physical environment, human dignity and freedom as quantitative and qualitative indicators in measuring quality of life of the people. Life expectancy at birth, infant mortality rate, crude death rate, literacy rate, per capita income, number of hospitals and dispensaries, telephone exchange, post and telegraph office, per capita availability of food grains, population covered by radio, TV were taken into account by Sarma et al. (1993) as indicators of quality of life. Hussain (1994) has also took into consideration population characteristics such as infant mortality, expectancy of life and literacy as crucial factors of physical quality of life. He also used GNP per capita, education and health in evaluating physical quality of life of the targeted population. Rajev (2006) pointed out that the spatial variation in the distribution of different urban social groups determines both urban landscape features, such as building density and house types, and differences in quality of life.

Smith (1977) considered different elements relating to improvement of the material quality (housing condition, resources), physical quality (health, reduced violence, preservation of the natural environment), mental quality (education, knowledge, cultural environment) and improvement in the spiritual quality (talents and capabilities, social harmony, moral and ethical stands) of life. Further, he prepared a list of several indicators relating to ecological, demographic, social, cultural, economic, environmental aspects in measuring the status of life quality of the inhabitants of a concerned region. Based on the various views (also outlined above), the housing represents a social establishment where the satisfaction of life mainly depends upon. Moreover, it has both social and spatial dimensions. Perera and Mensah (2019) investigated the way in which people utilised housing affordability as a reflexivity of their expectation for quality of life over time and space. Based on the systematic review method, a total of 227 publications that focused on quality of life and housing affordability were reviewed.

Special attention has to be paid to the relationship between quality of life and SD. Quality of life addresses peoples' perceptions of their position in life in relation to their culture, values, and expectations. Achieving progress in quality of life through SD, particularly at the city level, requires careful planning which is both place and culture specific and that involves community and citizen input. Improving quality of life and meeting the needs of the present through SD will help ensure greater likelihood of likewise accommodating the needs of future generations (Cusack, 2019). The parallels between quality of life and SD are unambiguous. Cusack (2019) also concluded that quality of life addresses peoples' perceptions of their position in life in terms of their culture and values and in relation to their goals and expectations. In compliance with that, quality of life is crucial for sustainability, as the essence of sustainability is basically considered to be about people's standards and concerns (Bell and Morse, 2008). The concept of SD should help develop means to accommodate future populations while at the same time improving qualities of life. According to Feng and Hsieh (2009) the concepts of quality of life and SD are similar. Fundamentally, sustainability is a concept which has central status to quality of life for present and future generations (Bijl, 2011). Then, sustainability, can be understood as a state where the key goals of SD are satisfied, a high quality of life is achieved, and the environment is preserved (Fischer and Adjo 2011). It is important to note that if people are not satisfied with their current quality of life, it cannot be expected that they will make sacrifices that may potentially benefit future generations. This means that SD strategies must address present-day wellbeing in addition to that of future generations (Morrill, 2011). Since progress in quality of life and progress in SD are mirroring processes, there are also shared constraints in terms of assessment and achievement. Especially, concepts of wellbeing and

sustainability are influenced by culture. Accordingly, relevant literature, emphasizes the need for greater cultural awareness and heightened intercultural dialog, while noting that different people hold different views of the environment (Gambini, 2006; Pellicer, 2008).

As regards the possibilities of measurement of quality of life reflecting the aspects of sustainability and SD, the results of several studies need to be mentioned. Although the concepts of quality of life and sustainability/SD are somewhat vague in meaning, and certain to vary from person to person and place to place, there are similarities in the tools used for measuring them. Currently, indicators of quality of life are widely tied with the concept of SD and create an important part of it (Lotfi et al., 2011). However, both can be defined and measured in a variety of ways. According to Cusack (2019), using measures such as the life satisfaction rating and the Human Development Index (HDI), both available from the UNDP, a positive correlation between self-assessed well-being and overall life satisfaction has become evident. The UNDP also provides an environmental performance index, which similarly correlates with wellbeing at both national- and city-specific levels. This knowledge is relevant for (and applied in) our study and the inequality-adjusted alternative of HDI, which is the inequality-adjusted HDI (IHDI), is used as one of the investigated composite indices, reflecting some aspects of both quality of life and SD (and wellbeing). With respect to methodological aspects, there are studies which apply an objective approach and statistically analyse variables that are considered to influence quality of life. However, there are also studies which apply a subjective approach to their analysis (see particular initiatives in Cusack, 2019). The Subjective Well-Being (SWB) approach assesses quality of life by simply asking people how un/happy and dis/content they are with their life (de Vries and Petersen, 2009). Many studies have focused on the dimensions of quality of life and SWB (Botha, 2016). The HD Report published by the UNDP also includes an overall life satisfaction rating by country. Such a ranking is based on self-perceptions of wellbeing, with the specific survey question being posed as such: *Please imagine a ladder, with steps numbered from zero at the bottom to ten at the top* (UNDP, 2011).

Cusack (2019) demonstrated that quality of life follows a general economic trend. Those countries with the greatest professed life satisfaction and scoring toward the top of the ladder are typically those categorized as having very high human development. The correlation between HDI scores and self-assessed wellbeing scores was confirmed. The simultaneous upward trends of these indicators indicate that overall life satisfaction is clearly influenced by such variables as health, education, and wealth. Since the standard of living concept focuses on economic welfare and quality of life includes culture, religious aspects, and the environment, such coinciding trends are of great importance (Ionciă and Petrescu 2016).

In order to determine the extent of relationships between the environment and quality of life, the wellbeing variable was evaluated in relation to the Environmental Performance Index (EPI). The EPI is used as a composite measure of sustainability and it covers both the environmental public health and ecosystem vitality (UNDP, 2011). The association between the EPI and self-assessed wellbeing was also demonstrated in Cusack (2019). The association between the two variables can indicate that the quality of the environment has an impact on the quality of life. This reinforces the principles of SD and the need for inclusion of the environment into any economic agenda. A positive general linkage between wellbeing and EPI was confirmed. Countries with higher EPI scores typically demonstrate higher overall life satisfaction scores. Overall life satisfaction is positively correlated with both HDI and environmental performance. Accordingly, neither the environment nor the economy can be sacrificed at the expense of the other; a fact which has significant policy implications.

Moreover, increases in income alone have played only a limited role in happiness. There are other variables which influence perceptions of wellbeing, such as health, environment, family, or freedom (de Vries and Petersen 2009). Finally, it can be confirmed that many of the relevant aspects of quality of life is difficult to quantify economically, including the intrinsic value of nature. The focus should be on holistic development that considers equity and the environment in conjunction with economic growth. The difference between economic growth and economic prosperity makes a critical distinction (economic growth being frequently associated with monetary aspects and prosperity as a broader term including the nonmonetary aspects of quality of life). A necessity of the prosperity to be sustained and inclusive has been acknowledged (Greenwood and Holt, 2010). It has also been recognized that income or other objective indices of wealth are not necessarily associated to increased quality of life.

The knowledge presented in this section forms the basic foundation of this work. Overall, all the previous works inspired this study in terms of the selection of factors and indicators (variables) reflecting quality of life.

2.2. Data and Methodology

The background, indicators used, data sources and methodology are defined in this section.

2.2.1. Data

On the basis of the knowledge obtained from the study of relevant works, three composite indicators were chosen to reflect crucial aspects of quality of life, sustainability (SD) and wellbeing. These are composite indicators, i.e. indices involving several indicators, which reflect important factors and areas of quality of life and wellbeing, as well as crucial dimensions of SD. Their choice is justified by the relevant works (see section 2.1).

Firstly, economic and social development, or human wellbeing, can be approximated with UNDP's widely recognized HDI and its inequality-adjusted alternative, IHDI. IHDI, which is even a more suitable measure than HDI, combines a country's average achievements in health, education and income with the distribution of those achievements among country's population by discounting each dimension's average value according to its level of inequality (UNDP, 2020). It can be interpreted as the level of human development when inequality is considered. The relative difference between the IHDI and HDI is the loss due to inequality in distribution of the HDI within the country. The IHDI goes beyond the average achievements of a country in health, education and income to show how these achievements are distributed among its residents (UNDP, 2015). Thus, this index better reflects the aspects of SD and wellbeing, as well as those of quality of life. The HDI is calculated as a geometric mean of the three dimension indices according to Eq. (1):

$$HDI = (I_{Health} \cdot I_{Education} \cdot I_{Income})^{1/3}, \quad (1)$$

where the symbol I indicates the corresponding dimension index. The cut-off points used for the four categories of human development achievements are: very high human development: ≥ 0.800 ; high human development: $0.700-0.799$; medium human development: $0.550-0.699$; and finally, low human development: below 0.550 (UNDP, 2015). The dimensional indices (I) are calculated as:

$$I = \frac{\text{Actual value} - \text{Minimum value}}{\text{Maximum value} - \text{Minimum value}}. \quad (2)$$

The IHDI is calculated as a geometric mean of the three dimension indices adjusted for inequality:

$$IHDI = (I_{Health}^* \cdot I_{Education}^* \cdot I_{Income}^*)^{1/3} = [(1 - A_{Health}) \cdot (1 - A_{Education}) \cdot (1 - A_{Income})]^{1/3} \cdot HDI, \quad (3)$$

where A is the inequality measure used. The inequality-adjusted dimension indices (I^*) are constructed for three dimensions of HDI and the whole formula, by which the HDI is multiplied, represents the loss in the HDI due to inequality and. The IHDI draws on the Atkinson (1970) group of inequality measures. The inequality measure used (see more in Drastichová, 2018) is calculated as:

$$A = 1 - \frac{g}{\mu}, \quad (4)$$

where g is the geometric mean and μ is the arithmetic mean of the distribution. The first dimension – health, is represented by the indicator of life expectancy (LE, years), the second dimension – education, by indicators of expected years of schooling and mean years of schooling, and the third one – standard of living, by Gross National Income (GNI) per capita (2011 purchasing power parity (PPP) USD).

Secondly, the Happy Planet Index (HPI) is used. It should represent an innovative measure, which shows the ecological efficiency with which human wellbeing is delivered. It is a measure of progress that is focused on what matters, i.e. sustainable wellbeing for all. It compares how efficiently inhabitants of different countries use natural resources to achieve long, high wellbeing lives. The HPI is referred to as an efficiency measure, which captures the degree to which long and happy lives are achieved per unit of environmental impact. In this way, it can be regarded as the SD indicator and the measure of sustainable wellbeing. It is obvious that this measure involves the crucial aspects of quality of life and the crucial features related to it. To calculate HPI scores, the mean LE of residents of a given country is multiplied by mean experienced wellbeing of residents in this country. In the 2016 release, for the first time the main results were adjusted to reflect inequalities in the distribution of experienced wellbeing and LE within the population of each country. The resulting HPI is interpreted as the number of inequality-adjusted Happy Life Years (HLY) experienced by a typical resident in each country. The average number of inequality-adjusted HLY achieved in each country is then divided by its Ecological Footprint (EF) per capita, to detect the average number of inequality-adjusted HLY produced per unit of demand on the natural environment from the residents of a country (Abdallah et al., 2012; NEF, 2016):

$$HPI \approx$$

$$\frac{\text{Experienced Wellbeing} \times \text{Life Expectancy} \times \text{Inequality of Outcomes}}{\text{Ecological Footprint}}. \quad (5)$$

The final formula is exhibited by Eq. (6):

$$HPI_{IA} =$$

$$\Phi \cdot \frac{([\text{Experienced Wellbeing}_{IA} - \alpha \cdot \text{Life Expectancy}_{IA}] + \pi)}{(\text{Ecological Footprint} + \beta)} \quad (6)$$

where: IA = inequality-adjusted, $\alpha = 0.158$, $\beta = 2.067$, $\pi = 3.951$, $\Phi = 0.452$.

The inequality-adjusted experienced wellbeing scores (where Eq. (4) is used for its calculation as well) are adjusted so that their coefficient of variance is equivalent to the coefficient of variance of the inequality-adjusted LE scores. This involves subtracting a constant from the inequality-adjusted experienced wellbeing of each country, i.e. constant α in Eq. (6). This ensures that each of these two variables contribute the same amount of variance to the product term, which is inequality – adjusted Happy Life Years. In other words, it is achieved that the HLY measure is equally sensitive to changes in inequality-

adjusted LE and inequality-adjusted experienced wellbeing. Subsequently, the EF scores are adjusted so that their coefficient of variance is equivalent to that of the HLY measure. Similarly, this is carried out by adding a constant to the EF, i.e. constant β in Eq. (6). Therefore, it is achieved that the overall HPI score is equally sensitive to changes in the HLY measure and in the EF. Two scaling constants, i.e. ϕ and π , are also incorporated in Eq. (6) in order to achieve that the HPI score of 100 would indicate excellent performance on all the three indicators. This is the situation when the inequality-adjusted LE reached 85 years, the maximum score for inequality-adjusted wellbeing (10/10) was achieved and the EF exhibited 1.73 gha, which was determined as the level of demand compatible with environmental sustainability. On the other hand, the HPI score of zero indicates the inequality-adjusted LE of 25 years, the minimum score for inequality-adjusted experienced wellbeing (0/10), and the EF of 16 gha, which is currently a higher level than in any single country in the world.

The EF indicator serves as one of the primary guides for the evaluation if the examined agents operate at a sustainable level (Rees and Wackernagel, 1994). It is referred to as a method for estimating the biologically productive area that is necessary to support current consumption patterns, given prevailing technical and economic processes (technology and resource management practices) (see more in Drastichová, 2018). The HPI shows how people's lives are going by means of measuring how long people live, how people are experiencing their lives directly, and by capturing the inequalities in those distributions instead of just using the averages. It also involves measuring the resource use to meet the peoples' needs (Jeffrey et al., 2016) and thus, to achieve these results, using the EF indicator, which reflects the environmental sustainability.

As the third indicator variable, Healthy Life Years (total, year) in absolute value at birth (HLY) was chosen. The indicator of HLY measures the number of remaining years that a person of specific age is expected to live without any severe or moderate health problems. On the other hand, LE at birth is defined as the mean number of years that a new-born child can expect to live if subjected throughout his life to the current mortality conditions. It is one of the most frequently used health status indicators and in this analysis, it is used as one of the explanatory variables reflecting health status. The LE indicator is included in the SDG 3 topic (*good health and wellbeing*) of the EU Sustainable Development Goals (SDG) indicator set (see more in Drastichová and Filzmoser, 2019). While LE clearly refer to quantitative aspects of life, HLY also indicates qualitative aspects. LE is not able to show whether extra years of life gained through increased longevity are spent in good or bad health. Therefore, indicators of health expectancies, such as healthy life years have been developed. HLY focuses on the quality of life spent in a healthy state, rather than the quantity of life, as measured by LE (Eurostat, 2020). It was considered

desirable to include both types of indicators in the analysis. HLY was included in order to more clearly reflect the aspects in SDG 3. As regards the relationships between LE and HPI, LE is also a part of HPI, but combined with the experienced wellbeing and weighted in order to create this composite indicator, so there is no significant correlation between HPI and LE. In the description above, the properties of these indicators related to quality of life, SD and wellbeing were outlined, so their similarities and differences. They were chosen in order to reflect as many aspects of quality of life, SD and wellbeing as possible.

The three composite indicators described above will be used as response variables in a regression setting. In the following, the explanatory variables (factors of quality of life) used in the analysis are defined and described. The knowledge from section 2.1 was used to determine the main factors of quality of life. Primarily, the variables (indicators) used by OECD (2020) to construct its Better Life Index (BLI) reflecting quality of life and wellbeing were used as explanatory variables. Several indicators were replaced with the indicators used by Eurostat (2020), more specifically, those included in the EU SDG indicator set, reflecting the EU's efforts towards achieving SDGs. These indicators represent crucial factors of quality of life according to the detailed analysis of relevant studies (see section 2.1). The main areas of quality of life according to BLI, for which the concrete indicators are chosen, are: Housing (HD, HE, RP), Income (MI, PR), Jobs (JS, ER, LU, PE), Community (QN), Education (EA, SK, YE), Environment (AP, WQ), Civic Engagement (SR, VT), Health (LE, SH), Life Satisfaction (LS), Safety (FS, HR), and Work-Life Balance (EH, CA, SE).

The data for the indicators used are available on Eurostat (2020), OECD (2020b) and UNDP (2020) and are used for the 26 countries (the sample). If data (or indicators) are missing for some countries, the most recent values (from previous years) were used in the analysis. Efforts were made to include indicators for the years or periods which are close to one another. Nevertheless, the HPI was used as one of the response variables although more recent data were not available, since this composite index significantly reflects the aspects of SD and wellbeing (both subjective and objective), and both health and environmental factors. Therefore, it can represent an important measure of quality of life.

2.2.2. Methodology

Principal component analysis (PCA) and regression analysis are the main methods applied in this work. PCA is a dimension-reduction tool that is applied to reduce a large set of variables to a small set that still contains most of the information. PCA is a mathematical procedure which transforms a number of (possibly) correlated variables into a (smaller) number of uncorrelated variables named principal components. The first principal component accounts for as much of the variability in the data as possible, and

Table 1. Explanatory variables reflecting particular factors of quality of life, source: Eurostat (2020), OECD (2020b)

Dwellings without basic facilities (HD): the percentage of the population living in a dwelling without indoor flushing toilet for the sole use of their households (an average of the data available between 2012-16/17, 2016 – Luxembourg and the Netherlands) (1).	Quality of support network (QN): a measure of perceived social network support; based on the question: <i>If you were in trouble, do you have relatives or friends you can count on to help you whenever you need them, or not?</i> and it considers the respondents who respond positively; OECD calculations based on the Gallup World Poll (GWP) (the 3-year average 2015-17) (10).	Voter turnout (VT): the ratio between the number of individuals that cast a ballot during an (parliamentary/presidential) election (whether this vote is valid or not) to the population registered to vote; percentage of the population (2018 – Finland, Hungary, Italy, Slovenia; 2017 – Austria, Czechia, the Netherlands, Norway, the UK; 2016 – Germany, Iceland, Ireland, Lithuania, Slovakia, Spain; 2015 - Denmark, Estonia, Greece, Israel, Poland, Portugal, Switzerland; 2014 – Belgium, Latvia, Sweden; 2013 – Luxembourg (17).
Housing expenditure (HE): Percentage of the household gross adjusted disposable income (2015, with the exception of 2016 for Denmark, the United Kingdom (UK); 2014 – Italy, Norway; and 2013 – Switzerland) (2).	Educational attainment (EA): the number of adults aged 25 to 64 holding at least an upper secondary degree over the population of the same age; Percentage of the adult population (aged 25 to 64) (2017) (11).	Life expectancy (LE): how long on average people could expect to live based on the age-specific death rates currently prevailing; refers to people born today, computed as a weighted average of LE for men and women; Number of years (2016, with the exception of 2017 for France) (18).
Rooms per person (RP): Rate (number of rooms divided by the number of people living in the dwelling) (an average of the data available between 2012-16/17, pending data availability and break in the series; 2016 – Luxembourg and the Netherlands) (3).	Student skills (SK): Students' average score in reading, mathematics and science as assessed by the OECD's Programme for International Student Assessment (PISA); (2015) (12).	Self-reported health (SH): the percentage of the population aged 15 years old and over who report <i>good</i> or better health. The WHO recommends using a standard health interview survey to measure it, phrasing the question as <i>How is your health in general?</i> with response scale <i>It is very good/ good/ fair/ bad/ very bad</i> ; percentage of the population (2016 with the exception of 2017 for Iceland) (19).
Mean equivalised net income (Purchasing power standard (PPS) (2017) (MI): the equivalised income attributed to each member of the household (calculated by dividing the total disposable income of the household by the equivalisation factor) (4).	Years in education (YE): the average duration of education in which a 5-year-old child can expect to enrol during his/her lifetime until the age of 39 (2016) (13).	Life satisfaction (LS): OECD calculations based on the GWP; people's evaluation of their life as a whole (a weighted-sum of different response categories based on people's rates of their current life relative to the best and worst possible lives for them on a scale from 0 to 10, using the Cantril Ladder (the 3-year average 2015-17) (20).
At risk of poverty rate (PR): cut-off point: 60% of median equivalised income after social transfers (2017) (5).	Air pollution (AP): the population weighted average of annual concentrations of particulate matters less than 2.5 microns in diameter (PM2.5) in the air (2013) (3-year moving average) (14).	Feeling safe walking alone at night (FS): The indicator is based on the question: <i>Do you feel safe walking alone at night in the city or area where you live?</i> and it shows people declaring they feel safe; percentage of people aged 15 and over (the 3-year average 2015-17) (21).
Job satisfaction (JS): Average rating of satisfaction, 16 years or over, Rating (0-10) (2018, Iceland – 2013) (6).	Water quality (WQ): people's subjective appreciation of the environment where they live, in particular the quality of the water; OECD calculations based on the Gallup World Poll (the 3-year average 2014-16) (15).	Homicide rate (HR): Age-standardised rate per 100,000 population (2015 with the exception of 2016 for Austria, Czechia, Hungary, Lithuania, the Netherlands, Sweden; 2014-16 for Iceland; 2014 for France, Ireland, Portugal, Slovakia; 2013-15 for Luxembourg) (22).
Employment rate (ER): the number of employed persons aged 15 to 64 over the population of the same age; Percentage of the working-age population (aged 15-64) (2017) (7).	Stakeholder engagement for developing regulations (SR): the extent to which formal stakeholder engagement is built in the development of primary laws and subordinate regulations; calculated as the simple average of two compo-	Employees working very long hours (EH): the proportion of dependent employed whose usual hours of work per week are 50 hours or more; percentage of the dependent employed (2017) (23).
Long-term unemployment rate (LU): the number of persons who have been unemployed for one year or more as a percentage of the labour force (2017) (8).		Frequency of participation in cultural activities in the last 12 months (cinema, live performances or cultural sites) (CA) (2015) (at least once, percentage) (24).

Personal earnings (PE): the average annual wages per full-time equivalent dependent employee; obtained by dividing the national-accounts-based total wage bill by the average number of employees in the total economy; then multiplied by the ratio of average usual weekly hours per full-time employee to average usually weekly hours for all employees (2017) (9)	site indicators (covering respectively primary laws and subordinate regulations) that measure four aspects of stakeholder engagement; the maximum score for each of the four dimensions/categories – one, the maximum aggregate score for the composite indicator – four (2017) (16).	Frequency of participation in sport activities in the last 12 months (SE) (2015) (at least once, percentage) (25).
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Notes: Following the description of the indicator, reference years or periods, as well as the number of the indicator, are indicated in brackets. Indicators highlighted in grey are from Eurostat (2020), while the others are from OECD (2020b). Detailed descriptions are available on Eurostat (2020), OECD (2020b). Moreover, two indicators were added – namely: frequency of participation in cultural activities and frequency of participation in sport activities in the last 12 months (Eurostat, 2020)

each succeeding component accounts for as much of the remaining variability as possible (Johnson and Wichern, 2007). This methodology was applied in a previous joint work by the authors (Drastichová and Filzmoser, 2019).

Regression analysis is the second main methodology applied in this paper. Since there are three response variables which should be jointly modelled with the explanatory variables, this is the setting of a multivariate regression problem. In general, the multivariate linear regression problem for responses Y_1, \dots, Y_m and explanatory variables x_1, \dots, x_p is given as

$$Y_j = \beta_{0j} + \beta_{1j}x_1 + \dots + \beta_{pj}x_p + e_j \quad (7)$$

for $j=1, \dots, m$, with the unknown regression parameters $\beta_{0j}, \dots, \beta_{pj}$ and the error terms e_j . The model can be written in terms of the observations, and the usual model assumptions (independence, normal distribution, homoskedasticity) are considered, see, e.g., Johnson and Wichern (2007). Traditionally, the matrix of regression coefficients is estimated by the standard least squares (LS) method. However, since the number of observations in this application is rather low compared to the number of explanatory variables, this approach may just be reasonable to fit the existing data, but it might result in a poor prediction model. Therefore, two alternative procedures are used to estimate the regression parameters. The first is Partial Least Squares (PLS) regression, where the relationship between explanatory variables and responses is modelled by fewer components (Varmuza and Filzmoser, 2009). The number of components to be used is a tuning parameter, and its choice is based on a cross-validated error measure, such as the mean squared error (MSE). A second approach is Lasso regression (Tibshirani, 1996), where a penalized LS problem is considered, with an L1 norm penalty on the regression coefficients. This has the advantage that – depending on the tuning parameter – some regression coefficients will be shrunk to zero, and thus the corresponding variables can be considered as irrelevant for explaining the response. Thus, this corresponds to a variable selection, and the resulting model should also achieve better predictive power.

3. Results

Section 3.1 presents the results of the PCA, while section 3.2 contains the results of the regression analyses. A detailed analysis of the results is included in both sections.

3.1. Results of Principal Component Analysis

By means of a PCA, important relationships between variables and also similarities and differences between countries were discovered. Figure 1 displays the results of the first two principal components (PCs), where the factors of quality of life (from Table 1) and the response variables (composite indicators) are included. This provides an overview of the data structure in terms of loadings and scores, which are jointly presented in this biplot. The first two PCs explain roughly 58% of the total variability, and thus this biplot can be well interpreted. The variables are shown by arrows and the countries by their common country abbreviations (in green). The variables are related if the arrows have small angles and they are related negatively, if the angles are close to 180 degrees. The orthogonal projection of countries in the variable vectors represent their values for the variables. Countries which are close together have similar behavior. One of the reasons to include the explanatory and the response variables (subsequently used for the regression analysis) was to obtain a view of how they are connected. For example, one can see that IHDI is closely related to the indicators SE, CA, QN, LS, FS, JS and WQ (positively), but negatively related to PR and AP.

It can be seen in Figure 1 that several groups of countries could be created which can be referred to as countries having similar levels of quality of life. If these smaller groups are combined, the sample as a whole can be divided into several groups of countries with similar features in terms of quality of life. The relative differences are especially taken into account in the analysis and comparisons (the absolute differences between some of the indicators are higher than between others). Estonia, Latvia and Lithuania are close to one another which means exhibited similar values in the indicators included. The exceptions especially exist for the HE indicator values (where Latvia had one of the highest, Lithuania one of the lowest values and Estonia the lowest value in the sam-

a

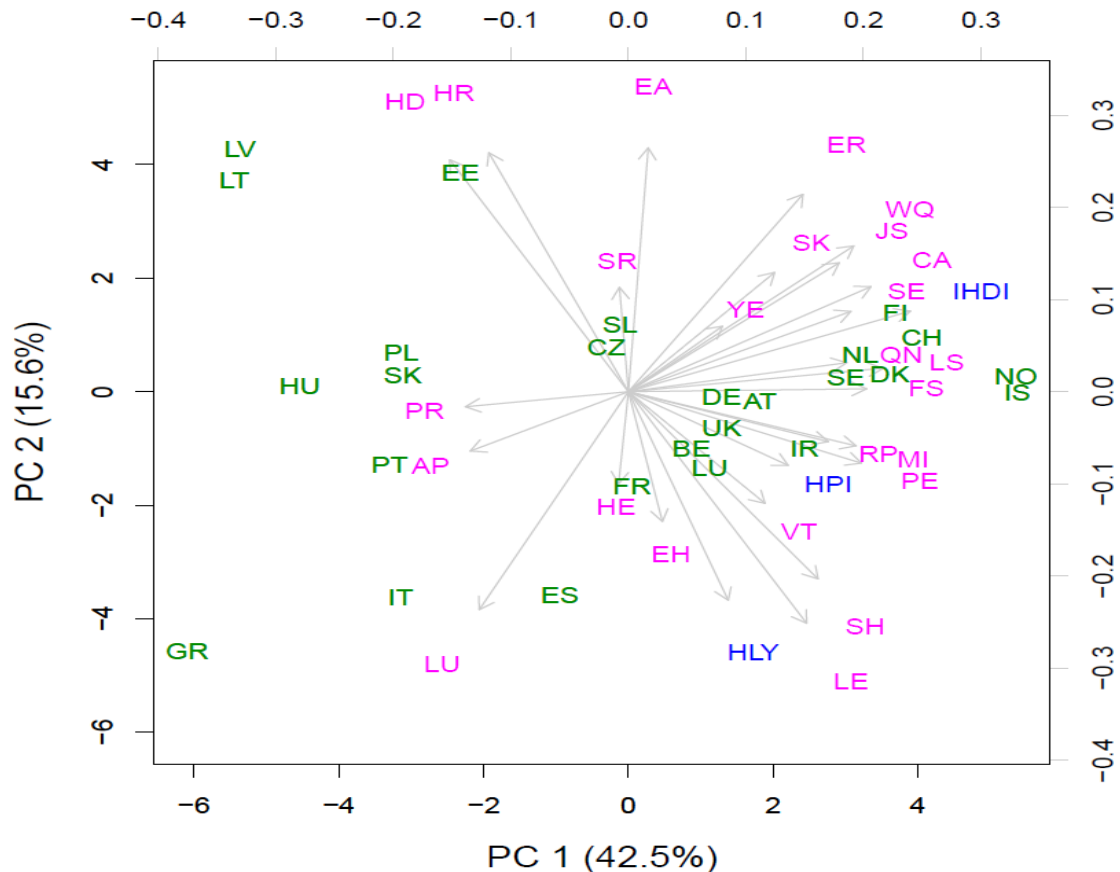


Figure 1. The biplot created by means of the PCA, source: author's calculations

Notes: The abbreviations of countries are in black, the abbreviations of the names of 25 indicators (explanatory variables) are in red, the abbreviations of the names of 3 composite indicators are in blue.

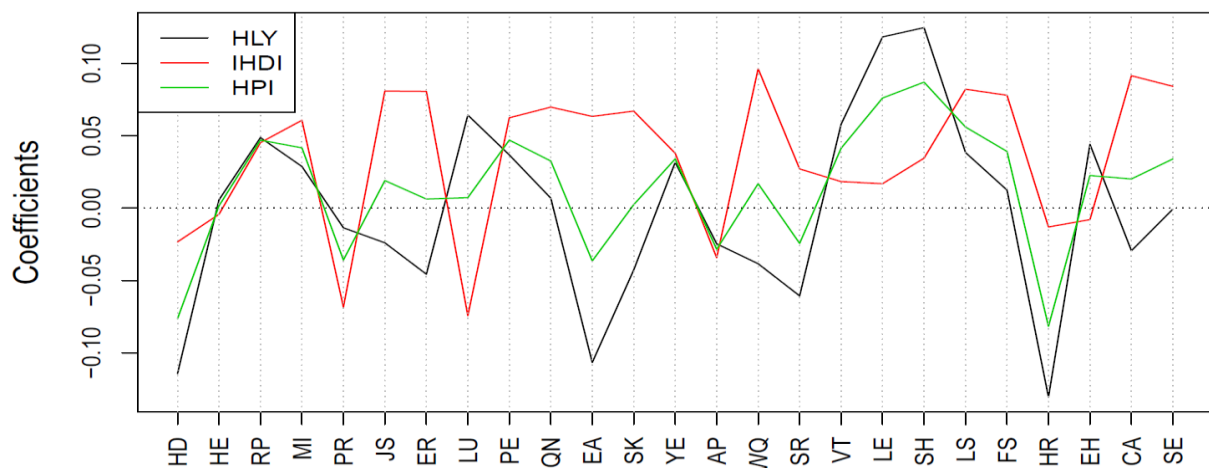


Figure 2. Regression coefficients for 25 explanatory variables – results of PLS regression, source: author's calculations

ple), the JS indicator values (where the absolute differences are small, but in relative values, Estonia had the highest and Lithuania the lowest value). In the SK indicator, Estonia exhibited the highest value in the sample, while the other two countries had among the lowest values. They also had relatively low values of three compo-site indices (response variables), with slightly higher values of IHD in Estonia. Greece, Italy and Spain also exhibited similar values of several indicators. However, HD was relatively low and FS relatively high in Spain. In the whole

sample, the values of JS, ER, QN, SK, WQ and LS were the lowest in Greece. Higher relative differences were exhibited for the JS, QN, SK and LS indicators. The values of ER and WQ are among the lowest in Italy and Spain as well. On the other hand, Greece had relatively high values of YE and EH. On the other hand, YE was relatively low and SR relatively high in Italy. Spain and Italy had among the highest values of LE in the sample (following Switzerland). All three countries had among the highest HLY and among the lowest IHD values, while the

values of HPI differ significantly, with the lowest value in Greece (the fifth lowest in the sample) and the highest in Spain (the second highest in the sample). Other groups of countries close to one another in several values of indicators are Iceland, Norway, and Finland; and, secondly, Sweden, Denmark, and the Netherlands. Countries of these two groups are also close to one another for several indicators. The Northern countries are often close to one another in different variations. Denmark and Finland are very close to one another (they also have similar values of the response variables), and it is also the case for Denmark and the Netherlands.

In a number of indicators, Slovakia, Hungary, and Poland are similar to one another; as is Czechia to Slovenia. Again, countries of both groups exhibited similar values for certain indicators. The HE indicator is one of the major exceptions with low values in Hungary and Slovenia and relatively high values in the remaining three countries. Slovakia also exhibited the fourth highest LU in the sample (following three Southern countries), which is a significantly higher value than in the remaining four countries. Austria and Ireland had often similar values of the indicators included. However, as regards the response variables, Ireland had a significantly higher value of HLY and a slightly higher value of IHDI. The value of HPI was slightly higher in Austria. Higher differences between these countries especially exist for MI, VT and both environmental indicators – AP and VQ (higher in Austria) and RP, ER, LU, QN, SH and SK (higher in Ireland). Germany is close to Austria as well (from the relative point of view more significant differences between them especially exist for HD, JS, FS, EH (higher values in Austria), SK, YE, HLY (higher values in Germany). From the response variables used, only HPI was slightly higher in Austria. Germany is also close to Ireland, albeit to a slightly lesser extent for several explanatory indicators. Nevertheless, these two countries exhibited very similar values for all three composite indices (with Ireland exhibiting higher values for all three indices). Therefore, Austria, Germany and Ireland can be assigned to a group with similar features and levels of quality of life. These countries are also close other groups, especially to the group containing the Netherlands, Sweden and Denmark. For several indicators, particular countries from both groups are close to one another. Most often, Germany is close to the countries of the second group.

France and the UK are close to one another in several instances (the exceptions mainly include the HE, PR, ER, QN, SR and FS indicators (higher values in the UK) and LU and VT (higher values in France). For several indicators, Luxembourg and Belgium are also close to each other. Countries from these two groups are often close to one another for different variations. Luxembourg had the highest values of MI and PE. In these features, it is close to Switzerland which had the second highest values. This is also the case for LE, where Switzerland had the highest value and it is followed by Spain, Italy and Luxembourg.

On the other hand, Luxembourg followed by Belgium, and the group consisting of Sweden, Denmark and the Netherlands, exhibited the highest values of VT, while Switzerland had the lowest level. In some cases, Portugal, which often stands alone (with no close similarities to other countries), is close to them for several indicators, especially France (for HE, RP, JS, LU, QN, SK, YE, EH and Se, among others). To sum up, some countries are close to one another, i.e. they exhibit similar values for a number, or the majority, of the included indicators, signifying similarities in quality of life achieved. Geographical closeness plays a role, but it is not necessarily decisive.

3.2. Results of Regression Analysis

Firstly, PLS regression was carried out with all 25 explanatory variables and the three composite indicators as responses, where we first scaled the variables in order to make the resulting regression coefficients comparable. Figure 2 contains all regression coefficients for 25 explanatory variables and 3 response variables applied (the concrete coefficient values are included in the Annex, Table 1).

For all three response variables, the coefficients are negative only for HD, PR, AP and HR, and positive for RP, MI, PE, QN, YE, VT, LE, SH, LS and FS. Rooms per person (RP) is the first indicator, reflecting housing, which has the positive coefficients for all three response variables. Next, the indicators of mean equivalised net income (reflecting income), quality of support network (QN) (reflecting community), personal earnings (PE) (reflecting jobs), years in education (YE) (reflecting education), voter turnout (reflecting civic engagement), life expectancy (LE) and self-reported health (SH) (each reflecting health), life satisfaction (reflecting itself), and the indicator of feeling safe walking alone at night (reflecting safety) also have positive coefficient values. In addition, at risk of poverty rate, (representing income), air pollution (representing environment), and homicide rate (HR) (reflecting safety), also had negative value coefficients for all three response variables.

All these results are justifiable in terms of quality of life. As regards housing (an important factor of quality of life), the first variable, dwellings without basic facilities (HD), exhibits a negative relationship with the response variables and negatively affect quality of life. For the second variable reflecting housing, i.e., housing expenditure (HE), a negative relationship was identified only for IHDI; nevertheless, all coefficients for the remaining two response variables were very low. In the group of the developed countries, poverty rates are relatively low in general. A negative relationship between PR and all three response variables was confirmed. This negative relationship is clearly seen in the Baltic countries, having the highest poverty rates and low values of the response variables, while the opposite is especially true for Iceland and Norway. However, the value of the coefficient for HLY is low in the absolute value. The three Southern countries with high HLY values (Greece, Italy, Spain) had among the highest poverty

rates. The four countries of the Visegrad Group, Denmark and Finland exhibited low poverty rates but the HLY values are low (Finland, Slovakia) or medium (the other four countries).

With regard to the indicators representing the factor of environment, a negative effect was identified for air pollution (AP), while a positive effect was identified for water quality (WQ). The exception is the relationship between WQ and HLY, where a negative relationship was identified. The reason is especially a negative relationship in some countries of the sample, such as the Southern countries, which had high values of HLY and low values of WQ. The opposite is especially true for Austria, Slovenia, Finland or Slovakia. In the area of health, both the objective and subjective indicator reflecting health status exhibit positive coefficient values with all response variables. Life satisfaction (LS) is the only indicator reflecting the area having the same name and its positive relationship with all three composite indices is of great importance. Quality of support network (QN) is a subjective indicator based on GWP, the positive coefficient for HPI is especially justifiable and for the other two response variables the positive values were exhibited as well. The importance of two indicators from the area of safety was also confirmed. The positive relationship of the FS indicator and the negative relationship of the HR indicator with all three response variables are evidence of the significance of safety for quality of life. Job satisfaction (JS) and employment rate (ER) exhibited negative values for HLY used as a response variable (JS and ER are relatively low in the Southern countries which show high values of HLY). The positive values are justifiable for the remaining two indices. Since HPI contains subjective wellbeing in the nominator, the JS indicator should positively contribute to its higher level. Student skills (SK) seem to have a positive effect on IHDI and HPI, but not on HLY. By the detailed examination of the sample, even the negative relationship can be confirmed (in the compliance with the negative coefficients). For example, the Southern countries and Iceland exhibited low values of SK and high values of HLY. Finland, Estonia and Slovenia had among the highest SK values, but their HLY values were among the lowest. The remaining indicator representing education, educational attainment (EA), exhibited a positive relationship only with IHDI. In this sample it can especially be related to very low values of EA in the Southern countries and Iceland, and high values in the Baltic countries, Slovakia, Slovenia, Czechia and Poland. Since HLY is high in the Southern countries, all response variables show high values in Iceland, low values in the Baltic countries (but they are not the lowest for IHDI, especially in Estonia) and some of the response variables are low in the remaining three countries, the negative relationships prevailed. Three indicators representing work-life balance predominantly had positive values of the coefficients as well. Each of them exhibited one negative value for one response variable, while all these values were

very low. It is possible that between HLY and cultural activities (CA) on one hand, and between HLY and sports events (SE) participation on the other a relationship might not exist or might not be strong. Moreover, a negative relationship between the proportion of employees working very long hours (EH) and IHDI was discovered in the sample. In a number of countries in the sample, especially those most developed, such a negative relationship is visible (Switzerland having the lowest EH and the third highest IHDI; similarly – the Netherlands, Sweden, Denmark, Norway and Finland have very low EH along with high values of IHDI).

As the results showed, some of the 25 explanatory variables can only be crucial for some of the response variables and finally they affect them in different directions. The results can also be explained additional factors that also determined the results. The construction of particular indicators can also play a significant role. An important conclusion is that when the three indices reflecting quality of life, wellbeing, and SD (taking into account the human development approach) are applied, indicators from the areas of housing, income, jobs, quality of support network, safety, education, environment, health, and life satisfaction are likely to affect them to the highest extent (when considering effects on all three composite indices). However, education seems to have clear positive relationship only with IHDI and the positive effects are least confirmed for the health-related quality of life (HLY). Nevertheless, years in education (YE) seem to have positive effects on all three response variables. Then very weak effects on the subjective index of wellbeing, HPI, were identified for two of them (YE and SK).

Next, a multivariate Lasso regression based on the same explanatory and response variables was applied which internally is performing variable selection. It can be seen in Figure 3 that only nine variables exhibited non-zero coefficients. So, from the original group of 25 indicators, only 9 indicators have an important effect on the composite indices representing quality of life. This group especially includes the indicators, which exhibited the highest coefficients in the previous regression analysis (see Figure 2 and Tables 1 and 2 in the Annex). All nine coefficients are statistically significant. This was confirmed by several tests, such as the Wilks, Pillai, Hotelling-Lawley and Roy test.

The highest positive value of the coefficient in PLS regression was found for the relationship between SH and HLY. The following two highest positive values were detected for LE and WQ on the one hand and HLY and IHDI on the other hand (respectively). The highest negative values were identified for the relationship between HR and HD on the one hand and HLY on the other hand. As Figure 3 shows, many similarities can be found when Lasso regression is applied. The highest positive coefficients were detected for self-reported health (SH), water quality (WQ) and life satisfaction (LS) (for HLY and IHDI as response variables respectively). The high-

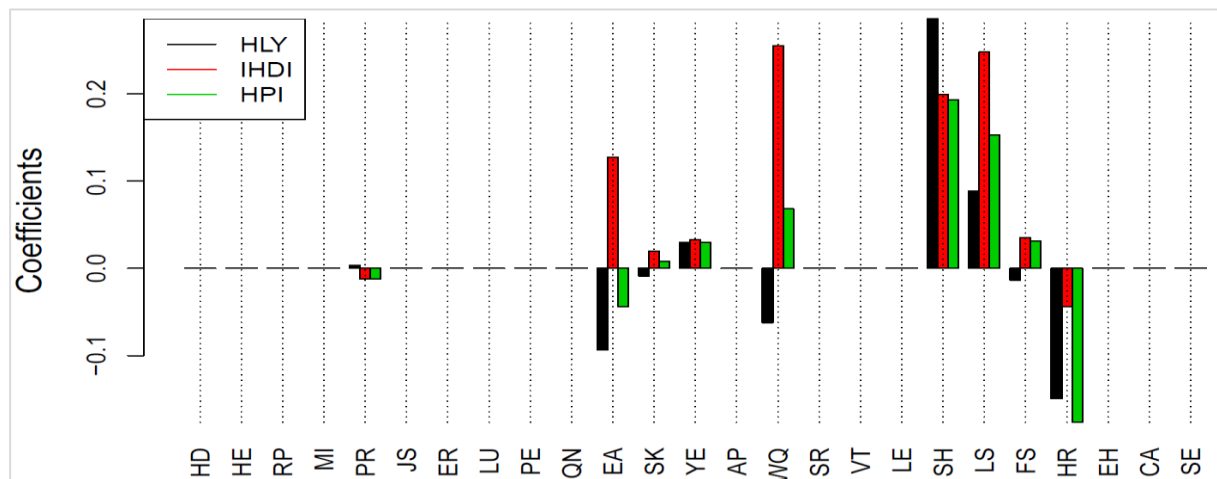


Figure 3. The non-zero regression coefficients – results of the Lasso regression, source: author's calculations

est negative coefficients were confirmed for the homicide rate (HR) indicator, especially when using HLY and IHDI as response variables.

A clear positive relationship exists between years in education (YE), life satisfaction (LS), self-reported health (SH) on the one hand and all three response variables on the other hand. A clear negative relationship between the homicide rate (HR) indicator and the indices used as response variables was detected. Except for IHDI, the coefficients are among the highest. The reason is that the negative relationships are not strong in all countries or they do not exist at all (for example, Finland has both high IHDI and relatively high HR, while the opposite is true for Italy). However, in a number of countries, the relationships are clearly visible, such as in the Baltic countries and Portugal, which have the highest HR values. Similar results were detected for PLS regression and therefore, these four indicators can be regarded as crucial for quality of life reflected by the three indices applied.

In the Lasso regression model the direction of relationships is also not always the same, i.e. the coefficients of several explanatory variables have different signs for different response variables (PR, EA, SK, WQ and FS). For FS, a slight negative coefficient was identified for HLY. It was already explained above that there is a number of countries that exhibited negative relationships between FS and HLY. As regards IHDI, Spain had relatively low IHDI and relatively high FS. Considering the results of both models and the fact that HLY is a more narrowly focused indicator (mainly reflecting quality of life related to health), this indicator can also be regarded as one of the crucial aspects of quality of life. Educational attainment (EA) significantly determines IHDI, but for the remaining two response variables, a negative relationship was identified (in the PLS regression analysis as well – see Figure 2). The relationships between variables in particular countries were explained above. For the SK and WQ indicator, the results are also similar to the previous PLS regression model. The explanation of the negative coefficients

for HLY is similar to the case of previous two indicators. Namely, HLY is more specific, mostly related to health, when compared to other two composite indicators. As it has already been explained, there are negative relationships in some countries between HLY and these indicators which is especially the case for three Southern countries – Greece, Italy and Spain. As regards poverty rates (PR) the coefficients are low in absolute values when applying Lasso regression. When compared to the results of the PLS regression models, the coefficients are lower in absolute values for both IHDI and HPI and for HLY a very low positive value was measured. The reason is similar – as it was explained for the previous four indicators, when HLY is used as a response variable the results often differ due to high HLY values in the Southern countries and relatively low performance in many other areas of quality of life. Different signs for several coefficients can be explained by the presence of the countries whose relationships between the explanatory and response variables to some extent deviate from the majority of the countries in the sample or additional factors that also determined the results.

Next, predictions for both regression analyses are displayed to see how well these models represent the measured values of the composite indicators. For the PLS mode, two PLS components have been used. Figure 4 displays predictions from PLS regression – here the 3 response variables were explained by contributions from all 25 explanatory variables.

Figure 5 displays the predictions from Lasso regression – here only 9 variables corresponding to non-zero coefficients contributed to the explanation of the three responses.

The plots in Figure 4 and 5 show the measured responses versus their predictions, and the line indicates equality of the values. Generally, both models yield similar predictions, and the prediction quality for the response IHDI is the best one. The Lasso model overestimates slightly the lower values, but also the PLS model reveals more variability in the prediction of the lowest values. For the indexes HLY

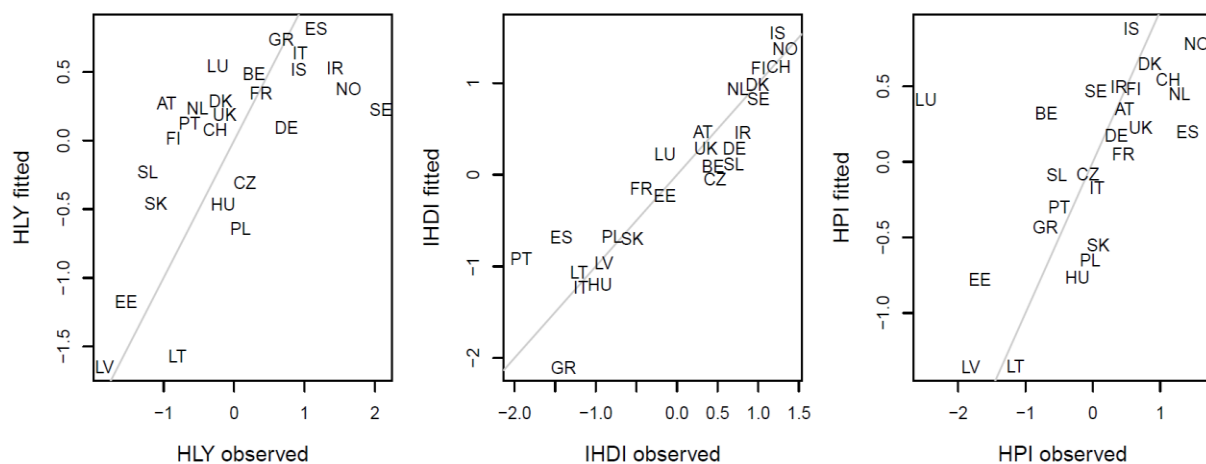


Figure 4. Predictions from PLS regression with the coefficients from Figure 2, source: author's calculations

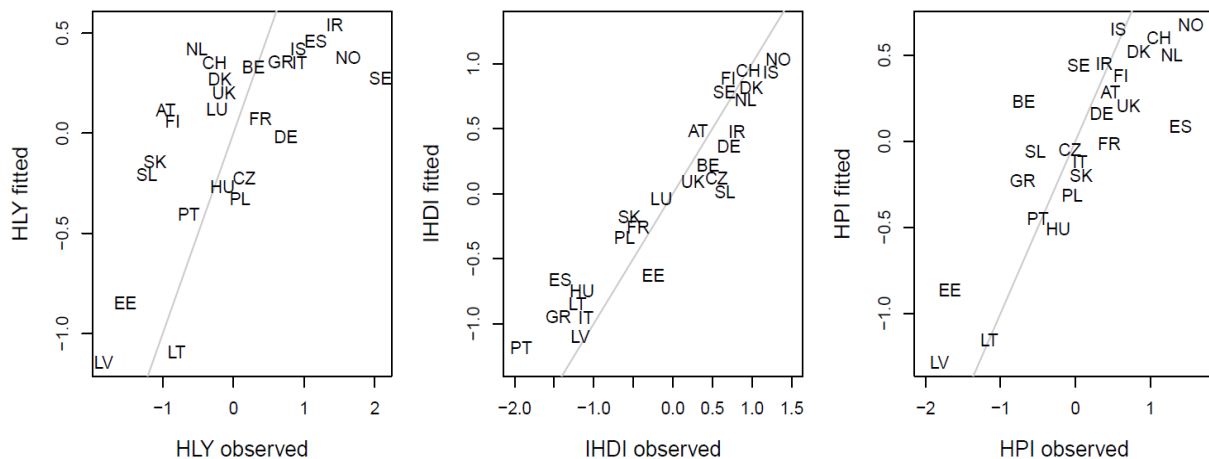


Figure 5. Predictions from LASSO regression with the coefficients from Figure 3, source: author's calculations

and HPI, both models deliver very similar prediction with the exception of the prediction for Luxembourg, which is far off for the PLS model. It seems that Luxembourg had a certain effect on the PLS model, most likely because some explanatory variables had unusual values. This effect could be suppressed in the Lasso model.

Overall, it is obvious that relationships exist between the composite indicators chosen as response variables to reflect quality of life, wellbeing and SD (taking into account the human development approach), and the indicators reflecting the selected factors of quality of life. However, some of the indicators affect these indices and quality of life more significantly. Accordingly, some factors are more crucial for quality of life.

4. Discussion

The quality of life is a key element of social planning, the aim of which is to promote and enhance the quality of life of an individual; of a family or inhabitants of a municipality, region, state and nation; and of the world by reducing detrimental conditions over a given time. In this direction, the SD and environ-

mental justice approach would positively work in maintaining and promoting the quality of life of people. There has been a deficiency of studies on quality of life in the field of geography. The factors of space, time, and society, the main domain of geographers, are significant to quality of life. Geographers should, therefore, pay more attention to this topic (Sinha, 2019), as should scientists from other disciplines. The focus should be on adequate planning of health, educational, and safety services and facilities, in addition to the aforementioned crucial factors of quality of life. The idea of SD should be a central philosophy of this planning and its principles and practical approaches putting the concept of SD into operation should be applied (see more in Drastichová, 2018). The problematic aspects revealed in relation to the concept of quality of life and its measurement should not mean that improvements in quality of life are unnecessary. Rather, there is a need for place- and culture-specific measures. Although it is a multidimensional concept, achieving progress in quality of life through SD is a necessary goal (Fischer and Adjo 2011, 40). However, a one-size-fits-all approach to SD and quality of life is not an appropriate one. The success of SD initiatives depends on how closely

they comply with and contribute to a sense of place in a given space. A sense of belonging also contributes to overall quality of life. After the detailed studies of relevant works and the analysis carried out in this work, it can be concluded that the concepts of quality of life and SD are interconnected and efforts to improve one may well positively affect the other as well (see also Cusack, 2019).

It is highly likely that many indicators related to SD, wellbeing, and quality of life will change significantly following the current pandemic situation. This includes economic (economic recession, economic problems generally etc.), social (especially with regard to health, poverty, and social inclusion), and environmental indicators (in which although there may be positive short-term changes, the long-term impacts are not clear), as well as those indicators generally related to quality of life and wellbeing. The concepts of SD and quality of life, as well as policies towards them, must further take into account and engage with these aspects. They should be adjusted to the new development and challenges affecting sustainability, SD, quality of life and wellbeing.

New, alternative and complementary concepts should be considered when dealing with SD, quality of life and wellbeing. Innovative ideas and strategies but also systemic changes in the longer period should be included. Not only the concept of Human Development but also the concepts of Degrowth or Buen Vivir should be considered. Ecological economics can provide a platform for a transformation towards a new socio-economic model respecting the environment (biophysical planetary boundaries), and improving wellbeing and quality of life (challenging current forms of economic growth and taking the above-mentioned concepts into account). As recent developments have shown, functioning health and social systems are essential for SD, wellbeing and quality of life, and this will be a crucial challenge for the near future.

5. Conclusions

The quality of people's lives at a national level was the main area of interest in this work, which considers the basic philosophy of SD. The aim of this work was to identify the crucial factors affecting quality of life, and to discover the relationships between these factors in the sample of 26 developed OECD countries. PCA with both explanatory and response variables, PLS regression and Lasso regression were the main methods applied.

The factors of quality of life included housing, income, jobs, community, education, environment, civic engagement, health, life satisfaction, safety, and work-life balance. Quality of life, which should result, ultimately, from SD, is, like SD, a global challenge. To this end, several composite indices reflecting crucial aspects of sustainability, SD, and quality of life, were selected and further used as response variables, i.e., those reflecting quality of life in conjunction with SD. In the case of both the 25 explanatory and 3 response variables, the essential aspects

and factors of both quality of life and SD are reflected, based on detailed studies and analysis of relevant research works.

PCA provided an overview of the data structure and the groups of countries with similar features and levels of quality of life were identified. The plot of the first two PCs explains roughly 58% of the total variability. Geographical closeness plays a role, but it is not necessarily decisive. The most important (bigger) groups identified are the Baltic countries; three Southern countries (Greece, Italy and Spain); Slovakia, Hungary and Poland, along with Czechia and Slovenia; Iceland, Norway and Finland, along with Sweden, Denmark, and the Netherlands; or Austria, Germany and Ireland. Some similarities can also be seen between France and the UK, or between Luxembourg and Belgium. Portugal does not exhibit significant similarities to any country in the sample, but some similar features were identified, especially to France.

Subsequently, the relationships between the explanatory and response variables were identified by means of PLS and Lasso regression. Lasso regression had the advantage that the most important variables related to the responses could be identified. The direction of the relationship between particular explanatory and response variables was not always the same, i.e., the coefficients of several explanatory variables had different signs for different response variables. Since the sample is composed of developed countries, some relationships are weaker, because all these countries have already achieved a relatively high performance in indicators reflecting quality of life.

The Lasso regression model identified nine indicators which were all significant. When the three indices reflecting quality of life, wellbeing, and SD (taking into account the human development approach), namely HLY, IHDI and HPI are applied as response variables, indicators from the areas of income (at risk of poverty rate (PR), education (educational attainment (EA), student skills (SK) and years in education (YE), environment (water quality (WQ), safety (feeling safe walking alone at night (FS) and homicide rate (HR), health (self-reported health (SH), and life satisfaction (representing the dimension of the same name, (LS) are likely to affect them to the highest extent. As regards the factor of income, only the indicator reflecting the risk of poverty (PR) had negative relationships with IHDI and HPI. All three indicators included in the factor of education, i.e. educational attainment (EA), student skills (SK) and years in education (YE), are in the group of crucial set of nine indicators, while only YE exhibited positive relationships with all three response variables. All three indicators affected positively only IHDI, which is justifiable. Student skills (SK) also had a very slight positive relationship with HPI. As regards the factor of environment, the indicator of water quality (WQ), composed as a subjective indicator, seems to be more important than the objective indicator of air pollution (AP). However, a positive relationship cannot be proven between WQ and HLY.

Self-reported health (SH) and life satisfaction (LS) exhibited a clear positive relationship with all three response variables in both PLS and Lasso regression analysis, while their coefficients were among the highest. This also confirms the importance of subjective indicators for quality of life, since all WQ, SH and LS are constructed as subjective indicators. A negative relationship between the homicide rate (HR) indicator and all three response variables used was confirmed in both PLS and Lasso regression models (they had among the highest absolute values, except those for IHDI). The indicator of feeling safe walking alone at night exhibited a positive relationship in both models (apart from the value for HLY in the Lasso regression model). Since the last two indicators represent the factor of safety, it seems that this factor can have a significant effect on quality of life.

The PLS regression model detected the importance of indicators representing the factors of housing, income, community, jobs, education, environment, civic engagement, health, life satisfaction and safety. Particularly, the indicators of rooms per person (RP) (reflecting housing), mean equivalised net income (reflecting income), quality of support network (QN) (reflecting community), personal earnings (PE) (reflecting jobs), years in education (YE) (reflecting education), voter turnout (reflecting civic engagement), life expectancy (LE) and self-reported health (SH) (each reflecting health), life satisfaction (reflecting itself), and the indicator of feeling safe walking alone at night (reflecting safety) had positive coefficient values for all three response variables. At risk of poverty rate, (representing income), air pollution (representing environment), and homicide rate (HR) (reflecting safety) had negative value coefficients for all three response variables. So, the crucial six factors resulted from both analyses. Additional factors to those resulting from the Lasso regression model, i.e. housing, community, jobs and civic engagement also play their important role. The weakest (but not insignificant) effect on quality of life was identified for the indicators reflecting work-life balance.

In both regression models, the coefficients for HLY exhibited opposite signs for a number of variables. This is explained as by the specificity of this index in terms of quality of life and therefore, the factors of quality of life in broader terms does not need to affect this indicator significantly, especially in the group of developed countries, where the performance in many areas of quality of life is generally relatively high. Moreover, there are frequently a number of countries in which the relationships between the response and explanatory variables vary from the majority of the countries in the sample. Three Southern countries, i.e. Greece, Italy and Spain, exhibited high HLY values, Spain also the highest HPI. On the other hand, all three countries had very low IHDI values and poor performance in a number of indicators of quality of life. Switzerland, having high performance in many aspects of quality of life, high IHDI and HPI, had, on the other hand,

relatively low HLY. The three Baltic countries, i.e. Latvia, Lithuania, and Estonia, exhibited poor performance in a number of indicators and in all three explained variables. However, their performance was relatively high in the two indicators reflecting education.

The two research questions we posed were confirmed. Firstly, there are many factors of quality of life, but some of them are more significant than the others. Both the PLS and Lasso regression models detected the crucial factors and indicators relevant for quality of life. Health is a crucial factor of quality of life, wellbeing and SD. Subjective indicators from several areas of quality of life (environment (WQ), health (SH), life satisfaction (LS)) are of great importance. Although life expectancy (as an objective indicator of health) had positive relationships with all three response variables in the PLS regression analysis, it was not identified as a crucial factor by means of the Lasso regression. So, it was demonstrated in this work that subjective indicators in the developed countries can be even more important since objective indicators have already achieved satisfactory levels. It is taken into account that the significance of factors is in compliance with the stage of development of countries included and the response variables play a role as well (although they were chosen carefully).

The concepts of SD and quality of life, as well as policies towards them, must further reflect new challenges and threats, especially those related to public health in the form of a current pandemic situation. They should be adjusted to a new development arising as a reaction to this situation. The importance of transformation discourses in relation to quality of life (including their application in the context of previous challenges) seems to be a challenge for future research as well.

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Annex

Table 1. Regression coefficients for 25 explanatory variables – results of the PLS regression, source: author's calculations

	HLY	IHDI	HPI		HLY	IHDI	HPI
HD	-0.114	-0.023	-0.077	AP	-0.025	-0.034	-0.028
HE	0.006	-0.004	0.002	WQ	-0.038	0.096	0.017
RP	0.049	0.045	0.047	SR	-0.061	0.027	-0.024
MI	0.029	0.061	0.042	VT	0.058	0.018	0.041
PR	-0.014	-0.068	-0.036	LE	0.118	0.017	0.076
JS	-0.024	0.081	0.019	SH	0.125	0.035	0.087
ER	-0.046	0.081	0.006	LS	0.038	0.082	0.056
LU	0.064	-0.074	0.007	FS	0.013	0.078	0.039
PE	0.037	0.063	0.047	HR	-0.131	-0.013	-0.082
QN	0.007	0.070	0.033	EH	0.044	-0.008	0.023
EA	-0.107	0.063	-0.037	CA	-0.029	0.092	0.020
SK	-0.043	0.067	0.002	SE	-0.001	0.084	0.034
YE	0.032	0.038	0.034				

Note: Fields with negative coefficient values are highlighted in grey.

Table 2. The non-zero regression coefficients – results of the Lasso regression, source: author's calculations

	HLY	IHDI	HPI
PR	0.003	-0.012	-0.013
EA	-0.093	0.127	-0.044
SK	-0.009	0.020	0.008
YE	0.030	0.033	0.030
WQ	-0.062	0.255	0.068
SH	0.286	0.199	0.193
LS	0.089	0.248	0.153
FS	-0.013	0.035	0.031
HR	-0.149	-0.044	-0.176

Note: Fields with negative coefficient values are highlighted in grey.

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Socioeconomic and Environmental Determinants of Health Outcomes: The Case of Transition Economies

Spółeczno-ekonomiczne i środowiskowe determinanty zdrowia: przypadek gospodarek w okresie przejściowym

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Abstract

This study examines the effects of economic and socio-demographic factors on the health status of men and women separately. The annual data of 16 selected transition countries for the period 2000-2016 were used. Life expectancy at birth was used as an indicator of health status in the study. Economic and environmental variables such as GDP per capita, health expenditures, unemployment, carbon emissions, access to safe water, and urbanization are considered as factors affecting life expectancy at birth. In the study, the Autoregressive Distributed Lags (ARDL) model was used.

The findings show that the effects of socioeconomic and environmental factors on life expectancy differ according to men and women. It has been found that above-mentioned factors are more effective on life expectancy of men than women in selected transition economies. Therefore, it can be recommended to prioritize economic and environmental targets in improving the health outcomes of countries.

Key words: Panel ARDL model, transition economies, health, socioeconomic factor, life expectancy

Streszczenie

W artykule przeanalizowano wpływ czynników ekonomicznych i społeczno-demograficznych na stan zdrowia kobiet i mężczyzn. Wykorzystano dane z 16 wybranych krajów reprezentujących gospodarki w okresie przejściowym za lata 2000-2016. W badaniu jako wskaźnik stanu zdrowia wykorzystano oczekiwaną długość życia w chwili urodzenia. Za czynniki wpływające na oczekiwaną długość życia w chwili urodzenia są uważane zmienne gospodarcze i środowiskowe, takie jak PKB na mieszkańca, wydatki na zdrowie, bezrobocie, emisje dwutlenku węgla, dostęp do czystej wody i urbanizacja. W badaniu wykorzystano model Autoregressive Distributed Lags (ARDL).

Okazuje się, że wpływ czynników społeczno-ekonomicznych i środowiskowych na oczekiwaną długość życia różni się w zależności od płci. Stwierdzono, że wyżej wymienione czynniki wpływają bardziej na długość życia mężczyzn niż kobiet w wybranych gospodarkach w okresie przejściowym. Dlatego należy zalecić priorytetowe potraktowanie celów ekonomicznych i środowiskowych w poprawie wyników zdrowotnych krajów.

Słowa kluczowe: Model panelowy ARDL, gospodarki w okresie przejściowym, zdrowie, czynnik społeczno-ekonomiczny, długość życia

1. Introduction

Nowadays, healthcare emerges as a very important input for economic growth, poverty reduction and long-term economic development (Asafu-Adjaye,

2007; Smith, 1999). At the macro level, protecting and improving population health is accepted as one of the basic policies of sustainable development (Bayati et al., 2013). In addition, health is considered to be essential input to sustainable development.

Without healthy nation it is hard to build prosperous society. Its value as a vital stimulus for development has contributed to the central positioning of health-related targets in the Sustainable Development Goals. Sustainable Development Goals (SDGs), a series of priorities adopted by member states of the United Nations as essential to sustainable human progress. Only SDG 3 is devoted to health. Nevertheless, health plays a major role in achieving other goals, too (Mohammed and Ghebreyesus, 2018). In other words, other development objectives such as poverty alleviation, gender empowerment, and universal education can be achieved through improved health status of population. It is stressed that overall economic and social progress cannot be sustainable without increasing health outcomes (Health in the Framework of Sustainable Development, 2014). So health has become a more pertinent issue in development, both as a contributor to and as a measure of sustainable development. For this reason, exploring the core factors that determine health status of people is vital to ensuring sustainable development.

Life expectancy at birth is often used to measure the health status of a population as well as to assess the improvement in health status in each country. Although health is a multidimensional concept, life expectancy at birth is one of the most widely used population health indicators (Sharma, 2018). Bilas et al. (2014) suggested that life expectancy is an important indicator in evaluating the economic and social development of a country or region. According to Pasichnyi and Nepyaliuk (2021) longevity can be considered as the direct consequence of the high economic development.

According to the World Health Report of the World Health Organization, people live healthier and longer today than they did 30 years ago. From 1998 to 2025, it is estimated that the average global life expectancy will increase by 7 years and life expectancy in 26 countries will exceed 80 (World Health Organization, WHO, 2008). Life expectancy increased by 8% globally between 2000-2016 (World Health Statistics, 2020).

It is argued that life expectancy depends more on lifestyle (Luy and Wegner-Siegmundt, 2015; Ok-suzyan et al. 2008), environmental (Mariani et al. 2009; Elo and Preston, 1992; Evans and Smith, 2005), economic (foreign direct investment and external trade (Herzer and Nunnenkamp, 2012; Owen and Wu, 2007), economic growth (Salahuddin, 2020) and socio-demographic (urbanization (Rogers and Wofford, 1989), access to safe water (Rogers and Wofford, 1989; Gullis, 2000)), education (Luy et al. 2019; Lleras-Muney, 2005), and income inequality (Matthew and Brodersen, 2018) factors.

It is extremely important to examine health outcomes for transition economies. Because these countries have been exposed to political, social and economic changes in the 1990s. Political and social transformations have also had significant effects on population health (Nolte et al. 2005; Grigoriev et al. 2010). Factors experienced during the transition period such as the increase in unemployment, the de-

crease in living standards, imbalances in income distribution and psychological stress caused health outcomes to deteriorate (Cornia and Panizza, 2000; Cockerham et al. 2006). It has been observed that the differences in life expectancy by gender are also beginning to increase. While men living in the Commonwealth of Independent States (CIS) countries in the 1960s lived 12 years longer than the global average, towards 2012 it is seen that their life expectancy was two years less than the world average. It has also been observed that there is a decrease for women life expectancy. While women lived 14 years longer than women in other countries in the early 1960s, towards 2012 this difference was recorded as two years.

It has been well documented that the socioeconomic factors may lead to better improved health outcomes of population (Sede and Ohemeng, 2015; Miladinov, 2020; Salami et al. 2019). Improvements in economic conditions are an important force behind the population health outcomes (Miladinov, 2020). In other words, the impact of economic conditions on health status could not be neglected (Hsiao, 2004). The results of prior research have highlighted that countries should take into account not only health care and healthful behaviors, but also the social and economic conditions that so strongly impact the health outcomes. Moreover, it has been stressed that other health factors such as health behaviors, clinical care, and the physical environment are impacted by socioeconomic factors. A large portion of health outcomes (40 percent) is attributable to socioeconomic factors. The two factors socio-economic and environmental factors are found to be more important than other factors (Swain, 2016).

It is assumed that advances in health are the by-product of higher income as nations with higher income dedicate more money for their health care, which will result in better health outcomes (Stengos et al., 2008). Moreover, higher incomes promote access to goods and services (e.g. food, accommodation, transport), decent working standards and a better quality of life, which in turn leads to increased health and longevity. Prior researches highlighted that income is one of the main drivers of increasing life expectancy.

The impact of unemployment on longevity has been an important issue for researchers (Ahn et al., 2004). Unemployment has an adverse impact on health since, rising unemployment increase stress and depressed mood (Dooley et al. 1988; Mckee-Ryan et al. 2005), spread unhealthy behaviours (Bolton and Rodriguez, 2009), and elevate mortality risk (Noelke and Beckfield, 2014).

There is a related literature on the impact of health expenditure on health outcomes. It is assumed that rising health expenditure can lead to improvements in health. The empirical literature shows that total health care expenditure per capita leads to an increase in life expectancy (Chireshe and Ocran, 2020; Karaman et al. 2020). In other words, health expenditures were found to be essential for improving population's health. Health expenditure was found to be a significant explanatory variable for at least one

Figure 1. Life expectancy of women vs. life expectancy of men, 2020, source: UN population division (2019 Revision), World Bank WDI

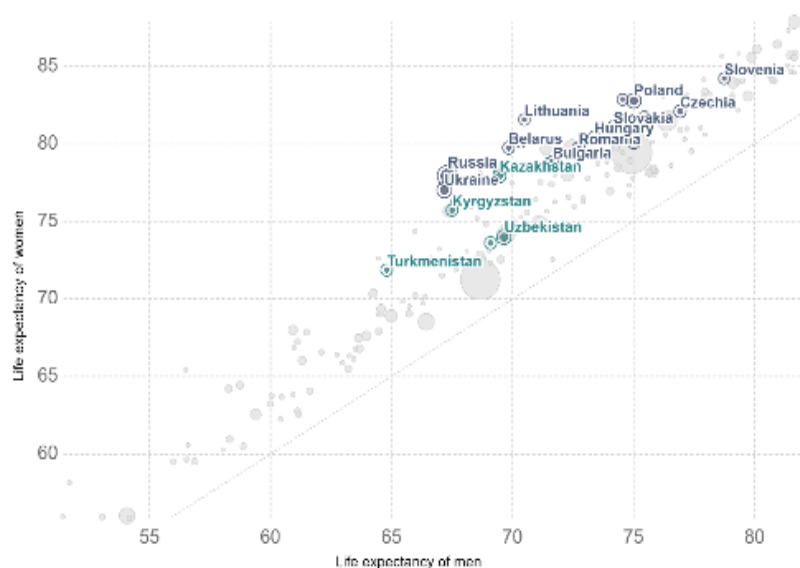
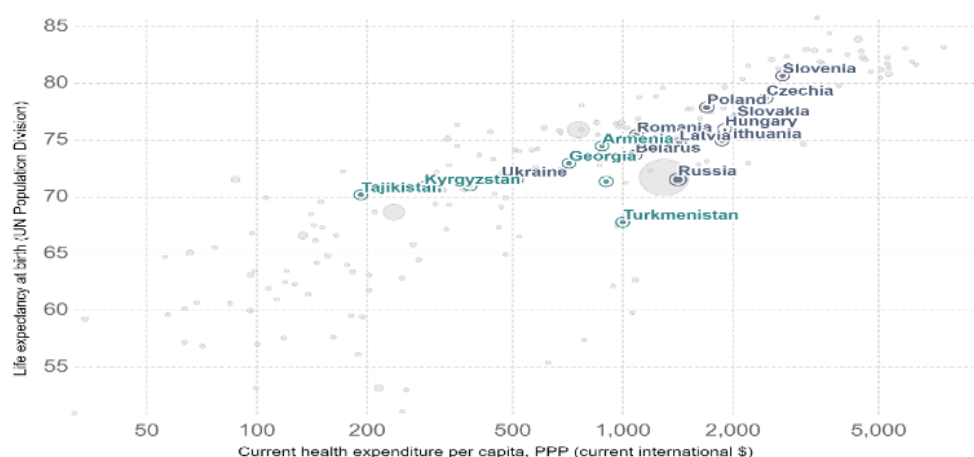


Figure 2. Life expectancy vs. health expenditure per capita, 2015, source: UN population division (2019 Revision), World Bank WDI



health outcome examined in 12 of 16 papers (Nixon and Ulmann, 2006). The contribution of health expenditure on health status may be differ according to gender. The evidence highlight that health care expenditure added 2.6 years to males and 2.8 years to female life expectancy.

The variation of life expectancy also can be explained by environmental factors. Much attention has been devoted to the contribution of urbanization, carbon emissions and access to safely water to health status.

Understanding the underlying factors of longevity is vital in devising effective health policies. The importance of aforementioned socioeconomic and environmental factors in enhancing health motivated us to conduct this study. So the scope of this study is to link the key parameters of socio-economic and environmental factors with longevity prospects. This study examines economic and environmental factors affecting life expectancy of women and men in selected transition economies (Armenia, Belarus, Bulgaria, Georgia, Estonia, Hungary, Kazakhstan, the

Kyrgyz Republic, Latvia, Lithuania, Moldova, Russian Federation, Slovak, Slovenia, Tajikistan, and Uzbekistan). In the empirical analysis, the annual data of these countries for the period 2000-2016 were used. Panel ARDL model was employed to reveal the effects of economic and environmental factors such as GDP per capita, health expenditures, unemployment, access to safe water, urbanization, and carbon emissions. Findings obtained from the study indicated that the effects of economic and environmental factors on life expectancy differ by gender.

The contribution of this study to the literature can be considered from the two aspects. First, it is examined whether health outcomes differ by gender in transition economies. When the literature is examined, no other study has been found that deals with transition economies and examines them from this perspective. It is seen that there is no study focusing on the relationship between socioeconomic, environmental variables and the life expectancy of women and men. Secondly, there is no other study using the panel ARDL model applied in this study in the context of

Figure 3. Life expectancy vs. GDP per capita, 2015, source: UN population Division (2019), Maddison Project Database (2018), Population Gapminder Hyde (2016) & UN (2019), <https://ourworldindata.org/>

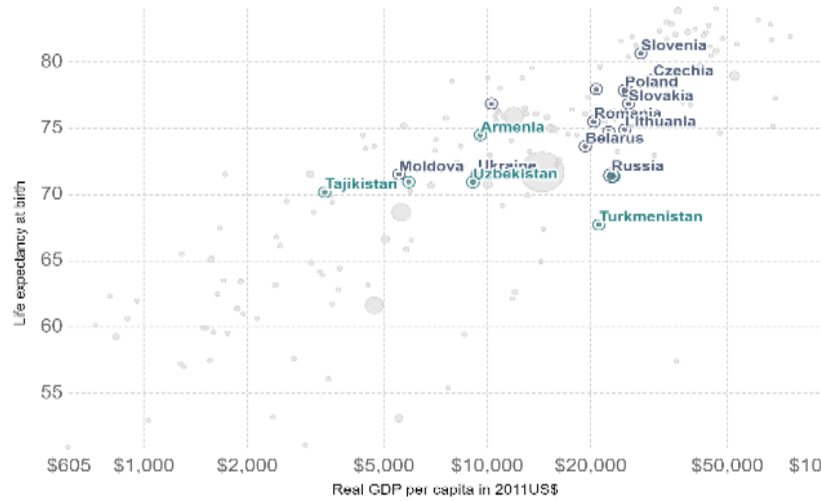
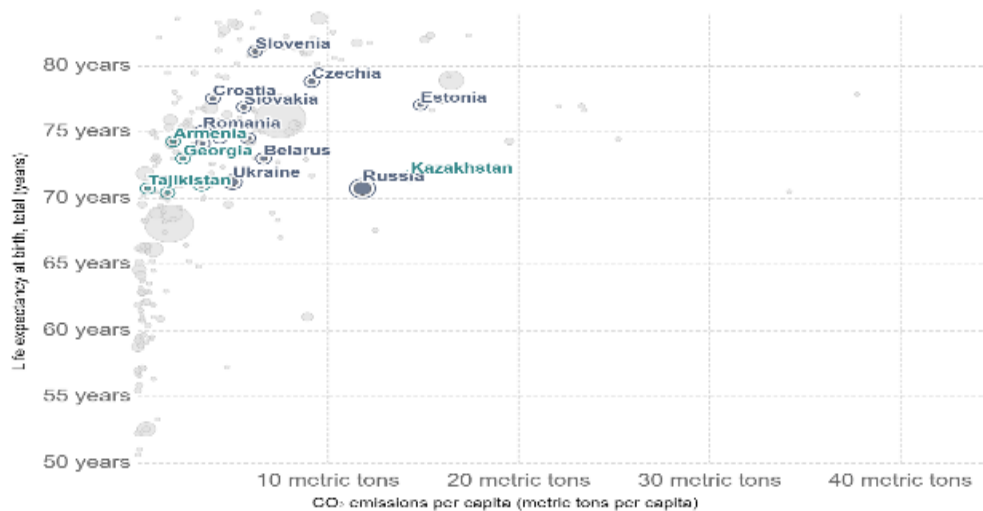


Figure 4. Life expectancy vs. CO₂ emissions per capita, 2014, source: UN population Division (2019), Maddison Project Database (2018), Population (Gapminder Hyde (2016) & UN (2019), <https://ourworldindata.org/>



transition economies. This model is used in order to examine both potential long and short-term effects between the variables.

In the second section following the introduction, contributing factors to life expectancy in transition economies are elaborated. In the third section, studies examining the main determinants of health are emphasized. The data set and variables are introduced in the fourth section. The methodology and findings are given in the fifth section. Our study ends with the conclusion part.

2. Contributing factors to life expectancy in transition economies

The life expectancy can differ by gender. Gender discrepancies in life expectancy are a global phenomenon. It is widely known that women live longer than men (Pinkhasov et al. 2010). According to the researchers, the reasons for this are based on biological, psychological and social factors. The difference

in life expectancy according to gender has been the focus of attention of researchers (Sundberg, 2018). It is suggested that 75% of this difference is due to non-biological (behavior, lifestyle, social roles etc.) factors (Luy and Wegner-Siegmundt, 2015; Oksuzyan et al. 2008). Since men consume more tobacco, use alcohol and are employed in more risky professions than women (Loef and Walach 2012; Oksuzyan et al. 2008) they live shorter lives.

As can be observed from Figure 1 in selected transition economies life expectancy of women is higher than for men. All countries lie above the grey line. Figure 2 shows that there is positive correlation between life expectancy and health expenditure in selected transition economies. It implies that people in selected transition economies will live longer with increasing level of health expenditure.

In Figure 3 is shown the relationship between life expectancy and income. It indicates that there exists a strong, positive relationship between two variables.

The increase in lifespan can be achieved by increasing in income.

In Figure 4 is plotted the relationship between the environment and health outcomes in transition economies. It can be observed from the Figure 4 that the life expectancy is higher in countries with low carbon emission, suggesting that environmental degradation is not good for longevity. Based on the above-mentioned drivers of health outcomes, empirical analysis were conducted by utilizing socioeconomic and environmental factors in the fifth section of this study.

3. Literature review

After the seminal paper of Auster et al. (1969), revealing the main determinants of health has become the focus of attention of researchers. The number of studies examining factors affecting health employing different methods for different countries has started to increase. It is observed that most of the previous studies dealt with the variables of economic, socio-demographic, environmental, lifestyle, access to health services as the main determinants of health. Life expectancy and infant mortality rates are frequently used as an important indicator of health. Another striking issue is that researchers mostly focused on OECD, European countries and the USA. Some of these studies are summarized in Table 1.

As can be seen from literature, researchers mostly focused on the effects of lifestyle (Shaw et al. (2005), environmental (Auster et al., 1969), economic (Salahuddin et al. 2020; Blazquez-Fernández et al., 2017) and socio-demographic (Rogers and Wofford, 1989; Gulis, 2000; Luy et al., 2019; Fayissa and Gutema, 2005) factors on health outcomes.

Kobza and Geremek (2015) linking health outcomes for Poland with lifestyle and health system, Korbilius et al. (2016) examined the effects of socioeconomic, health expenditures and environmental factors on life expectancy for the Czech Republic, Drastichová and Filzmoser (2020) investigated the impact of health expenditure on health outcomes, and Medas (2015) explored the impact of socioeconomic factors for Hungary.

When the previous literature is examined, it has been observed that transition economies are not considered altogether and are not investigated in the context of socioeconomic and environmental factors. Therefore, this study has two main differences from other studies. Firstly, this study focuses on the impact of socioeconomic and environmental factors on the health outcomes of women and men in transition economies. Secondly, the procedure employed in our study was not applied in previous studies.

4. Data set and variables

In this study, the annual data of 16 selected transition economies (Armenia, Belarus, Bulgaria, Georgia, Estonia, Hungary, Kazakhstan, Kyrgyz Republic,

Latvia, Lithuania, Moldova, Russian Federation, Slovak, Slovenia, Tajikistan, and Uzbekistan) for the period 2000-2016 were employed.

These countries were selected for three reasons: first, due to data attainability the number of countries are limited to these countries. Second, as can be seen from the prior literature panel data approach has not been applied in the context of transition economies, yet. Third, this study examines gender differences in life expectancy. It is known that economic and structural transformation that have taken place in 1990s affected the health status of people. It is well documented that political and economic transition in Eastern Europe and the former Soviet Union has been followed by a five-year drop in male life expectancy (Von Schirnding and Mulholland, 2002). On the basis of the reasons mentioned above current study will investigate the key determinants of health outcomes in the context of transition economies.

Life expectancy at birth was used as an indicator of health in the study. It has been emphasized in previous studies that the factors affecting the life expectancy of women and men differ according to gender. In this study socioeconomic and environmental factors are used as explanatory variables. Socioeconomic influences on life expectancy are represented by three variables: income per capita (Salami et al. 2019), unemployment (Norström et al. 2017) and health expenditure (Sede and Ohemeng, 2015).

Prior researches revealed that income is one the main determinants of health status. The existence of a significant positive association between income and health has been emphasized in the literature (Case et al. 2002; Deaton, 2002). It is believed that positive impact of per capita income on health can be observed until some threshold level, beyond which it is expected that adverse risky behaviors and unhealthy lifestyle to be prevail that may be detrimental to health (Chris James and Franco, 2017; De Vogli et al., 2005). Based on past studies squared term of income was included into the model.

While some of the studies examining the effect of health expenditures by gender emphasized that it has a stronger effect on female life expectancy (Ivaschenko, 2005), in others it has been revealed that it is more effective on men (Crémieux et al. 1999). So the results are mixed.

Unemployment can worsen health status (Marmot and Wilkinson, 2003) firstly, increasing unemployment means decreasing income, secondly, unemployment increases chronic disease (cardiovascular disease, hypertension, and musculoskeletal disorders) and premature mortality (Dean and Wilson, 2009). Health effect of unemployment may differ according to gender. As can be observed from D'Arcy's (1986) study women are tend to be more anxious, depressive and visited doctors more often than unemployed men. Dew et al. (1992) argued that negative impact of unemployment on health status of women is higher than on the men. The results of other study indicate that men with longer unemployment duration died earlier (Lavis, 1998).

Table 1. Literature review

Author	Country	Method	Findings
Salahuddin et al. (2020)	South Africa 1985–2016	ARDL model	It has been observed that economic growth and foreign direct investments have a negative effect on child mortality.
Miladinov (2020)	Macedonia, Serbia, Bosnia and Herzegovina, Montenegro, and Albania 1990-2017	Full Information Maximum Likelihood method	It has been demonstrated that an increase in GDP per capita and a decrease in infant mortality rates will improve life expectancy at birth.
Luy et al. (2019)	Italy, Denmark, and USA 1990-2010	A decomposition Analysis	Education has been found to improve health.
Matthew and Brodersen (2018)	USA 2006-2014	Probit regression analysis	It was concluded that income inequality has an impact on health.
Rahman et al. (2018)	SAARC-ASEAN countries 1995–2014	Panel data regression	It has been demonstrated that total, public and private health expenditures significantly reduce infant mortality rates. Increase in per capita income and improved sanitation facilities contributed to the improvement of population health in the region.
Blazquez-Fernández et al. (2017)	OECD Asia / Pacific region countries 1995-2013	Panel and time series analysis	Empirical results show that per capita income, unemployment and exchange rates lead to different health outcomes. It has also been found that spending more on healthcare expenditures does not always yield better results.
Tavares (2017)	28 EU countries	Panel data regression	GDP and giving birth before the age of 20 have been shown to affect infant mortality. It has been observed that infant mortality rate decreases as the mean age of the mothers for the first child increases.
Asiskovitch (2010)	19 OECD countries 1990–2005	Panel data regression	The health system has found a marginal effect on life expectancy at birth for both sexes. Public finance has a greater impact than private.
Fabella (2008)	134 countries 2000 and 2003	Cross-section data analysis	It has been demonstrated that the increase in the population increases the infant mortality rate.
Soares (2007)	Brazil states 1970-2000	Panel data regression	Availability of healthcare infrastructure has a significant impact on life expectancy.
Nixon and Ullman (2006)	15 EU countries 1980-1995	Panel data regression	Health expenditures have been found to have a marginal but positive effect on health outcomes for EU countries. It has been revealed that the change in health expenditures and the number of physicians in EU countries adds 2.6 and 1.6 years to male life expectancy, respectively, and causes a 0.63 and 0.22 percentage point decrease in infant mortality rate.
Afonso and St. Aubyn (2006)	30 OECD countries 2000 yılı	Two-step procedure for cross section data: data envelopment analysis and Tobit regressions	GDP per capita, education, tobacco use and obesity were found to be factors affecting health status
Fayissa and Gutema (2005)	31 Sub-Saharan African countries 1990-2000	2 stages Generalized Least Squares (GLS) method	It is concluded that the increase in per capita income and in the food availability variable and the decrease in the rate of illiteracy will improve life expectancy at birth.
Shaw et al. (2005)	19 OECD countries 1990	Cross section analysis	It has been observed that doubling annual drug spending will result in an increase in life expectancy for 40-year-old men from 1 year to less than a year for 65-year-old women. It was concluded that reducing

			tobacco use to two per day or increasing fruit and vegetable consumption by 30% would result in an approximately one-year extension in life expectancy for 40-year-old women.
Thornton (2002)	USA states 1990	Cross-section data regressions	The contribution of medical care in lowering the mortality rate is very low. More attention should be paid to the role of socioeconomic and lifestyle factors in preventing disease and improving life expectancy.
Lichtenberg (2002)	ABD 1960-1997	Maximum likelihood method	Medical innovation and medical care expenditures (especially public expenditures) have had positive effects on life expectancy.
Or (2000a)	21 OECD countries 1970-1992	Panel data regression	It is concluded that the increase in the employment share of white-collar workers and the per capita income is effective in decreasing of premature deaths. An important and positive relationship was found between health expenditures and health status, especially for women.
Or (2000b)	21 OECD countries 1970-1995	Panel data regression	It has been demonstrated that the increase in the number of physicians per person will lead to a decrease in early death rates, perinatal and infant mortality rates, and a longer life expectancy and lower heart diseases, especially at the age of 65.
Gulis (2000)	156 countries 1990	Multivariable linear model	The strong effect of education and access to safe water on health was emphasized. It has been demonstrated that a 10% increase in literacy rate will cause an increase in life expectancy to 2,439 years.
Barlow and Vissandjie (1999)	77 countries 1990	Multivariate cross section analysis	Literacy rate, per capita income and access to safe water resources have been found to have a significant positive impact on life expectancy. The negative effects of fertility and tropical location have been revealed. In addition, it has been observed that per capita consumption of animal products has an inverse U relationship with life expectancy. Per capita health expenditure and urbanization rate were found to be weak determinants.
Cremieux et al. (1999)	10 Canadian provinces 1978-1992	Panel data regression	Lifestyle factors were seen as the main determinants of health. The positive effect of income on life expectancy has been found. A 10% spending cut has been observed to result in a 6-month reduction in life expectancy for men and 3 months for women
Elola et al. (1995)	17 European countries	Cross-section data regressions	Health expenditures per capita may explain more variance in infant mortality than per capita GDP. Health spending is inversely proportional to female premature death and positively correlated with life expectancy of women
Rogers and Wofford (1989)	95 least developed countries	Multiple regression analysis	It has been concluded that urbanization, industrialization, education, access to safe water, number of doctors and adequate nutrition have an effect on life expectancy.
Auster et al. (1969)	USA 1960	Two-stage least squares and OLS method	It was concluded that the impact of environmental variables is higher than health services. It was emphasized that education reduces the mortality rate.
Author	Country	Method	Findings

Following Salami et al. (2019), urbanization, carbon emissions, and water access were included as environmental variables.

The impact of urbanization on health status can be either positive or negative. Positive impact can be explained by fact that urban population has better medical cares, better education opportunities and improved socioeconomic infrastructure (Kalediene and Petrauskiene, 2000). Negative impact can be observed by the increase in slum settlements, poverty, ill-health and the decline in urban capital per person (Self and Grabowski, 2003).

Safe drinking water was found to be the main determinants of life expectancy in many researches (Macfarlane et al.2000; Gulis and Kross, 1999 among others). Access to safe and clean water will reduce disease that can occur because of bacteria and viruses. So it is expected that clean water will promote health outcomes of population (WHO/UNICEF, 2017).

It is well documented in the literature that increased level of carbon dioxide emissions will cause reduction in longevity (Balan, 2016; Ali and Ahmad, 2014). Empirical findings exerted that life expectancy is negatively correlated with environmental degradation (Rozeňnalová et al.2021). Higher carbon dioxide emissions result in lungs, heart and cardiopulmonary system related health problems (Davidson, 2003). So it is anticipated that carbon emissions will reduce the lifespan.

The data were obtained from the World Bank database. Detailed information about the variables has been presented in Table 2. Variables were included into the model with their logarithms forms.

5. Methodology and findings

In this study, in order to determine the relationships between variables that are thought to affect the expected life expectancy of men and women, the Panel Autoregressive Distributed Lags (ARDL) model proposed by Pesaran et al.(1999) will be applied. For the estimation of the panel ARDL model, the following steps will be taken. First, it will be discussed whether there is a cross-sectional dependency between series. Then, panel unit root analysis will be employed in order to determine the integration order of the series.

Panel ARDL model can be employed when the series have different degrees of integration $I(0)$ and $I(1)$. It is a prerequisite for the series not to be integrated of order $I(2)$ (Bhutto and Chang, 2018). It is appropriate to apply the panel ARDL model, as the variables are a mixture of $I(0)$ and $I(1)$ series (Anjum et al.2017; Chang and Rajput, 2018). On the other hand, consistent results can be obtained in case of small sample sizes. Therefore, the panel ARDL

Table 2. Variables

Variables	Abbreviation	Definition
Life expectancy (female)	LEX _f	Life expectancy at birth, female (years)
Life expectancy (male)	LEX _m	Life expectancy at birth, male (years)
Economic variables		
Per capita income	LGDP	GDP per capita, PPP (constant 2017 international \$)
Health expenditure	LHE	Current health expenditure (% of GDP)
Unemployment	LUNEMP	Unemployment rate
Environmental variables		
Urbanization	LURBAN	Urban population
Access to safely water	LWATER	People using safely managed drinking water services (percentage of population)
Carbon emissions	LCO2	CO ₂ emissions (kg per 2010 US\$ of GDP)

model emerges as a frequently used approach to reveal the long-term relationships between variables. In the first stage, it should be examined whether there is a cross-sectional dependency between the series. Cross-section independence indicates that the countries that make up the panel are not affected by a shock in any of the countries. Estimation results are greatly influenced by whether cross-sectional dependency is taken into consideration (Breusch and Pagan, 1980; Pesaran, 2004). In other words, it is extremely important to test whether there is a dependency between units, as the results obtained may be inconsistent (Menyah et al. 2014). For this purpose, the CD (Cross-Section Dependence) test proposed by Pesaran (2004) was utilized. Pesaran (2004) CD test results are summarized in Table 3.

According to the results summarized in Table 3, the null hypothesis was rejected because the probability values were less than 0.01, and it was found that there was cross-sectional dependency in other series except urbanization variable. In case there is evidence for cross sectional dependence, it is recommended to apply second generation panel unit root tests. Accordingly, whether the series contain unit root or not was examined with the CADF (Cross-Sectionally Augmented Dickey Fuller) test proposed by Pesaran (2007). Pesaran (2007) suggested that the CADF test can be used effectively in both $T > N$ and $N > T$ situations. CADF regression equation can be estimated as follows:

Table 3. Cross-section dependence test

Variables	Test statistics	Probability
LEXf	42.48	0.000
LEXm	41.63	0.000
LGDP	42.92	0.000
LGDP ²	42.86	0.000
LUNEMP	10.46	0.000
LURBAN	-0.06	0.948
LWATER	38.48	0.000
LHE	10.35	0.000
LCO2	23.17	0.000

The test can be used in both cases when $T > N$ and $T < N$. The test statistics can be calculated as follows in cases where

$$T > N: CD = \sqrt{\frac{1}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N (T \hat{\rho}_{ij}^2 - 1) \sim N(0,1).$$

Where ρ_{ij} shows the simple correlation coefficient between the residuals obtained from the estimation of each equation using the least squares method. The null hypothesis, $H_0: \rho_{ij} = cor(u_{it}, u_{jt}) = 0 \ i \neq j$ implies that there no cross sectional dependenc among units.

$$\Delta Y_{it} = \alpha_i + b_i Y_{i,t-1} c_i \bar{Y}_{t-1} + d_i \Delta \bar{Y}_t + \varepsilon_{it} \quad (1)$$

Where \bar{Y}_t , refers to the average of all cross section observations over time. In the case of autocorrelation, the above equation can be expanded as follows:

$$\Delta Y_{it} = \alpha_i + \rho_i^* Y_{i,t-1} + d_0 \bar{Y}_{t-1} + \sum_{j=0}^p d_{j+1} \Delta \bar{Y}_{t-j} + \sum_{k=1}^p c_k \Delta Y_{i,t-k} + \varepsilon_{it} \quad (2)$$

CIPS (Cross-Sectional Augmented Im-Pesaran-Shin) statistic was estimated as follows:

$$CIPS = \frac{1}{N} \sum_{i=1}^N CADF_i \quad (3)$$

Where $CADF_i$ indicates the means of the t-statistics of the lagged variables. The Levin-Lin Chu (LLC, 2002) unit root test, one of the first generation unit root tests, was applied to urbanization variable. LLC (2002) t test statistics can be obtained as follows under the null hypothesis $\delta=0$:

$$t_\delta = \frac{\hat{\delta}}{std(\hat{\delta})} \quad (4)$$

(Pesaran (2007) and LLC (2002) unit root test results are presented in Table 4.

According to the results it cn be concluded that other variables except LURBAN are not stationary at level. In other words, it is seen that the variables are a mixture of I (0) and I (1) series. In this case, the relationship between the variables will be examined by utilizing the Panel ARDL model proposed by Pesaran et al. (1999). This procedure can be applicable to examine both the short and long-run relationships between the variables. In other words, via panel ARDL model can be obtained both short and long run properties of a model. Moreover, the advantage of implementing panel ARDL model with sufficient lags is a elimination of the issue of endogeneity (Pesaran and Smith, 1999). In addition, it is stressed that abovementioned procedure is efficient to capture the long-run relationship in case of small sample sizes.

Panel ARDL model, which assess the relationship between life expectancy and its determinants can be expressed as follows:

Table 4. Results of panel unit root tests

		t bar statistics	z bar statistics	Probability
		Level		
Pesa-ran unit root	LEX _f	-2.613	-1.318	0.094
	LEX _m	-2.038	0.958	0.831
	LGDP	-1.977	1.199	0.885
	LGDP ²	-1.986	1.165	0.878
	LUNEMP	-1.477	3.181	0.999
	LWATER	-1.951	1.303	0.904
	LHE	-1.717	2.229	0.987
	LCO2	-2.364	-0.332	0.370
	First Difference			Probability
	ΔLEX _f	-3.438*	-4.585*	
	ΔLEX _m	-3.620*	-5.307*	
	ΔLGDP	-2.497*	-3.007*	
	ΔLGDP ²	-2.464*	-2.880*	
	ΔLUNEMP	-2.951*	-4.786*	
	ΔLWATER	-2.767*	-4.068*	
	ΔLHE	-3.527*	-7.047*	
	ΔLCO2	-2.688*	-3.756*	
		t statistics		Probability
LLC	LURBAN	-2.6692*		0.003

The null hypothesis implies that there is unit root, the series is not stationary.
* denotes for 1 % significance level.

$$\Delta LEX_{it} = \sum_{j=1}^{p-1} \gamma_j^i \Delta LEX_{i,t-j} + \sum_{j=0}^{q-1} \delta_j^i \Delta X_{i,t-j} + \theta^i [LEX_{i,t-j} - (\beta_0^i + \beta_1^i X_{i,t-j})] + \varepsilon_{it} \quad (5)$$

Where γ and δ denote the short-run coefficients, β long-run coefficients, and θ error correction term. LEX is the dependent variable. X is a set of explanatory variables. A negative and significant coefficient of the error correction term implies evidence of long-run relationship between variables. Equation (5) is estimated with the help of Pooled Mean Group (PMG) and Mean Group (Mean Group, MG) estimators. Pooled mean group estimator assumes the long-run parameters the same for all units, while allowing the short-term coefficients to differ from unit to unit (Pesaran et al. 1997). The main feature of using PMG is that the PMG is less susceptible to the existence of outliers for a relatively small cross-section of data. PMG estimators are applied to predict long-term coefficients, to capture the pooling behavior of homogeneity constraints and short-term coefficients by the average across units used to derive the means of predicted error-correction coefficients and other short-term parameters (Pesaran et al. 1999).

Mean group estimator allows the constant term, slope coefficients and error variances to change from unit to unit (Pesaran et al. 1999). In other words, long-term and short-term parameters can differ

across units. Estimator requires a large enough N and T in order to obtain consistent outcomes. This estimator has some shortcomings. The drawback of MG estimator is that it does not take cross-sectional dependence into account. We will apply both estimators. Hausman test (1978) was employed in order to choose between two estimators. PMG estimator is preferred according to Hausman test results. Accordingly, the estimation results obtained by the pooled mean group estimator are presented in Table 5.

Table 5. Pooled mean group estimation results

	Model 1	Model 2
	Life expectancy (female) ARDL (1 0 0 0)	Life expectancy (male) ARDL (1 0 0 0)
Long-Run Coefficients		
LGDP	0.6002* (0.1080)	2.2056* (0.6607)
LGDP ²	-0.0314* (0.0059)	-0.1066* (0.0323)
LUNEMP	-0.0065* (0.0016)	
LCO2	-0.0146* (0.0033)	-0.0577* (0.0096)
LURBAN	0.3314* (0.0233)	
LWATER	0.0361* (0.0051)	0.1127* (0.0093)
LHE		0.0609* (0.0091)
Short Run Coefficients		
Error correction term	-0.3598* (0.1288)	-0.2592** (0.1024)
ΔLGDP	-1.0674 (1.1716)	2.0591 (3.3004)
ΔLGDP ²	0.0462 (0.0587)	-0.1084 (0.1621)
ΔLUNEMP	-0.0084 (0.0130)	
ΔLCO2	-0.0080*** (0.0043)	0.0011 (0.0063)
ΔLURBAN	0.5014 (0.5762)	
ΔLWATER	0.7246 (0.7995)	0.3911 (1.2038)
ΔLHE		-0.0076 (0.0070)
Constant	-1.3982* (0.5092)	-2.0169** (0.7995)
Hausman Test chi ² =0.09 Prob>chi ² = 1.000		chi ² =7.07 Prob>chi ² = 0.2155
Log Likelihood 1370.076		1242.233
Number of observations		256
*, ** and *** denotes significance level for 1%, 5%, and 10%, respectively. Standard errors are given in parentheses.		

According to the pooled mean group estimation results, the long-term coefficients of all variables for both models were found to be statistically significant at the 1% level.

Error correction terms were found to be negative (-0.35 and -0.25) and statistically significant in both models. This indicates that approximately 35% and 25% of the shock that occur in one period will recover in the next period, respectively. In other words, it confirms a stable long-run relationship between the variables.

For the income variable the coefficient of income is found to be positive and significant while the coefficient of income square is negative and significant. It specifies that life expectancy initially rise as income increases and then begin to decline. It is noteworthy, that the magnitude of escalation in emissions associated with urbanization is higher than the potential reduction. The magnitude of the health effect of income is greater compared to other variables. In other words, it implies a strong relationship between income and life expectancy. This findings are in good accordance with those of Pritchett and Summers (1996), Pritchett and Viarengo (2010), and Jetter et al.(2019).

We find unemployment has a long-run negative and statistically significant impact on life expectancy, implying that unemployment decreases life expectancy of women. This outcome corroborates with the findings of Tafran et al. (2020).

For the carbon emissions variable, the long run coefficients are negative and significant at the one percent level. We found a long-run coefficient of carbon emissions -0.01 and -0.05 for women and men, respectively. A 1% increase in carbon emissions decreases life expectancy of women and men by 0.01% and 0.05 %, respectively. These results are consistent with several researchers including the study Ahmad et al. (2018) and Matthew et al. (2018) among others.

The results indicate a positive and significant relationship between urbanization and life expectancy, suggesting that higher urbanization lead to higher life expectancy. This result of a positive relationship supports the findings of Monsef and Mehrjardi (2018).

Estimates indicate that a 1% increase in access to safe water leads to an increase in life expectancy of women and men by 0.03% and 0.11%, respectively. These results are in line with several studies, such as McCarthy and Wolf (2001), Heysen and Musgrove (1986), and Gullis (2000).

The health expenditure coefficient 0.06, suggests that 1% increase in health expenditure results in an increase of about 0.06% in life expectancy. This result is consistent with the findings of Novignon et al. (2012), Heijink et al. (2013), Rahman et al. (2018), and Bein et al.(2017) among others.

If we evaluate the findings in general, it is seen that economic and environmental factors have different effects on the life expectancy of men and women. The magnitude of above mentioned factors are greater in volume for men than for women.

6. Conclusion

In this study, socioeconomic and environmental factors affecting the life expectancy of men and women in 16 selected transition economies were examined. For this purpose the Panel ARDL model was applied to the annual data of the countries considered for the period 2000-2016.

Results revealed that all explanatory variables (income, unemployment, health expenditures, urbanization, carbon emissions, and access to safe drinking water) significantly affect the life expectancy of women and men. When the socioeconomic and environmental factors discussed in the study were evaluated in terms of gender, it was seen that they were different for women and men. It has been found that above-mentioned factors are more effective on life expectancy of men than women in selected transition economies.

In the light of these findings, priority should be given to improving socioeconomic and environmental factors while making decisions to promote and improve the health of women and men. In other words, it can be said that health outcomes can be improved by providing the population with safe and accessible drinking water and giving the necessary importance to income, urbanization and health expenditures.

In our study, findings were obtained that support the view that the increase in the carbon emissions reduce the longevity. In other words, environmental quality is a very important factor affecting health. Therefore, it can be said that environmental policy is necessary in the countries considered. In general, it is recommended to prioritize socioeconomic and environmental targets in the health policies of countries.

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Sustainable Development Management and Building a New Civilization

Zarządzanie rozwojem zrównoważonym a budowa nowej cywilizacji

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Abstract

The objective of the paper is to:

- analyze and assess assumptions which determine the functioning of the category of management;
- identify the criteria and assumptions of integrated sustainable development management.

The hypothesis: Integrated sustainable development management requires:

- Necessary conditions: the verification of the institutional solutions which function between the category of sustainable development and development concepts based on sustainability and unsustainability and between these concepts and management.
- Sufficient conditions: the decision-making will in accepting this verification, its assumptions and criteria, including the rules of universal procedures.

Final conclusion: Limiting the paradigm of consent, based on the paradigm of deregulation and institutional solutions, which limit creative decisions.

Key words: sustainable development, structural order, management, rules of universal procedures, civilization code, deregulation

Streszczenie

Cel artykułu:

- analiza i ocena założeń decydujących o funkcjonowaniu kategorii zarządzanie;
- wskazanie kryteriów i założeń zintegrowanego zarządzania rozwojem zrównoważonym.

Hipoteza: Zintegrowane zarządzanie rozwojem zrównoważonym wymaga:

- Warunki konieczne: weryfikacja rozwiązań instytucjonalnych funkcjonujących między kategorią rozwój zrównoważony a koncepcjami rozwoju opartymi na zrównoważeniu i niezrównoważeniu oraz między tymi koncepcjami i zarządzaniem.
- Warunki dostateczne: wola decyzyjna w akceptowaniu tej weryfikacji, jej założeń i kryteriów, w tym reguł powszechnego postępowania.

Wniosek końcowy: ograniczenie paradygmatu *przyzwolenie*, opartego na paradygmacie deregulacja i na rozwiązaniach instytucjonalnych ograniczonych kondycję do podejmowania kreatywnych decyzji.

Słowa kluczowe: rozwój zrównoważony, ład strukturalny, zarządzanie, reguły powszechnego postępowania, kod cywilizacji, deregulacja

Introduction

The following reasons justify addressing the subject of this paper:

- Development is a component of civilization. As a rule, the managers of the construction (and reconstruction) of civilization try to ensure development (better development);

- Development concepts are important in managing this process. Since the 1970s, reference to the category of *sustainable development* has had a key position in these concepts;
- According to the common understanding, the category of sustainable development as the foundation and attribute of the concept of development is associated with the structural order in social, economic and environmental terms. In management, this makes it possible to easily obtain the acceptance and approval of members of a particular community to implement the proposed development concept, which can, in essence, be separate from sustainability-based management (the structural order);
- The use of this scenario is confirmed in the field of theory and in the real sphere; in both spheres two subsets of concepts are formulated and function:
 1. Sustainability-based, including sustainable development;
 2. Based on unsustainability processes, including the globalization process and its options. The problem is that the term *sustainable development* is used for both subsets of concepts.

An accepted and implemented concept of development with a deregulated understanding and application of the term *sustainable development* determines the quality of development management: defining development strategies, tools used and implementation in real terms.

The purpose of the paper is to:

- Present the definition of the essence of sustainable development, indicate the separation within the meaning and application of this category in relation to the core definition, and subsequently, present the effects of this separation for development management in terms of the construction (reconstruction) of civilization;
- Identify mechanisms enabling the deregulation of the category of sustainable development and their importance for formulating concepts of development and use (usefulness) of types of management for implementation in real terms;
- Define absolutely necessary (*sine qua non*) and sufficient (*sufficiens*) conditions enabling the construction (reconstruction) of a civilization with sustainable development (the structural order) and properly understood globality (universality).

The following research hypothesis was adopted in the discussion: the effectiveness and efficiency of sustainable development management for the construction (reconstruction) of a civilization with the structural order and properly understood globality (universality) is determined by the fulfilment of the necessary and sufficient conditions (sub-hypotheses).

The following methods were used in the discussion: descriptive and critical analysis, deduction and coherence.

The objective and hypothesis determine the structure of the paper:

1. Reflection on the category of *sustainable development*, core categories and their deregulation;
2. *Sustainable development* management based on the separation of the concept of development;
3. Freedom in *sustainable development* management and its consequences for the construction (reconstruction) of a civilization,
4. Criteria for the integrated implementation of determinants in sustainable development management for a civilization with the structural order and globality.

In the available literature, the issue has not been raised. Partial studies address the issue in terms of effects (an end-of-pipe effect – an environmental protection concept). In addition to the scientific literature, journalistic publications have been indicated. The fact is that they shape social awareness, decision-making will, paradigms and institutional solutions, the management process and effects in the real sphere, thus they must not be overlooked.

1. Reflection on the category of sustainable development, core categories and their deregulation

Sustainable development management is a complex category: management + sustainable development.

The starting point for reflection is the author's definition of sustainable development: **it is the process of transformation, changes, transition to states or more perfect forms, subordinated to human capital (which serves man) and satisfying the criteria articulated by the rules of universal procedures** (norms of the Constitution of the World; Piontek, Piontek, 2019). They are part of the achievements of the civilization, and to a certain extent, they are articulated by national constitutions.

The definitions result in certain attributes of the categories of *sustainable development*:

- It is a superior category compared to the category of management. Management should be substantiated by this category in terms of criteria. In practice and with regard to theory, this means ensuring the structural order between economic entities and all actors in the management process (shareholders, marketers, banks, customers, local, national and global environments), between product quality and sustainability, between profit maximization and survival, etc. This is a necessary condition (*sine qua non*) for inscribing the economic process into sustainable development.

- The definition emphasizes the primacy of human capital (H) over economic (E) and natural (N) capital, hence the need for relationality (E: H: N);
- Sustainable development is a normative category. This attribute is significantly different from economic growth and environmental protection. In order to ensure this attribute, the development of normative economics (evaluating rather than replacing it with positive-descriptive economics) and in science and education, learning to think, in addition to efficiency;
- The adopted definition justifies the question: Can development be achieved separately from sustainable development? Development by definition is strategic, and this attribute requires the structural order, which excludes the separation of these categories. It is therefore not necessary to emphasize *sustainable development*;
- The adopted definition of sustainable development shows that sustainable development should take local conditions into account to a large extent. There is therefore a need to establish the proportion (relationality) between sustainable development at local, regional, national and global levels. The application of this criterion determines the attribute of reality in development management and orderly relationality in the process of implementation in real terms. The presented reflection on the category of sustainable development points to the important attributes of the concept of development, which are part of a subset of concepts based on sustainability processes, ensuring the structural order between the components of civilization.

An open question is: What mechanism makes it possible to formulate the definitions of sustainable development in isolation from the principles of logic and epistemology and apply them?

The component of a civilization –in terms of ensuring its structural order – is a core category: management, rules of universal procedures, including the civilization code.

The accepted classification of types (concepts and methods) of management distinguishes several subsets, namely:

- In terms of functions performed: management, administration, public management (including planning, organizing, motivating and controlling), system (process) management in endogenous and exogenous relationships, ensuring the efficiency of systems;
- As a set of procedures for building an organization and regulations of its operation and in technology (technologies are procedures, Ritzer 1999, pp. 174-178)
- As a strategy of the organization (benchmarking – equaling the highest achievers– in freely

defined areas, Zimniewicz 1999, p. 36) and outsourcing (including resources, and new means of supply, as well as service activities, Zimniewicz 1999, p. 48).

- Marketing is also a subset of management. In an extreme form, it may involve the management of people's awareness and stimulate their choices that determine the structural order or deregulation.

These types (concepts and methods) of management were developed based on broadly defined economic capital and a paradigm of the free market. They try to stimulate the functioning of other types of capital (human and natural) within the free market. They aim primarily at increasing economic capital: maximizing profits, lowering costs, searching for new markets and improving efficiency.

The question is: How are these priorities pursued in relation to the structural order, which is the essence of sustainable development, and which has become a major challenge today?

Their use in management aimed at achieving sustainable development so defined may be justified, but requires a deep verification of relationality in the functioning of economic systems, in particular:

- Reducing the primacy of the concept of development based on unsustainability over sustainability-based concepts;
- Determining the permissible scope of their application. Institutional relationships (legal and organizational ones, programs formulated by scientific teams) of natural relationality between human, economic and natural types capitals in their functioning;
- Identifying institutional (intellectual) assumptions relevant for sustainable development management. They are based on a paradigm of deregulation, which allows for any form of relationality in a wide range.

Therefore, not all management types (concepts and methods) enable the implementation of sustainable development and achievement of the structural order.

The rules of universal procedures constitute a set of fundamental rules, which define the functioning of human beings (every human being), that is the existence and operation of people, and as a consequence, the construction of civilizations (development in all dimensions). They are universal and affect the entire surrounding reality and all directions of development. This also means that they determine the structural order (the right relationality), which is the essence of development. They can be called the Constitution of the World (Piontek, Piontek 2017, p. 24, Piontek, Piontek 2016, p. 20), and they govern; they are fundamental theorems, whose veracity does not need to be proven; they are obvious, constitute the first and core principles of reasoning and learning the truth and a certain degree of certainty of the rule of

natural law: good must be done, and evil should be avoided.

Natural law must be distinguished from the laws of nature. It is a mistake to equate them. The laws of nature are biological and physical laws, and natural law, in a synthetic sense, is aimed at distinguishing good from evil. And the knowledge of the criteria which distinguish these laws is a necessary condition for the structural order.

Three subsets can be distinguished in a set of rules of universal procedures:

1. Axioms – obvious theorems. Their veracity does not require proof. They constitute the first and core principles of reasoning and learning the truth and a certain degree of certainty (Kowalewski 1959, p. 365, also Piontek, Piontek, 2016, p. 21)
2. Rules of natural law – which require distinction from the laws of nature (Grotius 1583-1645). The rules of the laws of nature are the result of understanding what is in harmony with the nature of man and which allows the construction of an orderly human community. This subset includes psychological and rational principles and the civilization priorities of nations (Kunzmann, Burkard, Wiedmann 1999, p. 101) and they include:
 - A human being as the highest value in the world of nature;
 - The right to freedom, including economic freedom;
 - The right to work;
 - The right to meet needs, at least the essential ones;
 - The right to the truth.

For example, these rules, established based on the laws of nature, for shaping relationality, and the structural order are absolutely necessary, but are not sufficient.

Natural law is essential and absolutely necessary. Cicero (106-43 B.C.) calls it **true law**. It is the right reason (*recta ratio*). *It is compatible with all people. The true law is immutable and eternal. Its commandments oblige one to fulfill obligations, and its prohibitions refrain from mistakes (...). Replacing it by opposite law (institutionally established, for example by social consensus, F.P.) is a crime. Failure to observe of even one of the commandments is prohibited and there is no possibility, nor any other mandate to abolish them completely* (Cicero: as cited in: Grocholewski 2009, pp. 21-22).

By interpreting Cicero's statement in a popular way, one can say that natural law is a moral system, inherent in human nature, which allows people to distinguish good from evil, truth from a lie, and achieve the goal of development and the construction of a civilization. For example, the Decalogue is the component of the natural law, which makes it possible to shape relationality vertically and horizontally. People of different cultures and religions also collect and

transmit – as a tradition – folk wisdom, which has universal value and which points to universal moral behavior.

The attributes of moral law include universality, invariability and cognizability (Grocholewski 2009, p. 27).

Superior values – are weights attributed to the choice variables. They shape the preferences of choice.

In a set of rules of universal procedures, values are primarily of a qualitative nature. For example, profit cannot fulfill a function of superior values in this set. It does not mean it is unnecessary, but survival is more important.

According to F. Fukuyama, the set of core values is defined by human nature (...) together with religion (Fukuyama, 2004, p. 20). A set of superior values includes:

- Transcendent human relations recognized by reason (Plutarch Philosophy, in *Moralia's* work as cited in: A. Świd-erkówna);
- Pertaining to human dignity and determining the bio-psycho-spiritual integration of man (Hvozdk 2000, p. 1);
- Arising from the law of nature defining human beings (listed above in the text);
- Concerning human moral and cultural behavior: credibility, loyalty, kindness, courage, kindness, trust, discipline, kindness to man, etc. (Davachi, 2001);
- Pertaining to building identity based on confirmed historical facts and priorities, the relativity of which has been verified.

The highlighted subsets of the rules of universal procedures are inseparable and function in an integrated way (Grocholewski, 2009).

It should be noted, however, that in the set of these rules, the rule, which is **the civilization code**, is particularly important. The civilization code is the principle of contradiction. In the language of logic it is written as follows:

YES ≠ NO

It determines the foundations of civilization: truth ≠ false; good ≠ evil; and beauty subordinated to human tastes should serve truth and goodness.

Aristotle considered it as the first principle, and G.W. Leibnitz includes it into the core principles of any rational cognition (the basis of logic and epistemology).

The construction (reconstruction) of civilization by its essence (by definition) must be directed towards the civilization code. Its change enables other actions. The question is:

- What is the change of the civilization code?
- What is it like and what can its objective scope be?

In this context, the change of the civilization code is a paradigm of deregulation (a creation of deregulation). Its application is highlighted by the Group of

Lisbon (G.L., 1996, p. 65-67) as one of the principles of the globalization process (the implementation of global concepts based on unsustainability). In logic, change of the civilization code is written as follows:

YES = NO = CAN BE

The broken civilization code provides a theoretical (ideological) foundation for formulating and accepting institutional assumptions and concepts of development which are separated from the rules of universal procedures (cf. section 1). These rules are essential to ensure the structural order (relationality) and sustainable development.

The use of the term sustainable development for such concepts misinforms and enables the use of the term sustainable development in a deregulated manner. This is confirmed by the number of definitions of this category and the reference to this term in the literature, in real life and in the media.

The objective scope of the civilization code and the rules of universal procedures include all components of the construction of a civilization (the broadly defined real sphere and superstructure). Therefore, the broken code and paradigms institutionally formulated on its basis enable the gradual transformation of all areas of civilization and change of their nature.

2. Sustainable development management based on the separation of the concept of development

Section one of the paper states and justifies that sustainable development is superior to management concepts and types, which determine its implementation in real terms (the structural order, relationality to development and the construction of civilizations). It must be concluded that development concepts based on the unsustainability of the development process (including the globalization process) are also superior to management. They limit (or exclude) the construction of the structural order and promote sectoral effects in shaping the relationship between economic (E), human (H) and natural (N) capital. The scope of this impact is relevant to the scope of sustainability-based concepts.

The separation of concepts arises from their different nature. According to the author's own definition (section 1), sustainable development is a natural concept. It is based on the rules of universal procedures, which define the functioning of the world and promote the primacy of human capital (H). The process of globalization (and a subset of unsustainability-based concepts) primarily promotes the primacy of economic capital (E – economic monism) and is based on institutional (intellectual) paradigms.

They are based on the following:

- A free market paradigm based on free and ruthless competition;
- The possibility of changing the objective scope of the category of sustainable development (e.g. absolute maximization of

profit over survival; growth identified with development, progress focused on innovation more important than product improvement);

- Improvement of the quality of life identified mainly with maximized consumption.

These paradigms in particular determine the separation of assumptions in development management. In order for development management to be effective, it is necessary to attempt to integrate this separation, which generates the different nature of sustainability-based concepts and concepts based on the processes of unsustainability.

3. Freedom in sustainable development management and its consequences for the construction (reconstruction) of a civilization

The implementation of sustainable development (and all sustainability-based concepts) and globalization (and all unsustainability-based concepts) requires different (separate) management assumptions in general, including sustainable development management.

The freedom indicated in the title refers only to concepts based on the unsustainability of processes. With regard to sustainability-based processes, they exclude the unlimited freedom of the rules of universal procedures of relationality in development management; in sections one and two respectively, the broken civilization code and the paradigm of deregulation are indicated (GL, 1996, pp. 65-67).

The effects of unrestricted freedom in shaping relationality between the concept of sustainable development, development concepts and types of management are as follows:

- The paradigm of social consensus can be replaced by social consent (Piontek, Piontek 2018, No 2, pp. 199-209, Beck 2008, p. 88)
- Federal integration of states can be replaced by the renunciation and liquidation of state sovereignty (Piontek 2019, No 33/4/, pp. 9-25), even when the national constitution prohibits it (the Constitution of the Republic of Poland, Article 8);
- Globality as shaping relationality in national and supranational dimensions can be replaced by a process of globalization understood as a stream of loans or a stream of a biological threat to human beings (the pandemic); Pawłowski 2020 No. 2; Piontek 2020 No 2);
- Deregulation allows for a change that is important in the education process of human capital. It reduces the complex education process (acquiring wisdom – gr. *sophia* + gaining competence – gr. *techne*) to gain competence and product excellence (dr. *techne*) in the field of narrow specialties.

This means educating contractors focused on productivity, innovation and product excellence. Their limited ability to value and verify technologies, organizational solutions, in terms of the achievement of the structural order, development and effects in the real sphere, are usually omitted (Piontek, Piontek 2019, no 1, p. 168-173; Piontek 2020, no 61(i), p. 184-196; Ortega Y Gamet 1932). These statements must not be used to limit verified technological and organizational progress to improve the structural order in the functional and real spheres and to continue the development strategy.

- In the field of science: a) change of the structure of science, b) change of the methodology of science, c) change of the nature of the university.

- a) in the classification of science, specific sciences have become superior over general science:

- philosophy was included in the specific sciences and metaphysics, logic and epistemology were eliminated (Piontek 2020 No 61);

- economics turned from a field into a discipline, and normative economics (evaluative) is replaced by positive economics (description of processes and effects).

- b) The methodology of general sciences was replaced by the methodology of specific sciences based on laws that allow for falsification and the understanding of the truth and certainty of formulated statements and conclusions. Modern quantum physics and philosophy ask this methodology questions that remain unanswered. They undermine the validity of the temporary findings of specific sciences, e.g. biology, physics, etc. (Jacyna-Onyszkiewicz 2012 No 11, Fronda 2021.02.22);

In view of these changes, attention should be paid to the term *sustainable development economics* in theory and in the real sphere (Rogall, 2010):

- it is a fact that the structural order needs to be built in management processes which ensure development;
- the rules of universal procedures play an important role in ensuring the structural order (including natural law: the good must be done and the evil should be avoided, cf. section 1). H. Rogall also refers to it;
- the question is: can economics as a discipline of science (positive rather than normative) based on institutional standards established intellectually and arbitrarily provide the structural order for development?

- c) it changes the nature of the university – through the liquidation of the academic community and the scholar – student relationship. This relationship becomes an area of efficiency (productivity) assessment and a space of disagreement (Readings 1995; Piontek 2020 No 61(1)) The category of sustainable development is superior to economics and management (cf. section 1). The term economics for sustainable development is flawed.

- In discussion on deregulation in human capital education, changes in the classification and functioning of science, promotion of a methodology based solely on empirical knowledge and changes in the functioning of universities, reference should be made to the two findings made by F. Fukuyama in his book on human identity (Fukuyama 2018):

- changes in understanding dignity (dignity democratization) – based on the implementation of the priorities of neoliberalism (F.P-deregulation), are psychologically conditioned and mean people's search for multiple identity;
- the European civilization (based on the achievements of the Greeks and Romans) did not provide articles of identity and dignity of people, including students.

F. Fukuyama's findings should be supplemented by the following:

- We agree with F. Fukuyama that Europe has not used its potential to rebuild the identity and dignity of every human being in the process of creating the Greek-Roman civilization.
- The fact, however, is that the Greek-Roman civilization has been enriched with Christian potential. This potential focuses on human identity and dignity, despite a great deal of negligence.
- It should also be noted that Thomas Aquinas, in his great contribution to the formulation of the theory of being, did not distinguish the functional being i.e. a human being equipped with the rules of universal procedures (the rules of the Constitution of the World, cf. section 1) and obliged to shape the structural order and development and therefore to fulfill his subjectivity, identity and dignity.
- However, it is also a fact that despite a great deal of negligence, this Christian potential distinguished the European (Greek-Roman) civilization from other civilizations.

- The open question remains: Is deregulation (YES = NO = CAN BE) a way to rebuild human subjectivity, identity and dignity (cf. Lorenz, Berrebi 2017)
- A component of the structural order and development management is environmental quality management. The paradigm of deregulation allows for the application of the principle of separation in environmental quality management. It consists of the implementation of diversified and mutually exclusive solutions, established institutionally such as law, organization, and technology:
 - a legitimate and determined fight to reduce pollutant emission into air while at the same time tolerating and even promoting road noise, behavioral noise and misunderstood culture;
 - promoting the maximization of consumption and environmental burden with disposed food;
 - legitimate and rigorous measures to improve the quality of the environment are degraded by consent to import waste with all the multidimensional environmental and social impacts (Piontek 20020 C). The exporting country is allowed to demonstrate the good quality of its environment. Scientific, press and media publications inform about numerous effects of deregulation in environmental quality management (cf. Piontek, 2020, No. 2).

The separation of the terms of sustainable development and the structural order has been proven in the process of civilization construction (reconstruction) and confirmed in the real sphere. It is also confirmed by the Declaration of the United Nations Conference on Sustainable Development in Johannesburg in 2002 (Piontek, Piontek 2017, p. 183).

It remains an open question whether the proposed management procedures have proved effective in reducing this separation.

4. Criteria for the integrated implementation of determinants in sustainable development management for a civilization with the structural order and globality

An attempt is being made to formulate criteria for integrated sustainability management:

1. Necessary conditions:
 - 1.1. Defining sustainable development in accordance with its nature ensures the structural order in human choices and in action;
 - 1.2. Sustainable development management in a way that integrates separate development concepts:

- a) Based on sustainability processes;
- b) Based on unsustainability processes, through:
 - accepting the rules of universal procedures (which form human thinking, human action and human choices). Such rules exist, among others, in national constitutions. These rules should verify paradigms (intellectual assumption) for the implementation of legal, organizational, and technological solutions and broadly defined processes;
 - acknowledging that sustainable development is a component of quality of life. It determines the structural order and globality, which are also demanded by unsustainability-based development concepts. This means recognizing the primacy of human capital over economic and natural capital. Development should be the aim of management in the construction of a new civilization and economics and ecology should and must serve people;
 - limiting the functioning of the paradigm of deregulation (one of the principles of globalization). It ensures freedom in generating destruction;
 - limiting the paradigm of free competition and the free market. The freedom of the market, in addition to institutional (legal and organizational) solutions should be governed by the rules of universal procedures (cf. Article 5 of the Constitution of the Republic of Poland);
 - abandoning indications which limit science and education to improving efficiency (Gr. *techné*) and product excellence. Such a restriction deregulates the functioning of social consensus.
2. Sufficient conditions:
 - 2.1. Knowledge of the achievements of concepts based on sustainability processes based on unsustainability processes and knowledge of the rules of universal procedures, including the articles of national constitutions.
 - 2.2. In integrated development management, a sufficient condition is the declaration of the decision-making will to shape integrated institutional (legal and organizational) solutions which ensure the structural order and globality (universality) in relations between people and between economic, human, and natural capital.

Conclusion

The discussion allows for the formulation of a synthetic conclusion. A condition for the implementation of development determinants in real terms is to

ensure the structural order by integrated development management.

The objective scope of management integration includes:

- the verification of freedom in defining a category of sustainable development, in shaping the relationality between separate development concepts, between development concepts and management (necessary conditions);
- expressing the decision-making will which accepts:
 - the verification of assumptions and criteria which determine the separation of development concepts and the choice of types of development management,
 - familiarizing oneself with the achievements created based on the separate concepts of development (a sufficient condition).
- Limiting the paradigm of *consent*, which changed the nature of social consensus. It functions based on the paradigm of *deregulation* and an institutional solution that restricts general sciences and subordinates science and education to efficiency and product excellence (necessary and sufficient conditions).

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Management of Social Risks and their Impact on the Spheres of Human Life in the Conditions of Sustainable Development of Ukraine

Zarządzanie zagrożeniami społecznymi i ich wpływ na ludzkie życie w warunkach zrównoważonego rozwoju Ukrainy

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Abstract

The aim of the article is to analyze risks in the social sphere and their impact on the development of society in Ukraine. Increasing the impact of risks in the sphere of demography, employment, remuneration, etc. in the context of sustainable development has been determined. The conducted research shows that the risks related to the labor sphere and the health of the population are the most aggressive and dangerous for the safety (as shown by the coronavirus pandemic) because protracted problems in the political, social and economic spheres are accompanied by job losses, economic decline, low wages for more than half of the working population. In view of the ambiguity and uneven economic development of the administrative territorial units of Ukraine it has been determined that education and knowledge can become a factor that can lead to the activation of innovative changes and reduce the negative impact of social threats. For this reason, the most important requirement for the sustainable development of Ukraine is the formulation of a social policy, based on an effective system of methods aimed at preventing risks and reducing probability of their occurrence.

Key words: risk, social sphere, labor force, human development, situation, labor market, education, measures, sustainable development, pandemic

Streszczenie

Celem artykułu jest analiza zagrożeń w sferze społecznej i ich wpływu na rozwój społeczeństwa na Ukrainie. Określono zwiększenie wpływu ryzyka w sferze demografii, zatrudnienia, wynagrodzeń itp. w kontekście zrównoważonego rozwoju. Z przeprowadzonych badań wynika, że zagrożenia związane ze sferą pracy i zdrowiem ludności są najbardziej agresywne i niebezpieczne dla bezpieczeństwa (o czym świadczy pandemia koronawirusa), ponieważ problemom w sferze politycznej, społecznej i gospodarczej towarzyszy utrata miejsc pracy, załamanie gospodarki i niskie płace dla ponad połowy ludności aktywnej zawodowo. Wobec niejednoznaczności i nierównomiernego rozwoju gospodarczego jednostek terytorialnych Ukrainy stwierdzono, że edukacja i wiedza to czynnik, który może prowadzić do aktywizacji innowacyjnych zmian i ograniczać negatywny wpływ zagrożeń społecznych. Dlatego najważniejszym warunkiem zrównoważonego rozwoju Ukrainy jest sformułowanie polityki społecznej, opartej na skutecznym systemie metod zapobiegania zagrożeniom i zmniejszania prawdopodobieństwa ich wystąpienia.

Słowa kluczowe: ryzyko, sfera społeczna, siła robocza, rozwój społeczny, sytuacja, rynek pracy, edukacja, środki, zrównoważony rozwój, pandemia

Introduction

The civilization progress of Ukraine in the conditions of information society is impossible without the successful realization of strategic tasks in the political, economic, environmental and social spheres. The changes occurring in the economic sphere at the state, regional and macro levels have also affected social risks in the system of which complex processes are taking place: some of them are weakening in their action, others on the contrary are increasing. The impact of globalization on the economic development of Ukraine has created new conditions for the manifestation of social risks, increasing their degree of danger which is first of all manifested in the health of the population in connection with the spread of the pandemic coronavirus. Against the background of the increased aggression of the coronavirus pandemic, the economy of all countries of the world is suffering significant losses. The world made the disappointing conclusion that the virus infects people regardless of social and economic status. Poverty, inaccessibility to normal medical care, false news and provocations, emotional stress, social depression are becoming a threat to humanity as a whole. The economic downturn, external self-isolation of states and the introduction of internal quarantine regimes have become a reality. An alarming trend regarding risks in human development is warned by an analytical study by the United Nations Development Program (UNDP), which notes that many crises have occurred in the world over the past 30 years, including the global financial crisis of 2007-2009. Each of them dealt a severe blow to human development, but in general, from year to year, one could observe an increase in development indicators around the world. The COVID 19 pandemic could reverse this trend (United Nations Development Program). UNDP estimates that 60% of children are out of education due to school closures. Given this and the significant inequality in access to online learning, 86% of primary school-aged children now have virtually no education in countries with low human development, compared with only 20% in countries with very high human development indicators (ibid.).

The United Nations Conference on Trade and Development (UNCTAD) predicts a 5-15% reduction in global foreign direct investment (UNCTAD). Today, more than ever, there is a need for risk management in various aspects of the social sphere (demographic, labor, health care, education, ecology, etc.), analysis of their specific features and formation of priority tasks of the state to ensure social stability in society development.

Review of literature

Risk problems, including social ones, are researched for a long time by different scientists both foreign and Ukrainian. Thus, a number of publications have been devoted to the assessment of social risks, in particular by scientists (Shapovalovoi et al., 2016) conducted a study of the cause and effect transformation of communications in the natural, socio-cultural and anthropogenic areas of personal habitat and major social risks.

The result of the work was the prediction of the probability of occurrence of social risks and an assessment of their importance in the context of the formation of the general situation in the society of the country. Mozgovaya (2018) proposes to assess social risks not only by socio-demographic characteristics, but also by the level and quality of life of the population, its individual and worldview features. Shapovalova et al. (2018) analyzed the structure of threats and risks of the habitat, identified the most effective countermeasures at the state level. Consideration of social risks in the energy sector has become the subject of research by scientists (Karimi et al., 2016; Kneysler et al., 2020), they prove that the transition to a constant energy regime is not only about engineering but also about social and cultural issues. They justify the role of the public in overcoming social risks in the energy sector.

Le Coze (2018) explored the relationship between public safety and the global world. He proposes risks to be divided into socio-technological risks, systemic risks and existential risks. He claims that our vision of social security needs to be understood through an understanding of how these three types of risks are intertwined, how the global problem challenges the governance of society in general and the governance of the security of the state in particular. Motta (2015) describes the use of social risks in national public discourses. In conclusion, the author proved the recognition of the need to take into account various aspects of opportunities to prevent social risks, such as political, discursive and economic in terms of sustainable development. Authors (Falconi et al., 2020) investigated the social problem as a change women's employment structure during the World War II era affected the risk of their disease and mortality. As a result of the analysis the authors concluded that an older group of women who joined the workforce before the outbreak of World War II found ambiguous differences in health. In the younger group of women who joined the workforce during World War II, the trend revealed negative links between work during the late postpartum age and health, experiencing higher mortality risks. Hence, the authors state that women's employment is influenced by politics, demographics, social forces and the environment in which they live.

Work and its role in shaping the social gradient in health by Clougherty (et al., 2010) proves the

relevance of the risk-related problem in the social and labor sphere and in the fields of demography and health care. In fact, employment is a social gradient metric first used to study the relationship between the etiology of social class and chronic disease. The work carried out the study of 6 risks: the role of status in the hierarchical professional system; The role of psychosocial hazards of work; Consequences of physical and chemical hazards in the workplace; Evidence that labour organization matters as a contextual factor; Consequences for gradient of new forms of non-standard or *unstable* employment, such as contract work and shift work; And new evidence that women can react differently to adverse working conditions. These risks affect people's health differently. Zelviene, Kazlauskas, & Maercker (2020) concluded in their work that work-related stresses and health-related stresses were significantly associated with impaired adaptation and that the type of stress is influenced by demographic characteristics.

Delaney (2019) considers the joint impact of labor market risks and selection to employment on the assessment of income from education received. It is proved that for women educational risks have particular importance when applying for work. They are significantly higher than men.

Delaney & Devereux (2019) prove that the level of education directly affects the increase in the employee's earnings. The results show that men who underwent changes before the law afterwards had less wage variability and less procyclical earnings. However, there is little evidence that education affects the variability of older people's earnings. Schuring et al. (2019) have justified that in all European regions there are inequalities in education and it affects the health and earnings of workers.

It is substantiated that science and education are a reliable segment for the spread of innovation (Andrusiv et. al., 2017; Zelinska et. al., 2020; Popadynets et. al., 2020). Kinash et. al., (2019) it is said that the development of the infrastructure of the country contributes to the improvement of social infrastructure. Ievdokymov et. al. (2020) in their study proved that social security should be viewed through the lens of social capital, as it is a limited real or potential resource of social interaction.

Economic conditions with labour market instability and higher unemployment rates create a scenario where the risk of poverty and social exclusion can affect young people and push them away from socio-economic participation in the life of the state, claim (Ruesga-Benito et al., 2018) in their research. Such social risks lead to an increase in unemployed persons in general and among young people.

So, the in-depth analysis of the scientific literature on the impact of social risks on different aspects of life in terms of sustainable development proves the relevance of the problem and points to its multidimensionality. However, the simple transfer of foreign experience of the impact of risks on

society to the realities of the Ukrainian state is impossible due to a number of different factors, in particular the peculiarities of the mentality of the population, its cultural and ethnic customs.

Despite the multifaceted study by foreign and domestic scientists of the problem of the emergence of various kinds of risks and the influence of their individual components of the economic, political and environmental sides in the current conditions of sustainable development of Ukraine Ukraine remain poorly investigated. Therefore, the need for in-depth study of them in particular of social risks in both theoretical and applied aspects is actualized.

Social risk methodology and the measurements that measure

In the process of generalizing the theoretical foundations of knowledge of the nature of risks, it has been found out that this problem remains relevant in science due to its interdisciplinary nature. The extent to which the state consistently implements effective policies in the fields of economy, politics, ecology will depend on the social security of the state. With the spread of the coronavirus pandemic in the world, the mass return of migrants home to Ukraine, the shutdown of enterprises and organizations, the issue of the emergence and spread of social risks becomes particularly acute, and therefore the analysis of their impact on society today's requires in-depth methodological research and special response from the state.

Social risk analysis in Ukraine

In modern conditions, the intensity of risk manifestation is constantly increasing. Ukraine has become resilient, threatening trends in the demographic situation (high mortality and mass labour and intellectual migration abroad and today also the return of migrants home), a decline in living standards and instability in the social and labour sphere (which lead to deepening employment risks, rising unemployment rates) an increase in poverty and social insecurity of the population, which limits their access to medical care and quality nutrition. The continuing protracted problems in the political, social and economic spheres are accompanied by job losses, economic decline, low wages in the majority of the working population. All this increases negative sentiment in society and causes new social risks in terms of sustainable development.

In examining social risks, we emphasize that risks are defined as the dangers that appear within the social sphere and the potential for negative consequences for both the individual and society as a whole due to the occurrence of certain events. Such dangers include a decline in the number of working-age populations, an increase in labour migration, an

increase in unemployment, a decrease in the income of the population and its standard of living.

Demographic factors are an important prerequisite for the social security of the State and the stability of the development of the labour market. Among the main indicators that characterize demographic factors and reflecting on structural transformations of the labour market, we note the birth and mortality rates of the population, natural and mechanical growth, migration coefficients of working age population, average life expectancy, etc.

Between 1991 and 2018 the population in Ukraine decreased from 52.1 million to 42.0 million namely for 10.1 million people. If in 1991, according to the State Statistics Committee of Ukraine, there was a natural decrease in the population due to the excess of the number of deaths over the number of births by 39.1 thousand people then in 2018 - the indicator crossed the limit over 220 thousand people. The lowest fall in fertility was recorded in 2015 (11.6%) (State Statistics Service of Ukraine, 2019). Despite the positive dynamics in the rate of fertility decline, Ukraine remains the leader in some types of diseases. According to the World Health Organization (WHO) in 2016, 392 thousand deaths occurred as a result of diseases of circulatory systems and for the reasons of malignant neoplasms 79 thousand people died in 2016 (13% of all reported deaths). Menacing statistics of the road accidents (RA), suicide, complication after operations, diseases of tuberculosis and many other things. On average, more than 4,000 people are killed in road accidents annually. Among the main reasons for this WHO refers to speeding, drunk condition of drivers, telephone conversations while driving, etc (World Health Organization, 2015). According to WHO data for 2015, Ukraine ranked 23rd place out of 172 countries in terms of suicide deaths (World Health Organization, 2015). The sad statistics of the demographic situation in Ukraine show not only the quantitative decline of the population in the state but also leads to reflection on its future. Confirmation of this fact is the superiority of Ukraine in mortality rate determined by the UN and the last place among the EU countries in the index of life expectancy of the population.

The nature of demographic processes in terms of sustainable development states creates an unfavourable environment for people's lives, manifested in such risks as the risk of premature death; Risk of dying from tuberculosis, risk of falling below the poverty line after the birth of a child; Risk of breaking family ties as a result of migration; Risk of loss of social protection due to forced labour illegal migration, risk of failure to receive retirement pension as a result of lack of required insurance experience, risk of loss of breadwinner, etc.

Regarding to labour migration for the majority Ukrainian it acts as a specific type of permanent employment due to the inability to find decent work

in the homeland. The inability to maintain family members or the desire to improve their material well-being have been motivated by the emigration of people of working age, both men and women. According to a sample survey of the households of the IOM Office in Ukraine, the majority of migrant workers are from Western regions. Thus, only from the regions of the Carpathian region (Lviv, Transcarpathian, Ivano-Frankivsk and Chernivts) about 700 thousand people annually go to temporary works abroad and in general this process covers from 5 to 7 million citizens of Ukraine (Report of the Survey of Innovation Activity in the Economy of Ukraine, 2019). Men aged 30-44 predominate among migrant workers. A significant proportion of migrant workers from Ukraine work abroad illegally. Since 1995 representatives of less skilled types of labour - builders, drivers, locksmiths, waiters and housewives - have been involved in emigration, in addition to persons of skilled types of work. The main countries of employment for Ukrainians in recent years were Poland, the Russian Federation, the Czech Republic, Italy and Spain. These countries account for more than 80% of labour migration flows of Ukrainian residents (Malinovskaya, 2016). According to the State Border Service Poland is the most popular country for the work and life of Ukrainian. The most active departure process was observed in 2015-2017. Poland's economy continued to grow and wages, according to the National Bank of Ukraine, for various types of activities exceeded Ukrainian by 4-6 times (in total in agriculture and construction). In addition, the country is nearby and it is easy for Ukrainians to adapt due to the close cultural field.

The outflow of personnel abroad is taking on a large scale, Ukrainian specialists fill niches mainly from low-paid jobs in the international labour market. The negative consequences of the risks of labour migration fully leave a mark in the social and domestic sphere (divorce from the family, wastefulness on the part of migrant children), lead to a decrease in professional level, discomfort related to integration into the new cultural and economic environment. In addition, potential risks of illegal employment abroad include possible discrimination and humiliation of human dignity, irregular working hours, threat of deportation, inability to obtain qualified medical care due to lack of health insurance, lack of guarantees with regards to getting earned money, dependence on criminal elements, which often causes a threat to health and life.

Particular attention needs to be paid to internal migration regarding displaced people as a result of Russian aggression in the east. The imperfection of the regulatory framework for such persons in Ukraine creates new social risks: risk of loss of housing, risk of poverty, risk of uncertainty in the future.

A generalized indicator of the level of development of individual states is the Human Development

Index (HDI). By this indicator, Ukraine ranked 88th among 189 countries with a value of 0.751 in 2018 and by happiness index in 2019 – 123rd place out of 156 countries in the world which indicates a lack of attention on the part of the State to human development in general (State Statistics Service of Ukraine, 2018).

In the near future, Ukraine is expecting a rapid depopulation, reduction and ageing of the population at a rapid pace. Therefore, the demographic forecast for Ukraine's sustainable development becomes disappointing.

According to the Institute of Demography the population will have decreased by 5.5 million people by 2050. At the same time, the number of people of working age (20-59 years) will decrease by 6,6 million people, while the number of people aged 60 and over will increase by 2,6 million people, their share in the population (ageing level) will grow to 33%. The ratio of age contingents of labour force (20-59 years) to retirement age (60 years or more) will decrease from the current 2.6 to 2 in the early 2030s and to 1.5 at the end of the projected period (Tkachenko, 2017). According to the forecast published in 2017, the population of Ukraine will have decreased to 38.5 million people by 2050, to 36.0 million people by 2100 (Tkachenko, 2017).

The unfavourable situation in the sphere of demography in the conditions of sustainable development of Ukraine has become in fact a precondition for the risks that accompany the labour market. The demographic characteristics of the population thus serve as a basic element of assessing the prospects and opportunities of forming a supply in the labor market. According to the State Statistics Agency of Ukraine, the average monthly number of economically active population aged 15-70 years in 2017 compared to 2016. It decreased by 0.6% to and amounted to 17.9 million people, of which 17.2 million were of working age. Out of the indicated number of citizens aged 15-70 years, 16.2 million people or 90.5%, were engaged in economic activity and the remaining 1.7 million people were unemployed. The level of economic activity of the population aged 15-70 decreased from 62.2% in 2016 to 62.0% in 2017. The number of employed population aged 15-70 in 2017 decreased by 0.7 % compared to 2016 and amounted to 16.2 million people, of whom 15.5 million are in the working-age. The highest employment rate of the working-age population was observed among people aged 35–49 years and the lowest in young people aged 15–24 and those aged 60–70 years (State Statistics Service of Ukraine, 2018). The unemployment situation has intensified. Unemployment rate at the age of 15-70 in 2017 in comparison with 2014 was 9.5% of the economically active population of the specified age, and 9.9% of the population of working-age. The corresponding indicator for the European Union countries (7.6%) was lower (2.3%) than in Ukraine.

The unemployment rate of young people aged 15-24 is almost double the average for the general population. Material problems, psychological discomfort due to lack of work force young people to engage in activities that are often dangerous to society. From the above, it follows that unemployment not only leads to political, economic and social instability in the country, it also leads to a significant burden on working people against the background of the demographic crisis, creating additional new risks. The return of Ukrainian migrants from abroad as a result of the spread of coronavirus and the loss of job further deepens the problem of unemployment and moneylessness in Ukraine, leading to new risks in other spheres of public life. The consequences of the risk of unemployment are low wages, which reduce solvent demand and reduce GDP growth, as well as increase budget spending on social security. In general, unemployment leads to the poverty of the population, the washing out of social values, the spread of corruption and criminalization and etc.

The depreciation of labour is a serious threat that affects the worsening employment situation. The wages of most workers do not fulfil incentive, motivational and reproductive functions. Unfortunately, in Ukraine in 2016 the share of wages in the total income of the population as a whole in the country amounted to 46.7%, and in certain regions barely reached the 30% mark (Yatsenko, 2016). The relationship between factors and manifestations of social risks on the quality of life of the population is shown in figure 1.

The average wage of full-time employees in 2017 was 7104 UAH, 90% of full-time employees who have worked 50% or more of the established monthly working hours, received a salary not exceeding 3,200 UAH, and another 24,4% of employees were paid wages in the amount of up to 4,000 UAH or almost at the level of actual amount of marginal profit taking into account the amount of tax on personal income (UAH 3924) (Yatsenko, 2016). Consequently, the wages of one third of workers are only able to provide a simple reproduction of the labour force today. In general, it should be noted that the impact of pay as a factor of social risks in the context of sustainable development, covers the whole system of risks of human development. Owing to excessive and unreasonable differentiation of salary of separate categories of workers the social tension grows in society and adding its low level in the majority of segments of the population it also deepens social inequality, leads to social instability. Among the negative effects of low wages should also include unfavourable and traumatic working conditions for people of working age, especially men, resulting in deteriorating health, high mortality

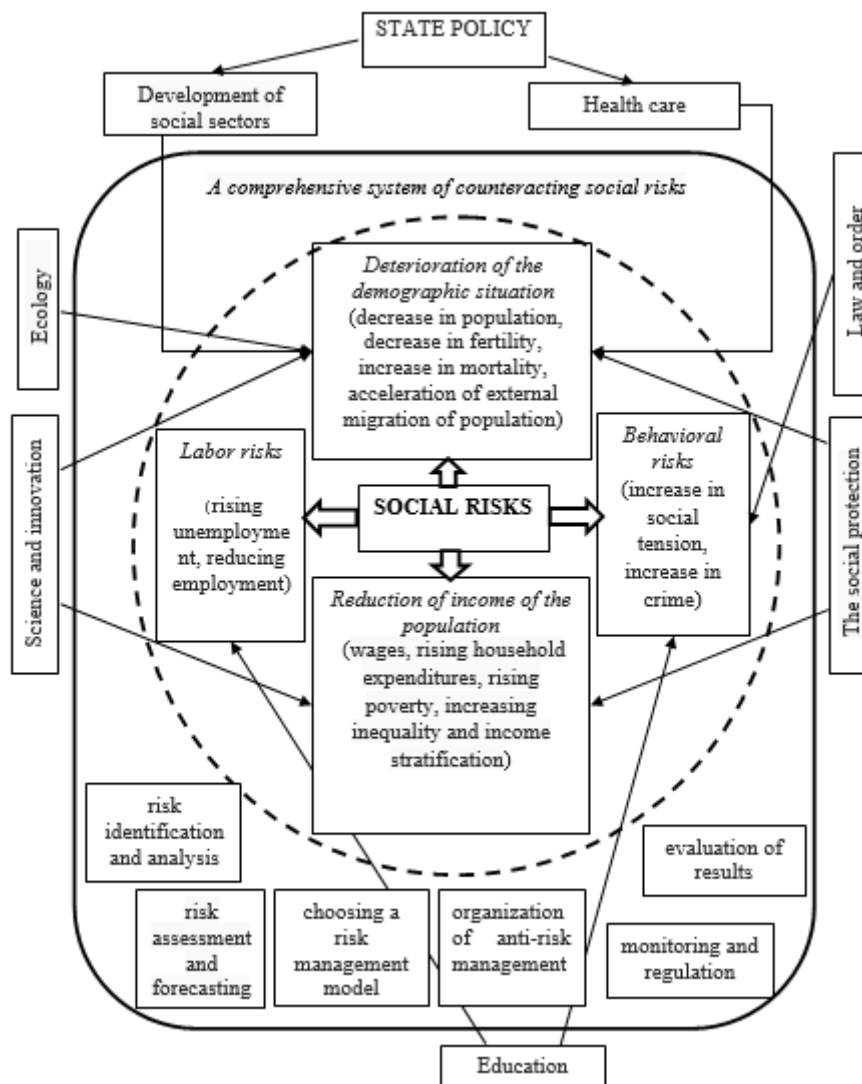


Figure 1. Model of counteraction to social risks in the spheres of human life in the conditions of sustainable development of Ukraine, source: author's development

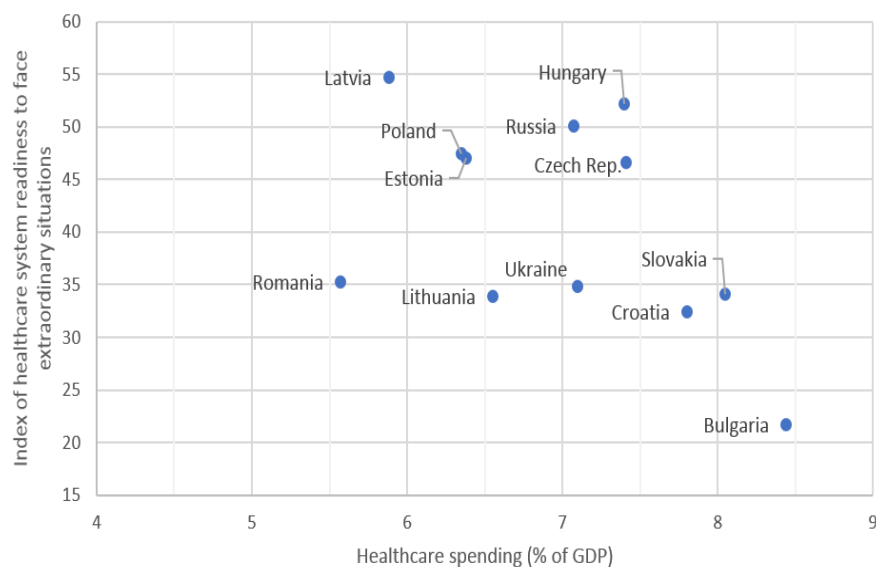


Figure 2. Index of Healthcare System Readiness to face the consequences of the coronavirus pandemic in Eastern Europe, source: author's development

and social insecurity for those who have lost their health.

The total COVID-19 epidemic has become a challenge for humanity, where there is an aggressive manifestation of social risks in the healthcare sector. In Western European countries, as a result of the start of vaccination of the population at the end of 2020, the incidence trend, which manifested itself in 2019, is gradually normalizing. In the group of Eastern European countries, the manifestation of social risks became more pronounced in late spring-autumn 2020. Figure 2 shows the Index of Healthcare System Readiness to face the consequences of the coronavirus pandemic in Eastern Europe (as of March 2021). At the beginning of 2021, mortality from the disease amounted to about 1.2% of the total number of cases, with 88% of all deaths occurring in people aged 65 and over (COVID-19 and Human Development: Assessing the Crisis, Envisioning the Recovery, 2020). And Ukraine as of 14.04.2021 is the leader in terms of mortality and ranks 3rd in terms of COVID-19 infection among the countries of Eastern Europe.

At the same time, mutations of the virus were noted in 2021 and more infections are observed in the younger generation, which is extremely dangerous. The consequences of the pandemic for the political, economic and social development of the world can already be predicted today. The pandemic crisis has negatively affected almost all sectors of the world economy. Over the next 5-10 years, a significant decline is expected in all sectors of production and agriculture. After growing by 2.5% in 2019, global GDP in 2020 decreased by 2%, and in the first half of 2021 – this decline will continue. The recession is also expected in the markets of 68 countries, compared to 11 countries last year, a decrease in international trade by 4.3% and an increase in world bankruptcies by 25%. Due to this, there is already a rapid rise in unemployment in the small and medium business sector. According to analysts, it could reach 15% growth in the world and 20% in Europe. These phenomena can cause significant social unrest, as retraining people and creating huge numbers of jobs in new sectors of the economy will be much slower than the destructive processes of the previous economic system (COVID-19 and Human Development: Assessing the Crisis, Envisioning the Recovery, 2020).

The UN in its Future Possibilities Report, 2020 identified six megatrends that transform the world after the end of the COVID-19 pandemic. They are as follows (Future Possibilities Report, 2020):

1. The Big Data Economy;
2. The Wellbeing Economy;
3. Low-Carbon Economy;
4. The Circular Economy;
5. The BioGrowth Economy;
6. The Experience Economy.

Thus, the analysis of the development of the COVID-19 pandemic at the beginning in the world showed that the developed countries of Western Europe, which were connected by the largest number of business, trade and transport contacts, both with China and among themselves, then the United States, suffered the most. A certain time lag in the spread of the pandemic allowed European countries to introduce quarantine measures and prepare for the response to the disease. It should be noted that in the countries of the post-Soviet camp (Ukraine, Belarus, etc.), in contrast to Western European countries, the manifestation of social risks is more aggressive, which is associated with poor government management and uncertainty about the start of vaccination of its own population (Ukraine). While almost all European countries have started vaccinations, Ukrainian citizens are left behind in this indicator. At the beginning of April 2021 Ukraine ranked 50th in terms of vaccination among 58 European countries. Therefore, the problem of social risk management, especially in the field of health care, is extremely important at the state level. For Ukraine, it is of particular importance, which is associated with the poverty of the population, rising unemployment and insecurity from the health care system and the state.

The intensification of innovative processes of sustainable development Ukraine makes it necessary to focus on increasing the role of education and vocational training in the development of human resources. Especially this problem was actualized in the conditions of the economic development, where knowledge becomes a key factor. Increasing the level of labour quality requirements with the development of modern technologies requires constant improvement of the knowledge and skills of the individual during his/her working life in order to ensure his/her employment, professional mobility and competitiveness in education and employment. A new way of communication creates a new outlook on society. *Smart work*, work at home, and distance learning are becoming the business card of the present for Ukraine. In the conditions of formation of an innovative society the functional features of education are not only *the ability to provide students with knowledge and skills gained in previous years, but also to increase the ability to perceive and use new scientific ideas, technical tools and production methods in practice, to develop innovative skills, initiative and entrepreneurship in workers* (Popadynets et. al., 2020). Among the factors that characterize the quality of the labour force is not only the level of its vocational training but also the ability to perceive innovations, psychological stability, the acquisition of new knowledge and skills, the presence of stable motivational attitudes to improve professional standards throughout life.

The effects of social risks in Ukraine increase risks of a non-social nature. The latter include adverse

socioeconomic and political changes; instability of the current legislation; Limited or incomplete information on the dynamics of macroeconomic changes, Shadowing of the economy; Fluctuations in market conditions in the world market etc.

You can reduce the negative impact of risks in various spheres of public life in conditions of sustainable development by learning to manage them. Social risk management requires an comprehensive approach to prevention, minimization of negative social consequences, and special attention should be paid to the analytical stage of social risk management to determine the factors and prerequisites for the formation of social risks. A comprehensive social risk management system can include (1) risk identification and analysis; 2) assessment and prediction of the risk situation; 3) selection of risk management model; 4) organization of anti-risk management; 5) monitoring and regulation; 6) assessment of results.

Conclusions

A feature of the manifestation of social risks in the conditions of sustainable development of Ukraine is that they are diverse: the manifestation in one sphere of human life leads to the consequence or enhances their action in another sphere of life.

It has been established that demographic risks are increasingly evident against the background of population ageing, depopulation and reduction of life expectancy. Forced labour migration of the population has an even greater impact on the state of demossituation.

Employment risks show that there is a continuing imbalance between supply and demand, the depreciation of labour and the loss of its motivational values. The most dangerous age category is young people and older people of working age. Not the possibility of self-realization in the sphere of work leads to an increase in crime, premature death, morbidity of socially dangerous diseases. The wages of one third of workers can provide only simple reproduction of the labour force. The impact of pay as a factor of social risks covers the whole system of risks of human development. Due to excessive and unjustified differentiation of wages of certain categories of workers, social tensions in society increase, and adding its low level in the majority of the working-age population it also deepens social inequality, leads to social instability.

Among the factors that characterize the quality of the labour force is not only the level of its vocational training, but also the ability to perceive innovations, learn new knowledge, and the existence of stable motivational attitudes to improve professional standards throughout life. Education as a factor of stabilization of tension in society in the context of sustainable development, can smooth and prevent risks in the sphere of labor.

Therefore, at the stage of Ukraine's transition to a knowledge society, the role of lifelong education has a particular importance and needs close attention from the state and needs close attention from the state.

So, as the analysis of certain components of the social sphere has shown, in the conditions of sustainable development of Ukraine has formed prerequisites for increasing the probability of the onset and realization of various types of social risks both for the state and for each of its citizens. They were exacerbated by the global crown virus pandemic. It should also be emphasized that the system of social risks is not permanent, it changes in accordance with the directions of development of the state, so Ukraine is updating the problem of creating an effective system of measures aimed at preventing risks, reducing the probability of their occurrence and preventing the negative consequences of their occurrence.

Further study of risks in the social sphere will be aimed at exploring their manifestations in the educational sphere and human behavior.

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Green Smart City as a New Paradigm of Local Development

Zielone Inteligentne Miasta jako nowy paradygmat lokalnego rozwoju

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Abstract

The idea of a smart city is widely discussed in literature but is associated to a lesser extent with the idea of moving towards a *green smart city*. Authors debate the critique of this type of approach and are of the opinion that climate change forces the construction of *green models*. Like businesses, municipalities must be systematically assessed to identify assistance in terms of specialist advice or financial aid. The aim of this article is to develop the concept of a *green smart city* model, which may become a new development paradigm for municipalities. The article introduces the term eco-transformation in relation to the evolution of changes in the *green smart city* idea and proposes a tool to measure the action taken by municipalities in their pursuit of ecological maturity. The proposed models are universal in nature, i.e. they can be used to study other areas of a municipality's activity. Many areas in the model are debatable and difficult for municipalities to incorporate without a critical approach to many areas of knowledge, for example, of municipality management processes, technology, macroeconomic and mesoeconomic specificity, and behavioural analyses.

Key words: local development, sustainable development, smart cities, green smart city

Streszczenie

Idea smart city należy do szeroko dyskutowanych w literaturze, ale w mniejszym stopniu wiąże się ją z ideą dążenia do *green smart city*. Autorzy polemizują z krytyką tego typu ujęcia i są zdania, że zmiany klimatyczne wymuszają budowanie *zielonych modeli*. Podobnie jak przedsiębiorstwa gminy, muszą podlegać systematycznej ocenie służącej określeniu pomocy w zakresie specjalistycznego doradztwa lub pomocy finansowej. Celem artykułu jest opracowanie koncepcji modelu *green smart city*, która może stać się nowym paradygmatem rozwoju dla gmin. W artykule wprowadzono termin eko-transformacji w odniesieniu do ewolucji zmian *green smart city* oraz zaproponowano narzędzie do pomiaru aktywności gmin w dążeniu do dojrzałości ekologicznej. Zaproponowane modele mają uniwersalny charakter tzn. mogą zostać zaproponowane do badania innych obszarów aktywności gminy. Wiele obszarów w modelu jest dyskusyjnych i trudnych do wcielenia przez gminy bez krytycznego podejścia do wielu obszarów wiedzy np. procesów zarządzania gminą, technologii, specyfiki makroekonomicznej i mezoekonomicznej, behawioralnych analiz.

Słowa kluczowe: rozwój lokalny, rozwój zrównoważony, inteligentne miasta, zielone inteligentne miasta

Introduction

The topic presented in this article fits within what may be broadly understood as issues of sustainable and intelligent local development (Castaldi et al., 2008). The article presents the concept of a *green smart city* model, which may become a new development paradigm for municipalities. The concept of eco-transformation was introduced in relation to the *green smart city* evolution of changes and a tool was proposed for measuring the activity of municipalities in their pursuit of ecological maturity. These three terms constitute the value that the authors of this article might add to existing achievements in the area of regional development. The proposed models have a universal appeal. This article was written as a result of work on the *Cross-border initiative for green smart cities / Grenzüberschreitende Initiative für grüne Smart Cities (GIGS)* project, financed by the Foundation for Polish-German Cooperation.

Rapidly changing global trends in information and communication technologies raise questions as to what extent technologies (Gazzola et al., 2019) might play a pivotal role in shaping sustainable development. The vision of such development is rapidly evolving towards *smart action*. All over the world, cities are eagerly and successfully using ICT *Information and Communication Technologies* and the Internet of Things (Belli et al., 2020) to accelerate a variety of processes (Mora et al., 2018b). Rebuilding the G20 economies after the COVID-19 pandemic requires a new approach. Climate change and other environmental threats are likely to have a major impact on the G20 in the future. Investment in a viable and affordable green transition is crucial for these economies. A good starting point for further considerations would be to draw conclusions about what worked and what did not work from previous ecological revival efforts for the economy during the Great Recession of 2008-2009 by examining the cases of the United States and South Korea (Barbier, 2020). As a result of problems arising in relation to global warming, urban pollution, smog, noise, etc., it was necessary to change the way cities functioned (Dembicka-Niemiec, 2017). Recently, action along such lines has gained traction in cities around the world, including in Europe. Interest in environmental protection has grown and the concept of sustainable development involving smart, creative solutions has become more and more widespread.

Adopting the concept of smart growth does not have to mean a departure from the more traditional, ecological narratives that form the basis of sustainable development. Their aim is to find ways or better solutions to support modern lifestyles and thus to consolidate the existing status quo and increase the consumption of natural resources and energy, albeit in a more efficient way, rather than placing the environment at the centre of the policy-making process and at the core of planning interventions for sustainable

development (Gazzola et al., 2019). One research objective of many authors is to answer this: to what extent do ecological and smart concepts overlap or move towards sustainable development?

Smart solutions usually have a social, economic and environmental dimension. Data integration provides a broader and faster insight into the resources, services and infrastructure that may better guide day-to-day operations, long-term planning and policy formulation for sustainable settlement (Bibri & Krogstie, 2017). Some synergistic effects of such activities may include the elimination of planning process duplication, identification of existing data and knowledge gaps, and the determination of which planning areas and sectors should be coordinated and integrated to solve environmental problems and respond to social needs intelligently, thereby creating a sustainable socio-ecological system (Bibri & Krogstie, 2017).

According to the authors of this article, it would seem necessary to aim the development of municipalities *Pol: gmina* in a direction that is not just *smart city*, but also *green smart city*. The close interdependence between ecology, technology and sustainable development provides a basis for monitoring this development and stimulating action. Taking into account the existing gap in the described research topic, a concept was proposed that would explain the dependencies between the municipality and its inhabitants, which could ultimately affect how the developmental needs of such municipalities are defined.

Within this concept, we suggest identifying four areas:

- 1) processes taking place in the municipality,
- 2) municipalities as an organisation,
- 3) technology,
- 4) the ecological behaviour of the residents.

The proposed model is dynamic; in other words, its components change over time. It is also relevant that all the areas outlined in the evaluation criteria may fluctuate quite significantly along with changes in the natural environment and human needs. The process that leads the municipality towards a smart green municipality is referred to as **eco-transformation**. In this case too it is possible to propose certain model stages, which may consequently determine the action that the municipality takes or will indicate what is going wrong in some areas. We can help individuals through expert assessments in outlining the type of support they require, analysing their needs, etc. The eco-transformation processes outlined create a model solution that is universal and may be applied in any municipality, but we also need to point out some research dilemmas related to this area. The conclusions formulated as a result of subsequent studies translate into recommendations for regional policy for business and local residents. The model sits within all new technological solutions related to the development of the digital economy. Its

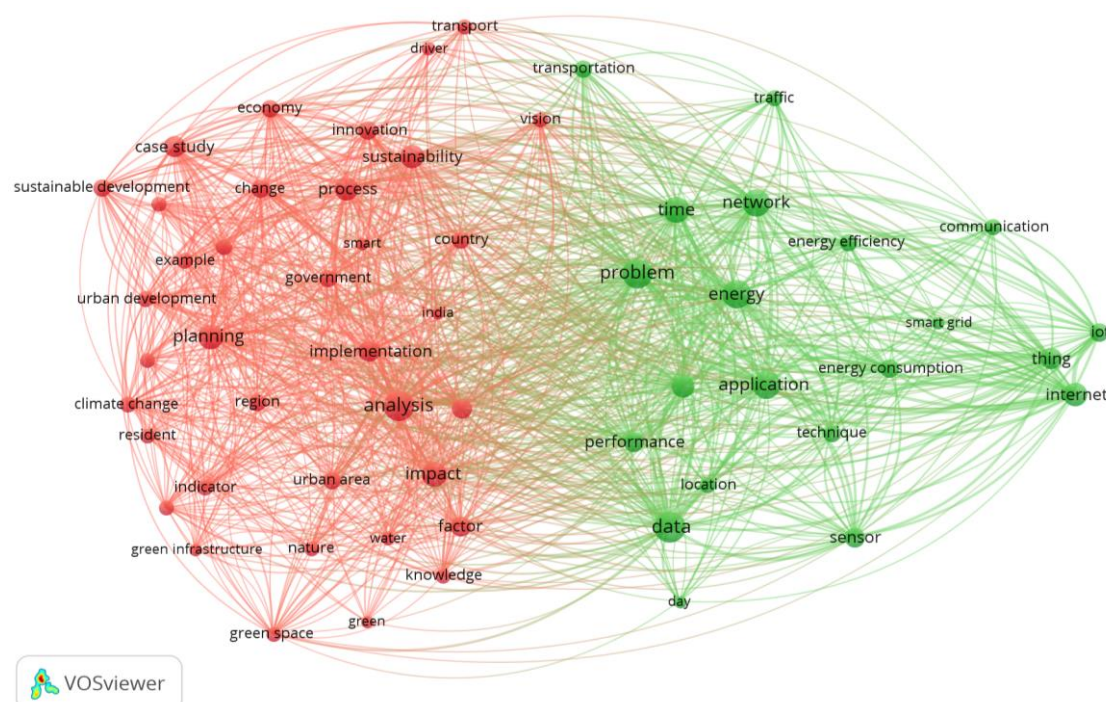


Figure 1. Thematic clusters identified on the basis of green smart city services between the years 2015-2020, source: own study

influence also extends into social aspects such as: environmental education, ecological awareness, social inclusion processes, etc.

The article focuses on the following three aspects: a critical analysis of achievements in the field of terminology characterising a *green smart city*, building a model of a green smart municipality and eco-transformation processes, determining the activity of municipalities in their pursuit of a *green smart city* as well as research dilemmas that emerge while building the model.

In the literature on the subject, we encounter various approaches to defining the issue of a smart city, although a concept gap exists regarding a unit that might be called a *green smart city*. In the context of civilisational progress and climate change, a need emerges to pinpoint such units in order to support their needs through socio-economic instruments *e.g. allowances, subsidies, expert assistance, etc.* and programmes depending on how far the processes have advanced in relation to the management of environmental goods *e.g. water and waste management etc.*, the maturity of the municipality, the share of creativity and technology in contribution to the development of the municipality, etc.

Objective: 1. The first goal of the article is to build a model of ecological maturity for a municipality as a *green smart city*.

Objective: 2. The second goal is to define the eco-transformation process and build the individual stages of this process through the prism of four pillars: the municipality as an organisation, ongoing processes, technology and creativity as well as the residents and their ecological maturity.

Objective: 3. The third goal is to propose a tool to study how a municipality may act towards its ecological maturity.

In the writing of this article, the research process included the following stages:

- bibliometric and critical analysis of the literature on the subject,
- defining a green smart city and the eco-transformation process,
- considerations related to research dilemmas,
- recommendations for further research.

Bibliometric analysis of terms related to a green smart city

The issues discussed in this article constitute a very young field from the point of view of how it links in with smart solutions in the area of local economy. It should also be emphasised that there are no publications in the literature databases that might approach the issue in a similar holistic way. An extensive collection of publications does exist in the area of sustainable development and smart cities per se. An analysis of the Scopus database for the years 2016-2020 using the keywords *green smart city* yielded 600 entries. Based on a search using the VOSviewer (ver. 1.6.6) software, a cluster map was assembled. There are two thematic clusters (Fig.1) that have very evenly distributed items when it comes to appearing keywords. It is clearly visible that most of this research work is interdisciplinary and combines IT knowledge with economics. Indeed, it is at the crossroads of different fields where work of particu-

lar importance occurs in terms of discovering the relevant socio-economic paradigms mentioned in the presented article.

Towards a *green smart city* and the eco-transformation of the municipality

Contemporary city development strategies differ significantly from those several years ago in that they largely embrace creative and smart solutions (Singh, 2019). Globally, strategies, development visions, and city development plans include a number of successful ideas that are related to technology and ecology (Mora et al., 2019).

Despite the growing interest in the topic of smart cities (Anthopoulos & Series, 2018), there is no universal definition of them, let alone green smart cities. The direction of ecological activities at various levels of the economy, including on the mesoeconomic scale – i.e. regional (Konecka-Szydłowska et al., 2019) and local (Orłowski, 2019) – is rooted in deteriorating environmental conditions and the need to limit or avoid harmful changes, but arises from people's attitudes, expectations and increased sensitivity to the quality of the environment. Regarding the diverse ways in which a smart city may be defined, the suggestion of certain developmental trends may also be observed. Such terms include *city of knowledge*, *digital city* and *ecological city*, which are used interchangeably in literature. Nevertheless, more and more people are trying to solve the problem of oversimplification of the smart city concept by offering holistic, multidisciplinary perspectives around the key areas of smart infrastructure, economy, mobility, governance, environment, etc. (Yigitcanlar & Inkinen, 2018). Within the scope of the systematic efforts undertaken by various authors to develop a comprehensive common definition of smart cities (Anthopoulos & Series, 2018), there is also a tendency to listen to people's voices when it comes to smart city design and decision-making, calling for direct participation from local actors and multiple stakeholders in planning and implementing social action, as well as technological and urban transformation for smart cities. However, serious questions arise concerning how this alternative approach – giving citizens a voice in smart city discourse – can be implemented in preexisting urban development processes using already available technological solutions (Pięta-Kanurska, 2017). This could in turn promote an alternative vision for smart cities that takes citizens' voices into account – a vision that is not compromised but achievable.

The common denominator of various definitions of a smart city are creative-minded residents. (Pięta-Kanurska, 2017), who can solve various problems by using modern technologies and also take advantage of information and communication technologies (ICT). In the literature, the definition of a smart city is often accompanied by sustainable development

and the sharing economy (Durante & Turvani, 2018). Innovative cities become more competitive (Szczech-Pietkiewicz, 2018) in the global space and more effectively meet the needs of their residents, i.e. in terms of quality of life. It should be emphasised that the popularity of the concept depends on financial support from the cities – e.g. through the availability of public funds – for instance, for the development of energy technologies, and the tendencies of global corporations (including Cisco, Google and IBM) to invest significantly in city digitisation projects.

Considering the various paths that constitute a smart city (Lazzeretti & Oliva, 2018), one might also move towards a new term: *green smart city*. Looking at trends, needs, deteriorating living conditions in cities, climate problems, people's needs, etc., this is the direction that combines the most important developmental visions, helping residents to improve their quality of life. Smart also means innovative solutions based on knowledge and those involving local communities (Lee, 2019). Such models are also conducive to businesses, which are more willingly to locate their capital in green spaces. In particular, Industry 4.0 (Ciffolilli & Muscio, 2018) aims for *clean* locations, as anything else may be hostile to the robots working there. Such examples may be found in Silesia (Klasik & Kuźnik, 2017), where the reason for changing location was the polluted environment. The new concept of a *green smart city*, like a smart city, may be assumed not to be limited by features such as:

- territory,
- city size,
- the range of proposed solutions, e.g. e-government, smart transport, city services, open data in cities and many others,
- project size,
- source of financing.

By taking into account a smart city's spectrum of features and adding the term *green* to it, we can successfully attribute the following smart city traits to such a developmental paradigm (Łaźniewska, 2019):

1. **The involvement of innovative processes** that can take various forms: product-based, organisational, procedural, and marketing-oriented. As the world population grows and consumption increases, the Earth's natural resources are shrinking, bringing climate change with it. This fact motivates us to create and introduce innovative technological solutions. Urban areas in particular are responsible for greater use of resources, resulting in a growing need for smarter infrastructures in search of a greener and more energy-efficient urban economy (Hancke et al., 2013).
2. **The role of knowledge in the concept.** Smart city concepts make use of all possible types of knowledge (Mora et al.,

2018a), which is crucial for the development of technological, social and economic processes. Knowledge is closely related to the institutions that operate within a given territory and cities with an established economic position have a real advantage in terms of numerous institutions operating in the field of science and knowledge.

3. **The relevance of caring for the natural environment.** There are cities – such as Vienna, Vancouver, Copenhagen – where the natural environment and sustainable development come first. Vienna promotes sustainable development and resource conservation through key strategies – Vienna's vision for a sustainable future in 2050 and an action plan for energy-efficient and climate-friendly urban development by 2020.
4. **Focus on competitiveness.** This is one of the key elements of the development strategy of each smart and green city. In the model approach, competitive cities are those that attract modern clean technologies, providing their residents with jobs and ensuring good earnings. Especially in the case of economic competitiveness, the evolutionary nature of the concept is of great importance, which in practice means more and more competitiveness in terms of technological progress. In this case, of key significance are the role and activity of the city applied in the area of active business support and cooperation with businesses in order to build solutions that might boost the competitiveness of given centres.
5. **Focus on the quality of human capital,** impacting the city's development and also as a consumer of innovative solutions, is another important feature. For the development of an innovative city, it is important to foster a creative milieu, whose members generate more ideas therefore leading to the a greater likelihood that they will establish new innovative companies that will certainly create a variety of interesting solutions for innovative cities. Professions such as engineers, scientists, architects, as well as people involved in culture and the arts are more useful for the development of the city. Their activity is related to the creation of new services, products and often the generation of innovative processes.

Climate-related issues are part of all urban development strategies either directly or indirectly, yet vary greatly from city to city. It would seem to be highly relevant to meet the needs of eco-development and to propose solutions that fit in with the need to enhance the residents' standard of living by improving environmental conditions (Plac, 2020).

Like industry, municipalities are currently facing a number of challenges that can be identified as the common denominator of e-transformation. **Eco-transformation** processes seem to be the most important in the era of modern changes, much like e-transformations. The sudden epidemic situation related to the covid-9 pandemic has made digital transformation a necessity rather than a choice (Folinas & Metaxas, 2020). Unfortunately, municipalities do not always cope well with extremely difficult contemporary challenges (Churski, 2017). Organisational and financial gaps, the lack of appropriate skills amongst competent employees, as well as the low level of education (Jara-figueroa & Bank, 2020) and involvement of residents affect regional differences in these processes. Taking into account the varied characteristics of the municipalities, e.g. resulting from their location on a national border, the challenges may turn out to cover a wide spectrum. In times of increasing ecological needs, the need to monitor the activity of municipalities in terms of ecological maturity is a very important challenge of the 21st century, and one that should not be ignored. In the process of eco-transformation, municipalities **strive for ecological maturity** and this is achievable when the municipality does not violate the ecological balance, by combining economic and technological progress with sustainable development. This process will be evaluated and adapted according to environmental needs. We must remember that technologies are only a means for improvement, not the end in itself. We can define the conventional stages of reaching this maturity. In the case of the presented model, it has been specified on a five-level scale that marks the various stages of transformation, to be discussed later in the article.

Looking through the prism of the common features adopted, what will be of key significance for the municipality is the unique ability to eliminate the negative impact on the natural environment of its residents and tourists visiting the municipalities, the companies operating there, institutions in the business environment and the local municipal government itself. As mentioned previously, long-term, strategic activities within the municipality are highly relevant, resulting from the developmental directions adopted as well as other ongoing operations undertaken *ad hoc*. The municipality should be committed to continuous improvement through appropriate management of change, risk, knowledge and ideas. The authorities should be open to bold proposals, frequently question the current state of affairs, and propose alternative solutions. Civil servants should be encouraged to work as a team on ecological projects that to a large extent require them to feel the situation, e.g. by using the Design Thinking Method.

A crucial element in the municipality's drive to achieve a high level of ecological maturity is a strat-

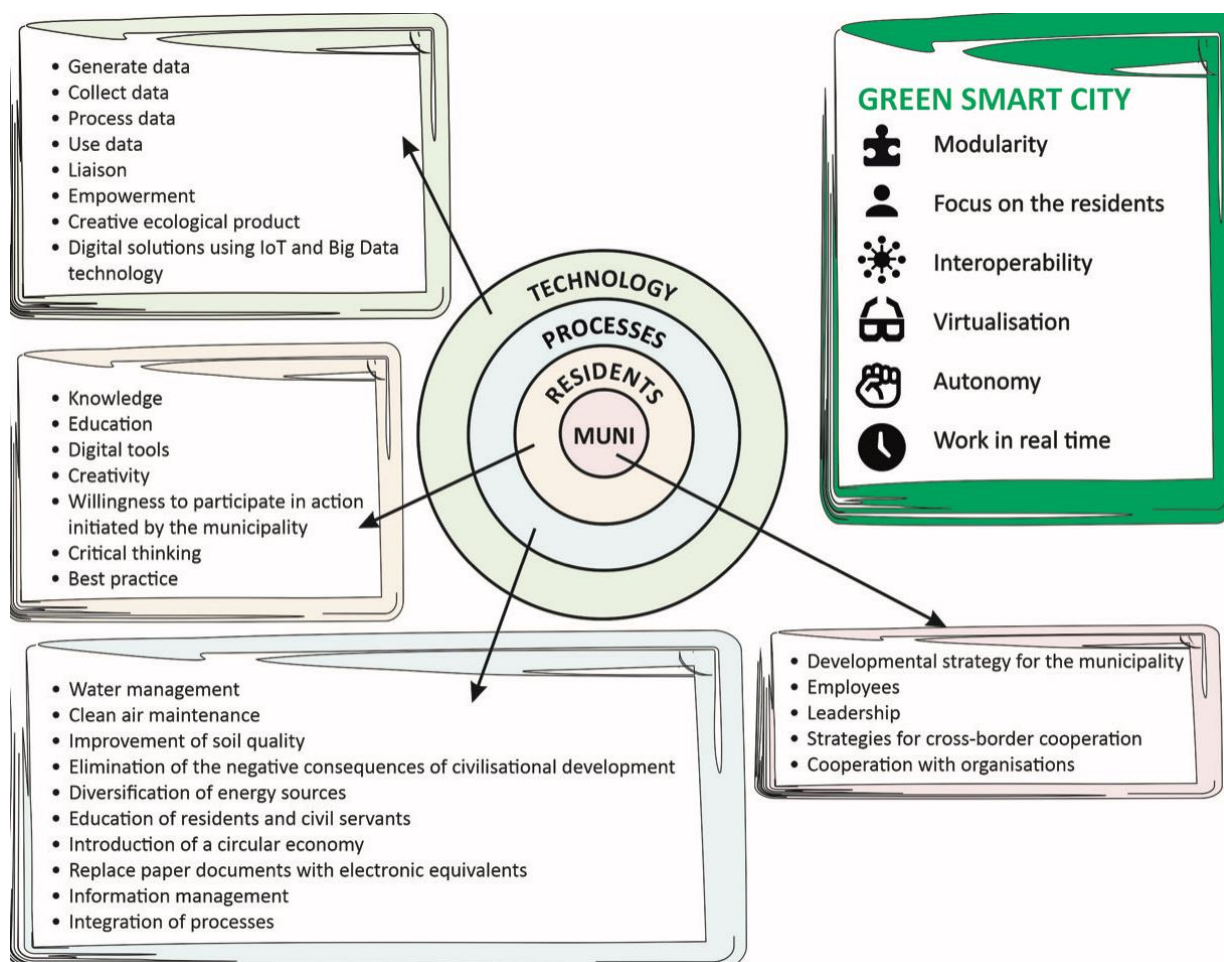


Figure 2. The *green smart city* model, source: Own study

egy of ecological development that makes use of smart digital solutions. It is important, on the one hand, to monitor achievements, and on the other hand, to ensure that the emerging new digital solutions are combined with interesting business models that will prove useful in various digital solutions adopted in municipalities. A key task facing the municipal authorities is the necessity for the municipality to cooperate with its residents. Digital solutions have an advantage over others, especially since they offer the possibility for digital products to be personalised, which in turn presents some very interesting opportunities, e.g. related to the area of energy, water or municipal waste management. Appropriate solutions, which are conventionally referred to as smart, allow for excellent cross-linking and monitoring of processes and the implementation of improvements that solve problems in a highly personalised manner. The development of solutions or identification of problems should involve groups of specialists who work with the design method.

Analysis of the municipality's activity in the area of ecological maturity is visible on many levels. In our adopted model, this analysis will deal with the following four areas: the municipality as an organisation, relations with residents, the inhabitants of a

given municipality, technology and creativity along with processes relevant to the municipality's pro ecological endeavours. It should be noted that both the technologies used by the municipality and the silent knowledge of the local community are very important for the model. On the one hand, it can be a barrier against initiatives or, on the other hand, an impulse for new projects.

The second figure shows the elements that comprise the *green smart city* model. Of course, this is not a closed model. It can be enriched with various components that may arise from the current state of knowledge, technology or changing socio-economic factors. Certain fields may also be supplemented. The first element of this model is the municipality as an **organisation**. It differs significantly from an enterprise in terms of structure, types of relationships, leadership features, method of financing, speed of changes, technologies used in solving problems, and above all, a mission and strategy that is focused on the residents. What connects the municipality and an enterprise is the pursuit of transformation by increasing the skills of employees, improving qualifications, know-how and creativity. All these features are indispensable for solving problems using digital tools based on the design method. This perspective

does not entail the need to transform the city's administrative structures. The decision-making process is made more innovative by using a network of technologies that consists in collecting all types of data and information regarding public management by sensors and networks of sensors, i.e. creating databases.

The literature distinguishes four perspectives of modern city management and rationality in decision-making (Meijer & Bolívar, 2016):

- The first perspective, i.e. administrating a smart city, is characterised by a low level of transformation. The local government must approve the city's development as a smart city, and at most it can promote or prioritise some of its areas or districts.
- The second perspective emphasises the need to make smart decisions and implement them. This perspective is not associated with the need to transform the city's administrative structures, but rather changes in the way decisions are made. The decision-making process is made more innovative by using a network of technologies.
- The third perspective in smart governance means creating new administrative structures, so-called smart administration. It is a new form of electronic governance that uses advanced information technologies to connect and integrate information, processes, institutions and physical infrastructure to better serve the urban community.
- The fourth perspective called smart governance requires the greatest transformation in city administrative structures. This means smart urban collaboration between various actors in the city and cooperation between local government administration departments, as well as with the community, facilitating the promotion of economic growth and undertaking endeavours mainly oriented towards the citizens. Smart urban collaboration is based on proactive structures within the city administration involving all actors within a conurbation. Such an approach maximises the socio-economic potential of the city while taking into account its ecological development. This proves decisive in the process of counteracting negative external factors and eliminating long-term historical circumstances and psychological barriers.

Another element of the model are the **processes** that the municipality should manage that are involved in improving the state of the natural environment, thus

implementing the principle of sustainable development. Becoming a smart city is one of the top priorities on the agenda in many European cities. Among the different strategies along the path of transformation, local governments strive to introduce innovations in their cities, for example by encouraging international enterprises to bring their green energy services and products to their municipalities. Knowing how to attract these businesses means that local leaders understand the multi-criteria decision problem faced by enterprises from various sectors such as energy, when deciding to expand to one city or another. These types of processes should be thoroughly identified and underpinned by knowledge.

Of key importance is the degree of integration of process management, as the processes in question may be fragmented in larger units. The issue of cooperation and communication with residents is equally significant. To this end, green projects *inter alia* are established within participatory budgets. Standardisation is a very topical element of these processes, and is particularly meaningful for residents, because it creates a new quality in relations with them and promotes the introduction of digital solutions, information exchange, etc. Process management involves areas such as: water management, maintaining air purity, improving soil quality, eliminating the negative consequences of civilisational development, diversification of energy sources, education of residents and office workers, introduction of a circular economy, replacing paper documents with e-documents as well as the very important process of information management.

Another very significant component of the model are the **residents**. Their role in the ecological transformation of the municipality focuses on their knowledge resources, creativity, sense of connection and identification with the municipality, ecological awareness, and willingness to achieve a certain standard of living. They expect the municipality to initiate various solutions that will help to combat ecological problems, e.g. bicycle paths, recycling of rubbish, access to the Internet, available cheap and convenient public transport. Of key relevance for the further development of the municipality is a well-thought-out strategy of communication with the residents, which may boost their activity in city life. This may succeed in mobilising the residents and building interpersonal relations. Social media are used in business. Polish cities, unlike businesses, tend to lag way behind when it comes to using tools such as crowdsourcing (Sobol, 2017). The residents themselves are willing to participate in the implementation of good ecological projects, but they must be environmentally conscious residents. *Smart people* force greater changes and accelerate green transformation. What is useful from the municipality's point of view are activities aimed at encouraging residents to actively participate in green and sustainable

solutions that enhance the attractiveness of the municipality in the long term. Conscious users focusing on ecological housing and living solutions ensure high quality. The use of online platforms as well as community activity on the Internet also forms the basis of the crowdfunding concept. Through financial involvement in local bottom-up projects, crowdfunding complements the investments implemented by the city (Sobol, 2017). The municipality's acceptance and openness to bottom-up solutions suggested by the residents create a coherent system of interdependent needs and expectations.

Consideration should also be made concerning whether the residents are ready to *be smart* in their daily relations with the city. For this to happen, it is necessary to educate residents and introduce marketing activities that might encourage conscious use of the digital solutions offered by the municipality. The use of digital tools should be especially visible among young people, because they are the largest user group of various digital products. One may also wonder if they are also aware of the digital solutions on offer as city residents. The reality, however, as can be observed from research conducted in Poznań, is completely different. A survey was conducted in October 2019 on a group of approximately 2,000 students studying in Poland at Poznań universities at technical and economic faculties. It can be argued that they constitute, in a sense, a representative indication of trends and changes in the near future. During the survey, students were asked about major nuisances related to living in the city. Problems with transport (personal and public) came to the fore, with relatively little interest in matters such as dirty public spaces or insufficient green areas and recreational areas in the city. It is clear, however, that these problems were worth pointing out for a significant number of those questioned, i.e. they are quite relevant from the point of view of the average person. The introduction of new information tools in the most pressing areas would certainly improve the situation. Apart from traditional social media like Instagram, Facebook, Messenger, almost half of the respondents also indicated the Poznań public transport system and agglomeration card services *PeKa* as well as ticket applications *JakDojadę?/ When I Arrive?* And *Mobilet*. Applications that help to locate services, recreational facilities or city bikes enjoy similar popularity. Therefore, it should be concluded that *smart* services are a highly desirable means of assisting city navigation, although only half of the respondents associate them with the city, and most see them through the prism of external companies. At this point, it is worth noting that most of the services are not related to the sustainable development of the city, which can undoubtedly be an important signal to take corrective measures.

The development of **technology** is a highly significant element of the described model. Big Data

(Tabakow, M., Korczak, J., Franczyk, 2014) and the evolution of the Internet of Things (IoT) played a major role in the implementation of the smart city strategy (Cellary, 2019). Large data sets enable cities to obtain valuable information from a variety of sources, and the Internet of Things facilitates the integration of sensors, and the identification of radio frequencies and bluetooth in the actual environment. There are many applications for the IoT in smart cities (Cellary, W., 2018). Examples include smart parking lots, traffic control, lighting, waste management, park hosing, flood warning systems, monitoring systems for buildings and infrastructure, as well as smart air quality monitoring systems.

The analysis of data generated by devices operating in the IoT is a great challenge that both Big Data researchers and businesses themselves will have to face. Regarding data generated by smart devices, according to the Cisco report (*Cisco.Com, 2020*) it is estimated that by 2023 more than 29 billion devices will be connected to the IoT network, which in fact are an example of Big Data of a different type than those that we produce today on the *traditional* Internet.

The application of statistical and analytical methods will be essential to understanding such large data sets. It might seem that when using Big Data, we already know everything and we can abandon traditional statistical methods, in which a major role is played by care for data quality, sample selection or uncertainty, among others. Meanwhile, if we want to draw conclusions about the entire population – for example, on the basis of data from Facebook – we should take into account that young people are far more likely to be users. It turns out that statistical methods such as time series analysis, cluster analysis, dimension reduction methods, classification or regression are necessary for Big Data analysis. On the other hand, such large amounts of data give some machine learning methods a chance to shine, since they only really reveal their true capability when they have huge learning sets at their disposal. Such techniques include, for example, deep neural networks (Bengio, Y., Courville, A., Goodfellow, 2018), which have become extremely popular in recent years.

With regard to the model itself, the research dilemma stems from the complexity of the individual areas analysed in the green smart city model itself. Four such areas have been identified, which consist of a number of factors subject to assessment. A question arises here regarding the indicators, universal measures and problems with the comparability of these measures. Our research experience also raises the problem of adapting measures to macroeconomic development and, consequently, the historical conditions of this development, as well as the level of socio-economic development.

Stages of ecological maturity

The stages of a municipality's ecological maturity are related to its transformation in various areas: technology, the type of organisation that the municipality is, the residents, processes to an open green smart city that make use of internationalisation of processes, integration of processes, orientation towards residents and improving the quality of life for these residents. An *open* municipality that creates new spaces for living and economic development also faces the self-assessment of its activity in the field of ecology. Through questionnaire research, it is possible to determine at what stage of development a municipality is. We need to find out what instruments it uses, in which areas it is particularly active, in which areas it has developmental deficits, what strategies it adopts, etc. This represents a great deal of knowledge, considering the multitasking nature of municipalities. The criteria for this evaluation must be adapted to the level of national economic development and must evolve in line with technological progress. The question of encouraging people to take action is relevant, in order to think in terms of developmental challenges, i.e. eco-transformation processes. The tool that is to be used for this purpose is referred to as the measurement of the municipality's ecological activity in striving for ecological maturity. This is a third element, which is integral in the adopted concept of a *green smart city*.

In accordance with the state of knowledge, the technologies that define the framework of this model may evolve in the future. The following features have been indicated:

1. Modularity, meaning that the applied solutions are universal and can be used in other municipalities,
2. Openness to residents' initiatives, meaning that the residents are included in decision-making processes and willingly take part in participatory initiatives, such as a participatory budget, or marking problem points on a map,
3. Interoperability, i.e. the compatibility of the proposed systems with other similar solutions,
4. Virtualisation, i.e. moving most data and operations to a virtual space, offering tremendous benefits in terms of easy access to information, speeding up the process of making strategic decisions in the municipality, etc.,
5. Applied solutions based on autonomous (maintenance-free) solutions, possibly including solutions for public transport, waste management, and water resources etc.,
6. Working in real time – a very important feature of this system – using the capabilities of modern technologies, and of

personal communication devices in particular, to allow for better problem solving, both in terms of communication flow from the city to citizens and collecting feedback.

The main research dilemma is also the measurability of the term *green smart city*, the number of categories, the breadth of the research scope and the standardisation of qualitative research. The variety and heterogeneity of municipalities' action in favour of the needs of their residents makes it difficult to maintain the principle of universality, while personal influences and the relativism of answers remain unavoidable in closed questions. The departure from the statutory obligations of the municipality strengthens the discretion and often misinterpretation of the phenomena under evaluation. Due to the utilitarian nature of the study, it is worth assessing two participants: the municipality and the residents.

In terms of action undertaken, five development stages have been distinguished. The individual stages are shown in Figure 4, Eco-transformation processes.

An **active municipality** is one that implements ecological and economic solutions with varying results, because it encounters a number of obstacles and difficulties. It could be much more active, but there is no maturity in the area of technology, process, as well as resident activity and creativity. The municipality is also organisationally weak. Many processes overlap, with no transparency in terms of competences, project approach, creativity in action; featuring an inability to find the right business models for municipal projects, a lack of a clearly defined development vision, strategy, etc. The needs of such municipalities are huge and it is necessary to support them by accurately identifying their requirements, gaps, obstacles, and environmental problems. The grouping and systematisation of these phenomena will allow for a gradual transition to higher stages.

The next stage is a **creative municipality**, much more involved in ecological development processes than an active municipality. It has digital and other solutions at its disposal that do in fact meet some of the residents' expectations. Unfortunately, these solutions are often random and have no logical consistency. They do not create harmonious systems that significantly reduce ecological problems. Again, help is needed to maximise the benefits of these different solutions.

A **municipality that includes its residents** is one that assesses its added value through the prism of the residents' high level of involvement in developmental processes. The benefits of this approach are far-reaching and result from better identification of problems, benefits that match solutions to the needs of the residents, residents who identify with the municipality, which has a positive effect on the image of the municipality, etc. By joining the development processes, the residents strengthen the municipality

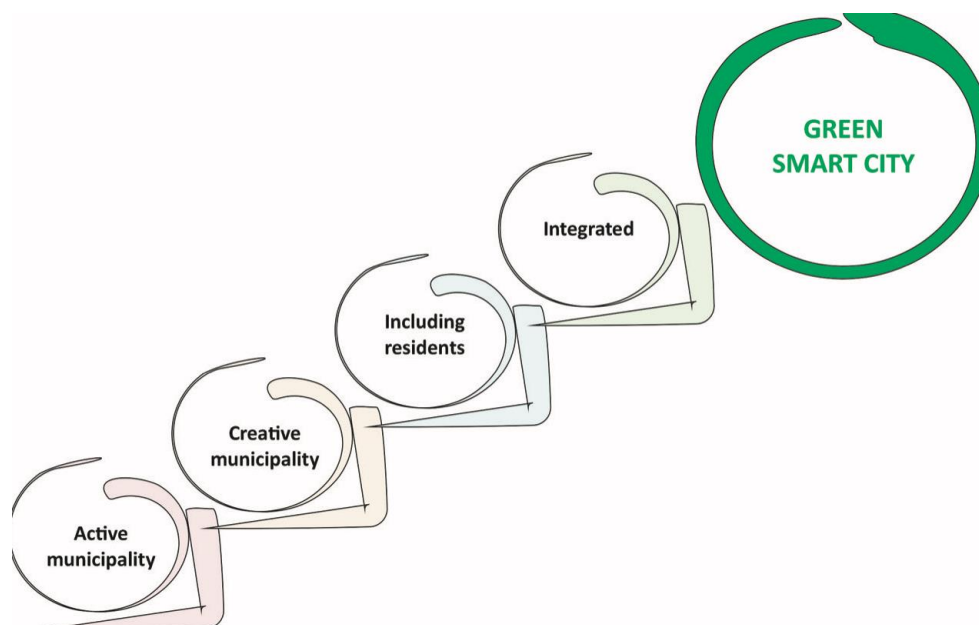


Figure 4. Eco-transformation processes, source: own study

with their knowledge, competences, investment decisions, etc.

An **integrated municipality** is one that has noticed the benefit from the integration of processes, internationalisation and standardisation, and willingly implements smart projects integrated into larger joint ventures, e.g. regarding mobility, waste or water management.

A **green smart city** is the highest level, and most open to new solutions and cooperation. Resistant to external factors. In the case of municipalities located near national borders, the socio-economic added value in municipalities becomes apparent by mobilising endogenous potential by strengthening the local potential as partners and initiators of cross-border cooperation, participation of economic and social entities, environmental organisations and tourist agencies (Ramírez, 2000). A relevant issue is the improvement of professional qualifications and environmental competences, additional development, e.g. in the field of infrastructure, transport, tourism, the natural environment, education, research and co-operation between small and medium-sized enterprises.

Taking into account the tremendous complexity of the entire ecosystem of the municipality, it is necessary, on the one hand, for the municipality to self-evaluate by means of tools that may determine their level of activity, while on the other hand it would seem indispensable to enlist the help of professionals who can prepare specific instruments to support particular areas of the municipality's work. It should be noted that not only financing is necessary here, but also the identification of specific gaps, niches and proposals for solutions to some problems. In terms of self-assessment, we suggest an instrument that

may be called *an evaluation of the municipality's activity towards its ecological maturity*. Such an instrument is ready to implement and is the subject of another publication of ours.

Summary

The considerations broached in this article may lead one to reflect that there is an urgent need to direct municipalities towards combining the benefits arising from the use of digital tools with attention to solutions that serve the environment. In the course of the discussion on what contemporary municipalities should do in the context of climate requirements, the achievements of municipalities should be monitored in terms of their ability to deal with contemporary developmental problems. In view of the climate challenges faced by municipalities, it is important to adapt quickly to the changing circumstances. They must follow two paths – i.e. propose smart solutions combined with sustainable development.

We emphasise that this is a model whose components must be adapted to the level of macroeconomic development of the economy and go hand in hand with technological progress. When implementing their ecological mission and goals, municipalities pass through a process of eco-transformation, which is closely related to e-transformation. Surveys can be used to measure a municipality's progress in the eco-transformation process. The ecological maturity stages of a municipality have been included in a five-point scale and mainly involve maturity levels. We intend to devote another publication to these issues. The added value resulting from the study of municipal action in pursuit of ecological maturity is manifested in:

- education of municipalities and residents,
- cognitive aspects,
- implications for regional policy,
- implications for cross-border cooperation in terms of ecology,
- identification of developmental niches and implications for businesses in terms of investment opportunities in a given area,
- guidelines for formulating further directions of development and adaptation of specific solutions,
- influence on the paradigm shift of process management in the municipality, from searching for the causes of changes in the natural environment to identifying the processes at a given moment (through the available information) for the extrapolation and anticipation of future changes.

Taking into account the considerations proposed in this article, we can also refer to a number of terms that may seem to be controversial and difficult for municipalities to incorporate without a critical approach to many areas of knowledge, e.g. municipal management processes, technology, the macroeconomic and mesoeconomic specifics, and behavioural analyses.

Further research is recommended to extrapolate individual areas within the model. The proposed *green smart city* model may indicate different elements depending on the economic realities in which the municipalities operate.

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Integrating Concepts of Blue-green Infrastructure to Support Multidisciplinary Planning of Sustainable Cities

Integracja koncepcji niebiesko-zielonej infrastruktury jako narzędzie wspierania interdyscyplinarnego planowania Zrównoważonych Miast

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Abstract

Currently, there is a tendency to apply nature-based landscape components as an important element in decentralised stormwater management, an essential part of sustainable urban development. The term *blue-green infrastructure* (BGI) is now used for many planning solutions of sustainable cities. Using thematic analysis of 27 studies and documents between 2006-2019, we identified 6 types of approaches to BGI. We then reclassified the six observed approaches into three basic categories of conceptual approaches to BGI. We distinguished four basic guidelines for the development of science and practice, aimed at promoting of an integrated concept of BGI to support multidisciplinary planning of sustainable cities. Based on the benefits of BGI presented in studies and documents, we show the importance of BGI from the perspective of the 2030 Agenda for Sustainable Development.

Key words: blue-green infrastructure, BGI, stormwater management, sustainable cities, urban planning, Sustainable Development Goals

Streszczenie

Obecnie istnieje tendencja do wykorzystywania naturalnego krajobrazu jako ważnego elementu w zdecentralizowanej gospodarce wodami opadowymi, będącej istotnej części zrównoważonego rozwoju obszarów miejskich. Termin *niebiesko-zielona infrastruktura* (BGI) jest używany w wielu rozwiązaniach planistycznych miast zrównoważonych. Korzystając z analizy tematycznej 27 badań i dokumentów z lat 2006-2019, zidentyfikowaliśmy 6 typów podejść do BGI. Następnie dokonaliśmy ich przeklasyfikowania na 3 podstawowe kategorie podejść koncepcyjnych. Wyróżniliśmy 4 podstawowe wytyczne dotyczące rozwoju nauki i praktyki, mające na celu promowanie zintegrowanej koncepcji BGI wspierającej interdyscyplinarne planowanie miast zrównoważonych. Opierając się na korzyściach płynących z BGI przedstawionych w omówionych opracowaniach i dokumentach, pokazujemy znaczenie BGI z perspektywy Agendy na rzecz zrównoważonego rozwoju 2030.

Słowa kluczowe: infrastruktura niebiesko-zielona, BGI, gospodarce wodami opadowymi, zrównoważone zrównoważone miasta, urbanistyka, Cele Zrównoważonego Rozwoju

1. Introduction and theoretical background

Sustainable water management associated with approaches to the vegetation elements within the urban landscape is considered a key issue of urban planning in cities all over the world (Morison & Brown, 2011; Giordano et al., 2013). Urban green infrastructure has played an important climate change mitigation role, along with water resources in the urban landscape (Sussams et al., 2015; Howe & Mitchell, 2012; Mrowiec et al., 2018). Nature-based solutions such as green roofs, bioswales or rain garden help to reduce local flooding and thermal discomfort. The EU Commission defines nature-based solutions (NBS) as *solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience* (EEA, 2015; Kabisch et al., 2017). Nature-based solutions can be considered as an umbrella for the other concepts: Green infrastructure, Ecosystem-based adaptation and Ecosystem services (Pauleit et al., 2017).

Green infrastructure is understood both in the sense of the ecosystem functions of urban green infrastructure – climatic and hydrological functions, support of biodiversity and air quality or noise regulation – and part of the urban social environment: recreational, aesthetic, cultural and community functions (Pauleit et al., 2019; Young et al., 2014; Voskamp & Van de Ven, 2015; Mell et al., 2017; Giordano et al., 2013). The need for economic evaluation of ecosystem functions has also brought about the development of the concept of ecosystem services (Escobedo et al., 2019; Hegetschweiler et al., 2017; Vierikko & Niemelä, 2016; Elmqvist et al., 2015). It is necessary to increase knowledge about how ecosystem services contribute to society from economic, social, environmental aspects of urban sustainable development (Edlund, 2020; Zaręba, 2014).

Sustainable water management is a major challenge of urban development agenda worldwide (Mrowiec et al., 2018). Current trends have been made evident by a number of systematically-introduced urban water-management schemes (Howe & Mitchell, 2012; Woods Ballard et al., 2015; Mrowiec, 2016; Hoang et al., 2017). Urban green infrastructure systems associated with elements of stormwater management have now advanced under the umbrella term *blue-green infrastructure* (BGI) in the current environmental and political context of planning urban adaptations to climate change (e.g. Voskamp & Van de Ven, 2015). The term is currently used in various contexts internationally, and it is applied at national levels of sustainable urban development planning (Ghofrani et al., 2017). For example, blue-green infrastructure (BGI) is defined as *a naturally-oriented water cycle contributing to the amenity of the city by bringing water management and green infrastructure together* (Thorne, 2016). The use of terms *green-blue-grey infrastructure* (Alves, 2020), *hybrid*

or *mixed infrastructure* (Depietri & McPhearson, 2017) shows the need for the combination of measures in practice.

The question is whether BGI is simply a new term used for many different meanings of urban green infrastructure or whether it constitutes a new thematic approach to sustainable urban planning. In urban planning, new approaches to water management are introduced in the concept of Blue-green cities (Thorne, 2016) or as variants of Sustainable cities, Eco-cities (De Jong et al., 2015; Bai et al., 2012), Healthy cities (de Leeuw et al., 2014), Biosensitive cities (Schandl et al., 2012) or Smart cities (Louda et al., 2016; Neirotti et al. 2014) with emphasis on a key role for BGI. The implementation of BGI is in line with The Shenzhen Declaration on EcoCity Development (Blewitt, 2008).

The Sustainable Development Goals (SDGs) are 17 global objectives to guide efforts towards addressing sustainable development worldwide by 2030 (United Nations, 2015; Woodbridge, 2015). Cities have been the drivers of innovative sustainable development at the local level (Condon, 2020). Our goal is to analyze the approaches to BGI and show their links to the SDGs.

This contribution strives to achieve the following tasks:

- i) to identify currently applied thematic areas of BGI and to classify basic types of approaches to BGI,
- ii) to present an integrated concept of BGI to support multidisciplinary planning of sustainable cities
- iii) to assess the benefits of BGI in achieving the SDGs

2. Research design

In the first part of the research, we carried out a thematic analysis of studies and documents. We selected twenty representative studies from the preceding frequency analysis dataset for this part of the research. For each team of authors to publish several articles using the same methodological approach, only one representative study was selected. In addition, seven major project documents that show BGI approaches in practice were included in the research. This way were selected studies and documents differed in their focus and represented different national or international project teams. It was not the aim to determine the number of documents, but to look for different types of hits.

Our aim was to identify thematic areas, key terms and definitions of BGI. Our methodology follows established procedures of thematic document analysis (Sussams et al., 2015; Alholjailan, 2012; Fugard & Potts, 2015; Bowen, 2009). It is based on putting keywords, definitions, phrases, and ideas into a rubric organized by differences in defini-

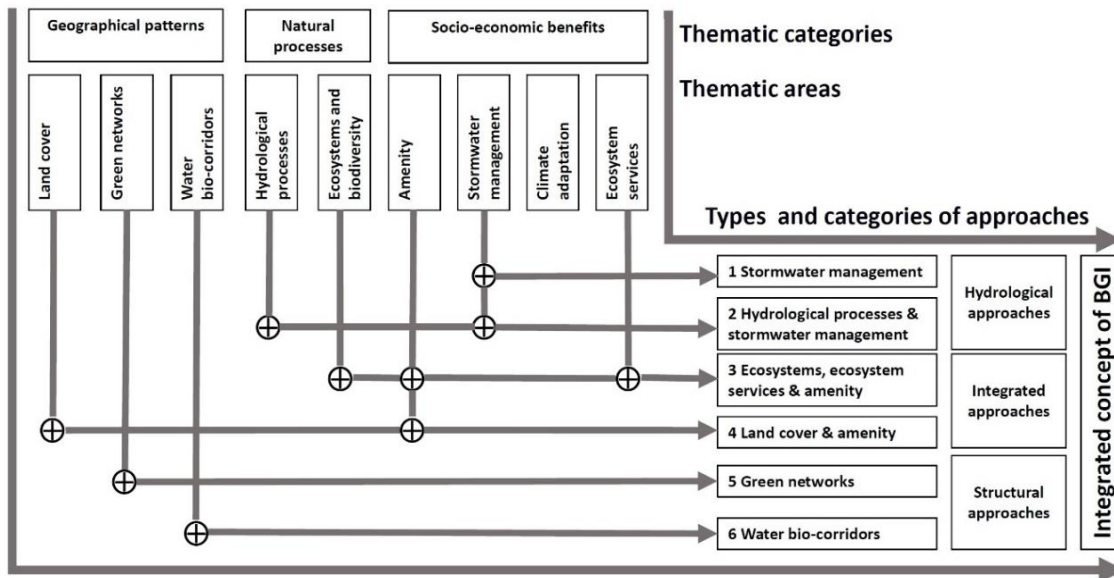


Figure 1. Review methodology – from thematic categories and areas of BGI studies focus to typology of approaches and integrated concept of BGI, source: prepared by the authors

Table 1. Typology of approaches to BGI based on thematic analysis of studies and documents, source: authors' analysis of the studies and documents cited

Studies and documents	Thematic areas								Typology of approaches to BGI	
	Geographical patterns			Natural processes		Socio-economic benefits			Types of approaches	Categories of approaches
	Land cover	Green networks	Water bio-corridors	Hydrological processes	Ecosystems and biodiversity	Amenity	Stormwater management	Climate adaptation		
Wörten et al., 2016 Voskamp & Van de Ven, 2015 Center for Neighborhood Tech., 2010 DELWP, 2017 Sexton & Jeremiah, 2017 Van Timmeren et al., 2016 Bacchin et al., 2016				•	•	•	••	•	1 Stormwater management	Hydrological
Wouters et al., 2016 Thorne, 2016 Hoang & Fenner, 2016	•			••	•	•	••	•	2 Hydrological processes & stormwater management	
UK Green Building Council, 2015 Vierikko & Niemelä, 2016 Vlaamse Landmaatschappij, 2015 Gehrels et al., 2016 Elmqvist et al., 2015 Bozovic et al., 2017	•	•		•	••	••	•	••	3 Ecosystems, ecosystem services & amenity	Integrated
Kazmierczak & Carter, 2010 Planning Department HKSARG, 2016 Pötz, 2016 Völker & Kistemann, 2015	••	•		•	••	••	•	•	4 Land cover & amenity	
Wagner et al., 2013 Ghofrani et al., 2017 Frischenbruder & Pellegrino, 2006 Chicago Dept. of Transportation, 2007 Schrijnen, 2000	•	••	••	••	•	•	••	•	5 Green networks	Structural
Perini & Sabbion, 2017 Philadelphia Water Department, 2009		•	••	••	•	•	••	•	6 Water bio-corridors	

•• key theme, • theme is taken into consideration

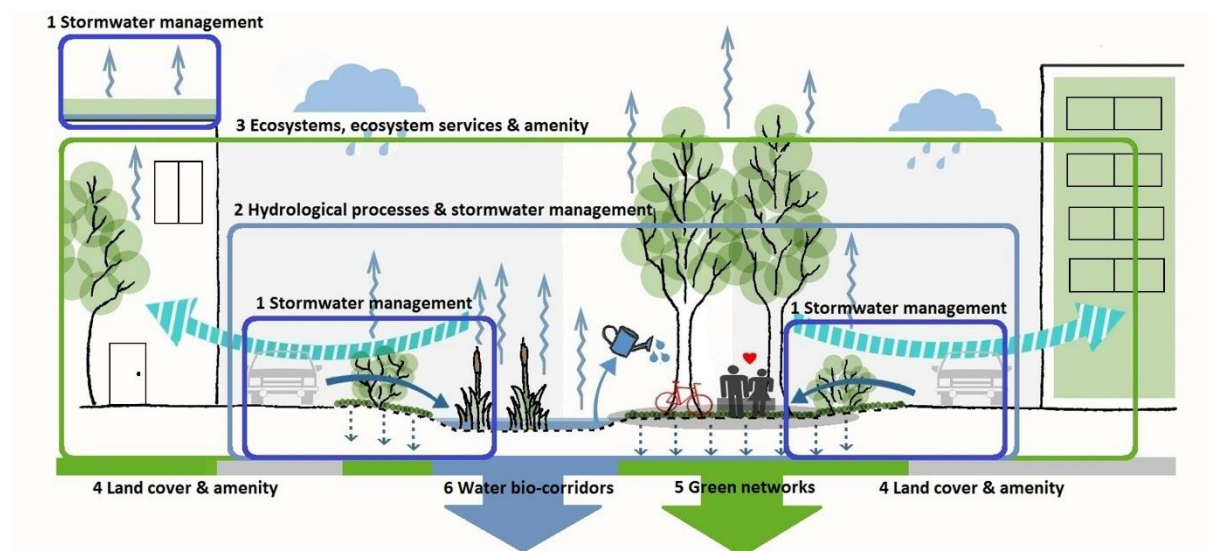


Figure 2. Schematic depiction of approaches to BGI in the urban landscape, source: authors' depiction based on the typology in Tab. 1 and Fig. 1; drawing of the urban landscape by Kopp et al. (2017) and Faltermaier, et al. (2016)

tions and uses of key terms. Our analysis focused on whether a given theme of BGI in a study was central to the study or not. On the basis of observed key themes, BGI definitions and variations of the BGI terminology, we were able to describe several types of approaches to the BGI concept (Fig. 1). Based on our frequency and thematic analysis we created an integrating concept of BGI in hopes of a more standardized and systematic use of the term.

In the follow-up section, we used the results of the thematic analysis to compare the BGI to the 2030 Agenda for Sustainable Development framework. The nexus between the BGI and the SDGs has been documented based on contingent target records inspired by relevant studies (Freyling, 2015; Sørup et al., 2019; Allen et al., 2017).

3. Results

3.1. Thematic analysis and typology of approaches

We selected twenty-seven studies and documents using BGI (Tab. 1). Our analysis confirmed that the definition of BGI is not stable in the international context, rendering the individual studies and projects thematically different in content definition (Perini & Sabbion, 2017; Fletcher et al., 2015; Silva & Wheeler, 2017). A more comprehensive concept of terminology can sometimes be ascertained at the national level (e.g. Vlaamse Landmaatschappij, 2015; Gehrels et al., 2016; Elmqvist et al., 2015), although this constitutes an exception rather than a rule and individual urban documents may still differ at the municipal level (Center for Neighbourhood Technology, 2010; Chicago Department of Transportation, 2007; Philadelphia Water Department, 2009). Despite the terminological inconsistency described above, we identified nine thematic areas which were frequently mentioned relating to BGI (Fig. 1; Tab. 1). Following studies that categorize similarly green infrastructure focus (Koc et al., 2017; Szulczewska

et al., 2017; Wang et al., 2018), we created the following three thematic categories of BGI studies focus: (a) geographical patterns (land cover, green networks, water bio-corridors), (b) natural processes (hydrological processes, ecosystems and biodiversity) and (c) socio-economic benefits (amenity, stormwater management and climate adaptation, and attempts to introduce ecosystem services). These categories are not mutually exclusive or exhaustive, but they cover all key BGI aspects.

3.2. Typology of approaches to BGI

Considering nine thematic areas related to the BGI concept described above, further analysis of the contents of the studies and documents was undertaken, resulting in the determination of six basic types of approach to BGI: 1. Stormwater management, 2. Hydrological processes & stormwater management, 3. Ecosystems, ecosystem services & amenity, 4. Land cover & amenity, 5. Green networks and 6. Water bio-corridors (Fig. 1, Tab. 1).

Proposed types of approaches can be classified into three basic conceptual categories: (a) hydrological approaches (Stormwater management, Hydrological processes & stormwater management), (b) integrated approaches (Ecosystems, ecosystem services & amenity, Land cover & amenity) and (c) structural (Green networks, Water bio-corridors). This classification into three basic conceptual categories is inspired from the categorisation of green infrastructure approaches in cities (Szulczewska et al., 2017; Wang et al., 2018).

The resulting types show that some studies and documents from a range of national environments and different planning contexts are related in terms of concept. The defined types are best interpreted as fuzzy sets that aid orientation in an otherwise unclear terminological environment, an area that lacks a unified definition of basic concepts in the field of BGI (Fig. 2).

3.3. Benefits of BGI to sustainable urban development

Sustainable urban development uses BGI to deliver maximum benefits for the provision and control of water quantity, quality, amenity, and biodiversity (Bacchin et al., 2016). The benefits of BGI to sustainable urban development were categorized under four broad domains: flood resilience, natural resources management, liveability, transition, and innovation (Sørup et al., 2019). Each type of approach to BGI emphasizes some of the listed benefit categories.

3.3.1. Flood control

Flood control is a key service of BGI for stormwater management. The largest number of documents studied perceives BGI primarily in terms of a stormwater management tool (Tab. 1, Type 1), in which ecosystem approaches are preferred, and water management measures are linked to the urban green infrastructure system (Voskamp & Van de Ven, 2015; DELWP, 2017). Urban green infrastructure intrinsically and naturally fulfils significant hydrological functions, facilitating interception, retention and evapotranspiration. On the other hand, the new ecosystem approaches are an important element of the water management concept of urban development, while BGI concepts integrate water management and other environmental benefits (Van Timmeren et al., 2016; Wouters et al., 2016; Kopp & Preis, 2019). A related concept was differentiated as a separate type (Tab. 1, Type 2), in which BGI is perceived as a tool for stormwater management but particular attention is also paid to the study, assessment and support of hydrological or more general fluvial processes in the urban landscape, including flood protection in river floodplains (Wouters et al., 2016; Thorne, 2016). These studies, as well as the first type, also refer to the need to adapt cities to climate change.

3.3.2. Liveability

New approaches to stormwater management are a great opportunity to transform urban space and promote the liveability of the cities. Any assumption that the term *BGI* is associated with emphasis on ecosystem functions as economic benefits for urban residents via the term *infrastructure* was only partially confirmed in the studies classified as belonging to the third type on the basis of thematic analysis (Tab. 1, Type 3). The third type includes the studies and project documents that tend largely towards linking BGI with the ecosystem approach to urban green infrastructure, supporting biodiversity, further making significant efforts to document and, if possible, expressing ecosystem services in economic/financial terms (Vierikko & Niemelä, 2016; Elmqvist et al., 2015). The socio-economic benefits that are associated with amenity BGI functions – recreational, cultural, and psychosocial and health con-

cerns – play an important role in this concept (Gehrels et al., 2016; Elmqvist et al., 2015; Bozovic et al., 2017).

3.3.3. Transition and innovation

One of the rules of sustainable urban development is: *Invest in lighter, greener, cheaper, smarter infrastructure* (Condon, 2010). Many BGI approaches such as green roofs and semi-permeable surfaces, or new designs of recreational space for exercise and social activities in cities may be considered good examples of such smart infrastructure (Wouters et al., 2016; Lamond & Everett, 2019). BGI implementation requirements are a new impetus for the technological innovations and the growth of the green economy.

Blue matters of BGI appear rather to be perceived as background water ecosystems that, fulfil certain socio-cultural functions in the urban landscape. A typical example are revitalized riverfronts (Perini & Sabbion, 2017). New parks, squares, and riverfronts with BGI elements support social interaction and social integration (Lamond & Everett, 2019; Wouters et al., 2016; Edlund, 2020). These amenities help to improve human physical and mental health (de Leeuw et al., 2014).

3.3.4. Natural resources management

BGI applications in the urban landscape enhance groundwater recharge, improve runoff quality, and reduce runoff quantity. BGI is a vital component of natural resources management and therefore urban planning supports the functioning of BGI networks. In some approaches (Tab. 1, Type 5), the more general *green infrastructure* concepts are followed (e.g. EC, 2013a; EU, 2016), involving the urban landscape as well as stressing the roles of functional planned greenery systems (Wagner & Breil, 2013; Schrijnen, 2000). *Green corridors* may run alongside waterways in the urban landscape (Frischenbruder & Pellegrino, 2006) or verges may provide *green strips* alongside streets (Chicago Department of Transportation, 2007; Newell et al., 2013). The urban ecohydrology specialization promotes a spatially interconnected system of the BGI elements (Wagner et al., 2013), an approach that prioritises and integrates the roles of waterways and hydrological processes at the same time. The studies in which the concept of water bio-corridors prevailed over that of green corridors were classified as a separate type (Tab. 1, Type 6). Fluvial bio-corridors are presented as *green infrastructure* (Philadelphia Water Department, 2009; Strickland et al., 2010) or as a fundamental part of the *green and blue infrastructure* (Perini & Sabbion, 2017). In this concept, BGI functions appear very loosely, with the emphasis on water management and ecosystem matters, together with the creation of recreational axes within the urban landscape.

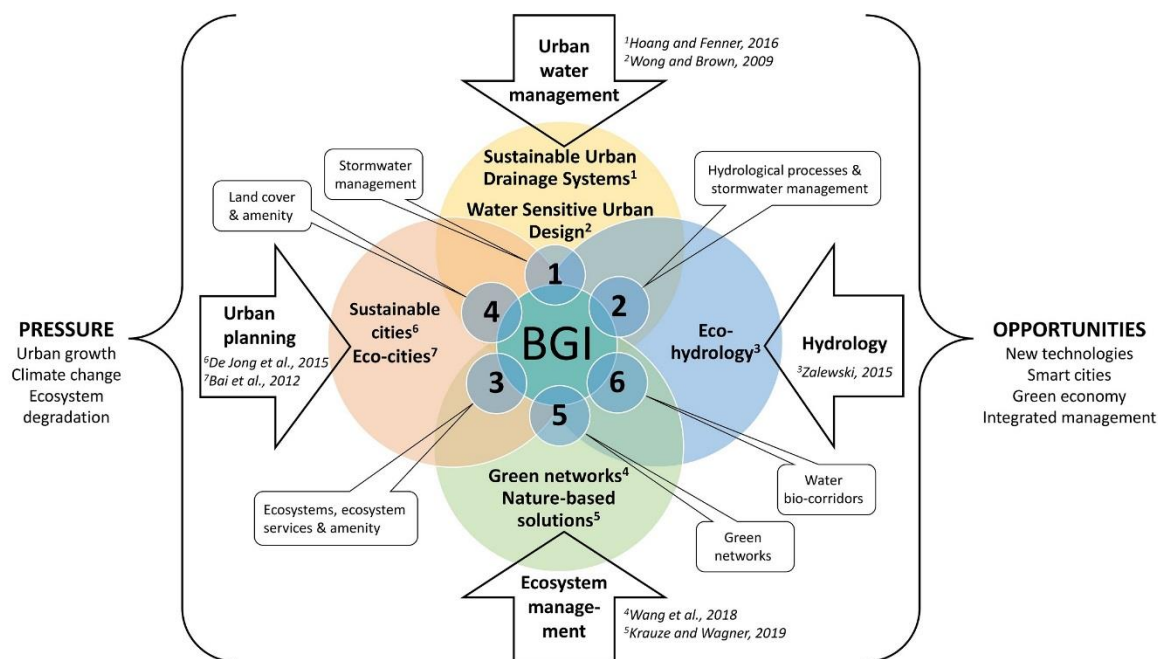


Figure 3. Integrating multidisciplinary concept of BGI based on the analysis of approaches and cited studies, source: prepared by the authors

Table 2. Nexus between specializations in the BGI field and benefits to relevant SDGs,s: Prepared by authors, based on: United Nations, 2015

SDGs	Disciplines and progressive specialization in the BGI field				SDGs targets (UN, 2015)
	Urban water management	Urban planning	Ecosystem management	Hydrology	
	SUDS & WSUD	Sustainable cities & Eco-cities	Green networks & NBS	Ecohydrology	
3	•	••	•		3.4, 3.9
6	•••	•		••	6.3, 6.5, 6.6, 6b
7		••			7.3
8		•			8.2
9	••	••	•		9.1, 9.4, 9.5
11	•••	•••	••	•	11.3, 11.5, 11.6, 11.7, 11b
12	•	••			12.2, 12.8
13	••	••	•••	•	13.1, 13.2, 13.3
14	•		•	•	14.1
15	•		•••	••	15.1, 15.3, 15.9
17	•	•			17.6

SDGs: 3 Good Health and Well-being; 6 Clean Water and Sanitation; 7 Affordable and Clean Energy; 8 Decent Work and Economic Growth; 9 Industry, Innovation and Infrastructure; 11 Sustainable Cities and Communities; 12 Responsible Consumption and Production; 13 Climate Action; 14 Life Below Water; 15 Life on Land; 17 Partnerships to achieve the Goal. Prioritizing the benefit to relevant SDG targets: ••• key benefit, •• important benefit, • marginal benefit

3.4. Integrated concept of BGI

Despite the differences in terminology we found many intersections in BGI approaches indicating a substantial need for deeper multidisciplinary integration. We suggest the BGI integrating concept to bring together the approaches of individual disciplines. Each discipline declares BGI to be a tool for progress in its area (Fig. 3), but their approaches to BGI vary in thematic analysis of documents. We see numerous intersections and interconnections between the types of approaches to BGI and between disciplines, not only in academia, but also in the practice of urban development. We can distinguish

four basic guidelines for the development of science and planning practice, aimed at promoting of an integrated concept of BGI: urban water management (Hoang & Fenner, 2016; Wong & Brown, 2009), urban planning (de Jong et al., 2015; Bai et al., 2012), hydrology (Zalewski, 2015), and ecosystem management (Wang et al., 2018; Krauze & Wagner, 2019).

3.5. Benefits of BGI in achieving the SDGs

Based on the analysis and typology of BGI approaches, the benefits of BGI for urban development were presented in the Section 3.3. We will now use

the integrating multidisciplinary concept of BGI (Fig. 3) as a starting point for classifying the benefits of BGI for relevant SDGs (Tab. 2) (United Nations, 2015). This overview shows that there are several objectives that BGI can support.

The development of urban water management, represented by the City State Continuum concept, is determined by the development of social needs, changing as a result of economic, technological, and environmental progress (Water by Design, 2009, Howe & Mitchell, 2012). In this way, the basic needs of cities in the area of water management (water supply, wastewater treatment) are gradually met (→Goal 6: *Clean Water and Sanitation*; United Nations, 2015). These include protection against floods and improved environment (water corridor quality, water quality). Moreover, tools for adaptation to climate change are widely used, such as the effective use of rainwater, and the amenity function of water in the city (recreational, social, aesthetic, cultural) are strengthened, in their mutual synergy, to form an ideal *water-sensitive city* (Wong & Brown, 2009) (→Goal 9: *Industry, Innovation and Infrastructure*; United Nations, 2015). The concept of sustainable cities (De Jong et al., 2015; Baynes & Wiedmann, 2012), based on the balance between environmental, economic and social development, is the most comprehensive, frequent, and broadest concept of environmental urban modernization (Epstein, 2008; Edlund, 2020; UN, 2012) (→Goal 11: *Sustainable Cities and Communities*; United Nations, 2015).

The increasing need to address the environmental problems associated with water management and to link ecological and landscape-ecological research methods with hydrological methods led to the establishment of ecohydrology at the end of the 20th century (Zalewski, 2000; Zalewski, 2015). Ecohydrological approaches are currently being applied also in the urban landscape. The main impetus for introducing new ecohydrological tools into urban management is the global impact of climate change (Farrelly & Brown, 2011), which is to be addressed with the support of BGI ecosystem functions (→Goal 13: *Climate Action*; United Nations, 2015). Projects supported by ecohydrological research focus on revitalizing urban water flows, building BGI, utilizing wastewater for bioenergy production and promoting urban cooperation among professionals from various industries, the general public and the business community (Wagner et al., 2013; Zalewski, 2015). Urban climate adaptation planning studies use the term BGI only sporadic (Kazmierczak & Carter, 2010; Voskamp & Van de Ven, 2015). The climatic effect of water elements and urban greenery is often presented separately (Giordano et al., 2013; Lehnert et al. 2020)

Support for the ecological stability of the landscape can only be achieved by ensuring the functional spatial coherence of the BGI elements. Considering the

prevailing sustainable design of communities in cities, BGI is the vital framework of urban ecosystem planning (Condon, 2020). The spatial organization of urban green infrastructure has shifted from the creation of bio-corridors or greenways to the planning and creation of green networks (Wang et al., 2018). The role of bio-corridors and greenways is fulfilled in many cases by natural water streams and their floodplains or waterfront zones in urban areas (Perini & Sabbion, 2017). It is important to build these corridors as a systematic part of BGI, as watercourses are both a source and recipient of water in the surrounding landscape) (→Goal 15: *Life on Land*; United Nations, 2015).

4. Conclusions

Studies using the term BGI have increased dramatically in the last five years. We identified six basic types of approaches to BGI, mentioning nine basic thematic areas: land cover, green networks, water bio-corridors, hydrological processes, ecosystems and biodiversity, amenity, stormwater management, climate adaptation, and ecosystems services (Fig. 1; Tab. 1). We classified the six types of approaches into three basic concepts: (a) hydrological approaches (1. Stormwater management, 2. Hydrological processes & stormwater management), (b) integrated approaches (3. Ecosystems, ecosystem services & amenity, 4. Land cover & amenity) and (c) structural (5. Green networks, 6. Water bio-corridors).

Two important conclusions emerge from the typology of the BGI approaches. First, BGI is crucial to most aspects of sustainable urban development. Second, the design and planning using BGI calls for multidisciplinary and integrated concepts consistent with sustainable development goals. Our content analysis clearly demonstrates the importance of BGI to urban sustainability (Purvis et al., 2019; Browder et al., 2019).

BGI addresses environmental improvements in a number of spheres such as clean water, dampening climate extremes, and enhancing biodiversity (Fig. 4). BGI can boost infrastructure system resilience due to its natural adaptive and regenerative capacity (Browder et al., 2019). From a social point of view, BGI has the potential to empower communities through participation in projects such as designing new community and recreational spaces in cities. The impact of BGI elements on improving public health in cities is significant. Economically, BGI provides opportunities for cost-effective stormwater, flooding, water quality solutions, and other ecosystem services (Edlund, 2020). The BGI solutions bring a new technological innovations and support the growth of the green economy.

The implementation of BGI develops cities towards strengthening their sustainability. Our analysis

demonstrates the importance of a clearly defined, integrated, and multidisciplinary BGI concept framework (Fig. 3) as an important component of achieving urban sustainability as defined by the UN SDGs. From the perspective of the 2030 Agenda for Sustainable Development, there are supported especially SDGs 6 Clean Water and Sanitation, 9 Industry, Innovation and Infrastructure, 11 Sustainable Cities and Communities, 13 Climate Action and 15 Life on Land (Tab. 2). It is clear that the importance of BGI varies according to the environmental, economic and social conditions of specific cities.

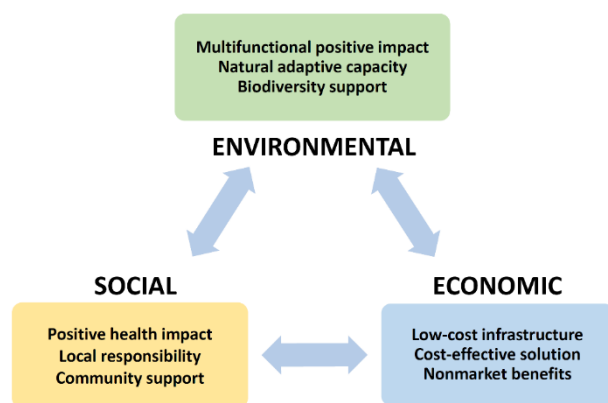


Figure 4. BGI benefits from a three-pillar conception of a sustainability perspective

Multidisciplinary support for new sustainable urban development measures can be not only in the category of normative and economic instruments, but also in the level of ethical tools aimed at changing thinking. This can be demonstrated by the example of progress in urban water management at the level of application of new technologies (e.g. green façades, household water recycling), on the organisational level (e.g. building water-decentralised neighbourhoods, organisational integration of the topic of water in urban administration and management), but also at the level of systemic change of thinking.

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The Effect of Green R&D Activities on China's SO₂ Emissions: Evidence from a Panel Threshold Model

Wpływ ekologicznych działań badawczo-rozwojowych na emisje SO₂ w Chinach – dane z panelowego modelu progowego

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Abstract

Previous studies on the effectiveness of improving sustainable development have acknowledged the importance of domestic research and development (R&D) activities. However, these studies remain general and ambiguous because they assume that all R&D activities are related to energy-saving and sustainable development. The corresponding empirical evidence is scabrous and ambiguous. In this paper, we focus on the effect of green innovation R&D activities on SO₂ emission which is an important greenhouse gas affect global climate change and eco-civilization. Considering that there is heterogeneity exists in the innovation activities, the R&D activities are divided into three performers with two purposes. The empirical results based on a Chinese inter-provincial dataset of 2000-2016 suggest that the green innovation R&D activities are crucial for the reduction of the SO₂ emission. However, the innovation R&D activities of different purposes and performers show statistically differentiated effects on SO₂ emission. The major positive effect of green innovation R&D activities on SO₂ emissions reduction is mainly from enterprises and utility-type of R&D activities. A further study based on the panel threshold also indicates that effects of green innovation R&D activities on SO₂ emissions are nonlinear, depending on the technology absorptive ability.

Key words: green innovation activities, SO₂ emissions, technology absorptive ability, sustainable development

Streszczenie

Dotychczasowe badania nad zrównoważonym rozwojem potwierdziły znaczenie krajowych działań badawczo-rozwojowych (B + R). Jednak badania te pozostają ogólne i niejednoznaczne, ponieważ zakładają, że wszystkie działania B + R są związane z energooszczędnością i zrównoważonym rozwojem. Odpowiednie dowody empiryczne są niejednoznaczne. W artykule skupiamy się na wpływie działań badawczo-rozwojowych związanych z zielonymi innowacjami na emisję SO₂, który jest ważnym gazem cieplarnianym, wpływającym na globalne zmiany klimatyczne. Biorąc pod uwagę, że istnieje heterogeniczność działań innowacyjnych, działalność B + R wskazano 3 aktorów z 2 celami. Wyniki empiryczne oparte na chińskim międzyprowincjonalnym zbiorze danych z lat 2000-2016 sugerują, że działania badawczo-rozwojowe związane z zielonymi innowacjami są kluczowe dla redukcji emisji SO₂. Jednak innowacyjne działania o różnych celach i różnych wykonawcach wykazują statystycznie zróżnicowany wpływ na emisję SO₂. Główny pozytywny wpływ działań B + R w zakresie zielonych innowacji na redukcję emisji SO₂ wynika głównie z działalności przedsiębiorstw i działalności B + R o charakterze użytkowym. Dalsze badanie oparte na panelu wskazuje również, że wpływ działań badawczo-rozwojowych związanych z zielonymi innowacjami na emisję SO₂ jest nieliniowy, w zależności od zdolności absorpcyjnej technologii.

Słowa kluczowe: ekologiczne działania innowacyjne, emisje SO₂, zdolność absorpcji technologii, zrównoważony rozwój

1. Introduction

Over the past 40 years of reform and opening up, China's sustainable development is becoming increasingly severe that attracts worldwide attention. The area of acid rain has already accounted for 30% of the country's land. The economic loss caused by acid rain and SO₂ pollution is more than 100 billion yuan per year. China's SO₂ emissions rank first in the world and have exceeded 20 million tons for many years¹. Sustainable development has always been a hot topic and the ultimate goal of global economic development. As the best embodiment of sustainable development, green energy-saving has been valued by governments of all countries, and China has taken green innovation and energy reduction as a long-term implementation of the whole society.

SO₂ emissions not only harms human health, but also forms acid rain, corrodes building materials, and damages the ecosystem, which are resulting in huge economic losses and it becomes one of the important factors of restricting the sustainable development of the environment and society. According to the report entitled with *Towards an environmentally sustainable future: the national environmental analysis of the People's Republic of China* jointly published by Asian Development Bank and Tsinghua University in 2013, among the 10 most polluted cities by SO₂ all over the world, China accounted for 70%. As an important factor of sustainable development, the SO₂ emissions have become an intractable problem that needs to be solved urgently. A series of reasons such as coal-based energy structure, immature desulfurization technology, and low pollutant discharge fees have caused serious SO₂ pollution facts which have affected the sustainable development of society and economy. Under this background, the analysis the driving forces of the change in SO₂ emissions has important implications in solving the contradiction between sustainable development and energy intensity. It is a possible way for China to join the management of climate change, and promote green transformation and development, as well as actively participating in new opportunities for global low-carbon development, and cultivating new motivation for sustainable development.

2. Literature review

Most scholars have investigated the driving forces of the change in SO₂ emissions, finding that the domestic R&D activities and structural change are important for SO₂ emission reduction. For instance, Voigt et al. (2014) used the World Input-Output Database to analyze energy intensity trends and drivers in 40 major economies around the world. They be-

lieve that technological advancement is the most important cause of the decline in energy intensity during the period 1995-2007. Yu (2012) used the spatial panel model to analyze the influencing factors of China's inter-provincial energy intensity from 1988 to 2007, whose research results show that the increase of R&D investment can significantly reduce China's energy intensity, while the heavy industry-based economic structure and coal-based energy consumption structure significantly hinders China's energy reduction. At the industry level, by employing the two-stage least square method, Shen and Lin (2020) report that the R&D inputs is positively associated with the energy intensity reduction for China's 27 manufacturing industrial sub-sectors over the period of 2001-2014.

Based on the literature above, it can be found that the increase in R&D activities helps to reduce SO₂, but these research results only consider the impact of overall R&D activities on SO₂, and do not distinguish between R&D activities related to green innovation and R&D not related to green innovation. In fact, not all R&D activities will affect environmental variables. Therefore, the research conclusions and policy recommendations obtained from the above studies are not scientific. In order to explore the impact of R&D activities on SO₂ more specific, it is necessary to focus on green R&D innovation activities.

Due to the importance of the SO₂ emissions, there have been a number of researchers who explored the driving factors behind China's SO₂ emission, and accordingly put forward policy guidance for the reduction of the SO₂ emission. Most of the existing researches focus on the effects of the entire technological innovation activities on CO₂, SO₂, etc. (Xu et al., 2019; Zheng et al., 2019; Li et al., 2012). In fact, only green innovation R&D activities can significantly affect CO₂ and the SO₂ emission (Zhang et al., 2015; Li et al., 2018; Cai et al., 2019; Teng et al., 2019). This also makes the relevant research conclusions and policy recommendations too scabrous and ambiguous, which make it is worth to be further discussed.

Second, significant heterogeneities exist within the green R&D activities. Different types of green R&D activities will result in differentiated ecological outcome. For example, there are different purposes of green R&D activities, which can be divided into utility-type activities and innovation-type activities. We can expect these two different types of activities have different effects on eco-civilization variables. Utility-type activities focus on practical value, which may have greater effect on SO₂ emissions. Although innovation-type activities show more attention to most advanced technology, they

¹ Based on the air quality report from Ministry of Ecology and Environment of the People's Republic of China 2001-2017.

still too stick to theoretical value which may cause less efficient to reduce SO₂ emissions.

Furthermore, the effect of green R&D activities on sustainable development is closely related to technology absorption capacity. For instance, it is more likely for the enterprises with higher level of technology absorption to have a positive effect from the R&D activities. By contrast, the ones with low level of technology absorption capacity are likely to undergo a negative spillover effect. Unfortunately, the majority of the existing studies have not given sufficient attention to this issue, and only a few scholars have carried out relevant studies. For instance, based on the panel threshold model and a China's provincial dataset over the period of 2000-2016, Chen et al. (2019) reported that when the human capital stock is low, it is hard to the provinces to expect a positive energy intensity reduction effect from the domestic R&D activities.

Similar to Steinberger et al. (2010) and Shafiei et al. (2014), Mensah et al. (2019) using STIRPAT and IPAT models, found transportation-related technologies have been beneficial to green growth in the Oceania sub-region. OECD Asia's technologies for production and processing of goods have been beneficial to green growth. Climate change technologies in relation to generation and transmission of energy are detrimental to green growth in the OECD economies and its impact is evident in Asia and Europe sub-panels. Environmental related budget and taxes have been found worthwhile in the pursuit of green growth from the dominant negative coefficient values. Various studies employ the IPAT model (Dietz et al., 1997; York et al., 2003). Wen et al. (2019) used the IPAT model and included 16 indicators from 2001 to 2016 to determine and classify the influencing factors of CO₂ emission. Empirical results show that affluence, technology and energy have a significant positive impact on CO₂ emission at the national level.

With these gaps in mind, this study focuses on the green R&D activities. The fixed effects model are employed to explore the effect of green R&D activities on SO₂ emissions at first. Considering that the impact of green R&D activities on SO₂ emissions will undergo structural break when the technology absorptive ability is at different levels, the panel threshold model is further applied. In addition, considering that there is significant heterogeneity within the green R&D activities, we divided the green R&D activities according to their purposes and the effect of green R&D activities, and an independent analysis is also conducted.

The main contributions of the current research are threefold. First, to provide the valid policy implications of sustainable development for the governments, the total R&D activities is narrowed down to its green R&D activities. Second, the green R&D activities are also classified according to their different purposes, showing more details how green R&D ac-

tivities influence the sustainable development. Third, the technology absorptive ability is also incorporated as an important factor influencing the effect of green R&D activities on reducing SO₂ emissions. The structure of the current study is as follows. As highlighted in Section 2, the literature review based on factors that influence SO₂ emissions. Section 3 undertakes the methodology and data management. Empirical results from linear regression and thresholds model are introduced in section 4. The conclusions and discussion are given in Sections 5, together with the policy implications respectively.

3. Methodology and data management

3.1. The empirical model for SO₂

The STIPRAT model is the most widely used to employ environmental problems at home and abroad. Usually, logarithms are taken on both sides of the equation to reduce data fluctuation and heteroscedasticity when processing panel data. After taking the logarithm, the equation becomes:

$$\ln I_{it} = \beta_0 + \beta_1 \ln P_{it} + \beta_2 \ln A_{it} + \beta_3 \ln T_{it} + \varepsilon_{it} \quad (1)$$

In the above equation, i stands for different provinces, t stands for time, β_0 stands for a constant term, ε_{it} is the random interference term. β_m ($m = 1, 2, 3$) are the parameters to be estimated, including the impact of population size, economic development level, and technological development level on SO₂ emissions.

In practical application, since the factors affecting SO₂ emissions are not limited to the independent variables above, but also related to other variables such as urbanization and environmental management, it is necessary to add in relevant variables appropriately according to the actual case of the research problem. In order to test whether there is an environmental Kuznets curve (EKC) between SO₂ emissions and economic development level, this paper further investigates the relationship between the SO₂ emissions and the GDP per capita of each province. By taking the GDP per capita and the square of GDP per capita as the independent variables, this paper follows the double logarithmic model proposed by Shafik and Bandy Opadhyay (1992), and expands the STIRPAT model as follows:

$$\begin{aligned} & \ln(PSO_{it}) \\ &= \beta_0 + \beta_1 \ln(PGDP)_{it} + \beta_2 (\ln(PGDP))_{it}^2 + \beta_3 \ln X_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

In the above formula, PSO represents SO₂ emissions, β_1 and β_2 represent the coefficients of provincial GDP per capita and GDP per capita square respectively; ε_{it} represents the disturbance terms. The footnotes i ($i = 1, 2, 3, \dots, M, N$) and t ($t = 1, 2, 3, \dots, S, T$) represent the province and year respectively. In addition to that, X are the control variables, including IND, UR, ENSTR and FDI_STR, denoting the

proportion of secondary industry to GDP, urbanization, energy structure and foreign direct investment structure, respectively. The shape of the environmental Kuznets curve can be judged by analyzing the sign of the coefficients².

The follow-up research of this paper will base on the equations (2). Since there may be unobservable heterogeneity in the aspects of production methods, social values, etc. among different regions, if OLS regression is directly performed on equation (2), the parameter estimation could be biased. Generally, an individual fixed effect (FE) model is used to eliminate the time-independent individual effects.

3.2. Data source and management

Since the data of Tibet, Hong Kong, Macao, and Taiwan is unavailable (cause the data cannot be captured), a panel dataset that only include China's 30 provinces between 2000 and 2016 are included in our sample analysis.

The explained variable (i.e. SO₂ emissions) is represented by the ratio SO₂ consumption divided by population (unit: Ton/person). The data on population and the SO₂ emissions are respectively sourced from China Statistical Yearbooks (CSY) from year 2001 to 2017.

GDP per capita is denoted by the ratio of GDP divided by population. Before calculating the GDP per capita, the data on GDP should be adjusted in 2000 constant price.

The ratio of the added value in the secondary industry to GDP denotes the economic structure. The proportion of FDI in fixed asset investment means the FDI structure. The effect of urbanization on SO₂ emissions is obtained by percentage of City Resident Population to total population. The corresponding data is available in the China Statistical Yearbooks. The ratio of the carbon consumption to total energy consumption denotes the energy structure. The corresponding data is available in the China Energy Statistical Yearbooks.

Energy-saving technology innovation is denoted by the number of energy-saving patents, which are sourced from the database of Chinese Patents. We obtain the number of energy-saving patents using the standard application date. The number of invention patents and utility model patents denote the different purposes of energy-saving innovations activities. The invention patents primarily represent energy-saving technological proposals on new products, new materials, and so on. Although the utility patents are less technological than invention patents, they emphasize practical application value. Finally, because of the time lag effect between energy-saving technology and SO₂ emissions, we employ the

lagged energy-saving patents rather than the current energy-saving patents, in our empirical model. Consequently, the number of energy-saving patents from 1999 to 2015 in our empirical analysis is applied. Table1 provides the definition and description of all variables.

Table 1. Definition and data description of the variables

Symbol	Definition	Proxy variables	Unit
<i>PSO</i>	SO ₂ emissions	The ratio of the SO ₂ emissions divided by population	%
<i>PGDP</i>	GDP per capita	The ratio of GDP divided by population	%
<i>PGDP2</i>	GDP per capita square	The square of GDP per capita	%
<i>IND</i>	Economic structure	The ratio of the secondary industry to GDP	%
<i>ENSTR</i>	Energy structure	The ratio of the carbon consumption to total energy consumption	%
<i>FDI-STR</i>	FDI structure	The ration of FDI in fixed asset investment	%
<i>UR</i>	Urbanization	City Resident Population rate	%
<i>ZZL</i>	Total patent	The total energy-saving innovation activities	pcs
<i>SYZL</i>	Utility-type patent	The utility-type of energy-saving activities	pcs
<i>FMZL</i>	Innovation-type patent	The innovation-type of energy-saving activities	pcs
<i>QY</i>	Enterprises patent	The energy-saving innovation activities carried by enterprises	pcs
<i>GX</i>	University patent	The energy-saving innovation activities carried by higher education institutions	pcs
<i>GR</i>	Individual patent	The energy-saving innovation activities carried by individuals	pcs
<i>FWGL</i>	Waste management	The green innovation R&D activities carried by waste management	pcs
<i>XZGL</i>	Administration management	The green innovation R&D activities carried by administration management	pcs
<i>JNJS</i>	Energy-saving technology	The green innovation R&D activities carried by energy-saving technology	pcs
<i>YS</i>	Transport	The green innovation R&D activities carried by transport	pcs

² The relationship between the coefficients and the EKC curve is as follows: When $\beta_1=\beta_2=0$, there is no stable correlation between environmental quality and economic growth. When $\beta_1 \neq 0$, $\beta_2 = 0$, there is a monotonous

increasing (or decreasing) linear relationship between environmental quality and economic growth. When $\beta_1 > 0$, $\beta_2 < 0$, the relationship between environmental quality and economic growth presents as an inverted U curve.

4. Results and discussions

4.1. Results from the Linear Regression Analysis

In Table 2, models (1) - (4) adopt fixed-effect model based on equations (2) respectively to examine the linear impact of various sources of technological progress on China's SO₂ emissions.

The regression results show that the proportion of secondary industry has a significant positive effect on SO₂ emissions. It can be seen from Table 2 that the correlation between industrial structure and provincial SO₂ emissions has passed the 1% significance test and is significantly positive. This shows that the larger the proportion of the secondary industry is, the greater the SO₂ emissions are. The environmental effect of the industrial structure is obvious. Unreasonable industrial structure will increase environmental pollution. Many scholars have done research on the environmental effects of industrial structure. For example, Ding et al. (2012) and other scholars have carried out research based on panel data of 30 provinces in China and obtained similar results. At present, although the industrial structure of most provinces in China is developing in a more rationalized fashion, some provinces still rely too much on the secondary industry, and the problems of high resource and energy consumption and serious environmental pollution still exist undoubtedly. Adjusting and optimizing the industrial structure is still a crucial issue in China's current stage of economic development. In particular, reducing the proportion of the secondary industry and improving the efficiency of economic development are important ways to improve China's environmental quality.

It is shown that the structure of FDI has a negative impact on the intensity of industrial SO₂ emissions and is significant at the 10% level. From the perspective of the effect of FDI structure on SO₂ emissions, the regression coefficients are -0.044 and -0.042, indicating that the inflow of FDI actually helps to promote the industrial sector to improve desulfurization equipment and reduce SO₂ emissions. However, judging from the significant results, this effect is very weak. In general, FDI has not shown a trend of transferring pollutants to China on a large scale but has helped to adjust and optimize related industries. By analyzing the above phenomenon, this paper believes that it is mainly caused by the following reasons. Firstly, the scale of FDI in China is constantly expanding. The advanced environmental technologies owned by foreign companies can help to promote the reduction of SO₂ emissions in the industry, and their technological spillovers to domestic companies can also compel domestic companies to lower SO₂ emissions. Secondly, with the continuous increase of FDI in China, the domestic environmental management system has been therewith strengthened, and the environmental standards for foreign-invested enterprises have been significantly height-

ened accordingly, meanwhile, the restrictions on the *pollution transfer* has much increased compared to that in the initial period of the opening up. China's positive environmental spill over is getting stronger in the long run.

Urbanization is an important factor in the continuous expansion of energy use. This study shows that urbanization has a negative and insignificant effect on SO₂ emissions. This judgment is mainly based on that urbanization is an evolutionary process, and that different stages of urban development will bring forth different industrial layouts and scales. Generally speaking, the industrial layout in the early stages of urban development is more focused on industries, and this stage is where pollutants increase rapidly. As the level of economic development improves, with more capital and technology, the ability of environmental governance and the environmental standards of the foreign-invested enterprises are enhanced. Meanwhile, some outdated production lines and industries with high pollution and high energy consumption will be phased out, and transferred to under-development regions and nations. Judging from the regression results, this kind of *pollution migration* has become more obvious. The *pollution refuge* has emerged among regions of different economic development levels, that is, pollutive industries move from areas with high population density to areas with low population density.

With regard to total patents, as expected, the coefficient (i.e. $\ln ZL$) is negative and significant, this suggests that total patents will have a positive role in reducing the SO₂ emissions. A 1% increase in total patents will lead to approximately 17.3% decrease in the SO₂ emissions.

4.1.1. The effect of green innovations with different purposes

When we consider the green innovations with different purposes (i.e. $\ln FMZL$ and $\ln SYZL$), we still employ the FE estimators to re-estimate the model. The empirical results are shown in column 3 of Table 2. Although the utility-type activities are equipped with lower technology level compared to the invention activities, they are devoted to solving the practical problems and emphasize practicability. Utility patents is significantly negative to SO₂ emissions (-0.243), while invention patents are significantly positive (0.047), which implies that invention patents hinder environmental improvement as they are not meant for practical application. As shown, it is still surprising that there are great differences in terms of the coefficients on $\ln FMZL$ and $\ln SYZL$. Between the two different purposes of green innovations, only the utility-type activities show a positive and significant role in decreasing the SO₂ emissions, implying the major positive reduction effect of the SO₂ emissions is from utility-type activities rather than the invention activities.

Table 2. The results based on fixed effect

	d1	d2	d3	d4
<i>lnPGDP</i>	0.389*** (-0.087)	0.353*** (-0.088)	0.516*** (-0.089)	0.511*** (-0.096)
<i>lnPGDP2</i>	-0.141*** (-0.029)	-0.126*** (-0.028)	-0.088*** (-0.029)	-0.137*** (-0.028)
<i>lnIND</i>	0.531*** (-0.104)	0.514*** (-0.101)	0.507*** (-0.101)	0.475*** (-0.104)
<i>lnENSTR</i>	0.702*** (-0.085)	0.707*** (-0.083)	0.681*** (-0.083)	0.699*** (-0.084)
<i>lnFDI_STR</i>	-0.044* (-0.023)	-0.03 (-0.023)	-0.018 (-0.023)	-0.042* (-0.023)
<i>lnUR</i>	-0.107 (-0.195)	-0.072 (-0.192)	-0.002 (-0.188)	-0.005 (-0.196)
<i>lnZZL</i>	-0.173*** (-0.03)			
<i>lnSYZL</i>		-0.243*** (-0.033)		
<i>lnFMZL</i>		0.047* (-0.028)		
<i>lnFWGL</i>			-0.129*** (-0.031)	
<i>lnXZGL</i>			-0.065*** (-0.019)	
<i>lnJNJS</i>			0.038 (-0.024)	
<i>lnYS</i>			-0.108*** (-0.029)	
<i>lnQY</i>				-0.072*** (-0.022)
<i>lnGX</i>				-0.083*** (-0.031)
<i>lnGR</i>				-0.085*** (-0.031)
_cons	-0.944 (-0.889)	-0.928 (-0.862)	-1.102 (-0.847)	-1.092 (-0.875)
Hausman(p)	32.72***	32.17***	32.77***	40.1***
Heteroscedasticity test	1174.05***	2735.51***	1210.46***	1143.8***
Autocorrelation test	75.389***	68.702***	75.595***	69.405***
CD	38.754***	38.792***	39.282***	38.554***
N	510	510	510	510

Notes: (a) ***, **, and * denote significance at the 1% level, 5% level, and 10% level respectively. (b) Values in () denote the std. error for the coefficient. (c) The null hypothesis for heteroscedasticity test is that there is no heteroscedasticity. (d) The null hypothesis for autocorrelation test is that there is no first order autocorrelation. (e) The CD test checks cross-sectional dependence of residuals. In CD test, the null hypothesis is cross-section independent.

4.1.2. The effect of green innovations with different types

When we examine the green innovations with different types (i.e. *lnFWGL*, *lnXZGL*, *lnJNJS* and *lnYS*), we still employ the FE estimators to re-estimate the

model. The empirical results are shown in column 4 of Table 2. Waste management, administrative management, and transportation is all significantly negative to the SO₂ emissions, suggesting that such green innovation R&D activities have positive effect on

the reduction of the SO₂ emissions, while energy saving technology does opposite. As shown, it is still surprising that there are great differences in terms of the coefficients of $\ln FWGL$, $\ln XZGL$, $\ln NJS$ and $\ln YS$. Among the four different types of green innovations, only the energy-saving technology activities show a negative role in decreasing the SO₂ emissions emission, implying the major positive reduction effect of the SO₂ emissions is not from energy-saving technology rather than other three activities.

4.1.3. The effect of green innovations with different performers

Based on the above analysis, when discussing green innovations with different performers, we can expect a positive role from utility and invention patents. This implies that green innovations with different performers are very effective in reducing SO₂ emissions per capita. However, there are significant heterogeneities within the activities because different performers undertake them, when considering R&D activities from the perspective of different performers (i.e. $\ln QY$, $\ln GX$, and $\ln GR$). The fourth column of Table 2 shows estimates of the roles of different performers in the SO₂ emissions based on FE estimator. To examine whether the activities of universities, enterprises and individuals are beneficial in reducing the SO₂ emissions, we also employ FE for the estimation. Column 5 shows the results. The purpose of the enterprises is clear, which is to maximize profit. Besides they are at the forefront of production and understand practical production problems. Notably, all the three performers have significant influence in reducing SO₂ emissions emission, implying positive effect from green innovations carried out by different performers in reducing the SO₂ emissions. Patents from enterprises, universities and individuals are all beneficial to the reduction of SO₂ emissions, but among which the effect of university patents (-0.063) is weaker than enterprise patents (-0.083) and individual patents (-0.095), suggesting that enterprises will actively adopt energy saving technology to survive in the market of full competition and thus lowering the SO₂ emissions.

4.2. Results from the threshold models

For the purpose of comprehensively revealing the manner in which the technology absorption capacity impacts various innovations that influences China's SO₂ emissions, the panel threshold model is employed. Before carrying out the nonlinear analysis, it is necessary to test the presence of a threshold impact between technology innovations and China's SO₂ emissions with the use of *bootstrap method* put forward by Hansen. Subsequent to the application of *bootstrap method* for testing if there is a threshold

effect, the number of thresholds requires estimation as follows.

$$\ln pso_{i,t} = \theta_1 X_{it}(q_{it} \leq r) + \theta_2 X_{it}(q_{it} > r) + \mu_i + e_{it}, \quad (3)$$

where subscripts i and t represents the region and time, respectively; X corresponds to the independent variables, namely green R&D activities, economic structure, energy mix, FDI, and export; θ_i ($i = 1, 2$) denotes the vectors of the coefficients on X on either side of the threshold; r represents the selected threshold value; and q denotes the threshold. The specification of model (3) could be extended to the multiple threshold case.

As indicated in Huang et al., Lai et al., and Cohen and Levinthal, human capital stock (HCS) and full-time equivalent of R&D personnel (FEP) are capable of not just serving as a key driver for accelerating the technological progress, but also improving the technology absorption capacity as well. Accordingly, HCS and FEP are typically considered to be a tool to measure technology absorption capacity. We use the number of years of education per capita to indicate HCS and number of R&D staff recruited in accordance with their duty hours to indicate FEP³.

Table 3 and 4 provides the nonlinear estimation findings through the application of the panel threshold model when HCS is at varied levels. When selecting total patents ($\ln ZZL$), utility-type patents ($\ln SYZL$), invention patents ($\ln FMZL$), enterprise patents ($\ln QY$), university patents ($\ln GX$), individual patents ($\ln GR$), together with green innovation R&D activities as the variables we are concerned about, the rejection of non-existent thresholds for the total patents ($\ln ZZL$), utility-type patents ($\ln SYZL$) and green innovation R&D activities generated by waste management ($\ln FWGL$), administrative management ($\ln XZGL$), and transportation ($\ln YS$) reached significance at the 1% level. In summary, the test results in Table 3 and Table 4 show that the impact of technological innovations generated by various channels on the SO₂ emissions of China has a significant threshold effect, which will change with the intensity of HCS input and is very sensitive. Table 3 and Table 4 give the specific estimation results using the threshold panel model.

As shown in Table 3, row 6 shows HCS as the threshold variable. The impact of technological innovations generated by the invention patent ($\ln FMZL$) channel on the SO₂ emissions varies as the degree of HCS input changes. When the HCS entry level is less than the first threshold (i.e. 8.2146), the technological innovation effect of the invention patent channel can significantly increase SO₂ emissions. Once the HCS exceeds the first threshold but is less than the second threshold value (i.e. 9.4226), the technological spillover generated by $FMZL$ chan-

³ when FEP or HCS is selected as another threshold variable, the test findings still clearly reject the linear structure of the model. The above empirical evidence reveals that

various innovations manifest high sensitivity towards changes in HCS or FEP (paper is limited, one can ask the author for results).

Table 3. Test of threshold effects by selecting HCS as the threshold variable – part 1

Threshold variable	Independent variable	Threshold value	Variable	Coefficient	Threshold value	Variable	Coefficient	Threshold value	Variable	Coefficient
HCS	lnZZL	$\gamma < 8.2146$	lnZZL	-0.1369***	$8.2146 < \gamma < 9.4226$	lnZZL	-0.1678***	$9.4226 < \gamma < 10.3528$	lnZZL	-0.203***
	lnSYZL	$\gamma < 8.2146$	lnSYZL	-0.2187***		lnSYZL	-0.2493***		lnSYZL	-0.2910***
			lnFMZL	0.0610*		lnFMZL	0.0610*		lnFMZL	0.0610*
	lnFMZL	$\gamma < 8.2146$	lnSYZL	-0.2295***	$8.2146 < \gamma < 9.4226$	lnSFDI	-0.2295***	$9.4226 < \gamma < 10.3528$	lnSFDI	-0.2295***
			lnFMZL	0.0748**		lnFMZL	0.0386		lnFMZL	-0.0020
	lnQY	$\gamma < 8.2387$	lnQY	-0.0461*	$8.2387 < \gamma < 9.4226$	lnQY	-0.0811***	$9.4226 < \gamma < 10.3528$	lnQY	-0.1193***
			lnGX	-0.0761***		lnGX	-0.0761***		lnGX	-0.0761***
			lnGR	-0.0719**		lnGR	-0.0719**		lnGR	-0.0719**
	lnGX	$\gamma < 8.2146$	lnQY	-0.0632**	$8.2146 < \gamma < 9.4226$	lnQY	-0.0632**	$9.4226 < \gamma < 10.3528$	lnQY	-0.0632**
			lnGX	-0.0680*		lnGX	-0.1062***		lnGX	-0.1488***
			lnGR	-0.0659*		lnGR	-0.0659*		lnGR	-0.0659*
	lnGR	$\gamma < 8.2146$	lnQY	-0.0676***	$8.2146 < \gamma < 9.4226$	lnQY	-0.0676***	$9.4226 < \gamma < 10.3528$	lnQY	-0.0676***
			lnGX	-0.0812**		lnGX	-0.0812**		lnGX	-0.0812**
			lnGR	-0.0524		lnGR	-0.0845**		lnGR	-0.1269***

Table 4. Test of threshold effects by selecting HCS as the threshold variable – part 2

Threshold variable	Independent variable	Threshold value	Variable	Coefficient	Threshold value	Variable	Coefficient	Threshold value	Variable	Coefficient
HCS	lnFWGL	$\gamma < 8.2146$	lnFWGL	-0.1098***	$8.2146 < \gamma < 9.4226$	lnFWGL	-0.1413***	$9.4226 < \gamma < 10.3528$	lnFWGL	-0.1822***
			lnXZGL	-0.0515**		lnXZGL	-0.0515**		lnXZGL	-0.0515**
			lnNJS	0.0521***		lnNJS	0.0521***		lnNJS	0.0521***
			lnYS	-0.1109***		lnYS	-0.1109***		lnYS	-0.1109***
	lnXZGL	$\gamma < 8.1662$	lnFWGL	-0.1221***	$8.1662 < \gamma < 9.4226$	lnFWGL	0.1221***	$9.4226 < \gamma < 10.3528$	lnFWGL	0.1221***
			lnXZGL	-0.0205***		lnXZGL	-0.0695***		lnXZGL	-0.1147***
			lnNJS	0.0501*		lnNJS	0.0501*		lnNJS	0.0501*
			lnYS	-0.1136***		lnYS	-0.1136***		lnYS	-0.1136***
	lnNJS	$\gamma < 8.2146$	lnFWGL	-0.1226***	$8.2146 < \gamma < 9.4226$	lnFWGL	-0.1226***	$9.4226 < \gamma < 10.3528$	lnFWGL	-0.1226***
			lnXZGL	-0.0488**		lnXZGL	-0.0488**		lnXZGL	-0.0488**
			lnNJS	0.0626**		lnNJS	0.0315		lnNJS	-0.0085
			lnYS	-0.1126***		lnYS	-0.1126***		lnYS	-0.1126***
	lnYS	$\gamma < 8.2146$	lnFWGL	-0.1189***	$8.2146 < \gamma < 9.4226$	lnFWGL	-0.1189***	$9.4226 < \gamma < 10.3528$	lnFWGL	-0.1189***
			lnXZGL	-0.0494**		lnXZGL	-0.0494**		lnXZGL	-0.0494**
			lnNJS	0.0511*		lnNJS	0.0511*		lnNJS	0.0511*
			lnYS	-0.0976***		lnYS	-0.1370***		lnYS	-0.1846***

nel has no significant effect on SO₂. When HCS further increases, i.e. $9.4226 < \gamma < 10.3528$, technological innovation in FMZL channel will reduce the SO₂ emissions. This shows that the increase in HCS has changed the negative effect of FMZL on the SO₂ emissions.

As above, the empirical results of selecting HCS as a threshold variable show that the increase in HCS can enhance the positive spillover effect of green innovation R&D activities on reducing the SO₂ emissions. The increase in HCS can make the impact of utility patents on SO₂ reduction more significant, because the enterprises in production will actively digest and absorb the SO₂ emissions reduction

knowledge and technology, which will help various channels to form a positive spillover effect on reducing the SO₂ emissions. In theory, human capital can not only directly create knowledge and improve economic efficiency, but at the same time improve the performers' ability to digest and absorb advanced knowledge and technology and promote technological innovation in various channels. The empirical results show that the purpose of HCS investment by Chinese enterprises and universities is clear and can directly reduce the SO₂ emissions. This conclusion is similar to Zheng et al. (2011) who studied the non-linear effect of independent innovation on the export channel of China's industrial energy intensity.

Table 5. Test of threshold effects by selecting FEP as the threshold variable – part 1

Threshold variable	Independent variable	Threshold value	Variable	Coefficient	Threshold value	Variable	Coefficient	Threshold value	Variable	Coefficient
FEP	lnZZL	$\gamma < 19368.1$	lnZZL	-0.1104***	19368.1 < $\gamma < 31494.6$	lnZZL	-0.1450***	31494.6 < $\gamma < 94551.9$	lnZZL	-0.1709***
	lnSYZL	$\gamma < 19368.1$	lnSYZL	-0.1720***	19368.1 < $\gamma < 31494.6$	lnSYZL	-0.2107***	31494.6 < $\gamma < 135781.8$	lnSYZL	-0.2352***
			lnFMZL	0.0427		lnFMZL	0.0427		lnFMZL	0.0427
	lnFMZL	$\gamma < 17751.3$	lnSYZL	-0.2016***	17751.3 < $\gamma < 31494.6$	lnSFDI	-0.2016***	31494.6 < $\gamma < 94551.9$	lnSFDI	-0.2016***
			lnFMZL	0.0805**		lnFMZL	0.0362		lnFMZL	0.0082
	lnQY	$\gamma < 18559.7$	lnQY	-0.0278	18559.7 < $\gamma < 31494.6$	lnQY	-0.0774***	31494.6 < $\gamma < 94551.9$	lnQY	-0.1019***
			lnGX	-0.0505		lnGX	-0.0505		lnGX	-0.0505
			lnGR	-0.0586		lnGR	-0.0586		lnGR	-0.0586
	lnGX	$\gamma < 19368.1$	lnQY	-0.0586**	19368.1 < $\gamma < 31494.6$	lnQY	-0.0586**	31494.6 < $\gamma < 94551.9$	lnQY	-0.0586**
			lnGX	-0.0334		lnGX	-0.0707*		lnGX	-0.1004***
			lnGR	-0.0575		lnGR	-0.0575		lnGR	-0.0575
	lnGR	$\gamma < 19368.1$	lnQY	-0.0663***	19368.1 < $\gamma < 31494.6$	lnQY	-0.0663***	31494.6 < $\gamma < 94551.9$	lnQY	-0.0663***
			lnGX	-0.0582		lnGX	-0.0582		lnGX	-0.0582
			lnGR	-0.0285		lnGR	-0.0675*		lnGR	-0.0919**

Table 6. Test of threshold effects by selecting FEP as the threshold variable – part 2

Threshold variable	Independent variable	Threshold value	Variable	Coefficient	Threshold Value	Variable	Coefficient	Threshold value	Variable	Coefficient
FEP	lnFWGL	$\gamma < 19368.1$	lnFWGL	-0.0991***	19368.1 < $\gamma < 31494.6$	lnFWGL	-0.1391***	31494.6 < $\gamma < 94551.9$	lnFWGL	-0.1610***
			lnXZGL	-0.0546**		lnXZGL	-0.0546**		lnXZGL	-0.0546**
			lnZNJS	0.0382		lnZNJS	0.0382		lnZNJS	0.0382
			lnYS	-0.0621*		lnYS	-0.0621*		lnYS	-0.0621*
	lnXZGL	$\gamma < 18559.7$	lnFWGL	-0.1208***	18559.7 < $\gamma < 53322.1$	lnFWGL	-0.1208***	53322.1 < $\gamma < 93743.5$	lnFWGL	-0.1208***
			lnXZGL	-0.0138		lnXZGL	-0.0794***		lnXZGL	-0.0542**
			lnZNJS	0.0405		lnZNJS	0.0405		lnZNJS	0.0405
			lnYS	-0.0844**		lnYS	-0.0844**		lnYS	-0.0844**
	lnZNJS	$\gamma < 19368.1$	lnFWGL	-0.1158***	19368.1 < $\gamma < 31494.6$	lnFWGL	-0.1158***	31494.6 < $\gamma < 94551.9$	lnFWGL	-0.1158***
			lnXZGL	-0.0515**		lnXZGL	-0.0515**		lnXZGL	-0.0515**
			lnZNJS	0.0632**		lnZNJS	0.0196		lnZNJS	-0.0008
			lnYS	-0.0712*		lnYS	-0.0712*		lnYS	-0.0712*
	lnYS	$\gamma < 19368.1$	lnFWGL	-0.1141***	19368.1 < $\gamma < 31494.6$	lnFWGL	-0.1141***	31494.6 < $\gamma < 94551.9$	lnFWGL	-0.1141***
			lnXZGL	-0.0540**		lnXZGL	-0.0540**		lnXZGL	-0.0540**
			lnZNJS	0.0368		lnZNJS	0.0368		lnZNJS	0.0368
			lnYS	-0.0429		lnYS	-0.0866**		lnYS	-0.1164***

It is easy to see from table 5 and table 6 that when FEP is the threshold variable, the impact of technological innovations generated by different innovations varies with the changes in FEP. Regardless of the range of FEP, the technological innovations generated by the above channels can all play a role in reducing SO₂ emissions, which is similar to the results in table 3 and 4.

5. Conclusion and policy implications

This paper establishes a unified analysis framework that includes the technological progress formed by green innovations, and analyzes the impact of various technological progresses on the SO₂ emissions

using China's inter-provincial panel data from 2000 to 2016. Firstly, this paper applies a fixed effect model to analyze and compare the impact of various sources of technological progress on the SO₂ emissions. Secondly, given that the obvious differences in technology absorption capacity may lead to differentiated effects of various technological innovations on the SO₂ emissions, this paper also applies the threshold panel model to analyze the characteristics of the impact of HCS and FEP on the SO₂ emissions through various technological innovations channels. The main research conclusions and policy recommendations of sustainable development are as follows.

The regression results based on the linear model show that: among various sources of technological progress, enterprises play a vital role in reducing the SO₂ emissions per capita in China, and their impact is far greater than the technological innovation produced by universities and individuals. Secondly, utility-type patents can reduce the SO₂ emissions, while the technological innovations formed by invention patents have instead increased the SO₂ emissions in China. Finally, among the impacts of technological innovations formed by green innovation on the SO₂ emissions, channels including waste management, administrative management and transportation are all able to reduce the SO₂ emissions. However, technological innovations formed by energy-saving technologies have instead increased the SO₂ emissions in China.

Provinces have the opportunity of increasing the production efficiency and lowering the manufacturing costs through the absorption, digestion, and application of external knowledge. The technology absorption capacity is one of the pivotal factors for the determination of the emission of SO₂. The empirical research based on the threshold panel model shows that the impact of technological innovations formed by various channels on the SO₂ emissions has a non-linear effect, which is closely related to factors such as HCS and FEP. When the level of HCS is low, the technological innovations generated by enterprises, universities, and individuals can reduce the SO₂ emissions, but the effect is not significant. With the increase of HCS, the technological innovations formed by enterprises, universities, and individuals on the SO₂ emissions will be significantly enhanced. Similar to the impact of invention patents on the SO₂ emissions, the effect of technology innovations generated by energy-saving technologies will also vary from positive to negative as the level of HCS increases. This shows that invention patents and energy-saving technologies need more upfront investment to finally form a positive effect, which is conducive to the reduction of China's SO₂ emissions and also to the sustainable development.

The empirical model also shows that the effect of technological innovation formed by enterprises, universities, individuals, administrative management and transportation on the SO₂ emissions will increase with the increase in FEP. However, invention patents cannot increase the effect on the reduction of the SO₂ emissions, instead, it suppresses it.

The results above show that in order to reduce the SO₂ emissions and achieve the final goal of sustainable development, China should continue to adhere to the development path of green innovation and regard green innovation as an important tool. Technological innovations from various channels are important factors affecting the SO₂ emissions, particularly utility-type patents and waste management. In

order to promote the positive spillover effect of energy-saving technologies and invention patents on the reduction of SO₂ emissions, despite the introduction of policies on patent protection, China should also combine technological innovation policies with sustainable economic development strategies. The non-linear effects of various technological innovations on the SO₂ emissions indicate that policymakers should fully consider the characteristics of the impact of various sources of technological progress on SO₂ when formulating corresponding policies. In order to maximize the positive spillover effect of various technological innovations, the level of HCS should be appropriately increased, with the emphasis on strengthening enterprises' innovation. In addition, the government should improve the energy structure and industrial structure, meanwhile promote the decline in the proportion of secondary industries and reduce the proportion of high energy consumption industries.

Although the empirical research conclusions of this paper are helpful to reveal the impact mechanism of various technological innovations on China's SO₂ emissions, due to the data limitations (e.g. some patents data is 0), the constructed indicators cannot fully and accurately reflect the characteristics of technological absorption capacity of green innovations affecting the SO₂ emissions per capita in China and the sustainable development should be more considered in the future policy.

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Cognitive Modeling Concepts of Sustainable Development of Society

Koncepcje kognitywnego modelowania zrównoważonego rozwoju społeczeństwa

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Abstract

In the context of rapid scientific and technological progress, which is the result of the development of science and technology and the process of accumulation and creation of new knowledge, fundamental and applied scientific research, information and technological changes are taking place. As a result, scientific-technological progress arose new forms and methods of organization of production, introduced a new technology, automated production processes, accelerating rate digitalization of all spheres of society, etc. The information society creates prerequisites for the diversification of the structure of production and consumption, thereby changing the needs of society, encouraging the producer to create more and more new goods and services. However, along with the development of advanced technologies, there is the rapid destruction of nature and environmental pollution caused by the consequences of human industrial activity. The article substantiates the socio-ecological aspects of sustainable development on the basis of cognitive modeling, as well as suggests specific measures that contribute to the implementation of certain goals of the International strategy for sustainable development 2030. It is proved that the functioning of the technogenic system leads to the emergence of technogenic risks, the existence of which confirms the presence of a causal relationship between the technogenic load on the environment and the state of public health. The necessity of diagnostics of ecological and safe development of the population, which is designed to identify the selected parameters of the technogenic danger in the changing socio-economic reality, is justified.

Key words: ecology, technogenic risks, technogenic system, economy, society, business, sustainable development, cognitive modeling

Streszczenie

W czasie szybkiego postępu naukowo-technicznego, będącego wynikiem rozwoju nauki i techniki oraz procesu gromadzenia i tworzenia nowej wiedzy, prowadzone są badania naukowe, zachodzą zmiany informacyjne i technologiczne. Postęp naukowo-techniczny zaowocował nowymi formami i metodami organizacji produkcji, wprowadził nową technologię, zautomatyzował procesy produkcyjne, przyspieszył tempo cyfryzacji wszystkich sfer społeczeństwa itp. Społeczeństwo informacyjne stwarza warunki do dywersyfikacji struktury produkcji i konsumpcji, zmieniając tym samym potrzeby społeczeństwa, zachęcając producentów do tworzenia coraz większej ilości nowych dóbr i usług. Jednak wraz z rozwojem zaawansowanych technologii następuje gwałtowne niszczenie przyrody, rośnie także zanieczyszczenie środowiska. Artykuł konkretyzuje społeczno-ekologiczne aspekty zrównoważonego rozwoju w oparciu o modelowanie poznawcze, a także sugeruje konkretne działania, które mogą

przyczynić się do realizacji określonych celów Międzynarodowej strategii zrównoważonego rozwoju 2030. Udowodniono, że technologie technogeniczne prowadzą do powstania zagrożeń, których istnienie potwierdza istnienie związku przyczynowego między obciążeniem technogenicznym środowiska a stanem zdrowia publicznego. Uzasadniona jest konieczność diagnostyki ekologicznego i bezpiecznego rozwoju populacji, mającej na celu identyfikację wybranych parametrów zagrożenia technogenicznego w zmieniającej się rzeczywistości społeczno-gospodarczej.

Słowa kluczowe: ekologia, ryzyka technogeniczne, system technogeniczny, ekonomia, społeczeństwo, biznes, zrównoważony rozwój, modelowanie kognitywne

1. Introduction

Modern conditions of development are characterized by constant transformations in science, technology, economy, business, and society, which was the result of the beginning of the fourth industrial revolution. This fact can be argued by the thesis of the experts of the WEF (World Economic Forum) The Taoist Forum, which in January 2017 stated *is underground*, which means *the fourth industrial revolution is in full swing*. The head of this non-governmental organization, Klaus Schwab (2016), spoke about its offensive back in 2016. Previous revolutions were marked by several events, thanks to which, on the one hand, modern society crossed the barrier of the fourth round of development, and on the other, caused enormous damage to the environment. So the result of the first industrial revolution (1778-1869) was the invention of mechanisms that replace manual labor, which changed the consciousness of society and contributed to the transition to the next stage of development. The electrification and production of Bessemer steel contributed to the improvement of technology (the second industrial revolution of 1870-1914), and programming, the creation of industrial robots, automation of production, and rapid economic growth after the 1970s led to the emergence of mobile phones, personal computers (the third industrial revolution of 1948-2010), without which modern society cannot imagine its life. Thus, the growing needs of the *consumer society* are an incentive for the development of products to meet these very needs at any cost. So there is a problem in the irrational use of natural resources, the disposal of already produced goods, etc. In this connection, the problem of the formation of sustainable development is gaining more and more relevance, which over the past twenty years has attracted the attention of scientists, businessmen, and society as a whole, which led to the choice of the direction of research. The article focuses on the conceptualization of the theoretical, methodological, and applied apparatus that contributes to the implementation of the goals of the international strategy for sustainable development *Transforming our World: the agenda for sustainable development for the period up to 2030*.

The purpose of this study is to provide cognitive modeling of the concept of sustainable development of society.

2. Methodology

The methodological basis of the research is a set of methods of scientific knowledge, general scientific and special research methods. The theoretical basis of the author's statements regarding the concepts of *technogenic system* and *technogenic risks* is the fundamental research of scientists in the field of economic theory, regional economics and sustainable development of territories, sociology, strategic management of socio-economic development of regions. The main conclusions of the authors regarding sustainable development are based on the research of Peter Senge, who developed ideas about the rational use of resources, arguing that it is our common duty (Senge, 2008). The basis for the conceptualization of sustainable development of society was formed by the works of Artur Pawłowski (Pawłowski, 2015). In particular, he discusses the general and specific principles of sustainable development that contribute to solving the methodological problem of sustainable development. The results of research by A. Skowroński (Skowroński, 2003) and B. Sienenhuner (Sienenhuner, 2000), whose works raise questions about new concepts and values of sustainable development, contributed to the idea of transformation in the structure of production, as a result of which the *basic scheme of the functioning of the law of the elevation of needs* was developed.

Works by V. Gradovsky (Gradovsky, 2003), D. Zerkalov, K. Tkachuk (D. Zerkalov, K. Tkachuk, 2011), N. Blinova, V. Mokhonko (Blinova, Mokhonko, 2009) which are devoted to solving several environmental problems, namely: V. Gradovsky studied the impact of ecology on human health; D. Zerkalov, K. Tkachuk, who considered engineering ecology, proposed methodological support for monitoring the state of the environment; in the studies of N. Blinova, V. Mokhonko, the issues of environmental standardization and certification are considered. Theoretical and methodological developments I. Nujna, O. Nesterova, O. Pozharitskii (Nujna, 2012), (Nesterova, Pozharitskaya, 2018) They allowed us to form conceptual provisions on the diagnosis of ecological and safe development of the population based on the assessment of well-being from the perspective of sustainable human development, as well as to establish that in modern science there is no single methodology for determining the assessment of

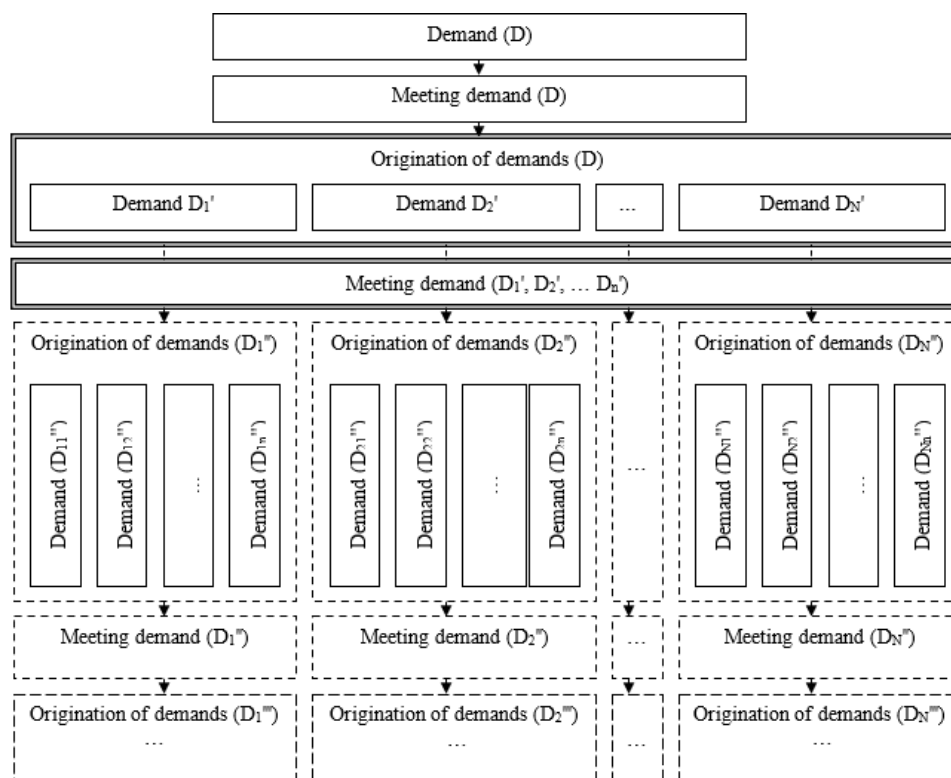


Figure 1. Schematic diagram of the functioning of the law of the elevation of needs, compiled by the authors

man-made hazards, so this problem requires additional scientific analysis and study.

Based on the analysis of scientific studies by F. Machlup (Machlup, 2000), Y. Masuda (Masuda, 1981), M. Dvornik (Dvornik, 2013), which are devoted to the formation and development of the information society, conclusions were made about the impact of information on the life of society. However, despite the relative development of the problems and prospects of sustainable development, certain aspects of this multi-faceted sphere remain controversial, sometimes contradictory, which require further study.

The applied basis of the research is based on the Brundtland Report, or as it is also commonly called the report of the World Commission on Environment and Development *Our Common Future*, which was published in October 1987 by the United Nations through Oxford University Press and is the basis of the modern international strategy for sustainable development *Transforming our world: the 2030 Agenda for Sustainable Development* (Report, 1987).

3. Findings and Discussion

Goal 12 *Ensuring the transition to rational consumption and production models*. The solution to the stated problem involves clarifying such concepts as the technogenic system and technogenic risks, as well as their impact on the state of the environment.

The functioning of the technogenic system of the territory is accompanied by the emergence of technogenic risks. It should be noted that when considering technogenic risks, the emphasis is placed on their real and potential impact on the environment.

In modern science, certain methods of assessing man-made risks have already been formed: first, it is the definition of economic losses, which are defined as the loss of material values; second, it is environmental damage, which manifests itself in the form of negative consequences of environmental impact and; third, it is social losses, which are determined by human casualties, namely, these are losses caused by accidents that led to the loss of temporary disability, disability, deaths, occupational diseases, etc.

Economic science has proved that the satisfaction of some needs of society leads to the emergence of many others, the satisfaction of which will be directed to the efforts of their producer. This postulate is based on a pattern confirmed by the long history of mankind, which is the *law of the exaltation of needs*. This is also evidenced by the simple fact that every ten years the number of types of consumer goods and services increases more than twice, while the volume of their consumption increases (Skowroński, 2003), (Sienenhuner, 2000). In the conditions of the development of society, there is a modification of needs, the disappearance of some, and the emergence of others. In turn, this causes changes in the structure of production and determines the development of the technogenic system. Schematically, the effect of this law can be represented in the form of Figure 1.

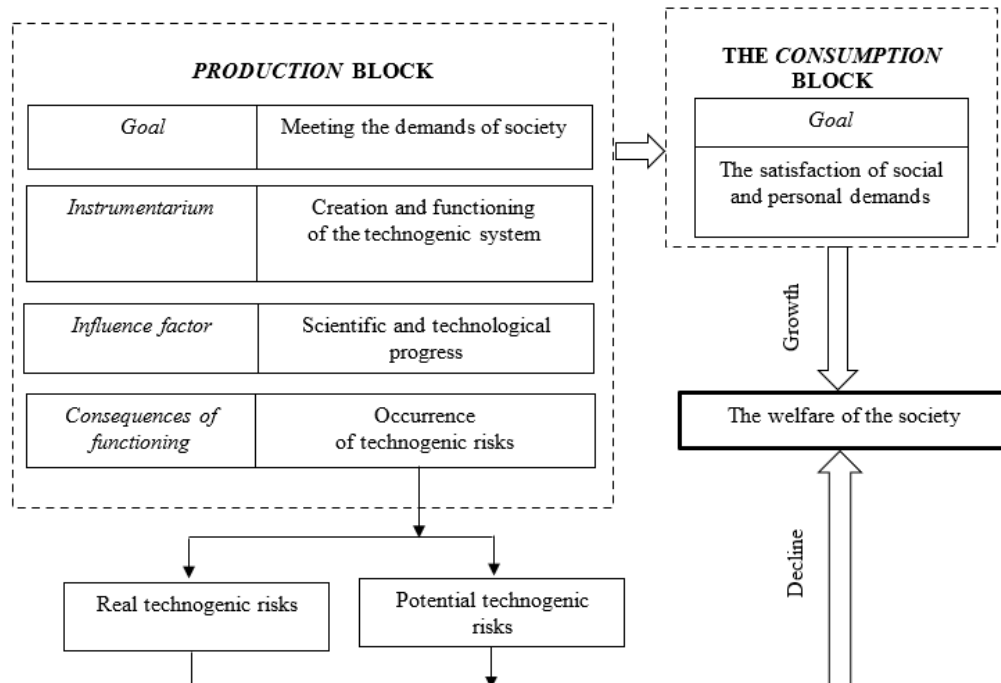


Figure 2. The mechanism of the influence of the technogenic system on the formation of the well-being of society (Compiled by the author based on a summary of scientific publications, based on Pawłowski, 2015)

The interpretation proposed in the figure is related to the implementation of Goal 13 *Taking urgent action to combat climate change and its consequences* of the international strategy for sustainable development *Transforming our World: the 2030 Agenda for sustainable development*. It allows you to display the transformation of needs in a concise form and focus the actions of society on solving a specific problem, the name of which is *irrational consumption*. However, such a vector of development also has a negative impact. First of all, this is a global problem of environmental pollution caused by industrial technological processes. On the other hand, this is the occurrence of accidents and emergencies due to errors and non-compliance with production processes; exceeding the critical level of wear of the equipment used, buildings, and structures; non-compliance with the technology of storage and transportation of fuels and lubricants and the operation of military facilities, and so on.

Under the technogenic system, the authors of the article understand a set of interrelated technical, technological, and social objects created by man in the cycle of production and economic activity under the influence of scientific and technological progress, which provide an increase in the rate of intensification of production and economic activity and social changes in society.

The development of the technogenic system of a territory (state, region) is inherently contradictory. On the one hand, an important condition for the development of the territory is scientific and technological progress. The positive effect of such development is reflected in the creation of an enabling environment

to meet the diverse and ever-increasing needs of society. On the other hand, the opposite of such development is the pollution of the environment and the destruction of the natural landscape. So, as a result of the vital activity of society, there is such a change in the quality of the natural environment that leads to the undermining of the natural conditions of human existence. The consequences of these changes in the future may be the destruction of the biosphere.

Thus, the functioning of the technogenic system leads to the emergence of technogenic risks, the existence of which confirms the existence of a causal relationship between the technogenic load on the environment and the reproduction of the living conditions of society (Fig. 2).

Theoretical and methodological understanding of the mechanism of the influence of man-made systems on the formation of the welfare of society helps to extend the scientific basis based on which development measures applied to ensure the realization of Goal 13 *take urgent action to combat climate change and its impacts*; Goals 14, *Conserve and manage the oceans, seas and marine resources for sustainable development* and Goals 15, *Protect and restore terrestrial ecosystems and promote sustainable use, manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss* of the international strategy for sustainable development, *Transforming our World: the 2030 Agenda for Sustainable Development* (Development program of the Organization of the United Nations, 2020).

It should be noted that technogenic risks in this study are understood as the probability of occurrence of undesirable events as a result of human production

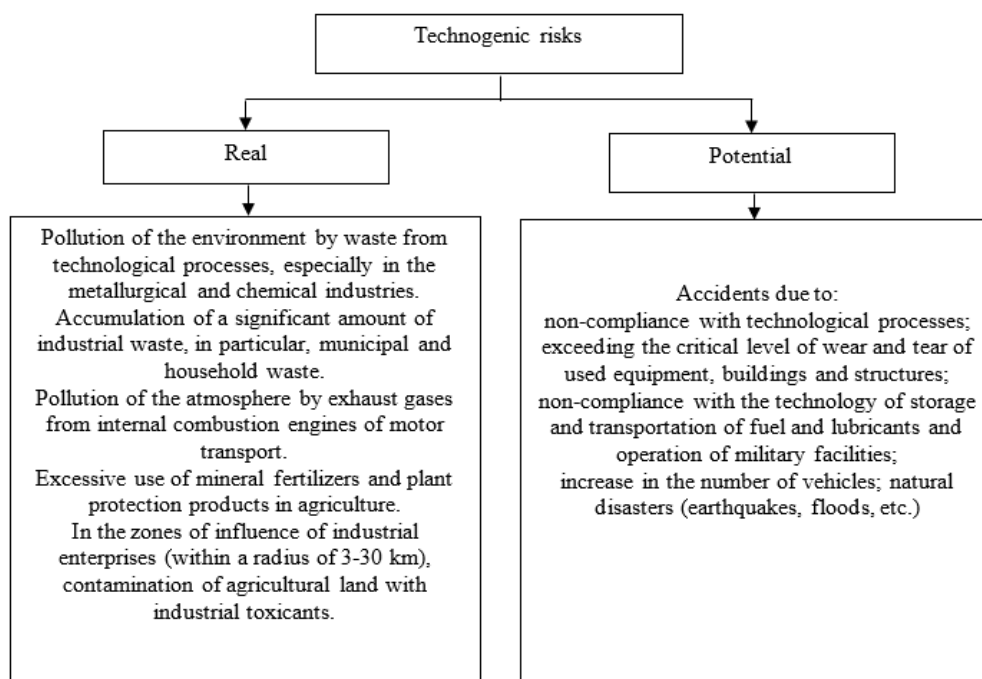


Figure 3. Risks generated by the functioning of the technogenic system (Compiled by the author based on the generalization of scientific results, based on: Gradovsky V., 2003; Zerkalov D., Tkachuk K., 2011; Blinova N., Mokhonko V., 2009)

and economic activity in the form of a real and potential danger of obtaining damaging effects on humans and the environment (Fig. 3). Consideration of technogenic risks (real and potential) is associated with the implementation of Goal 11 *Ensuring openness, security, resilience and environmental sustainability of cities and human settlements*, since the consequences of such impacts can be not only negative, but also catastrophic, and negatively affect the health of people, their livelihoods, change (in the worse way) their well-being, and can also be disastrous for the ecology of the territory.

The effect of real technogenic risks is manifested in the pollution of the environment by waste from technological processes, especially in the metallurgical and chemical industries; the accumulation of a significant amount of industrial waste, as well as municipal and household waste; air pollution by exhaust gases from internal combustion engines of motor transport; excessive use of mineral fertilizers and plant protection products in agriculture; contamination of agricultural land with industrial toxicants within a radius of 3-30 km. zones of influence of industrial enterprises, etc.

Goal 13 *Take urgent action to address climate change and its impacts*. If a wide range of technical measures and behavioral changes are applied, it is still possible to keep the increase in global average temperature at 2 degrees Celsius higher than before the advent of the era of industrialization (Development program of the Organization of the United Nations, 2020). The impact of potential technogenic risks is manifested in the occurrence of accidents due to non-compliance with technological processes; ex-

ceeding the critical level of wear and tear of used equipment, buildings, and structures; non-compliance with the technology of storage and transportation of fuel and lubricants, and operation of military facilities; an increase in the number of vehicles, etc.; natural disasters (earthquakes, floods, etc.).

Environmental pollution as a result of human production activities, man-made accidents, the consequences of which can be catastrophic, negatively affect both people's health and can affect their material well-being. An example of the largest man-made disaster in the history of mankind is the accident at the fourth power unit of the Chernobyl nuclear power plant, which occurred on April 26, 1986, in the former USSR. It not only led to the radioactive contamination of vast territories and the exposure of millions of people, significant material damage but also caused moral damage to society. The result is a nine-point earthquake and tsunami on 11 March 2011 in Japan at Fukushima was the largest nuclear disaster, which killed more than 25 thousand people. This accident caused the radiation threat on a global scale. The consequences of the disaster are still being eliminated (Find out everything, 2020).

According to experts, the explosion on the Deepwater Horizon drilling platform that occurred in 2010 (Gulf of Mexico) was bound to happen and was just waiting for its moment. As a result of the incident, about 5 million barrels of oil fell into the water, and the resulting oil slick reached an area of 75 thousand square kilometers, which was about 5 % of the area of the entire Gulf of Mexico. According to experts, this release *cannot be considered a disaster in the traditional sense. This is one of those accidents*

Table 1. Assessment of the well-being of society in the context of its sustainable development, Compiled by the authors on the basis of a summary of the results of the study Nyukhnya 2012; Nesterova, Pozharnitskaya 2018

Economic block	Social Block	Environmental block
<i>Direction of research</i>		
Condition of development of the country's economy	Living conditions of the society	Environmental condition
<i>Research indicators</i>		
GDP per capita; the volume of industrial production; consumer price index; government debt (% of GDP); gross domestic savings; GDP deflator; purchasing power parity; the volume of exports/imports of high-tech products (% of GDP); income and expenses of the population; personal consumer spending and other	Average life expectancy at birth; Gini coefficient; government spending on education (as a % of GDP); government spending on health (as a % of GDP); number of Internet users (per 100 people); the crime rate, and others	The concentration of pollutants in the atmosphere; the concentration of pollutants in water; the concentration of pollutants in the soil; indicators of global climate change; the number of natural resources and others.
<i>Research instrumentarium</i>		
Methods of quantitative and qualitative assessment of the state of the economic system and its elements	Methods for recognizing and establishing the level of social well-being and social health of the society Assessment of the state of social infrastructure Determination of the reference or normative state of a social object; the ratio of the reference and real state of a social object; sociological research; surveys on various social problems of individual target groups and categories of citizens	Methods of studying the state of natural complexes and their components based on the data of biological indication and analysis of indicators of specialized test systems, monitoring, environmental assessment, and audit
<i>The result of the study</i>		
Comprehensive identification of problems, additional reserves for the development of the state, region, enterprise definition of measures to neutralize the negative impact	Establishing the level of social well-being and public health of the society Determination of social motives and reasons for the behavior of an individual, group, and society Recognition of social pathologies and problems of public life	Establishing the existing level of anthropogenic pressure on natural resources and ecosystems Assessment of the ecological state of natural objects and identification of the consequences of man-made load on the biosphere

that could have been completely prevented (Popular Mechanics, 2020).

As a result of a leak (explosion) of toxic methyl isocyanate at a chemical plant for the production of pesticides in the Indian city of Bhopal in early December 1984, a man-made disaster occurred. The release of 27 tons of toxic gas led to the death of more than 20 thousand and injured up to 600 thousand people. The water and the area of the city and surrounding areas remain contaminated to this day (Popular Mechanics, 2020). And this is only the smallest part of the listed man-made disasters.

Every year in the world there are disasters caused by human production activities, as a result, death of people, destruction of infrastructure, and/or environmental disaster. Of course, the scale of these accidents is different, there are local or large-scale, with significant material losses or minor, etc. But the essence of these events (the onset of man-made disasters) is manifested in the postulate that it is caused by human production activity.

In modern science, certain methods of assessing man-made risks have been formed (Nyukhnya, 2012; Nesterova, Pozharnitskaya, 2018):

Firstly, this is the definition of economic losses, from the loss of material values as a result of a man-made accident;

Secondly, it is the environmental damage caused by the negative consequences of a man-made accident; Thirdly, these are social losses that are assessed by a person, namely, these are losses caused by man-made accidents that led to the loss of temporary disability, disability, the occurrence of occupational diseases, and the like.

The negative consequences of the impact of man-made risks include a decrease in the well-being of society (human).

It should be noted that the assessment of the well-being of a society in the context of its sustainable development is based on the relationship and interdependence of the following blocks – economic, social, and environmental (Table 1).

The economic component. In the economic life of society, the impact of man-made risks can manifest itself in the deterioration of a person's financial situation. Namely, the destruction of the infrastructure of the territory; material damage in the event of disability as a result of occupational injuries, occupational diseases caused by harmful working conditions, disability and death associated with the production, and the like.

The social component. In social life is the influence is more than the maximum concentration of harmful substances, which is the increase in the incidence of, and mortality from such diseases. It should be noted that along with material and social well-being, the most valuable for a person is the state of his health. Thus, almost all scientists in the world consider such an indicator as life expectancy at birth, which reflects the state of public health and longevity, as one of the main indicators that characterize the quality and standard of living, the well-being of society, and human development. Therefore, in this study, the authors focus on the impact of the state of the natural environment on human health (Senge, Peter, 2008; Machlup, F. 2000; Masuda, 1981).

Environmental component. The state of the natural environment is one of the most important factors affecting human health. According to the definition of the World Health Organization, the main factors affecting the health of the population are lifestyle, the state of the environment, biological and medical (Figure 4).

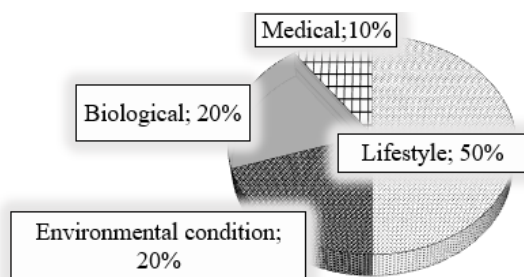


Figure 4. The main factors influencing the health status of the population, Compiled by the author according to the World Health Organization, 2020

According to scientists of the IEPI NAS (Institute of Industrial Economics of the National Academy of Sciences of Ukraine), there is a positive correlation between morbidity and emissions of harmful substances into the atmospheric air (Institute of Economics of Promislovosti, Soldak, 2020).

The same point of view is shared by scientists of the Institute of Economic and Legal Studies of the National Academy of Sciences of Ukraine V. Vasilenko, A. Blagodarny, E. Boychenko. Thus, as a result of the conducted studies, it is proved that the increase in morbidity occurs with an increase in emissions of harmful substances into the atmosphere, soil, and water. Consequently, the constant impact on the state of health of the negative consequences

of the functioning of the technogenic system accelerates the accumulation of pathological changes in the human body, contributes to the emergence and development of malignant neoplasms, significantly increases the risks of cancer and deaths from them. Such an analysis is possible based on the relevant indicators of the state of not only the ecological situation but also the technogenic danger of the territory (Vasilenko, Blagodarny, Boychenko, 2012).

The legal aspect. To solve the problems of environmental pollution, the international community has developed and implemented international environmental standards. The decision to develop these standards (ISO 14000) was the result of the Uruguay negotiations on the World Trade Deal and the Summit on Environment and Development in Rio de Janeiro in 1992. These standards define the methods of creating and ensuring the functioning of environmental management systems in enterprises, organizations, requirements for such systems, requirements for environmental audit, etc. (Zerkalov, Tkachuk, 2011).

The functioning of the environmental management system is aimed at greening all spheres of social activity, achieving and maintaining the necessary level of public health and life of the population, the state of the environment, and harmonizing the relationship between society and nature. Environmental management is based on the biotic principles of harmonization of life activity and sustainable development of society. Continuous improvement of the process of greening is one of the conditions of the international and European systems of standardization of environmental management (Blinova, Mokhonko, 2009).

In Ukraine, an environmental policy is also implemented at the state level, the main purpose of which is to protect the natural environment, rational use of natural resources, and ensure the environmental safety of society as an integral condition for sustainable economic and social development. (Official Portal of the Verkhovna Rada of Ukraine, 2020).

Conclusion

Thus, the article takes measures to solve the theoretical, methodological, and applied aspects of sustainable development based on cognitive modeling. The dependence of the emergence of new, previously non-existent needs on the appearance of new, previously non-existent goods and services is established. An explanation of irrational use of resources of mankind, the essence of which is not in the growing and changing human needs, and growth needs that are not subject to the natural laws of nature, therefore, concluded the formation of the *new society wasteful consumption*. It is proved that the functioning of the technogenic system leads to the emergence of technogenic risks, the existence of which confirms the presence of a causal relationship between the tech-

nogenic load on the environment and the state of public health.

Based on the above, the article offers a theoretical, methodological, and applied justification of the conceptual provisions of sustainable development that contribute to the implementation of the goals of the international strategy for sustainable development *Transforming our world: The Agenda for Sustainable Development for the period up to 2030*. In particular, the grouping of technogenic risks (real and potential) contributes to the implementation of Goal 11 *Ensuring openness, security, resilience and environmental sustainability of cities and human settlements*.

The author proposes a mechanism of the influence of man-made systems on the formation of the welfare of society helps to extend the scientific basis on which basis within the framework of the implementation of the sustainable development strategy of Ukraine until 2030, develop measures applied to ensure the implementation of strategic and operational goals. In particular, the implementation of Strategic Goal 5 *Ensuring the transition to balanced consumption and production models, sustainable management of natural resources and strengthening the response to climate change* within the Ukrainian regions contributes to the implementation of Goal 12 *Ensuring the transition to rational consumption and production models* and Goal 13 *Taking urgent measures to combat climate change and its consequences* of the international strategy for sustainable development *Transforming Our World: the 2030 Agenda for Sustainable Development*.

The realization of the Strategic goal 6 *Conservation of terrestrial and marine ecosystems and promote sustainable use of their resources*, provides an implementation of Goal 14 *conserve and sustainably use the oceans, seas and marine resources for sustainable development* and Goal 15 *Protect and restore terrestrial ecosystems and promoting their rational use, forest management, combating desertification, Halting and reversing land degradation and halting the loss of biodiversity* in the international strategy for sustainable development, *Transforming Our World: the 2030 Agenda for Sustainable Development*.

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Sustainable Development and Transhumanism – Enlightenment Visions of Future Generations

Zrównoważony rozwój a transhumanizm – oświeceniowe wizje przyszłych pokoleń

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Abstract

Both sustainable development and transhumanism are based on forecasting, meaning making judgments about what the future will be like, and they are made according to the results of scientific research. Sustainable development is an already implemented concept, yet transhumanism is still far from a similar degree of implementation. However, it is worth reflecting on their coexistence, as they already have their place in the scientific discourse. The element connecting sustainable development with transhumanism seems to be an enlightenment vision of human development. The aim of the article is to show the similarities and differences in these approaches to future generations.

Key words: sustainable development, transhumanism, enlightenment, future generations

Streszczenie

Zarówno zrównoważony rozwój, jak i transhumanizm bazują na prognozowaniu, czyli na sądach odnoszących się do przyszłości, sformułowanych pod wpływem wyników pozyskanych z badań naukowych.

Zrównoważony rozwój jest koncepcją już realizowaną, a do podobnego stopnia realizacji daleko jeszcze transhumanizmowi. Warto jednak podjąć refleksję nad ich koegzystencją, gdyż posiadają już swoje miejsce w dyskursie naukowym. Elementem łączącym zrównoważony rozwój z transhumanizmem wydaje się być oświeceniowa wizja rozwoju ludzkości. Celem artykułu jest pokazanie podobieństw i różnic w ich podejściu do przyszłych pokoleń.

Słowa kluczowe: zrównoważony rozwój, transhumanizm, oświecenie, przyszłe pokolenia

Introduction

Predicting the future, or rather being able to accurately assess what might happen, is a characteristic trait of all people living in every historical period. Initially, it was not very rational, mostly intuitive, and commonsensical at best. It had a very low degree of certainty. Currently, attempts to predict the future are becoming more and more rational; they are not only based on common sense, but direct scientific observations (Rolbiecki, 1970; Becht and Filipkowski, 2018). This way of predicting the future by using

strictly rational, scientific methods can be defined as forecasting. It allows us to formulate fairly objective judgments about the possible sequence of future events, processes, trends, etc. These judgments remain uncertain but verifiable, and therefore largely acceptable.

Forecasts provide information about a studied phenomenon (informational function), presenting the premises leading to rational decisions (preparatory function) and then stimulate the realization of a favorable forecast or counteracting an unfavorable one (activating function). In the light of the above, it

should be emphasized that the concepts of *sustainable development* (hereinafter abbreviated SD) and *transhumanism* (abbreviated H+) also apply to the human future. While SD is the implementation of previous forecasts, H+ provides new information about the future of humanity, and this has already found its place in the scientific discourse, now quite difficult to ignore. Therefore, it is worth reflecting on the possible confrontation between SD and H+, at least in the context of the approach to future generations of people, namely their future condition, development opportunities, or even conditions for surviving. The mentioned type of reflection will be the main goal of the publication.

A general outline of SD and H+

The Encyclopedia Britannica provides the following definition of SD by Federico Cheever and Celia Campbell-Mohn: *Sustainable development is an approach to economic planning that attempts to foster economic growth while preserving the quality of the environment for future generations* (Cheever F., Campbell-Mohn C. I., 2002). It should be noted, however, that the first and most general definition of SD was developed by the World Commission for Environment and Development summoned by Gro Harlem Brundtland. In the opinion of the same Commission: *sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs* (Brundtland, 1983, p. 41). According to Monika Stanna and Adam Czarnecki (2011, p. 15), this definition emphasized the concept of intergenerational justice and the ability to forward intergenerational thinking. The main emphasis was placed on the permanent intergenerational dimension of meeting people's needs. Such issues as, for example, socio-economic development or environmental protection appeared later.

Ewa Rokicka and Wojciech Woźniak (2016, p. 98-123) illustrate the multitude of existing definitions of SD. These authors distinguished, inter alia, official international definitions emphasizing the goals of SD, definitions focusing on indicators measuring SD, definitions referring to the basic values of SD and definitions referring to practicing SD. Therefore, taking into account all the above-mentioned definitions, it should be concluded that SD consists in seeking a compromise between social, economic and ecological reasons for keeping in mind the future generations of people. Moreover, the problem of the lack of one definitive, unambiguous definition of SD, is closely related to the multidimensional issue of SD, since it takes into account, for example, the spatial, institutional, and even moral dimensions, and additionally tries to place all this into an intergenerational perspective.

In the case of H+, the Encyclopedia Britannica presents the following definition by Sean Hays: *Trans-*

humanism, social and philosophical movement devoted to promoting the research and development of robust human-enhancement technologies (Hays, 2014). In turn, Max More, a leading transhumanist, formulated a definition of H+ accepted by almost all environments related to H+ and available on the official H+ website. In his opinion, *Transhumanism is a class of philosophies of life that seek the continuation and acceleration of the evolution of intelligent life beyond its currently human form and human limitations by means of science and technology, guided by life-promoting principles and values* (More, 1990).

H+, as the movement's official website reports, analyzes the dynamic interaction between humanity and the acceleration of technology. It uses an interdisciplinary approach to do so, aiming to ethically use currently available and other hypothetical technologies. The interests of H+ focus, for example, on both human and posthuman topics, issues related to singularity, the risk of extinction and mind transfer, whole brain emulation, substrate-independent minds, etc. (More, 2013). As in the case of SD, also in relation to H+ one can speak of a multitude of definitions. Generally speaking, H+ looks for common elements located in the process of human development and in the accelerating development of technology, taking into account the various social, economic and environmental implications (Bardziński, 2015; Rutkowska, 2017).

Similarities and differences in the approach to future generations

Taking into account the above approaches to SD and H+ and the remarks concerning them, one can notice significant similarities and differences between them. Both SD and H+ relate to future generations and take into account various issues, such as economic, ecological, etc. Both orientations are, therefore, characterized by an interdisciplinary approach. More precisely, SD focuses on achieving stability in meeting human needs, while H+ focuses on achieving stable human enhancement technology.

The difference between SD and H+ revealed above is most likely already present in the inspirations that the representatives of SD and H+ draw from the Enlightenment era. John Harlow (2011) mentions Francis Bacon, Adam Smith and Jean-Jacques Rousseau among the precursors of SD. The views expressed by these authors meant that, according to Andrzej Papużiński (2017, p. 310), SD drew the following theses from the Enlightenment: (1) recognizing global problems as social problems that begin with the problems of individual people, (2) the belief that all social problems are solvable as problems born within social practice, (3) the concept of the possibility of solving global problems in a political way. Nick Bostrom (2005, p. 2-4) indicated that the precursors to H+ include Francis Bacon, Isaac Newton,

Thomas Hobbes, John Locke, Immanuel Kant, Nicolas de Condorcet, Julien de la Mettrie, Benjamin Franklin and Friedrich Nietzsche. According to Bostrom, the work of these researchers meant that H+ adopted the Enlightenment conviction of humanism: (1) concerning humanity's continuous improvement (2) with the use of technology (reason).

In terms of generations, SD focuses on solving problems that developing humanity must face. H+ presents new perspectives for future generations related to the development of technology. Thus, it can be argued that the problem of SD seems to be wider and somehow includes the issues related with H+. The source of differences seems to be the following. Lech Gawor (2007, p. 25) points out that in SD, human rationality is related to the degree of coexistence of the human world with the world of nature.

A destructive economy using natural goods worsens the quality of human life. Therefore, taking into account the development of civilization, one should include values, human needs and the possibility of satisfying them, keeping in mind that there are limited natural resources. This approach also takes into account technological development as presented by Zbigniew Hull (2007, p. 50), one of the three main threats to humanity undertaken by SD. The time needed to become aware of the effects of new technologies is longer than the timeline of their implementation, and sometimes their effects are not even analyzed at all. New technologies are being introduced into ecosystems and incorporated into biogeochemical cycles. In addition, worth mentioning here is the World Report (Rashid et al., 2018) issued by the United Nations Economic and Social Council devoted to pioneering technologies that herald hope for humanity.

The difference between SD and H+ is also visible in the concepts of the changeability vs. stability of human nature present during the Enlightenment era, as assumed by SD and H+. Sławomir Raube mentions the sources of this dichotomy in the Enlightenment (2015, p. 23, 25). In his opinion, during the Enlightenment, ideas for reforming the world were sought primarily in man. On the one hand, thinkers such as Voltaire, Montesquieu or Diderot mostly emphasized the primacy of reason. From the point of view of reason, man naturally possessed some extremely important equipment, meaning laws that had to be explored. On the other hand, David Hume, Adam Smith, Francis Hutcheson, Adam Ferguson and others diminished the importance of reason, emphasizing feelings.

It is difficult to find any permanent natural disposition in man in this kind of orientation; man is who he is at the present moment. In view of the above distinction presented by Raube, both SD and H+ emphasize the idea of human development through reason, and this develops man's world. Yet, SD seems to accept the stability of human nature, whereas H+ states the opposite: human nature is changeable in its

foundations, thus susceptible to change, and should be changed by technology. This conclusion can be reached by looking at both previous and current publications on SD and H+. In the case of SD, it is difficult to find publications reflecting on human nature, while many publications on H+ include it (Hołub, 2015). Moreover, Bostrom (2005, p. 2-4) emphasizes that H+ shares the Enlightenment belief about humanism and man's continuous improvement through the use of technology, even to the extent that it allows radically changing human nature.

Taking into account the aforementioned differences between SD and H+, it should come as no surprise that these orientations differ in their approach to future generations. At this point, worth highlighting are Edith Brown Weiss' thoughts (1992, p. 22-23) on honesty towards future generations. The author has distinguished three normative principles of intergenerational equality. The first is the principle of maintaining the freedom to choose development options, presupposing the need to protect the diversity of the natural and cultural resource base in such a way that each generation does not excessively limit the possibilities of solving problems and satisfying the personal values of future generations. The second is the principle of maintaining quality, according to which each generation should hand over the planet in a state no worse than the condition in which it was received, because maintaining diversity does not necessarily mean maintaining quality. The third point is the principle of protecting access to available resources. It should be flexible enough for the next generation to achieve their goals according to their value system. There is no doubt that in SD, a generation is understood as humanity living in a similar period and having specific values, and therefore analyzed from a demographic and economic perspective. In H+, the above perspectives are also taken into account, but limited in time, only until a human being is understood as information unions present on the medium of a human body in the basic version (body version 1.0) or partially improved (body version 2.0). This perspective changes if you have a convertible body (body version 3.0).

Grzegorz Hołub (2015, p. 87-93) draws attention to the problems related to the concept of the human person understood in this way, a person having an interchangeable body as presented by Raymond Kurzweil. One of the main problems seems to be the issue of the principle of what constitutes a person, what it means to deal with a person. The fact is that naturalists do not accept the existence of a constitutive principle that is qualitatively superior, supernatural. For naturalists, the constitutive principle is related to the collocation or combination of natural (biological, psychological, social, cultural, etc.) elements that make up a person.

Unfortunately, according to Kurzweil, in the near future, this part will be able to be modified and processed, so such patterns cannot comprise a principle

constituting a person. Another problem mentioned by Hołub is the question of the identity of the person recorded on a new (e.g. extra-biological, electronic) medium. Kurzweil himself points out that such a person is not the same. The copy merely personifies the copied human person. Also, the inner world of the copied person will be different because the medium is different. The problems presented by Hołub lead to further issues. The creation of a new person will not be related with the biological growth of their body. This will force us to draw a new borderline between one generation and the next, and perhaps even redefine the concept of a generation. It will also be difficult to define common values that will guide a given generation in their development.

Final remarks

It is possible that SD and H+ will have to coexist with each other. SD already exists and, as an idea or program of action, has entered into many areas of human life. It has become the subject of academic research and university analyses. SD has found its place in legislation, government policy, as well as social and local government projects. In turn, the entire H+ philosophical worldview, along with its political and social movement, is now centralized around the Humanity + organization. It has offices around the world, an official website, an internet magazine, and organizes meetings and conferences. H+ is also present in politics. In the USA, it is promoted by such political parties as the U.S. Transhumanist Party and in the UK the Transhumanist Party as well. It is also known in Russia (Sykulski, 2013). A narrow group of respondents who participated in Anna Czajkowska's research (2018, p. 182) is convinced of the mentioned coexistence of SD and H+. People who have some knowledge about H+ see potential in this concept and a chance for humanity. However, they emphasized the need to take into account SD as a kind of guarantor of creating conditions that will not endanger human life. Such integration is also being considered by Vyacheslav Mantatov and Vitaly Tutubalin (2018, p. 722-723). According to them, this integration, even in the event of technological singularity, can become an existential opportunity for human existence if we look at man's development from a cosmocentric perspective.

Under the new environmental conditions, technical measures will enable unlimited expansion of consciousness, strengthening one's cognitive abilities and human bodily parameters. This will allow humanity to develop in an unlimited and sustainable way. The problem is that, according to Michał Klichowski (2014, p. 145), technologically improving a human being (cyborgization) means preferring efficiency, standardization and homogeneity instead of individuality, diversity and otherness. In other words, striving to attain the status of a post-human being means striving towards an identical being, so

it is *de facto* dehumanized, deindividualized. It is a journey towards a world of perfect clones, a neutralized, universal world that can be called an identity hell.

In conclusion, despite differences in the approaches to understanding future generations, integrating SD and H+ is possible. Raymond Kurzweil presented an extreme H+ position, unfortunately most often quoted in scientific studies. However, one should also take into account moderate transhumanists who do not want to free man from his corporeality nor make him immortal, but only extend his biological life as long as possible. Following the division presented by Marcin Garbowski (2015, p. 35-36), such H+ trends as technogaianism or immortalism are worth taking into consideration. Technogaianism is a combination of transhumanism and ecology. It calls for using non-invasive technology to restore the natural ecosystem and bring about the harmonious coexistence of humans and the natural environment. Technological progress is the main factor that will allow people to responsibly use natural resources and stop environmental destruction. Immortalism, in turn, is a trend that promotes the idea of radically extending human life through the use of genetic engineering, stem cells and nanotechnology. Key figures in this orientation are biogerontologists Aubrey de Gray and Marios Kyriazis.

It should be noted at this point that the immortalist approach to future generations of humans, people with only partially perfected bodies, agrees with the approach proposed by SD, as it only extends the duration of a generation. On the other hand, in the case of generations that can exchange bodies, important questions and doubts arise regarding this immortalistic orientation. Some of them are worth pointing out. For example, as the evolutionary basis of consciousness, meaning the biological body, becomes irrelevant, should the environment from which it evolved be cared for? Besides, how are we to distinguish in an information system between a consciousness uploaded from a biological human and a consciousness created artificially?

Wouldn't it be better to generate awareness programs right now, thus creating future generations of new people, instead of working on new vehicles for those born biologically? How are we to think about the next generations of people, since in current evolutionary computer programs, entire generations of objects pass us by in a second? In the light of the above remarks, it seems reasonable for Klichowski (2014, p. 145-147) to state that the real technical and technological possibilities of improving both an individual person and entire future generations does not mean the necessity to implement them. Not everything that is possible is worth pursuing. The price that can be pre-estimated now, and that humanity will have to pay in the future, may turn out to be simply too high.

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The Future We Want: Sustainable Development Goals Accomplishment with Organic Agriculture

Przyszłość, której chcemy: możliwości osiągnięcia Celów Zrównoważonego Rozwoju w rolnictwie ekologicznym

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Abstract

The aim of the paper is to enlighten the role that organic agriculture can have in the achievement of Sustainable Development Goals (SDG). Currently, sustainable agriculture systems are not adequately recognized in SDG and supported by the decision-makers. Given that agriculture plays one of the key roles in sustainable development accomplishment, the expansion of an organic agriculture can be a basis to implementing SDG. Organic agriculture has multiple benefits as most valuable option in redesigning food systems to achieve ecological, economic, and social sustainability. Moreover it could encompass and establish food system from field to fork necessary to complete the SDG without oversize resource depletion and negative impact on the environment. The study showed that by placing organic agriculture high in the agenda of SDG it is possible to create conditions for sustainable development while identify and manage trade-offs in agriculture and maximize co-benefits.

Key words: organic agriculture, ecological intensification, agroecology, sustainability, environment

Streszczenie

Celem artykułu jest wyjaśnienie roli, jaką rolnictwo ekologiczne może odgrywać w osiągnięciu celów zrównoważonego rozwoju (SDG). Obecnie systemy zrównoważonego rolnictwa nie są odpowiednio uwzględniane w SDG i wspierane przez decydentów. Biorąc pod uwagę, że rolnictwo odgrywa jedną z kluczowych ról w realizacji zrównoważonego rozwoju, wprowadzenie rolnictwa ekologicznego może być podstawą do rzeczywistej realizacji SDG. Rolnictwo ekologiczne ma wiele zalet, jako najcenniejsza opcja w przeprojektowywaniu systemów żywnościowych w celu osiągnięcia zrównoważonego rozwoju ekologicznego, gospodarczego i społecznego. Ponadto może ustanowić system żywnościowy od pola do stołu niezbędny do ukończenia celu zrównoważonego rozwoju bez nadmiernego wyczerpywania zasobów i negatywnego wpływu na środowisko. Badanie wykazało, że umieszczając rolnictwo ekologiczne w agendzie SDG można stworzyć warunki dla zrównoważonego rozwoju, jednocześnie identyfikując i zarządzając kompromisami w rolnictwie oraz maksymalizując korzyści.

Słowa kluczowe: rolnictwo ekologiczne, intensyfikacja ekologiczna, agroekologia, zrównoważoność, środowisko

Introduction

Globally, agriculture is the world's largest employer and the most important economic sector for many countries, especially the developing ones. At the beginning of the 21st century, agriculture represented a complex system created by the integration of agriculture and industry, which make the preconditions

for increasing production efficiency while reducing costs and increasing profits. The establishment of world trade allows for increased availability of all types of food throughout the year, regardless of season and region (Suweis et al., 2015). As a result, agriculture in the 21st century has the potential to provide more than enough food for over 7.7 billion people (World Resource Report, 2019). This contradicts

the view that food is deficient and that food security has been dramatically compromised by the use of agricultural products for industrial purposes and by global climate change (Godfray et al., 2010). In addition to that, arable land needed to produce a fixed quantity of crops, calculated as arable land divided by the crop production index, has considerably decreased over time, from 1.0 (1961) to 0.3 in 2014, while the yield of major staple crops increased (Ritchie and Roser, 2020). According to Gaurav et al. (2017) there is increase in usage of arable crops (up to 40% of production) for bioethanol and biodiesel production, which dramatically changes the objectives of agriculture.

Because of that there is an intensive, global discussion and confrontation of views on the most appropriate ways of agricultural development that can accomplish the goals of increasing production on a sustainable basis (Hickel, 2019). Opinions are divided and range from advocating highly industrialized forms of production using genetically modified organisms to completely ignoring them and promoting the fundamental ecological principles in agriculture. At the same time, the circumstances of growing constraints and uncertainties caused by the COVID-19 pandemic (Elleby et al., 2020; Altieri and Nicholls, 2020), affected agriculture and initiate an internal transformation whose results are yet to come. Current situation, with the increasingly pronounced effects of global climate change on agriculture (Agovino et al., 2019), demonstrated sensitivity of primary agricultural production and exposes weak points of food supply chains (Ray et al., 2019). Consequently it imposes reconsideration of approach to food production and redefines its further development.

Given a current trend in agriculture and future perspective the aim of this paper is to enlighten the role of agriculture in sustainable development goals achievement. Starting hypothesis is that the accomplishment of sustainable development goals can be realized through sustainable agricultural systems such as organic agriculture, but only if organic agriculture is established and scaled out as niche *food system*.

Agriculture on the crossroad

The United Nations Food and Agriculture Organization (FAO) estimates that, by the year of 2050, 9.7 billion people will live on our planet, while 70% of the global population, with the current 49%, will be in urban areas. Based on the estimates given, it is anticipated that the annual production of cereals will increase by 20% in the future, from the current 2.5 billion tones, while the meat consumption will go up to 480 million tones. In addition to the warning facts about the world population increasing need of for

food, one of the main problems is the highly subsidized and inefficient production and use of food. Approximately 88 Million tonnes of food is wasted in the EU each year and the environmental impacts of these losses throughout the food supply chain are widely identified (Scherhauser et al., 2018). The lack and unequally developed awareness of the ways and potentials of waste recycling with the reduction of energy consumption and non-renewable resources is one of the key problems facing modern agriculture (McCarthy et al., 2018).

At the same time, the dramatic increase in population on our planet has imposed the task for agriculture to continuously strive for dynamic growth in all sectors. The main goal has become to obtain cheaper product while continuously searching for new solutions to exploit renewable and non-renewable resources regardless of the means for increased production efficiency or rational use of raw materials. The question arises as to whether this is the right path for agricultural development, knowing that increasing production volumes lead to negative environmental consequences and increased pressure on ecosystems (Lal, 2016). The negative outcomes of such agriculture cannot be rationally viewed in a shorter period; however, more studies indicate its long-term unsustainability (Tuomisto et al., 2012). According to Galluzzo (2017), an improvement of food self-sufficiency has been tightly linked to an increase of pollution in terms of greenhouse gas emissions. This leads to the conclusion that the problem of food security cannot be solved by increasing production, but the potential solution can be homogeneous food distribution (Lappé et al., 1998). For that reason, primary food production is not considered as key pillar of food security and crucial point of intervention for food availability. This speaks of uneven economic relations in food production and a long term overflow of surplus value from agriculture. In the long run, this situation is unsustainable and does not give hope that agriculture is strategically oriented towards the quality and healthy food.

Taking into account subsidies for agriculture Scown et al. (2020) noted that global agricultural subsidies are over \$700 billion per year, but often drive environmental damage and fail to provide broader social benefits beyond farming. In the EU, around €54 billion per year of public funds have been spent under the Common Agricultural Policy (CAP) since 2006, but still did not address the sustainability issue of agriculture. The above mentioned authors come to conclusion that the distribution of €59.4 billion of 2015 CAP payments exacerbates income inequality within agriculture, while little funding supports climate-friendly and biodiverse farming regions. More than €24 billion of 2015 CAP direct payments went to regions where average farm incomes are already above the EU median income. A further €2.5 billion

in rural development payments went primarily to urban areas. All of this indicates that, although SDGs are present from 2016, the agriculture as a sector is still at its begging when talk about achieving these goals.

According to Semedo (2017), humanity is facing a crisis of such magnitude that if we do not drastically change our attitude towards agriculture, we have only 60 years left to produce food – hypothesis of *the 60 harvests left*. The most important global issues of the twenty-first century are thought to have been created by inappropriate solutions to some routine problems. Sometimes the impression is that *the root cause of the problem is its solution* (Bartlett, 1994).

Sustainability of agriculture – a way forward

Sustainable development is a complex term, not yet unambiguously defined that unites in itself economic, technological, social, political, physiological and environmental aspects (UNEP, 2015; Tomaš Šimin et al., 2019). These pillars are interconnected by a series of cause-and-effect relationships that are sometimes difficult to understand and measure (Bossel, 1999, Munitlak-Ivanović 2005, Rigby et al., 2001). Janker et al. (2019) pointed out that sustainability has become a key term for linking environmental, economic and social issues, in both the sciences and politics. It can even, sometimes, be understood as an integral part of wider rural development theory (Huttunen S., 2019).

The study of economic growth and development is a phenomenon that appeared in economic theory in the middle of the 20th century. It has led to the emergence of a significant number of theories of growth and development. They were formulated by economists who, in connection with growth and development, tried to determine the laws, as well as the possibilities to manage growth and development. The terms economic growth and economic development are very often used in the economic literature. These two terms, despite the fact that they explain complementary ideas in a certain sense, are essentially different. They have diverse economic context, so in addition to their definition, there is often a need for them to be precisely defined. Economic development is defined as a process (Todaro & Smith, 2015; Bogdanov, 2015). In this process, long-term sustainable growth of production and income of a country is ensured, if it takes place in the conditions of structural improvements. It results in the realization of basic national values such as raising living standards, establishing financial independence and strengthening the political freedoms of the population. Thus, economic development is a complex category that, viewed in a qualitative sense, encompasses a whole spectrum of very different socio-economic changes that characterize the process of continuous transformation of the economy and society. This also implies the increase of the volume of national production

over time, that is, the realization of economic growth. But, the current situation in economy introduces *new reality* in humanity that will generate the end of the system as we know (Pawłowski, 2020). Moreover, as in agriculture permanent growth is difficult to sustain, we should focused our activities and strategy to secure the sustainable growth.

The understanding of the term agricultural sustainability differs depending on whether the developed country or the developing country are analyzed (Table 1), which is related to the expectations and the role that agriculture as an industry has at different stages of development of a society. Regarding agriculture, Janker et al. (2019) interpret that there are an increasing number of social certifications for agricultural products but they are often not explicitly related to sustainability but more to fair production and trade, such as fair payment of farmers and workers and transparent trading conditions. The mentioned authors in their work give a comprehensive and scientifically based overview of the prevailing attitudes and general neglect of social sustainability in agrarian systems.

They find that, due to severe criticism of the negligence of the social dimension in sustainability conceptions and assessments from social science, this dimension of research has received increasing attention in recent decades. The aim of future societies is to have agriculture that improve social welfare, but how to achieve this, while limiting environmental degradation, is a major unknown.

With this in mind, Laurett et al. (2021) conducted a study, trying to identify what can be understood as sustainable agriculture in social dimension. They argue that different authors consider different attributes as sustainable. For example, demographic factors, such as farmer's level of education, age and gender were also identified in the literature as predictors of sustainability (Siebert et al., 2006; Ma et al., 2009; Rodriguez et al., 2009; Foguesatto et al., 2020) together with altruistic feelings eg. thinking about other people well-being (Miranda-Ackerman & Azzaro-Pantel, 2017; Mupfasoni et al., 2018). However, despite advances in social research, Janker et al. (2019) conclude that the social dimension of framing is urgently needed to complement the existing environmental and economic pillars of sustainability of assessment tools, sustainability strategies and sustainability politics for agriculture.

Common to all definitions related to sustainable development is that they are associated with the scarcity of natural resources. Therefore, many of the researchers used different agricultural sustainability closely explain the sustainability triptych. The part of sustainability related to environmental protection implies the implementation of a certain economic activity, or any other form of activity in a way that will not have a harmful effect and endanger the environment currently or in the long run. This also applies to agriculture. One part of the scientific literature is

Table 1. Focuses of sustainable agriculture, source: Bogdanov, N. (2015) according to Amekava, Y. (2010)

Themes and questions	Developed countries	Developing countries
The main focus of a sustainable agricultural system	Sales of food in the local market on the basis of direct sales	Growth of self-sufficiency
	Providing low risk food in terms of quality	Resistance to economic crises
	Consumer support to producers	Low level of input use is an advantage for manufacturers
Technical-technological practices	Use of modern innovative inputs	Emphasis on traditional production practices
The main actors	Individual producers and consumers	NGOs and producer associations
Economic motives for producers	Commercial business orientation	Orientation to survival; sale of modest surpluses
Goals and results	Sustainable profits from agriculture for small farms	Input use reduction
	Health	Food security and self-sufficiency
	Environmental protection	

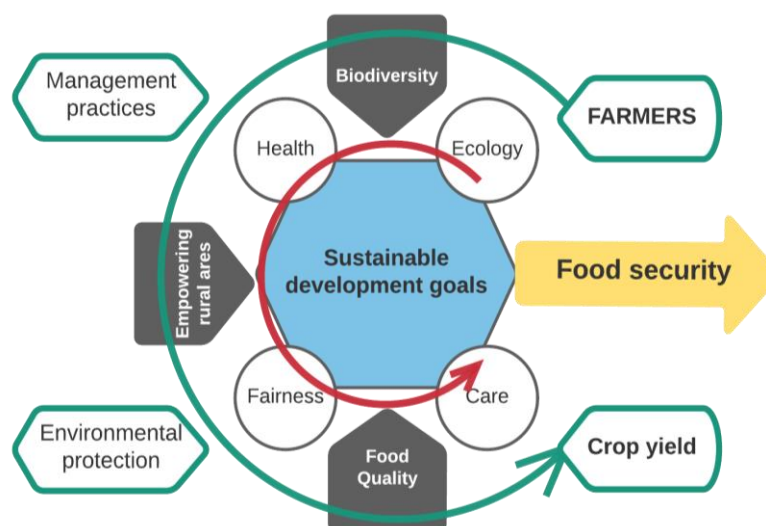


Figure 1. SDG environment for agriculture

focused on the analysis of the negative effects of modern agriculture on the environment and its degradation (Praneetvatakul et al., 2013, Krajewski, 2016), as a consequence of increasing dependence on the industry (in terms of fertilizers and pesticides) and the introduction of monoculture, for the sake of profit. Some authors (Peyraud et al., 2014) argue that one of the main problems of modern agriculture is specialization, so territories specialized in crop-growing face soil impoverishment and have to import mineral fertilizer and pesticides. Hall and Crowther (1998) discuss water pollution with nitrate and pesticides, methane and nitrogen oxide emissions, fossil fuel usage and Pang et al. (2020) inferred that shortage of water resources and soil erosion of fertilizer are important factors that restrict sustainable agricultural development. Bengochea Paz et al. (2020) conclude that agriculture is thus dependent on the natural environment, but it also heavily transforms this environment.

Pathways to unlock the contribution from economic models to sustainability

Due to its multi-functionality, agriculture can be the backbone of different *economic models* that inherently consider the possibilities of achieving sustainability and in many ways contribute to the achievement of Sustainable Development Goals (SDG). From the economic point of view, it is considered that agriculture becomes profitable only if it uses natural resources efficiently, because in cases where the level of intensity of exploitation decreases, profit also decreases (Lazić & Šeremešić, 2017). Therefore, there is a wide range of approaches that address the future of agriculture by combining the dimensions of economy, sustainability and ecology. Initially, the term *biobased economy* was used to describe ecology-based economics. DG Research (2006) defines biobased economy as *sustainable eco-efficient transformation of renewable biological resources into food, energy and other industrial*

products. Bio-economy also refers to the transformation of biological resources from land, plants, animals or marine organisms (McCormick, 2014), waste, including food residues, as well as inputs for industry and energy production. In February 2012, the European Commission adopted a strategy for a sustainable biobased economy aimed at ensuring meaningful green development for Europe (EU Commission, 2012). *Bio-based economy* (BBE) or *knowledge-based bio-economy* (KBBE) are concepts that are based on biomass instead of fossil fuels and focused on the transformation of renewable resources. One of the models that target ecology is eco-functional intensification that relies on building the synergies in a multifunctional and resilient agricultural system in agreement with its surroundings. There is an idea that balanced intensification of agriculture can ensure food security (Figure 1). *Sustainable intensification* would reduce the adverse effects of agriculture on the environment and optimize food production with increased efficiency in resource exploitation (Garnett et al., 2013). Sustainable intensification in agriculture can lead to increased productivity, stability and *resilience* of agroecosystems. The green economy, on the other hand, has a similar approach. The most common type of green production and economy is recognized through biomass recycling, thus making a significant step forward in socio-economic, agricultural, energy and technological aspects. The green economy recognizes the role of sustainable agriculture as a strategic commitment because it engages large numbers of workers and potentially has a major environmental impact. According to Marković et al. (2010), ecological economy seeks to place economic activities in the context of biological and physical systems that sustain life, that is, starting from limiting human activity to environmental capacity. In this way, it shows great compatibility with organic farming. It is argued that the way in which the ecological economy manages the complex relationships that exist between ecological and socio-ecological systems can represent a good framework for decision making in organic production (Kledal et al., 2006).

In addition to the different economical approaches, contribution to sustainability could come from development of Voluntary Sustainability Standards. According to the information provided by the Eco-label Index (2020), today there are 463 standards in 199 countries and 25 sectors of the economy. The most prominent are: Rainforest Alliance, Fairtrade International, UTZ Certified, etc. Private voluntary sustainability standards are an innovative, market-based approach to promoting sustainable production and business practices. They are basically intended to be voluntary and not created, led or required by governments or state regulatory bodies. Instead, they are non-governmental initiatives that target sustainable production and consumption by generating market demand for sustainable products and supplies

and meeting those needs. They help buyers (consumers and businesses) identify sustainable food production around the globe and affect supply-side economic activity in ways that positively contribute to sustainable development. Their use is conditioned by the confidence of the customers, the conviction that they contribute to the protection of the environment and the improvement of the life of the producer (farmer). For that reason, they have many points of contact with the other sustainable systems but also can be competitive in some segments. Currently, there is a global trend towards products containing a greater number of eco-labels, which can confuse potential buyers (Nuttavuthisit & Thøgersen, 2017).

Relationship of organic agriculture and economic concepts in sustainability

Organic agriculture is linked to contemporary economic concepts of sustainable development in many ways. Similar to other sustainable agricultural systems, it is based upon relationships that ensure fairness with regard to the common environment and life opportunities. It is dedicated to the establishment of ecosystem health that connects soil to our planet. From the technological side, production process results in large quantities of by-products that can be the basis for the development of an ecology-based economy. On the other hand, it is also a major consumer of green technologies but also increasingly relies on information communication technologies (ICT). With strict rules and regulation, organic production represents a holistic system that combines best environmental practices and processes with preservation of natural resources to meet demands of certain consumers (IFOAM, 2017). Organic agriculture owes its dynamic growth to the development of standards and international associations (IFOAM, Soil Association, Rodale Institute, FIBL, ISO FAR, etc.). Organic agriculture today is based on IFOAM guidelines (IFOAM, 2017) and agenda of *Organic 3.0* that envisages the transition of organic agriculture from the position of alternative production to the generally established ecological system of production as an integral part of multifunctional development for the enormous challenges facing planet Earth and our civilization (Rahmann et al., 2017). The organic market in the world is constantly growing, which is also indicated by the fact that the global sales reached 95 billion euros with an area of 71.5 million hectares (Willer et al., 2020).

Although it shows clear trends in area increase and production volume, organic agriculture still faces criticism regarding production efficiency and underdeveloped biotechnical solutions to the problems that arise in practice. This generally casts doubt on its ability to provide stable yields of adequate quality (Reganold & Wachter, 2016). Due to the relatively slow acceptance of a large number of individual innovations in organic agriculture, the only effective

solution is to creation of a small scale ecological self-sustained system that could be efficiently scaled up. Although it is the core of organic production today, standardization and co-optation of organic agriculture by national and international institutions suggests certain problems in the future. Lady Eve Balfour (1977) points out *I am sure that the techniques of organic farming cannot be imprisoned in a rigid set of rules. They depend essentially on the outlook of the farmer. Without a positive and ecological approach it is not possible to farm organically*. Ikerd (2018) stressed that when an organic farmer is not a person but a large publicly traded corporation, or production takes place under conditions dictated by such an economic entity, production and profit inevitably take precedence over *farm integrity*. Thicke (2017) by analyzing the U.S. organic agriculture sector warns that the impact of industry in organic farming is much greater than the producers' influence. This created the preconditions for the emergence of "organic light" model. The concept of *organic light*, presented by Guthman (2004), anticipated big agribusiness model of farming practices and adaptation (specialization to high value crops) leading to the conventionalization of organic production. Such a trend leads to the conclusion that it is necessary to redefine the positions in organic farming in order to ensure and preserve its integrity for the future.

The context of agriculture in SDG achievements

The UN Agenda 2030 can provide a framework for formulating a new Sustainable Development Strategy, as well as other sectorial policies that are directly focused on the specific SDG goals (Breuer et al., 2019; UN, 2020). This agenda has taken the initiative to eradicate extreme poverty, achieve universal education and promote gender equality and environmental protection. SDG adopted in September 2015, are striving to align development with the challenges that humankind expects by 2030 (UN, 2015). They represent a universal set of 17 goals (with 169 targets that constitute them) and indicators that UN members can use to develop their own national agendas and policies by 2030. The defined and adopted goals of sustainable development provide guidance for the well-being of all humankind and shift the focus towards sustainable and compliant development that will lead to the advancement of all spheres of human being (Sachs, 2020). In their research, Lamichhane et al. (2021) investigate the status of OECD countries' sustainable development performance towards reaching the 17 SDGs. They found that Sweden had the first rank (when it comes to fulfillment the SDGs), which was followed by Finland, Norway, and Denmark, while Mexico was ranked as the last. Within Europe a high performance of the Northern countries and a poor performance of the Southern countries can be confirmed (Drastichová & Filzmoser, 2019).

As an essential link between people and the planet, agriculture and food are high on the list of priorities in SDG agenda. The reason is that agricultural production and meeting the needs of safe food are the main prerequisites for a healthy and productive life and for the advancement of society (Goals 1 & 2). As SDG provide a strategic framework for securing and managing development, they also provide the opportunity to achieve sustainability by selecting appropriate production systems and targeting environmental values.

As a result, the agricultural sector has a new opportunity to offer solutions that will conserve resources and provide food security with high cost-effectiveness. The assumption is that in order to achieve SDG, it is not enough to change the way of production in agriculture, but to change the whole food production chain, the so-called *Food system*, because only in this way food security can be guaranteed (Figure 1). In addition to that, it is very important that there is a change in awareness, not only among producers but consumers as well.

According to Mensah & Casadevall (2019) new paradigm is needed, which involves raising awareness of the need to reconcile human economic development with environmental constraints and to align it with the social and cultural values of the region in which it is performed. Thus, there is a broad consensus that without a developed agricultural sector it is not possible to achieve a sustainable development of civilization (UN, 2012; Griggs et al., 2013), where it is necessary to simultaneously develop moral responsibility for the use of non-renewable and interdependent resources that agricultural production relies on.

Meeting the SDG is particularly challenging in the agricultural sector given the heterogeneity of local conditions, the diffuse nature of its environmental impacts, and the important interactions with various aspects of sustainable development – from education and poverty alleviation, to human health and the environment. And yet it is precisely because of these interactions are vibrant, resilient because of that sustainable national agricultural sectors are key to the SDGs' success (Kanter et al., 2016). However, few countries have developed a clear understanding of how to make transformative changes in their often complex and diverse agricultural and food systems that would enable them to address these kinds of key cross-sectoral issues in a coordinated way.

Sustainable Development Goals and organic agriculture

In recent years the significant progress has been made in recognizing organic agriculture as a sustainable integration of economic, social and environmental dimensions (Eyhorn et al., 2019). The comparison on SDG targets and organic agriculture principles and goals showed many overlapping and the

deep linkage between them. (Sachs, 2020; Willer et al., 2020). The empirical evidence showed that organic agriculture in developing country has the potential for achieving their development goals (Setboonsarng & Gregorio, 2017). Even so, there is very limited literature dealing with this issue.

By considering organic agriculture as a mechanism for achieving SDG, different institutions can be mobilized and closely involved in the development of capacity for its implementation. Creating a favorable environment for small farms, converting conventional land to organic, and aiming at the development of this sustainable branch of agriculture would consequently create more favorable socio-economic conditions for rural areas and the employment of the rural population. Given that the organic food production involves a short value chains and reduced number of intermediaries between producers and consumers scaling out organic agriculture can encourage sustainable development (Šeremešić, 2020). Preserving the diversity of rural performance through the promotion of organic production, i.e. its integration with other business activities, would create favorable conditions for the expansion of multifunctional activities such as rural, eco-and ethno-tourism, the production and processing of products according to traditional recipes, the preservation of old crafts and other types of services that would create added value and encourage rural growth, but above all, it would create the conditions for young people to stay in the rural areas and develop small and self-sufficient farms.

The implementation of such strategy must be organized in a top-down manner so that it can reach every producer, otherwise it will not give adequate results. Such an approach requires a SDG agenda that can offer a smooth transfer of knowledge, technology and decision-maker support. This view is in contradiction with the approaches of agro-ecological science where the reverse path of establishing a sustainable system (the bottom up approach) is recommended. With bottom up path the disconnection of participants or institutions in the chain impedes the achievement of the goals set. Developing consumer awareness of the importance and value of organically produced food, followed by an increase in people's purchasing power, will lead to the conversion of conventional plots into certified organic ones, where smaller family farms should find the largest share. Encouraging such sustainable directions for agricultural development, especially in protected areas (natures reserves, Natura 2000, etc), through the support in the training of potential producers, the procurement of equipment and certification of organic production, the introduction of balanced crop rotation and the cultivation of cover crops, would preserve soil resources, biodiversity and affect the creation of healthier agroecosystems. In addition to that, it will allow for organic producers to create a

production space on their farms where the boundary between nature and human activity is barely visible and the benefits generated over a long period of time will serve future generations.

Despite its undeniable significant achievements in environmental protection, and high awareness of consumers, which indicate a vast potential for the development of organic farming, a number of major hurdles and problems still lie ahead and need to be overcome. Firstly, focusing on single dimension in order to optimize the system, in most cases, failed to deliver functional sustainability. Therefore, it is necessary to follow a holistic approach and scale out niche production system under organic agriculture. Generating capital on all levels of value chain, efficient use of available funds, co-creation of knowledge, efficiency of production, processing and marketing are all important issues to be addressed in the course of accomplishment of SDG through organic production.

Conclusion

In the overall SDG accomplishment agriculture and especially sustainable agriculture has made a significant contribution. However, the sustainable agriculture sector that participates in this achievement has not adequately recognized and rewarded by the decision-makers. The various methods of sustainable agriculture exist but only a few of them can be relevant for SDG achievement. One of the most prominent is organic agriculture because it seeks to redesign whole food systems to achieve ecological, economic, and social sustainability. Up to now, organic agriculture showed huge perspective in combining the scientific research, community based innovation and information and communications technologies (ICT). Global interest in organic agriculture is growing, especially in areas where the conventional farming system has degraded resources essential to agricultural production. The best alternative for further expansion and development of organic agriculture is its integration into a global strategic framework such as the SDG as to connect various aspects of sustainable agriculture and stakeholders and to secure a pivotal position in healthy and safe food production while protecting the environment. Consequently, SDG will help organic agriculture to play a central role in agriculture expansion in the future and simultaneously can contribute the new paradigm in agriculture *Agriculture 3.0* and *Climate-smart agriculture*.

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Conditions for Unethical Environmental Behaviour in Organizations

Uwarunkowania nieetycznego zachowania wobec środowiska w organizacjach

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Abstract

The objective of the paper is to identify and classify the conditions for unethical environmental behaviour. It has been shown that the primary condition for unethical environmental behaviour is the level of environmental ethics dominant in a community and the observed inconsistency between the declared level of this ethics and the practice of business, institutional (including legal), social, market, etc. behaviour towards the environment. The observed axiological inconsistency generates numerous external and internal phenomena (factors, conditions) that create fertile ground for unethical activities leading to environmental degradation. The external conditions comprise, among others, complicated tax systems, subsidy and subvention systems and prices of emission allowances. The short term perspective of enterprises, the decreasing average working time of managers, a crisis of ethical leadership and a low level of responsibility for the environment have been identified as the most important internal conditions. Unethical environmental behaviour is further intensified in the absence of control and external reaction to its occurrence.

Key words: environmental ethics, environmental behaviour, unethical behaviour, conditions, enterprises

Streszczenie

Celem artykułu jest identyfikacja i klasyfikacja uwarunkowań nieetycznych zachowań środowiskowych. Wykazano, że głównym, źródłowym uwarunkowaniem nieetycznych zachowań wobec środowiska jest dominujący w danym społeczeństwie poziom etyki środowiskowej oraz obserwowane zjawisko niezgodności między deklarowanym poziomem tej etyki a praktyką zachowań wobec środowiska – zachowań biznesowych, instytucjonalnych (w tym prawnych), społecznych, rynkowych itp. Zaobserwowane zjawisko niezgodności aksjologicznej generuje liczne pochodne zjawiska (czynniki, uwarunkowania) zewnętrzne i wewnętrzne, stwarzające podatny grunt dla działań nieetycznych, degradujących środowisko przyrodnicze. Wśród uwarunkowań zewnętrznych zidentyfikowano m.in. skomplikowane systemy podatkowe, systemy dotacji i subwencji oraz rozbieżne ceny emisyjne. Za najważniejsze uwarunkowania wewnętrzne uznano m.in. krótkookresową optykę przedsiębiorstwa, zmniejszający się przeciętny czas pracy menedżerów, kryzys etycznego przywództwa i niski poziom odpowiedzialności za środowisko. Nieetyczne zachowania środowiskowe są dodatkowo wzmacniane w sytuacji braku kontroli i reakcji zewnętrznej na takie zachowania.

Słowa kluczowe: etyka środowiskowa, zachowania środowiskowe, zachowania nieetyczne, uwarunkowania, przedsiębiorstwa

1. Introduction

For many years, two opposite tendencies in the contemporary enterprises' development of relations with the environment have been visible in the field of management sciences. Some enterprises consider – not only declaratively – environmental issues to be important and take a number of ethical pro-environmental actions aimed at minimizing their negative impact on the natural environment. They implement the concept of Total Quality Environmental Management (TQEM) and apply the principles of green supply chains, green human resources, green investments, etc. The countertendency in the approach to environmental protection is manifested in the fact that some enterprises treat it instrumentally, and short term costs and revenues are the main reasons for taking, or refraining from taking, specific pro-environmental actions. Unethical but pro-organizational behaviour often occurs in such enterprises (Umphress, Bingham, 2011). In the opinion of the authors of this paper, four types of behaviour deserve special attention:

1. Greenwashing, a problem studied so far from the perspective of advertising and consumer perception (Schmuck et al., 2018; Topal et al., 2020; Zhang et al., 2019), the causes (De Jong et al., 2018; Lee et al., 2018; Testa et al., 2018) and the consequences of such behaviour (More, 2019; De Jong et al., 2018; De Jong et al., 2020; Torelli et al., 2020).
2. Carbon leakage, a problem analysed in the literature on the subject mainly due to its causes and related risks (Gurtu et al., 2016; Santos et al., 2019; Sommer, Kratena, 2020), the measurement methodology (Zhang, Fang, 2019) and business justifications for such environmental behaviour (Van der Ploeg, 2016).
3. Offshoring, analysed most often in the context of the relationship between the owner and the contractor (Qiao, 2019), the factors influencing the choice of its optimal form (Tomiura, 2009) and the role of organizational values and failures related to its application (Aron, Singh, 2005; Kelly, Noonan, 2008).
4. Unethical lobbying, previously considered in terms of the reasons for its use (Kim, 2019) and impact on organizational performance (Baron, 1995).

It should be stressed that, in the field of management sciences, the problems of environmental ethics and awareness as a key determinant of unethical actions towards the environment continue to be underestimated, despite considerable achievements of environmental ethics in philosophical sciences (Epting, 2018; Rolston, 2012a; Rolston, 2012b; Stables, 2020). In management-related works, attention is mainly paid to the problem of ethics in undertaking investment and development activities with potential impact on the environment (Besha et al., 2020;

Damian et al., 2019) and ethical problems accompanying the setting of emission reduction targets (Dahlmann et al., 2019).

None of the works published so far has presented a taxonomy of conditions for unethical anti-environmental actions of persons managing enterprises, taking into account the cause-and-effect cycle, i.e. the division into primary conditions (causes) and secondary conditions (causes and effects), as well as external and internal conditions. It is, therefore, a research gap identified in the cognitive and applicative dimensions. The objective of this paper is to bridge this gap by pursuing the achievement of the following four supporting goals:

1. Presenting the fundamental role (as the primary cause) of the axiological background of unethical environmental behaviour, i.e. value systems in the context of environmental ethics and awareness.
2. Identifying and classifying external and internal conditions derivative of a value system and facilitating unethical environmental behaviour.
3. Conducting an analysis of the four selected types of unethical environmental behaviour: greenwashing, carbon leakage, offshoring and unethical lobbying.
4. Indicating new fields of research within the framework of the issues analysed in this paper.

2. Research methodology

The main research method used by the authors was a literature review. The literature on the subject was reviewed in the course of the following stages: (1) selecting the key words: unethical behaviour, carbon leakage, greenwashing, overseas outsourcing, offshoring, lobbying, decision, counterproductive behaviour, (2) searching databases for works containing the identified key words, (3) becoming familiar with the returned publications, (4) reviewing the publications, (5) preparing a map of the available literature, (6) summarizing the selected publications and (7) arranging the collected research material. The applied procedure is consistent with the general methodology of conducting research (Craswell, 2013; Easterby-Smith et al., 2015). The systematic literature review was supplemented with an analysis of the available grey literature (Adams et al., 2016).

3. A house graph of conditions facilitating unethical environmental behaviour

The concept of the *house* graph of conditions facilitating unethical environmental behaviour presented in Figure 1 is based on two important methodological assumptions that are worth emphasizing.

Firstly, it is based on recognizing the axiological background of such behaviour as a key condition generating other derivative conditions, both external and internal ones. It is worth noting that, in the pre-

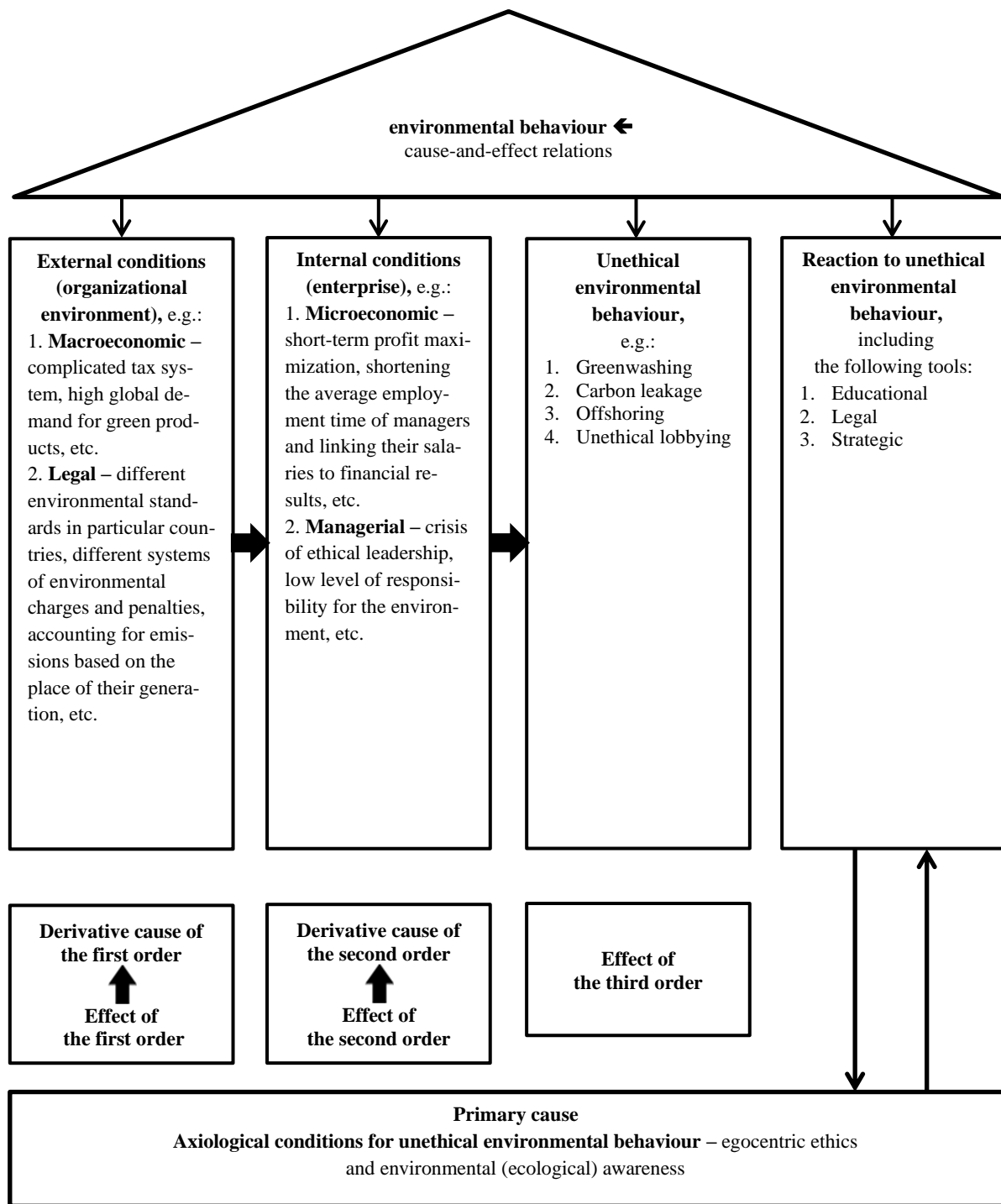


Figure 1. A “house” graph of the conditions for unethical environmental behaviour in an enterprise – cause-and-effect relations, source: the authors' own work.

vious approaches to the identification of the conditions of unethical environmental behaviour, the ethical and moral conditions were predominantly treated on an equal footing with other types of conditions, especially those manifesting themselves in the division into external and internal ones (Kinzig et al., 2013). There are many analogies to the approach to the concept of corporate social responsibility presented in many works, in which ethical and

moral responsibility is regarded the same as economic, financial, legal, social and environmental responsibility (Simpson, Kohers, 2002). A different approach to corporate social responsibility will be applied to the process of identifying the conditions of unethical environmental behaviour. It was presented, among others, in the works of T. Borys (2011, 2014), in which the four types of responsibility are *filtered through* ethical and moral responsibility.

ity, which is of fundamental importance for other components of CSR.

Secondly, it is based on the use of the cause-and-effect analysis in the process of identifying a set of conditions of unethical environmental behaviour and the application of the three key categories of this analysis, i.e. cause (sources, factors, determinants, premises, etc.), effect (consequence, result, outcome, etc.) as well as reactions to effects and causes. This analysis, as proposed by T. Borys (2006), consists in creating a shorter or longer sequence of causes and effects and determining the final element of this sequence, i.e. the reaction. In the course of this sequence, the successive effects of the primary cause, i.e. the effects of a higher order, become in fact the causes of the effects of a lower order.

This explanation is of key importance for the construction and concretization of the cause-and-effect sequence in the analysis of unethical environmental behaviour. It is assumed in this paper that cause-and-effect sequences for this phenomenon are created first of all by axiological conditioning as a primary (fundamental) cause determining all other elements of a cause-and-effect sequence (Fig. 1), i.e.

- external conditions for unethical environmental behaviour as an effect of the first order and a cause of the same order for internal conditions,
- internal conditions for such behaviour as an effect of the second order and a cause of the same order for unethical environmental behaviour itself, which constitutes, in this respect, effects of the third order,
- the concept and form of reaction to external and internal conditions and to unethical environmental behaviour itself.

The subsequent parts of this paper will be devoted respectively to the following:

- a presentation of the axiological background of unethical environmental behaviour, i.e. the fundamental conditions for such behaviour,
- an identification of the main manifestations of unethical environmental behaviour,
- a more detailed analysis of such manifestations in the context of the external and internal conditions for their occurrence.

4. Axiological background of unethical environmental behaviour

The axiological condition for unethical environmental behaviour is the fundamental cause of this behaviour determining all the other elements of the cause-and-effect sequence shown in Figure 1. In the entire sequence of conditions fostering unethical behaviour and reactions to it, there are people with specific ethics and morality, i.e. people representing a particular system of values and level of awareness.

A system of values relating to man's behaviour towards the natural environment and expressing man's

attitude to the surrounding nature is the subject matter of environmental ethics.

The division of behaviour into ethical or unethical is crucial for this paper and needs to be clarified because different types (levels) of environmental ethics have developed, depending on the adopted (egocentric or supra-egocentric) value system. As a consequence, behaviour towards the environment considered to be ethical in one value system (e.g. the egocentric one) may be considered as unethical in another system (e.g. the supra-egocentric one). Therefore, this relativization of assessments of behaviour towards the environment requires the determination of the kind of ethics being the basis for considering a specific behaviour as unethical, stressing that all varieties of environmental ethics focus on the ethical-moral foundations of man's responsibility for actions in the environment and attempt to determine how far this responsibility extends. Each type of this ethics, however, provides a different answer to this fundamental question.

Over the past fifty years, three main trends have crystallized within environmental ethics: anthropocentric (including egocentric), biocentric and ecocentric. The patocentric and cosmocentric trends have been omitted in this paper as less relevant to its objectives. Figure 2 shows the key perspectives related to the recognition of certain types of behaviour towards the environment as unethical, i.e. the width of the ethical field determining a type of environmental ethics and level of ecological awareness adequate to this width, the hypothetical distribution of the human population considering a given ethical field as the basis of its reference to the natural environment and the frequency of recognizing behaviour towards the environment as unethical.

Currently prevailing in environmental ethics, anthropocentrism is a view that recognizes human needs (interests, well-being) and values as the main reference point for any moral valuation. Human needs are more important than the needs of non-human beings, both animate and inanimate (Ganowicz-Baczyk, 2015). However, this trend is not homogeneous, as it is characterized above all by egocentric environmental ethics (or rather an illusion of ethics), based on strong (absolute) anthropocentrism, in which only man has an inner value, while other species and the entire planet have only utilitarian value for the achievement of human goals (Konstańczak, 2008).

This ethics is defined by a very narrow ethical plane (ethical field) that assumes the ethical subjectivity of only that part of society with which we currently identify, that is to say, it has a very clearly limited temporal perspective (the current generation), without reflecting on the quality of life of future generations, and an exploitative approach to the environment and its natural resources. Here, too, a rather absurd assumption is made, from the point of view of the vision of man, that man is guided mainly by the logic of such emotions as greed, egoism, cupidity,

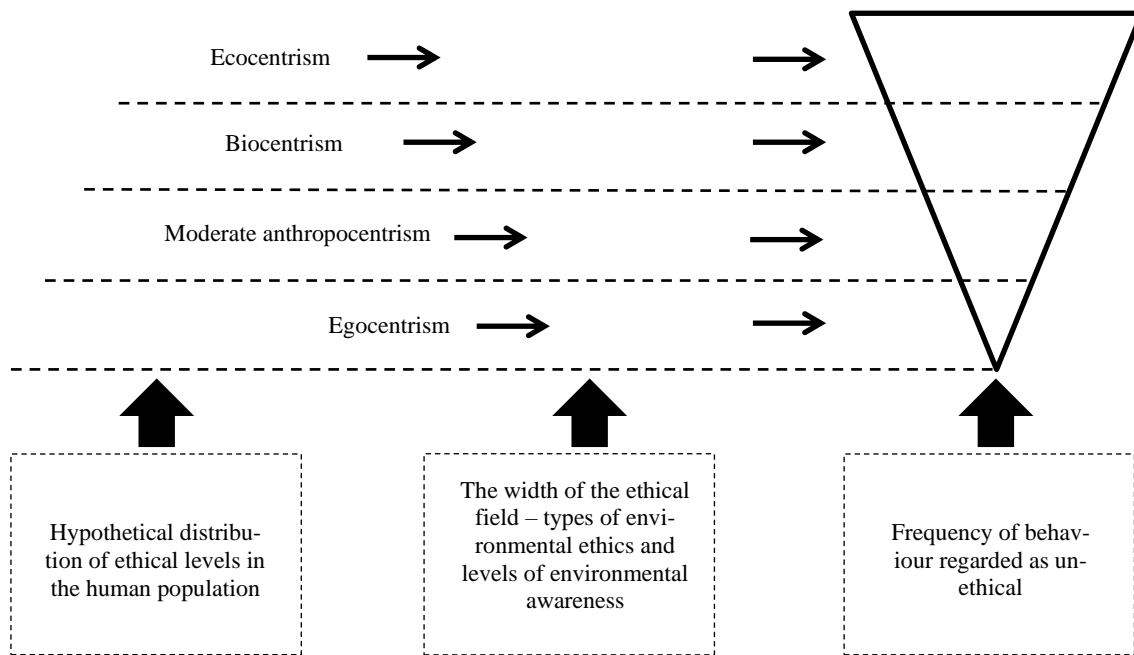


Figure 2. Unethical environmental behaviour and the width of the ethical field, source: the authors' own work.

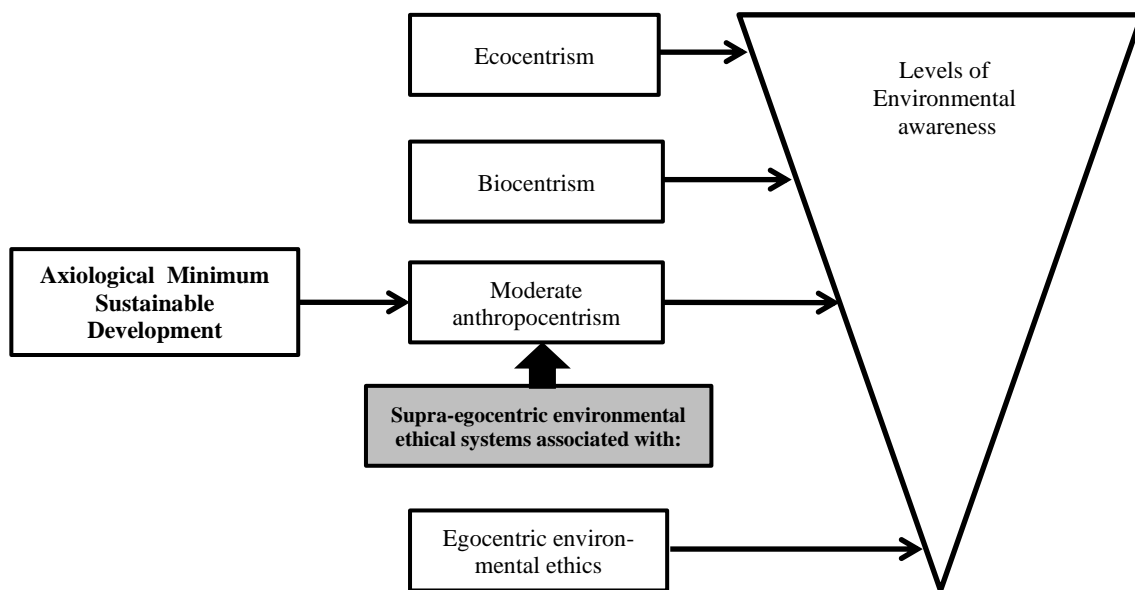


Figure 3. Egocentric and supra-egocentric environmental ethical systems and the level of environmental awareness, source: the authors' own work.

pride, etc., i.e. man is by nature an egocentric (with exuberant ego) and cannot be different, and the notions of good and evil are relativized and conditional; therefore, morality is determined by conditions (Skolimowski, 1981).

It can be seen that egocentrism, as if by its very nature, *multiplies* unethical environmental behaviour without reflecting on the consequences of such behaviour and without a sense of guilt or shame. A constitutive feature of egocentrism is a low level of ecological awareness which, according to A. Papuziński (2006), can be defined as the entirety of accepted ideas, values and opinions about the environment as

the place of life and development of man and society (cf. Fig. 2 and 3) which plays a key role as a primary cause in shaping and disseminating unethical environmental behaviour. Some research shows clearly the direct impact of this awareness on such behaviour of employees in enterprises (Safari et al., 2018). The results of some research also indicate the role of egocentric value systems (or rather anti-value systems) as important generators of unethical environmental behaviour. It often occurs in the absence of moral motives (Gatersleben et al., 2019), properly shaped connections to nature (Whitburn et al., 2020), appropriate personal and social standards (Kinzig et

al., 2013) and an organizational value system (Zhang, 2020). Although the identified axiological factors have an important cultural and educational background, the consolidation and development of negative behaviour also takes place when there are no appropriate behavioural patterns from other participants, especially leaders (Kinzig et al., 2013).

It should be noted that egocentrism also marks the boundary from which, with the expanding ethical field, constructions and messages from the supra-egocentric environmental ethical systems start to emerge (Fig. 3).

A special role is played here by environmental ethics based on moderate (weak, relative) anthropocentrism in which both humans and other living beings together with the environment have an intrinsic value, but the value of humans is incomparably higher than the value of the remaining part of nature. Humans have the right to secure their basic needs, i.e. food, water, shelter, sanitation, health care and education, but their implementation should not have a destructive impact on the health and integrity of ecosystems (Ganowicz-Bączek, 2015, Passmore, 1974).

It can be seen that moderately anthropocentric environmental ethics is defined by an ethical plane broader than egocentrism and recognizing the ethical subjectivity of each individual regardless of the time perspective (present and future generations), gender, race, religion or age. This type of environmental ethics recognizes the fundamental principle of sustainable development, namely the principle of intergenerational justice. This kind of anthropocentrism also defines the axiological minimum of the new development paradigm (Fig. 3) and presupposes a correspondence between what man as an empathetic being feels, thinks, says and accomplishes. This also creates a compatibility in man's relations with nature, i.e. man's ethical environmental behaviour that takes place in the current reality.

In this reality, however, unethical environmental behaviour also occurs, based either on egocentric, destructive thinking and acting towards the environment or being a manifestation of a kind of individual or collective *schizophrenia* that becomes increasingly evident in the successive empathetic but futile declarations of the need and even the necessity to protect the environment, in the absence of actual ethical environmental behaviour in practice. This axiological dissonance between the pro-environmental empathetic declaration creating artificial and false images for show and egocentric performance is still quite common. Examples of such unethical environmental behaviour will be described in the next chapter.

5. Main manifestations of unethical activities of enterprises

Enterprises may undertake various activities aimed at satisfying their own interests, which will not necessarily be beneficial to the environment. Most publications focus on the following four types of behaviour: greenwashing, carbon leakage, offshoring and unethical lobbying.

Greenwashing, less commonly referred to as greenwash, green eyewash or green lie, is the process of giving customers looking for goods produced in accordance with the principles of ecology and environmental protection the impression that given goods or their manufacturer are environmentally friendly. The term refers to misleading messages that aim to create overly positive beliefs among stakeholders about a company's environmental practices (Torell et al., 2020). Enterprises use different tactics in this regard. Some provide false information, while others use half-truths to give false information about selected aspects of a product, e.g. its functional characteristics (De Jong et al., 2020).

Carbon leakage consists in transferring carbon dioxide emissions from one country to another. Carbon leakage occurs when, as a result of a restrictive climate policy concerning CO₂ emissions reduction in one country, carbon-intensive production is transferred outside the borders of the country or the European Union to countries where such restrictions do not exist or are less costly. As a result, global CO₂ emissions do not decline, and may even increase when a new location uses production methods that generate more CO₂ per tonne of a given product (Gaška et al., 2019).

Carbon leakage has become a major problem for emissions trading systems in recent years (Sun et al., 2019). However, studies ordered by the European Commission after the completion of Phase II of the EU ETS have not shown the occurrence of a noticeable carbon leakage from the countries covered by this system (European Union, 2020). Data also indicate a serious leakage of CO₂ emissions from developed countries to developing countries (Zhang, Fang, 2019). The transfer of greenhouse gases, in particular CO₂, due to international trade is a phenomenon related to classical carbon leakage. It is referred to as the export of embodied emissions.

Another unethical practice is overseas outsourcing, or offshoring. With regard to environmental issues, it involves the transfer of selected processes, not only those related to CO₂ emissions, to countries with lower environmental costs and less stringent environmental standards (Andreessen, 2004; Li, Zhou, 2017). Production and service processes are also often transferred to countries characterized by low levels of economic development and more liberal environmental regulations (Taylor, 2005).

Lobbying as an environmentally unethical activity has a smaller scope and frequency than the three types of unethical behaviour discussed earlier. In general, lobbying is one of the political strategies implemented by enterprises for favourable treatment or a reduction of uncertainty arising from the regulatory environment (Kim, 2019). Lobbying is an activity undertaken in a non-market environment in order to create value by improving overall performance (Baron, 1995).

Lobbying may be secret or public (Laboutková, Vymětal, 2019). The problem arises when secret, and therefore non-transparent, lobbying takes place as it can give rise to environmentally unethical lobbying behaviour. Examples of ethically questionable behaviour include the lobbying of passenger car manufacturers during the coronavirus pandemic in order to avert environmental standards related to CO₂ emissions reduction (The Guardian, 2020).

6. External conditions

The external conditions favouring greenwashing or carbon leakage practices are primarily of a macroeconomic and legal nature.

Greenwashing occurs when a company has something to hide, when the actual values of environmental performance and efficiency ratios differ adversely from the normative values or those communicated to the general public (Jones et al., 2019). There are several main reasons for this unethical phenomenon. Some authors note that it is the marketing success of green products that has led to the phenomenon of *green laundering* (De Jong et al., 2018). However, this problem can also be seen in a broader context, namely, profits that companies generate due to the application of the Corporate Social Responsibility (CSR) principles. Recently, there has been a lively discussion on CSR, and the concept itself has aroused many emotions, both positive and negative. The main objection is that an enterprise's intentions and motivations do not always result from business ethics, but from a narrowly understood economic balance, and CSR is only one way to improve financial performance. Companies usually try to publicize the fact that they are socially responsible (Lee et al., 2018).

In some research, the importance of the pressure exerted by different stakeholder groups on the application of green practices is also taken into account. For example, research carried out by Testa et al. (2018) has shown that pressure from suppliers and shareholders contributes to the ecologization of corporations, and pressure from customers and industrial associations usually encourages green laundering. External conditions are also largely responsible for the practice of carbon leakage. In the literature on the subject, the following aspects are emphasized in particular: the lack of equal globally binding GHGs, emission reduction targets, diverging GHG emission

prices or even their absence in some countries (Gaška et al., 2019). Current practices of accounting for emissions are production-based, which guarantees their incomplete calculations in national emission inventories. This is when outsourcing occurs, which is the cause of increasing global emissions (Gurtu et al., 2016). Views on the impact of some legal regulations on carbon leakage are divergent. Some authors believe that there is no evidence that the EU Emissions Trading System (EU ETS) causes carbon leakage (Naegele, Zaklan, 2019). However, there is fundamental consensus that the risk of carbon leakage is higher in the case of energy-intensive industries.

The carbon leakage inclination depends not only on emission prices, but also on the tax system (Sommer, Kratena, 2020). Some countries have carbon or hydrocarbon taxes. However, not all taxes are fiscally neutral and have an incentive effect, especially if their rates are low. The concern about the potential use of carbon leakage leads to actions aimed at the development of effective emissions valuation instruments. However, carbon leakage risk assessment is still neglected in many countries (Santos et al., 2019).

The main reasons for offshoring include in particular tax incentives, government subsidies for labour costs and access to skilled and available workforce (Jordan et al., 2014). However, it should be assumed that one of the hidden causes of this phenomenon is the attempt to bypass restrictive environmental laws in many countries. This thesis is confirmed by the results of studies carried out by Li and Zhou (2017), which show that the four main anthropogenic air pollutants (sulphur dioxide, nitrogen oxide, carbon monoxide and soot) emitted in China are linked to the production of goods for export. The problem arises particularly in legal systems where there are restrictive environmental laws and liberal economic laws (Taylor, 2005).

In the case of unethical lobbying, the problem is not only enterprises' attempts to influence the legislative process, but the very fact of their participation in the process, e.g. producer associations (Lock, Seele, 2016). On the one hand, companies communicate that they are oriented towards green practices, while on the other hand, they are not interested in revealing their relations with governments and lobbying groups (Winston, 2019).

7. Internal conditions

The internal conditions for taking unethical actions are primarily related to people who have an influence on management, i.e. top managers and owners. The mere existence of external conditions favouring unethical behaviour does not mean that such behaviour will be adopted. For such behaviour to occur, favourable conditions within an enterprise must also occur.

The first group of internal factors are microeconomic conditions. As it has already been noted, decision-making processes of owners and managers may be influenced by the narrowly understood economic balance, and then green practices may be one way of maximizing short-term profits. In the recent years, the amount of capital invested in clean energy has been growing rapidly (Bloomberg, 2020). The attitude of investors has also been changing as green subsidies grew stingier (The Economist, 2019). More and more often, stock exchange indexes containing environmental components (e.g. the Sustainability Index) are a database used by investors relying on the Environment, Social, Governance (ESG) criteria in decision-making processes. Durand et al. (2019) pointed out that 78% of analysts take ESG performance into consideration in their investment decisions, according to the CFA Institute. Investors also increasingly respond to the content of enterprises' reports concerning CSR (Aureli et al., 2020). On the other hand, microeconomic factors may be an incentive to demonstrate pro-environmental behaviour.

The average employment time of managers is decreasing (Forbes, 2020; Harvard Law School Forum, 2020), managers' salaries are usually linked to enterprises' financial results, and their components are often share options. With favourable external practices detrimental to the environment, individual managerial targets related to salary levels and a short term perspective can lead to unethical environmental actions. Furthermore, it should be borne in mind that the relationship between the environmental behaviour of stakeholders and the valuation of company shares is still not fully clarified (Durand et al., 2019). As a consequence, one of the most important factors for unethical environmental behaviour in an enterprise is a deficit or lack of ethical leadership. The literature on workplace ethics often emphasises the importance of adapting systems and processes to organizational values and the role of leadership in the development of an ethical culture (Treviño et al., 2018). The study by Boiral et al. (2018) shows that managers' pro-environmental awareness has a positive impact on civic behaviour in this area, i.e. eco-initiatives and eco-assistance. Pro-environmental behavioural patterns are also influenced by actions and expectations of other relevant people (Collado et al., 2019; Lauren et al., 2019).

The lack of appropriate values, standards, behavioural patterns, and ethical leadership are conducive to unethical behaviour, but such factors as the absence of a sense of guilt and shame about such behaviour (Schneider et al., 2017), a tendency to take risks (Yiannakoulis et al., 2020), as well as moral and ethical implications of environmental restoration (Damian et al., 2019) also play an important role.

8. Proposed directions of further research

This paper allows one to raise a number of questions indicating further research directions and existing research gaps:

1. To what extent are managers encouraged to set easy-to-achieve objectives by being rewarded for the accomplishment of environmental targets?
2. Does the tendency to make transparent decisions and avoid greenwashing increase along with growing investments?
3. How do managerial factors (e.g. high salaries and short-term employment prospects), modified by the cultural conditions of the management process influence the effectiveness of pro-environmental measures?
4. How does competition between certification bodies and auditors affect the maturity of environmental management systems and environmental performance?
5. Does counter-productive behaviour demonstrated as a result of obtaining a *moral license* also apply to the natural environment?

9. Conclusions

External conditions and factors, mainly legal and economic ones, may contribute to an increase in the occurrence of unethical pro-environmental behaviour. This is particularly evident when there is no international cooperation in the development of legal regulations, when there are various types of political pressure and games, and when only one's own short-term goals are pursued. Complicated tax systems, subsidies and prices of emission allowances make it quite easy for particularly large, strong enterprises to engage in greenwashing, carbon leakage, offshoring and unethical lobbying.

External conditions increase the likelihood of unethical behaviour, but it must be borne in mind that certain internal conditions and factors must also occur for it to take place. A short-term perspective resulting from the adopted business model, decreasing average employment time of managers in enterprises and their high salaries, in a situation of high insecurity and a lack of social control, may contribute to actions detrimental to the environment being taken by individuals in enterprises. Such attitudes and actions are intensified when there is a lack of control and external reaction. Much depends also on such decision-making factors as a tendency to take risk, a sense of guilt or uncertainty, which are also important for unethical behaviour and further degradation of the environment.

In the occurrence of unethical environmental behaviour, the axiological background to such behaviour plays a fundamental role as the primary cause, that is, value systems considered in the context of environmental ethics and awareness the level of which

influences the scope and frequency of unethical activities.

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The Challenges before Higher Education for the Composite Growth of a Sustainable Society

Wyzwania stojące przed szkolnictwem wyższym w kontekście kształtowania złożonego zrównoważonego społeczeństwa

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Abstract

A society is a large composite structure moulded by many interconnected non-autonomous entities. As the growth of the society is an inevitable continuous process, its structure and so also its demands keep on changing. This alteration, yields up many challenges to be met by the individual of a society. The sustainable growth of society, along with its diversity and disparities, needs a holistic approach to development. Therefore, there is a demand of fostering a durable human resource. The higher education besides being value addition to a person's cognitive ability, must enhance the readiness to face any problem in life with sufficient empirical competence. The greatest challenge before higher education is to inculcate humanitarian values, civic knowledge and sensitivity towards other life forms and the environment in a learner; so that s/he can realise her/his obligation to the social and natural environment.

Key words: composite society, humanitarian values, civic knowledge, sustainable growth

Streszczenie

Spółeczeństwo to wielka złożona struktura utworzona przez wiele połączonych ze sobą nieautonomicznych bytów. Ponieważ rozwój społeczeństwa jest nieuniknionym procesem ciągłym, jego struktura, a więc także wymagania, ulegają ciągłym zmianom. Ta zmiana stawia przed jednostką społeczną wiele wyzwań. Zrównoważony rozwój społeczeństwa, wraz z jego różnorodnością i dysproporcjami, wymaga holistycznego podejścia. Dlatego istnieje potrzeba wspierania trwałych zasobów ludzkich. Wykształcenie wyższe oprócz tego, że stanowi wartość dodaną do zdolności poznawczych osoby, musi zwiększać gotowość do stawienia czoła każdemu problemowi życiowemu z wystarczającymi kompetencjami empirycznymi. Największym wyzwaniem stojącym przed szkolnictwem wyższym jest wpajanie uczącym się wartości humanitarnych, wiedzy obywatelskiej i wrażliwości na inne formy życia i środowisko; tak, aby mogli oni realizować swoje zobowiązania wobec otoczenia społecznego i naturalnego.

Słowa kluczowe: społeczeństwo złożone, wartości humanitarne, wiedza obywatelska, zrównoważony wzrost

1. Introduction

A society is a large composite structure moulded by many interconnected non-autonomous entities. As the growth of the society is a continuous process, its structure and so also its demands keep on changing. This alteration, especially in the post-modern world, crops up many *challenges* to be met by the individual of the society. The sustainable and composite growth

of society, along with its diversity and disparities, needs a holistic approach to development. Therefore, there is a demand of building up a strong human resource which would be supported by a highly moral value system to face any problems in the society. Education is the process of change in the human beings – mentally, physically and emotionally. The Greek philosopher Confucius had the vision that, *if you think in terms of a year, plant a seed; if in terms of*

ten years, plant trees; if in terms of hundred years, teach the people (brainyquote.com, 2021). Therefore, we have to reconsider our commitment and strategy to higher education because any problem of the society is a challenge for the higher education system. The Nobel laureate Nelson Mandela in his address entitled *Lighting your way to a better future* (2003) had said, *education is the most powerful weapon we can use to change the world* (Nelson Mandela Foundation, 2021).

This paper contains many grass root level examples to make us realise what are the factors impeding the sustainable growth of society, ponder over the lacunas in the existing higher education system and few suggestions regarding how to face the challenges through reformation in it. The challenges to the higher education system stem from many sectors – social discourse, lack of ethical values and civic sense, economic system, rigid mindset, underdeveloped human resource, deterioration in the standard of education, the tension between the socio-cultural need and the pressure to compete with the global standard etcetera. Secondly, the requirement of a composite society for sustainable development is pondered upon. Thirdly, several propositions are made in this direction. The suggestions are general in nature and are applicable to all most all the countries for the balanced growth of their societies. Finally, the pivotal role and importance of literature in higher education is established.

2. The Challenges

The problems faced by the society keep on shifting. Earlier it was war among small or big nations ruled by the kings and the emperors, then colonialism and now neo-colonialism; earlier it used to be the terror of the pirates, the burglars, now is the fear of the terrorists. The hostility between various social classes of the past has been replaced by the pressure groups these days. Earlier kings' favourites are replaced by politicians' vote banks; superstitions are replaced by experimentations like drug addiction. The fundamental vices and the cardinal virtues are elemental in human nature; both the angelic as well as demonic sides are there in our character. It is up to us how we are trained to explore ourselves.

2.1. Social

The nature of the social problems varies at various levels. The local level problems of which a layman is aware of are – inflation; spread of endemic diseases; natural calamities; communal riots; child trafficking, child labour, child abuse; sexual harassment; chit fund scams; uneven economic distribution; environmental hazard, environment pollution; brain drain; rampant corruption, black money possession; discrepancies on caste, gender, birth, colour basis etc. Even if legal provisions are made against some

of these, they have not been proved to be much effective. Irrespective of education the mass reacts to such situation in adverse spontaneously. Here is the lack of a humanitarian value. *Equality, fraternity and Liberty* are only few idealistic terms very often confined to the books. It seems that we have not learned anything from history because wittingly history is repeating itself. Frederick W. Robertson says, *instruction ends in the school-room, but education ends only with life* (brainyquote.com, 2021) and the continuation of the above problems confirms that people of our society are not well educated.

2.2. Lack of civic sense

Again, the failure of our higher education system to build up our character can be demonstrated through the few following examples. Children reluctant to take care of their old and alien parents; people making public place dirty by disposing polythene and garbage; writing, inscribing and damaging the floors, walls of public structures and the national monuments; the street begging culture of able young people; commercialisation of religious institution- grace of God in proportion to money offered; rise in the of the fake *babas* (so-called spiritual leaders) and their blind supporters; beating animals for hedonistic pleasure; scolding and misbehaving servants; wasting electricity and natural resources like petroleum and water; ignoring a helpless accident victim on the road and indifference to the physically challenged people when they face difficulty at public places; breaking rules in the absence of the authority like-violating traffic rules, unnecessarily blowing horn, cracking bombs, playing music loudly and creating civic inconveniences; breaking a queue due to impatience; wasting food, injecting hormones and colour to make the fruit size bigger and lucrative and so on. Again, violence during strike and damage to the public property; tearing pages from the library books; black marketing; child labour at home, restaurant and garage; using pesticides then plucking and selling vegetables before the required time period to earn money, hoarding consumer items and creating an artificial shortage are due to the blind hunger of greed etc. Such blunders can be committed by any insensible person- both an illiterate man and a highly qualified person. Can we call such person with high academic qualification well educated? We are so familiar to such nuisances that we ignore them. Sometimes they are not opposed deliberately and sometimes these are recognized as the normal course. These are such problems most of which do not come under the circumference of law and order so that a desired change can be brought by force in the society. Here people cannot be compelled. Here comes the role of higher education that can impel more mature and skilled minds to guard the ethics, value system and tradition while introducing the changes that can make life better in a com-

patible way with the prevalent system. Even if democratic system, freedom of expression right to information and well-articulated constitution is available to us these benefits are not reaped properly due to lack of awareness.

2.3. Lack of ethical values

It seems that getting highly educated mass in the current education system is not the solution to the problems concerning ethical issues. It is not that those who commit such blunders in the society are not aware of what they are doing; rather ironically, they are proud of doing all these evils to promote their interest. Good conducts are to be infused in to the behaviour pattern of the people through education. Only empowerment of human resource is not enough; how the power is being used is to be watched and directed. The person who had explored the potentiality of atomic energy was a scientist. How to use that energy – as atom bombs to devastate a civilization, or to possess the potential to frighten others, or to use that in the nuclear reactor to produce electricity is our choice. Roth firmly asserts that college teaches young people to think and to engage, allowing them to better themselves and their societies. In his vision, *liberal education matters far beyond the university because it increases our capacity to understand the world, contribute to it, and reshape ourselves.* (Roth, 2014).

2.4. Economic disparities

As far as basic level education is concerned, it is not much expensive, but for higher education, the government has to invest a lot. It is the demand of the hour from each government, that they should venture into higher education segment to convert the burden of population growth into human resource. Economic growth of each person and a country as a whole directly depends on the education level. It helps to alter the structure of a society from agrarian to non-agricultural. This implies that with help of the technology (in an environmentally friendly way), with a smaller number of work force one can produce the desired amount of crop. The rest of the human resource can be utilised at some other sectors. *Higher education is the strongest, sturdiest ladder to increased socio-economic mobility* (weforum.org, 2015) as articulated by Drew Gilpin Faust, an American historian. With access to higher education for all, it can be hoped that the economic gap in the society would be reduced.

2.5. Human resource development

In order to survive in the tough competition in the liberal market economy and with direct foreign investment in globalised world, a nation has to equip its human resource. Despite belonging to a developed country, Meg Whitman in an interview in ABC News on November 17, 2009 was expressing his concern regarding the future of the US as: *because if*

you don't have a great workforce, a great higher education system, you're not going to have the next eBay, the next AmGen, the next, you know, Miasole, and not only California but America is going to fall behind a whole new competitive context which is obviously China, India, and other countries (ABC News, 2009).

This is a lesson for all the countries, drawing attention to the urgency of working upon human resource development to make the society sustainable.

2.6. Deterioration in the standard of education

The academic challenges in the higher education are the quality of the provided study environment- competent teaching faculty, world standard syllabus, giving place to new area of interest in curriculum, resurrection of traditional ancient knowledge, introducing smart class and interdisciplinary courses; good library facility, including e-library; correspondence course, lower cost of education; well-equipped laboratory; grants, scholarships, for the disadvantaged group, more investment in higher educational sector; guard against fake universities, paying attention to vocational training to produce skilled self-employers. No walk of life should be neglected by higher education system.

2.7. Rigid Mindset

It is a challenge for higher education to make people feel its own significance by bringing certain reform in its contribution according to the social need – in the academic field and cultural field. Following are some of the challenges faced by higher education system from society itself. Few orthodox people in the society due to their certain conservative notions regarding higher education accept it reluctantly. For example, girls are kept at home and are prepared for their marital life by doing household chores which they are supposed to do throughout their life. Certain faith, tradition and practices being designated superstition and unreasonable, evil thing offends the old orthodoxy. Often it appears that the older generation's faith is challenged to answer the present questions. Their age-old rituals are mocked at as superstitions. Often it is heard that highly literate daughters-in-law are untameable. Therefore, a feeble resistance can be felt to the questioning spirit of higher education. Higher studies mean longer study carrier. It delays earning for the family for few years; whereas sometimes the poor economic condition of the family demands another helping hand for it. If there is some family business generally people do not opt for that because they do not realize the importance of further study. Often highly educated people get opportunity to go abroad for job but instead of returning home they prefer to settle there. Families who feel insecure regarding their possession of their children prefer not to provide higher education to their children. To some extent their lack of nationality is responsible for this.

3. Composite Growth of Society

Usually, people cannot relate the knowledge gained from higher studies to their day today life beyond the basic skills they acquire at secondary level which is more general in nature. The cause of merge enrolment of students at universities of drop out and high levels is that most of the people cannot relate it to their social contexts and cultural practices. Without mass involvement in higher education a wholesale transformation in the society could not be accomplished. The composite growth of a society demands a proportionate growth of all the components and all the sections of the society, who should live together in harmony with each other and society as a whole. Thus, shrinking disparities and division of the society based on class, caste, clan, sect, faith, colour which indeed is one of the biggest challenges. The Nobel laureate R. N. Tagore had said: *the highest education is that which does not merely give us information but makes our life in harmony with all existence* (Rosca, 2015).

4. Suggestions

In higher education one gets the opportunity to specialize in one's area of interest at a mature state. However, roughly it can be divided into two parts- the preparatory section that is, graduation, post-graduation and the research part. Moreover, research can be basic research and development and inter disciplinary research. Development in any field is beneficial only when it is useful in the public interest and not in contradiction with other social issues.

The main branches of higher education are science, commerce and humanities. Science makes our living comfortable. Society does not exist without commodity so its tread and transport are dealt by commerce. The branch *arts* is alternatively called humanities because it carries humanitarian values. Sociology is the study of the nature of societies, its trends, needs; law is for justice; journalism is for awareness; psychology is the study of mental issues; and the role of philosophy is to contemplate; economics and political science are about way of the world; history teaches the lessons we have learned from the mistakes that were committed in the past; language provides us an opportunity to peep into and interact with other cultures; at last comes literature that deals with all the above mentioned now in the disguise of fiction. None of the branches of studies is as effective in cultivating humanism in a human being as the study of literature. Since childhood such values are injected into the tender mind of a child through fables, stories and anecdotes. During primary and secondary schooling these values are to be served before them further through education, group activities, team work. But as soon as higher education is started, specialization of the course begins and the gap among various branches of studies

and its direct link with the day today life dwindles. Studies become more and more carrier oriented; the students read to score good result so that they can perform get seat at the next level or do well in the competitive examinations. One after another qualification is earned and with that eligibility to get better job is enhanced. The materialistic approach to life leads T. S. Eliot to say in *The Rock: Where is the Life we have lost in living? Where is the wisdom we have lost in knowledge? Where is the knowledge we have lost in information?* (Eliot, 1934).

Moreover, once Einstein had remarked, *education is what remains after one has forgotten everything he learned in school* (brainyquote.com, 2021). It is the trace that remains in us after years of formal training.

4.1. Teacher training

Queen Rania of Jordan has said, *good teachers teach. Great teachers transform* (weforum.org, 2015). One problem faced during the recruitment of teaching faculty for universities is that the posts are remaining vacant due to lack of eligible candidates. This reflects how the quality of education has gone down. Expansion of higher education system is the demand of the situation but that should not be done at the cost of quality of education. Immediate attention must be devoted to teacher training for the development of the faculties because, as Ron Lewis has held, *ensuring quality higher education is one of the most important things we can do for future generation* (brainyquote.com, 2021).

4.2. Glocal syllabus

Being global does not mean that one would neglect one's local needs. The reorientation of syllabus in the process of globalisation of education would keep us update with the new advancements and at par with other developed countries of the world. However, care must be taken not to neglect local language, geography, history and culture to save education from being abstract to the social context. It is advisable to gain the local knowledge at the preliminary stages of education and widen the scope of learning to the international level during the later phases of education, especially, higher education. Hence, the overall curriculum has to address *glocal* issues. At the research level of higher education, the motto should be to learn globally, and implement locally. Then only the benefit of the knowledge developed and preserved in any remote corner of the world can be accessible to others.

4.3. Creating scope in the job market to learn new course

Due to the emerging recognition of various professions private institutes are cropped up, palmistry, journalism and mass media, architecture, animation, interior designing, dress designing, sculptor, making cartoon, painting art schools are founded. For film industry, theatre, drama, mime acting schools are es-

tablished; music schools are teaching how to play various musical instruments and reviving classical music and pop songs. All these are signs of a developed civilisation where people find leisure to indulge in artistic pursuits. If these knowledges would get the recognition and support of the universities, then they would thrive vibrantly.

4.4. Work integrated learning approach

Work integrated learning programmes facilitates highly effective in helping scholars uncover their true potential. This can be implemented only at higher education level. The benefits of work integrated learning are practical application of the theories learnt in the books, entering into the job market before the completion of the course, thus gaining additional work experience, building up a firm employability-base, developing self-awareness and comprehending career opportunities and the job market. Besides this, inter-disciplinary courses are beneficial in earning more than one degree for the students. They can be specialised in more than one specific subject. Thus, courses like integrated law, integrated MBA, biodiversity, biotechnology, polytechnics, comparative literature studies and so forth should be introduced at the university levels. These should be developed along with more specialisation like industrial economy, women studies, creative writing, rural management, cyber law, criminology, aeronautics to produce experts in each walk of life. Hence, more options should be opened before students at an early stage because these are subjects those can be handled after the general courses.

4.5. Connecting course and Learning International lingua-franca

In order to establish harmony among all the branches of higher studies at least one or two papers of other branches are to be introduced into the syllabus of a course. For example, at the graduation level all the students of science stream and engineering have to study papers on communicative English, environmental studies, population studies and cultural studies. Like that the students of arts have to go through computer education, reasoning and data analysis. Generally communicative English is kept as a paper in all most at all the branches of studies at the graduation level. But at post graduate level and after that no such provision is made. Whatever has done yet in this direction is not enough; more care should be taken to bridge the gap. At least one foreign language, should be made compulsory even in post-graduation because it is the sole medium to connect with the outer world. Being skilled in a widely spoken international language enhance one's communication ability to get connected to the major population on the earth, greater mobility and job opportunity.

4.6. Equal opportunity for all

Sometimes financial pressure of the private institutions and technical educations deprives many talents to opt for these branches. Whereas the government universities seat numbers are limited to accommodate students in large number, only the top performers are fortunate enough to get enrolled. Thomas Frank says, *for profit higher education is today a booming industry, feeding on the student loans handed out to the desperate* (brainyquote.org, 2021). Many fake universities are cropping up to cheat students and such activities has to be checked. Scholarship for bright students, financial aid for financially backward section, loan facilities for the poor and encouragement should be provided to the female students. There are provisions also but they are not well executed in time. However, keeping reservation for certain category while getting a seat at an educational institution or at job may be used as a strategy to encourage learning for that particular group, but it conveys a negative message for the rest. In fact, education has to be free throughout the career. Irrespective of the gender, caste, creed, faith, sect, community, nationality each human being should have equal access to education in their life. Then there would be no need of reservation at all. Thus, education would remain out of politics.

4.7. Technological intervention in teaching

Heavy use of technology is to be introduced in the higher studies as it has immense potentiality to cater the demand in the direction of sustaining our society. José Antonio Bowen, in *Teaching Naked: How Moving Technology Out of Your College Classroom Will Improve Student Learning* mentions that, *time for reflection and interaction is a casualty of the digital age, and one of the primary goals of higher education should be to reclaim this time* (Bowen, 2014). Digitalisation of education is more effective, the World Wide Web, e-education, e-books world's biggest libraries through e-library would be at the disposal of a common student. The COVID- 19 pandemic taught us a nice lesson in terms of the potentialities of virtual platforms. Many e-conferences and regular classes can be organised in a smooth manner. Subsequently, steps must be taken to make people access such online education.

4.8. Distance mode of learning

Sometimes due to their busy schedule and other issues, people do not get opportunity to pursue higher education, despite being interested in contributing their share for the social wellbeing. Introduction of courses in distance mode, along with e-learning run by various universities can exploit this opportunity. Such courses should be of short duration and the application of the theories taught are to be done side by side by project works, team works, workshops, seminars, field work, mini research works, exhibitions, internship for few months are to be done. These

would develop group behaviour, fellow feeling, responsibility, carefulness, self-assertion among the scholars. Distance education is a boon for those who cannot attain class because of their inaccessibility to higher education at their locality.

4.9. *Physical training*

Physical education in the form of martial art, yoga, aerobics, self-defence training is also mandatory for the physical wellbeing of the students during graduation, but it is confined to pen and paper only; arbitrarily grades are distributed on the mark sheets against this criterion. Physical fitness would let a person help oneself, others. The awareness of physical fitness would draw attention to healthy habits, consuming organic products, inhaling oxygen rich air, maintaining a clean and eco-friendly environment. One would realise the importance of the flora and fauna and try to preserve them for one's own sustenance.

4.10. *Vocational training*

Each walk of life that fulfils social needs is significant. The culture of not to undermine any of the professions should be developed. Generally, aversion to agriculture is found among the young generation. It is alarming that in Japan the average age of a farmer is around sixty. If all the students would aspire to opt for only few professions like doctor, engineer, scientists, management professionals, chartered accountant, lawyers, civil servant then who shall be the farmer, cobbler, carpenter, plumber, making pottery, bangle maker, tailor, goldsmith, weaver, barber, working on jute, bronze, copper, silver and vehicle mechanic? Development of a skilled labourer can eradicate unemployment problem and fast and finished completion of their job leading to greater productivity. Usually, these professions practices are transmitted from ancestral family occupations. Why should such fields be relegated to the illiterates and unskilled stock? How many training schools are there for such professions? It is essential to teach vocational training alongside the general courses. The application of the theories taught in the classroom should be done by project works. Vocational education can create independent entrepreneurship self-employment.

4.11. *Revive Indigenous knowledge*

There are many communities in the world who have preserved their age-old indigenous knowledge in the form of culinary dishes, preparing spices, herbal medicines, body massage, body sculpting, handicraft, weaving, pottery and other handicrafts, architectural knowledge (*vastu shastra* and *Feng sui*), numerology, palmistry, acupressure etcetera. All these would extinct unless they are preserved and promoted. Loss of a such ethnic craft, is loss to the whole humanity. These must not be relegated as obsolete, rather these should be respected as these are

scientifically based on experience of many generations. Transformation of heart can be achieved through the extra-curricular activity. This must be done through the mass involvement of the students in the cultural programmes conducted and promoted by the universities. It also includes the behaviour of the staffs of a university.

4.12. *Research oriented education*

Research should be directed towards long term sustainable development of society. It must not be like developing a composition of chemicals to suppress a health problem which may provide a temporary relief with a lot of side effects and selling them as medicine. Inter disciplinary researches should be encouraged for better social benefits. New scientific inventions and discoveries make our living comfortable, but our value system should be such that we would not permit us to become easy going and earn money at the cost of wellbeing of others. At Nasik, the grape farmers hesitate to consume the grapes they sell. The US had refused to import mangoes from India because of harmful pesticides particles were found in them. Like that being easy going people are using canned and packed food persevered by unpermitted harmful chemicals. The introduction of Green Revolution in Punjab and Haryana is a failure in so far as sustainable growth of agriculture is concerned. No doubt productivity had increased but heavy use of pesticides and fertilisers have damaged the natural fertility of the soil. Therefore, though scientific research and developments make our life comfortable, saves time, energy and cost effective, we have to be selective in adopting and implementing them in our life. It is to be watched that our environmental condition would neither get hamper at present, nor in the future due to a new found technology.

4.13. *Religious education*

In the fast-changing postmodern world where there is no constancy, no permanent solution of existential problems, only tentative reconciliation seems soothing, there is no faith that cannot be questioned in such circumstances if the elemental humanitarian qualities would be encouraged inside people the moral backbone of the society would provide it strength to face the present as well as the unpremeditated challenges. Religious education has to be introduced because no religion is anti-social and they all are based on a faith. The modern sceptical, rootless, faithless mind needs some solid support to save it from anarchy.

4.14. *Sensitivity towards other life forms and the environment*

The ideology of Hindu *Adweta Vedanta* (non-dual principle) pleads for a pantheistic view. It says that all the beings, even non-living beings are essentially not different and separated, because they all embody

the same essence of the God. *Ayam nijah paroveti ganana laghuchetasam, udaracharitanantu vasudhaiva kutumbakam* (*The Maha Upanishad*).

This means those who are mean, they think in terms of *mine-yours*; but broadminded people consider the whole world to be a single family. Here broadening of mind means being able to understand stand others' point of view and being tolerant to that. Only an enlightened mind can do so. One who realises this, that person never can harm or exploit others – human beings, animals and plants and damage the environment. Thus, the aim of higher education should be to, '*amaso ma jyotirgamaya* (*Brhadaranyaka Upanishada* I.iii.28), lead us from darkness of ignorance to the enlightenment of knowledge.

5. Value education through Literature

Finally, the most important challenge before higher education is to make society a better place to live in a society free of fear, actual or potential terror, extremist behaviour, corruption, and disharmony. Scientific developments have made life much easier but it is doubtful whether with the technical progressions and transformation, human being has earned more happiness and achieved more wisdom than one was a century ago.

According to a Chinese anecdote, once there was a king. He had a retired minister who was living peacefully in a joint family of a few hundred members. Being curious, the king visited his house. The king carefully observed the conduct of the members. Every one attentively did his job and there was mark of pleasure and satisfaction in every face. The king was much impressed and urged the retired minister to write down all the aspects the family nurtured as a result of which it was united and everyone lead a peaceful secured and prosperous living. The wise minister wrote nothing but one word repeatedly. The word was *tolerance*. All the social evils we encounter have different causes but all the causes have the common root and it is intolerance. *Education is simply the soul of a society as it passes from one generation to another* (brainyquote.com, 2021).

The greatest challenge before higher education and to a great extent education in general, is how to inculcate humanitarian values in the human mind. It is easy to teach $(a + b)^2 = a^2 + b^2 + 2ab$ but how can one teach somebody compassion and what a person in pain feels like! The lesson taught in history retells us what has already happened; religious teachings, metaphysics sermons preach us *dos* and *don'ts*. But art and specially literature narrates meticulously what should have been, the most ideal and perfect situation through the fictional mask of narration. A live performance of a human struggle with social problem on stage moves us, the performance of the actor in films makes us laugh and shed tear as well. These moving, smiling at the favourable situation of

the character with, and shedding tear at a tragic situation, laughing at folly, aversion at the undesirable unacceptable sights is nothing but our sympathy and empathy for the fictional characters with whom we unwitting get involved due to our suspension of distrust. Film sessions and cultural programmes should be organised at university because in them we get the most vibrant representation of emotions that can move us. These make us tender, sensible and acquaint us with the human in us.

According to Aristotle, *educating the mind without educating a heart is no education at all* (goodreads.com, 2021). Here Kabir's *doha* (a form of self-contained rhyming couplet in Hindi poetry composed in *Mātrika* metre) seems to be the most appropriate simile to describe a person with high academic qualification but devoid of humanitarian value as, *Bada Hua To Kya Hua, Jaise Ped Khajoor Panthi Ko Chhaya Nahin, Phal Laage Atidoor* (santkabirdas.blogspot.com, 2021).

This means a person may be a highly talented wise person but if his rich knowledge cannot be served for the wellbeing of the society and he became self-centred then that person is like that of a tall date tree which does not provide shadow to the tramp and whose fruits are not accessible easily. Higher education enhances a person's mobility and job opportunity. Gautama Buddha had compared education to that of *Kamdhenu*, the Hindu mythical cow that fulfils all wishes, it helps one to realise one's dreams in another land, it protects one from alienation and it earns admiration, and it is a hidden treasure of a person.

6. Conclusion

The challenges before higher education are to inculcate humanitarian values and civic sense in learners, so that they can realise their obligation to the society and fellow human beings. While creating equal opportunity for all, technological intervention in teaching and distance mode of education are to be considered to bring all under the scope of higher education. Reviving indigenous knowledge and promoting vocational training would connect generations and research-oriented higher education would vent innovations, based on the previous knowledge. Creation of a work-integrated learning approach, vocational training and generating scope in the job market would make room for learning new courses. With introduction of a global syllabus, breaching the gap among various branches of studies and learning international lingua-franca to remove the barriers in communication, higher education would adopt an all-inclusive approach towards social development. Then only they shall serve the society with the mantra of *Bahujana sukhaya bahujana hitaya cha* (*The Rigveda*, for the happiness of many, for the wellbeing of many). The physical training and religious education would tend the corporal and spiritual dimen-

sions, respectively. A balance has to be maintained between the knowledge gained from higher education and its empirical benefits for the construction of a sustainable society. Finally, morality, philosophy, value system, lessons learned from histories can be conveyed effectively especially through the fictional mask of literature. It would impel a person to become sensitive towards other life forms and the environment and tolerant to other point of views leading to composite growth of a sustainable society.

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Health Impact Assessment as an Essential Element of Environmental Law in the National Legal Order. Considerations on the Basis of International Law

Ocena Oddziaływania na Zdrowie jako niezbędny element prawa ochrony środowiska w krajowym porządku prawnym. Rozważania na gruncie prawa międzynarodowego

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Abstract

The purpose of this paper was to prove that the standards for environmental friendliness set out by international law require the states to carry out Health Impact Assessment (HIA) before implementation of public or private investments having a potential human health impact even if national legal systems do not require it. The analysis of both soft international law and treaty law, as well as the case-law of international courts and tribunals show that Environmental Impact Assessment (EIA) is the international law *ius cogens*.

At the same time the human right to information and protection of life and health are regarded as fundamental human rights. According to the authors it means that carrying out proper Environmental Impact Assessment without Health Impact Assessment is not possible. It would be contrary to the human right to information and the obligation of the authorities to provide citizens with active transparency mentioned by the Inter-American Court of Human Rights and with the principle of fair balance developed in the case-law of the similar European Court together with the objective on sustainable development adopted in Agenda 2030.

According to the authors Health Impact Assessment is an immanent and integral part of environmental impact and the possible absence of provisions in the national law requiring investors to carry out HIA where EIA is necessary, does not justify the failure to assess.

Key words: public health, health security, environmental security, human environment, human rights, health impact assessment, law

Streszczenie

Celem niniejszej publikacji było wykazanie, że wyznaczone przez prawo międzynarodowe standardy ochrony środowiska wymagają od państw przeprowadzania oceny oddziaływania na zdrowie przed realizacją inwestycji publicznej lub prywatnej, która mogłaby potencjalnie oddziaływać na zdrowie nawet wówczas gdy nie wymagają tego krajowe porządki prawne. Analiza zarówno miękkiego prawa międzynarodowego, jaki i prawa traktatowego oraz orzecznictwa międzynarodowych sądów i trybunałów wskazuje, że ocena oddziaływania na środowisko jest międzynarodowym prawem *ius cogens*. Równocześnie prawo człowieka do informacji oraz ochrony życia i zdrowia uznawane są za fundamentalne prawa człowieka. Oznacza to w ocenie autorów, że przeprowadzenie prawidłowej oceny oddziaływania na środowisko z pominięciem kwestii oddziaływania na zdrowie człowieka nie jest

możliwe. Byłoby sprzeczne z prawem człowieka do informacji, oraz z obowiązkiem rządów zapewnienia obywatelom aktywnej przejrzystości, o której wspomina Międzyamerykański Trybunał Praw Człowieka, czy z zasadą fair balance wypracowaną w orzecznictwie adekwatnego Trybunału w Europie oraz z celami zrównoważonego rozwoju przyjętymi w Agendzie 2030. Zdaniem autorów ocena oddziaływania na zdrowie jest immanentną i integralną częścią oceny oddziaływania na środowisko, zaś ewentualny brak w prawie krajowym przepisów nakładających na inwestora obowiązku przeprowadzenia oceny oddziaływania na zdrowie, tam gdzie istnieje konieczność przeprowadzenia oceny oddziaływania na środowisko nie uzasadnia zaniechania przeprowadzenia tej oceny.

Słowa kluczowe: zdrowie publiczne, bezpieczeństwo zdrowotne, bezpieczeństwo środowiskowe, środowisko człowieka, prawa człowieka, ocena wpływu na zdrowie, prawo

1. Introduction

According to the definition of WHO, Health Impact Assessment (HIA) means: *a set of different procedures, methods and tools needed to assess the potential impact of investments, programmes or policies on health defined as a state of complete physical, mental and social wellbeing, not merely the absence of disease or infirmity* (Goetheborg, 1999). The main purpose of HIA is to support decision-making regarding investments or strategy papers. Public health remains in the centre of interest of HIA. This procedure goes hand in hand with Environmental Impact Assessment and usually complements it. Though, it happens to operate independently complementing the set of documents needed for carrying out investments or implementing so called strategy papers – in accordance with the principle of sustainable development.

This publication is intended to demonstrate that environmental protection standards set out by international law require the states to carry out HIA before implementation of public or private investments having a potential human health impact even if national legal systems do not require it.

2. Interdependence between healthy environment and healthy humans

The international community at institutional level notices both a clear correlation between healthy, unpolluted environment and a healthy man and a link between environmental change and its impact on human health. This is a multi-vector impact and essentially each impact on the environment can result in certain health problems – even in case of natural nuisance through dust emission into the atmosphere because of volcanic eruption. The impact can be both direct by the effect of ionizing radiation, suspended particulate matter or noise, and indirect, for example, when water conditions are affected influencing human health globally and locally.

The shrinkage of the Aral Sea caused by the construction of the irrigation system to water the Kuzyl

Kum desert with the water of this lake is a fine example of an investment with severe health repercussions. The investment resulted in the fast shrinkage of the lake, the increase of contaminant concentration (especially heavy metal and herbicides) and the change of the Mediterranean climate in the region in the desert one (Mall, Van Der Meer, Upshur, 2001). The whole region registered a dramatic increase in infant mortality which is the most visible health problem (Turkmenistan, Uzbekistan, Kyrgyzstan, Tajikistan, Kazakhstan) (Kiessling, 1998). Bełchatów Power Plant is a Polish example of an investment that may imply a negative effect to health due to emissions - as the report HEAL Poland notes¹ - which are responsible for 1,270 of premature deaths, 359,200 of lost working days, 630 new cases of chronic bronchitis, 1,310 cases of hospitalization annually and charge the costs up to 3,45 million of Euros per year to the Polish healthcare system (Jensen, Stauffer, Zander, Michalak, Puljic, 2020). Another example – fortunately considered to be of historic interest – is lead poisoning among children (over the period 1930-1980) living in the vicinity of Non-Ferrous Metals Works in Szopienice and in Miasteczko Śląskie (Upper Silesia) (Przybytek, 2015)². Any intrusion of environment has effects on human health. The effect may differ from close to long-term, direct to indirect and from short-term to far-reaching ones. However, it is always a man who is finally affected in individual, holistic, social and species approach.

This fact, perceived from Agenda 2030 perspective, is of particular importance in view of the transformation of our world in the spirit of the principles of sustainable development. The objectives of Agenda have to take into account the fundamental principle of human dignity. This is about building the world with full respect for universal human rights, the rule of law, justice, equality and non-discrimination, irrespective of racial and ethnic background and cultural diversity; where there are equal opportunities allowing the human potential to be fully exploited and contributing to improve the shared wellbeing. Such

¹ HEAL (Health and Environment Alliance) – an international organization dealing with the dissemination of access to health care, health promotion, support for women and micro-donations in the field of health protection.

² The information about this epidemic is purely journalistic due to the information embargo imposed by the communist authorities of Poland on doctors who have made a medical diagnosis of the problem.

reality can be created on one hand building the society with the right to information that efficiently exercises this right, and on the other hand without losing sight of concerns about protecting public and human health. Therefore, the objectives of Agenda are designed in such a way. The third objective focusing on assuring the health and promoting the well-being of people calls for the need to reduce perinatal and children mortality and also to eliminate communicable and non-communicable diseases. This goal cannot be reached without a public access to relevant information and without awareness on sustainable development expressed in objective 12. This means that Health Impact Assessment within the meaning of Agenda is one of the non-codified but obvious methods of achieving its objectives (UN Resolution, 2015).

3. Man vs. environment – observations in the context of international health policy

3.1. *International Public Health Conferences about the correlation between health, environment and human rights*

The issue of the relationship between human and public health, environmental risks and the human right to health, healthy environment and health information was discussed on the international public health conferences under the auspices of WHO. They are an element of so called soft law. This means international standards not legally binding but showing certain legal value. These are different types of declarations, guidelines, recommendations and finally acts half stating political will. The legislation of soft law acts usually follows the development of treaty law (hard law) legally binding the state internationally.

International environmental law and global health protection law have their beginning in numerous soft law acts drawing attention to a strong correlation between public health issues, human health and the environment. The Stockholm Declaration (1972), which was the first, global document on environmental problems, has initiated that process. The declaration formulated 26 demands, three of which referred to the link between health and the environment, even though the concept of *health* was not anywhere to be directly mentioned (Stockholm, 1972). Then the following conferences organized under the auspices of WHO raised that issue: The Alma Ata Declaration (Alma-Ata, 1978), Ottawa Charter for health promotion (Ottawa, 1985), Adelaide Recommendations (Adelaide, 1988), Sundsvall Statement (Sundsvall, 1991), The Jakarta Declaration (Jakarta, 1997), The Ministerial Declaration concluding the fifth Conference of Public Health in Mexico (Mexico, 2000), The Bangkok Charter *Health for all* (Bangkok, 2005), The Helsinki Statement (Helsinki, 2013).

The abovementioned documents show that public health and health promotion are perceived as an enabling process to be made towards informed and consistent decision-making on everything that affects human health. This is possible only in civil societies. The governments should – according to the abovementioned documents – adopt clear control and settlement mechanism concerning health impact. They engender trust between the governments and their citizens.

The Rio Political Declaration on Social Determinants of Health (Rio, 2011) calls for commitment for promoting and facilitation of clear and inclusive decision-making process, for implementation of responsibility for health and for health management at all levels by an access to information and justice. It also calls for public participation, strengthening of the role of communities, increasing the civil society's contribution into developing and implementing policies by adopting measures to enable their effective participation in decision-making for reasons of public interest.

Having followed the international standards of the protection of human rights it should be assumed that an essential element of this right is that each person has the right to information and public participation in decision-making on projects having public health implications. This approach was explicitly presented in the Final Documents of the Conference in Adelaide, Sundsvall and Jakarta and in the Rio Declaration. The Adelaide Declaration notes that healthcare system cannot be created only for people but it should be developed with their help. That is why, citizens must be provided with an access to investment plans that may affect human health. People's opinion should also be respected in this matter. Standards of international law, set among others in the Universal Declaration of Human Rights, guarantee the right to information, the right to freedom of expression and the right to take public opinion into account. This objective can be achieved by adding health impact assessment to the environmental impact assessment procedure so that it could form its integral part.

3.2. *Health Impact Assessment in Gothenburg Consensus Paper*

So called Gothenburg Consensus Paper entirely focuses on Health Impact Assessment procedure (Gotheborg, 1999). It came about in Gothenburg in October 1999 with the participation of European Centre for Health Policy, Nordic School of Public Health, in cooperation with the European Commission and the participants from all over Europe. This paper defines HIA as a combination of the procedures, methods and tools by which policy, a programme or a project can be evaluated against the potential impact and the distribution of these impacts within the population. It also proposes the fixed aspects in HIA:

- a) examining evidence concerning expected relationships between policy, a programme

- or a project and the health status of the population;
- b) taking account of opinions, experience and expectations of people who may be affected by proposed policy, a programme or a project;
- c) ensuring better understanding among decision-makers and the public of the influence of policy, a programme or a project on health;
- d) proposals for adjustments/options to maximise positive and minimise negative impact on health.

Setting out the principles to be followed for HIA, the paper justifies that it must be an integral part of any process which influences or may influence human health. The process of HIA should start when there is a proposal, an intention to continue or modify the existing policy to reflect changes or launching new policy or a project. The process of HIA should be implemented soon enough to take into account the results before strategic and fundamental decisions. Defining the determinants of health, consensus indicates directly among others environmental factors which may have a health impact on the population. The document points out that HIA should be founded on democracy, therefore the right for people to participation in the transparent process of policy-forming, policy-implementation and policy-evaluation, which is one of its four basic values directly and indirectly affecting people's lives. It suggests that HIA in the meaning of Gothenburg Consensus Paper is functionally related to the right to life, health, a healthy environment, information and to the right to be heard. These are elementary human rights in the system of international human rights protection at global and regional level.

4. Health Impact Assessment as part of the right to a healthy environment in relation to the system of international human rights protection

The global system of human rights protection and regional systems establish the protection of fundamental right to life. This is stated in Article 3 which provides that everyone has the right to life, freedom and safety (Universal Declaration of Human Rights) (UDHR, 1948). It is repeated in the International Covenant on Civil and Political Rights, which in Article 6 recalls, that every human being has the inherent right to life (ICCPR, 1966). The regional systems of human rights protection also recognise it as a fundamental human right. Article 4(1) of the Inter-American Convention on Human Rights stipulates that everyone's right to life shall be protected by law essentially from conception (ACHR San Jose, 1969). Banjul Charter (African Charter on Human and Peoples' Rights) shows in Article 4 that human beings

are inviolable and every human being shall be entitled to respect for his life and the integrity of his person (Banjul Charter, 1981). The fundamental right to life of the European Convention for the Protection of Human Rights is cited as the first one in the catalogue of rights protected by this convention (Rome, 1950).

The right to health being considered in relation with the right to life is for the first time clearly mentioned in Article 25 of the Universal Declaration of Human Rights as the right to a standard of living adequate for the health and well-being (UDHR, 1948). This right is repeated in the International Covenant on Economic, Social and Cultural Rights, which obliged the parties to recognise the right of every human being to benefit from the highest, attainable standard of physical and mental healthcare (Article 12) (ICESCR, 1966). The right to the highest, attainable standard of health is defined as a human right and appears directly in the Constitution of the World Health Organisation. In *Preamble* we read: *The enjoyment of the highest, attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition. The health of all people is fundamental to the attainment of peace and security and is dependent upon the fullest co-operation of individuals and States* (New York, 1946).

General Comment of the Committee on Economic, Social and Cultural Rights No 14/2000 in the General Comment to Article 12 of the International Covenant on Economic, Social and Cultural Rights of 11 August 2000, indicates that the right to health is closely related and depends on implementation of other human rights including the rights to information and to freedom of expression. This comment recalls that the right to health includes a wide range of socio-economic factors promoting healthy living conditions. The right to health is also extended to health determinants such as the environment, eating and accommodation. The operative commission's interpretation of Article 12 (International Covenant on Economic, Social and Cultural Rights) indicates that public participation in decision-making related to human health at community, national and international level is an essential element of this right. This interpretation also defines the concept of the availability of information, which covers the right to search for, receive and impart information and ideas on health problems (UN Economic and Social Council Geneva, 2000).

The Inter-American Court on Human Right sees a close connection between the right to life, health, health environment and the right to information. In the advisory opinion it points out the existence of the obligation of active transparency for the state parties of the American Convention on Human Rights. This obligation includes providing environmental information and the environmental impact on human

health ex officio in order that all citizens get universal, affordable and comprehensible access to it. In the Court's view *the obligation of active transparency* imposes on states an obligation to provide natural persons with the necessary information in order to ensure the full enjoyment of other human rights. This is particularly important as regards the right to life, physical integrity and health. Referring to public participation in decision-making, the Court indicated that it is one of the fundamental pillars of formal human rights because the participation allows an individual democratic control of the state. An individual can also question, examine and assess the compliance with public welfare. Therefore, public participation allows an individual to become a part of decision-making process and his or her opinions to be heard. In particular, public participation enables communities to hold their governments accountable for making decisions and improves the efficiency and credibility of government processes. The Court considers that public participation requires the implementation of the principles of transparency and disclosure and above all they should be supported by an access to information which enables public control by effective and responsible participation. *In view of these considerations the Court has commented on local communities pointing out that the state is obliged to ensure the right to consultation and participation at all stages of planning and implementation of a project or an activity which may influence communities (...) or other rights. Therefore, the states must ensure that in addition to receiving and providing information all community members are fully aware of possible risks including health and environment threats to be able to issue a freely-given, informed opinion on each project which may affect their territory in the consultation process. The state must create continuous, trusted and effective channels for dialogue with the public, ensuring effective consultation and decision-making processes* (Advisory Opinion, 2017).

The European Court of Human Rights under Article 8 of the European Convention on Human Rights (the right to privacy) developed the principle of fair balance, which assumes that there is freedom for the states to choose between environment protection and other social matters if the authorities issuing environmental decisions have fulfilled procedural requirements in assessing among others whether:

- a) the investment process included the prior assessment of the impact on environment and human rights;
- b) the public gets an access to adequate, environmental information;
- c) interested community members could participate as decision-makers;
- d) the right to freedom of expression and association has been respected.

It is pointed out that actions complementing retroactively the prior procedural shortcomings are prohibited because a contrario it would result in tolerating the ostensible nature of state's activity in these matters (Mowbray, 2010).

Affecting the fair balance gave rise to the judgement of the European Court of Human Rights on 24 January 2019 in *Cordella et al v Italy*, in which the Court found Italy responsible for the violation of the right to private and family life due to the air pollution resulting in smog.

Building up the principle of fair balance the European Court of Human Rights paid attention to a number of procedural, environmental obligations which could be aimed at guaranteeing the exercise of the right in accordance with the European Convention of Human Rights. This refers to the obligation to ensure sound and informed decision-making ((ECHR, 2004). As noted in the European jurisprudence this process *has to involve appropriate researches and studies to foresee and assess in advance impacts which could cause serious damage to the environment and violate human rights* (ECHR, 2007; ECHR, 2003; ECHR, 2009). The concept of *environmental democracy* has been outlined where the Court encourages the public to participate in decision-making with the corresponding obligation to take into account individuals' views (ECHR, 2004) and the results of researches should become available to the public (Boisson de Chazournes, 2020).

The global and regional human rights protection system makes an obvious connection between the rights to health and environment and the right to information and between the right to be heard and the rights to participation in the investment process. This means that it is impossible to develop national legislation excluding the principle of obligation of active transparency or fair balance without providing the public with the co-decision rights to inspect the programmes and investments – both public or private ones – which may affect the environment and human health. This, therefore, means that on grounds of international protection of human rights there is a need for implementation of HIA into national law as a condition sine qua non for providing a citizen with the real right to objective information. On the other hand everybody should have the opportunity to comment on obtained information and thus to have a real impact on the final concept or even a planned investment admissibility.

5. Health Impact Assessment in the context of regional acts of international law

5.1. International legal basis for HIA

The elements of HIA in international hard law should be sought primarily in the Espoo Convention (25 February 1991) on environmental impact assess-

ment in a transboundary context and in the supplementary Kiev Protocol on the Strategic Environmental Assessment on 21 May 2003, in Aarhus Convention on 25 June 1998 and in the Escazu Agreement on 4 March 2018 (the Regional Agreement aiming to guarantee the full and effective implementation in Latin America and the Caribbean of the rights of access to environmental information, public participation in the environmental decision-making and access to justice in environmental matters).

These international law acts create regional systems justifying HIA because of the public and private investments.

The Environmental Impact Assessment (EIA) issues have been first covered in the Espoo Convention and then in the Kiev Protocol. This Convention defines *an impact* in Article 1 viii (Espoo, 1991) as *any effect caused by a proposed activity on the environment including human health and safety, flora, fauna, soil, air, water, climate, landscape, and historical monuments or other physical structures or the interaction among these factors; it also includes effects on cultural heritage or socio-economic conditions resulting from alterations to those factors*. Similarly *an impact* is defined in the Kiev Protocol in Article 2.7 (Kiev, 2003) where environmental including health effect means any effect on the environment, including human health. This impact as developed in the Convention refers by definition to human health. According to the abovementioned definition the sound carrying out of the Environmental Impact Assessment procedure is not possible without HIA. The Aarhus Convention refers also to it indicating that *every person has the right to live in an environment adequate to his or her health and well-being, and the duty, both individually and in association with others, to protect and improve the environment for the benefit of present and future generations*. The Convention indicates that the state of human health and safety (Article 2.3c of the Convention) is environmental information and that the way in which public authority make it available to the public is transparent and effectively accessible (Article 5.2 of the Convention) (Aarhus, 1998). This means that the same information should be available in the field of health impact. Both conventions consider human health as a part of the environmental and public access to information as a condition sine qua non of achieving sustainable development objectives.

The decision III/8 adopted by the Parties of the Espoo Convention contains guidelines for public participation in Environmental Impact Assessment pointing to the need for active participation of citizens in the whole investment process. It reminds that *Principle 10* of United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, (Brazil, 3-14 June 1992), underlines that environmental issues are best handled with the participation of all concerned citizens at the relevant level.

Agenda 21 adopted by UNCED recognized the important role of broad, public participation in EIA as one of the fundamental prerequisites for the achievement of sustainable development. A public debate on the suggested actions for all interested groups in the early-decision making process may prevent or mitigate conflicts and negative environmental impact of decisions with cross-border effect. The same should also apply to the public participation in drawing up plans and public programmes under the Kiev Protocol (Cavtat, 2004). As previously indicated *an impact* under the Espoo Convention is considered as every impact on human health. The abovementioned decision extends to human health impacts in accordance with point 2.1 of Decision III/8 where it is recommended that at least the national procedures of Environmental Impact Assessment include regulations ensuring that:

- a) the public is informed of all proposals on activities potentially harmful to the environment in cases subject to the EIA procedure in order to obtain a permit to act;
- b) the public in areas which may be affected is entitled to express comments and opinions on proposed action when all options are open before a final decision is taken;
- c) reasonable time-frames for providing enough time for each of various stages of public participation in the EIA shall be ensured;
- d) making a final decision on the proposed actions, public participation results in the EIA procedure are duly taken into account.

A real need to inform on health impact is required explicitly by the Escazu Convention adopted on 4 March 2018 in Escazu, Costa Rica. This Convention open for 33 States of Latin America and Caribbean has been signed by 9 states so far and has not yet entered into force. Nevertheless, with respect to Health Impact Assessment, it constitutes a significant novum, introducing this concept into international law. Each party shall guarantee mechanisms for the participation of the public in decision-making processes revisions, re-examinations or updates with respect to projects and activities and in other processes for granting environmental permits that have or may have a significant impact on the environment, including when they may affect health (Article 7 (2) of the Convention). The Convention defines *Environmental Information* as any information related to environmental risks, and any possible adverse impacts affecting or likely to affect the environment and health, as well as to environmental protection and management (Article 2c of the Convention). In accordance with that legal act, the parties guarantee that consumers and users have formal, clear and relevant information on environmental goods and services, their impact on health and promoting sustainable patterns of production and consumption. Exam-

ining this Convention one could carefully risk saying, that as it stands, the institution of Health Impact Assessment is for the first time clearly justified under international law (Escazú Convention, 2018).

The need to develop Environmental Impact Assessment including the elements of human health was strongly emphasised in the case-law of the International Court of Justice. That Court referred at least twice to environmental issues in its case-law: for the first time in Advisory Opinion of 1996 recognizing that *the environment is not an abstraction but represents the living space, the quality of life and the very health of human beings, including generations unborn. The existence of the general obligation of States to ensure that activities within their jurisdiction and control respect the environment of other States or of areas beyond national control is now part of the corpus of international law relating to the environment* (ICJ Advisory Opinion, 1996).

The Court of Justice in the judgement in the case *Argentina v. Uruguay*, where each of the states were not party to the Convention, referred directly to the environmental impact not only as a concept and inter partes proceedings resulting from the Espoo Convention but as an element of ordinary, international law. In the justification to the judgement the Court held that *a practise, which in recent years has gained so much acceptance among States that it may now be considered a requirement under general international law is to undertake an environmental impact assessment where there is a risk that the proposed industrial activity may have a significant, adverse impact in a transboundary context, in particular, on a shared resource* (ICJ Judgment, 2010). It means that the procedure of EIA is considered a principle of international law on an erga omnes basis (Boyle, 2012), and the doctrine indicated that such an approach of the Court to environmental rights has already been stated (Stec, 1998). Taking account of Article 38 of the Statute of the International Court of Justice it should be pointed out that the obligation to carry out the Environmental Impact Assessment procedure in the investment process at the international level is one of the fundamental principles of international law (ICJ Statute, 1945).

5.2. Health Impact Assessment in the context of the implementation of international law to the European legal order.

In European Union (EU) the institutions of Health Impact Assessment and of Access to Environmental Information are implemented by EU Directives:

- a) Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment (EIA Directive, 2011);
- b) Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain

plans and programmes on the environment (SEA Directive, 2001);

- c) Regulation (EC) No 1367/2006 of the European Parliament and of the Council of 6 September 2006 on the application of the provisions of the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters to Community institutions and bodies (Regulation (EC), 2006).

Directive 2011/92/EU called also the Environmental Impact Assessment Directive indicates that the environmental legislation of the Union includes regulations enabling public authorities and other bodies to take decisions which may have a significant effect on the environment as well as on person health and wellbeing (Directive, 2011). It means that effects of the project on the environment should be assessed in order to take account of concerns to protect human health, to contribute by means of a better environment to the quality of life, to ensure maintenance of the diversity of species and to maintain the reproductive capacity of the ecosystem as a basic resource for life. Environmental Impact Assessment in accordance with Article 3 should include description and assessment of direct and indirect effects of the project on humans that cannot be conducted properly without the impact of the investment on human health. The results of the public consultations and information collected during the procedure have to be taken into consideration by the state in the investment decision procedure. The Directive prejudices the final form of its implementation into the national legal order in the way that it is not possible to skip comments from local people or just ignore them. The same approach is adopted by the SEA (SEA Directive, 2001). Directive which points out the criteria of the potential, significant environmental effects where threat to health is one of them, requiring in such a case the implementation of the Strategic Environmental Impact Assessment. This is due to the information that must be submitted by entities referred to in Article 5(3) of the SEA Directive and which should include, but not be limited to, the likely significant effect on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage, including architectural and archaeological heritage, landscape and the interrelationship between the above factors. Therefore, undertaking HIA should not be questionable in terms of plans and programmes which may always have a significant impact on the environment. The connection between the state of the environment and human health and the need to assess the planned investment were subjects to legal proceedings held by the Court of Justice of the European Union. In a previous opinion of 13 July 20014, the Advocate General of the CJEU indicates that it derives from points

4 and 14 of the EIA Directive that by this assessment it is necessary to achieve the objectives of the Union regarding the environmental protection and the quality of life (EIA Directive, 2011). The effects of the project on the environment should be assessed in order to take account of concerns to protect human health, to contribute by means of a better environment to the quality of life and to maintain the reproductive capacity of the ecosystem as a basic resource for life. The issue of human health protection from the adverse impacts of the environment was repeatedly cited by the Court as the (additional) prerequisite which enables an individual to refer to the regulations of the European Union law, capable of direct application, on environmental protection (Curia, 2014). In the abovementioned opinion, the Advocate General also points to the fact that the EIA Directive from its supplementation by Directive 2003/35 is intended to adapt the EU law to the Aarhus Convention. Therefore, the EIA Directive must be interpreted both in the light of the Aarhus Convention and while taking account of its objectives. As mentioned in recital 7 of the Aarhus Convention every person has the right to live in an environment adequate to his or her health and well-being, and the duty, both individually and in association with others, to protect and improve the environment for the benefit of present and future generations. As mentioned in recital 8, to be able to assert this right and observe this duty, citizens must be entitled to participate in decision-making and have access to justice in environmental matters.

The Court of Justice commented positively on the linkage of HIA and EIA for example in the judgement of 14 March 2013 (Leth v. Austria, C-420/11) where noted that from Article 1(1) of Directive 85/337 and also from recitals 1, 3, 5, 6 it follows that this Directive shall apply to the assessment of the effects of certain public and private projects on the environment whereas it is necessary to achieve one of the Community's tasks in the sphere of the protection of the environment and the quality of life. To meet this requirement a developer should supply the information specified in Article 5(1) and in Annex IV to Directive. The criteria for assessing whether minor project, referred to in Annex III to Directive, must be subjected to EIA, serve the same purpose. It follows from recitals 3 and 11 to Directive 85/337 that it is necessary to achieve one of the Union's objectives in the sphere of the protection of the environment and the quality of life and the effects of the project on the environment must be assessed in order to take account of concerns to contribute by means of a better environment to the quality of life (Curia, 2013).

The transposition of international law into the EU law has effectively introduced the link between the environment and human health. An environmental impact assessment of a project or a programme must not be carried out without taking into consideration

health effects of a project. The Court of Justice of European Union also points out that health and environmental issues should not be resolved separately. In practice, this means implementation of the postulates of European Charter on Environment and Health adopted by Ministers of the Environment and Health of the Member States of the European Region of WHO meeting together for the first time at Frankfurt-am-Main on 7 and 8 December 1989. The Preamble of the Charter recognized the dependence of human health on a wide range of crucial environmental factors and entitled every individual of EU to information and consultation on the state of the environment, and on plans, decisions and activities likely to affect both the environment and health (WHO Europe, 1989). Last but not least it falls to be considered the place of HIA in the light of Agenda 2030. Agenda 16 aims to promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels. Within this objective a task 16.10 defined as Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements is foreseen. In favour of linking the right to information with the right to health indicates also *SDG Good Practice A Compilation of success stories and lessons learned in SDG implementation* (UN Resolution, 2015).

6. Conclusion

International law does not clearly say about the institution of HIA, however, it can be drawn from a series of legal standards scattered across a number of different instruments of international law. Primarily it should be noted that there are obvious correlations between the environment and both human and public health. There is now a political will to strengthen the links between the environment and human health expressed in the numerous documents of the Conferences organised under the auspices of WHO (Conferences in Alma-Ata, Ottawa, Sundsvall, Adelaide, Bangkok, Nairobi) and the United Nations (Stockholm, Rio de Janeiro, Johannesburg). This will is reflected in such interpretation of global regulations for the Protection of Human Rights which the right to live in a healthy environment derive from the human right to life, health, information and from the right to be heard. The right to healthy environment and to information cannot be carried out without the right to information about the health impact of investments or planning. This approach has been reflected in the regional systems of human rights protection and is shared by the Inter-American Court of Human Rights and the European Court of Human Rights. This means that the adoption by national legal order measures eliminating or reducing the institution of Health Impact Assessment, whilst implementing the investment that might affect it, may be

considered by international justice as violating human rights to life or to privacy.

The case-law of the International Court of Justice has raised the profile of Environmental Impact Assessment of an investment having cross-border effects from inter partes towards erga omnes inserting it into international ordinary law, not related to the Treaties.

The availability of integrated, relevant, high-quality, timely and easily accessible environmental information provides the means for assessing environmental status and the foundation for meaningful and informed environmental governance. Timely, relevant, reliable and easily accessible environmental information is also essential to efforts to inform citizens about the quality of their environment, raising their awareness in that regard and enabling them to defend their basic right to live in a healthy and safe environment (UNECE, 2020).

Health Impact Assessment must be important part of EIA, so in view of these circumstances, it is inadmissible for an impact assessment not to be carried out even if it were not available in the national legal order. This right is part of general international law and the corpus of human rights that is the right to life, and it can never be derogated.

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Legal Problems Concerning Implementation of Sustainable Ecotourism in Russia

Wyzwania prawne odnoszące się do wprowadzania ekoturystyki w Rosji

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Abstract

This paper proposes a fresh look at ecotourism within the framework of sustainable development. The author discusses selected issues involved in the sphere of ecotourism and proposes new ways to improve its current practice in Russia. Answers to questions of the nature, significance, and consequences of ecotourism, the relationship between sustainable development and ecotourism, and the problems of sustainable use of wildlife have been given. The comparative study of practical experience in facilitating ecotourism initiatives overseas has allowed the author to argue their conclusions and recommend a specific scientific approach to the sustainable use of wildlife in Russia.

Key words: ecotourism, sustainable development, the balance of convenience, sustainable use of wildlife, game resources

Streszczenie

W artykule zaproponowano nowe spojrzenie na ekoturystykę w kontekście zrównoważonego rozwoju. Autorka omawia wybrane zagadnienia z zakresu ekoturystyki i proponuje nowe sposoby doskonalenia jej dotychczasowych praktyk w Rosji. Przedstawiono propozycje odpowiedzi na pytania dotyczące natury, znaczenia i konsekwencji ekoturystyki, relacji między zrównoważonym rozwojem a ekoturystyką oraz problemów zrównoważonego użytkowania dzikiej przyrody. Analiza porównawcza praktycznych doświadczeń zagranicznych inicjatyw ekoturystycznych pozwoliła autorce zaproponować nowe naukowe podejście do zrównoważonego użytkowania dzikiej przyrody w Rosji.

Słowa kluczowe: ekoturystyka, zrównoważony rozwój, równowaga, zrównoważone wykorzystanie dzikiej przyrody, zasoby gatunków dziko żyjących

Introduction

Ecotourism is an effective way to implement the principles of sustainable development. Overseas, the potential of ecotourism as a useful tool for sustainable use is so great that nowadays a lot of states, especially developing countries, include it into their long-term plans for economic development. Today, ecotourism is one of the most promising and rapidly developing sectors of the tourism industry in foreign countries, holding one of the key positions. According to many experts, the share of ecotourism accounts for more than 10-20% of the profits from the

entire tourist market (Lapochkina, Kosareva, Adashova, 2016).

Tourism contributes significantly to ensuring sustainable socio-economic development and social stability. This industry is crucial for the development of small businesses and micro-enterprises, generating employment, and also encourages self-employment. Ecotourism operates as a facilitator for the development of municipalities by providing alternative livelihoods for the local community. Today, tourism forms 3.4 percent of the gross domestic product in Russia, affecting 53 related industries. Each job created in the sphere of tourism entails the creation of

up to 5 workplaces in such sectors of the economy as agriculture, forestry, and fishery (On Approval of the Concept of the Federal Target Program *Development of Domestic and Inbound Tourism in the Russian Federation (2019-2025)*). The growing interest in ecotourism encourages the state to create and develop a system of specially protected natural areas, reserves, national parks, and wildlife reserves. These territories are the primary objects of Russian ecotourism. In 2017, about 9 million tourists visited national parks in Russia, and other 2 million tourists visited wildlife reserves (Skory, 2018).

National parks and a system of specially protected natural areas should be available to the public. It is ecotourism that allows for catering to the environmental, economic and social needs of the state and the population. Balancing economic and social interests, when using rare, endangered animal species in specially protected natural areas (hereinafter referred to as SPNA), can be carried out through the organization of ecotourism.

Russia is a vast country, with unique nature monuments, invaluable national reserves, and outstanding potential tourist sites, but it still does not hold a leading position among countries specializing in ecotourism. In particular, today the share of ecotourism in the overall structure of the Russian tourist market is about 1 percent (Anisimov, Ryzhenkov, 2014). One of the reasons for the underdevelopment of this industry in Russia is the poor infrastructure of ecotourism in specially protected natural areas (sometimes there is no infrastructure at all) and inadequate resourcing of programmes in ecotourism.

In this regard, opinions and decisions proposed in this article can be used by representative and executive bodies of Russia and representatives of business in developing new plans and strategies in the field of sustainable use and conservation of wildlife objects. This article may also be of interest to environmental lawyers researching the development of ecotourism, as well as ordinary citizens interested in the development of ecotourism in Russia and abroad.

1. Concept and elements of ecotourism: an international aspect

Tourism is one of the most critical areas in the modern economy, aimed at meeting the needs of people and improving the quality of life of the population, which at the same time does not deplete the earth's natural resources. In recent years, ecotourism has been especially popular around the world. The distinctive features of ecotourism are that it simultaneously focuses on preserving wildlife and socio-economic development of the state and society.

One of the most critical factors determining the popularity of ecotourism is the concern of the entire world community about the conservation of the environment and its components. Humanity has be-

come aware of the relationship between tourist revenues and the safeguarding of natural resources. Visitors to specially protected natural areas feel satisfied that their visit can assist in the preservation of a unique natural landscape or some wildlife species. Thus, getting ecotourism services, each person makes their contribution to the conservation of wildlife.

Tourism is a very complex activity and, therefore, requires the availability of legal instruments that ensure the implementation of economic, social and environmental requirements of sustainable development. One such tool is international treaties on the tourist industry. No doubt, *Agenda 21* policy paper was one of such first international instruments (United Nations Conference on Environment and Development, 1992). Although tourism was not included as a separate topic into that document, later on, World Travel and Tourism Council (WTTC) and Earth Council developed and adopted a document entitled *Agenda 21 for the Travel and Tourism Industry* on its basis (World Travel and Tourism Council, World Tourism Organisation and Earth Council 1995). This document identified such principles for the development of tourism as the promotion of preservation, protection, and rehabilitation of ecosystems, the participation of local people in the tourism process, support of culture and interests of indigenous communities. In such a manner, *Agenda 21 for the Travel and Tourism Industry* has become the basis for the formation of ecotourism not only as a segment of the tourist market but also as a whole philosophy.

From the standpoint of philosophy, ecotourism is a vivid example of the combination of nature, sport, and ecology to promote spiritual and physical development of a person.

So far, ecotourism has formed the basis of some critical official international declarations: the *Charter for Sustainable Tourism* (1995), the *Berlin Declaration on Biological Diversity and Sustainable Tourism* (1997), the *Global Code of Ethics for Tourism* (GCET) (1999), and the *Quebec Declaration on Ecotourism* (2002). The principles and conditions of sustainable ecotourism were also developed in the *United Nations Environment Programme* (1995), the *Seville Strategy for Biosphere Reserves* (1995), the *UNEP Principles of Environmentally Sustainable Tourism* (2000) and other international instruments. Thus, the norms of international instruments in the field of sustainable development and sustainable forms of tourism have become useful tools in implementing the principles of ecotourism.

The analysis of the above-mentioned international instruments leads to the conclusion that the essential components of ecotourism are:

- education of tourists, i.e., the creation of educational tourism products with an environmental focus, aimed at in-

creasing knowledge about nature and its components;

- preservation of ecosystems, which involves the careful use of resources on the route;
- participation of tourists and tour operators in campaigns to protect wildlife; respect for the customs and traditions of local communities, which results in intercultural exchange (Lapochkina, Kosareva, Adashova 2016).

There are a lot of generally accepted definitions of ecotourism in the scientific literature. Their analysis provides a clear picture of its main features. The Mexican environmentalist Héctor Ceballos-Lascu-ráin first formulated the term *ecotourism*. Initially, this term was used to study the environment and its components based on travel to protected areas with educational purposes. Thus, ecotourism was seen as an *environmentally responsible travel and visitation to relatively undisturbed natural areas, in order to enjoy, study and appreciate nature (...) that promotes conservation, has low negative visitor impact, and provides for beneficially active socio-economic involvement of local populations* (Ceballos-Lascu-ráin, 1996).

Subsequently, ecotourism is getting associated with the category of sustainability. From this point of view, ecotourism is a natural ecologically sustainable tourism, which includes research and analysis of the natural environment and its components. This definition recognizes that natural ecotourism is aimed at studying components of the environment. Moreover, sustainable tourism implies receiving appropriate profits by the local population and the long-term conservation of wildlife (Review of Nature Based Tourism, 2007). Thus, ecotourism focuses on the enhancement and maintenance of natural ecological systems.

At the same time, ecotourism is considered to be a particular form of tourism, within the framework of which a specific area of wildlife is explored, including the local culture of the community in this area. Ecotourism involves non-consumptive use of wildlife and contributes to the preservation and development of the visited area through payment for services rendered (Ziffer, 1989). Such a definition of ecotourism is based on the following characteristics: 1) it includes a travel to relatively undisturbed natural zones; 2) its focus is on the study of wild animals and their habitats; 3) ecotourism is economically beneficial to the local population; 4) ecotourists do not deplete natural resources, but support the environment; 5) ecotourism aims to educate tourists in keeping with the spirit of values and respect for the culture and traditions of the local population (Chesworth, 1995).

Although the authors distinguish between various attributes of the ecotourism concept, most of its definitions come down to the existence of three criteria

denoting the essence of ecotourism. In particular, ecotourism *provides for environment conservation; includes meaningful community participation; is profitable and can be self-sustained* (Kiper, 2013).

As a result, ecotourism is based on conceptual provisions observing the balance of environmental, economic and social interests of society, state, and business. The advantages of ecotourism could be provided as follows: 1) ecotourism activities are most often carried out within the boundaries of specially protected natural areas; 2) ecotourism contributes to the preservation of components of the environment and sustainable use of natural resources; 3) as part of ecotourism, the necessary financial resources are accumulated to ensure permanent wildlife conservation; 4) ecotourism allows to meet economic and social needs of the local population; 5) it is directed to the environmental education of people; 6) ecotourism should include conditions for the effective long-term management of the infrastructure, with minimal impact on biological diversity.

The indicated advantages of ecotourism can become a sufficient incentive for business entities in terms of developing and improving the implementation of tourist services, as well as for those entities that are only planning to organize their business in the field of ecotourism.

2. Ecotourism as a measure of ensuring sustainable use of wildlife: international and Russian best practices

Sustainable use of wildlife resources, including wild animals, significantly complements economic development and its opportunities worldwide. Ecotourism is an integral part of sustainable tourism. Ecotourism should be seen as a useful tool for implementing the sustainable development conceptual framework. For example, in many countries of Western Europe and developing countries ecotourism is perceived as an element of economic development and is seen as a measure to preserve wildlife.

The purpose of ecotourism is the preservation of wildlife objects, implementation of sustainable use of wildlife resources, conservation of their habitat and the acquisition of economic and social benefits. Therefore, tourism can be sustainable if its development meets the needs of tourists and local communities, protecting the biodiversity of the animal world. Thus, it is noted that sustainable ecotourism mainly protects natural areas, contributes to the preservation of biodiversity and ensures the sustainable use of rare species of wild animals. Otherwise, sustainable use may result in the reduction or even the destruction of certain species of wild animals or their habitat. This happened in the Himalayas when the number of tourists had increased by more than 25 times. Residents started actively cutting down the forest – for heating campgrounds and numerous hotels. The mountain ranges, which had been covered by rose

bay shrublets several years before, turned into barren wastelands, the paths were littered, and the populations of many animals and birds declined. However, there are not so many *absolutely positive* examples of ecotourism development in the world. Primarily and mainly, one can talk about the successful implementation of certain specific principles of ecotourism (Bochkareva, 2007).

Ecotourism is designed to ensure not only the sustainable use and preservation of wildlife in specially protected natural areas but also the sustainability of the tourist activity itself. Positive aspects of ecotourism development include the following: preservation of wildlife objects and their habitat, creation of new jobs for the local population, increased investment in infrastructure, growth in the well-being of the local people, and development of local self-government. Along with the positive aspects of ecotourism, in the context of developing the idea of sustainable use of wildlife objects, some challenging issues should be resolved. Thus, in practice, the discrepancy between the declared tourist programs and the principles of ecotourism is revealed; *attracting management personnel from the outside, which results in the lack of motivation in the local population; creating conditions for tourists that worsen rather than support the environment; curbing of economic and cultural life for the sake of tourist needs* (Bochkareva, 2007).

Therefore, ecotourism grows at a sustained pace when tourists follow its principles and all ecological paths and routes are checked and classified into tourism categories, individual routes, and environmental tours. These ecotourism routes should be protected from mass tourism and based on the principles of sustainable tourism.

Providing an alternative source of livelihood for local communities, ecotourism assists in the development of rural settlements. The purpose of sustainable ecotourism is to preserve wildlife and its habitat, ensure sustainable use of wildlife and generate income in the provision of tourism services. Ecotourism allows for involving the local population into the conservation of biological diversity and environmental protection.

Sustainable tourism is based on three targets: quality, optimal exploitation, and the combination of interests of the state, business, and population. In particular, quality means that tourism should influence the quality of life for all participants in the tourism process. Optimal exploitation implies the exploitation of natural resources to ensure their recovery. The combination of interests of the state, business and population means that the balance of distributing benefits between participants of the tourism process should be fair (Mukhambetov et al., 2014).

Thus, ecotourism can be sustainable if the implementation of its services meets the needs of tourists and residents, while ensuring the protection of natural objects for the present and future generations. Sustainable ecotourism focuses mainly on studying

the biological diversity of the animal world, its habitat, exploring natural ecological systems, as well as preserving the cultural heritage of the local population. According to some scientists, ecotourism model involves a combination of environmental activities and tourism in order to obtain financial benefits for local communities, with particular emphasis on sustainability (Witt, Merwe, Saayman, 2011).

In comparison with other countries, which should be looked up to, not a single type of tourism in Russia is adequately developed. The main problems hindering the development of ecotourism in this country should include the problem of *fiscal federalism; national problems of SPNA boundaries and setting of standards regulating the development of ecotourism in Russia* (Tsvigun and Vasilyev 2013). It is necessary to agree with the authors' opinion and add that the problem of organizing and developing ecotourism also consists in the lack of motivation, desire, and proper financing. Similar problems of ecotourism development are observed in Kazakhstan (Kairova, Esimova, Malikova, 2018).

In the modern world, people have long learned to sell the most absurd and, in fact, unremarkable objects. In this case, in Russia, nothing needs to be invented; it is only necessary to prioritize the promotion of tourist facilities correctly with environmental, natural areas, in particular. There are also examples of developing countries that are highly popular among eco-tourists, including Kenya, Tanzania, Belize, Ecuador, Laos, and Nepal (Lapochkina, Kosareva, Adashova, 2016). For instance, *in South Africa, 90% of the 1,052,000 tourists registered in the country in 1995 travelled to visit the national parks and generated an economic flux of R13 million. In Tanzania, wildlife tourism generates a global income of about US\$570 million a year* (Chardonnet et al., 2002). Thus, wildlife has become the basis and support of the tourism industry.

In Russia, it is necessary to take into account the experience of other countries in the field of ecotourism. It should be noted that in some areas of the Russian Federation there is already a trend towards the development of ecotourism as a measure of ensuring sustainable use of wildlife. For example, in the Orenburg State Nature Reserve, within the framework of ecotourism, services are provided in the form of guided walks along ecological paths, where one can observe wild animals with all precautions taken to conserve rare, endangered species (Orenburg Conservancy Area, 2017). At the same time, users of wildlife objects transfer a certain amount of money to the institution (reserve) account for the services rendered; this money could later be used to finance measures to conserve rare, endangered species and restore their number. No doubt, the economic profit from ecotourism in the Orenburg nature reserve is small, but there is also a positive trend. Simultaneously with the development of infrastructure within the framework of ecotourism, the social interest of

residents by providing them with jobs is being realized. If wildlife can be managed in such a way so that *local people get substantial material benefits from this, they will most likely cooperate with travel agencies and take measures to protect the environment* (Mikhailova, 2010). At the same time, despite the significant increase in the number of tourists in nature reserves and national parks, Russia still cannot compete with other countries and is clearly inferior to them in the organization of ecotourism in specially protected natural areas.

As a result, ecotourism is a useful measure of legal support for the sustainable use of wildlife. Unlike other countries, this idea did not go any further in Russia. However, in some regions of Russia, the development of ecotourism provides a balance of environmental, economic and social interests of citizens and the state within the framework of the concept of sustainable development concerning rare, endangered species of animals. At the same time, ecotourism provides additional income and incentive for the sustainable use of wildlife objects, since all activities and services carried out in the field of ecotourism should be carried out on a sustainable basis in order not to cause excessive harm to rare, endangered species, damage to their habitats from overuse and pollution.

3. Hunting tourism in Russia: problems and solutions

Sustainable use of environmental components is an essential principle that has been recognized worldwide as useful for the conservation of natural resources and biodiversity. At the International Congress of the International Union for Conservation of Nature (IUCN), held in Amman in 2000, it was stated that the sustainable use of natural resources was one of the most important mechanisms for their conservation. Thanks to this approach, biodiversity is preserved in the long term and the needs of the state, business and society are met.

The *Convention on Biological Diversity* (1992) and The *Addis Ababa Principles and Guidelines for the Sustainable Use of Biodiversity* (2004) also indicate the need for the sustainable use of natural resources. According to some scientists, sustainable use does not exclude the protection of wild animals and the environment. The categories *protection* and *use* are two sides of the same coin (Baldus, Damm, Wollsheid, 2008). For example, a combination of protection and sustainable use of wildlife occurs when creating national parks. However, the use of resources and human interference, especially in specially protected natural areas, should be minimized.

In most specially protected natural areas, populations of wild animals need to be managed to balance their impact on other animal species and vegetation. Such processes of population management may include hunting. There are many options for using wild

animals. In particular, they can be a source of food, a subject of commerce and trade, entertainment and tourism. Of all users of wildlife, hunting tourism is the most economically beneficial one. Hunting can provide an opportunity to receive relatively high incomes with the minimum withdrawal of individual game animals, most often aging males. *The well-regulated take-off of 1 to 2% of prime or post-prime males does not damage the respective game populations*. Also, *relatively high revenues can be generated by few clients* (Sustainable Hunting Tourism Position Paper of the CIC Tropical Game Commission, 2008). If revenues generated from sustainable hunting tourism are directed towards the conservation of wildlife resources, and the local population derives economic benefits from this, then this form of using natural resources can directly contribute to reducing rural poverty and will help to strengthen efforts to preserve wildlife. Thus, hunting tourism can give a significant impetus to the economic and social development of rural, remote areas. Hunting tourism can positively influence wild animals, their habitat, and also contribute to the social and economic support of the local population. Therefore, hunting tourism is widely recognized as an integral part of rural development. Hunting can provide income for nature conservation and, at the same time, be aimed at economic and social improvement of the quality of life for local people.

However, every step in the development of hunting and hunting tourism should have a wise and ecologically sustainable character, so that hunting tourism fulfills its role as a tool for positive management and as a powerful incentive to preserve hunting resources. For example, in Serbia, there are well-established programs for hunting as a type of tourism. This type of tourism requires strict observance of specific rules of conduct regarding border crossing, travel to hunting grounds, issuing weapons and ammunition permits, provision of qualified guides, registration of veterinary permits for exporting game and other rules. A hunting tourist can hunt and train hunting dogs at the hunting ground only with the mediation of an authorized agency which has entered into an agreement with the user of the hunting ground. A hunter must have issued permits on hunting weapons, telescopic sights, and ammunition, as well as hunting dogs. They have the right to shoot only those types of game that are specified in their hunting license, namely, with the permission of a qualified guide. *Before the hunter can remove the shot game and its parts (trophy, meat, skin) from the hunting ground, he or she must make payment according to the price list of the hunting association* (National Tourism Organisation of Serbia, 2018).

At the same time in the process of hunting tourism implementation, there are numerous abuses by hunters, representatives of tourist companies, state and municipal authorities. Among them are such adverse

phenomena as corruption, fraud, overstatement of shooting quotas, poor management and reduction in the number of wild animals, depletion of biodiversity. Negative examples of this kind can be found in any country in the world. So, in Belarus, not all hunters can afford to pay high prices for the services rendered as part of hunting tourism. For example, prices for hunting a European bison start from € 10,000, as for the other animals, one can choose between a wild boar (€ 100-600), an elk (€ 700-4,500) or a red deer (€ 700-3,500).

Poaching continues to be a widespread activity for many hunters, especially in rural areas. *Corruption thrives, as both local people and local power holders often make deals with forestry workers* (Smok, 2015). At the same time, hunting tourism attracts a new wave of vandal tourists, who view hunting as a shooting club, and nature as a bottomless pit. Unfortunately, no travel agency is able to replace the team of a hunting society that can educate such a hunter in the spirit of a proper hunt (Polikarpova, 2003). It is estimated that there are about 15 million hunters in the United States alone. In North America, according to experts, about 175 million wild animals are annually killed by tourist hunters. In Botswana, entire hunting grounds of hunting-animal species have been destroyed by illegal hunters. In Italy, hunters illegally shoot populations of migratory birds in places where they breed and pass the winter.

In many countries, and primarily in developing countries, over the past 50 years, the volume of organized hunting tourism has rapidly increased. Hunting tourism has plenty of advantages for the host country and its rural population: preservation of ecosystems; income generation and job creation in poor and deprived areas; economic and rational use of habitats unsuitable for agriculture or conventional tourism; raising awareness of the local population concerning the value of wildlife, otherwise hunting tourism is associated with causing damage, problems, and costs; less harmful impacts on the environment than with other forms of tourism; *less poaching through the concerted efforts of all who are interested in the revenues generated by hunting tourism* (Sustainable Hunting Tourism Position Paper of the CIC Tropical Game Commission, 2008). Thus, hunting tourism gives a significant positive impetus to the economic and social development of remote, underdeveloped rural areas.

Hunting tourism, the primary purpose of which is to render services in the field of hunting, has already been quite firmly established in the practice of Russian hunting providers. Russia is visited annually by relatively few, no more than 2,000 hunters (Visloguzov, 2013). Hunting tourism is the most common activity in the Magadan region, Chukotka and other subjects of the Russian Federation. For example, at present, Yakutia may be of interest to a tourist-hunter with a Kolyma elk, a snow sheep, and a wild reindeer. At the same time, when organizing

a hunt in those regions, a helicopter is often used, the cost of a one hour flight comes to 200 thousand rubles (more than \$3,000), and not all hunters can afford it (Makrushenko, Andreev, 2014).

Thus, such a hunt becomes uncompetitive with other services within the framework of hunting tourism. In this connection, in order to avoid significant expenses, hunting is often executed without licenses, which, in our opinion, speaks for insufficient work of the authorized government bodies, lack of proper control on their part and inadequate legislation. Also on the territory of Russia, there is an unreasonably complicated procedure for the temporary importation of hunting firearms into the country (Makrushenko, Andreev, [2008] 2009).

The solution of existing problems in this area will allow one to count on the sustainable development of hunting tourism and ensuring the sustainable use of hunting resources.

As a result, it should be noted that hunting tourism in Russia is at the stage of development. Unfortunately, the current legislation on hunting and legislation in the field of tourism do not ensure the sustainable use of hunting resources. The process of hunting tourism does not satisfy the social and economic needs of the local population. Organizing hunting tourism in the stationary shooting preserve, the hunting provider is interested only in receiving large incomes, and, very often, the local population cannot afford this kind of service. Therefore, such adverse phenomena as poaching and corruption take place. In this regard, it is necessary to formulate a development strategy for hunting tourism in Russia based on the principles of sustainable development and take into account the recommendations of the author of this article on improving legislation in the field of hunting and tourism.

Conclusion

The author views ecotourism as a measure for the legal provision of sustainable use and conservation of wildlife objects through the prism of sustainable development. Moreover, a system for adequate balancing of economic, ecological and social interests, aimed at solving some theoretical and practical problems in the field of sustainable use of wildlife, has been proposed. This approach will make it possible to move from the idea of ecotourism to that of sustainable ecotourism based on the principles of sustainable development and ensuring a balance of interests for the local population, business, and the state.

Developing ecotourism is a long-term process that requires constant efforts on the part of all agents, including the government, business, and society. Currently, for the development of ecotourism, it is necessary to adopt and ensure the phased implementation of the main directions and strategies for the development of ecotourism concerning all wildlife ob-

jects. Therefore, the main advantages of ecotourism, such as the preservation of wildlife objects, can be obtained not immediately, but after a long period. Based on the analysis of individual provisions of the legislation on wildlife and law enforcement practice, the author argues that in Russia there are no criteria for sustainability in the field of ecotourism. According to the author, the following sustainable ecotourism criteria could be outlined: the conservation of historical areas of wild animals; increase in the number of populations of individual species of wild animals; active interaction between local people and ecotourists; creation of permanent jobs for the local population; development of other related industries. The criteria for sustainable use of wildlife developed by the author determine the conditions that should be fulfilled in order to confirm that wildlife objects are used sustainably.

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Role of Innovation in Sustainable Sanitation System: A Case Study of India

Rola innowacji w zrównoważonym systemie sanitarnym: studium przypadku Indii

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Abstract

Sanitation and water are one of those problems which have been given top priority in the sustainable agenda. However, scanty resources, geographical condition, natural environment, tradition, institutional and financial constraints lead to several challenges of feasibility, affordability, availability, and acceptability. This study reveals the inequality in the access to improved toilet facilities based on wealth index and locality of households using National Family Health Survey (NFHS) data. These problems can be addressed by applying different types of social innovations in which novelty in product and process can play a crucial role. This paper critically examines the role of innovation which can play in expanding transition to sustainable development in the sanitation sector which needs some financial, organizational, and institutional agreement. The progress in sanitation sector is dependent on the consumer behavior. However, it still lacks a variety of quality-price ranges and its utility as the basic needs of dignified life.

Key words: sustainable sanitation, innovation, product, process

Streszczenie

Warunki sanitarne i woda to jedno z najważniejszych wyzwań w kontekście zrównoważonego rozwoju. Zarazem skąpe zasoby, warunki geograficzne, środowisko naturalne, tradycja, ograniczenia instytucjonalne i finansowe prowadzą do kilku wyzwań związanych z wykonalnością, przystępnością cenową, dostępnością i akceptowalnością. Badanie to ujawnia nierówności w dostępie do ulepszonych toalet w oparciu o indeks zamożności i lokalizację gospodarstw domowych na podstawie danych National Family Health Survey (NFHS). Problemy te można rozwiązać, stosując różne rodzaje innowacji społecznych, w których nowość w produkcie i procesie może odgrywać kluczową rolę. W artykule krytycznie przeanalizowano rolę innowacji, które mogą odegrać istotną rolę w przejściu do zrównoważonego rozwoju w sektorze sanitarnym, które wymaga finansowego, organizacyjnego i instytucjonalnego zabezpieczenia. Postęp w sektorze sanitarnym zależy też od zachowań konsumentów. Jednak nadal brakuje tu różnych przedziałów jakościowo-cenowych i użyteczności zapewniających podstawowe potrzeby godnego życia.

Słowa kluczowe: zrównoważony system sanitarny, innowacje, produkt, proces

Introduction

Sustainability is one of the key terms which has been on priority in the Brundtland Report of 1987 to Sustainable Development Goals. This is all about the balance between the wellbeing of present with the consideration of need of the future. The word *well*

being is often used as welfare in the broader sense which demands security, justice, education, freedom, and democracy. The quality of life depends upon the capabilities of human beings to achieve these needs (Sen, 1993). There are a lot of debates on the sustainability over the time. On the contrary, it is not limited only to production, agriculture, ser-

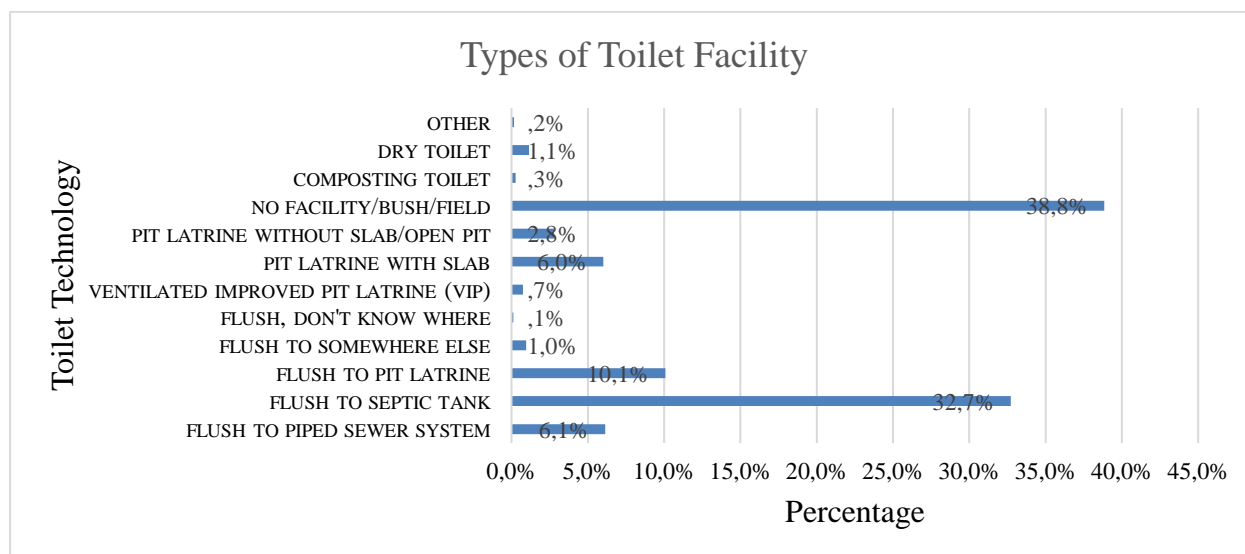


Figure 1. Types of toilet facility used by households in India, source: NFHS 4 (2014-15), compiled by Authors

vices, and manufacturing in the era of cosmopolitanism but also concerned with sanitation. Sustainable sanitation is not only required for the basic need of the people in a country but also associated with the economic growth and development of a nation. However, there are multi-level problems in developing countries like India, such as lack of resources and skilled manpower which create a problematic situation. Sanitation has recently got a significant attention in the development agenda and becomes a political priority for the government and non-governmental organizations. Despite relative success in some countries for Millennium Development Goals (MDG) to reduce halves of the proportion of the population without access to sanitation and water, there is still a pathetic situation where a large proportion of the population still practice open defecation and do not have access to improved drinking water source. Till 2015, 2.3 billion population lacked even a basic sanitation service including 892 million population which practice open defecation worldwide. Although 75 % of the population use an improved source of water within the premises (JMP, 2017), yet this situation is more alarming in rural areas as nine out ten, practice open defecation resides in rural areas (UNICEF/WHO, 2015).

Several studies have revealed ill impacts of inadequate sanitation facilities on the socio-economic and environmental status of a nation. Lack of sanitation and water supply have been noted as major causes of spread of various diseases like diarrhea, jaundice, cholera etc. and death of millions of people every year (Dwivedi, 2012). The availability of these facilities also eliminate poverty at the individual level and reduce the expenses on health care facilities of the nation. Apart from this, access to these basic but fundamental amenities reduces the work burden of girls and women and loss of man days. However, it is an alarming fact that India is in the situation of

half-empty and half-full status even after the implementation of many programmes and policies.

Making access to these basic facilities to the last person of the community needs a system which is sustainable and affordable. This requires a better understanding of the gaps in the sanitation sector and implementing some innovative model and technology for the solution of the problem. Innovation is at the core of sustainable development. Even, it acquires its place as a goal in a sustainable development goal and as a means to achieve other targets. Social Innovation does not mean only the processes to introduce something new but altering the dynamics of a complex system which can change the flow of resources and information for the betterment of the society. There is a need to understand the broad concept of social innovation to harness the benefits of achieving sustainable sanitation. This paper identifies critical gaps and obstacles in India, which threaten the progress in the sanitation sector and examines the role that social innovation can play in the expanding transition to sustainable development in the sanitation sector.

Challenges in sanitation sector: a complex reality

Developing countries like India are facing multi-layered challenges, i.e., operational, and structural deficiencies in the sanitation sector. National Family Health Survey (NFHS), 2014-15 factsheet reveals that 48.4 % of the households in India have improved sanitation facilities, whereas 89.9 % of households have improved drinking source of water. However, the state of situation is worse in rural India as only 36.7 % of households has improved sanitation facilities.

Figure 1 reveals that 6.5 % of households in India have flush toilet connected with sewage system. According to one study undertaken by Wankhade

(2015), two-third of total wastewater generated remains untreated in the urban area alone. The situation is more pathetic in rural and slum areas where sewage infrastructure is in poor state. Besides, 32.84 % and 10.2 % of household's flush toilet wastewater in pit and septic tank respectively, which can be termed as onsite sanitation system. This type of system requires extensive cleaning process in which cost should be borne by the users. There is no clear plan for emptying of these septic tanks resulting into overflow, contamination, and offensive smell (O'Connell, 2014). Apart from this, pit toilets generally collapse due to poor construction, and some toilets get choked after some use due to improper technology and engineering (Manisha, 2018). This situation forces the community to go again for open defecation. Whereas the transportation of the waste materials for the treatment is quite difficult in informal settlements. There are only six functional fecal treatment plants for 8000 cities in India. This makes it nearly impossible to treat onsite waste generation (Dutta, 2017). According to the Centre for Science and Environment (CSE), there is a generation of 1.75 million tons of excreta in India in which 78 % of excreta are disposed of in open, river and lake (Manisha, 2018). There is evidence of chemical and microbial contamination from pit and septic toilets to the groundwater storage, which affects human health (Shivendra et al., 2015). This situation leads to epidemics and threaten to quality of both surface water and ground water sources. Hence, this cannot be referred to as sustainable sanitation.

Table 1. Percentage of households who practice open defecation by their wealth category, source: NFHS 4 (2014-15), compiled by Authors

Wealth Index	Percentage of Population (open defecation)
Poorest	47.0
Poorer	32.2
Middle	16.7
Richer	3.8
Richest	0.3

Sanitation coverage in India is characterized by the unequal distribution of these basic services. The NFHS data clearly shows that more than 75 % of the households having poorest and poorer wealth index in general practice open defecation. While the situation is quite different in the case of richer section, only 3.8 % households having richer and richest category of wealth index practice open defecation (Table 1). It clearly reveals that, poor specially marginalized group consisting of children and women who were bypassed in the previous programmes and policies are highly exposed to the risk of health hazards due to poor public health system.

The adaptability of toilet technology depends upon several factors like the availability of raw material, skilled labor, purchasing power and behavior of the household. However, the availability of resources

mainly depends upon the geographical location. The value of binary logistic regression shows that the richest group tends to use (1/0.005) 200 times of improved sanitation such as offsite sanitation, septic tanks, ventilated improved pit, pit latrine with a slab in comparison to poorest group of community (Table 2). This gap narrows down with the rise in the Wealth Index. It is evident that the wealth of a family highly influences the acceptance of toilet technology. There is also inequality which depends on the locality of the household. Analysis reveals that urban households have more accessibility to the better technology like offsite sanitation, septic tanks, pit latrine with slab, composting toilet, and other technologies in comparison to the rural households. The economic status and regional settlement still influence the selection of toilet technology in India. Hence, the fundamental question arises over here is the capabilities of community to access the welfare scheme by the government (Sen, 1993).

Table 2. Binary Logistic Regression, source: NFHS 4 (2014-15), compiled by Authors

Type of toilet facility		B	Sig.	Exp(B)
Improved Toilet	Intercept	1.954	0.000	
	Poorest	-5.383	0.000	.005
	Poorer	-3.783	0.000	.023
	Middle	-2.715	0.000	.066
	Richer	-1.151	0.000	.221
	Urban	-.156	0.000	.855

There are straightforward available technologies for the treatment of fecal waste, but cultural inclination of Indian people tends to go for flush and forget toilet which is not able to sustain the benefits of sanitation practices. The need of India is quite different from other developed countries in the sanitation sector because of the culture and tradition. It is complex and vivid which is constructed due to various caste, religion, class, language, gender, and region. Toilets in India is taken as impure and ritually polluting. Hence, upper castes in India do not want to clean their toilet by their own which ultimately promotes inequality, untouchability, and manual scavenging (Khare, 1962). Again, open defecation and urination in India are not just accepted by the society but also seen as the symbol of masculinity and strength. Hence, toilets in India is not only about the infrastructural design but also has its roots in the social issue. Moreover, people in India prioritize other expenditure instead of construction of the sanitation infrastructure. This situation arises due to the lack of knowledge about the health-related issues related to sanitation among the community (Bhattacharya et al., 2017).

Studies have revealed that sanitation system in India suffered due to various institutional factors and governance failure (Manisha, 2018). There was little or less debate on toilet technology among the political decision-makers in the past. Again, there has been

former experience of poor linkages between different agencies involved in the management of sanitation sector like government, municipalities, Panchayats, civil societies, and other external and internal agencies. Within the municipalities, there is no single unit which can be termed as accountable for this sector. In most case, inhabitants did not feel accountable for the availability of public services in the sanitation sector. This may be due to subsidies which have been given by the government in the past (Evans, et al., 2009).

Hence, Sanitation is related to different aspects of community behavior, climate, operation, supply and maintenance of toilet and water resources which need diversified but appropriate infrastructure i.e., optimal use of local resources to develop technology which can address the needs of the people with the consideration of socio-economic condition and cultural practices (Schumacher, 1973).

Social innovation: way to sustainable sanitation

The WHO/UNICEF Joint Monitoring Program (JMP) defines sanitation as a system in which excreta are managed from the facilities which are used by the individual through emptying and transport of excreta for treatment and eventual discharge or reuse (WHO, 2017). However, sanitation is closely linked to socio-economic, behavior and technological issues. Hence, some definition includes a more inclusive definition of sustainability which ensures the protection of environment and resources, the human health and operation through appropriate technology and institution which is economically viable and socially acceptable (Bracken et al., 2005). Sustainable sanitation is a comprehensive approach rather than a mere technology which ensures fulfilment of a set of criteria to achieve equitable and universal access to services over the long period of time. Sustainability of any services is guaranteed by the community and local government where the community can pay and have skills to utilize it locally and the local government can operate, maintain, extend and replace the infrastructure in order to obtain reliable service (McConville, 2008). Hence, a sanitation system should qualify the criteria of financial viability, social acceptability, simplicity, technicality and institutional appropriateness, and protection and conservation of the environment and natural resources.

It is evident to understand sanitation as system for the successful implementation of the given criteria of sustainable sanitation. These criteria also demand that all the elements in the system are taken together for sustainability and equity in sanitation. The elements of the system are community, nature, infrastructure, and treatment. Community variables are attitude, behavior, economic condition, beliefs and taboo related to the waste and human excreta. Nature includes geographical condition like temperature,

humidity, water, and soil. Treatment means the physical, chemical, and biological process for the safe disposal of human excreta and human waste. Infrastructure describes the user interface i.e., type of toilet, latrine or urinal for on-site structure and treatment unit for off-site structure. (Winblad et. al, 2004)

Within Sustainable Development Goal, innovation itself is posited as one of the SDGs (Goal 9) and as a means for achieving other SDG (U. N. ,2016). Innovation should be considered as anything that involves a change which is novel to the individual and community involvement. The term innovation is a broad term containing various components as it incorporates creation, discovery, diffusion, and utilization aspects (Gault, 2016). The questions arise what to create or discover and what to be utilized and by whom? This can directly be taken as the creation of new things which should create technology-based opportunities for a new market and services. Joseph Schumpeter (1934) takes innovation as the novel combination of knowledge resource and products for purpose of commercialization. It is imperative that new products and idea should be diffused among the community for being called innovation.

The role of innovation can be traced out in the development of any nation throughout the history of human civilization. The innovative ideas and products make human life dignified with the imaginative construction of the world. For instance, green innovation makes the city a cleaner and hazards free environment for human. It has also been integrated with a business model which creates a window for the better socio-economic condition through the job creation. It is perceived that innovation can only enhance the large industries. However, innovation can also play a significant role in the terms of social, economic, and environmental benefits under the tree of developmental policies. This type of innovation is often termed as social innovation.

Social innovation is different from other form of innovations because of the focus on the wellbeing and welfare of individual and community. This can be new ideas, products and services which meets the social needs and transform social relationship for social impact (Murray et al., 2010). However, social innovation is new to the context in which it appears. It might not be entirely new, but it must be new to those involved in its implementation. It is essential to distinguish between the social impact due to innovation and impacts due to social innovation. For instance, the cell phone has a great societal impact but can't be termed as social innovation but the awareness programme through cell phone can be termed as social innovation. One of the most key elements of this type of innovation is people's participation and behavior modification. Thus, social innovation can refer to encompassing products, services, behavior practices, and policies which is novel, satisfy human needs, provide well-being, change social relation,

Table 3. Different forms of Innovation in the sanitation sector, source: compiled by Authors

Products	Delivery	Organization	Communication	Policies
Eco-san Model Garv Toilet Bio-Toilet Soil composting sanitation system Twin Pit Toilet Precast Textile Reinforced Concrete (TRC) based Toilet	Subsidy Loan Micro-credit Output Based Aid Sanitary Mart	Monitoring Mechanism (Using Digital software) Public Private Partnership Social Enterprise Changing role of Universities	Community Lead Total Sanitation Awareness Programme through digital platform Kalash Yatra to end Open-Defecation	Strengthening Complaint Redressal Systems THE PROHIBITION OF DEFECACTION IN OPEN PLACES BILL, 2019 No Tea And Haircuts For Those Who Fail To Use Toilets

engage beneficiaries and transform social relation for social impact.

In the case of sanitation sector in India, there is a paradigm shift in the recent decades with the launch of different programmes and policies. However, it still lacks at different levels i.e., financial inclusion, behavior modification, institutional arrangements, and appropriate technological choices. Hence, it needs different form of social innovation in products, delivery, communication, organization, and policies (Table 3).

Product Innovation

The type of sanitation products available in India is limited, which indeed do not fulfil the requirements of the community. There is an urgent need to develop wide range of available technologies which should be affordable, adaptable, simple, and acceptable like low water consumption, sustainable maintenance, and easy operation to solve the sanitation crisis. A sanitation product should prevent pollution with the capability of preventing the direct contact of fecal pathogens to human. Moreover, sanitation technology should be carefully selected with reference to the concerned geographical and socio-cultural condition. For instance, the risk of contamination of groundwater is high due to pit latrines in the areas when groundwater table at less depth and areas prone to flooding. Looking into the problem of poverty rate and cultural practices in India, it is very much necessary that the design should be economically viable and acceptable.

There are different examples where waste materials may act as a potential source of energy and manure. For instance, biogas linked toilet converts waste into a conventional energy source which can be used for various purposes like cooking and electricity. The desired innovation should focus on this component of recycle, renew, and reuse as it creates the opportunity to initiate business and minimize the cost of users. Moreover, the availability of other resources like the availability of skilled workers and techniques for easy installation and maintenance is also required.

There are several products in the sanitation sector which needs to be implemented, commercialized, and utilized promptly with the little improvisation for the sustainable sanitation. For instance, the Vietnamese double vault eco-san toilet which is developed for the people who are the wipers has been implemented for the washers in Kerala by using decomposition process instead of dehydration process (Calvert, 1999).

Process Innovation

After the development of any product, it should be adopted by the society for being characterized as novel. In the case of sanitation sector in India, there are already some good existing technologies which can serve the need of the nation after a little alteration depending on the local situation. However, the basic problem is the implementation of those technologies which needs some sort of process innovation. Process innovation is the implementation of method for the provision of service and products which is either new or significantly improved from the previous process (Bloch & Bugge, 2013). In the simple context, it is the new or significantly improved ways of producing or delivering of goods and services. It may be through innovative change in organizational structure or change in the communication strategy. In many cases, there are materials goods that have been improved through technical change which lead growth in the production and delivery. Hence, Process innovation can be further categorized in the delivery innovation, communication innovation, organization, and policy innovation (Gault, 2016).

Delivery innovation is very much vital in the successful implementation of public services as it promotes optimum use of resources and consumer satisfaction. Various agencies like NGO, administration, Companies involved in Corporate Social Responsibility (CSR) are offering the delivery of services in the sanitation sector. However, they are constrained to a particular technology because of government guidelines for the construction of toilets. This hinders the delivery of the sanitation service to the people. Hence, sanitation sector

needs service level provision approach rather than specifying a particular technological choice. This will give authority to service delivery agency to deliver the product to the community by taking consideration of local socio-economic and cultural condition.

The delivery of the sanitation services is dependent on the accessibility and availability of the products, Skilled labors, and technical capabilities. Rural Sanitation Mart is one of the innovative ways to ensure the accessibility of the products under the various programmes. Self Help Groups (SHG) can also be very useful for the establishment of the production centre of the sanitary product at the local level. A similar example has been seen in the Keeraplayam block of Tamilnadu where informal groups are formed from the revolving fund of the SHG has been used to establish the production center of the toilet pan (Prakash, 2005).

The affordability of the sanitation product is one of the crucial factors in the sustainable sanitation. By taking consideration of the poverty in India, it is imperative to take some innovative way to deliver the sanitation facilities such as subsidy, micro-credit and granting easy loan for the construction of toilet. There is some other innovative way to tackle this problem i.e., Output Based Aid (OBA). Unlike tradition approach, OBA link the payment of the services based on the delivery of sanitation services within the community. In this approach, the delivery is contracted to the third party. However, the Panchayati Raj institution can also act as that third party and get the payment for the delivery.

Communication innovation is like the marketing innovation where organization implement new methods to promote the products and services through significant change in product design, placement, and pricing. However, it is different from marketing innovation at the same time in the context of public services. Firstly, organization involved in the public sector does not have a particular marketplace. Secondly, there is ongoing promotion and campaigning without any delivery of services or product. Hence, communication innovation is the implementation of new methods to influence the behavior of individuals and others (Bloch & Bugge, 2013). Behavior change is a critical component in the successful implementation of sanitation programme. Tradition approach of behavior change in the sanitation programme includes educational messages focused on germs and diseases associated with poor sanitation. However, this has been acknowledged that these approaches are not very successful for the behavior change (Kelly and Barker, 2016). Hence, it needs more innovative ways of communication depending upon the geographical, economical, and socio-cultural context.

Benefits and beliefs are the determinants of the behavior change in the sanitation practices. One should use these determinants according to the local condi-

tion. For instance, Community Lead Total Sanitation approach is successful in Bangladesh because of purdah system due to their religious belief. This is because their toilet can ensure their latent demand connected to their cultural belief. Moreover, there are some other innovative ideas for the behavior change which is developed by the local community. For instance, Kalash Yatra where women of the village go for worship of the deities through those ways where people go for open defecation usually. Social networking sites like Facebook and WhatsApp can be used for the awareness of sanitation. There is a considerable number of subscribers of social networking sites in India. According to an estimate made by STATISTA (2015-23), 422.7 million people will use social networking in India by 2022. Promotion on this type of platform can give better coverage.

Organizational innovation is about the new method in the organization and management of the work. The workplace and organizational structure are quite important for the improvement in the production and distribution. Innovation requires interaction between different stakeholders, i.e., local suppliers of construction materials, local NGO for imparting skills and technique to the community, Universities that do the research activity and provide technical assistance to train the NGOs. These stakeholders communicate with each other for the better solution of problems. However, there are various loopholes for interaction in this sector. Hence, the mechanism should be developed for the fruitful engagement of all the actors especially community, university and civil society into research and developmental projects.

The involvement of social enterprise in Public Private Partnership can play a crucial role in the drive of sanitation sector. They see social and environmental problems as the business opportunities. Again, these types of organization often have the strong social network and personal funding (Shaw, 2004). This acts as enablers for the success of sanitation facilities. However, the involvement of private sector in India is limited to maintenance and delivery of sanitation services rather than development of new infrastructural design which is unusual from the business organization. For instance, much of the CSR fund is invested in the construction of the toilet for the community. Hence, it is needed to organize these social enterprises at all levels of sanitation sector.

Sanitation is the subject of state government in India. It means that state government will implement the programmes under the guidance of central government. Government of India has launched various schemes and programmes time to time since independence such as Central rural sanitation programme, Nirmal Bharat Abhiyan, and Swachh Bharat Abhiyan to eliminate open defecation. These schemes involved various institution which is governed by various rules and guidelines. However, these guidelines and rules becomes obstacles in the

developmental projects. For instance, the implementing authority in the sanitation sector often verifies the infrastructure for the subsidy, which is mentioned in the government manual. This discourages the community to accept the new infrastructural technological development, which can be based on their needs and requirements. This is due to the inadequate knowledge of the actors involved at the different levels of programmes.

There is also poor linkage between different actors in the sector which affects the efficiency of the programmes. Hence, there is need to develop strengthen collaboration between the actors and knowledge at the different level. There should be efficient complaint addressal system in the programmes to ensure the participation of the community. However, there is also needed to put some strong laws and regulation against open defecation at the same time. Recently, Shri Naranbhai Kachhadiya, M.P in lower house has introduced a bill to provide for prohibition of defecation and urinating in open places to keep open places clean and disease free. This can be effective, but these laws and regulation should not be limited to the administration but also from the community decision. For example, Kelwara Gram panchayat in the Merwar region has introduced the rule of *no haircut and teas who fails to use toilets*. These types of rules and regulation is much more needed from the community decisions.

Barriers in innovation: an Indian sanitation scenario

India has attained its status of being one of the largest growing economies of the world in recent years and continues to mark its position among developing countries for its scientific research. It ranked 48th in the list of Global Innovation Index in 2020 which is the best performance of India till now (WIPO, 2019). However, this figure only shows the overall performance of research and development in several sectors in India. The situation of research and development remains pathetic in the sanitation sector. The innovation in sanitation sector can be classified as pro-poor innovation because of the nature of the need of the marginalized community. It has been observed that several households with less income generally practice open defecation.

There are various problems in innovation in sanitation sector on account of financial, institutional, and organizational obstacles. The recent paradigm of Indian Innovation system shows that the role of technology in attaining developmental challenges has been found least efficient for the marginalized community. Private industries and corporate sectors are not able to trace the need for the poor because of their profit-making attitude (Dhar, et al. 2014). Hence, it requires investment from the government.

Fig.2 shows that there is only 1628 publication till 2020 in while majority of research is done after

2000. The most number of the publication i.e., 157 has been done in 2019 just after completing five years of Swachh Bharat Abhiyan. Again, there are six medical colleges or universities in the list of top ten affiliation for the publication in Scopus indexed journals. So, it is evident that the involvement of the educational institution and research institute is much less than medical colleges and university in the term of publication of Scopus indexed journals. Hence, the volume of publication should be increased, majorly by the research institution and NGOs for the knowledge creation in the sanitation sector.

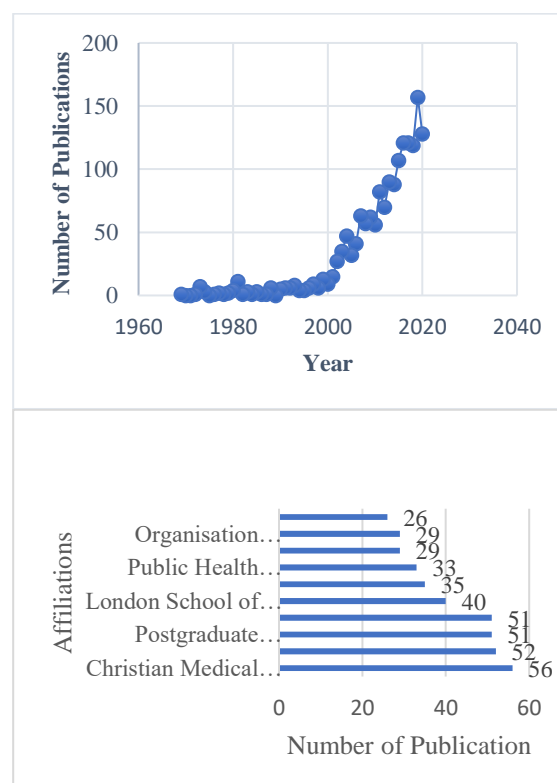


Figure 2. Publication pattern in the area of sanitation in India during the period 1969-2020, source: SCOPUS Data base

The number of research and development projects sanctioned is six in 2017-18 and thirteen in 2018-19 under the Swachh Bharat Mission-Gramin (SBM-G) and water sector respectively. The country like India requires huge investment in the R&D in the sanitation sector where geographical, social and economic conditions are very diversified. Moreover, innovation requires interaction between different stakeholders, i.e., local suppliers of construction materials, local NGO for imparting skills and technique to the community, and universities that do the research activity and provide technical assistance to train the NGOs. These stakeholders communicate with each other for the better solution of problems. However, there are various loopholes for interaction in this sector. There may be a difference of opinion among NGO and universities regarding standardization in the sanitation

sector. This makes difficult to understand the need for end-user.

Institutions should broaden their roles in the innovation system. The role of education institution seems to limit at imparting skills by providing education and for research and development activities. However, much more can be contributed by these educational institutions (Etzkowitz, 2008). For instance, the responsibility is given by the central government of India to different IITs for making some villages open defecation free under the Namami Gange Project. This initiative will make scholars understand more about the community. The difference of view between practitioner and innovator may be easily eliminated. There is only one rural technology park which is focused on sustainable rural housing technologies under the National Institute of Rural Development and Panchayati Raj. This type of more scientific park is needed all over India.

Conclusion

There are numerous problems in development of the sanitation sector, such as poor infrastructure, inequality, financial constraints, social unacceptance due to norms and institutional constraints. The approach towards sustainable sanitation can provide various opportunities of social, financial and environmental benefits in the long run. A sanitation system should qualify the criteria of economic viability, social acceptability, technicality and institutional appropriateness, and protection of the environment and natural resources. However, the problems regarding technological choices, poverty, awareness, and education still hampers the adoption by community. These problems need to be addressed through inputs which requires some financial, organizational, and institutional agreement. There is need of better infrastructure, suitable institutional framework, and community participation to achieve the goal for sanitation for all.

Here, the innovation in products and process plays a crucial role by providing better infrastructure and implementation process keeping in view the concern of geographical condition, resource availability, socio-economic need, and cultural belief. There are various constraints in the path of developing innovation for the sanitation sector. Less or no involvement of the private sector, entrepreneur, and research institute act as barriers in the innovation system. However, India can manage the constraint in the innovation of the sanitation sector with the improvement in the organizational and institutional framework.

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Formation Aspects of an Accessible Environment in Modern Landscape Architecture in Azerbaijan

Aspekty formacyjne dostępnego środowiska we współczesnej architekturze krajobrazu w Azerbejdżanie

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Abstract

Despite the recent complex reconstruction in Azerbaijan, public spaces, parks and boulevards still do not fully respond to inclusivity. A long-term comprehensive action plan should be developed, and targeted actions should be undertaken to address these short comings. Thus, in order to achieve full accessibility, equipment and construction should be carried out not only in parks, but also in public spaces, taking into account the needs and interests of people with different categories of disability. It is also necessary to improve the regulatory framework, to promote public awareness, to develop a positive attitude towards physically challenged people, and to train new generations of professionals to take action to ensure a high level of working on this field in the future.

Key words: landscape architecture, inclusiveness, mobility impairments, barrier-free environment, universal design

Streszczenie

Pomimo przeprowadzanej skomplikowanej przebudowy Azerbejdżanu przestrzenie publiczne, parki i bulwary nadal nie w pełni spełniają kryteria inkluzywności. Należy więc opracować długoterminowy kompleksowy plan działania, aby zaradzić tym niedociągnięciom. Stąd, aby osiągnąć pełną dostępność, urządzenia i konstrukcje należy instalować nie tylko w parkach, ale także w przestrzeni publicznej, uwzględniając potrzeby i interesy osób z różnymi kategoriami niepełnosprawności. Konieczne jest również ulepszenie ram regulacyjnych, promowanie świadomości społecznej, kształtowanie pozytywnego nastawienia do osób niepełnosprawnych fizycznie oraz szkolenie nowych pokoleń specjalistów do podejmowania działań w celu zapewnienia wysokiego poziomu pracy w tej dziedzinie w przyszłości.

Słowa kluczowe: architektura krajobrazu, inkluzywność, niepełnosprawność ruchowa, środowisko bez barier, uniwersalny projekt

*Architecture can be empowering,
only if architects develop empathy*

Raymond Lifchez, Architect, author of the book
Design for Independent Living

1. Introduction

When referring to the people with disabilities, first our society incorrectly implies visually and hearing

impaired including those who use wheelchairs. Actually, this group refer to children, the elderly, people of short stature, taller people, parents with babies in strollers, pregnant women, including people with neurological and mental impairments, people with autism and even tourists having troubles with landmark and language in a foreign location. Creating accessible environment for these people is one of priorities of the social environment of any government. Today, modern society is guided by the

principles of compliance with the interests of people with disabilities and sets new goals for architects, builders and designers.

One of the important factors of the environment is its accessibility. A barrier-free environment protects people's health by preventing situation to cause injury and disabilities, and promotes the work and social integration of people with impairments. Recently, attention to this problem is growing in our country and abroad. This is especially due to the adoption by the UN in December 2006 of the Convention on the Rights of Persons with Disabilities (The Convention on the rights of persons with disabilities, 2006). However, the history of this issue spans several decades. Efforts to create a barrier-free environment abroad related with the emergence of a large number of people with various physical and mental impairments after World War II. In the early 1950s, the Council of Europe launched a commission to address the issues of creating a habitat that meets the needs of persons with disabilities. In the 1960s and 1970s, norms and standards regulating architectural activities and meeting the requirements of disabled people appeared in Europe. The first planning recommendations for creating a barrier-free environment in the USSR were developed in the late 1980s. Based on them, Guidelines for the Movement of Persons with Disabilities Using a Wheelchair in Public Building Projects, Planning and Development of Residential Areas were published. Sustainable Development Goals in the field of inclusiveness in Azerbaijan, especially in Baku, can be explained as follows:

1. Integrated provision in all areas of inclusiveness;
2. Formulating norms and requirements based on international practice and national mental values to ensure inclusiveness;
3. Development of an appropriate legal normative base;
4. Development of a mechanism to monitor the implementation of laws adopted by the State;
5. Development of government programs for the training of new generation specialists in all areas to properly organize future inclusiveness;
6. Conducting awareness activities forming public perception about the attitude towards people with disabilities and their correct treatment;
7. Providing psychological support for people with disabilities to make them feel comfortable in society;
8. Organization of inclusiveness in all spheres of tourism of non-oil sector, which in recent years has been an relevant State strategy in Azerbaijan;

9. To ensure inclusive transport network among all regions of Azerbaijan by providing inclusiveness;
10. To ensure involvement of people with physical disabilities in working groups in the implementation of all these processes.

At present, there are some requirements approved by laws and regulations of Azerbaijan to create barrier-free environment for people with disabilities. However, despite the existence of these standards, they are not always met. The main problem of existing buildings in Azerbaijan is the lack of accessibility. People with disabilities in multi-storey buildings spontaneously arrange ramps for themselves from stairs and entrances, equip apartments on the first floors with a flat ramp. But all this must be done in accordance with accepted norms and requirements, based on the experience of other countries in the world. Nevertheless, our country should also master the production of specialized devices for the people with disabilities.

Each of us in different periods of life get different degree of disability. It can be temporary or permanent due to some disease, age, pregnancy and many other reasons. In short, disability¹ is a complex situation, which numerous people deal with at a certain time frame for various reasons. But what is considered by *people with mobility impairment*:

- People with locomotor impairment
- Visually impaired people
- Hearing impaired people
- People with mental impairments
- People with psychiatric impairments
- People with invisible disabilities

This also includes the following:

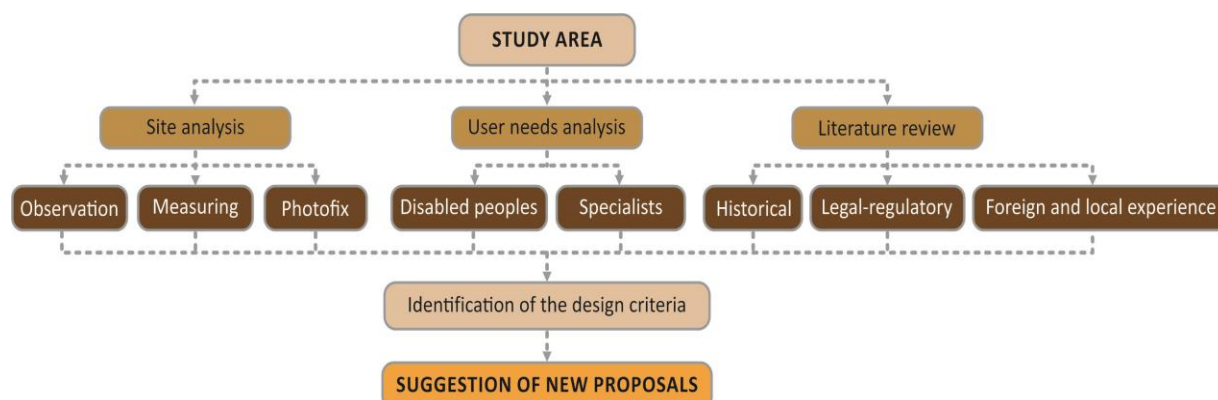
- The elderly
- Children
- Pregnant women and parents with small children
- Short stature and taller people
- Overweight people
- People with strollers or wheelchairs for baggage and cargo transportation
- People with temporary injuries (sprain, fracture, etc.)
- Foreign citizens

Also:

- Medical personnel and the emergency
- Emergency service

According to statistics for 2019, to date, 611,496 people with different degrees of disability have been registered in Azerbaijan. If we add people belonging to the groups listed above to this number, we can say with complete confidence that the problem of inclusiveness of the urban environment belongs to more than half of the population.

¹Law of the Republic of Azerbaijan On the Rights of Persons with Disabilities of May 31, 2018 No. 1153-VQ.



Scheme 1. The basic framework of the study

Not a small number at all.

Nowadays, large-scale reconstruction works are carried out in all regions of Azerbaijan, as well as in the capital city Baku, the city infrastructure is renewed, streets, gardens and parks improved, new transport hubs created, greenery planted, open areas meeting modern requirements delivered for use by the population. But, along with all this, we are not able to say that Baku and other cities are fully accessible today. To achieve this, it is not enough just to remove obstacles on the roads running into parks, install new ramps on the streets, avenues and crossroads. This requires the elimination of stress factors, which are a sensitive issue for people with limited opportunities and disabilities, and the improvement of comfort in green areas.

If we analyze the open areas in our cities from this point of view, we see that there are practically no conditions for mobility impairments: obstacles, ascents, descents, steps, stairs, lack of handrails, tactile pavings, information boards and so on. People with disabilities, particularly those who use wheelchairs, are not able only to move freely in the parks and gardens, and enjoy the greenery, they can't even get out of their homes and get close to these places. In the winter months, the situation worsens, and the lack of an accessible environment forces these people to live in their apartments in a limited way.

2. Material and methods

Empirical, theoretical and historical methods were used during the study. Thus, the empirical method is based on observations, measurements, descriptions, etc. that investigate the level of inclusivity in the selected area of the study area – the open spaces of Baku, where the defects are visually recorded or photo-fixed. The materials obtained were, in some cases, confirmed by measurements and described in writing. The theoretical approach is based on the comparative method, which facilitates the comparative study of international experience, existing norms and requirements, as well as the models proposed by the author to address the shortcomings. All these results are based on the historical method, the

work that has been done so far in the international arena and in our country to address the problem of inclusivity, with the stages of formation of public opinion on people with disabilities, the knowledge of the history of the concept of *groups of people with disabilities* and *universal design*. The structure of the research is as presented on scheme 1.

3. Historical background

The lack of an accessible environment in our cities is not a problem of recent years. And this situation is observed not only in Azerbaijan, but also in the entire post-Soviet space. In fact, there are historical reasons why our cities today are not inclusive and still do not take disability factor into account in architectural design. Thus, according to the ideology of the Soviet system, in which we were part for more than 70 years, there could not be disabled person in the flourishing Soviet Union. 2.5 million persons with disabilities were registered after World War II alone (Volkova, 2016). Disloyal attitude prevailed towards such people in the USSR. Soviet citizens could not be impaired. People who received no social assistance other than a small pension, lost their body part during the war or were disabled for some other reason, in many cases had to beg. And the Soviet state, as part of its fight against such *negative* elements of society, offered, and in some cases even forced them to move to specially created homes for disabled veterans. Over time, as a result of such measures, beggars from the streets, albeit partially, began to decline. Some of the disabled settled in boarding schools, while some did not leave their homes. All these measures put the concept of an inclusive environment on the back burner in the Soviet area or, to be more precise, consciously were forgetting issues related to people with disabilities.

In the 1950s and 1960s, the situation for disabled children growing up and being brought up in boarding schools was partially good. Here they grew up with Soviet ideology, received education and medical care, believed that everyone was equal in the Soviet Union. After reaching adulthood, they left the boarding school and realized how difficult it was to

have a disabled life outside the *native* walls. Wheelchairs were not sufficiently in the Soviet Union. Besides of this, no accessibility were taken into account for the movement by these means, and there could be no talk of inclusiveness.

Already from the mid of 1960s to the early 1980s, independent civic activity - dissident movements began to dominate in the public scene. Thus, in May 1978, dissident disabled persons, Yuri Kiselyov, Valeriy Fefelov and Faizulla Husainov created an Initiative Group for the Protection of the Rights of Persons with Disabilities in the USSR. It was the first informal alliance of human rights defenders established in the USSR in May 1969, a group that submitted general statements, but without a clear structure and charter. The group, which had done a great deal of work to protect persons with disabilities, was considered an anti-Soviet. The Committee for State Security started to chase Fefelov, Kiselev and Husainov. Excerpted from the book *There are no disabled people in the USSR!* by Fefelov: *The organizers of sports competitions held in Stoke Mandeville, England invited Soviet athletes to take part in these competitions. In response, Soviet leaders: 'There are no invalids in the USSR'!* (Fefelov, 1986)

Attitudes towards disabled people only in the last decades of the USSR began to change for the better. In the 1970s and 1980s, the Soviet government adopted many laws aimed at increasing the level of Social Security: the disabled were given various benefits, the pension and health system improved. The first guidelines for the planning a barrier-free environment were developed in the late 80s. On their basis, Guidelines were published for ensuring the movement of wheelchairs in public building projects, planning and development of residential areas.

4. International practice

In the middle of the last century, not only in the USSR, but also in many countries of the world, there were significant events related to the protection of people with disabilities. Thus, in Berkeley, USA riots began in the streets, organized by Ed Roberts, a great advocate of inclusiveness (Isachenko, 2019). Ed Roberts, who suffered from polio and partially paralysis at childhood was a rebel by nature and a man of strong character. In a short time, he formed the Rolling Quads, bringing together like-minded students from around the world. Members of the group began to fight for the civil rights of persons with disabilities through radical and provocative methods. Activists with heavy hammers broke the sidewalks, preventing them from moving on the streets with wheelchairs. In the result, the Berkeley authorities was compelled to respond to all these demonstrations and provide ramps for the residents. The 60s and 70s, the USA was remembered for numerous civil reforms and mass riots. Movements to protect the rights of people with disabilities extended

from Berkeley to all the states. Those who used a wheelchair held pickets in front of government organizations, prevented transport, in short, tried to attract the attention of the authorities. As a result, President Bush signed the Americans with Disabilities Act (ADA) in 1990, act on the rights of Americans with a disability (Adata.org, 2021).

Today the Ed Roberts Campus, located in Berkeley, California, USA, with an area of 7 thousand square meters, has become worldwide model of accessibility and versatility (Isachenko, 2019). Headquarters of the Center for Independent Living is in this building, designed by Leddy Maytum Stacy Architects (LMS Architects) and named after Ed Roberts, the defender of people with disabilities. It provides training, education, medical and legal services for people with disabilities and sensory issues. The building designed with 7 Principles of Universal Design is still fully compliant with the requirements of ADA. It uses acoustic landmarks, high contrast walls and textured floors to independently determine the direction of the visually impaired. The elevators are equipped with buttons at leg level. Doors can be operated remotely. There are no stairs, and it is possible to climb to the second floor with a red ramp, the object of focus in the central atrium. Only natural materials were used in construction and interior decoration. The indoor air is regularly cleaned up and moistened with innovative filters. It is designed for the comfort of people with allergies, asthma and special chemical sensitivities. During the construction of the campus, the Ashby Bart Station was also upgraded as part of the inclusiveness. Today, as a result of comprehensive measures, hundreds of persons with disabilities can visit this *island* of inclusivity.

It should also be noted that the work in this direction in various parts of the world is called differently: in the U.S. the term *universal design* (first used by the pioneer of this stream Robert Mace in 1985), in the UK it sounds like *inclusive design*, in the Nordic countries as *design for all*.

What does inclusive design in Robert Mace's theory mean? (Isachenko, 2019)

Inclusive (comprehensive) design means the design of objects, furniture, programs and services developed for the most convenient use by all people without the need for adaptation or special design. According to Robert Mace, inclusive design consists of 7 basic principles:

1. **Equitable Use:** The design should be developed for use by individuals with diverse physical abilities. Appealing design for all users.
2. **Flexibility in Use:** The design must meet a wide range of individual preferences and skills. It should help the user to get the product correctly and accurately. Right- and left-hand characteristics should be taken into account while using.

3. **Simple and Intuitive Use:** The use of a product at this time should be understood by any user regardless of their experience, knowledge, language skills and level of concentration.
4. **Perceptible Information:** Regardless of the environmental conditions and the user's perception, the design must provide the user with the necessary information.
5. **Tolerance for Error:** Preventing unconscious actions in the performance of important tasks, minimizing threats and negative factors.
6. **Low Physical Effort:** The user should utilize the design as efficiently and comfortably as possible with minimum effort.
7. **Size and Space for Approach and Use:** Regardless of size, shape or mobility, any user should be provided with a comfortable approach to the product, access (transition), appropriate size and space for its manipulation and use.

Considering all this, the built-up spaces should not only meet the standards, but also be attractive, and have accessible landscape and architectural structures. In 2016 in the USA, the First National Study of Neighborhood Parks showed that only 4% of park visitors are the elderly (Isachenko, 2019). This indicates that it is necessary not to limit ourselves to standards of accessibility, when designing parks it is required to stimulate the desire of groups of people with special requirements to come to places, using landscape and architectural solutions that awaken a sense of psychological comfort. Designing a garden, a park, a street landscape is a very emotion-based activity. And the purpose of this work is to create feelings. Nobody likes the same, similar, sterile places nowadays. When it comes to parks, we are supposed to talk about the implementation of solutions that affect all our senses, awaken imagination and create cognitive contact with its location. Universal design today can be referred to an architectural ideology that brings together anyone who wants to make urban spaces as accessible, efficient, sustainable, aesthetic and economic as possible. Thus, the above-mentioned principles of Universal Design were also used in the reconstruction of the International Trade Centre in New York and the construction of the 9/11 Memorial. The author of the project was architect Michael Arad and landscape architecture designer Peter Walker (Isachenko, 2019). The differences in the level of construction that prevailed at the memorial, which began in 2006, were replaced not by stairs but by inclination. These inclinations are solved so smoothly that most pedestrians do not even feel them. The names of the victims of the tragedy were written at such a height that they can be comfortably read by children, adults and those who use wheelchairs. Here people with disabilities can comfortably

and without obstacles visit museums, cafes and auditoriums.

Another successful example of universal design is the yard of the Queen Elizabeth National Spinal Injuries Unit based in Glasgow (Isachenko, 2019). This project, developed by designer Cleve West, consists of six different green areas. Each area serves to develop the activation of different sensory organs and development of the sensory perception. The author of the idea of creating such a garden, contributing to the rehabilitation of patients, was a surgeon Horatio Chapple, a 17-year-old schoolboy. The young man worked here as an independent assistant, conducted a survey among patients and explored their opinions and wishes. Although the surgeon Horatio Chapple died tragically, his dream was fulfilled and the garden got incredible positive feedback in 2012. Obviously, a great role in the creation of such a therapeutic garden played a long experience of garden and park art of the English empire. But regardless of this, there must also be desire, good intentions and empathy.

5. Research by design approach

Nowadays, numerous projects can be observed designed to create an accessible environment as a result of large-scale reconstruction works of the streets in Baku. The ends of the sidewalks are equipped with ramps (Figure 1), and the streets and parks are provided with information and navigation boards (Figure 2), many crossings have lifts for people using wheelchairs and having problems with the locomotor system, parking lots have special seats for the disabled, public transport is provided by inclusive means of transport, revolving doors are installed almost in all public facilities, commercial and entertainment sites. Notwithstanding, our environment still cannot be considered accessible.



Figure 1. The new ramps in the streets of Baku

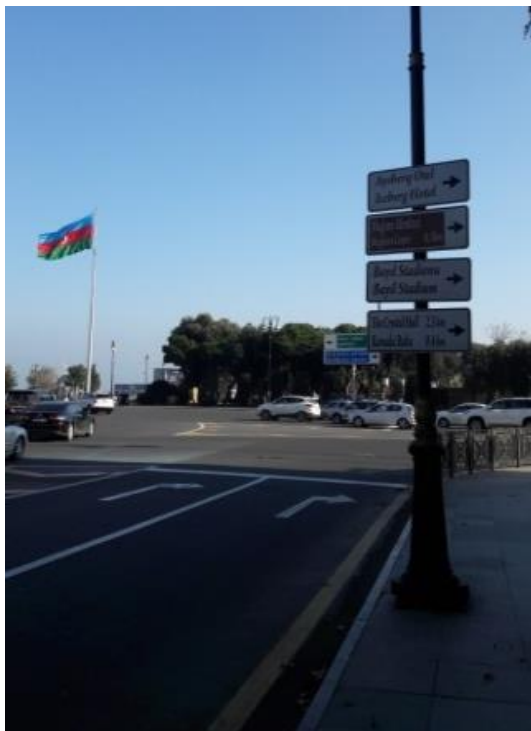


Figure 2. Information and navigation boards

An integrated approach to a barrier-free environment includes the following measures:

- Considering the needs and interests of people with various types of disability.
- Removing all kinds of obstacles
- Creating physical accessibility
- Creating information accessibility
- Developing policies and procedures for the provision of accessibility services
- Training of staff for working with persons with disabilities
- Identifying and creating an accessible environment area
- Defining objects, services and information

Today we will face many challenges if we want to adjust open areas, streets and avenues, gardens and parks, the inner life of our cities to the principles of universal design. This process is not so simple and quick to solve. In many instances, it is even easier to implement these principles in new projects than in reconstruction projects. Therefore, at the initial stage of design it is necessary to be guided by 7 basic principles of Universal Design developed by Ronald Mace. Therefore, at least the navigation system should be as simple, logical and understandable as possible for everyone. Visual guidance should be repeated with tactile, audible signals and braille alphabets. Considering the high propensity of people with visual and hearing impairments to smell, landscape architects can use the scents of flowers in determining the direction. Furthermore, colorful plants can be used for navigation. People automatically remember the landmarks selected in the general context in respect of color and shape – public art ob-

jects, greenery elements and small architectural patterns. It can assist people with visual and mental impairments conveniently and freely determine directions.

Besides, it is important that the parks, along with the open areas, are partially closed. While older people like open areas (figure 3), people with autism and visual impairments prefer calmer, more intimate and colouristically simple spaces (figure 4). Therefore, they will prefer the shading covered with lianas or benches surrounded by high plants above the wide alley near any fountain or children's playground. Surely, creating such special places in small gardens, inter-neighborhood and transit gardens is difficult or in some cases impossible, but in large parks, boulevards, forest parks it is mandatory.



Figure 3. Open areas



Figure 4. Simple spaces

Predictability is one of the important factors. Navigation boards should indicate not only directions but also distances to necessary objects – shady area, springs, small architectural patterns and sanitary facilities. Although it is not very important for healthy people, this data is necessary for people with disabilities. They must correctly calculate their strength according to the distance.

It is also important to properly illuminate open areas. We should ensure people's visits to the parks not only during the daytime, but also in the evenings. So,

parks shouldn't lose their accessibility in the evening hours too. In this case, the spectrum, intensity and direction of light play an important role. The lights should not be too intense or weak. We should not forget the multifunctionality of the parks as well. Active recreation and sports areas should not only be for children and adolescents. Today there are also street fitness facilities for people with disabilities, which can be installed in outdoor sports venues. In some cases, we face serious disadvantages in our parks and gardens. Although regular people do not feel these situations, persons using wheelchairs see and, in many cases, even fall into despair (Figure 5).



Figure 5. A ramp just in a staircase march in Officer's Park, Baku, Azerbaijan

While creating inclusive parks, attention should also be paid to the relief. Obviously, the inclination of the roads should be correctly set, that is, no more than 5% in length and 1-2% in width. While designing the roads, we must consider the will of the persons with disabilities, who use not only wheelchairs but also crutches (Figure 6). The floors of the roads should not be slippery. Especially in autumn and winter months. In this case, it is necessary to work out the drainage system and streams of rainwater properly. The availability of inclusive parks should start from the entrance area – the public transport stops and parking. The parking areas for people with disabilities should be wider than others so that the wheelchair user can easily and fully open the doors. According to the norms, this size constitutes 3.5×5 m. In general, all green locations need to be concentrated under a continuous network of green corridors under the design of landscape architecture of open areas. So that people with disabilities can move freely and safely from one place to another (Safonov, 2005; Stenfeld, 2012).

Another important factor is that public sanitary facilities don't meet inclusivity today. Such accessible sanitary facilities should be created not only in gardens and parks but also in all public areas. This work should not be limited only with the creation of such cabins. These measures should be addressed in a comprehensive manner, and the locations of such cabins should be identified by a special navigation system (repeated in braille alphabet), and the roads

leading to these cabins should be equipped with tactile pavings and ramps, and cabins should be equipped with the necessary equipment. (Rahimli, 2018; Lazovsky, 2015).



Figure 6. Central Park in the center of Baku, newly put into service

6. Results

In view of the above, it is regrettable to say that today our open areas are not inclusive, and there is no talk about the full accessibility of the environment. Taking into account sustainable development perspectives, it is necessary to use the principles of a systematic approach with the participation of all relevant institutions, organizations, social movements, architects and builders in forming the environment. It is necessary not only to design new buildings taking into account the accessibility of habitat and human needs, but also to adjust completed projects and restore old buildings. It is obvious that only architects, designers, especially landscape architects are able to cope with this problem at the initial stage of the implementation of comprehensive measures. In addition, the whole society should approach the issue with empathy. This process should not start with a project for the reconstruction of a site, but with a training process for professionals working in this field. We should today not only create accessible conditions based on world practice, but also train new generation specialists working in this field. Topics on accessibility should be included in core education programmes. Targeted work in this direction

has already been carried out on a global scale. For instance, the Department of Architecture at the University of Buffalo offers a master's degree in Inclusive Design and Architecture. They train professionals who can provide equal opportunities for people of all categories and ages.

Recently, ASLA (American Society of Landscape Architects) has published a new Guideline on Universal Design (Isachenko, 2019; asla.org, 2020). Based on Ronald Mace's principles, this Guideline uses the concepts of *multisensory*, *predictability*, *intuitiveness* and others, and sets new requirements for parks, public areas and children's playgrounds. It stipulates that open areas should be accessible to all, regardless of physical, cognitive or mental abilities.

It should also be noted that little has been done recently in this direction in Azerbaijan. Thus, after gaining independence in Azerbaijan, people with disabilities began to acquire the status of equal members of society. At first, it began to be reflected in legislative and regulatory documents. The Republic of Azerbaijan has also studied and started applying UN Conventions and other international experience. One of the most important documents is the Law *On the Rights of Persons with Disabilities* approved by Presidential Decree #213 of 31.05.2018 (Law of the Republic of Azerbaijan on the rights of person with disabilities, 2018). The document represents a purposeful scientific and methodological basis for the initiatives of architects and designers, production organizations and firms, public security authorities. Additionally, Union of Disabled People Organizations (UDPO) of the Republic of Azerbaijan developed rules for *creating the necessary living and working conditions for the people with disabilities and limited mobility in the design of buildings and structures* (Rahimli, 2017).

Over the course of time, the environment changes depending on a particular reason, natural or anthropogenic factors. Today we should try to make spaces inclusive, universal and accessible, for all.

7. Conclusion

Over time, the environment changes depending on one reason or another, natural or anthropogenic factors. We must work today to make the spaces more inclusive, universal and accessible – for everyone. This process, of course, is not a quick and inexpensive process. On the contrary, today there is a need

for the implementation of purposeful and well-organized global social projects that require significant financial and time investment, not only for open spaces but also everywhere. In this case, public opinion, public opinion based on national and moral values, and tolerance towards the individual characteristics of persons with disabilities also play an important role.

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A Sustainable Journey of Handmade Paper from Past to Present: A Review

Zrównoważona podróż papieru czerpanego od przeszłości do dziś

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Abstract

Paper is an excellent medium of expression and knowledge preservation and communication because of its writing, printing, and packaging abilities. It is a thin sheet or web-like structure made by a dilute suspension of cellulosic fibres. Handmade papermaking technology was mass accepted and considered a precious commodity before development of an industrialised wood- pulp based paper industry. This modern papermaking practice harms the environment as it uses enhanced natural resources (ample amount of water, trees as a primary source for wood pulp) and generates pollution due to release of harsh chemicals.

This paper reviews the history and process of handmade paper manufacturing from past to present. Along with that, all the pillars of sustainability (environmental, economic, and social) in relation to the handmade paper industry are deep rooted since ancient times and very much relevant for the present era of sustainable development. Various kinds of cellulosic raw materials from plants (Paper mulberry, Kazo, Gampy, hemp, bamboo, banana, etc.) and other used materials (old rags, ropes, nets, newspapers etc.) with the chemical-free production process and products make this industry eco-friendly. Craft based, small scale and labour-intensive guild art gives it social strength; whereas an infinite product range having functional and decorative uses, as well as strong export potential of the industry gives it an economic strength.

Due to the present need of sustainable production, waste minimisation, and circular economy, the handmade paper seems to very potential industry to recycle various kind of waste like weedy battles, textiles, tetra packs, currency, plastic etc. This paper is an attempt to review the journey of handmade papers, its recycling potential, various production processes, products, advantages and disadvantages of the industry from past to present.

Key words: handmade paper, sustainable production, cellulosic materials, recycling

Streszczenie

Papier jest doskonałym środkiem zachowania wiedzy oraz komunikacji ze względu na jego zdolności do pisania, drukowania i pakowania. Jest to cienka struktura przypominająca arkusz lub wstęgę wykonana z rozcieńczonej zawiesiny włókien celulozowych. Technologia ręcznego wytwarzania papieru była powszechnie przed rozwojem przemysłu papierniczego na bazie masy drzewnej. Ta nowoczesna praktyka papiernicza szkodzi jednak środowisku, ponieważ wykorzystuje ulepszone zasoby naturalne (duże ilości wody, drewno jako główne źródło miazgi drzewnej) i generuje zanieczyszczenie z powodu uwalniania agresywnych chemikaliów.

W artykule dokonano przeglądu historii i procesu produkcji papieru czerpanego od przeszłości do współczesności. Wszystkie filary zrównoważonego rozwoju (środowiskowy, ekonomiczny i społeczny) w odniesieniu do przemysłu papieru czerpanego występowały już od czasów starożytnych i mają bardzo duże znaczenie dla obecnej epoki. Różne rodzaje surowców celulozowych z roślin (morwa papierowa, kazo, babka, konopie, bambus, banany itp.) i innych używanych materiałów (stare szmaty, liny, siatki, gazety itp.) z bezchemicznym procesem produkcyjnym czynią tę branżę przyjazną dla środowiska. Oparta na rzemiośle, drobna i pracowita sztuka cechowa daje jej

siłę społeczną; mając na uwadze, że nieskończona jest gama produktów o funkcjonalnych i dekoracyjnych zastosowaniach, a także silny potencjał eksportowy przemysłu, zapewnia jej także mu siłę ekonomiczną. Ze względu na obecną potrzebę zrównoważonej produkcji, minimalizacji odpadów i gospodarki o obiegu zamkniętym, papier czerpany wydaje się bardzo idealny do recyklingu różnego rodzaju odpadów, takich tekstylia, opakowania tetra, plastik itp. Ten artykuł jest próbą opisanie historii papieru czerpanego, jego potencjału w zakresie recyklingu, a także omówienia różnych procesy produkcyjnych, produktów oraz zalet i wad tej branży.

Słowa kluczowe: papier czerpany, zrównoważona produkcja, materiały z celulozy, recykling

1. Introduction

Parallel to the development of human culture and civilisation, there was the development of various mediums through which feelings can be expressed, messages can be passed, and knowledge can be preserved. Various hard and soft mediums were used from time to time to full fill the need for written records. Paper was the material that was found most suitable and appropriate for writing, printing, and packaging purposes. *The word paper is derived from the Latin word – reedy plant 'Papyrus' and French 'Papier'.* Different styles and forms of paper were used worldwide.

Present paper technologies, both handmade and industrialised, are the rectified version of paper technology developed by China many centuries ago (A detailed, n.d.). Moreover, this invention gave birth to a *new era of civilisation*. Between 600 AD to 1500AD, the technology of handmade paper making diffused from China to east and central Asia through Buddhist monks; and from there it reached Mediterranean region and to other parts of Europe. According to the available raw materials, religions, and cultures, technology diffusion also took place after use and trade (Bloom, 2017).

Handmade paper is a thin sheet or web-like structure made by the dilute suspension of cellulosic fibres. This dilute suspension is either poured or drained through a mesh-like structure so that a layer of interwoven cellulosic fibres is achieved after drying and removal of excess of water. Various cellulosic fibrous plants (paper mulberry, gampy, mitsumata, banana, sisal, hemp, kenaf etc.) and cellulosic waste materials (textile waste, jute waste, nets, ropes, used paper etc.) are used as the primary source of raw materials for paper making.

Handmade paper making technology was mass accepted and considered as one of the very precious commodity before the development of industrialised wood pulp-based paper industry during the 18th century in Europe. This modern technique aimed to develop a wide variety of papers to meet the need of the masses and to earn profits at any cost. Industrialised production of paper wrecked handmade paper production.

This modern practice of papermaking harms the environment because it uses an ample amount of natural resources (ample amount of water, trees as the primary source for wood pulp) and generates pollution (harsh chemicals). Approx. six million km² of

earth's forest has been lost in the last 200 years (Kumar et al., n.d.). The modernised paper industry uses approx. 460 bamboo plants and 270 eucalyptus trees to produce one ton of paper (Teijgeler et al., 2001). Around 40 % of timber is used for paper production only.

This unconscious use of natural resources has led us in a dangerous situation. The researchers, government and citizens globally are finding ways for sustainable production and consumption where economic, environmental and social benefits can be achieved. Most of the sustainable practices are the amalgamations of past methods with present inventions. For sustainable alternatives of many industries, we have to look back into our past to take inspiration. Old methods may serve as a foundation for contemporary sustainable practices.

The handmade paper industry is one such industry which is an amalgamation of arts as well as science and uses renewable, biodegradable, used and unused cellulosic materials with recycling potential. The manufacturing process of handmade paper is also eco-friendly and can be made chemical-free.

2. History of handmade paper development from past to present

History of paper is vibrant and varied, and rests on sustainable practices. Before the invention of paper *Shruti* (Sanskrit word) means the verbal transformation of information was done for the transfer of information. Along with that, many predecessors of paper were also used since ancient time. Various types of hard materials like bones, stone, metal, shells, earthenware, terracotta etc. were used as writing materials. Engraving, embossing, painting and scratching were done on them. Wooden board, barks of trees, palm leaves, leather and cotton clothes are some of the examples of soft writing materials (Tiwari, 2019). History of handmade paper can be described as follows.

2.1. Papyrus in Egypt (3500 BCE/ BC)

Papyrus is a generic botanic term used for tall grass-like plant *Cyperus* of wet origin. A fine paper-like sheet could be achieved by laminating fine strips of pith portion of the plant. Wetting, pressing, hammering and sun drying of the strips were done for lamination of strips (Wiedenmann, 1983). Before the discovery of handmade paper in China, Papyrus was considered as the most appropriate material for writ-

ing especially in Egypt. Egyptian had the monopoly to grow efficient thickness papyrus plant suitable for producing writing material (Bloom, 2017).

2.2. *Parchment and vellum in Europe & Asia (2500BCE/BC)*

During 2nd century BC, animal skin (mainly calf, sheep, goats) was used as writing material in Europe; later it became famous throughout the Islamic region.

Animal skin was limed, scraped and dried under tension so that both the side of the skin can be used as writing materials. Vellum was the superior form of parchment obtained from the skin of young or unborn calf hide (The Intriguing, n.d.). The availability of parchment over papyrus was more and easy, i.e. it was more used, but its spread towards east and central Asia was limited due to Buddhism and Hindu religions.

2.3. *Handmade paper in China (105CE/AD)*

The present-day paper is a modified form of paper invented by China. China was the pioneer of paper making technique for approx. 1000 years and hid this secret to earn monetary benefits. For several years this paper was exported to many countries through Silk Road, and gradually the art of handmade paper making leaked.

The oldest piece of writing paper was excavated from a tomb at Fangmatan in Gansu province, China, and dates back as early as Western Han (179-41 BCE). The occupant of the tomb was buried with a paper map laid on his chest, showing mountains, waterways and roads (The intriguing, n.d.)

According to Chinese record, an official in the imperial Chinese court called Cai Lun (Tshai Lun or T'sai Lun), during the Han Dynasty, presented a report made up of handmade paper to emperor He Di in about 105 AD. This paper was made up of paper mulberry (Kozo) and other bast fibres along with fishnets, old rags, and hemp waste. At around 600 AD woodblock printing was invented in China, and the first newspaper was printed on (740 AD) (Hunter, 1937; Jugaku, 1959; Tsang, H. 2015).

2.4. *Handmade paper in Japan (106CE/AD)*

Approx. after 500 years of handmade paper production in China, paper making technique reached to Japan. During the 6th century AD, the art of handmade paper making first reached to Korea and from their technique was introduced to Japan during 610 AD by a Korean monk named Don-cho (Tsang, H. 2015). A lot of technical developments happened to enhance the quality and uses of paper. Empress Shotoku of Japan in the year 770 ordered approx. one million religious prayers called *Pagodas*. These pagodas were made on handmade papers with wooden block printing. The strips of handmade papers then placed over 4-5 inch strips of carved wooden. Many of the pagodas are surviving till today and maybe the earli-

est evidence of mass printing (Clapperton, 1934; Hunter, 1947; Anon, 1962; Hubbe, 2009).

2.5. *Handmade paper in Arab (715CE/AD)*

The journey of handmade paper towards Islamic and western world was prolonged. Till 715CE papermaking technique was limited to China and Japan. After the battle of *Atlatkh* near Talas (present-day Kyrgyzstan), the Chinese army was defeated by Arab forces and this secret was obtained from Chinese prisoners. This led to the introduction of the first paper mill in the Islamic world that was founded in Samarkand, which is modern-day Uzbekistan. After that paper making technique spread to various regions through Silk Road. Paper developed in this reason was known as *Kagaz*. The name *Kagaz* is derived from the Urdu word *Kavas*, which means paper and craftsmen of *Kagaz* manufacturing are called *Kagzi's*. Foldable use of paper in a codex format suitable to write religious books especially *Koran* (religious book of Muslims) was started from Baghdad (Farid, 2003; Hubbe, 2009).

2.6. *Handmade paper in Europe*

Europeans were not aware of the art of handmade paper manufacturing for a long time. During the 10th century AD, this art spread to Egypt through Arabs and then Europe. Papermaking centres mainly flourished in Italy and Spain. Fabriano was the main center where art of handmade paper flourished first and from there it reached to other European countries (Dabrowski, 2008). In Europe, significant technological improvements were done to ease the process of handmade paper making (Hubbe, 2009) use of metal in making fixed screen moulds, the invention of the first printing press by A.D Johan Gutenberg in 1453, development of Hollander beaters in the 1660s or 1670s, watermarks on handmade sheets for their identity by the help of metal screens and development of first industrialised handmade paper making machine by Nicholas- Louis (1798) were some of the significant inventions in the direction of papermaking. By the middle of the 19th-century mechanised wood pulp-based paper industry replaced the handmade paper industry in Europe. European paper manufacturing industry overruled the paper industry of Asia and dominated the market. Only a few craftsmen, artisans and few rebellions against industrialisation tried for the revival of this dying practice.

2.7. *Handmade paper in India*

Handmade paper manufacturing technique reached Tibet at around 650 AD, and from there it was introduced to India (645AD) (Hunter, 1939; Tsang, H. 2015). At the time of Hsuan Tsang's (Chinese Buddhist monk) visit to India, the technique of handmade paper making was known, but it was not so popular, as use of palm leaves was preferred for writing purpose. With the start of Mughal rule (1526), handmade paper industry flourished a lot in India

and gradually became a major centre and a precious export commodity. Many paper manufacturing centres (Kagzipura) were established. Some of them are still surviving. The handmade paper industry is still one of the potential art and craft small scale industry in India, employing nearly 37,000 through its approx. 3000 production units (KVIC India, Dwivedi et al., 2013).

The handmade paper units are scattered throughout the country with concentration most in the Kalapi (Jhansi, Uttar Pradesh), Sanganer (Rajasthan), Pune (Maharashtra), Kurukshetra (Haryana), Mahaboobnagar (Andhra Pradesh) and some clusters are in West Bengal (KVIC, India) (Dwivedi et al., 2009). Sanganer village near Jaipur, Rajasthan, India) and Kalpi (Jhansi, Uttar Pradesh, India) are considered as the largest handmade paper producing centers in the world.

3. Raw materials used for the handmade paper

Cellulose is the base material for the construction of paper as higher length to width ratio, cohesiveness, pliability, tensile strength, water absorbency, and resistance to tearing, are some of the properties which are desirable in a paper. Various kinds of cellulosic fibres can be used in paper construction. Their origin can be directly from plants or cellulosic waste materials. The blending of plant fibres and waste materials was a more practised option as by the use of a combination of different fibre types and fibre sizes desirable properties could be achieved. For example, long-staple fibres give strength and anti-cracking properties to the paper when used along with short length fibres. It also reduces the cost of paper (Heller, 1978). Evidence of one of the oldest Chinese paper presented by Cai Lun (105 AD) was made up of used rags, along with old rope, fishing nets, hemp, and flax (Clapperton, 1934; Turner and Skiold, 1983).

In India, Gunny bags made from jute (*Corchorus capsularis* or *Corchorus olitorius*), nets and rope made from Sun hemp (*Crotalaria Juncea*) were majorly used as raw materials (Teijgeler, 2001)

It has been suggested that the earliest papermakers mainly used rags as a fibre source. Papers made from cellulosic waste materials were considered inappropriate for religious and ceremonial artwork (Jugaku, 1959; Hubbe, 2009) so later attention turned almost exclusively to locally available fresh vegetative sources (Bloom, 2001). Jute, hemp, flax, ramie, rattan, paper mulberry (koso), mulberry, and bamboo etc. fibers were used by early Chinese paper makers (Tsien, 1973).

Koreans used the fibres of hemp, rattan, mulberry, bamboo, rice straw, and seaweed to make paper pulp (Hunter, 1936; Tsang, H., 2015). Kozo, Mitsumata and Gampi were the most used bast fibres for handmade papermaking in Japan. The inner bark of Fig tree (*Mudakh*) was used to get white fibres suitable

for papermaking in Yaman (Bloom, 2017). Flex, jute, banana and bamboo fibres were used by Islamic and Indian handmade paper manufacturers along with used textiles and papers. European paper makers majorly used rags for handmade paper making.

In Nepal, handmade paper is made from the inner bark of Lokta fibers (*Daphne bholua* and *Daphne*) and cotton cutting waste with the ratio of 70% and 30 % respectively. This fiber grows at Himalayan region abundantly and resistant to insect and mildew (Biggs et al., 2005).

A small mountain village Moktu in Arunachal Pradesh India uses locally available raw material similar to Nepal and Tibet called *Daphne Paperacea*, locally called shoughun for paper pulp which requires no chemicals (Bloom, 2017).

Many researchers have worked to standardise the recipe of handmade paper manufacturing through various plant fibers. Hunter (1930), Mason (1963), Lorente (2004) gave paper making recipes from a wide range of common plants. Kumar, V. & Maheswari, R.C. Turner and Skiold (1983) gave detailed descriptions of fibres from seed hairs (cotton, cotton linters), leaf fibres (esparto, manila, grasses, giant nettle, rice straw, rattan), bast fibers (linen/flax, jute, hemp, kozo, gampi, mitsumata, ramie), and wood-derived fibres (made by wasps or by pulping processes) (Hubbe, 2009).

Cotton fibre has an almost insignificant role in paper manufacturing till the 18th century, later large amount of cotton was exported to Europe from India and cotton rags were used to make handmade papers (Bloom, 2017). In present time cotton cutting waste generated by garment manufacturing units is the most usable raw material for the production of handmade paper in India.

Blends of various other materials like dry flowers, pigments, seeds, coloured fibres etc are also used to impart functional and aesthetics properties in the paper. During the 18th century Afshani papers from Daulatabad, Maharashtra was world-famous because of its beautiful blends with gold and silver scraps (Teijgeler, 2001).

3.1. Some new cellulosic materials for the manufacturing of handmade paper

The rising cost and limited availability of cotton cutting waste are escalating problems and to solve this, there are many recent researches to find out the new plant fibres and natural cellulosic materials suitable for the manufacturing of handmade paper pulp which have a superior quality of cellulosic content and easy and cheap availability. Arafat, et al., 2018, researched, to make handmade paper using banana fibres and banana waste fibres which contains lingo cellulosic wastes. According to his research, the properties of handmade paper made from the waste of banana fiber extract are inferior, but the production of handmade paper is possible. Kumar et al., 2013, studied the suitability of Banana (*Musa sapi-*

entum) and ankara (*Calotropis procera*) fibres for the production of handmade papers. Chemical analysis of these fibres showed excellent properties like high cellulose, low lignin and ash. The handmade papers made from these fibers can be used to make tissue paper, bond paper, card sheets and decorative items etc. Ghosh et al., 2009, studies the production of chemical-free handmade paper from date palm (*Phoenix Dactylifera* L) leaves which is a sustainable agro-residue. An attempt was taken by Kulria, 2016; to recycle linen fabric waste to develop handmade papers. Linen Fiber waste (both unbleached and bleached varieties) were collected from a reputed Linen manufacturer. Two varieties of papers, viz., 90 gsm and 130 gsm, were made using the process. Chauhan et al., 2009, experimented to make handmade papers from the currency waste of the Reserve bank of India by bio-enzymatic pulping of currency. This currency handmade made paper gave excellent results in terms of strength and could be used for paper making. Recent research conducted by Kumar Appa National Institute of Handmade Paper, Jaipur, where the handmade paper was produced with the help of 50% single used plastic polythene. Bottle covers made from these papers were specially promoted by the government of India. (Teijgeler, 2001). Asare, et al. (2013) did a research to develop handmade papers with the use of garment cutting waste, old clothes of various fiber types (linen, cotton, wool, nylon, polyester and acetate) and paper mulberry with the ratio of 70% and 30% respectively. Produced handmade papers were also tested with various color mediums. Emmclan et al. (2018) used various aquatic weeds (*Cyperus digitatus*, *Cyperus iria* and *Scirpus grossus*) for the suitable production of handmade paper. Produced handmade papers can be used for production of paper plates, paper boards and decorative paper.

Production of handmade papers with animal dung has become a trendy guild craft. Sri-Lankan paper and paper-mache products made from elephant dung have tremendously flourished. In India handmade papers and some of its products are made by cow dung. Cow is a sacred being in India and respected as *mother*. *Gaukriti* is a brand in India which sells handmade paper products specially made from cow dung. Extensive research took place at Sri Aurobindo Ashram, India to produce handmade papers using algae. Villagers of Pudukkuppam, a village near Pondicherry, India were facing the problem of algae growth at saline water, and now these villagers are selling algae to the Ashram (Teijgeler, 2001). Many recent researches are also focused on developing various functional products like cardboard, paper plate, cups, spoons, straw etc. made from handmade paper. Research has been conducted by Indian Institute of Technology, Delhi, India where rice straw waste has been used to make handmade papers, cardboard and paper plates. Every year Approx. 20 million tons of rice straw (locally called *Parali*) is

burned leading to a severe problem of air pollution in some parts of north India which is very hazardous (A startup, 2018).

4. Techniques used for handmade paper production

Present handmade papermaking techniques still follow the traditional way of papermaking with little technical advancement by different countries. Descriptions of these developments are as follows.

4.1. Raw material selection

The first step to make handmade paper is the selection of appropriate raw material according to the availability and end product.

4.2. Sorting

It is one of the most tedious and time-consuming processes. Since ancient times, it was done manually. Sorting was done to separate foreign particles, for example, barks, leaves, stones, dust etc. It was also done to separate similar colour and fiber type of the materials. Recently most of the handmade paper industries use cotton hosiery waste as raw material which does not require an intensive sorting process. Their primary sorting is done on the basis of colours by the supplier of the raw materials. If required, bleaching is done. Earlier bleaching method was to expose the raw materials into the sunlight. Later chlorine and oxidising bleaches were also used to bleach the raw materials and to increase the brightness.

4.3. Pulping

Pulp is a wet or semi-liquid mixture of one or more materials which are made by chemical and mechanical mixing of any component with its solvent. Cellulosic materials of various origins (plants or rags) are mixed with water. Various mechanical and chemical treatments are given to the raw materials to make clear pulp suitable for paper making. Following procedures are used to make a clear paper pulp.

4.3.1 Mechanical treatment of the pulp (Beating and shearing)

Beating and shearing of cellulosic raw materials is done to make appropriate paper pulp. In the case of plant originated fibres, beating process is required to remove lignin and to separate fibres from each other. Various other sub-processes like steaming of stems, peeling the bark, stripping coloured layers away from the bark, chemical retting, fermentation, cooking of fibres in lye or lime, sun bleaching etc. are done to make paper pulp. In the case of cotton hosiery waste, shearing is the most essential and initial step. Some of the procedures (cooking, steaming, retting etc.) are by the past in case of cotton cutting waste. Shearing processes do the delamination within the fibre walls, which provides more fibril-

lated fibrous surface, which generates more surface area for bonding.

Use of human power for beating is the most ancient practice. It was done in various ways: one common way was by lifting and dropping a heavy rod. Fibres were mixed with water in a suitable amount to make a pulp. Hand Beating was a less forceful and tiring process. After that hampers with wooden trip hammers were used for beating purposes which were water-powered. In 1660-1667, Hollander beaters were invented which were wind-powered in which pulp is circulated repeatedly between rotating rolls with metal blades. After the use of Hollander beaters, fermentation procedure was not required to make refined pulp (Hunter, 1947; Cutbush, 1990; Hubbe, 2009).

The duration of the mechanical beating of the fibres again depends on the selection of raw materials and the end product. Finer paper products like tissue; bond paper requires more beating time to make fine pulp. In present time Electric powered Hollander beaters are used to make pulp and cotton cutting waste needs beating operation for approx. 3-4 hours.

4.3.2. Chemical treatment of the pulp (rotting and fermenting)

Chemical treatment is given along with mechanical beating and sharing because the use of chemicals makes the procedure easy and fast. Chemicals are the compound which has either natural or synthetic origin and helps to degrade the natural binding agents by breaking bonds. Chemical treatment shortens the beating time needed for inter-fibre bonding and makes the pulping procedure easy and less time-consuming. Again chemical treatment is essential in case of plant originated fibres.

Ashes (by burning straw, wood), lime powders were mainly used to remove lignin and to soften the fibres. Piles of rags were generally rotted by wetting them and leaving them for several months along with lime (Hunter, 1947; Toale, 1983; Hubbe, 2009).

4.3.3. Other additives in pulp

Certain properties of cellulosic fibres make it self-sufficient for paper making but to impart certain desirable properties and to ease the process of paper making certain additives are added. Experimentation with certain natural and synthetic materials to make paper production more powerful is ancient and interesting. Nagashi-Zuki method is one such method used by the Japanese to make Washi paper where the addition of mucilage was done in paper pulp (Bunsho, 1959; Barrett, 2005). In Japan, these mucilaginous agents are called *Neri*, which were obtained by soaking the roots of Tororo-Aoi plant. Addition of mucilage makes paper firmer, smoother and glossy (Barrett, 2005; Hubbe, 2009).

Before the Islamic world, one side of paper sheets was used. During the Islamic world, both sides of pa-

pers were used for writing with the help of mineral fillers (e.g. clay, ground limestone), which used to increase paper's opacity Clapperton (1934). According to McFarlane (1993) Islamic paper makers sometimes added cooked starch to the vat in order to strengthen the paper. To get colorful paper sheets, some of the natural dyes and mordants were added in paper pulps. Salt, vinegar, sodium carbonate, cream of tartar, brass, iron, tin, copper, alum, and tannic acid are some of the common mordants out of which alum (e.g. aluminium sulfate) was the most used and useful mordant. (Hubbe, 2009). In the beginning of the 18th century, a new practice of internal sizing of paper started to impart hydrophobic properties in paper sheets (Cutbush, 1990). Combination of rosin with aluminum sulfate was used for internal sizing, which had few negative impacts like rapid degradation, resistance to folding and weaker strength (Barrett, 1989; Hubbe, 2009). Use of water is one the essential requirement to make paper pulp, along with that particular natural property of water of specific regions gave extra advantages and properties to the paper of that particular region. Use of clean and clear water gives clean and bright papers sheets. Handmade paper from Nepal is slightly glittery because of mica containing water. In India, many handmade paper artisans use magnet slabs at the bottom of vats to collect iron rust so that brightness of paper can be improved (McFarlane, 1993; Hubbe, 2009).

Fibre Separation, beating, repeatedly soaking, retting, washing, boiling, bleaching, mixing of ingredients and again beating are some of the common steps for paper pulp making.

4.4. Sheet formation

Various time to time inventions also took place to make sheets. Early Chinese used a wove mould and pour method to make paper sheets. In Wove moulds a fabric was stretched on a bamboo frame to make a rectangular mould, and paper pulp was poured on the top of the mould and spread out by the papermaker which is called pour method. After that, sheets were sundried.

In Japan, a new type of mould was developed, which was called Sugeta. Sugeta screens were made from parallel bamboo strips and tiny reeds which were woven with silk thread and horsehair (Pietzcker, 2009). To form a sheet, a screen lifting method was used in which Sugeta is dipped into a vat of paper pulp and lifted. Excess of water is run between the bamboo strips. The paper sheet is immediately transferred on the flat surface because of rollable screens. This entire process is known as the Tame Zuki method of papermaking (Hubbe, 2009).

Papermaking art flourished in the Islamic region after the 12th century. Some of the new fibres and techniques were introduced to make Khurasani paper or Gaz.

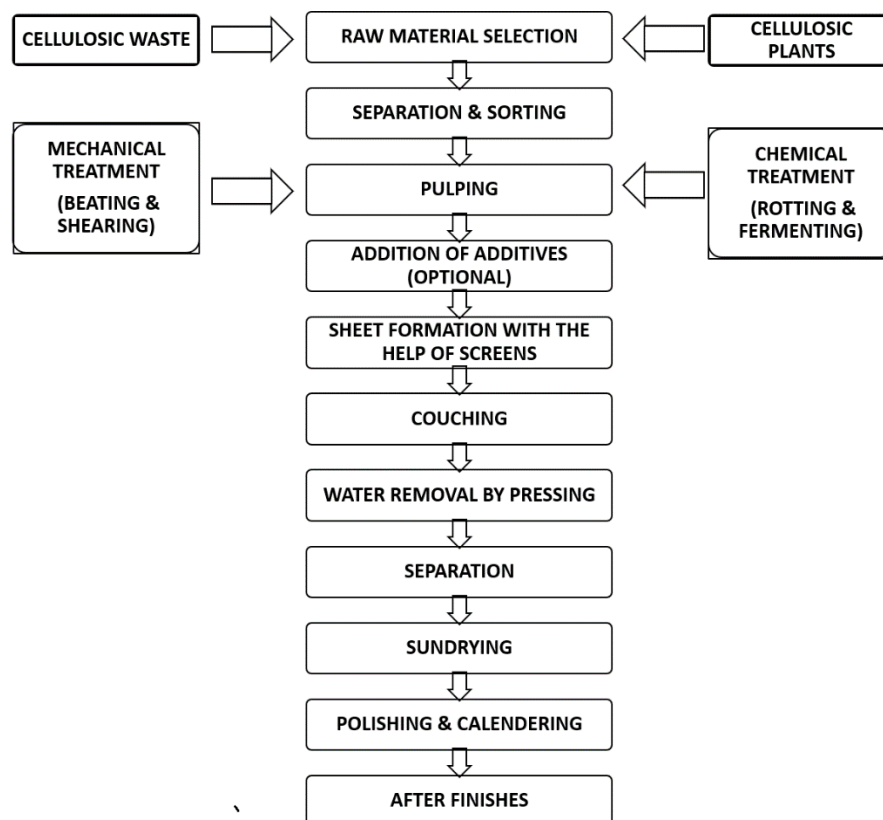


Figure 1.1 various steps of handmade paper production

Laid moulds are the moulds which were used most commonly throughout Asia, Islamic region and even in Europe. In Laid moulds, monofilaments were prominently aligned in one direction to give a specific impression on papers. These moulds were often made from bamboo and grass filaments woven with silk thread, animal hair and other types of thread to make a uniform mat with subtle patterns. In India, patterns made due to thread are called *Chapri lines* or *Chain lines*, often used to distinguish the papers of different sources (Clapperton, 1934; McFarlane, 1993; Hubbe, 2009).

In the 12th century the concept of watermarks started in Italy. Watermarks were the specialised designs or logo to distinguish the papers of different producers. They were made by bending a design in brass wire and attaching it to the mould so that it left an impression on finished sheets (Bloom, 2017). The first watermark was developed by the Fabriano paper mill in Fabriano, Italy and it was in the figure of 8. (Hubbe, 2009). With the availability of finer wires embossing of intricate watermarks were possible. In the present time, most of the handmade paper manufacturers use wooden frames screens made with fine stainless steel wire mesh for corrosion-free metal screens.

4.5. Water removal

Water removal is the tricky step in handmade paper production. To remove the water, first, a bundle of layers of wet handmade paper sheets are prepared.

Each sheet is separated to each other either with nylon or muslin mesh or felt. Once the screen is lifted from paper pulp vat, wet layer of the paper sheet is covered with the mesh/ felt. The screen or mould is then gently flipped to transfer the paper sheet on a flat surface. A thick bundle of sheets is prepared, and this process is called couching. An appropriate size of the bundle is pressed to remove the excess of water (Hubbe, 2009). Earlier pressing was done with the help of some weighty object, mainly stones. They were kept over the bundle of papers. Gradually stones were replaced by hydraulic press machines.

4.6. Drying

Approx. 80% of water is removed by pressing, but for complete drying of the sheets, open-air drying is done. For that purpose, one by one separation of wet sheets from the bundle is done very carefully. Each sheet is separated from each other and dried. The one common way of drying is the use of solar energy. The sheets are transferred on wooden boards and sun-facing walls. Once they are dried, it can easily be removed from the surface. Sometimes powder dusting is done at the surface for easy removal of the paper sheets. Another way of drying is the hanging of the paper in lofts. The most common approach is to hang the sheets over ropes. In case of bad weather conditions, especially in rainy seasons, steam-heated metal surfaces are sometimes used in Japan (Jugaku 1959; Longenecker 1985; Hubbe, 2009). A related

approach has been used by some modern papermakers as well.

4.7. After finishes

Sizing and polishing are the two most important after finishes given to the handmade sheets after drying. Sizing of paper sheets after drying is the common practice adopted by Islamic paper makers. Sizing process improves the strength of paper and makes the surface more suitable for writing. Starch made from rice and sorghum was majorly used. Wheat starch was not preferable due to extraction difficulty and disagreeable odour. In the presence of humidity, starch promotes the growth of microorganism, which is the problem for cold and humid climate areas like Europe. Italian papermakers used Gelatin to size the paper which was made from the hoofs, hides, and horns of the animals (Bloom, 2017). The size solution can be applied to the paper either by dipping the sheets into the solution or by brushing the solution on the surface. After sizing, polishing of the sheets is done to get a smooth and shiny surface. In ancient times stones and shells were rubbed against the paper sheets to get a smooth surface.

German papermakers used water-powered metal hammers for polishing the paper surface. Dutch invented a more advanced method of paper polishing by passing papers between metal rollers under pressure (Turner and Skiold, 1983). The process is called calendering. This process is continuing for polishing the paper surface. Apart from these two basic operations, embossing, printing, embroidery and other surface embellishments are also done to impart specific desirable properties.

5. Variations and Products of handmade paper

Paper is a fantastic material which has unique properties that makes it eligible for multipurpose uses. It can be impregnated, creped, layered, waterproofed, waxed, glazed, marbled, bent, folded, pasted, twisted, cut, torn, moulded, crumpled, embossed, enamelled for various purposes.

In present time approx. 95% handmade paper demand is for consumer-based, and 5% demand is for industrial products like filter paper, cardboard, blotting paper, and tissue paper etc. A lot of variations in quality, thickness, texture and surface embellishments can be seen now.

The history of handmade paper reveals that the spread of this precious technology was very slow and steady from country to country. Various functional and decorative products and the use of handmade paper emerged from time to time. Some of the very creative and innovative uses of handmade paper are as follows.

5.1. Functional handmade paper

Stationary, writing pads, conference folders, computer printouts, drawing, documentation sheets, certificate, wrapping papers, toilet papers, tissue papers

and degree awards etc. are some of the present time practical uses of handmade papers. In the Islamic world, the paper was used for writing, painting, wrapping, offering, and for making kites and playing cards (Bloom, 2001). One fascinating use of handmade paper was done by the Japanese in making balloons to cross the Pacific Ocean during the Second World War (Hunter, 1947; Barrett, 2005; Hubbe, 2009). Selective raw materials and specialised handmade paper artists were selected to make such balloons which were polished with oil to make airtight and water-resistant. Apart from that, Shifu and Paper mache are the art forms where exciting and innovative use of handmade paper has been done.

Shifu: Shifu is an art of making Shifu garment using very fine quality of washi paper in Japan. Very fine strips (not more than 2 mm) of handmade paper are cut which are used as warp and silk threads used in weft direction to weave Shifu. This Shifu fabric was used to make baskets, mats, bags, clothing and other art objects (Bunsho, 1959; Barrett 2005; Hubbe, 2009). Similar to Shifu technique, there are certain recent studies where used garments and cotton rags are used to make handmade paper, and very thin strips of paper are cut (1-2 mm). These strips are used as yarns and woven together with silk yarns to make fabrics and garments (Gambhir, 2011).

Paper Mache: Paper Mache is a 3D art originated from China, which is made with papers. Paper Mache was mainly used to make face masks and dolls in Europe. As its name suggests mashed paper or paper pulp is used to form 3 dimensional objects. Generally some forms of gum (gum Arabica), ceramic or sand are mixed with mashed paper to make a dough which can be used to make 3-dimensional objects. The objects get strength after drying.

5.2. Decorative handmade paper

Umbrellas, wallpapers, wrapping sheets, pen holders, diaries, carry bags, greeting cards, marriage cards and gift boxes etc. are some of the present time decorative uses of handmade paper. Use of handmade papers for invitation cards and gift boxes is one of the major domestic uses of handmade papers in India. Washi paper of Japan was used for various products like umbrellas, fans, screens for windows, fireworks, books, kites, calligraphy paper, letters, envelopes, bags, lanterns, and, of course, toilet paper (Longenecker, 1985; Barrett, 2005, Hubbe, 2009). Apart from various decorative products, handmade papers are also used for Origami, Chiyogami, Quilling, which are Japanese art forms to create beautiful handcrafted products using handmade papers.

6. Advantage of the handmade paper industry

6.1. Eco Friendly process

Handmade paper manufacturing is a 100% wood-free, eco-friendly process, which uses various used

(textile waste, ropes, gunny bags, etc.) and unused (plant fibres) cellulosic raw materials which are locally available. A survey shows that 11 lakh greeting cards made from handmade papers can save approx 500 trees. (A detailed, n.d.). Cellulosic fibres are self-sufficient to make paper but to impart specific desirable properties, mild chemicals (lime, soda as caustic soda, oxalates, oxygen, and peroxides) are used so that a simple effluent treatment plant can treat the effluent, and industry can get *Zero effluent Mill* status easily (Kumar et al., n.d.).

6.2. Waste recovery potential

Handmade paper can be up-cycled and recycled into variegated functional and decorative products. Up-cycling of paper into garments (Shifu), 3-d sculptures (paper mache), and other craft products through Chiogamy and Origami is possible. Recycling of various waste products like garment cutting waste (cotton, linen, jute, and hemp), agro residue waste, animal dung (cow, elephant), plastic, old currency etc. is possible into handmade paper. Recycling of old newspaper, tetra packs and the handmade paper itself into handmade paper or cardboard is also done. In the case of handmade paper, maximum recycling limit is approx eight times (Kumar et al., n.d.). In one of the recent research done by Kulshreshtha (et al., 2013), the sludge of handmade paper and cardboard along with wheat straw was found suitable for the cultivation of mushrooms (*Pleurotus citrinopileatus*).

6.3. The people-friendly industry

Handmade paper industry requires low investment and capital cost with limited machinery. Regular handmade paper industry needs approx. Rs 3 -3.5 lakh as the initial investment. The industry needs only semiskilled or skilled labour (Dwivedi et al., 2009).

6.4. More strength

As compared to machine-made paper, hand-made paper has more tensile strength, bursting as well as tearing strength. In addition, double-fold strength is also higher as fibres of handmade paper can be shaken in all the four direction whereas those of machine-made paper can be shaken side to side (Kumar et al, n.d.; Kulria, 2016).

6.5. Creativity Exploration

Technique of handmade paper manufacturing is an excellent medium of artistic expression where each piece of paper is unique and handcrafted. There are options to explore creativity by way of making infinite designs, textures and products. Currently, a wide variety of handmade papers on the basis of thicknesses and surface embellishments are available.

6.6. Available for various uses

There are unlimited options for paper manipulations like tearing, cutting, mutilating, burning, scorching, stamping, krumping, painting, drawing, packaging, writing, rolling, casting, recycling, upcycling and weaving are possible with the help of handmade paper.

7. Disadvantage of the handmade paper industry

7.1. Erratic Availability of raw material

Supply of raw material for handmade paper is not continuous and uniform, as raw materials for handmade paper are agro and textile waste and are dependent on the production of those industries.

7.2. Slow Production

Production of handmade paper is slow as compared to machine-made paper because of manual work, limited production units and raw materials. One sheet of handmade paper is formed at a time indicating a low productivity

7.3. Non Uniform production

Each sheet of handmade paper is handcrafted, so the bulk amount of uniform production is not possible in case of handmade papers. Due to the handcrafted process, the surfaces of handmade papers are rough and patchy as compared to machine-made paper and not suitable for some works.

7.4. Cost of handmade paper

Cost of handmade paper is high as compared to machine-made paper because of limited handcrafted production, specialised labour and raw materials.

7.5. Handling of handmade paper

Sometimes handling of handmade paper becomes difficult because of chemical-free production. There are huge chances of fungal growth and germination in a moist and humid environment.

7.6. Unstable market demand

Uniform surface, bulk production, maintenance, cost, and easy availability of machine-made paper give tough competition to handmade papers, and there is a problem of non -continuous market demand for handmade paper which creates a problem for the labour-intensive industry to sustain.

Conclusion

Since ancient times to present era, paper is considered as one of the valuable and serviceable commodity. After the industrialization, handmade papers were replaced by wood pulp based machine made papers which destroyed production of handmade pa-

pers. In the present era of sustainability, there is need to recognize and encourage traditional handmade paper production technology for its social, economic and environmental benefits. The current demands of sustainable design suggest value to be generated from waste to move in the cycle of attaining circular economy. This is a painstakingly slow process to implement and varies with scale of production even within the same industry. Handmade paper industry like any other handcrafted industry is socially significant as it employs a rural population with a basic index of skilling. The industry has a strong potential because of the variegated product range, acceptance in the domestic market as well as sustained exports. The production process is in genesis with the ecosystem and aligned to sustainable development goals. It embraces an industrial symbiosis where the waste of one industry becomes the raw material for another industry similar to the handmade industry where the waste of garment manufacturing industries are becoming raw material for the handmade paper industry.

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Socio-cultural Sustainability through Study Material: English Language Teaching in India

Problematyka zrównoważonego rozwoju społeczno-kulturowego w materiałach dydaktycznych: nauczanie języka angielskiego w Indiach

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Abstract

Teaching materials are the primary source of input in the language classroom. The potential of English language teaching (ELT) materials to preserve and transmit our culture, value, identity, and language make it significant for socio-cultural sustainability. The materials developed by the National Council of Education and Research Training (NCERT) are far and wide running study materials in primary and secondary schools in India. India exhibits a massive variety of cultures, customs, languages, and religious beliefs. The selection and development of apt materials is, therefore, a matter of serious deliberation. The centrally developed material, despite numerous benefits, often lacks in representing different groups of students, especially the backward and marginalized ones. The contents, in most cases, are representative of the mainstream. Therefore, the study suggests teachers developed supplementary materials to which learners from all the groups can relate. The researcher has taken the context of Jharkhand and illustrates self-developed supplementary materials prepared using contents from learners' social and cultural backgrounds. The article offers various suggestions on how to develop such materials that could bring socio-cultural equity in the classroom, making a significant contribution to social sustainability.

Key words: language teaching, material development, social sustainability, supplementary materials

Streszczenie

Materiały dydaktyczne są głównym źródłem informacji w klasie językowej. Potencjał materiałów do nauczania języka angielskiego (ELT) w ochronie i przekazywaniu naszej kultury, wartości, tożsamości i języka sprawia, że są one istotne z perspektywy zrównoważonego rozwoju społeczno-kulturowego. Materiały opracowane przez National Council of Education and Research Training (NCERT) są szeroko stosowanymi materiałami do nauki w szkołach podstawowych i średnich w Indiach. Indie wykazują ogromną różnorodność kultur, zwyczajów, języków i przekonań religijnych. Wybór i opracowanie odpowiednich materiałów jest zatem kwestią poważnej refleksji. W materiale opracowanym centralnie, mimo licznych korzyści, często brakuje reprezentacji różnych grup uczniów, zwłaszcza tych zacofanych i marginalizowanych. Treści w większości przypadków są reprezentatywne dla głównego nurtu. W związku warto zasugerować nauczycielom opracowanie materiałów uzupełniających, do których mogą odnieść się uczniowie ze wszystkich grup. W artykule przyjęto perspektywę Jharkhanda i przedstawiono własne materiały uzupełniające wykorzystujące treści pochodzące ze środowisk społecznych i kulturowych uczniów. Artykuł zawiera konkretne sugestie dotyczące opracowywania takich materiałów, które mogłyby zapewnić równość społeczno-kulturową w klasie, wnosząc znaczący wkład we wprowadzanie zrównoważonego rozwoju społecznego.

Słowa kluczowe: nauczanie języka, rozwój materiałów, zrównoważony rozwój społeczny, materiały uzupełniające

1. Introduction

The idea of development has to do with the growth and well-being of a larger population that ensures freedom, social acceptance, and economic security to all. Sustainable development can be referred to as the equitable and balanced exploitation of resources that considers intergenerational needs. For such extensive and interminable growth, the interest of different groups of people must be taken care of within and beyond the existing generation. The established connection between the economic, environmental, and social components work together to produce sustainable development (UN General Assembly, 2005). Nonetheless, the literature lacks theoretical and empirical studies on social and cultural sustainability. Previous studies, as mentioned by the National Research Council (1999) in its report, mostly focus on economic development like employment, wealth, and consumption. However, it says recent literature has emphasized more on human development like life expectancy, literacy, and equity, etc. The board has paid attention to the calls to development of the society, including factors such as security, social capital, and well-being of people from different groups. The UK Government Sustainable Development Strategy (2005) defines sustainable development as *places where people want to live and work, now and in the future. They meet the diverse needs of existing and future residents, are sensitive to their environment, and contribute to a high quality of life. They are safe and inclusive, well planned, built and run, and offer equality of opportunity and good services for all.* This definition makes room for social equity and development by emphasizing people's diversity, inclusive needs, equality, and opportunity.

The present study has a focus on equity, culture, society, identity, and language that make a great part of social sustainability. Education, especially language literacy, for social sustainability covers a wider sphere of interest. In this respect, the paper redirects the attention of teachers, administrators, and material writers to the issues of equality, acknowledgment, and relevance to every individual or group in the study material. It discusses the significance of English Language Teaching (ELT) materials in sustainable development. Further, it explores the role of teachers as material developers. Before illustrating the examples of extended materials, the context for which the materials prepared is discussed in brief.

2. ELT Material for Socio-cultural Sustainability

The ELT materials have the potential to pass knowledge and information to the next generations. The subject matter, as well as competencies incorporated in the material, reflects society's educational

canon. In India, the English language curricular package in schools mainly consists of textbooks and supplementary readers. The curriculum, through the appropriate content selection, can contribute significantly to the education for sustainable development by endowing learners with the ability of decision making. The guideline by UNESCO MGIEP (2017) mentions that; *EDS needs to be reflected in the content of what teachers must teach and the pedagogy they implement. Embedding ESD into core subjects is one of the most effective and efficient ways to achieve SDG Targets 4.7.*

The ELT materials could function as an efficient medium to bring balance in today's uncertain times of growing violence, social injustice, immigration, identity crisis, geographical destruction, global exchange, and communication. There is a need for education for sustainable development that *empowers learners to make informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations, while respecting cultural diversity* (UNESCO, 2014, p.12). The language teaching materials potentially shape one's thoughts, ideologies, and perspectives to see the world. These could promote equity, social justice, better communication, peace, and global harmony. However, it becomes a great challenge to select and develop materials that are relevant and justifiable to every group of learners. The textbook often has limited content coverage to serve the need of all the students. Therefore, there should be a definite and notable place of supplementary materials in the language curriculum to fill that gap. The supplementary materials can be a greater means to bring learners' culture and context into the classroom. The use of culturally motivated supplementary materials can be constructive in the language classroom to motivate learners' interest and active participation. Besides, teaching through such materials also helps in developing learners' awareness of self and surroundings.

3. Teachers as Materials Developers: Supplementary Material

The ELT classrooms in India are multilingual and multicultural with a diverse group of learners. As discussed earlier, the centrally prescribed study materials have limitations in servicing the needs and interests of different groups. The article doesn't disagree with having centrally prescribed textbooks but suggests to supplement that with the extended materials developed by teachers who are well acquainted with learners' context. Teachers could prepare contextual materials representative of the cultural identity of all the individuals in the class. It is, therefore, necessary to train teachers in material development. This article suggests teachers deploy their potential in material development to establishing social justice, equity, and relevance in the class.

For this, first of all, the teachers can identify the different ethnic groups of the learners in the classroom. Meetings and interaction with the parents can give much insight into the background of the learners. The teachers can sometimes visit the social places of target learners to understand their living and culture. The school should permit such activities and provide time and resources for that. While developing the extended material various resources like published material (story, song, poem, riddles, proverbs etc), internet (audio, video, YouTube clips, short films etc), and authentic materials (cartoon and caricatures, newspapers cuttings, games, original recordings, pictures etc) can be used.

4. The setting of the study

The researcher prepares supplementary materials targeting the students of state government secondary schools that reside within the Dumka district (Jharkhand). These schools have an affiliation to Jharkhand Academic Council (JAC) that follows the NCERT curriculum. The prepared materials could be utilized in the upper middle schools, possibly to the learners of standard VIII. Typical to Indian classrooms, the students in the particular context belong to diverse socio-cultural backgrounds. Despite that, their cultures are often mixed and influenced by each-others. The concerned area has learners with different ethnic groups with tribal prevalence. Based on their socio-cultural background, a set of supplementary materials and relevant activities are prepared, which could be a guide to teachers or material designers to adapt in their context.

5. Strategies to develop supplementary materials: Tasks and activities

The study suggests teachers on how to select and develop culturally influenced extended material to which all the students in the classroom can relate. Here are a few examples of such materials that researchers have prepared for the target learners. Several tasks and activities have been prepared through the contents of learners' immediate contexts. The teachers can follow the given strategies in developing extended materials to their context.

5.1. Using the materials that have a reflection of target learners' social sphere

As stated by Asgari (2011), societal factors are important while selecting contents and teaching goals. The socio-cultural contents are directly related to the learners' interests and cognitive abilities (Harrer, Kachalove Borodin & Katchalov, 2014). The reflection of the familiar surroundings makes them feel acknowledged. These factors help to shape learners as a responsible citizen. Inculcating cultural and social traits make them sensitive towards people and

society. In this section, one short story, *The poor widow*, by Bompas (2010), has been taken to prepare a task for the target learners. Through the story, the learners can relate to the class of labourers who depend on an everyday income. Many of the parents of the target learners work on daily wages. Some supernatural elements in the story make it more interesting. Besides, students can very well relate to the terms and concepts used in it. Here is the story:

The poor widow

Once there was a poor widow who has two children; she lived by daily labour and if she got no work any day, then that day they had to go without food. One morning she went out to look for work and a rich woman called her and asked if she wanted a job; she said *yes, that is what I am looking for*, then the rich woman said *stay here and pick the lice out of my hair, and I will pay you your usual wages and give you your dinner as well*. So the poor widow agreed and spent the day picking out the lice and at the evening the rich woman brought out a measure of rice to give her as her wages and, as she was measuring it, she felt her head itch and she put up her hand and scratched and pulled out a large louse.

Then she got very angry and scolded the widow and said that she would pay her nothing as she has not done her work properly and she turned her out. Then the widow was very unhappy as she had nothing to give her starving children and she wished that she has stuck to her usual work. When she got home and her children began to cry for food, she remembered that she had seen some wild *saru* (vegetable) growing in a certain place; so she took a basket and a sickle and telling her children not to cry and went out to gather it. It was dark and lonely and she felt frightened but then she thought of her children and went on and gathered the *saru*, and returned home crying because she has nothing better to give her offspring. On the way she met an old man who asked her why she was crying and she told him all her story. Then he told her to take the herbs home and chop them all up and to put some in every basket and pot she had and to cook the rest for supper. So when she got home she did as she had been directed and when she came to take the herbs which she had cooked out of the pot, she found that they had turned into rice, and she and her children ate it with joy. The next morning, she found that every pot and basket into which she had put the herbs was full of rice; and from that time she prospered and brought goats and pigs and cattle and lived happily ever after.

But no one knew where the old man came from, as she had forgotten to ask him (Bompas, 2010).

Based on the story, the following types of activities can be derived:

1. Divide the class in the group of two, based on their opinion (against and for) about the following question. Then, commence a discussion/debate on it by asking for the reasons for their justification.

- Was that rich woman right as she didn't pay the wages to the widow?
 - Do you think such a miracle happens?
2. Regarding the following question, students can be involved in a debate where one can give reasons for her/his selection, and the other can make counter-arguments with her/his different selections.
- What do you think who was that older man whom the widow encountered at night was? Select any one of the given options and justify the reason, why do you think so?
 - a. Ojha b. God c. Magician d. Kind man

5.2. *Using materials that might belong to only one or a few groups in the classroom but with which all students are familiar*

India has cosmopolitan societies, where people are more or less familiar with the culture of each other. The target students are somewhat acquainted with the living styles and cultural values of their fellow mates. According to Hofstede, Hofstede, and Minkov (2010), the students are more ready to learn from cultural contents if they belong to the cosmopolitan society and where they are familiar with cultural diversity as compared to the students who are part of a closed society. In that case, the teacher can alternatively select the materials from different ethnic groups and prepare the activities on that. It would lead students to understand and respect each other's cultures and customs. As an example, the study, the researchers prepare a task using the cultural song of santals. Songs are the inextricable part of their culture. A good number of songs for almost every occasion like a birth, marriage, festival, death is at their disposal. The romantic love songs to mournful songs have identified to be available among them; in fact, large numbers of songs are already present in published form. Here, one beautiful song of twelve lines is used to prepare the activity. The song is about *Sohrai* which is one of the major festivals of Santals celebrated in Dumka. All learners can surely relate themselves to the poem. The song is like this:

*Elder sister, elder sister
Go out, O elder sister
The festival like an elephant
Is coming near
You with a lota of water
I with a cup of water
Let us go and bring it in
The festival like an elephant
You with a plate and water
I with a long-tailed cow
With the tail of that cow
We will fan and bring it in* (Archer, 2016).

The teacher can divide the students into groups in which culturally mixed students are there, and in each group, there needs to be at least one or two San-

tal students. The teacher can ask if any student knows how to sing the song and motivate them to sing it. This song can be given to the students to read and then to have a discussion in groups. Various interpretative questions as the following can be asked to the learners:

- a. Which festival is being referred to in the song?
- b. Who do you think addressing the *elder sister*?
- c. What is the significance of *water, plate, cow* and *fan*?
- d. How are the two persons mentioned in the song welcoming the festival? How do you welcome a guest in your house?
- e. Why is the festival being compared with an elephant?
- f. With which different images the festival is being compared?
- g. What is the closest counterpart of the word *lota* in English?

5.3. *Using common heritages/objects of socio-cultural significance*

As the majority of students in a classroom generally belong to the same place or region, objects of cultural values of the place that is familiar to everyone can be used to prepare supplementary materials – for example; river, jungle, monuments, public places, etc. The teacher can variedly make use of common objects in creating different tasks. Such type of content could help them connect more for collaborative works. For the target learners of the study, a task is prepared using the two public heritages of the Dumka District that are Mayurakchhi River and Hijla Mela (Fair) Dwar (Door). The Mayurakchhi River is a lifeline for farming in the region, which provides greater insight into the socio-cultural richness of the particular place. Hijla Mela Dwar is the massive structure behind which the Hijla fair is held every year in the Dumka Community development block.

For developing tasks, the teacher could ask students to narrate two different stories (one by one) related to the two given heritages. The teacher, during the story writing, would give a point/idea every two minutes to assist in creating a plot. The teacher could give five points for each story. The student has to relate those given points with the Hijla Mela Dwar (or Mayuracchi river in the next story) and write about it within the given time slot. The five points that the teacher could provide students while writing a story regarding Hijla Mela Dwar can be; a seven-year-old child with parents, balloons, sweets, lost and found. The five points for another heritage, i.e., Mayurakchhi river, could be; a farmer, his field, rain, crops, and his children. Each student would come up with different interesting stories, probably with the same storylines. At least any five students could be asked to share their stories in the classroom, and rest can

be asked to submit. Similarly, the teacher can develop various other tasks.

5.4. Deploying multiple cultures in a single task

Teachers can bring different cultures together in a single task by using materials like pictures, audio-video clips, or text. They can try to search for the materials of different cultures and then prepare the tasks where cultural extracts of all the groups can be incorporated. Suppose a teacher chooses a topic, i.e., dressing style. S/he could collect images of dressing habits of all the cultural groups present in the classroom. S/he could develop a task where s/he can include these images.

Similarly, food culture, folk narrative, means of entertainment, arts, and artifacts, and so on can be selected to develop tasks. For the target classroom, for example, a task can be developed that consists of divergent cultures of the learners. The students belong to different classes, including Farmer, Lohar (who make iron stuff), Potter, etc. The teacher can ask students to perform role-play by taking different roles such as *Farmer and seed seller*, *Potter and buyer*, *Lohar and his son* and many more. Various kinds of tasks or activities could be prepared to owe to varied contexts and resources.

5.5. Students can bring their materials into the classroom

Engaging students in the material collection task can be very exciting. It could encourage their participation and ownership in language learning. The teacher can give them different projects to look for some materials of their choice. For example, the teacher can ask students to bring some newspaper articles, images, recordings of tales and cultural songs, etc. The students can also be asked to bring their collection of pictures from social gatherings and cultural events they have attended. By using such materials, several interesting tasks can be tailored.

5.6. Use of common beliefs and practices

In India, people follow several religions and castes. Despite that, their culture is influenced by each other. According to Buttaro and King (2001), the most favourable second language learning is when students share the same cultural background and can freely take part in the discussion of English content. Therefore, the common festivals, beliefs, or practices can be targeted to formulate classroom contents. In the target classroom, there are heterogeneous tribes, but they have some common festivals. For example, they all celebrate *Sarhul* (festival of tribes), but they celebrate it in different ways.

6. Conclusion

The study advocates the significance of a socially and culturally responsive curriculum for sustainable

development. Such materials help learners to endure their own as well as others' cultures. It exposes learners to social equity, cultural values, acceptance for difference, tolerance, respect, and peace. It could help in shaping strong cognitive minds that can make decisions free of prejudices. The paper discusses the various types of materials and strategies for developing materials for social sustenance. In different places or contexts, there should be the availability of different kinds of resources. Every classroom is distinct, and therefore, types and levels of the material may vary from place to place. The teacher needs to understand the context of their learners, their intake level, their ethnic diversity, and the available resources to collect materials for a different set of learners. Using suggested ways and methods, the teacher can collect socio-culturally relevant materials and utilize the given strategies to develop tasks and activities that can appeal to all the learners in their classroom. The suggestions build on Agenda 2030, redirecting teachers to place education for sustainable development (ESD) at the core of ELT materials in a way that is culturally relevant to the students.

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