

# PROBLEMY EKOROZWOJU

Problems  
of Sustainable Development



ISSN 1895-6912  
e-ISSN 2080-1971  
European Academy  
of Science and Arts,  
Salzburg

Vol. 12, No 2, 2017



# PROBLEMY EKOROZWOJU

# PROBLEMS OF

# SUSTAINABLE DEVELOPMENT

Journal of the European Academy of Science and Arts, Salzburg  
Czasopismo Europejskiej Akademii Nauki i Sztuki z siedzibą w Salzburgu

Impact Factor: 0,804, 5-Year Impact Factor: 0,480 (2014)

ISSN 1895-6912, e-ISSN 2080-1971, Internet: <http://ekorozwoj.pollub.pl>

---

## Editor-In-Chief Redaktor Naczelny

Artur Pawłowski  
[ekorozwoj@wis.pol.lublin.pl](mailto:ekorozwoj@wis.pol.lublin.pl)  
Politechnika Lubelska, Poland

---

## Co-editor Zastępca Redaktora Naczelnego

Leszek Gawor  
[leszek.gawor@gmail.com](mailto:leszek.gawor@gmail.com)  
Uniwersytet Rzeszowski, Poland

---

## Assistant Editor Sekretarz Redakcji

Agnieszka Żelazna  
[a.zelazna@wis.pol.lublin.pl](mailto:a.zelazna@wis.pol.lublin.pl)  
Politechnika Lubelska, Poland

---

## Journal Secretariat Sekretariat Redakcji

Katarzyna Wójcik-Oliveira  
[ekorozwoj@wis.pol.lublin.pl](mailto:ekorozwoj@wis.pol.lublin.pl)  
Politechnika Lubelska, Poland

---

## Editorial Office Adres redakcji

Problems of Sustainable  
Development  
Politechnika Lubelska  
Wydział Inżynierii Środowiska  
Ul. Nadbystrzycka 40B  
20-618 Lublin, Poland

---

## Editorial Board Komitet Redakcyjny

Johann Baumgaertner  
[johann.baumgartner@unimi.it](mailto:johann.baumgartner@unimi.it)  
University of Milan, Italy

Jerzy Błażejowski  
[Jerzy.blazejowski@ug.edu.pl](mailto:Jerzy.blazejowski@ug.edu.pl)  
Uniwersytet Gdański, Poland

Wojciech Błoz  
[w.bloz@uksw.edu.pl](mailto:w.bloz@uksw.edu.pl)  
Uniwersytet Kardynała Stefana  
Wyszyńskiego, Warszawa, Poland

Tadeusz Borys  
[Tadeusz.Borys@ue.wroc.pl](mailto:Tadeusz.Borys@ue.wroc.pl)  
Uniwersytet Ekonomiczny we  
Wrocławiu, Poland

Yucheng Cao  
[caoyucheng@zafu.edu.cn](mailto:caoyucheng@zafu.edu.cn)  
Zhejiang Agricultural and  
Forestry University, China

Ladislau Dowbor  
[ladislau@dowbor.org](mailto:ladislau@dowbor.org)  
Pontificia Universidade Católica,  
São Paulo, Brasil

Paul T. Durbin  
[pdurbin@udel.edu](mailto:pdurbin@udel.edu)  
University of Delaware, USA

Ignacy S. Fiut  
[isfiut@agh.edu.pl](mailto:isfiut@agh.edu.pl)  
Akademia Górniczo-Hutnicza,  
Kraków, Poland

Wojciech Franus  
[w.franus@pollub.pl](mailto:w.franus@pollub.pl)  
Politechnika Lubelska, Poland

Włodzimierz Galewicz  
[galewicz@if.uj.edu.pl](mailto:galewicz@if.uj.edu.pl)  
Uniwersytet Jagielloński,  
Kraków, Poland

Józef Hoffmann  
[jozef.hoffmann@pwr.wroc.pl](mailto:jozef.hoffmann@pwr.wroc.pl)  
Politechnika Wrocławska,  
Poland

Gjalt Huppkes  
[huppkes.cml@gmail.com](mailto:huppkes.cml@gmail.com)  
Institute of Environmental  
Studies, Netherlands

Zbigniew Hull  
[zhull@wp.pl](mailto:zhull@wp.pl)  
Uniwersytet Warmińsko-  
Mazurski w Olsztynie, Poland

John Ikerd  
[jeikerd@gmail.com](mailto:jeikerd@gmail.com)  
Professor Emeritus of  
University of Missouri,  
USA

Ryszard Janikowski  
[ryszard.janikowski@gwsh.edu.pl](mailto:ryszard.janikowski@gwsh.edu.pl)  
Górnośląska Wyższa Szkoła  
Handlowa, Katowice, Poland

Jan Krokos  
[jkrokos@uksw.edu.pl](mailto:jkrokos@uksw.edu.pl)  
Uniwersytet Kardynała Stefana  
Wyszyńskiego, Warszawa,  
Poland

**Chris Laszlo**  
*Chris@SustainableValuePartners.com*  
Sustainable Value Partners Inc.,  
USA

**Ishikawa Masanobu**  
*masanobu@yhq.att.ne.jp*  
Kobe University,  
Japan

**Lesław Michnowski**  
*leslaw.michnowski@gmail.com*  
Former Member of Komitet  
Prognoz Polska 2000 Plus

**Michael S. Pak**  
*mpak@laist.ac.kr*  
Korean Advanced Institute of  
Science and Technology,  
Daejeon,  
Republic of Korea

**Andrzej Papużiński**  
*papuzin@ukw.edu.pl*  
Uniwersytet Kazimierza  
Wielkiego w Bydgoszczy,  
Poland

**Lucjan Pawłowski**  
*l.pawlowski@pollub.pl*  
Politechnika Lubelska,  
Poland

**Zdzisława Piątek**  
*z.piatek@iphils.uj.edu.pl*  
Uniwersytet Jagielloński,  
Kraków,  
Poland

**Barbara Piontek**  
*bempiontek@gmail.com*  
Wyższa Szkoła Biznesu  
w Dąbrowie Górniczej,  
Poland

**Franciszek Piontek**  
*f\_piontek@wp.pl*  
Wyższa Szkoła Biznesu  
w Dąbrowie Górniczej,  
Poland

**Michael Redclift**  
*michael.r.redclift@kcl.ac.uk*  
King's College London,  
United Kingdom

**Antoni Sanchez**  
*antoni.sanchez@uab.cat*  
Universitat Autònoma de  
Barcelona, Spain

**Delyse Springett**  
*dvspringett@gmail.com*  
Retired Director, Centre for  
Business and Sustainable  
Development, Massey  
University, New Zealand

**Stanisław Skowron**  
*s.skowron@pollub.pl*  
Politechnika Lubelska,  
Lublin, Poland

**Peter A. Strachan**  
*p.a.strachan@rgu.ac.uk*  
Aberdeen Business School  
The Robert Gordon University,  
Scotland

**Wiesław Sztumski**  
*ws34@op.pl*  
Uniwersytet Śląski  
w Katowicach,  
Poland

**Włodzimierz Tyburski**  
*Wlodzimierz.Tyburski@umk.pl*  
Uniwersytet Mikołaja Kopernika  
w Toruniu,  
Poland

**Peter A. Wilderer**  
*peter@wilderer.de*  
Institute Of Advanced  
Studies On Sustainability  
Muenchen,  
Germany

**Tomasz Winnicki**  
*Tomasz.Winnicki@kpswjg.pl*  
Professor Emeritus of  
Wrocław University of  
Technology,  
Poland

**Felix Unger**  
*presidential.office@european-academy.at*  
The President of European  
Academy of Science and Arts,  
Salzburg,  
Austria

**Lech W. Zacher**  
*lzacher@wspiz.edu.pl*  
Akademia Leona Koźmińskiego,  
Warszawa,  
Poland

# PROBLEMY EKOROZWOJU

## PROBLEMS OF SUSTAINABLE DEVELOPMENT

Vol. 12

No 2

2017

### Table of Contents – Spis treści

|   |       |
|---|-------|
| <b>Troublesome Evaluation of Technological Innovations. Balancing Between a Blessing and a Bane of Technical Progress</b><br>Kłopotliwa ewaluacja innowacji technicznych. Balansowanie między dobrodziejstwem a przekleństwem postępu technicznego<br><i>Wiesław Sztumski</i> .....   | 7-13  |
| <b>Multi-criteria Evaluation of the Eco-innovation Level in the European Union Countries</b><br>Wielokryterialna ocena poziomu ekoinnowacji w krajach Unii Europejskiej<br><i>Andrzej Kobryń, Joanna Prystrom</i> .....   | 15-26 |
| <b>Decomposition Analysis of the Greenhouse Gas Emissions in the European Union</b><br>Analiza rozkładu emisji gazów cieplarnianych w krajach Unii Europejskiej<br><i>Magdaléna Drastichová</i> .....   | 27-35 |
| <b>Call for Integral Protection of Biocultural Diversity</b><br>Postulat integralnej ochrony różnorodności biokulturowej<br><i>Ryszard F. Sadowski</i> .....  | 37-45 |
| <b>Modern Issues of Development of the System of Specially Protected Natural Areas in the Context of the Concept of Sustainable Development</b><br>Współczesna problematyka rozwoju systemu obszarów specjalnej ochrony w kontekście koncepcji rozwoju zrównoważonego<br><i>Aleksey Anisimov, Kermen Lidzheeva, Anatoliy Ryzhenkov</i> .....      | 47-57 |
| <b>Sustainability, Corporate Community Engagement and Enterprise Development – Lessons from a Case Study in Emu-Ebendo Niger-Delta, Nigeria</b><br>Zrównoważenie, korporacyjne zaangażowanie społeczne i rozwój przedsiębiorstw – lekcja z Emu-Ebendo w delcie Nigru, Nigeria<br><i>O.E Ajide, P.A. Strachan, A. Russell and D.R. Jones</i> ..... | 59-68 |



|   |         |
|---|---------|
| <b>Corporate Environmental Responsibility for a Sustainable Future</b><br>Odpowiedzialność środowiskowa biznesu dla zrównoważonej przyszłości<br><i>Pankojini Mulia, Ajit Kumar Behura, Sarita Kar</i> .....  | 69-77   |
| <b>Environmental Impact of Application on the Concept of Corporate Social Responsibility in Selected EU Countries</b><br>Środowiskowe konsekwencje wprowadzania koncepcji Odpowiedzialności Społecznej Biznesu w wybranych krajach UE<br><i>Jana Hroncová Vicianová, Štefan Hronec</i> .....                | 79-88   |
| <b>Wellbeing versus Sustainable Development – Conceptual Framework and Application Challenges</b><br>Dobrostan a zrównoważony rozwój – struktura koncepcyjna oraz wyzwania wdrożeniowe<br><i>Anna Dłużewska</i> .....   | 89-97   |
| <b>Understanding Farmers’ Adoption Decisions for New Cash Crops: Evidence from Xishuangbanna in Tropical China</b><br>Uwarunkowania zainteresowania rolników nowymi uprawami komercyjnymi: przykład rejonu Xishuangbanna w Chinach<br><i>Le Zhang, Yasuyuki Kono, Xiaobo Hua, Lin Zheng, Rui Zhou</i> ..... | 99-108  |
| <b>Development Aid as a Gift of Love: Re-inventing Aid on a Spiritual Foundation</b><br>Pomoc rozwojowa jako dar miłości: oparcie pomocy na duchowości<br><i>Rohana Ulluwishewa</i> .....   | 109-118 |
| <b>Where Science Fails, Outdated Religion Provides Clues</b><br>Gdzie nauka zawodzi, niemodna religia daje szansę<br><i>G Venkatesh</i> .....   | 119-122 |
| <b>Encyclical of Pope Francis Laudato Si’ as Inspiration for Shaping Sustainable Landscape</b><br>Encyklika Laudato Si’ papieża Franciszka, jako inspiracja dla kształtowania zrównoważonego krajobrazu<br><i>Sebastian Bernat, Małgorzata Flaga, Wioletta Kalamucka</i> .....                              | 123-131 |
| <b>Sustainable Development in the Russian Federation – Indicator-based Approach</b><br>Zrównoważony rozwój w Federacji Rosyjskiej – podejście wskaźnikowe<br><i>Bartosz Bartniczak, Andrzej Raszkowski</i> .....  | 133-142 |
| <b>Twenty-five Years of Independent Ukraine: Is there a Way to Sustainable Healthy Development?</b><br>Dwadzieścia pięć lat niepodległej Ukrainy: czy jest na drodze zrównoważonego rozwoju?<br><i>Viktoriya Pantyley, Roman Lozynskyy, Roman Slyvka</i> .....  | 143-160 |

|  |         |
|--|---------|
| <b>Youth Attitudes Towards Goals of a New Sustainable Development Agenda</b><br>Postawy młodzieży wobec celów Nowej Agendy na rzecz zrównoważonego rozwoju<br><i>Tatjana Borojević, Matjaž Maletič, Nataša Petrović, Jelena Andreja Radaković, Marjan Senegačnik, Damjan Maletič</i> .....                     | 161-172 |
| <b>Utilitarian Technological Solutions to Reduce CO<sub>2</sub> Emission in the Aspect of Sustainable Development</b><br>Utylitarne rozwiązania technologiczne ograniczające emisję CO <sub>2</sub> w aspekcie zrównoważonego rozwoju<br><i>Tomasz P. Olejnik, Elżbieta Sobiecka</i> .....                     | 173-179 |
| <b>Environmental Risks Related to the Recovery and Recycling Processes of Waste Electrical and Electronic Equipment (WEEE)</b><br>Ryzyka ekologiczne związane z procesami odzysku i recyklingu zużytego sprzętu elektrycznego i elektronicznego (ZSEE)<br><i>Agnieszka Generowicz, Ryszarda Iwanejko</i> ..... | 181-192 |
| <b>INSTRUCTIONS FOR AUTHORS/ NOTA DO AUTORÓW</b> .....   | 193-194 |





## Troublesome Evaluation of Technological Innovations. Balancing Between a Blessing and a Bane of the Technological Progress

### Kłopotliwa ewaluacja innowacji technicznych. Balansowanie między dobrodziejstwem a przekleństwem postępu technicznego

**Wiesław Sztumski**

*Silesian University, Katowice, Poland  
E-mail: ws34@op.pl*

---

#### Abstract

Technological innovations are the driving force of the technological progress. They must be multiplied and accelerated so that people could live, the humanity be preserved, to survive in a world full of threats, to develop people, to improve the standards of living and to satisfy ever growing needs. For this reason, we assess them favorably. On the other hand, however, there are certain disadvantages because they generate different and serious threats to people and the natural and social environments. This includes nuclear, chemical, biological, psychological and information weapons, as well as robotics, use of pesticides, genetic engineering, and interference of techniques in the consciousness and the sub-consciousness of men. Certain threats manifest immediately and others – after a long time, like ticking time bombs. Therefore, the evaluation of innovation is very troublesome. It is also problematic and ambivalent because of the huge diversity of people who make the assessment.

**Key words:** technology, civilization, progress, evaluation, mankind

#### Streszczenie

Innowacje technologiczne są siłą napędową postępu techniki. Koniecznie trzeba je mnożyć i przyspieszać, żeby żyć w ogóle, zachować ludzkość, przeżyć w świecie pełnym zagrożeń, rozwijać się, mieć się coraz lepiej i zaspokajać wciąż rosnące potrzeby. Z tego względu oceniamy je dobrze. Ale z drugiej strony, oceniamy je źle, ponieważ stwarzają różne poważne zagrożenia dla ludzi i środowiska naturalnego oraz społecznego. Chodzi tu o broń jądrową, chemiczną, biologiczną, informatyczną i psychologiczną, jak i o robotyzację, chemizację, inżynierię genetyczną oraz ingerencję techniki w świadomość i podświadomość. Jedne zagrożenia dają znać o sobie natychmiast, a inne po dłuższym czasie, jak tykające bomby zegarowe. Dlatego ocena innowacji jest wielce kłopotliwa. Jest też problematyczna i ambiwalentna ze względu na różnicowanie ludzi, którzy jej dokonują.

**Słowa kluczowe:** technika, cywilizacja, postęp, ewaluacja, ludzkość

---

*The technology will reach such perfection  
that man will be able to do without himself  
(Stanisław Jerzy Lec)*

The technology ensures that people live, and the human species survives in the struggle with nature. It also helps people win in the competitive struggle in various aspects of social life, especially in the military, economic and political spheres. Thus, from the

beginning, keeping this in mind, the man constantly develops technology – improves technical devices and modernizes technologies. Thanks to this, the progress accelerates proportionally to each new innovation. The principle of acceleration, like in the development of civilization (the progress of civilization depends, after all on the technical progress) applies here. It is necessary to accelerate technological innovations so that people could live, the humanity



be preserved, to survive in a world full of threats, to develop, to improve the standards of living and to satisfy ever growing needs. This shows the recent history of technology (from the beginning of the 20<sup>th</sup> century), when the number of innovations began to grow rapidly, including a lot of well-known revolutionary and epochal inventions. Technological progress cannot be stopped. Moreover, it would not do any good by returning us to the state of savagery. Then, as if on our own volition, we are doomed to the technological progress that occurs at a galloping pace.

\*       \*       \*

Some people, named *statists*, are passive observers of technical progress, fond of the past and want to preserve the world as it is out of the fear of an uncertain future, are afraid of the technological progress, while the others, named *dynamists*, are keen on all the news and fondly discover themselves and the world (Postrel, 1998). The former and the latter are guided by some subjective or objective rations in order to justify their attitudes. Technological progress results in an improvement of the quality of our life, intellectual development, greater physical and mental efficiency, growth of consumption, better, greater and more extensive satisfying of various needs, constantly changing and growing, more comfortable and faster communication (transport and connection), the ability to collect huge amounts of information and easy access to them, which reduces the bodily and intellectual effort, alimentation of growing population, improvement of health, and many other benefits. Certainly, one could have doubts about this, because there are both advantages and disadvantages, one thing is gain and another is lost. Thus, for example, *research in the field of medicine have made such enormous progress that today – practically speaking – no-one is healthy* (Russels). Benefits of the technological progress are well known to everyone, as experienced in their daily life. At present, people are increasingly willing to take advantages of the latest technologies, more and more intricate technical devices and gadgets, to a greater extent than ever before in everyday life, work, learning and entertainment. However, in spite of the undeniable benefits of the technological progress, many people experience a growing fear of these innovations from various reasons. People do not trust the technology and are afraid of it, because it creates a lot of real and potential threats and big risks related to the nuclear, chemical, biological, psychological, and information weapons, with robotics, chemization, genetic engineering as well as the interference of technology in the consciousness and the subconsciousness. In addition, the negative historical experience from the period of industrialization, when the technology was associated mainly with machines, which were perceived as enemies and as relevant causes of exploit-

tation, unemployment and other misfortunes, lingers on. The fear of technological progress is fuelled by the mass media, which present shocking information about the risks for human health and life. Some of them are founded, others – irrational. It is hard to say why the consciousness of the masses perpetuates more what harms than what helps. Perhaps, this is the result of upbringing in the culture of prohibitions (Sztumski, 2011), where the fear prevails over the boldness and the risk of loss seems to be greater than the chance to achieve the benefits. One should think that people aware of the dangers posed by the technological progress should oppose it – they should slow its pace, reduce it to the necessary dimension and control it. However, the truth is different – the majority of people, both in the developed and underdeveloped countries, is fascinated by the achievements of the modern technology and by benefits resulting from these. Even if these people are aware of threats, they are too engaged in their paid work and affairs so they do not pay attention to any dangers. either because they do not have time or they do not want to worry too much. Therefore, these people behave like careless moths rushing to the flame which burns them. Why should they be afraid of technology, when it does so well. Why should they limit the technical progress and suffer discomfort? Is this because one day, perhaps, according to forecasts conducted by corrupt experts and pessimists, it comes to the destruction of mankind? Even if so, then it is not worth worrying about such a distant future. Indeed, it is important to focus on here and now. What if the forecasters are mistaken and this nightmare scenario will never come true, and the development of technology will, as before, help the human species in the struggle for existence and survival as well as in the pursuit of maximum comfort and well-being?

The causes of such relation to the threats of further unlimited technological development are following:

- Intentional stupefying by consumerism lobbyists undermining justifiable fears of environmentalists.
- The disappearance of future oriented thinking.
- The excessive optimism resulting from the well-known adage: *what technology spoils, it is able to repair*.
- Dissemination of exaggerated courage by proclaiming an otherwise known appeal: *Do not be afraid!* – in this context of monster technology. It grows in the power, develops and winds up the endless spiral of production and consumption to the delight of the masses and multiplies the wealth of world financiers.

Presentist thinking becomes more and more widespread. It results from the fact that people do not worry too much about their future and about the fate of coming generations, except perhaps of their own children. The most important thing is what is hap-

pening now. The technology itself does not repair anything. It only constitutes a potential, which can be used by people to repair the harms caused by it. Unfortunately, not all damages can be repaired because some are irreversible. It is well known that only a stupid person is not afraid of anything, because they are not aware of the threat and ignore it, in spite of the common sense (that is why soldiers are administered before the attack, thus boosting their courage). A man of sound mind and having the appropriate knowledge, always has fear and is not ashamed of it. And the more knowledge he has, the more he is afraid: fear is growing proportionally to life experience, education and awareness of the risk or danger. Stupidity and lack of knowledge are not only causes of disregarding threats, but also of exaggerated fear related to the use of new technologies in everyday life. It turns out that together with the formation of a knowledge society, despite the steadily increasing number of students at different educational levels (resulting in a growing number of people with diplomas, but unfortunately, less and less educated) people seldom use their reason and have growing gaps in general knowledge, especially in the field of logic, science, technology and nature (Nowacki, 1983). Computerization or the use of artificial intelligence does not help, because as stated by the American writer, artist and philosopher Elbert Green Hubbard (1856-1915): *artificial intelligence does not stand a chance against the real stupidity* (Hubbard E. & B., 1946). In addition, the current population of fools is about 80%, but will increase at an accelerated pace with the progress of civilization because stupid reproduce more and generate even more stupid people than themselves.

\* \* \*

Many things indicate that recently (about half a century ago), the technology began failing in fulfilling its basic function, i.e. giving people a greater chance of survival. In this respect, it could do more harm than good. Especially when the technology and its progress are managed by irresponsible people and lacking imagination, as rightly pointed out by A. Einstein: *technological progress is like an axe in the hands of a pathological criminal*<sup>1</sup>. As stated the Flemish writer Phil Bosmans: *computers do not have a soul. In the hands of soulless people they can be dangerous* (zamyslenie.pl, 2017). The man built a lot of great devices, but is not able to properly handle them and control the technological novelties. Their consequences are unpredictable and dangerous mainly because of human own interest, corruption, greed and abuse of power. Technological innovations do not support the natural or instinctive desire to survive that is characteristic of all living beings,

<sup>1</sup> *Technischer Fortschritt ist wie eine Axt in den Händen eines pathologischen Kriminellen*, <http://gutezitate.com/zitat/276803> (11.01.2017).

but on the contrary, they contribute to its atrophy and therefore may accelerate the degradation of the human species in several dimensions, and even lead to its total destruction. When this happens, then – as Einstein said that: *the universe will not shed tears after the humanity*<sup>2</sup>. The advancements technology and stronger interference of ingenious technological devices in the human life have a negative impact on the human relationships life environment and the important features of human species. Increasingly faster technology changes from an effective tool supporting human life in an equally effective weapon for destroying its creators and promoters. This is the effect of alienation of technology which raises concerns of many wise people and experts in various fields of science. However, their appeal to control the technological progress in the context of the idea of sustainable development is ineffective when the old primitive thinking in modern economics which prefers extreme desire of profit and increasing wealth wins in the competition with the common sense. There is no greater enemy of a man than the lack of common sense that is stupidity, because, as ancient Romans would say, *Whom Fortune wishes to destroy she first makes mad (Stultum facit fortuna, quem perdere vul)*. In addition, the number of wise people calling for a judicious attitude towards technological progress in the name of humanity welfare and its survival is much lower than the number of its uncritical enthusiasts. Thus, their ability to influence the masses is very small. *Even Hercules cannot cope with a lot (Nec Hercules contra plures)*. However, the crowd is not governed by reason or wisdom, only by foolishness. Therefore, the masses succumbing to the presentist philosophy characteristic of the neoliberal ideology are not afraid of the technology and do not care about how will their attitudes to technological innovation, actions or omissions harm the future generations.

\* \* \*

The technology is understood as a means by which the people satisfy their different needs, make their own life easier and expand the framework of freedom. This instrumental treatment of technology has always motivated people to technological creativity and progress. However, in the minds of the majority of people, the encoded use of technology which subdues, tames and devastates the nature, lingers on. Indeed, mainly due to these purposes, technology is reduced the Darwinian survival of the fittest. On the basis of such an understanding, the present relationship between the technology and treating it as something which allows wielding the nature and wasting its resources with impunity, was born. Therefore, Ernst Bloch rightly noted, that: *our hitherto technol-*

<sup>2</sup> *Das Weltall wird der Menschheit keine Träne nachweinen*, <http://janko.at/Zitate/Autoren/Einstein.htm> (11.01.2017).



ogy is like an army occupying forces in enemy territory (Bloch, 1954).

\* \* \*

The understanding of technology and the attitude towards it have changed since it has begun playing a new role. Namely, the technology has not only become a necessary tool for survival, to outwit and to consume the natural resources, but also a tool which people use consciously to transform the realities of nature and society. It is also a tool in the hands of a man who involuntarily changes himself. Modern technology is increasingly becoming a human partner in the process of realizing their existential and non-existential goals. After about a hundred and fifty years, the prophetic aphorism Ralph Waldo Emerson has updated: *people have become tools of their tools*<sup>3</sup>. This means that:

- Things that were invented in order to make our life easier become the things on which we depend in many respects.
- They control our life and, to a large extent, we rely on them in making responsible decisions.
- We cannot function without our laptops, mobile phones, televisions, etc. during work and in the free time.
- Not so long ago, after working we put our tools aside and went home. Now, we have the tools with us always and everywhere, and we must adjust our life accordingly to them.
- Things that we have created in order to help us, require our care for them (repair and maintenance) and so, in some sense, they use us as their tools.

Not without reason, more and more people talk about highly developed technological device called a *brother robot*, emphasizing the need for subjective treatment. As a result, one perceives it not as an enemy, and rather begins to relate to it like to a friend. Thus, the technology began to play an important new role in the life of people. For various reasons it seems to be more important than the previous one.

\* \* \*

At present, the technology simultaneously realizes two important functions:

- It is a tool of man in the struggle with the forces of nature.
- It is a partner of a human in shaping his life environment.

How long before the destructive forces of nature and unpredictable natural phenomena (tsunamis, volcanic eruptions, typhoons, earthquakes, floods, etc.) occur, directly threatening our existence? Probably one will never be able to accurately predict, fully control them and prevent their effects – as long one has to use technology to outwit the nature. On the other hand, we do not outwit other species of living creatures (with the exception of some insects, bacteria and viruses) in the Darwinian survival of the fittest, because already they are no longer dangerous for us. We are more threatened by other people. Now we increasingly often threaten the existence and survival of other species. That is why, unfortunately, we began caring for them and protecting them from extinction a bit too late.

\* \* \*

Following facts influenced the formation of a new way of relating to technology:

- Awareness that technology is not an addition to life, but a necessary condition for the proper functioning and survival.
- Technological progress satisfies the most sophisticated human needs, created naturally and artificially to an increasingly larger degree.
- We grew accustomed to using the most intelligent technological devices in everyday life – at work, in entertainment and while studying to a much greater extent than ever.
- Technological devices increasingly often are taking over our functions in the production, thinking, memory, calculation and even creativity; they are more and more frequently used to support or substitute our natural internal organs.
- Thanks to the technological progress in the field of cosmetics, one can freely change the appearance.
- Technological devices, above all different kind of computers and robots, which replace humans in the areas of performance, controls, are more and more distrusted by people which allows them to reduce the responsibility for their own decisions and actions (often in critical situations, a person completely relies on a device and this device, rather than them, make the choice. The man forgets that the final decision belongs to him and it is more important than that which prompts technical device. Therefore, blaming the device is meaningless).

<sup>3</sup> *Men have become the tools of their tools* (Ralph W. Emerson (1803-1882), American poet and essayist who was called *the American Socrates* by Adam Mickiewicz).

\* \* \*

The process of alienation has led to the fact that modern technology increasingly gets out of control and it governs itself almost independently. The human can influence it and its development only marginally. For now, the technological progress is the work of the people, because they are the creators of innovations and inventions. However, this may change if a device will be able to reproduce itself, and improve without the participation of the people. Construction of such devices is only a matter of time and money (yet in 2005, researchers led by prof. Honda Lipson of Cornell University in Ithaca, NY, have developed a self-reproducing robot<sup>4</sup>). Therefore, the sense of powerlessness of people is growing in relation to the ultra-modern technological products, along with the awareness that if one cannot fight with them, it is better to live together and adapt. If one cannot stop the avalanche of technological progress, then one should get used to it. However, the problem is the question whether the possibility of adaptation of people is endless. If not, then the technological progress, which guaranteed the survival of the people, will be the gravedigger of mankind. As for now, we have to live in symbiosis with the technology for as long as possible.

For various reasons, people are connected with different kinds of technological devices and innovative technologies to the extent that they become reliant on them as if on stimulants or drugs. It is said already, for example, about the Internet disease. Surely, the ideology of consumerism has significantly contributed to this. Technological innovations, especially gadgets, which are produced in increasing amounts, have become fashion elements and indicators of modernity. Who would dare to oppose the canons of fashion or pass as someone non-progressive and be socially excluded? It is better to *be on top* and become a slave of technology. This shows a specific paradox of the technological progress. On the one hand, without a doubt, it makes us free, because it allows us to overcome the powers of nature and frees us from the constraints originating from social life, and, on the other hand, it contributes to an increasing enslavement. Edward Younkins (Professor of Accountancy & Business Administration, Executive Director of the Institute for the Study of Capitalism and Morality in Wheeling Jesuit University, West Virginia) argues that there is a mutual dependence (positive feedback) between the development of technology and freedom: freedom is a necessary condition for technological progress and the technological progress expands freedom. That is why neoliberalism creates the best conditions for

technological innovation, and new technologies promote the development of a free society, because they provide new opportunities to communicate, work, competition and deal with other people. While the older technological innovations (steam, internal combustion and electric engines, circle, incandescent lighting, etc.) boosted and supplemented human bodily powers, the today's innovations (microprocessors, Internet, cryogenics, photovoltaics, aerogels, fuel cells, radio-controlled lighting, etc.) reinforce and supplement human intellectual powers (Younkins, 2000). Man, for whom technology is a condition *sine qua non* of life, health and social functioning and who fell into the technological slavery, is not being able to control the technological progress to a sufficient degree, became a kind of a prisoner or a hostage of the technology.

\* \* \*

The difficulty of evaluating the technological progress results from the following reasons:

- Its role in people's lives is ambivalent.
- The results of studies on the harmful effects to health are not fully objective, because the expertises vary diametrically depending on whose behalf they are made and what company pays for it.
- Confirmation of results obtained from experimental studies can only occur after several generations.

Some of the technologies and innovations are unquestionably harmful, others do not (Unger, 2014). These mainly include all kinds of deadly weapons and ammunition, especially those that threaten the entire population. Other innovations which are not intentionally produced for killing or maiming people may cause such effects unintentionally. A good example of this is the car. In the United States, despite a number of security measures and strict observance of the Highway Code, approx. 300 thousand victims of car accidents are noted annually, and worldwide – up to 1.2 million. According to the World Health Organization approx. 260 thousand children annually die of car accidents<sup>5</sup>. The second example constitutes simplified technologies that enable the household production of natural drugs (opium, cocaine, etc.) and synthetic (e.g. crystal methamphetamine). Drug abuse has ruined the lives of millions of people. It is difficult to say how many, because of the lack of reliable statistics. Moreover, it is difficult to estimate the number of deaths caused directly or indirectly by illegal drugs. Though other inventions do not create a direct threat, they either generate side-threats, or the long-term threats. They become apparent with

<sup>4</sup> It does not possess any useful functions with the exception of self-replication, but soon it will be possible to create robots that will replicate or at least regenerate themselves. See. B. Steele, Researchers build a robot that can reproduce, in: *Cornell Chronicle*, May 2005.

<sup>5</sup> I quote from B. Wilson, Traffic Accidents Top Cause of Fatal Child Injuries, in: *NPR Science* 10.12.2008; <http://www.npr.org/templates/story/story.php?storyId=9805556> 7 (11.01.2017).



more or less delay, and so they are similar to time bombs. Among other things, these technologies utilize lead and asbestos. In 1920, lead was added to the gasoline for economic reasons, in order to increase the efficiency of gasoline engines. After several years it was proven that these innovations are very harmful to the health of many millions of people. Lead emitted from the exhaust pollutes the air and enters the blood of humans and animals. Despite this, it is still not removed from gasoline, but its emission is limited through the use of catalytic converters, because the economic reasons are more important than environmental ones. Equally harmful are the technologies using asbestos (LaDou, 2010). The degree of danger coming from the use of mobile phones is unknown – negative effects may appear only after many years. For now, it is believed the experts lie about their harmlessness. That is why mobile phones are very popular worldwide. Currently, more than 250 million people in the US and about 5 billion around the world use cell phones exposing themselves to an unexplored risk. Another real, serious and long-term threat of technological innovation is Decerebration of people. It threatens not only each new generation, but in the future may contribute to the destruction of the whole human species. This threat is growing at an accelerated rate, proportionally to the technological progress, but especially since the so-called smart machine began replacing natural functions of the human brain – ranging from logical thinking to creativity.

\* \* \*

Thinking and creativity have evolved with the development of civilization from the very beginning, since it was necessary to cudgel one's brain how to survive in a world full of various threats more in natural reality than in social. Therefore, wisdom grew the fastest in the earlier stages of human evolution over thousands of years, when living conditions enforced the growth of intelligence. However, probably in ancient times, the so-called Athenian man was already at the zenith of wisdom. From that moment onward, the phase of the loss of wisdom began, above all, sequentially due to urbanization, industrialization and technological progress. As a result of urbanization, people became increasingly less mobile and more attached to their places of residence. Industrialization attached people to workplaces often for the entire life. As a result of technological progress, people become not only increasingly domesticated, because they had everything within the home, but also more lazy both bodily and mentally. Since recently, human started transforming into a couch-potato who watches TV for hours on end, and into an iPad-man, who is chained to his portable computer. The tech-

nological progress, owing to which a modern man makes his life more comfortable, weakens the need to develop his intelligence. As a result, it reduced the human ability to eliminate (by natural selection) the genes responsible for the deficiency of intelligence. Therefore, at a fast pace – in proportion to the technological progress – it rapidly reduces the number of genes that favor the development of intelligence. Thus, is in accordance with the first law of Lamarck: *the permanent disuse of any organ imperceptibly weakens and deteriorates it, and progressively diminishes its functional capacity, until it finally disappears*. In line with his second law: *all these changes are preserved by reproduction to the new individuals which arise*, we have to deal with a progressing decrease of the intelligence of people from one generation to the next. The changes in their life environment caused by the technological progress make the process of human intelligence deterioration natural and inevitable. Therefore, people will become fools a lot faster than they think. Perhaps, the nature defends itself and abreacts against destructive activities of those intruders who systematically destroy it and in this way, it wants to get rid of the human. The simplest way is to fool them systematically, because *Stultum facit nature quem vult perdere (Whom Fortune wishes to destroy she first makes mad)*<sup>6</sup>. Thus, the belief that the human should become increasingly smarter as a result of the natural evolution is untrue. The conviction that human species is the most intelligent and smartest among other species, is spread on the basis of achievements of technology and culture, as well as on the ground of the anthropo-chauvinism. However, it turned out that the natural and cultural evolution clearly aimed at something entirely opposite, namely at the mass and global stupidization of people. Intelligence and wisdom of people are attacked by nature and culture, but the culture fools people to a greater extent and more efficiently than the nature.

\* \* \*

Evaluation of the technological innovation is made by means of a variety of parameters more or less important to the life and functioning of the human, depending on the perspective from which this assessment is made. According to some people, the assessment of the technological innovation is positive, according to others – it is negative. Therefore, the evaluation by means of a single parameter or partial criteria must be relative. The absolute evaluation can be accessed using a systemic criterion. The problem is that it is not. Therefore, based on partial criteria, one would find out what is beneficial for the people, and what is harmful, what promotes or can promote their existence and development, and what creates or may

<sup>6</sup> This is my paraphrase a well-known Latin aphorism *Stultum facit fortuna quem perdere vult (Whom Fortune wishes to destroy she first makes mad)*.

create threat or further fate of mankind. Then, one must make the balance of the actual and potential gains and losses. Such a procedure is neither simple nor easy. Furthermore, statistical inference is problematic, because it is rarely confirmed. Besides, due to the huge differentiation of people (racial, ethnic, cultural, etc.), one can have serious reservations regarding what is considered as good and as bad for the whole of humanity understood as global and homogeneous set of individuals. Therefore, there is no other option than to consider two extreme assessments of the technological innovations: a blessing and a curse for people, for in fact the truth lies between the two extremes. However, this ethical evaluation does not change our actions. Constantly subjected to pressures of economics, we do everything to create conditions favorable for increasing the technological innovativeness. In this way, we accelerate the progress of technology, which at one time turns out to be a benefit for us, and at another time – a curse.

## References

1. BLOCH E., 1954, *Das Prinzip der Hoffnung*, Suhrkamp, Berlin.
2. DOMINICZAK M., 2017, *Księga mądrości*, <http://booklikes.com/ksiega-madrosi-maciej-dominiczak/book> (11.01.2017).
3. HUBBARD E., HUBBARD B., 1946, *The Philosophy of Elbert Hubbard*, H. Wise & Co., New York.
4. LADOU J. et al., 2010, The Case of Global Ban on Asbestos, in: *Environmental Health Perspectives* July.
5. NOWACKI W., 1983, *Civilization and Logic: the Law of Inversely Proportional Stupidity*, Forest Hills, NOW Mail Order Books, New York.
6. POSTREL V., 1998, *The Future and Its Enemies: The Growing Conflict Over Creativity, Enterprise and Progress*, Free Press, New York.
7. STEELE B., 2005, Researchers build a robot that can reproduce, in: *Cornell Chronicle*, May.
8. SZTUMSKI W., 2011, Jeszcze jeden kodeks etyczny? Rzecz o kulturze zakazów, in: *Sprawy Nauki* No 11.
9. SZTUMSKI W., 2009, The Mythology of Sustainable Development, in: *Problemy Ekorozwoju/ Problems of Sustainable Development*, vol. 4, no 2.
10. UNGER S.H., 2014, *Is Progress in Technology Always Beneficial?*, <http://www.opednews.com> (11.01.2017).
11. WILSON B., 2008, Traffic Accidents Top Cause Of Fatal Child Injuries, in: *NPR Science* 10.12.2008.
12. YOUNKINS E., 2010, Technology, Progress, and Freedom, in: *Foundation for Economic Education*, January.
13. ZAMYSLENIE.PL, 2017, *Komputery nie mają duszy, w rękach ludzi bezdusznych mogą być niebezpieczne*, <https://www.zamyslenie.pl/aforyzm/komputery-nie-maja-duszy-w-rekach-ludzi-bezdusznych-moga-byc-niebezpieczne-3235274> (14.02.2017).



## Multi-criteria Evaluation of the Eco-innovation Level in the European Union Countries

### Wielokryterialna ocena poziomu ekoinnowacji w krajach Unii Europejskiej

Andrzej Kobryń\*, Joanna Prystrom\*\*

*\*Faculty of Civil and Environmental Engineering, Białystok University of Technology,  
ul. Wiejska 45E, 15-351 Białystok, Poland*

*E-mail (corresponding author): a.kobryn@pb.edu.pl*

*\*\*Faculty of Economics and Management, University of Białystok,  
ul. Warszawska 63, 15-062 Białystok, Poland*

*E-mail: j.prystrom@uwb.edu.pl*

---

#### Abstract

The purpose of this paper is to analyze and evaluate the level of eco-innovations in the European Union countries. For this purpose, a new method of multi-criteria analysis were used, i.e. PROTERRA method, which was developed by the authors of this article. Analysis concerns a data from the year 2015. There have been determined aggregate ratings, which characterized the eco-innovation level of particular European Union countries. Four classes of innovation level were defined: eco-innovation leaders, good eco-innovators, weak eco-innovators and eco-innovation outsiders. Then, based on the calculated global ratings, European Union countries were assigned to the appropriate classes.

**Key words:** eco-innovation level; evaluation, multi-criteria analysis

#### Streszczenie

Celem niniejszego artykułu jest analiza i ocena poziomu ekoinnowacji w krajach Unii Europejskiej. W tym celu została użyta nowa metoda analizy wielokryterialnej, tzn. metoda PROTERRA, która została opracowana przez autorów tego artykułu. Analiza obejmuje dane z roku 2015. Zostały wyznaczone oceny zagregowane, które charakteryzują poziom ekoinnowacji w poszczególnych krajach Unii Europejskiej. Zostały zdefiniowane cztery klasy ekoinnowacji: liderzy ekoinnowacji, dobrzy ekoinnowatorzy, słabi ekoinnowatorzy oraz outsiderzy ekoinnowacji. W rezultacie, na podstawie obliczonych ocen globalnych, kraje Unii Europejskiej zostały przyporządkowane do odpowiednich klas.

**Słowa kluczowe:** poziom ekoinnowacji, ocena, analiza wielokryterialna

---

#### 1. Introduction

The essence of eco-innovation refers to the development of products and processes that contribute to sustainable development, applying the commercial application of knowledge to elicit direct or indirect ecological social improvements. The term eco-innovation takes into account three kinds of changes towards sustainable development: technological, so-

cial and institutional innovation (Rennings, 2000). In the book (Bossink, 2013) author notes that sustainability is a phenomenon that must be pursued in a complex system of interrelated elements of business, society, and ecology. This book presents an approach, according to which sustainable innovation as the systematic coherence of drivers of eco-innovation and sustainability has to be envisioned, conceptualized, realized, and improved.

Innovations, and especially eco-innovations, and sustainable development are of fundamental importance for the economic growth. Sustainable development has been one of European priorities for a long time. At present it has acquired a new significance in the light of the crisis connected with climate changes and the financial crisis. It is a great challenge for EU countries. Eco-innovations may relate to environmental changes in technology, organizational structure and management: establishment, business or economy of the country.

Eco-innovation can be included in the products or services, production processes, management and organization. Eco-innovation in the products or services help to reduce or eliminate environment pollution. Currently, it is known that it is easier and cheaper to use new technologies, than to look for ways to reduce the pollution caused by the use of outdated technologies (Janasz and Koziół, 2007). Relationships between the eco-innovation and the sustainable development were the subject of discussion in many works. This is illustrated by the paper (Sarkar, 2013) that includes a holistic and strategic literature review on how the eco-innovations and their eco-specific promotional and developmental efforts to stimulate the sustainable development.

There are different definitions of eco-innovation and related definitions such as environmental innovation. Past studies of eco-innovation have focused on environmentally motivated innovation, overlooking the environmental gains from *normal* innovations. Kemp and Pearson (2008) define eco-innovation as *the production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives*. In the Eco-Innovation Observatory ([www.eco-innovation.eu](http://www.eco-innovation.eu)), the aspect of resource use is made the central element of eco-innovation, i.e. *Eco-innovation is innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle*.

The concept of eco-innovation is quite young. One of the first appearances of the concept of eco-innovation in the literature is in the book (Fussler and James, 1996). Eco-innovation as area of research is of increasing concern for policy makers, academics and practitioners. The article (Díaz-García et al., 2015) includes an overview of the existing body of literature on eco-innovations, and identification of the most relevant publications in the field and the topics of interest. This review of literature includes 384 articles and shows that there is a clear increase in the relevance of this issue within academia and several thematic trends arise in eco-innovation

research, with drivers of eco-innovation being the most popular.

An important role in the development of eco-innovation play an appropriate regulatory frameworks and policy instruments. There is much interest in the role of environmental policy in encouraging environmental innovation, and also some empirical evidence for the importance of policy actions (i.e. Ashford et al., 1985; Jaffe et al., 2002; Kemp and Pontoglio, 2008; Wijen et al., 2012). Most developed countries have innovation policies for green innovation. These issues are analyzed e.g. in the articles (Leitner et al., 2010; Kemp, 2013). The first article shows how regulation drives innovation and how various diffusion pathways can be used by external stakeholders to direct and promote innovation. The second article proposes a framework for eco-innovation policy-making and policy evaluation, which should be based on the ten principles of eco-innovation defined by the author.

In shaping the right eco-innovation policy are helpful information about the degree of achievement of the objectives of eco-innovation policy. It is important to explore and identify relevant indicators for environmental innovation that could be used to develop innovation policy for all economic sectors, as well as for the field of environmental technologies (Arundel et al., 2006). For example (Kanerva et al., 2009), based on literature and data analysis, were chosen key indicators include five fields (environmental regulations and venture capital for the eco-industry; environmental publications, patents and business R&D; eco-industry exports and FDI; sales from environmentally beneficial innovation across sectors; and environmental impacts related to energy intensity and resource productivity of economies). It was found there that finding key eco-innovation indicators related to such factors is important for policy makers, as environmental innovation policy is required to counter the two market failures associated with environmental pollution and the innovation and diffusion of new technologies. Other works, which raised issues of building the system of eco-innovation indicators, are for example (Fukasaku, 2005; Legler et al., 2003; Oltra et al., 2007; van der Voet et al., 2005).

A useful tool for national governments may be the European Innovation Scoreboard, which includes eco-innovation indicators developed by the Eco-Innovation Observatory ([www.eco-innovation.eu](http://www.eco-innovation.eu)). The Eco-Innovation Scoreboard illustrates eco-innovation performance across the European Union member states. Based on these eco-innovation indicators, later in this article was assessed level of eco-innovation in each European Union country using one of the methods of multi-criteria analysis, which is the PROTERRA method developed by the authors of this article. Then, on this basis, were made adequate rankings of EU countries, as well as those



countries were assigned to the appropriate class in terms of eco-innovation level (eco-innovation leaders, good eco-innovators, weak eco-innovators and eco-innovation outsiders)

## 2. Characteristics of the analyzed data

As mentioned in section 1, the Eco-Innovation Scoreboard illustrates eco-innovation performance across the EU member states. The scoreboard aims at capturing the different aspects of eco-innovation by applying 16 indicators grouped into five thematic areas: eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency and socio-economic outcomes (Table 1). It thereby shows how well individual member states perform in different dimensions of eco-innovation compared to the EU average and presents their strengths and weaknesses. The Eco-Innovation Scoreboard complements other measurement approaches of innovativeness of European Union countries and aims to promote a holistic view on economic, environmental and social performance. The Eco-Innovation Scoreboard shows how well individual member states perform in different dimensions of eco-innovation compared to the EU average.

Currently, the Eco-Innovation Scoreboard covers a time series from 2010 to 2015. Recent data on the achievements of the EU countries in the field of eco-innovation apply to the year 2015. As the previous versions, the 2015 scoreboard is based on 16 indicators in 5 thematic areas:

- **Eco-innovation inputs**  
Eco-innovation inputs contain investments (financial resources, human resources, technical resources) that ensure an initiative for eco-innovation activities at companies, research organisations, and other institutions. Therefore, eco-innovation investments are an important determinant of eco-innovation performance at the level of companies, sectors and countries.
- **Eco-innovation activities**  
Eco-innovation activities are defined as the eco-innovation efforts regarding to developing new or improved products and services, changing business models, and introducing eco-management in companies or organisations. The scoreboard aggregates company level data to present the country level of performance.
- **Eco-innovation outputs**  
Eco-innovation outputs are the instant results of eco-innovation activities. Indicators in this ingredient are used to verify the extent to which knowledge outputs generated by businesses and researchers are related to eco-innovative capacity.
- **Resource efficiency outcomes**  
Resource efficiency outcomes of eco-innovation include indicators, which can reinforce the realization of a low-carbon, resource efficient

economy through increasing the resource efficiency performance of sectors and countries. Eco-innovation can have a double positive impact on resource efficiency. It can lead to increase of the generated economic value, while at the same time to decrease pressures on the natural environment.

- **Socio-economic outcomes**  
Socio-economic outcomes of eco-innovation include both the benefits and disadvantages of eco-innovation activities. Their scope includes jobs created or eliminated, changes in competitiveness, as well as turnover, revenues, profits and expenses of companies.

A detailed analysis of the scoreboard and its components will be provided in the upcoming Eco-Innovation Observatory Annual Report 2016.

The authors of this article have proposed a different approach to the assessment of the eco-innovation level in each EU country. For processing the initial data in the form of a set of values of eco-innovation indicators they used a multi-criteria analysis tools. Concretely, it is a new method of multi-criteria analysis, which was developed by the authors of this article. The analysis covered the latest sets of initial data, included recently in the Eco-Innovation Scoreboard ([ec.europa.eu/environment/ecoap/scoreboard\\_en](http://ec.europa.eu/environment/ecoap/scoreboard_en)), which cover the different above-mentioned aspects of eco-innovation. The analyzed values of individual indicators are presented in Table 2.

## 3. Proposed method of multi-criteria evaluation

Much attention has been paid in the past years to multi-criteria evaluation approaches (MCE) for solving of various decision problems. Multi-criteria evaluation represents many techniques useful for improving the transparency, control and analytic rigour of these decisions (Dunning et al., 2007). The MCE allows the processing of ratings of alternative decision options in the light of multiple criteria which are typically measured in different units. Today MCE is an established methodology (Figueira et al. 2005; Tzeng and Huang, 2011, Zopounidis and Pardalos, 2010) which has numerous applications in various fields (Dounpos and Grigoroudis, 2013; Mateo, 2012).

MCE can be defined as a decision model which includes a set of decision options which need to be ranked or scored by the decision maker, a set of criteria, typically measured in different units and a set of performance measures, which are the raw scores for each decision option against each criterion. In this sense, the MCE is identical to methods which are known as multi-criteria analysis (MCA) or multi-criteria decision analysis (MCDA). A minimum requirement for the MCE model is at least two criteria and two decision options ( $m \geq 2$  and  $n \geq 2$ ). The importance of each criterion is usually given in a one dimensional weights vector  $\mathbf{w}$  containing  $n$  we-

Table 1. The eco-innovation indicators according to Eco-Innovation Scoreboard 2015, source: <http://www.eco-innovation.eu>

| Type of indicators | Eco-innovation dimension     | Indicator number | Indicator   | Short description   |
|--------------------|------------------------------|------------------|---|---|
| INPUTS             | Eco-innovation inputs        | 1.1              | Governments environmental and energy R&D appropriations and outlays (% of GDP)  | The relative priority given by governments to investing in research and development in the areas of energy, including renewables, and environment   |
|                    |                              | 1.2              | Total R&D personnel and researchers (% of total employment)   | Indicator of the knowledge and research capabilities of a country. Since the data for R&D personnel involved in eco-innovation or environmental or cleantech research is not available, the generic indicator is used   |
|                    |                              | 1.3              | Total value of green early stage investments (USD/capita)   | The value of early stage investments in cleantech industries  |
|                    | Eco-innovation activities    | 2.1              | Firms having implemented innovation activities aiming at a reduction of material input per unit output (% of total firms) | Indicator of material efficiency oriented eco-innovation in companies   |
|                    |                              | 2.2              | Firms having implemented innovation activities aiming at a reduction of energy input per unit output (% of total firms)   | Indicator of energy efficiency oriented eco-innovation in companies   |
|                    |                              | 2.3              | ISO 14001 registered organisations (per mln population)   | The importance of observing environmental management requirements for business. Can be seen as a proxy indicator for the level of environmental awareness and management capability of business.  |
| OUT-PUTS           | Eco-innovation outputs       | 3.1              | Eco-innovation related patents (per mln population)   | According to OECD's scoping of patents in environmentally-related technologies: Energy generation from renewable and non-fossil sources PLUS Combustion technologies with mitigation potential PLUS Emissions abatement and fuel efficiency in transportation PLUS Energy efficiency in buildings and lighting PLUS Complementary Patstat queries conducted by EIO team |
|                    |                              | 3.2              | Eco-innovation related academic publications (per mln population)   | Institutions being involved in publications with the following list of English key-words in title and/or abstract: eco-innovation, energy efficient/efficiency, material efficient/efficiency, resource efficient/efficiency, energy productivity, material productivity, resource productivity   |
|                    |                              | 3.3              | Eco-innovation related media coverage (per numbers of electronic media)   | Number of hits in all electronic media covered by <i>Meltwater News</i> with key-word <i>Eco-innovation</i> (translated in all EU-27 languages)   |
|                    | Resource efficiency outcomes | 4.1              | Material productivity (GDP/Domestic Material Consumption)   | Illustrates the GDP generated by material consumption of a country  |
|                    |                              | 4.2              | Water productivity (GDP/Water Footprint)  | Illustrates the GDP generated by domestic water consumption   |
|                    |                              | 4.3              | Energy productivity (GDP/gross inland energy consumption)   | Illustrates the GDP generated by domestic energy use  |
|                    |                              | 4.4              | GHG emissions intensity (CO <sub>2</sub> e/GDP)   | Illustrates the amounts of GHG emissions generated per unit of GDP  |
|                    | Socio-economic outcomes      | 5.1              | Exports of products from eco-industries (% of total exports)  | Based on selected list of trade codes referring to <i>environmental goods and services</i>  |
|                    |                              | 5.2              | Employment in eco-industries and circular economy (% of total employment across all companies)                            | Indicates the share of employment in eco-industry and circular economy in total employment. Total employment is an aggregate employment in all companies across sectors in a specific country. Data have been sourced from the Orbis database.  |

|  |  |     |  |   |
|--|--|-----|--|---|
|  |  |     |  | Eco-industry company population was selected based on NAICS codes for eco-industries, including waste treatment, water sector, environmental technologies, recycling, reuse and recovery. The selection excludes companies engaged in energy generation and storage. The scope has been defined specifically for the EcoIS. Annex I provides the full list of NAICS codes selected for data extraction. Annex II provides additional information on how this indicator was calculated.  |
|  |  | 5.3 | Revenue in eco-industries and circular economy (% of total revenue across all companies) | Indicates the share of revenue from eco-industry in total revenue across sectors in a specific country. Total revenue is aggregate revenue in all companies across sectors in a specific country. Data have been sourced from the Orbis database.<br>Eco-industry company population was selected based on NAICS codes for eco-industries, including waste treatment, water sector, environmental technologies, recycling, reuse and recovery. The selection excludes companies engaged in energy generation and storage. The scope has been defined specifically for the EcoIS. Annex I provides the full list of NAICS codes selected for data extraction. Annex II provides additional information on how this indicator was calculated. |

ights, where  $w_j$  denotes the weight assigned to the  $j$ th criterion. The MCE model is represented by an evaluation matrix  $\mathbf{D}$  of  $m$  decision alternatives and  $n$  criteria:

$$\mathbf{D} = \begin{bmatrix} D_{1,1} & D_{1,2} & \dots & D_{1,n} \\ D_{2,1} & D_{2,2} & \dots & D_{2,n} \\ \dots & \dots & \dots & \dots \\ D_{m,1} & D_{m,2} & \dots & D_{m,n} \end{bmatrix} \quad (1)$$

The individual values  $D_{i,j}$  are ratings of the analyzed alternatives  $A_i$  ( $i = 1, 2, \dots, m$ ) in the light of the assumed criteria  $C_j$  ( $j = 1, 2, \dots, n$ ).

Later in the article, a new technique (which is the original authors proposal) will be used in the evaluation of eco-innovation level in the EU member states. The proposed method were named as PRO-processing Technique of Ratings for Ranking of Alternatives (PROTERRA). The starting point of the analysis is evaluation matrix  $\mathbf{D}$  given by Eq. (1). The consecutive steps of the process include appropriate processing of the ratings for each pair of the alternatives. The normalization of the initial matrix  $\mathbf{D}$  is the first step in the analysis, so that all criteria are reduced to benefits. This can be done using the following formulas:

- for benefits criteria:

$$d_{i,j} = \frac{D_{i,j}}{D_{\max}} \quad (2)$$

- for cost criteria:

$$d_{i,j} = \frac{D_{\min}}{D_{i,j}} \quad (3)$$

In the above equations, values  $D_{\min}$  and  $D_{\max}$  denote, adequately, the lowest and highest ratings of the elements considering criterion  $C_j$  ( $j = 1, 2, \dots, n$ ).

After the normalization of the decision matrix  $\mathbf{D}$ , can be derived the normalized matrix  $\mathbf{d}$ :

$$\mathbf{d} = \begin{bmatrix} d_{1,1} & d_{1,2} & \dots & d_{1,n} \\ d_{2,1} & d_{2,2} & \dots & d_{2,n} \\ \dots & \dots & \dots & \dots \\ d_{m,1} & d_{m,2} & \dots & d_{m,n} \end{bmatrix} \quad (4)$$

Next, for each pair of the alternatives  $A_i$  and  $A_k$  ( $i = 1, 2, \dots, m$  and  $k = 1, 2, \dots, m$ ,  $\forall i \neq k$ ) it is necessary to calculate the ratio of normalized ratings  $d_{i,j}$  and  $d_{k,j}$ :

$$q_{i,k}^{(j)} = d_{i,j} / d_{k,j} \quad (5)$$

Using the value  $d_{i,k}^{(j)}$ , we can create matrix  $\mathbf{q}^{(j)}$ :

$$\mathbf{q}^{(j)} = \begin{bmatrix} q_{1,1}^{(j)} & q_{1,2}^{(j)} & \dots & q_{1,m}^{(j)} \\ q_{2,1}^{(j)} & q_{2,2}^{(j)} & \dots & q_{2,m}^{(j)} \\ \dots & \dots & \dots & \dots \\ q_{m,1}^{(j)} & q_{m,2}^{(j)} & \dots & q_{m,m}^{(j)} \end{bmatrix} \quad (6)$$

In this manner, a appropriate component matrix  $\mathbf{q}^{(j)}$  is created for each of the assumed criteria ( $j = 1, 2, \dots, n$ ).

If  $q_{i,k}^{(j)} > 1$ , then the individual elements of  $q_{i,k}^{(j)}$  located in the  $i$ th row of matrix  $\mathbf{q}^{(j)}$  determine whether and to what any alternative  $A_i$  is better than alternative  $A_k$ . If  $q_{i,k}^{(j)} = 1$ , then both alternatives are equivalent. Otherwise (if  $q_{i,k}^{(j)} < 1$ ) alternative  $A_i$  is worse than alternative  $A_k$ . In view of (5), the elements of matrix  $\mathbf{q}^{(j)}$  located symmetrically with respect to the main diagonal for any  $i \neq k$  pair are:

Table 2. The values of eco-innovation indicators according to Eco-Innovation Scoreboard 2015, source <http://www.eco-innovation.eu>

| Country             | INPUTS                |          |          |                           |          | OUTPUTS                |          |          |                              |          |          |          |        |                         |          |          |
|---------------------|-----------------------|----------|----------|---------------------------|----------|------------------------|----------|----------|------------------------------|----------|----------|----------|--------|-------------------------|----------|----------|
|                     | Eco-innovation inputs |          |          | Eco-innovation activities |          | Eco-innovation outputs |          |          | Resource efficiency outcomes |          |          |          |        | Socio-economic outcomes |          |          |
|                     | 1.1                   | 1.2      | 1.3      | 2.1                       | 2.2      | 2.3                    | 3.1      | 3.2      | 3.3                          | 4.1      | 4.2      | 4.3      | 4.4    | 5.1                     | 5.2      | 5.3      |
|                     | benefits              | benefits | benefits | benefits                  | benefits | benefits               | benefits | benefits | benefits                     | benefits | benefits | benefits | costs  | benefits                | benefits | benefits |
| (AT) Austria        | 89,49                 | 129,60   | 73,82    | 156,31                    | 160,68   | 61,68                  | 160,61   | 150,99   | 94,92                        | 79,85    | 119,82   | 105,61   | 121,90 | 117,55                  | 68,34    | 33,27    |
| (BE) Belgium        | 74,50                 | 120,05   | 73,79    | 136,94                    | 163,75   | 48,59                  | 42,71    | 108,03   | 181,21                       | 115,81   | 95,96    | 83,68    | 98,08  | 55,42                   | 71,32    | 85,03    |
| (BG) Bulgaria       | 5,44                  | 50,88    | 0,00     | 50,53                     | 53,58    | 108,82                 | 16,06    | 26,38    | 39,99                        | 35,24    | 28,53    | 63,98    | 55,07  | 23,46                   | 100,44   | 119,48   |
| (CY) Cyprus         | 6,71                  | 36,41    | 2,24     | 62,11                     | 70,94    | 29,71                  | 8,56     | 237,52   | 150,13                       | 75,30    | 48,72    | 104,62   | 79,62  | 17,41                   | 14,56    | 17,80    |
| (CZ) Czech Republic | 82,89                 | 103,36   | 170,30   | 165,32                    | 172,32   | 205,78                 | 45,15    | 78,13    | 18,86                        | 72,29    | 67,44    | 65,43    | 57,67  | 99,21                   | 183,40   | 159,36   |
| (DE) Germany        | 172,06                | 120,05   | 801,34   | 223,24                    | 220,81   | 42,73                  | 230,37   | 88,08    | 101,40                       | 105,07   | 123,10   | 103,90   | 95,31  | 147,47                  | 50,14    | 64,27    |
| (DK) Denmark        | 135,73                | 167,40   | 16,19    | -                         | -        | 71,21                  | 195,60   | 227,17   | 49,68                        | 80,19    | 116,58   | 120,78   | 113,11 | 141,95                  | 54,64    | 61,69    |
| (EE) Estonia        | 145,25                | 73,94    | 100,55   | 159,48                    | 61,53    | 167,41                 | 16,23    | 122,02   | 19,91                        | 33,96    | 41,90    | 59,30    | 55,07  | 49,63                   | 131,52   | 120,03   |
| (ES) Spain          | 90,76                 | 91,43    | 207,83   | -                         | -        | 133,51                 | 45,65    | 101,44   | 160,00                       | 148,98   | 59,40    | 117,99   | 120,63 | 53,10                   | 136,79   | 126,36   |
| (FI) Finland        | 172,06                | 167,40   | 66,63    | 172,81                    | 159,93   | 124,19                 | 230,37   | 284,32   | 56,14                        | 43,22    | 119,20   | 59,30    | 85,56  | 100,84                  | 143,00   | 116,78   |
| (FR) France         | 137,29                | 130,39   | 0,00     | 143,26                    | 131,63   | 56,44                  | 164,80   | 66,54    | 92,90                        | 121,61   | 96,72    | 89,43    | 126,22 | 101,72                  | 181,80   | 129,97   |
| (GR) Greece         | 58,66                 | 97,00    | 15,83    | -                         | -        | 37,25                  | 38,24    | 141,86   | 123,54                       | 81,38    | 53,52    | 107,99   | 69,83  | 34,02                   | 74,47    | 74,15    |
| (HR) Croatia        | 5,07                  | 50,88    | 8,48     | -                         | -        | 100,26                 | 18,87    | 85,79    | 162,44                       | 81,40    | 45,33    | 99,65    | 93,74  | 48,76                   | -        | -        |
| (HU) Hungary        | 139,84                | 72,35    | 3,80     | 95,13                     | 97,75    | 101,13                 | 8,56     | 54,39    | 18,86                        | 87,57    | 35,84    | 98,03    | 102,26 | 112,83                  | 162,89   | 102,07   |
| (IE) Ireland        | 25,32                 | 104,15   | 801,34   | 164,98                    | 176,41   | 64,75                  | 25,66    | 146,16   | 22,12                        | 64,30    | 140,41   | 125,45   | 87,75  | 41,05                   | 94,35    | 53,35    |
| (IT) Italy          | 91,75                 | 88,25    | 43,80    | 71,53                     | 82,02    | 200,20                 | 53,54    | 107,80   | 189,23                       | 147,28   | 73,33    | 120,65   | 121,74 | 105,80                  | 101,45   | 96,36    |
| (LT) Lithuania      | 44,00                 | 68,38    | 16,28    | 91,77                     | 82,67    | 107,54                 | 17,01    | 69,23    | 89,58                        | 63,18    | 42,68    | 118,81   | 97,79  | 52,06                   | 110,98   | 97,53    |
| (LU) Luxembourg     | 77,78                 | 163,78   | 76,86    | 139,23                    | 148,86   | 57,02                  | 141,87   | 284,32   | 189,23                       | 170,47   | 137,28   | 103,29   | 114,80 | 147,47                  | 14,56    | 17,80    |
| (LV) Latvia         | 59,07                 | 51,68    | 18,47    | 50,53                     | 53,58    | 74,72                  | 64,53    | 120,33   | 99,58                        | 43,06    | 32,59    | 94,95    | 109,14 | 50,54                   | 125,03   | 151,22   |
| (MT) Malta          | 5,07                  | 69,17    | 0,00     | 88,82                     | 94,12    | 31,58                  | 12,88    | 26,38    | 124,72                       | 116,77   | 55,24    | 125,45   | 118,96 | 17,41                   | -        | 74,42    |
| (NL) Netherlands    | 64,86                 | 118,46   | 14,92    | 79,09                     | 88,07    | 64,14                  | 65,33    | 144,21   | 108,65                       | 170,47   | 131,92   | 98,92    | 96,45  | 70,97                   | 93,94    | 159,36   |
| (PL) Poland         | 63,70                 | 52,47    | 2,80     | 67,71                     | 65,91    | 29,71                  | 71,07    | 32,65    | 71,60                        | 53,14    | 50,76    | 86,84    | 58,90  | 84,65                   | 33,67    | 111,37   |
| (PT) Portugal       | 149,06                | 83,48    | 4,54     | 223,24                    | 220,81   | 56,72                  | 15,98    | 182,41   | 50,54                        | 71,74    | 47,01    | 116,16   | 107,58 | 60,70                   | 118,31   | 116,64   |
| (RO) Romania        | 79,18                 | 36,41    | 0,00     | 107,73                    | 101,75   | 205,78                 | 34,26    | 56,04    | 70,13                        | 33,96    | 28,53    | 107,64   | 86,64  | 54,56                   | 168,65   | 136,40   |
| (SE) Sweden         | 137,21                | 139,14   | 86,45    | 133,08                    | 142,81   | 185,22                 | 170,23   | 269,56   | 39,43                        | 74,74    | 128,72   | 79,85    | 126,22 | 88,53                   | 93,43    | 97,20    |
| (SI) Slovenia       | 93,12                 | 128,80   | 0,00     | -                         | -        | 92,32                  | 55,47    | 182,77   | 55,49                        | 90,67    | 60,35    | 77,22    | 83,25  | 87,28                   | 183,40   | 155,87   |
| (SK) Slovakia       | 53,86                 | 58,83    | 0,00     | 75,23                     | 79,50    | 149,30                 | 14,10    | 93,50    | 46,92                        | 89,46    | 59,49    | 80,08    | 83,96  | 50,15                   | 105,95   | 106,00   |
| (UK) United Kingdom | 78,67                 | 100,97   | 198,56   | -                         | -        | 116,09                 | 56,93    | 113,72   | 50,23                        | 152,62   | 140,41   | 107,09   | 105,19 | 104,51                  | 72,24    | 84,92    |

If  $q_{i,k}^{(j)} > 1$ , then the individual elements of  $q_{i,k}^{(j)}$  located in the  $i$  th row of matrix  $q^{(j)}$  determine whether and to what any alternative  $A_i$  is better than alternative  $A_k$ . If  $q_{i,k}^{(j)} = 1$ , then both alternatives are equivalent.

Otherwise (if  $q_{i,k}^{(j)} < 1$ ) alternative  $A_i$  is worse than alternative  $A_k$ . In view of (5), the elements of matrix  $q^{(j)}$  located symmetrically with respect to the main diagonal for any  $i \neq k$  pair are:

$$q_{k,i}^{(j)} = 1/q_{i,k}^{(j)} \quad (7)$$

Further procedure is similar to one which is used in the PROMETHEE method, which is a very popular method of multi-criteria decision analysis (Brans et al., 1984; Brans and Mareschal, 2005). Nevertheless, the proposed approach does not specify a preference function. Values of appropriate outranking indices, which determine the strengths and weaknesses of each alternative, are calculated on the basis of ratios described by (5). They will be named as global superiority index and global inferiority index. In turn, the global superiority index indicates the degree to which alternative  $A_i$  dominates other alternatives. The global inferiority index indicates the degree to which  $A_i$  is dominated by the alternatives. These indices are calculated as follows:

- global superiority index

$$E_i^+ = \frac{1}{m-1} \sum_{j=1}^n \sum_{\substack{k=1 \\ k \neq i}}^m w_j q_{i,k}^{(j)} \quad (8)$$

- global inferiority index

$$E_i^- = \frac{1}{m-1} \sum_{j=1}^n \sum_{\substack{k=1 \\ k \neq i}}^m w_j q_{k,i}^{(j)} \quad (9)$$

whereby the criteria weights  $w_j$  ( $j = 1, 2, \dots, n$ ) satisfy the condition

$$\sum_{j=1}^n w_j = 1 \quad (10)$$

The weighting of the criteria can be performed by applying any of the commonly used methods.

Basing on the indices described by Eqs. (8) and (9), a global ranking index can be calculated:

$$E_i = E_i^+ - E_i^- \quad (11)$$

It is the balance among the global superiority and global inferiority indexes. The higher the global ranking index, the better is the alternative, so that:

$$\begin{cases} A_i \succ A_k & \text{if } E_i > E_k \\ A_i \sim A_k & \text{if } E_i = E_k \end{cases} \quad (12)$$

#### 4. Evaluation of the eco-innovation level in European Union countries

Evaluation of the eco-innovation level in the European Union member states focuses on the latest data, which includes a Table 2. The indicators in the groups Eco-innovation inputs and Eco-innovation activities were considered jointly as INPUTS. Whereas, indicators belonging to groups Eco-innovation outputs, Resource efficiency outcomes and Socio-economic outcomes were considered jointly as OUTPUTS. All indicators (as evaluation criteria) were treated as equally important and have received equal weight values. The analysis was performed in three variants: separately for INPUTS (Enablers and Firm activities), OUTPUTS, and also generally, taking into account all eco-innovation indicators. The calculations results are presented in Tables 3 and 4 (Table 3 shows the aggregated ratings separately for INPUTS and OUTPUTS, Table 4 shows the aggregated ratings, which result of all indicators analyzed jointly). At the bottom of these tables are also given statistical measures, which were used in subsequent analyzes. Namely, on the basis of the ratings shown in Tables 3 and 4 all European Union countries were classified into four groups: eco-innovation leaders, good eco-innovators, weak eco-innovators and eco-innovation outsiders. It was used at the following criteria:

- eco-innovation leaders, when

$$E_i \geq \bar{E} + s_{\bar{E}} \quad (13)$$

- good eco-innovators, when

$$\bar{E} + s_{\bar{E}} > E_i \geq \bar{E} \quad (14)$$

- weak eco-innovators, when

$$\bar{E} > E_i \geq \bar{E} - s_{\bar{E}} \quad (15)$$

- eco-innovation outsiders, when

$$\bar{E} - s_{\bar{E}} > E_i \quad (16)$$

where:

$E_i$  - the aggregated rating of  $i$  th alternative (country)

$\bar{E}$  - an average value of all aggregated ratings,

$s_{\bar{E}}$  - standard deviation.

Assignment of the particular countries to the above classes is illustrated by table 5. The results shown in Table 5 allow to conclude that:

1. The individual EU countries are characterized by wide differences in the values of global ranking indexes, as illustrated by Figures 1, 2 and 3.
2. A large group of EU countries shows such a level of eco-innovation, which allows to include them to the same class both in terms of INPUTS, OUTPUTS, as well as GENERALLY. This applies to Austria, Belgium, Cyprus, Germany, Spain, Greece, Italy, Lithuania, Luxembourg, Portugal, Slovenia, Slovakia and United Kingdom.



Table 3. Aggregated ratings in the field of INPUTS (Eco-innovation inputs, Eco-innovation-activities) and OUTPUTS (Eco-innovation outputs, Resource efficiency outcomes, Socio-economic outcomes)

| EU member country   | Aggregated ratings for INPUTS      |                                    |                              | Aggregated ratings for OUTPUTS     |                                    |                              |
|---------------------|------------------------------------|------------------------------------|------------------------------|------------------------------------|------------------------------------|------------------------------|
|                     | Global superiority index ( $E^+$ ) | Global inferiority index ( $E^-$ ) | Global ranking index ( $E$ ) | Global superiority index ( $E^+$ ) | Global inferiority index ( $E^-$ ) | Global ranking index ( $E$ ) |
| (AT) Austria        | 2,2386                             | 0,9648                             | 1,2738                       | 1,8180                             | 1,1030                             | 0,7150                       |
| (BE) Belgium        | 2,0668                             | 1,0938                             | 0,9730                       | 1,4700                             | 1,0894                             | 0,3806                       |
| (BG) Bulgaria       | 0,5282                             | 3,7314                             | -3,2032                      | 0,8199                             | 2,4570                             | -1,6371                      |
| (CY) Cyprus         | 0,3665                             | 11,3434                            | -10,9769                     | 1,0530                             | 3,1485                             | -2,0956                      |
| (CZ) Czech Republic | 3,6161                             | 0,6737                             | 2,9424                       | 1,3920                             | 1,4578                             | -0,0658                      |
| (DE) Germany        | 11,0901                            | 0,7465                             | 10,3436                      | 2,1238                             | 1,0118                             | 1,1120                       |
| (DK) Denmark        | 1,5682                             | 1,4860                             | 0,0822                       | 2,0199                             | 1,0478                             | 0,9721                       |
| (EE) Estonia        | 2,9072                             | 0,9250                             | 1,9823                       | 1,0247                             | 2,0135                             | -0,9888                      |
| (ES) Spain          | 3,4350                             | 0,5242                             | 2,9107                       | 1,5720                             | 1,0321                             | 0,5399                       |
| (FI) Finland        | 2,9448                             | 0,7372                             | 2,2076                       | 2,3263                             | 0,9575                             | 1,3687                       |
| (FR) France         | 1,6475                             | 0,7366                             | 0,9108                       | 2,0201                             | 0,8895                             | 1,1306                       |
| (GR) Greece         | 0,8335                             | 1,9364                             | -1,1030                      | 1,2120                             | 1,3054                             | -0,0934                      |
| (HR) Croatia        | 0,4642                             | 5,3583                             | -4,8941                      | 0,9510                             | 1,2463                             | -0,2953                      |
| (HU) Hungary        | 1,5731                             | 5,3595                             | -3,7863                      | 1,0977                             | 2,3415                             | -1,2439                      |
| (IE) Ireland        | 10,0319                            | 1,1644                             | 8,8675                       | 1,1253                             | 1,6671                             | -0,5417                      |
| (IT) Italy          | 1,9453                             | 1,2139                             | 0,7314                       | 1,6926                             | 0,9434                             | 0,7492                       |
| (LT) Lithuania      | 1,0835                             | 2,1277                             | -1,0442                      | 1,0626                             | 1,5955                             | -0,5329                      |
| (LU) Luxembourg     | 2,2215                             | 0,9964                             | 1,2252                       | 2,2070                             | 1,7319                             | 0,4751                       |
| (LV) Latvia         | 0,9903                             | 2,3170                             | -1,3267                      | 1,3588                             | 1,2593                             | 0,0995                       |
| (MT) Malta          | 0,4812                             | 3,9464                             | -3,4652                      | 0,9039                             | 2,1587                             | -1,2548                      |
| (NL) Netherlands    | 1,1928                             | 2,1395                             | -0,9467                      | 1,7679                             | 0,8628                             | 0,9050                       |
| (PL) Poland         | 0,7728                             | 7,7512                             | -6,9784                      | 1,1430                             | 1,6305                             | -0,4875                      |
| (PT) Portugal       | 1,8976                             | 4,5117                             | -2,6141                      | 1,1969                             | 1,5037                             | -0,3068                      |
| (RO) Romania        | 1,3536                             | 0,9985                             | 0,3552                       | 1,1474                             | 1,5976                             | -0,4502                      |
| (SE) Sweden         | 2,9586                             | 0,7149                             | 2,2437                       | 1,9752                             | 0,9897                             | 0,9855                       |
| (SI) Slovenia       | 1,0876                             | 0,4468                             | 0,6408                       | 1,6029                             | 0,9981                             | 0,6048                       |
| (SK) Slovakia       | 1,0252                             | 1,0527                             | -0,0276                      | 1,0661                             | 1,6320                             | -0,5658                      |
| (UK) United Kingdom | 3,2304                             | 0,5544                             | 2,6761                       | 1,5447                             | 1,0231                             | 0,5216                       |
|                     |                                    |                                    |                              |                                    |                                    |                              |
|                     |                                    |                                    | $\bar{E}$                    | 0,0000                             | $\bar{E}$                          | 0,0000                       |
|                     |                                    |                                    | $s_{\bar{E}}$                | 4,1779                             | $s_{\bar{E}}$                      | 0,9070                       |
|                     |                                    |                                    | $\bar{E} + s_{\bar{E}}$      | 4,1779                             | $\bar{E} + s_{\bar{E}}$            | 0,9070                       |
|                     |                                    |                                    | $\bar{E} - s_{\bar{E}}$      | -4,1779                            | $\bar{E} - s_{\bar{E}}$            | -0,9070                      |

Figure 1. Values of the global ranking indexes in the case of INPUTS

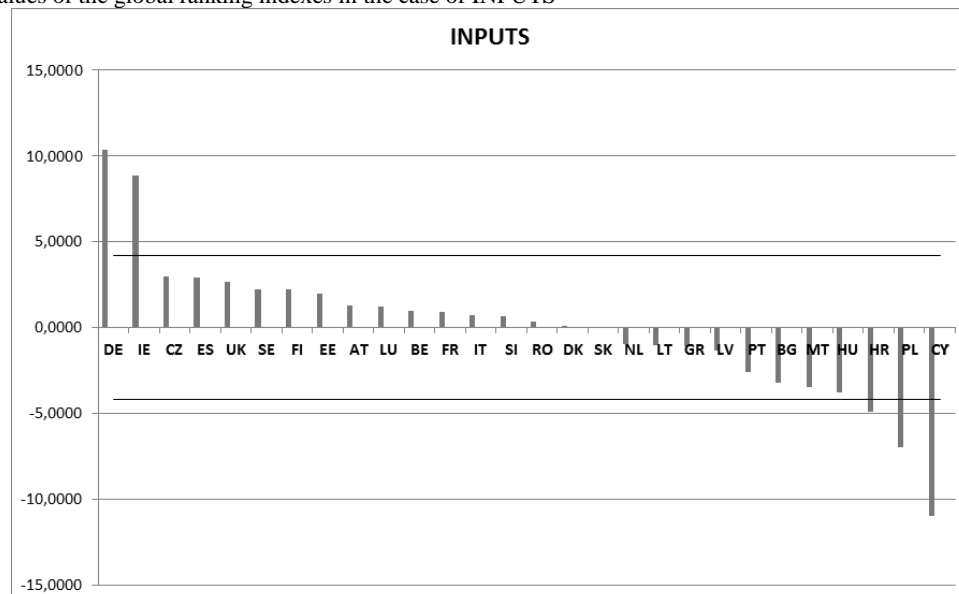


Table 4. Aggregated ratings of the eco-innovation level in European Union countries (GENERALLY)

| Country                 | Global superiority index ( $E^+$ ) | Global inferiority index ( $E^-$ ) | Global ranking index ( $E$ ) |
|-------------------------|------------------------------------|------------------------------------|------------------------------|
| (AT) Austria            | 1,9757                             | 1,0511                             | 0,9246                       |
| (BE) Belgium            | 1,6938                             | 1,0911                             | 0,6027                       |
| (BG) Bulgaria           | 0,7105                             | 2,9349                             | -2,2244                      |
| (CY) Cyprus             | 0,7956                             | 6,2216                             | -5,4261                      |
| (CZ) Czech Republic     | 2,2261                             | 1,1637                             | 1,0623                       |
| (DE) Germany            | 5,4862                             | 0,9123                             | 4,5739                       |
| (DK) Denmark            | 1,8505                             | 1,2121                             | 0,6384                       |
| (EE) Estonia            | 1,7306                             | 1,6053                             | 0,1253                       |
| (ES) Spain              | 2,2706                             | 0,8416                             | 1,4290                       |
| (FI) Finland            | 2,5582                             | 0,8749                             | 1,6833                       |
| (FR) France             | 1,8804                             | 0,8322                             | 1,0482                       |
| (GR) Greece             | 1,0700                             | 1,5420                             | -0,4720                      |
| (HR) Croatia            | 0,7684                             | 2,7883                             | -2,0199                      |
| (HU) Hungary            | 1,2760                             | 3,4732                             | -2,1973                      |
| (IE) Ireland            | 4,4653                             | 1,4786                             | 2,9867                       |
| (IT) Italy              | 1,7874                             | 1,0449                             | 0,7425                       |
| (LT) Lithuania          | 1,0705                             | 1,7951                             | -0,7246                      |
| (LU) Luxembourg         | 2,2125                             | 1,4561                             | 0,7564                       |
| (LV) Latvia             | 1,2206                             | 1,6560                             | -0,4353                      |
| (MT) Malta              | 0,7454                             | 2,8291                             | -2,0837                      |
| (NL) Netherlands        | 1,5522                             | 1,3416                             | 0,2106                       |
| (PL) Poland             | 1,0042                             | 3,9257                             | -2,9216                      |
| (PT) Portugal           | 1,4596                             | 2,6317                             | -1,1721                      |
| (RO) Romania            | 1,2247                             | 1,3729                             | -0,1482                      |
| (SE) Sweden             | 2,3439                             | 0,8866                             | 1,4573                       |
| (SI) Slovenia           | 1,4096                             | 0,7914                             | 0,6183                       |
| (SK) Slovakia           | 1,0508                             | 1,4147                             | -0,3640                      |
| (UK) United Kingdom     | 2,1769                             | 0,8474                             | 1,3295                       |
| $\bar{E}$               |                                    |                                    | 0,0000                       |
| $s_{\bar{E}}$           |                                    |                                    | 1,9500                       |
| $\bar{E} + s_{\bar{E}}$ |                                    |                                    | 1,9500                       |
| $\bar{E} - s_{\bar{E}}$ |                                    |                                    | -1,9500                      |

Figure 2. Values of the global ranking indexes in the case of OUTPUTS

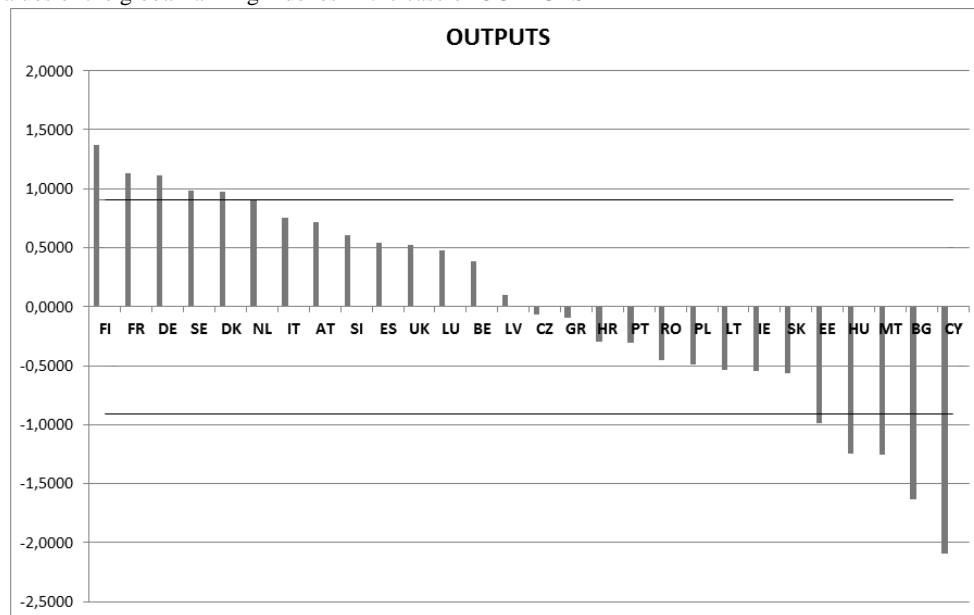


Table 5. Assignment of the European Union countries to defined eco-innovation classes

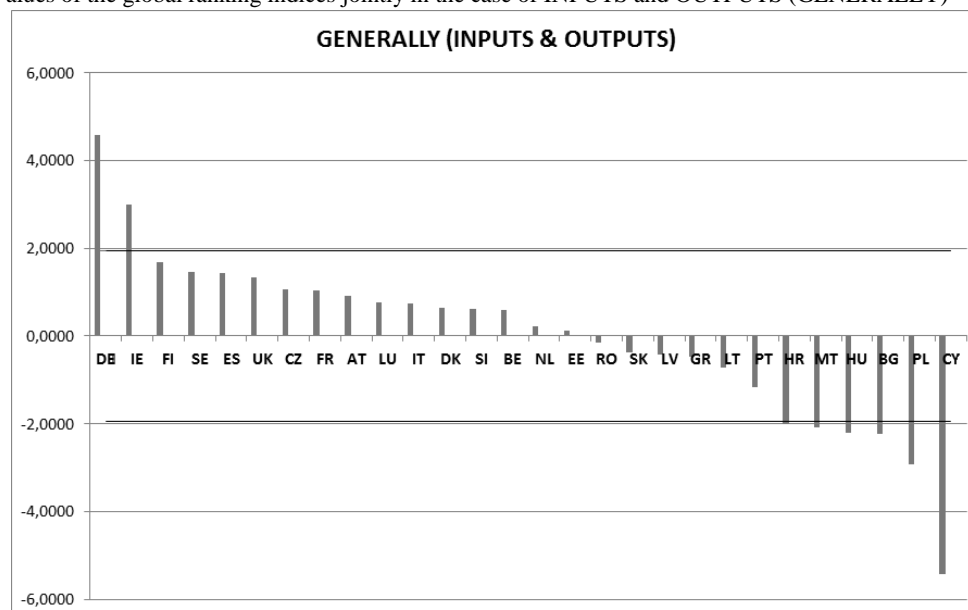
|                     | INPUTS                 |                     |                     |                           | OUTPUTS                |                     |                     |                           | GENERALLY              |                     |                     |                           |
|---------------------|------------------------|---------------------|---------------------|---------------------------|------------------------|---------------------|---------------------|---------------------------|------------------------|---------------------|---------------------|---------------------------|
|                     | Eco-innovation leaders | Good eco-innovators | Weak eco-innovators | Eco-innovation out-siders | Eco-innovation leaders | Good eco-innovators | Weak eco-innovators | Eco-innovation out-siders | Eco-innovation leaders | Good eco-innovators | Weak eco-innovators | Eco-innovation out-siders |
| (AT) Austria        |                        | X                   |                     |                           |                        | X                   |                     |                           |                        | X                   |                     |                           |
| (BE) Belgium        |                        | X                   |                     |                           |                        | X                   |                     |                           |                        | X                   |                     |                           |
| (BG) Bulgaria       |                        |                     | x                   |                           |                        |                     |                     | x                         |                        |                     |                     | x                         |
| (CY) Cyprus         |                        |                     |                     | X                         |                        |                     |                     | X                         |                        |                     |                     | X                         |
| (CZ) Czech Republic |                        | x                   |                     |                           |                        |                     | x                   |                           |                        | x                   |                     |                           |
| (DE) Germany        | X                      |                     |                     |                           | X                      |                     |                     |                           | X                      |                     |                     |                           |
| (DK) Denmark        |                        | x                   |                     |                           | x                      |                     |                     |                           |                        | x                   |                     |                           |
| (EE) Estonia        |                        | x                   |                     |                           |                        |                     |                     | x                         |                        | x                   |                     |                           |
| (ES) Spain          |                        | X                   |                     |                           |                        | X                   |                     |                           |                        | X                   |                     |                           |
| (FI) Finland        |                        | x                   |                     |                           | x                      |                     |                     |                           |                        | x                   |                     |                           |
| (FR) France         |                        | x                   |                     |                           | x                      |                     |                     |                           |                        | x                   |                     |                           |
| (GR) Greece         |                        |                     | X                   |                           |                        |                     | X                   |                           |                        |                     | X                   |                           |
| (HR) Croatia        |                        |                     |                     | x                         |                        |                     | x                   |                           |                        |                     |                     | x                         |
| (HU) Hungary        |                        |                     | x                   |                           |                        |                     |                     | x                         |                        |                     |                     | x                         |
| (IE) Ireland        | x                      |                     |                     |                           |                        |                     | x                   |                           | x                      |                     |                     |                           |
| (IT) Italy          |                        | X                   |                     |                           |                        | X                   |                     |                           |                        | X                   |                     |                           |
| (LT) Lithuania      |                        |                     | X                   |                           |                        |                     | X                   |                           |                        |                     | X                   |                           |
| (LU) Luxembourg     |                        | X                   |                     |                           |                        | X                   |                     |                           |                        | X                   |                     |                           |
| (LV) Latvia         |                        |                     | x                   |                           |                        | x                   |                     |                           |                        |                     | x                   |                           |
| (MT) Malta          |                        |                     | x                   |                           |                        |                     |                     | x                         |                        |                     |                     | x                         |
| (NL) Netherlands    |                        |                     | x                   |                           |                        | x                   |                     |                           |                        | x                   |                     |                           |
| (PL) Poland         |                        |                     |                     | x                         |                        |                     | x                   |                           |                        |                     |                     | x                         |
| (PT) Portugal       |                        |                     | X                   |                           |                        |                     | X                   |                           |                        |                     | X                   |                           |
| (RO) Romania        |                        | x                   |                     |                           |                        |                     | x                   |                           |                        |                     | x                   |                           |
| (SE) Sweden         |                        | x                   |                     |                           | x                      |                     |                     |                           |                        | x                   |                     |                           |
| (SI) Slovenia       |                        | X                   |                     |                           |                        | X                   |                     |                           |                        | X                   |                     |                           |
| (SK) Slovakia       |                        |                     | X                   |                           |                        |                     | X                   |                           |                        |                     | X                   |                           |
| (UK) United Kingdom |                        | X                   |                     |                           |                        | X                   |                     |                           |                        | X                   |                     |                           |

Attention:

X – the same assignment to a specific class in terms of Inputs, Outputs and Generally

x – assignment to a specific class in terms of Inputs, Outputs or Generally

Figure 3. Values of the global ranking indices jointly in the case of INPUTS and OUTPUTS (GENERALLY)



3. A leader of eco-innovation is Germany, and to a slightly lesser extent, Denmark, Finland, France, Ireland and Sweden.
4. A group of good eco-innovators includes Austria, Belgium, Spain, Italy, Luxembourg, Slovenia and United Kingdom, and to a slightly lesser extent, Czech Republic, Netherlands and Estonia.
5. A group of weak eco-innovators includes Greece, Lithuania, Latvia, Portugal, Romania and Slovakia.
6. An outsider of eco-innovation is Cyprus, and to a slightly lesser extent, Bulgaria, Croatia, Hungary, Malta and Poland.
7. For the 15 countries (Austria, Belgium, Cyprus, Germany, Spain, Finland, France, Greece, Italy, Lithuania, Luxembourg, Portugal, Slovenia, Slovakia and United Kingdom), it can be stated that they have a consistent assignment to a specific class of eco-innovation level both in terms of INPUTS and OUTPUTS. This shows that the indicators system of The Eco-Innovation Observatory is well designed and through OUTPUTS appropriately reflects the effects of eco-innovation policy, which is characterized by the INPUTS.

## 5. Conclusions

The Eco-Innovation Scoreboard can be important for each country to monitor their own eco-innovation level, as well as to compare this state with the achievements of other countries. In this paper there were analyzed values of the eco-innovation indicators, which are recently published by the Eco-Innovation Observatory as Eco-Innovation Scoreboard 2015. The evaluation of the eco-innovation level was carried out using a new multi-criteria analysis method (PROTERRA), that is a new method developed by the authors of this article.

Based on the analysis of the calculation results, the group of the eco-innovation leaders includes Germany, Denmark, Finland, France, Ireland and Sweden. Whereas, to the outsiders of eco-innovation may be qualified Cyprus, Bulgaria, Croatia, Hungary, Malta and Poland.

In the opinion of authors of this article, the results of analysis of the eco-innovation level broken down into INPUTS, OUTPUTS and GENERALLY (which base on indicators of The Eco-Innovation Scoreboard) show the strength and / or weakness of the European Union countries in this regard. As a result, they can be a valuable material that can help shape an appropriate eco-innovation policy by the governments of these countries.

## References

1. ARUNDEL A., KEMP R., PARTO S., 2006, Indicators for environmental innovation: What and how to measure, in: *The international handbook on environmental technology management*, ed. Marinova D., Annandale D. and Phillimore J., Edward Elgar, Cheltenham.
2. ASHFORD N.A., AYERS C., STONE, R.F., 1985, Using regulation to change the market for innovation, in: *Harvard Environmental Law Review*, vol. 9, p. 419-466.
3. BEHZADIAN M., KAZEMZADEH R.B., AL-BADVI A., AGHDASI, M., 2010, PROMETHEE: A comprehensive literature review on methodologies and applications, in: *European Journal of Operational Research*, vol. 200, p. 198-215.
4. BOSSINK B., 2013, *Eco-Innovation and Sustainability Management*. Routledge – Taylor & Francis Group, New York.
5. BRANS J.P., MARESCHAL B., VINCKE PH., 1984, PROMETHEE: A new family of outranking methods in multicriteria analysis, in: *Operational Research '84*, North-Holland, Amsterdam.
6. BRANS J.P., MARESCHAL B., 2005, PROMETHEE methods, in: *Multiple Criteria Decision Analysis: State of the Art Surveys*, ed. Figueira J., Greco S., Ehrgott M., Springer, New York.
7. DÍAZ-GARCÍA C., GONZÁLEZ-MORENO Á., SÁEZ-MARTÍNEZ F.J., 2015, Eco-innovation: insights from a literature review, *Innovation: Management, Policy & Practice*, vol.17, p. 6-23.
8. DIME.EU, [http://www.dime-eu.org/files/active/0/Foxon\\_Speirs\\_Pearson\\_final.pdf](http://www.dime-eu.org/files/active/0/Foxon_Speirs_Pearson_final.pdf), (09.12.2016).
9. DOUMPOS M., GRIGOROUDIS E. (eds.), 2013, *Multicriteria decision aid and artificial intelligence. Links, theory and applications*, John Wiley & Sons, Ltd., Chichester.
10. FIGUEIRA J., SALVATORE G., EHRGOTT M. (eds.), 2005, *Multiple criteria decision analysis: state of the art surveys*. Springer, Berlin-Heidelberg-New York.
11. FUKASAKU Y., 2005, The need for environmental innovation indicators and data from a policy perspective, in: *Towards environmental innovation systems*, ed. Weber M. and Hemmelskamp J., Springer, Berlin.
12. FUSSLER C., JAMES P., 1996, *Driving eco-innovation: A breakthrough discipline for innovation and sustainability*. Pitman Publishing, London.

13. JAFFE A.B., NEWELL R.G., STAVINS R.N., 2002, Environmental policy and technological change, in: *Environmental and Resource Economics*, vol. 22, p. 41-69.
14. JANASZ W., KOZIOŁ K., 2007, *Determinanty działalności innowacyjnej przedsiębiorstw*. PWE, Warszawa.
15. KANERVA M., ARUNDEL A., KEMP R., 2009, *Environmental innovation: Using qualitative models to identify indicators for policy*. United Nations University – MERIT, Maastricht.
16. KEMP R., PEARSON P., 2008, *Measuring eco-innovation (Final Report MEI project)*, UNU-MERIT, Maastricht.
17. KEMP R., PONTOGLIO S., 2008, The innovation effects of environmental policy instruments – A typical case of the blind men and the elephant. *Paper for DIME WP 2.5 Workshop on Empirical Analyses of Environmental Innovations*, Fraunhofer Institute for Systems and Innovation Research (ISI), 17-18 January, Karlsruhe.
18. KEMP R., 2011, Ten themes for eco-innovation policies in Europe. *S.A.P.I.E.N.S.*, vol. 4, p. 1-20.
19. LEGLER H., SCHMOCH U., GEHRKE B., KRAWCZYK O., 2003, Innovationsindikatoren zur Umweltwirtschaft, *Studien zum deutschen Innovationssystem*, Nr. 2., NIW and Karlsruhe: Fraunhofer Institut, Hannover.
20. LEITNER A., WEHRMEYER W., FRANCE CH., 2010, The impact of regulation and policy on radical eco-innovation: The need for a new understanding, in: *Management Research Review*, vol. 33, p. 1022-1041.
21. MATEO J.R., 2012, *Multi-criteria analysis in the renewable energy industry*. Springer-Verlag, London.
22. OLTRA V., KEMP R., DE VRIES F., 2007, *Patents as a measure for eco-innovation. Report for the MEI project*. University of Bordeaux, UNU-MERIT and University of Stirling, Bordeaux.
23. RENNINGS K., 2000, Redefining innovation – eco-innovation research and the contribution from ecological economics, in: *Ecological Economics*, vol. 32, p. 319-332.
24. SARKAR A.N., 2013, Promoting eco-innovations to leverage sustainable development of eco-industry and green growth, in: *European Journal of Sustainable Development*, vol. 2, p. 171-224.
25. SPEIRS J., PEARSON P., FOXON T., 2008, Adapting Innovation Systems Indicators to assess Eco-Innovation, in: *DIME working paper*, Brussels.
26. TZENG G.H., HUANG J.J., 2011, *Multiple attribute decision making. Methods and applications*. CRC Press, Taylor&Francis Group, Boca Raton.
27. VAN DER VOET E., VAN OERS L., MOLL S., SCHUTZ H., BRINGEZU S., DE BRUYN S., SEVENSTER M., WARRINGA G., 2005, *Policy review on decoupling: Development of indicators to assess decoupling of economic development and environmental pressure in the EU-25 and AC-3 countries*. Report commissioned by the European Commission, Leiden.
28. WIJEN F., ZOETEMAN K., PIETERS J., VAN SETERS P. (eds.), 2012, *A Handbook of globalisation and environmental policy*, Second edition. National government interventions in a global arena. Edward Elgar Publishing, Northampton.
29. ZOPOUNIDIS C., PARDALOS P.M. (eds.), 2010, *Handbook of multicriteria analysis*. Springer Verlag, Berlin-Heidelberg.



## Decomposition Analysis of the Greenhouse Gas Emissions in the European Union

### Analiza rozkładu emisji gazów cieplarnianych w krajach Unii Europejskiej

**Magdaléna Drastichová**

*VŠB-Technical University of Ostrava, Faculty of Economics, Department of Regional  
and Environmental Economics, Sokolská 33, 701 21 Ostrava, Czech Republic  
E-mail: magdalena.drastichova@vsb.cz*

---

#### Abstract

Climate change is a significant threat to sustainable development (SD). Using the Log-Mean Divisia Index Method (LMDI) a decomposition of the data on the greenhouse gas (GHG) emissions in the European Union (EU) in 2000-2013 is carried out. To detect if decoupling of the environmental variable represented by the GHG emissions from the economic variable represented by the GDP was taking place in the EU economy, the changes of the GHG emissions were divided into three effects. These factors include the economic activity (scale), the composition or structure of the EU economy with respect to the countries, and GHG intensity of the countries. The aim of the paper is to detect if decoupling of the GHG emissions from the GDP development in the EU took place and to detect the factors of this development. The intensity effect was mainly responsible for the reduction of the GHG emissions in the EU while the scale effect contributed to their increase. The role of the composition effect was only marginal; however, it was positive. As the intensity effect often showed the high negative values, the total effect was often negative as well, which means that decoupling of GHG emissions from GDP took place.

**Key words:** decomposition, climate change, European Union (EU), Greenhouse Gas Emissions (GHGs), Log-Mean Divisia Index Method (LMDI), Kyoto Protocol, sustainable development

**JEL Classification:** Q51, Q54, Q56, F64

#### Streszczenie

Zmiany klimatyczne stanowią istotne zagrożenie dla zrównoważonego rozwoju (ZR). Przy pomocy metody LMDI przeprowadzono analizę rozkładu emisji gazów cieplarnianych w krajach Unii Europejskiej (UE) w okresie lat 2010-2013. Aby sprawdzić, czy decoupling zmiennej środowiskowej reprezentowanej przez emisję gazów cieplarnianych od zmiennej ekonomicznej reprezentowanej przez PKB w kontekście zmian emisji gazów cieplarnianych zachodzi we Wspólnocie, uwzględniono następujące efekty: aktywność ekonomiczną (skalę), skład i strukturę europejskiej ekonomii z uwzględnieniem różnic charakterystycznych dla poszczególnych krajów i poziomu ich emisji gazów cieplarnianych. Celem artykułu jest potwierdzenie, czy decoupling emisji gazów cieplarnianych od wzrostu PKB faktycznie zachodzi i jakie czynniki na niego wpływają. Efekt intensywności okazał się być odpowiedzialny głównie za zmniejszenie emisji gazów cieplarnianych w Europie, podczas gdy efekt skali przyczyniał się do wzrostu tej emisji. Efekt struktury odgrywał rolę marginalną, choć pozytywną. Efekt intensywności zwykle charakteryzował się wysokimi wartościami ujemnymi, to samo odnosiło się do efektu całkowitego, co oznacza, że decoupling emisji gazów cieplarnianych od PKB faktycznie zachodzi.

**Słowa kluczowe:** dekompozycja, zmiany klimatyczne, Unia Europejska, emisja gazów cieplarnianych, metoda LMDI, Protokół z Kioto, rozwój zrównoważony

---

## 1. Introduction

Climate change is a significant threat to sustainable development (SD). The scientific community agrees that man-made GHG emissions are the dominant cause of Earth's average temperature increases over the past 250 years (IPCC, 2014). This has, among others, led to extreme weather conditions worldwide (Eurostat, 2016c). At the international level, the commitments related to the greenhouse gas (GHG) emission limitation / reduction are included in the *Kyoto Protocol (KP) to the United Nations Framework Convention on Climate Change* (UNFCCC) which is an international agreement linked to the UNFCCC. The KP commits its Parties by setting internationally binding emission reduction targets. It was adopted at the Conference of the Parties (COP) 7 in Kyoto / Japan, on 11<sup>th</sup> December 1997 and entered into force on 16<sup>th</sup> February 2005. Its first commitment period started in 2008 and ended in 2012. At the COP 18 in Doha / Qatar, on 8<sup>th</sup> December 2012, the *Doha Amendment to the Kyoto Protocol* was adopted which includes new commitments for Annex I Parties to the KP who agreed to take on commitments in a second commitment period from 1<sup>st</sup> January 2013 to 31<sup>st</sup> December 2020. During the first commitment period, 37 industrialized countries and the European Community (EC) committed to reduce GHG emissions to an average of 5% against 1990 levels. During the second commitment period, Parties (different composition) committed to reduce GHG emissions by at least 18% below 1990 levels in the eight-year period from 2013 to 2020. The EC / EU's commitments go beyond these basic commitments and the EU and its countries committed themselves to reduce the GHGs by 8% on average in the first period and by 20% on average in the second period (UNFCCC, 2015). However, the countries are provided with flexibility via the flexible mechanisms due to the different structures of their economies and therefore differences in the GHGs' reduction costs exist. Thus, the possibilities of the countries to reduce the GHG emissions also vary.

Sustainable development (SD) is a global challenge which requires a progressive transformation of economies (Hediger, 2006). The most quoted definition of the SD is that of the World Commission on Environment and Development (WCED, 1987) which claims that SD is *development that meets the needs of the present without compromising the ability of future generations to meet their own needs*. Although the term of SD is still vague there is a political consensus on its desirability (Daly, 1996). SD is amongst the top policy priorities worldwide (FEEM, 2011) and an overarching objective of the EU policies enshrined in its primary law. SD became a fundamental objective of the EU in 1997 when it was included in the *Treaty of Amsterdam*. Subsequently, the *EU Sustainable Development Strategy* (EU SDS) was launched in 2001 and renewed in 2006. The

2001 strategy is composed of two main parts. The first proposed objectives and policy measures to tackle the key unsustainable trends while the second part called for a new approach to policy-making that ensures the EU's economic, social and environmental policies mutually reinforce each other. Climate change is one of the results of the unsustainable trends, which are GHG emissions from human activity.

The aim of the paper is to detect if decoupling of the GHG emissions from the GDP development in the EU took place and to detect the factors, i.e. drivers of the development. The concept of decoupling environmental pressure from economic development is a useful tool of operationalizing SD concept. Decomposition analysis (DA) can subsequently reveal the factors behind de/coupling.

## 2. Theoretical Background

This section presents the introduction of the DA, its application with the more detailed focus on the emission issues, as well as the decoupling definitions. Particularly, the literature review with the relevant approaches applied in the analysis is presented.

### 2.1. Decomposition and Decoupling Analysis (Literature Review)

The DA and specifically the Index Decomposition Analysis (IDA) has become a widely accepted analytical tool for policymaking on national energy and environmental issues (Ang, 2004). Literature survey of IDA studies can be found in Ang and Zhang (2000) and a comparison and evaluation of IDA methods in Ang (2004). Ang and Zhang (2000) indicate that a survey in 1995 listed a total of 51 studies. Since then, new studies and new decomposition methods have been reported and the methodology has been increasingly used in energy-related environmental analysis. Decomposition methodology has traditionally been applied to decompose changes in an aggregate indicator over time in a country. Proops et al. (1993), Chung (1998), and Ang and Zhang (1999) used this methodology for cross-country comparisons.

The decomposition studies, and particularly the IDA, have been mostly applied in the former EU-15 countries and Asia, mainly in China, with some applications in the USA and Canada, and the OECD countries. Very few applications of the DA have been carried out for African countries, which is likely due to the insufficient availability of data. There are few applications in the region of Central and Eastern Europe (Tsuchimoto and Ščasný, 2011). Viquier (1999) and Cherp et al. (2003) decompose air emissions for several Central and Eastern European countries, while Brůha and Ščasný (2006) or Tsuchimoto and Ščasný (2011) decompose changes in emissions year-by-year for the Czech Republic. Vehmas et al. (2008) apply the DA to examine changes in several

indicators. Their analysis is mainly focused on the indicators in the EU SDIs set and the DA carried out is based on the Advanced Sustainability Analysis (ASA) approach and a revised Sun/Shapley decomposition technique.

Overall, the IDA has also become a useful tool in energy and environmental analysis in general (Ang and Zhang, 2000) and as a part of such analysis also one of the common methods of the emissions trends analysis (Tsuchimoto and Ščasný, 2011) including CO<sub>2</sub> emission topics. As climate change and GHG emissions became a global issue in 1990s, IDA was first extended from energy consumption to energy-related CO<sub>2</sub> emission studies in 1991. Since then many studies have been reported for various countries and emission sectors. Xu and Ang (2013) elaborated a comprehensive literature survey and revealed the relative contributions of key effects on changes in the aggregate carbon intensity by emission sector and by country. Concerning IDA methodology, decomposition models for analyzing emission changes are slightly more complex than those for energy consumption changes. More factors are normally included in the IDA identity and a larger dataset is generally needed. Thus, IDA is a useful analytical tool for studying the drivers of changes in CO<sub>2</sub> emissions. In energy-related CO<sub>2</sub> emission studies, more effects are included as the aggregate emissions depend on the fuel mix in energy consumption (Xu and Ang, 2013). Xu and Ang (2013) also concluded that that energy intensity change was generally the key driver of changes in the aggregate carbon intensity in most sectors and countries. In most cases, it contributed to decreases in the aggregate carbon intensity. If energy intensity is taken as a proxy for energy efficiency, improvements in energy efficiency have been the main driver of decreases in the aggregate carbon intensity for most sectors in most countries. The contribution of activity structure change and that of carbon factor change have been less significant. While there were some uniform patterns among countries with respect to the underlying developments of the aggregate carbon intensity, there were also diversities, which led to differences in development among countries. This has implications on future development of CO<sub>2</sub> emissions, especially of the developing countries. This also indicates that to reduce growth in future CO<sub>2</sub> emissions, countries should focus more on activity structure and carbon factor. Description and application of the DA to CO<sub>2</sub> emissions in Germany can be found in Seibel (2003).

## 2.2. Decoupling Definition and Indicators

The aim of the Paper is to detect if decoupling of GHG emissions from GDP development took place. The decoupling concept refers to breaking the link between two variables, often referred to as the driving force, mainly economic growth expressed in terms of GDP, and the environmental pressures, such as the use of natural resources (materials, energy,

land, etc.), the generation of waste, and the emission of pollutants to air or water, etc. Thus, decoupling indicates breaking the link between environmental bads and economic goods (OECD, 2002). It points out the relative growth rates of a direct pressure on the environment and of an economically relevant variable to which it is causally linked. The purpose of decoupling indicators is to monitor the interdependence between these two different spheres and they usually measure the decoupling of the environmental pressure from the economic growth over a given period (OECD, 2003). Decoupling occurs when the growth rate of the economic driving force exceeds the growth rate of the environmental pressure over a given period. It can be either absolute or relative. The first takes place when environmental variable is stable or decreasing while the economic one is growing. Decoupling is relative when the environmental variable is growing, but at a lower rate than the economic variable (OECD, 2002). Generally, decoupling is the process that is inevitable to draw closer and achieve the SD path. Therefore, decoupling is also applied in the monitoring of the SD in the EU using the decoupling indicators (Drastichová, 2014).

## 3. Data and Methodology

In this section the source of used data, the indicators and the applied DA methodology are introduced.

### 3.1. Data

The used indicators related to the climate change are included in the Sustainable Development Indicators (SDIs) set for monitoring of the EU SDS which are presented in ten themes. They include more than 130 indicators, while ten of them were identified as headline indicators (Eurostat, 2016b).

The annual GHG emissions are estimated and reported under the UNFCCC, the KP and the Decision 280/2004/EC. The EU as a party to the UNFCCC reports annually its GHG inventory for the year t-2 and within the area covered by its Member States. The inventory also constitutes the EU-15 submission under the KP while the Kyoto basket includes six gases: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF<sub>6</sub>). The impact of land use, land use changes and forestry (LULUCF) on the GHG inventories is excluded. International aviation is included. Emissions are weighted according to the global warming potential of each gas. Emissions in CO<sub>2</sub>-equivalents are obtained using their global warming potential (GWP) where the following weighting factors are used: CO<sub>2</sub>=1, CH<sub>4</sub>=21 and N<sub>2</sub>O=310, SF<sub>6</sub>=23900. HFCs and PFCs comprise a large number of different gases that have different GWPs (Eurostat, 2016c). The GHG (in CO<sub>2</sub> equivalent) indexed to 1990 indicator shows trends in total man-made emissions of the

Kyoto basket of GHGs. The indicator does not include emissions and removals related to LULUCF, nor does it include emissions from international maritime transport. GHG emissions from international aviation are included (not included in the data, which is indexed to the Kyoto base year because these emissions are not covered by the KP).

The GHG emissions indicators are included in the EU SDI used for the assessment of the progress towards the objectives and targets of the EU SDS. The latter indicator, i.e. indexed to 1990, serves as a headline indicator for the whole *Climate Change and Energy* theme and the former, i.e. in million tonnes, as one of the operational indicators for the *Climate Change* subtheme in this theme.

It is important to choose the appropriate GDP indicator for this analysis. As the EU-28 is analysed, data of Eurostat (Eurostat, 2016a) are used. Firstly, GDP in chain linked volumes (CLV) (2010), million euro, and secondly, GDP in current prices, million Purchasing Power Standards (PPS) are used. When PPS series are used, different price levels between countries are removed and they should be used for cross-country comparisons in a specific year but they do not constitute time series. Chain-linked level series are created by successively applying previous year's price's growth rates to the current price figure of a specific reference year, in this case 2010. On the other hand, chain-linking involves the loss of additivity for all years except the reference year and the directly following year, as these are the only periods expressed in prices of the reference year. For other years, chain-linked components of GDP will not sum to chain-linked GDP, and chain-linked Member States' GDP will not sum to chain-linked EU GDP. However, there are no GDP figures, which allow for comparisons in two dimensions, both time and geographic area. GDP in CLV PPS to a reference year should be used to compare countries over time, but it does not exist (Eurostat, 2014). Thus, both above-mentioned GDP indicators are applied in the DA to better estimate the effect of the factors.

As it was explained above, chain-linking involves the loss of additivity and the sum of EU countries GDP figures in chain-linked volumes does not exactly equal to the EU-28's aggregate level. For GDP in CLV the highest deviation reached 0.199% (2000). In the case of GDP in PPS, the deviations are only marginal while the highest reached only 0.012% (2013). As the EU economy is the subject of the analysis and its structure is based on the countries, it would be difficult to redistribute these deviations among the countries. However, in percentage terms, these deviations are relatively low and therefore, the results of the analysis can still be regarded as reliable.

### 3.2. Methodology

The DA is aimed at explaining the channels through which certain factors affect a variable (Tsuchimoto

and Ščasný, 2011). Thus, the different factors need to be identified whereas this is fully a case-specific issue (Vehmas et al., 2008). There are two basic streams of DA, concretely the SDA, which is based on input-output (IO) models, and the IDA founded on index theory. While the SDA can distinguish between a variety of technological and final demand effects which IDA is not able to detect and can also capture the indirect effects, i.e. the effect of a direct change in demand of one sector on the inputs of other sectors, the IDA merely considers the direct effects, but requires less data. However, the simplicity and flexibility of the IDA methodology make it easy to be adopted in comparison to the SDA where IO tables are required (Ang, 2004). The starting point of any DA is to create an equation by means of which the relations between a dependent variable and several *underlying causes*, i.e. factors, are defined. In that equation, the product of all the factors has to be equal to the variable, the change of which is analyzed in this DA. The selected factors are often the ratios where the denominator of one factor is equal to the numerator of the next one. As regards the DA in the environmental field, the environmentally-related variable is often decomposed into three factors which affect its development. The first, *scale*, or *activity factor*, measures the change in the aggregate associated with a change in the overall level of the activity. The second, *composition*, or *structural factor*, is related to changes in the structure of the economy, i.e. the change in the aggregate linked to the change in the mix of the activity by sub-category. It is usually measured via the share of partial, often sectoral, production in overall production assuming the constant scale of economy and technologies. Thirdly, *intensity*, or *technique factor*, expresses the input intensity of a partial / sectoral production, such as the material, or emission intensity to produce a unit of an output. More generally, it is the change in the aggregate associated with changes in the sub-category *environmental intensities* (Tsuchimoto and Ščasný, 2011).

For the IDA various decomposition methods can be formulated to quantify the impacts of the factors changes on the aggregate. The two most important decomposition approaches are the methods based on the Divisia Index including the LMDI and those based on the Laspeyres Index (Ang, 2004). For both categories, the decomposition can be performed additively or multiplicatively and the choice between the two is arbitrary (Ang, 2004). In multiplicative decomposition the *ratio* change of an aggregate, and in the additive approach its *difference* change, is decomposed (Ang, 2004). The differences lie in ease of result presentation and interpretation (Ang and Zhang, 2000). For the Divisia index based methods, Ang and Choi (1997) proposed a refined Divisia method based on the multiplicative form using a logarithmic mean weight function instead of the arithmetic mean weight function.

Table 1. Formulas for Multiplicative and Additive LMDI Decomposition, source: Ščasný and Tsuchimoto (2011), Ang and Zhang (2000), own elaboration

| Multiplicative LMDI  | Additive LMDI  |
|--|--|
| $E_{total} = \frac{E_T}{E_0} = E_{x1} \times E_{x2} \times E_{x3} \dots \times E_{xn}$ (2)                             | $\Delta E_{total} = E_T - E_0 = \Delta E_{x1} + \Delta E_{x2} + \Delta E_{x3} + \dots + \Delta E_{xn}$ (3) |
| $E_{total} = \frac{E_T}{E_0} = E_{act} \times E_{str} \times E_{int}$ (4)  | $\Delta E_{total} = E_T - E_0 = \Delta E_{act} + \Delta E_{str} + \Delta E_{int}$ (5)                      |
| $E_{xk} = \exp\left(\sum_i \frac{L(E_i^T, E_i^0)}{L(E^T, E^0)} x \ln\left(\frac{x_{ki}^T}{x_{ki}^0}\right)\right)$ (6) | $E_{xk} = \sum_i L(E_i^T, E_i^0) \times \ln\left(\frac{x_{ki}^T}{x_{ki}^0}\right)$ (7)                     |

Table 2. Description of Variables and Formulas used in the Analysis, source: Ščasný and Tsuchimoto (2011), Ang and Zhang (2000), author's elaboration

| Formula   | Indication               | Description  |
|---|--------------------------|--|
| $\frac{GHG}{GDP} = \sum_i \frac{GHG_i}{GDP_i}$          | Greenhouse Gas Emissions | $GHG_i$ : GHG emissions in country $i$ ; $GHG$ : total GHG emissions in the EU; (in tonnes, in period $t$ )  |
| $\Delta_t \frac{GDP_i}{GDP} = \sum_i \frac{GDP_i}{GDP}$ | Scale effect             | The scale (activity) effect: the effect of change in performance of whole economy on the GHG change, i.e. the effect of the economic growth; $GDP_i$ : GDP in country $i$ ; $GDP$ : overall GDP of the whole EU economy (in period $t$ ).        |
| $\Delta_t \frac{GDP_i}{GDP} (S_i)$                      | Composition effect       | The composition (structural) effect: the effect of changes in countries' GDP on the change in GHG emissions levels.  |
| $\Delta_t \frac{GHG_i}{GDP_i} (I_i)$                    | Intensity effect         | The intensity effect: the effect of changes in GHG emissions intensity across countries. The GHG intensities in country $i$ in period $t$ : the ratio between the GHG and the production in GDP terms in the EU countries: $I_i = GHG_i/GDP_i$ . |

The logarithmic mean of two positive numbers  $x$  and  $y$  is defined as:

$$L(x, y) = \frac{y-x}{\ln(\frac{y}{x})}; \text{ If } x \neq y, \text{ otherwise } L(x, y) = x; (1)$$

From the theoretical foundation viewpoint, the LMDI I methods seem to be the most appropriate ones. They comply with basic tests for a good index number, i.e. the factor-reversal test as well the time-reversal test. It is a perfect, i.e. no residual decomposition. Multiplicative and additive DA results are linked by a simple formula. The multiplicative LMDI I also possesses the additive property in the log form. Next, the quantitative foundation of the applied DA using the LMDI is presented by Eq. 2 – 12. This method is used because it complies with the property of perfect decomposition, i.e. no residuals are generated and there is a clear linkage between the additive and the multiplicative decomposition. The general formulas are included in Tab. 1. For the multiplicative LMDI decomposition, the formulas are presented in the first column, expressed by Eq. 2, 4, 6 and for the additive LMDI in the second column by Eq. 3, 5, 7. Total environmental effect ( $E_{total}$ ) from period 0 to period  $T$  is generally decomposed into  $n$  factors where  $E_{xk}$  denotes the contribution of  $k^{th}$  factor to the change in total environmental effect from 0 to  $T$  (Eq. 2 and 3). In terms of three-factor DA  $E_{total}$  is divided into an activity effect ( $E_{act}$ ), a structural effect ( $E_{str}$ ) and an intensity effect ( $E_{int}$ ) (Eq. 4 and 5). Applying the LMDI methodology, the three effects are calculated from Eq. 6 and 7, using the logarithmic weights for the corresponding effects, where  $i$  denotes countries.

Regarding the appropriate properties of the additive form of LMDI decomposition, it is described in detail. Resulting from Eq. 7, the three effects are calculated:

$$\Delta E_{act} = \left(\sum_{i=1}^n L(E_i^0; E_i^T) * \ln\left(\frac{Y^T}{Y^0}\right)\right), \quad (8)$$

$$\Delta E_{str} = \left(\sum_{i=1}^n L(E_i^0; E_i^T) * \ln\left(\frac{S_i^T}{S_i^0}\right)\right), \quad (9)$$

$$\Delta E_{int} = \left(\sum_{i=1}^n L(E_i^0; E_i^T) * \ln\left(\frac{I_i^T}{I_i^0}\right)\right), \quad (10)$$

where symbols  $Y$ ,  $S$ ,  $I$  indicate the scale, structure and intensity effect respectively and according to the Eq. 1 we obtain:

$$L(E_i^0; E_i^T) = \frac{E_i^T - E_i^0}{\ln E_i^T - \ln E_i^0}. \quad (11)$$

Applying the IDA to the relation of GHG emissions and GDP development, the variables and formulas are described in Tab. 2. As the analysis is aimed at the EU and its countries, the structural effect is based on the *structure of the EU*, i.e. its countries. This kind of analysis is crucial to examine the SD path in the EU, because this methodology is applied to the issue of decoupling, i.e. the one operationalizing SD, putting this concept into practise. Moreover, this analysis is applied to the EU SDIs that are the main indicators for monitoring the EU SDS. These indicators are organized in a theme-oriented framework and thus the concrete interlinks among the SD issues are less visible. So, they can be clearly detected using the DA.

Using the additive decomposition, the total GHG emissions in the EU in period  $t$  is split into three components:



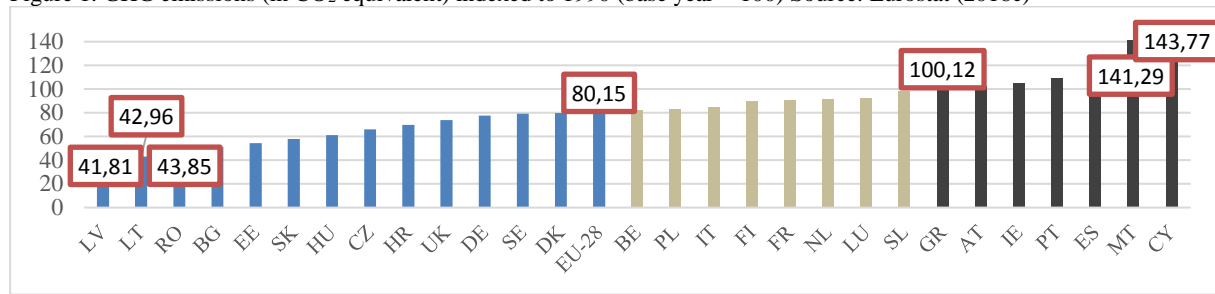
Figure 1. GHG emissions (in CO<sub>2</sub> equivalent) indexed to 1990 (base year = 100) Source: Eurostat (2016c)

Table 3. Results of the year-by-year DA using GDP in CVL (2010) Source: author's calculations

|   | 2001   | 2002  | 2003  | 2004  | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  | 2013  |
|---|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| S | 2.221  | 1.336 | 1.317 | 2.529 | 2.065 | 3.328 | 3.053 | 0.496 | 4.326 | 2.081 | 1.720 | 0.475 | 0.186 |
| C | 0.160  | 0.308 | 0.442 | 0.382 | 0.332 | 0.438 | 0.485 | 0.463 | 0.191 | 0.066 | 0.096 | 0.061 | 0.080 |
| I | -1.482 | 2.466 | 0.025 | 2.864 | 3.059 | 3.828 | 4.594 | 3.067 | 3.068 | 0.220 | 4.902 | 1.041 | 2.097 |
| T | 0.900  | 0.823 | 1.734 | 0.048 | 0.662 | 0.062 | 1.055 | 2.108 | 7.203 | 2.235 | 3.086 | 1.455 | 1.832 |

Note: S – scale effect; C – Composition Effect; I – Intensity Effect; T – Total Change (Effect)

$$\Delta_t \text{GHG} = \sum_i \Delta_i \text{GDP} + \Delta_t \frac{\text{GDP}_i}{\text{GDP}_1} + \Delta_t \frac{\text{GHG}_i}{\text{GDP}_1} = \sum_{i=1}^n Y + S_i + I_i, \quad (12)$$

where all the components are described in Tab. 2 ( $i$  – the country,  $t$  – the period).

#### 4. Results of Analysis

Firstly, the EU countries' results of meeting the KP commitments and subsequently the results of LMDI decomposition of GHG emissions are presented in this section.

##### 4.1. The GHG emissions development in the EU

Many of the EU countries achieved significant progress towards meeting the commitments of the KP in the first and also in the second period while some countries have already met the commitments of the second one (see Fig. 1). Nine transition economies, except for Cyprus, Malta, Slovenia and Poland, achieved the GHG emissions reduction by more than 30% in 2013 compared to 1990, while three of them, i.e. Lithuania, Latvia and Romania, even more than 50%. The emissions increased only in seven countries including Cyprus and Malta showing the highest growth (more than 40%), three Southern countries, Ireland and Austria. Twelve countries already achieved the higher reduction than 20% in 2012 and thirteen in 2013. The EU as a whole showed the reduction of 19.85% in 2013 and thus significant progress has been made towards meeting the Kyoto commitments.

The development of the GHG emissions can be assessed as quite positive, when significant reduction

was achieved. The only two cases of significant increase occurred in small island states, Malta and Cyprus, both with low level of the overall GHG emissions (3.125 and 9.045 mill. tonnes in 2013 respectively). The transitive economies have had great potential to reduce GHG emissions due to the inefficient resource use in the former regime and the majority of them showed the highest drops (Fig. 1). The countries with the highest total emissions, Germany and the United Kingdom (604.272 and 976.326 mill. tonnes in 2013 respectively), also showed significant drop of emissions compared to 1990. The progress of other major producers of GHGs, such as France, Italy, Poland, Spain and Netherlands, was slower. The varied progress is the result of differences in the structures of economies, their resource base and a range of other factors affecting their possibilities to reduce GHG emissions.

##### 4.2. Decomposition Analysis of GHG emissions in the EU

The results of the year-by-year DA are presented in Tab. 3 using GDP in CVL (2010) and in Tab. 4 using GDP in PPS as indicators of economic activity. Before the results of the DA are assessed, the annual changes of GDP and GHG emissions are investigated to detect if decoupling took place. For GDP this results from the first line of Tab. 3 for GDP in CLV<sup>1</sup> and Tab. 4 for GDP in PPS while the last lines of these Tables show the GHG emissions changes. There is only one year in the monitored period with no decoupling at all, i.e. 2003. The absolute decoupling took place in 2002, in every year from 2005 to

<sup>1</sup> As it was mentioned in Section 2.1., chain-linking involves the loss of additivity and thus the growth rates of the aggregate slightly differ from the growth of the sum of

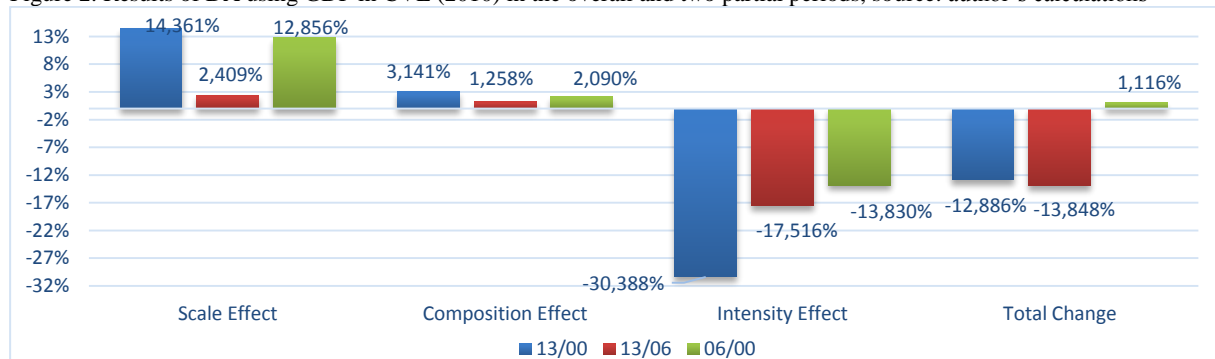
the GDPs of the EU countries. However, the direction remains the same and the differences are quite marginal.

Table 4. Results of the year-by-year DA using GDP in PPS, source: author's calculations

|   | 2001   | 2002   | 2003   | 2004   | 2005   | 2006   | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | 2013   |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| S | 4.092  | 3.616  | 1.620  | 4.922  | 4.362  | 5.611  | 5.810  | 0.614  | 5.650  | 4.350  | 2.923  | 1.881  | 0.846  |
| C | 0.114  | 0.295  | 0.352  | 0.350  | 0.143  | 0.254  | 0.390  | 0.277  | 0.267  | 0.188  | 0.122  | 0.145  | 0.032  |
| I | -3.306 | -4.734 | -0.238 | -5,223 | -5.167 | -5.927 | -7.255 | -2.998 | -1.820 | -2.303 | -6.131 | -3.481 | -2.711 |
| T | 0.900  | 0.823  | 1.734  | 0.048  | 0.662  | 0,062  | 1.055  | 2.108  | 7.203  | 2.235  | 3.086  | 1.455  | 1.832  |

Note: S – scale effect; C - Composition Effect; I – Intensity Effect; T – Total Change (Effect)

Figure 2. Results of DA using GDP in CVL (2010) in the overall and two partial periods, source: author's calculations



2008, in 2011 and 2013. In 2001 and 2004, the relative decoupling occurred as the GHG emissions annually increased but as slower rate than GDP. In 2009, the most significant effects of the economic crisis became evident as both GDP and GHG emissions dropped, but the emissions decreased more significantly. The results for 2010 and 2012 are not clear. In 2010, there is no decoupling when GDP in CLV is used and the relative decoupling when GDP in PPS is used due to the fact that emissions annually increased, but the GDP in PPS increased more and GDP in CLV less than GHG emissions. Emissions dropped in 2012, similarly GDP in CLV, but at lower rate. On the other hand, GDP in PPS slightly increased. It is obvious that the results in more recent period, since 2009, have significantly been affected by the effects of the economic crisis.

As regards the overall / average change, the scale and composition effects are positive and the intensity and total effects are negative for both indicators. The intensity effect followed by the scale effect reached the highest levels when GDP in PPS is used. For GDP in CVL these numbers are relatively lower. On the other hand, the composition effect showed the lowest absolute value; lower when GDP in PPS is used. Concerning the annual changes, the scale and composition effects are predominantly positive. The scale effect was only negative in 2009 for both and in 2012 when GDP in CVL is used. The composition effect is only negative in 2010 when GDP in CVL is used and still positive when GDP in PPS is used as the indicator of economic activity. The intensity effect is still negative except for 2010 when GDP in CLV is used. Thus in 2010 the results diverge concerning the direction of the composition and intensity effect. The results correspond with the kind of

decoupling indicated above and those of the more recent period can still be affected by the economic crisis. Although the intensity effect in 2013 helped reduce the overall GHG, the scale effect was low due to the very slow economic growth.

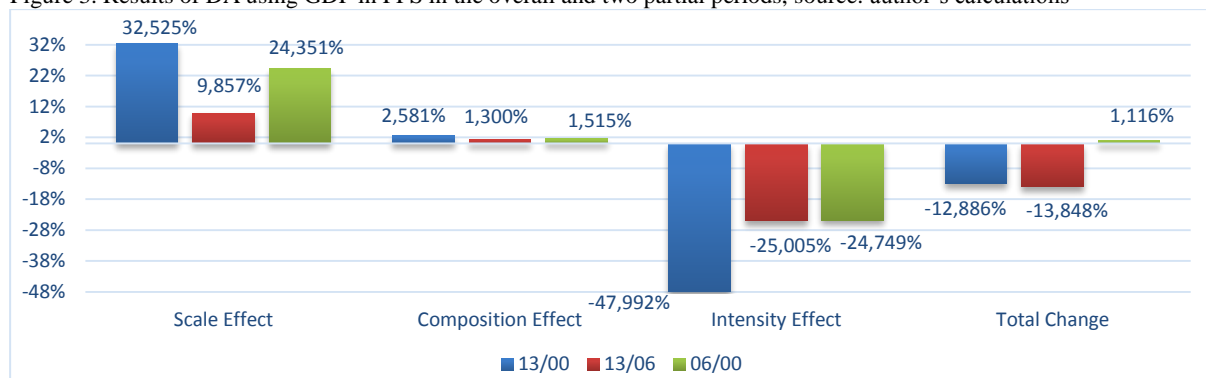
The changes for the overall and two partial periods are depicted in Fig. 2 and 3. These results confirm those of the year-by-year DA. The intensity effect showed the highest extent, but it is negative. This also affected the total effect, which is negative as well (except for period 2000-2006), but lower in absolute values, because it is also affected by other two effects, which were positive in overall as well as in both partial periods. While the scale effect also showed the relative higher absolute values, the composition effect was only marginal.

Comparing Fig. 2 and 3, it can be seen that the extent of the scale and intensity effect is relatively higher when GDP in PPS is used, but the application of this indicator led to the lower extent of the composition effect, except for period 2006-2013.

It can be concluded that the intensity effect has mainly been responsible for the reduction of the GHG emissions in the EU while the scale effect has contributed to their increase. However, in the overall and both partial periods the intensity effect showed the higher absolute value. The role of composition effect was only marginal, however, it was positive and in period 2000–2006, the positive effects outweighed the negative intensity effect and the GHG emissions increased. In the second partial period 2006-2013 and the overall period 2000-2013, the GHG emissions dropped due to the significant contribution of the negative intensity effect.

This results from the effort of the EU and its countries to meet the international commitments, particu-

Figure 3. Results of DA using GDP in PPS in the overall and two partial periods, source: author's calculations



larly those of the KP, and of a large number of corresponding laws, strategies to reduce GHG emissions, such as the long term EU SDS and Europe 2020 strategy, many initiatives, mitigation and adaptation measures. These activities also respond to the commitments included in the primary law of the EU, where in the wording of the Lisbon Treaty, *Union policy on the environment shall contribute to the objectives of promoting measures at international level to deal with regional or worldwide environmental problems, and in particular combating climate change* (EU, 2012). The structure of the EU institutions has also been adapted to better meet the objectives related to combating climate change (e.g. establishment of the Directorate-General for Climate Action in the European Commission). The significant effort to reduce GHG emissions and the impacts of climate change still needs to be deepened not only in the EU, but also worldwide, as the effects are still more visible. Although some flexibility in commitments of the countries is inevitable due to their different conditions, the major producers should take responsibility and apply appropriate structural reforms. As it results from the analysis, the role of the composition effect in the EU has been marginal. The EU is composed of the countries with significant differences in the overall GHG emissions and successful reduction mainly depends on the major producers. On the other hand, the international aspects of this issue should also be considered.

## 5. Conclusions

The aim of the paper was to detect if decoupling of the GHG emissions from the GDP development in the EU took place and to detect the factors of the development. The IDA and the LMDI method were applied to examine the GHG emissions development in the EU. The EU as a whole showed significant reduction of GHG emissions and thus the steady progress has been made towards meeting the Kyoto commitments. However, the progress varied among the countries. This is the result of distinction between the structures of their economies, their resource base and other factors affecting their reduction possibilities.

In the monitored period 2000-2013 and the second partial period 2006-2013, the GHG emissions dropped in the EU due to the significant contribution of the negative intensity effect. The intensity effect was mainly responsible for the reduction of the GHG emissions in the EU while the scale effect contributed to their increase. The role of composition effect was only marginal; however, it was positive. In the overall period 2000-2013 and both partial periods, the intensity effect showed the higher absolute value. Only in the first partial period 2000-2006, the positive scale and composition effects together outweighed the negative intensity effect and the GHG emissions increased. However, this trend was already reversed. As regards the year-by-year DA, the results are similar; the major exception is the year 2009 with the negative scale effect caused by the economic recession. The total change of GHG emissions was negative in the majority of the years and decoupling took place, often its absolute alternative. No decoupling was typical only of 2003, but the more recent years were affected by the economic crisis and the results are ambiguous. The economic problems, such as the most recent economic crisis, can significantly affect the results. In 2009, the GDP as well as GHG emissions dropped while the emissions dropped more significantly. This is not the result of structural reforms, but economic problems and recession. While the absolute decoupling occurred in the last monitored year 2013, it was also not only affected by the negative intensity effect, but also by very small scale effect.

Thus, the appropriate structural reforms are needed to further reduce the GHG intensity of the GDP, i.e. to strengthen the negative intensity effect, which can lead to the reduction of the GHG emissions also by stronger economic growth. The EU should continue in institutional improvements, adopting appropriate legislation and strategies to combat climate change. The major producers should intensify their efforts and the international aspects of the problem should be taken into account.

## References

1. ANG B. W., 2004, Decomposition analysis for policymaking in energy: which is the preferred method?, in: *Energy Policy*, vol. 32, no 9, p.1131-1139.
2. ANG B.W., CHOI K. H., 1997, Decomposition of Aggregate Energy and Gas Emission Intensities for Industry: A Refined Divisia Index Method, in: *Energy Journal*, vol.18, no 3, p.59-73.
3. ANG B. W., ZHANG, F. Q., 2000, Survey of Index Decomposition Analysis in Energy and Environmental Studies, in: *Energy*, vol. 25, no 12, p. 1149-1176.
4. ANG B.W., ZHANG F. Q., 1999, Inter-regional Comparisons of Energy-related CO<sub>2</sub> Emissions using the Decomposition Technique, in: *Energy*, vol. 24, no 4, p. 297-305.
5. BRŮHA, J., ŠČASNÝ, M., 2006, Economic Analysis of Driving Forces of Environmental Burden during the Transition Process: EKC hypothesis testing in the Czech Republic. Paper presented at the 3rd Annual Congress of Association of Environmental and Resource Economics (AERE), Kyoto, 4-7 July, 2006.
6. DALY H. E., 1996, *Beyond Growth: the Economics of Sustainable Development*, Beacon Press, Boston.
7. DRASTICHOVÁ M., 2014, Monitoring Sustainable Development and Decoupling in the EU, in: *Ekonomická revue - Central European Review of Economic Issues*, vol. 17, no 3, p.125-140.
8. EU, 2012, *Consolidated Version of the Treaty on the Functioning of the European Union*. Official Journal of the European Union, C 326/132.
9. EUROSTAT, 2016a, *Data. Database. Economy and Finance*, <http://ec.europa.eu/eurostat/data/database> (10.12.2016).
10. EUROSTAT, 2016b, *Sustainable development indicators. Indicators*, <http://ec.europa.eu/eurostat/web/sdi/indicators> (10.12.2016).
11. EUROSTAT, 2016c, *Sustainable development indicators. Indicators. Climate change and energy*, <http://ec.europa.eu/eurostat/web/sdi/indicators/climate-change-and-energy> (15.12.2016).
12. EUROSTAT, 2014, *Eurostat Metadata. Annual National Accounts (nama\_10)* [http://ec.europa.eu/eurostat/cache/metadata/en/nama\\_10\\_esms.htm](http://ec.europa.eu/eurostat/cache/metadata/en/nama_10_esms.htm) (16.12.2016).
13. FEEM, 2011, *Sustainability Index. Methodological Report* [http://www.feemsi.org/documents/methodological\\_report2011.pdf](http://www.feemsi.org/documents/methodological_report2011.pdf) (10.12.2016).
14. HEDIGER W., 2006. Weak and Strong Sustainability, Environmental Conservation and Economic Growth, in: *Natural Resource Modeling*, vol. 19, no 3, pp. 359-394.
15. CHERP A., KOPTEVA I., MNATSAKANIAN R., 2003, Economic transition and environmental sustainability: effects of economic restructuring on air pollution in the Russian Federation, in: *Journal of Environmental Management*, vol. 68, no 2, p.141-151.
16. IPCC, 2014, Summary for policymakers. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects*. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, p. 1-32.
17. OECD, 2002, Sustainable Development. Indicators to measure Decoupling of Environmental Pressure from Economic Growth. [SG/SD (2002) 1/FINAL.], OECD, Paris.
18. OECD, 2003, OECD Environmental Indicators. Development, Measurement and Use [Reference Paper], OECD, Paris.
19. PROOPS J. L. R., FABER M., WAGENHALS G., 1993. *Reducing CO<sub>2</sub> Emissions: a Comparative Input-Output Study for Germany and the UK*. Springer, Berlin.
20. CHUNG H. S., 1998, Industrial Structure and Source of Carbon Dioxide Emissions in East Asia: Estimation and Comparison, in: *Energy and Environment*, vol. 9 no 5, p. 509-533.
21. SEIBEL S., 2003, *Decomposition analysis of carbon dioxide-emission changes in Germany - Conceptual framework and empirical results*. European Communities, Luxembourg.
22. TSUCHIMOTO F., ŠČASNÝ M., 2011, Decomposition Analysis of Air Pollutant in the Czech Republic. Paper submitted to 18th Annual Conference of the European association of Environmental and Resource Economists (EAERE), Roma 29 June – 2 July 2011.
23. UNFCCC, 2015, *Kyoto Protocol*, UN.
24. VEHMAS J., LUUKKANEN J., PIHLAJAMÄKI M., 2008, *Decomposition Analysis of EU Sustainable Development Indicators*. Final Report of the DECOIN project (Development and Comparison of Sustainability Indicators), Deliverable D3.1 of WP3, Turku School of Economics, Finland Futures Research Centre, Turku.
25. VIGUIER L. 1999, Emissions of SO<sub>2</sub>, NO<sub>x</sub> and CO<sub>2</sub> in Transition Economies: Emission Inventories and Divisia index Analysis, in: *Energy Journal*, vol. 20, no 2, p.59-87.
26. WCED, 1987, *Our common future*. Oxford University Press, Oxford.
27. XU X. Y., ANG B. W., 2013, Index Decomposition Analysis applied to CO<sub>2</sub> Emission Studies, in: *Ecological Economics*, vol. 93, p.313-329.



## Call for Integral Protection of Biocultural Diversity

### Postulat integralnej ochrony różnorodności biokulturowej

**Ryszard F. Sadowski**

*Cardinal Stefan Wyszyński University in Warsaw, Institute of Ecology and Bioethics,  
Wóycickiego 1/3, building 23, 01-938 Warsaw, Poland  
E-mail: r.sadowski@uksw.edu.pl*

---

#### Abstract

The contemporary ecological crisis compels us to undertake research and adopt measures that will ensure the sustainable development of humanity. The main point here is that while satisfying the needs of current generations, it is necessary to respect the needs of future generations as well as nature's capabilities. Works on a concept of development that would allow this task to be accomplished have been carried out for the last several decades. They resulted in the formulation of the still-evolving idea of sustainable development. With the current state of knowledge, it seems vital that this idea should comprise protection of biocultural diversity since, as clearly evidenced by the research conducted, the interrelated biological, cultural and linguistic diversity affects development. This article aims at highlighting the necessity of incorporating biocultural diversity into the idea of sustainable development and it points out the need for integral concern for the diversity of Earth's heritage. Only integral care of all types of diversity gives hope for the protection of each of them and increases the chances of building a sustainable world.

**Key words:** biocultural diversity, biodiversity, cultural diversity, linguistic diversity, sustainable development

#### Streszczenie

Współczesny kryzys ekologiczny skłania do podejmowania badań i działań, które zapewnią trwały rozwój ludzkości. Chodzi o to, by zaspakajając potrzeby aktualnego pokolenia respektować potrzeby przyszłych pokoleń oraz możliwości przyrody. Prace nad koncepcją rozwoju, która pozwoli zrealizować to zadanie trwają od kilku dekad. W ich wyniku powstała idea zrównoważonego rozwoju, która wciąż ewoluuje. Przy obecnym stanie wiedzy ważne wydaje się uwzględnienie w niej ochrony różnorodności biokulturowej. Badania jednoznacznie wskazują bowiem na korelację pomiędzy rozwojem a wzajemnie ze sobą powiązanymi różnorodnościami: biologiczną, kulturową i językową. Artykuł ten stawia sobie za cel ukazanie potrzeby włączenia różnorodności biokulturowej do idei zrównoważonego rozwoju oraz wskazanie na konieczność łącznej troski o różnorodność ziemskiego dziedzictwa, tylko integralna troska o wszystkie rodzaje różnorodności daje bowiem nadzieję na ochronę każdej z nich i zwiększa szanse na zbudowanie zrównoważonego świata.

**Słowa kluczowe:** różnorodność biokulturowa, bioróżnorodność, różnorodność kulturowa, różnorodność lingwistyczna, zrównoważony rozwój

---

#### Introduction

Recognition of the scale of risks posed by the modern ecological crisis led to a number of studies on the relation of man to the surrounding world. Formulation of the idea of sustainable development, which is meant to define the proper style of human presence in the world, proved to be one of the greatest

achievements in this regard. For several decades, the idea of sustainable development has been a subject of in-depth reflection of scholars, politicians and environmental activists. This reflection allows for a more thorough recognition of the emerging threats and for the development of ever more subtle ways of curbing them. As a result of the research conducted, the idea of sustainable development is constantly

evolving, taking into account the ever-new perspectives of reflection on the ecological crisis. It seems that, at the current stage of research, it is necessary to link the idea of sustainable development with biocultural diversity, since it gives us hope for the possibility of developing a more friendly human relationship with the environment and a more effective way of overcoming the ecological crisis.

The importance of biocultural diversity was first acknowledged in the 1980s. One of the first international initiatives aimed at providing comprehensive protection of endangered species and threatened cultures was undertaken at the First International Congress of Ethnobiology (1988). The assembled scientists, environmentalists and representatives of endangered cultures jointly issued the *Declaration of Belém*, in which they called for concrete and immediate action to protect the cultural and biological heritage of our planet (FICE, 1988).

Since then, interest in the protection of diversity, understood as a comprehensive concern for preserving the richness of species and cultures, has been steadily growing. This is confirmed by studies that point to a link between linguistic, cultural and biological diversity and to similar challenges faced today by all those diversities. A good illustration of the ever-growing interest in and popularization of integral care for the diversity of our planet is a document issued by the United Nations Environment Programme (UNEP) in 2007. The chapter on biodiversity clearly shows the link between biological and cultural diversity. Biodiversity encompasses more than just variation in appearance and composition. It includes diversity in abundance, distribution and in behaviour, including interactions among the components of biodiversity. Biodiversity also incorporates human cultural diversity, which can be affected by the same drivers as biodiversity, and which has impacts on the diversity of genes, other species and ecosystems (Ash, 2007).

Luisa Maffi seems to have been the first to provide a clear definition of biocultural diversity, describing it as *the diversity of life in all its manifestations: biological, cultural, and linguistic – which are interrelated (and possibly coevolved) within a complex socio-ecological adaptive system* (Maffi, 2007). Maffi pointed to three important characteristics of biocultural diversity: (Maffi, Woodley, 2010).

- ✓ The diversity of life is made up not only of the diversity of plant and animal species, habitats and ecosystems found on the planet, but also of the diversity of human cultures and languages.
- ✓ The diversities do not exist in separate and parallel realms, but rather are different manifestations of a single, complex whole.
- ✓ The links among these diversities have developed over time through the cumulative global effects of mutual adaptations, proba-

bly of a co-evolutionary nature, between humans and the environment at the local level.

Thus understood, biocultural diversity constitutes a set of values motivating us to take initiatives to protect both endangered species of flora and fauna and endangered cultures.

The present study aims at highlighting the necessity of integral concern for preserving biological, cultural and linguistic diversity and including it in the concept of sustainable development. There is ample evidence that biological, cultural and linguistic diversity directly, or at least indirectly, interact with one another, condition one another and, together, provide the basis for the development of our civilization. The building of a truly sustainable world must, therefore, take into account all those components, since it is only by protecting the widely understood heritage of our planet, that we can cherish hopes for optimistic forecasts for the various forms of earthly life, in all its manifestations.

## 1. Diversity of Earth's heritage

The heritage of our planet manifests itself in an extraordinary diversity of both animate and inanimate nature. A special place in this nature is taken by man who stands out in his unique character, revealing itself, among other things, in the ability to create culture. While undertaking an analysis of the diversity of Earth's heritage, one can, therefore, identify three main categories: biological diversity, cultural diversity and linguistic diversity.

### 1.1. Biological diversity

The term biodiversity (biological diversity) was first used in scientific literature in the early 1980s. Usually, biodiversity is defined as a *variety of life on Earth, ... [which] includes all organisms, species, and populations; the genetic variation among these; and their complex assemblages of communities and ecosystems* (UNEP, 2015; UN, 2016d).

The definition of biodiversity presented in UNEP documents points to three important elements (UNEP, 2015):

- ✓ Species diversity – describes the wide variety of plants, animals and microorganisms that exist on the planet.
- ✓ Ecosystem diversity – ecosystems represent a dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit.
- ✓ Genetic diversity – genetic material represents any material of plant, animal, microbial or other origin containing functional units of heredity. Genetic diversity improves the ability of each species to adapt to disease, pests or habitat variation. The



lower the level of genetic diversity, the more vulnerable a population is to changing environments or disease.

Until recently, it was assumed that 5 000–50 000 million species lived on Earth throughout all its history while, nowadays, there are approximately only 50 million species. These figures indicate that more than 99% of flora and fauna species had become extinct long before the advent of man (McKinney, 1997). In light of research from May 2016, the statistics prove to be far worse. In fact, it is estimated that Earth could have been home to as many as 1 billion species (NSF, 2016).

Analyses of paleontological data show that in the history of our planet there were *big five* mass extinctions and many minor events that led to the disappearance of such a large number of species (Hallam, Wignall, 1997). With the advent of man, an accelerated loss of biodiversity referred to as the Holocene extinction took place and it was mainly induced by the destructive style of human presence in the environment (Kolbert, 2014).

In its publications, UNEP highlights both the dangers associated with loss of biodiversity and the benefits issuing from its protection. UNEP reports stress that short-term economic and social benefits resulting from irresponsible use of the environment leading to loss of biodiversity are not commensurate with the long-term costs associated with that loss (UNEP 2010; UNEP 2015).

### 1.2. Cultural diversity

Reflection on cultural diversity was undertaken with the realization of the challenges faced by today's culture. Technological development, liberalization of trade and of the cultural goods market and, especially, development of new communication technologies created conditions for both deepening of diversity and cultural unification. It is difficult to tell clearly what the final result of this process will be. However, there are indications that the tendency towards unification will prevail, since the direction of changes seems to be in fact supported by globalization processes (Voiskounsky, 1998). In order to highlight the importance of cultural diversity, the UN General Assembly proclaimed the years 1988–1997 the World Decade of Cultural Development (UN, 2016e).

The UN established UNESCO, whose task is to protect the cultural heritage of humanity. One of the most important initiatives of UNESCO in this regard was the World Conference on Education for All (1990). Conference participants pointed out that culture determines effective education and confirmed the importance of caring for the diversity of cultures and cultural identity (Power, 2014, 108). In 1993, in turn, the World Commission on Culture and Development (Cuéllar Commission) was established. Its main task was to prepare a World Report on Culture and Development and to *prepare proposals both for*

*urgent and long-term action to meet cultural needs in the context of development* (UNESCO, 1993). The report pointed out that *many development failures and disasters stem from an inadequate recognition of cultural and ethnic complexities* (WCCD, 1996). Another important initiative for the protection of cultural diversity was the Intergovernmental Conference on Cultural Policies for Development, whose participants pointed to a close relationship between respect for culture and development (Stockholm, 1998). The UN commitment to protect cultural diversity resulted in the adoption of the *Universal Declaration on Cultural Diversity* in 2001, which also drew attention to the links between cultural diversity and development. The purpose of this declaration was to prepare a discussion on development during the World Summit on Sustainable Development in Johannesburg. Another important document on cultural diversity is that from the *Convention on the Protection and Promotion of the Diversity of Cultural Expressions* adopted in 2005 (UNESCO, 2005).

The UN activities for the protection of cultural diversity were summed up in the report *UNESCO and the Question of Cultural Diversity 1946-2007. Review and Strategies* (UNESCO, 2007). One of UNESCO's last important achievements in the field of cultural diversity protection is the report *Investing in Cultural Diversity and Intercultural Dialogue*. This report takes into account the recent global economic crisis and in its perspective shows both the temptation to reduce spending on culture and emphasizes the importance of culture in sustaining development (UNESCO, 2009).

### 1.3. Linguistic diversity

Just as in the case of biological and cultural diversity, the disappearance of linguistic diversity was also generally acknowledged with time. In order to describe this phenomenon, the Index of Linguistic Diversity (ILD), which allows for measurable evaluation of the disappearance of linguistic diversity, was developed. This index refers to the concept of biodiversity. Language richness can be thought of as being analogous to species richness, the number of species found in a given area. In addition to richness, a second component in species diversity is evenness, or the distribution of individual organisms among species. In the case of linguistic diversity, evenness is the distribution of individual speakers among languages. For example, two regions in both of which ten languages are spoken each have the same richness, but the region in which each language is spoken by 10% of the population has greater evenness, and therefore higher linguistic diversity, than one in which 91% of the population speaks one language and only 1% of the population speaks each of the other nine (Harmon, Loh, 2010).

According to the data from 2016, the diversity of living languages in particular regions of the world pre-

sents itself as follows: Europe – 287; both Americas – 1062; the Pacific region – 1313; Africa – 2139 and Asia – 2296 (Lewis et al., 2016). It is estimated that in 2005 there were 7299 living languages in the world. However, as in the case of biological and cultural diversity, linguistic diversity is systematically decreasing. In the years 1970–2005 the number of living languages in the world decreased by 20%. It is also worrying that the disappearance of languages is proceeding at a growing pace. In the 1970s, the decrease of linguistic diversity was noted to reach 0.3% per year, now this decrease exceeds 1% (Harmon, Loh, 2010).

## 2. Integral character of Earth's heritage diversity

The existence of interrelationships between culture and nature has long been acknowledged, and contributed to the formulation of a number of concepts showing the nature of those links. Today, there is a broad consensus that culture and the natural environment mutually interact, although the nature of those interactions is still the subject of ongoing debates. Current research on biocultural diversity leads to the conclusion that biological, cultural and linguistic diversity are interrelated, they mutually condition one another and constitute an integral whole, in which the diversity of our planet is manifested. This is confirmed by a recent study cited in UNEP documents – *cultural diversity and biodiversity are intimately related to each other. If we lose one, we risk losing the other. The diversity of societies, cultures and languages that has developed throughout human history is intimately related to biodiversity and its use* (UNEP, 2010).

Today, we are more and more aware of the fact that life's diversity manifests itself in both biological diversity through many forms of living organisms and in cultural diversity through numerous concepts of human beliefs, systems of values and worldviews. Culture and nature are interrelated due to a number of co-dependencies. There are many indications that the natural environment provides conditions for the occurrence of cultural processes and formation of human systems of beliefs. As a result, the environment is a kind of cultural archive documenting human activity throughout history (Pretty et al., 2009). A strong link between culture and nature is also reflected in the similarity of threats that both those realities face nowadays. Also, the effects of the threats that can be observed both on the natural and cultural plane have a similar character (Pretty et al., 2009). Relationships between cultural and biological diversity can also be seen in different worldviews of various human communities, since the concept of the world is largely dependent on the dominant culture, the language and the level of civilization of a given community. It seems that man's culturally conditioned perception of himself as an interdependent element of nature or as a being separate from nature or

even dominant over nature significantly affects the shape of the human relationship to the environment (Harmon, 2002).

A close connection between the natural world and the world of culture is also reflected in the fact that any interference in one of these worlds often causes changes in the other one. The relationship between cultural and biological diversity can also be clearly seen in the convergence of areas that are crucial for both types of diversity. Many regions which are rich in the wealth of biological species also abound in different ethnic groups, characterized by enormous cultural and linguistic diversity (Sutherland, 2003; Gorenflo et al., 2012). Knowledge of nature gathered by various communities also constitutes a confirmation of the link between culture and nature. This knowledge is present in customs, religious rituals, stories, traditions and language of communities which in this way work out answers to questions about the functioning of the world and man's relationship to it. Fikret Berkes defined this phenomenon as a *knowledge-belief-practice* complex and pointed to its essential role in indicating the link between nature and culture (Pretty et al., 2009; Berkes, 2012).

An important role in this phenomenon is played by linguistic diversity. The multiplicity of human languages exerts its impact not only on the various ways of shaping culture but also on biodiversity. Scientists generally agree that degradation of the natural environment has a direct influence on the loss of cultural and linguistic diversity. Recent studies indicate that there is also an inverse relationship, i.e. loss of linguistic diversity has a negative impact on biodiversity. This phenomenon results from strong links between language and traditional knowledge on biodiversity, since local communities often developed a complex system of describing the natural world based on a thorough knowledge of their local environment. This knowledge is embedded in indigenous names, oral traditions and taxonomies. With the disappearance of a given language, this knowledge will be irretrievably lost (UNESCO, 2016). The importance of traditional knowledge for the preservation of biological diversity is confirmed by numerous projects aimed at protecting or restoring endangered species of flora and fauna. Acquaintance with that knowledge or taking it into account often decides the success or failure of environmental projects (Nabhan, 2001).

Research into linguistic diversity clearly points to its significance both in the context of environmental concerns as well as in the development of civilization. The role of linguistic diversity in the conservation of biodiversity is now better recognized and appreciated. Tove Skutnabb-Kangas, in a report for the Council of Europe addressing the issue, states that linguistic and cultural diversities are the storehouse of historically developed knowledge. He also claims that linguistic and cultural diversity is connected to biodiversity (Skutnabb-Kangas, 2002). This report

indicates that linguistic diversity is now even more threatened than biodiversity. Experts estimating the state of biological and linguistic diversity for 2100 show its significant impoverishment. Depending on the adopted methods, it is estimated that at the beginning of the 22<sup>nd</sup> century, the diversity of Earth's species of flora and fauna will constitute 80–98% of the species living at the beginning of the 21<sup>st</sup> century. The estimates for linguistic diversity are much worse. In 2100 people will use only 10–50% of the currently used languages (Skutnabb-Kangas, 2002). The links between linguistic diversity and cultural diversity are stronger than those with biodiversity. The impact of language on the shape of culture is in fact more direct (Kim, 2003). The language used by man affects the way in which he expresses his ideas and beliefs which shape culture (Elmes, 2013). Each language has its limitations, which results in the fact that a person who speaks a given language perceives the world differently than a person using a different language. This, in turn, has an impact on the diversity of cultures shaped in different linguistic traditions. Each language has its own mentality, which accentuates certain ways of viewing the reality. In some languages, for example, it is important who, where, how many times and when an activity is performed, while other languages do not pay so much attention to numbers and time, but put more emphasis on communicating how the speaker acquired information on a specific activity, i.e. whether he witnessed it personally, formulated his own conjectures on the basis of various facts or heard about it from a third party (Bloom, 2002).

A good illustration of the ways in which specific languages affect different worldviews is provided by research conducted by Lera Boroditsky. As the scientist notices, some indigenous tribes say north, south, east and west, rather than left and right, and as a consequence have great spatial orientation. The Pirahã, whose language eschews number words in favour of terms like few and many, are not able to keep track of exact quantities. In one study, Spanish and Japanese speakers couldn't remember the agents of accidental events as adeptly as English speakers could. Why? In Spanish and Japanese, the agent of causality is dropped: *the vase broke itself*, rather than *John broke the vase* (Boroditsky, 2009).

Current knowledge shows that Earth is one big and integrated system of interrelated and mutually conditioning elements, where biocultural diversity plays an important role. Loss of any diversity affects others and brings dramatic consequences both to humanity and to Earth (Maffi, 2005).

### 3. Diversity of Earth's heritage for sustainable development

Recent studies clearly highlight the importance of biological, cultural and linguistic diversity in building a sustainable world. It has long been attempted to

work out a concept of development which would enable realization of this project. However, only in recent years, can we perceive that different types of diversity are being included in the concept of development.

Numerous UN conferences have devoted a lot of attention to the issue of development. Their goal was to work out a concept of development which would meet the needs of the present generation in such a way as not to endanger the needs of future generations. The principle of sustainable development formulated by the UN is aimed at improving the life quality of all people, taking into account the needs of the environment. Realization of this task will only be possible provided that the following questions are integrally taken into consideration:

- 1) economic growth and equitable distribution of benefits;
- 2) protection of natural resources and of the environment and
- 3) social development.

In order to accomplish this task, the UN prepared documents that specify the way of building a sustainable world. An important step in this direction is *Agenda 21*, a comprehensive plan of action for the 21<sup>st</sup> century, and the *Millennium Development Goals* (MDGs). To emphasize the importance of this issue the UN announced the years 2005–2014 a Decade of Education for Sustainable Development, later referred to as the Decade of Change, aimed at promoting sustainable behaviour and at inspiring critical and creative thinking which would allow a solution to be found to the problems preventing sustainable development (UNESCO, 2016c). Another important UN document is the *2030 Agenda for Sustainable Development*, which sets itself the task of continuing the MDGs by identifying 17 Sustainable Development Goals. The new objectives are to help in the further fight against poverty and to lead to sustainable development before 2030 (UN, 2016).

An outline of the UN initiatives presented above shows the determination of international structures to build a sustainable world. Despite an apparent lack of connection between the principle of sustainable development and biocultural diversity, the existence of such a link must be taken for granted. If we understand sustainable development as a type of development that takes into account the balance of three planes: economic, social and natural, a link between biological, cultural and linguistic diversity and all these planes becomes evident.

Most evident is the relationship of biodiversity with nature. This link is clearly present in the document *Agenda 21*, Chapter 15 of which is entitled *Conservation of Biological Diversity* (UNCED, 1992). The link of biodiversity with the seventh MDG, *Ensure Environmental Sustainability* also seems obvious. To achieve this objective, the UN sought to achieve by 2010 a significant reduction in the rate of biodiversity loss by protecting ecosystems covering

15.2% of land and 8.4% of coastal marine areas worldwide (UN, 2016c). A direct connection between biological diversity and the principle of sustainable development is also evidenced by the 15<sup>th</sup> sustainable development goal of the 2030 *Agenda for Sustainable Development*. This objective bids us to: sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss (UN, 2016b).

The link between cultural diversity and the social component of sustainable development also seems quite obvious. A world UNESCO report on cultural diversity states that this diversity is a key dimension of sustainable development. An important role in grasping the importance of cultural diversity for sustainable development can be ascribed to the World Summit on Sustainable Development in Johannesburg. It was indicated, though, that cultural diversity should not be considered as the fourth pillar of sustainable development, but rather as a significant cross-cutting factor, since it plays a substantial role beginning with poverty eradication and the safeguarding of biodiversity to resource management and climate change (UNESCO, 2009).

The report worked out in Johannesburg points to the fact that the importance of cultural diversity for such issues as loss of biodiversity and climate change is underestimated. It also highlights the fact that the initial focus on technical measures which were meant to resolve the above issues was insufficient. Today, the need to include cultural diversity in the creation of a sustainable world is more and more often emphasized (UNESCO, 2009). Cultural diversity is now recognized as one of the roots of development, understood not simply in terms of economic growth, but also as a means to achieve a more satisfactory intellectual, emotional, moral and spiritual existence (UNESCO, 2002). In order to fully grasp the impact of culture on the development of modern civilization it is necessary to think of culture as the values, beliefs, and norms that a group of people share. In this sense, culture conditions individuals' perceptions of the world, influences what they consider important and suggests courses of action that are appropriate and inappropriate. Cultural factors can, for example, influence consumption behaviour and may be a particularly important driver of environmental change (Nelson, 2005). Moreover, the *Universal Declaration on Cultural Diversity* points to the importance of cultural diversity for human creativity and fostering of international solidarity and stresses the indivisibility of culture and development. This document simply states that cultural diversity must also be seen as a motor of development (UNESCO, 2002).

The link of linguistic diversity with development is less evident. The most frequently highlighted effects of the loss of linguistic diversity refer only to its negative impact on the acquisition of scientific, traditional and ecological knowledge and loss of cultural heritage encoded in the language. The association of

linguistic diversity with human rights and social justice is also mentioned here. Although all of these have an important role to play, the economic significance and consequences of the global loss of linguistic diversity have not yet been seriously studied or appreciated (Romaine, 2016).

In its recent documents, UNESCO stresses, however, the relationship of linguistic diversity to sustainable development. Languages are of strategic importance for people and the planet. There is growing awareness that languages play a vital role in development, not only in ensuring cultural diversity and intercultural dialogue, but also in attaining quality education for all and strengthening cooperation, in building inclusive knowledge societies and preserving cultural heritage and in mobilizing political will for applying the benefits of science and technology to sustainable development (UNESCO, 2016b).

According to Suzanne Romaine, conservation of biodiversity, cultural-linguistic diversity, sustainable development and the welfare of the poor are inextricably linked. Just as biological diversity increases the resilience of natural systems, cultural-linguistic diversity has the capacity to increase the resilience of social systems. Loss of linguistic diversity has, therefore, serious social and economic consequences for the well-being and resilience of individuals and communities (Romaine, 2016). Romaine also indicates that implementation of the MDGs calls for a new approach to the key role of language in human development. In her view, only by placing language at the central point of development will the MDGs and other global agendas such as Education for All and Education for Sustainable Development be achieved (Romaine, 2013).

Documents issued by the European Union also highlight the major importance of linguistic diversity for sustainable development. The Committee of the Regions emphasizes that sustainable development of a region is always based on its cultural heritage and identity, that language is the most important factor supporting the cultural identity of localities and regions and hence support for linguistic diversity is essential for the sustainable development of Europe's regions (Council of Europe, 2002).

It seems that nowadays we begin to realize that biocultural diversity constitutes a key element in building a sustainable world. Recognition of its significance is an important prerequisite for ensuring sustainable development. Development models produced since the 1970s have clearly failed, despite constant revision, to live up to the expectations they raised. The new challenges arising from globalization are making it increasingly important to redefine the relationship between culture and development or, to be more precise, between diversity, dialogue and development: the *three Ds*. Cultural diversity is a site that induces continuously flowing and unifying dialogue open to each and every expression of identity.

Acknowledgement of that daily dialogue as a founding principle is what needs to be asserted and preserved. Diversity and dialogue are mutually interrelated. The causal link that binds them cannot be severed without undermining sustainability. Cultural diversity, far from being divisive, unites individuals, societies and peoples, enabling them to share in a fund made up of the heritage of bygone ages, the experience of the present and the promise of the future. This shared fund, with all parties being both contributors and beneficiaries, is what underpins the sustainability of development for all (UNESCO, 2002).

## Conclusion

Building a sustainable world appears to be the greatest challenge faced by man in the contemporary world, since it is not only the survival of humanity but perhaps of all life on Earth that is threatened. Reflection on the styles of human presence in the world becomes, therefore, an extremely urgent and important task. Only by changing man's destructive attitude towards nature and by adopting an approach that would take into account human needs and the capabilities of nature may give us hope for a propitious future for humanity. It is generally acknowledged that adoption of the principle of sustainable development provides a guarantee of such a change. This principle, however, evolves with the ongoing reflection on the ecological crisis. This allows us to shape the model of human attitude to the world and increasingly respect the needs and capabilities of nature.

It seems that at the present stage of this reflection, inclusion of the heritage of our planet in all its manifestations is an important element conditioning the possibility of working out an adequate concept of development. The point is that it is necessary to protect both biodiversity as well as cultural and linguistic diversity. All these types of diversity are in fact interrelated and mutually dependent. Only integral concern for the diversity of all manifestations of life on Earth gives hope for effective protection of this wealth. Contrary to some opinions, biocultural diversity should not, however, constitute a *fourth pillar* of the principle of sustainable development, since biological, cultural and linguistic diversity penetrates all its three traditional pillars: economic efficiency, environmental concerns and social balance (UNESCO, 2009). Acknowledgement of the key role of those diversities points to the complexity of the contemporary ecological crisis and of the global ecosystem as well as to the multiple conditionings and relationships of their individual elements. This, in turn, makes it possible to develop strategies more effective than ever in overcoming the crisis and building a sustainable world.

The call for integral care of all aspects of Earth's heritage precludes antagonizing culture and nature. Culture must respect nature because, otherwise, it degenerates into a sort of anti-nature and, consequently, turns against man. However, it is important to point to the risk of identifying the ways in which nature and culture develop, since their evolution has an analogous, not homologous, character (Łepko, 1991).

A homologous view of nature's and culture's functioning leads to reducing culture to nature. Using the concept of biocultural diversity, one can consequently speak of two dangers resulting from the ways in which we define culture and nature. Putting too much emphasis on the differences between them as well as their antagonization can lead to degeneration of culture, which results in a destructive relationship of man to nature. Overemphasizing similarities, on the other hand, and treating them as homologous concepts may lead to an inadequate conception of culture, which also implies negative consequences for both man himself and nature. Therefore, an adequate definition of culture and nature calls for a balanced definition of the differences and similarities between them. Only their adequate definition will allow for proper use of the concept of biocultural diversity and create conditions for more effective building of a sustainable world, which will protect human needs while respecting the needs and capabilities of nature.

Proper use of the concept of biocultural diversity gives us hope not only for the possibility of changing the destructive relationship of man to nature but also of shaping this relationship in such a way as to ensure that life on Earth can be protected in both its biological and cultural manifestations. Built in this way, a sustainable world will be a place where man will live in a human manner, i.e. he will be surrounded by a healthy natural environment and he will be creatively involved in the world of culture, and this means, in turn, that the humanity of man will be protected (Lorenz, 1973).

## References

1. ASH N., FAZEL A., 2007, *Biodiversity*, in: UNEP, *Global Environment Outlook 4: Environment for Development*, UNEP, Nairobi.
2. BERKES F., 2012, *Sacred Ecology*, Routledge, New York.
3. BLOOM P., 2002, Explaining Linguistic Diversity, in: *American Scientist* vol. 90, no 4, p. 374-375.
4. BORODITSKY L., 2009, How Does Our Language Shape the Way We Think?, in: *What's next? Dispatches on the Future of Science: Original Essays from a New Generation of Scientists*, ed. Brockman M., Vintage Books, New York. p. 116-129.

5. COUNCIL OF EUROPE, 2002, *Linguistic Diversity. A Challenge for European Cities and Regions*, Council of Europe Publishing, Strasbourg.
6. ELMES D., 2013, *The Relationship between Language and Culture*, in: *Annals of Fitness and Sports Sciences*, vol. 46, no 3, p. 11-18.
7. FICE (First International Congress of Ethnobiology), 1988, *Declaration of Belém*, [www.ethnobiology.net/wp-content/uploads/Decl-Belem-Eng-from-Posey.pdf](http://www.ethnobiology.net/wp-content/uploads/Decl-Belem-Eng-from-Posey.pdf) (3.10.2016).
8. GORENFLO L. J., ROMAINE S., MITTERMEIER R. A., WALKER-PAINEMILLA K., 2012, Co-occurrence of Linguistic and Biological Diversity in Biodiversity Hotspots and High Biodiversity Wilderness Areas, in: *PNAS*, vol. 109, no 21, p. 8032-8037.
9. HALLAM A., WIGNALL P. B., 1997, *Mass Extinctions and Their Aftermath*, Oxford University Press, Oxford, New York, Tokyo.
10. HARMON D., 2002, *In Light of Our Differences: How Diversity in Nature and Culture Makes us Human*, Smithsonian Institution Press, Washington.
11. HARMON D., LOH J., 2010, The Index of Linguistic Diversity: A New Quantitative Measure of Trends in the Status of the World's Languages, in: *Language Documentation & Conservation*, vol. 4, p. 97-151.
12. KIM L. S., 2003, Exploring the Relationship between Language, Culture and Identity, in: *GEMA Online Journal of Language Studies*, vol. 3, no 2, p. 64-76.
13. KOLBERT E., 2014, *The Sixth Extinction: An Unnatural History*, Henry Holt and Company, New York.
14. ŁEPKO Z., 1991, *Antropologia Konrada Lorenza*, in: *Z zagadnień filozofii przyrodniczości i filozofii przyrody*, ed. Lubański M., Ślaga Sz., ATK, Warszawa, p. 157-279.
15. LEWIS M. P., SIMONS G. F., FENNIG Ch. D., 2016, *Ethnologue: Languages of the World*, SIL International, Dallas.
16. LORENZ K., 1973, *Civilized Man's Eight Deadly Sins*, Harcourt Brace Jovanovich, New York.
17. MAFFI L., 2005, Linguistic, Cultural, and Biological Diversity, in: *Annual Review of Anthropology*, vol. 29, p. 599-617.
18. MAFFI L., 2007, *Biocultural Diversity and Sustainability*, in: *The SAGE handbook of environment and society*, ed. Pretty J.N. et al., SAGE, Los Angeles, p. 267-277.
19. MAFFI L., WOODLEY E., 2010, *Biocultural diversity conservation: a global sourcebook*, Earthscan, London, Washington.
20. MCKINNEY M. L., 1997, *How do Rare Species Avoid Extinction? A Paleontological View*, in: *Biology of Rarity: Causes and Consequences of Rare-Common Differences*, ed. Kunin W. E., Gaston K. J., Springer, Dordrecht, p. 110-128.
21. NABHAN G. P., 2001, Cultural Perceptions of Ecological Interactions: An 'Endangered People's' Contribution to the Conservation of Biological and Linguistic, in: *On Biocultural Diversity. Linking Language, Knowledge and the Environment*, ed. Maffi L., Smithsonian Institution Press, Washington, London, p. 145-156.
22. NELSON G. C., 2005, Drivers of Ecosystem Change, in: *Ecosystems and Human Well-Being: Current State and Trends*, Vol. 1, ed. Hassan R. M., Scholes R. J., Island Press, Washington, p. 73-76.
23. NSF (National Science Foundation), *Researchers find that Earth may be home to 1 trillion species*, [http://www.nsf.gov/news/news\\_summ.jsp?cntn\\_id=138446](http://www.nsf.gov/news/news_summ.jsp?cntn_id=138446), (8.10.2016).
24. POWER C., 2014, *The Power of Education: Education for All, Development, Globalisation and UNESCO*, Springer, Singapore.
25. PRETTY J., ADAMS B., BERKES F., de ATHAYDE S., DUDLEY N., HUNN E., MAFFI L., MILTON K., RAPPORT D., ROBBINS P., STERLING E., STOLTON S., TSING A., VINTINNERK E., PILGRIM S., 2009, The Intersections of Biological Diversity and Cultural Diversity: Towards Integration, in: *Conservation and Society*, vol. 7, no 2, p. 100-112.
26. ROMAINE S., 2013, Keeping the Promise of the Millennium Development Goals: Why Language Matters, in: *Applied Linguistics Review*, vol. 4, no 1, p. 1-21.
27. ROMAINE S., 2016, *Language and Sustainable Development*, in: *The Economics of Language Policy*, eds. Gazzola M., Wickström B.A., MIT Press, Cambridge, p. 402-431.
28. SKUTNABB-KANGAS T., 2002, *Why Should Linguistic Diversity be Maintained and Supported in Europe? Some Arguments*, Council of Europe, Strasbourg.
29. SUTHERLAND W. J., 2003, Parallel extinction risk and global distribution of languages and species, in: *Nature*, vol. 423, p. 276-279.
30. UN, 2016a, *The Sustainable Development Agenda*, <http://www.un.org/sustainabledevelopment/development-agenda/> (25.10.2016).
31. UN, 2016b, *Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss*, [www.un.org/sustainabledevelopment/biodiversity/](http://www.un.org/sustainabledevelopment/biodiversity/) (25.10.2016).
32. UN, 2016c, *Goal 7: Ensure Environmental Sustainability*, [www.un.org/millenniumgoals/environment.shtml](http://www.un.org/millenniumgoals/environment.shtml) (25.10.2016).
33. UN, 2016d, *Convention on Biological Diversity*, [www.cbd.int/doc/legal/cbd-en.pdf](http://www.cbd.int/doc/legal/cbd-en.pdf) (14.10.2016).

34. UN, 2016e, *Proclamation of the World Decade for Cultural Development*, [www.un.org/documents/ga/res/41/a41r187.htm](http://www.un.org/documents/ga/res/41/a41r187.htm) (13.10.2016).
35. UNCED, 1992, *Agenda 21*, <https://sustainable-development.un.org/content/documents/Agenda21.pdf> (25.10.2016).
36. UNEP, 2010, *What is Biodiversity?*, UNEP.
37. UNEP, 2015, *YouthXchange Biodiversity and Lifestyles Guidebook*, UNEP.
38. UNESCO, 1993, *World Commission on Culture and Development*, UNESCO, Paris.
39. UNESCO, 2002, *Universal Declaration on Cultural Diversity*, UNESCO, Paris.
40. UNESCO, 2005, *Convention on the Protection and Promotion of the Diversity of Cultural Expressions*, UNESCO, Paris.
41. UNESCO, 2007, *UNESCO and the Question of Cultural Diversity 1946-2007. Review and Strategies*, UNESCO, Paris.
42. UNESCO, 2009, *Investing in Cultural Diversity and Intercultural Dialogue*, UNESCO, Paris.
43. UNESCO, 2016a, *Biodiversity and Linguistic Diversity. Maintaining Indigenous Languages, Conserving Biodiversity*, [www.unesco.org/new/en/culture/themes/endangered-languages/biodiversity-and-linguistic-diversity/](http://www.unesco.org/new/en/culture/themes/endangered-languages/biodiversity-and-linguistic-diversity/) (20.10.2016).
44. UNESCO, 2016b, *Cultural and Linguistic Diversity*, <http://www.unesco.org/new/en/indigenous-peoples/cultural-and-linguistic-diversity/> (2.11.2016).
45. UNESCO, 2016c, *UNESCO a Zrównoważony Rozwój*, <http://www.unesco.pl/edukacja/dekada-edukacji-nt-zrownowazonego-rozwoju/unesco-a-zrownowazony-rozwoj/> (25.10.2016).
46. VOISKOUNSKY A. E., 1988, Internet: Culture Diversity and Unification, in: *Cultural Attitudes Towards Communication and Technology*, ed. Ess Ch., Sudweeks F., University of Sydney Press, Sydney, p. 100-115. [https://www.it.murdoch.edu.au/catac/catac98/pdf/07\\_voiskounsky.pdf](https://www.it.murdoch.edu.au/catac/catac98/pdf/07_voiskounsky.pdf) (13.10.2016).
47. WCCD (World Commission on Culture and Development), 1996, *Our Creative Diversity*, UNESCO, Paris 1996.





## Modern Issues of Development of the System of Specially Protected Natural Areas in the Context of the Concept of Sustainable Development

### Współczesna problematyka rozwoju systemu specjalnych obszarów ochrony w kontekście koncepcji rozwoju zrównoważonego

Aleksey Anisimov\*, Kermen Lidzheeva\*\*, Anatoliy Ryzhenkov\*\*\*

*Kalmyk State University, Russian Federation*

*\*E-mail: anisimovap@mail.ru*

*\*\*E-mail: Elidzheeva\_kv@mail.ru*

*\*\*\*E-mail: 4077778@list.ru*

---

#### Abstract

The article proposes a new perspective on the issues of development of the system of specially protected natural areas (SPNAs) in the context of the concept of sustainable development. The authors suggest ways of finding a balance of economic, environmental and social interests in SPNAs, which will not lead to a decrease in their number or area, however, prevent a number of economic and social problems. The change in approaches to the management of the system of SPNAs including in terms of their creation, modification of their boundaries or termination of their operation will allow including SPNAs in the system of social economic relations of regions and certain countries, provide an opportunity to withdraw from the current one-sided bias solely in favor of environmental factors. This will ensure the necessary balance of the interests of the local population, business and protection of nature.

**Key words:** sustainable development, national park, balance of interests, subsurface use; entrepreneurs, specially protected natural areas

#### Streszczenie

W artykule zaproponowano nowe podejście do zagadnień rozwoju obszarów specjalnej ochrony w kontekście rozwoju zrównoważonego. Autorzy wskazują na sposoby równoważenia ekonomicznych, środowiskowych i społecznych celów na terenach chronionych, które nie będą prowadziły do zmniejszenia ich ilości bądź obszaru, zapobiegając zarazem powstawaniu ekonomicznych i społecznych problemów. Sugerowane zmiany w zarządzaniu obszarami chronionymi w kontekście ich tworzenia, zmiany granic czy ich zniesienia pozwolą na włączenie tych obszarów do systemu społeczno-ekonomicznych zależności w poszczególnych regionach i krajach, co oznaczać będzie wycofanie się z obecnego jednostronnego podejścia ograniczającego się wyłącznie do kwestii środowiskowych. W ten sposób zapewniona zostanie równowaga pomiędzy potrzebami lokalnych społeczności, biznesu i ochrony przyrody.

**Słowa kluczowe:** rozwój zrównoważony, park narodowy, równowaga interesów, użytkowanie podpowierzchniowe, przedsiębiorcy, obszary specjalnej ochrony

---

## Introduction

In the second decade of the 21<sup>st</sup> century mankind is on the threshold of profound and irreversible changes. The ongoing process of globalization gave new dynamics to international relations, which manifests itself in strengthening of the interrelation of all states of the world. Full-scale development of even such world leaders as the USA and countries of the European Union is heavily dependent on the world economic situation and the ecological state of many other regions of the planet. All this fully applies also to Russia, which, as part of Europe and the bridge between Europe and Asia, is interested in the economic and environmental cooperation with all European countries including those in the EU.

Full international cooperation and collective settlement of the world economic, environmental and social issues is promoted by the fact that in the end of the 20<sup>th</sup> century European countries began to form a new policy the emergence of which was caused by to the increased risk of global threats to the life of all mankind. It is based on theoretical concepts the discussion of which was started still in the second half of 20<sup>th</sup> century by representatives of natural, technical and social sciences. The concept of sustainable development stands out among these concepts. With its emergence in European philosophical and legal thought we can observe the beginning of study of the interrelation between the state of the environment, economic and social problems.

Many scientists agree that the uncontrolled increase in anthropogenic pressure on nature (especially by economically developed countries) sooner or later will result in so-called *boomerang effect*, which means that the destruction of the natural environment will lead to serious economic and social losses. This fact is of particular importance for Russia, where according to the expert estimates about 300 000 people die annually due to the unfavorable environmental conditions. Environmentally unfavorable zones cover about 15% of the territory of Russia, where up to 60% of its population live. In accordance with the climate laws, every seventh year becomes critical for agriculture. Under these conditions, overcoming the increasing contradictions in the field of interaction of society and nature, resolution of conflicts between economic, social and environmental interests of citizens and their associations is impossible without taking into account the theoretical and practical developments related to the concept of sustainable development which aims to radically change worldviews, to be an alternative to the prevailing practice of consumer attitude of man to nature and its resources.

Analysis of such an essential guarantee of implementation of the theory of sustainable development as development of the system of specially protected natural areas (hereinafter SPNAs) plays a special role in this situation. Including natural ecological

systems SPNAs ensure the balance between economic, environmental and social interests of man and society, serve as filters, cleaning air, water and other natural components keeping the environmental balance and improving the quality of the environment. Meanwhile, the organization of the system of world SPNAs leaves open a number of questions.

## 1. Stages of formation of the concept of sustainable development and implementation of its provisions in international law and judicial practice

The main reasons for the emergence of the concept of sustainable development were prevalence of consumer psychology, irrational economic models and global environmental problems caused by all these factors.

The first attempt to assess the global environmental situation, systemize the causes of its aggravation and start searching for ways of resolution of environmental problems was made during the UN Conference on the Human Environment held in 1972 in Stockholm, one of the results of which was the approval of the United Nations Environment Programme (UNEP) – a special body coordinating activities of the international community to exercise the human right to a favorable environment.

Later in the report of the World Commission on Environment and Development (Brundtland Commission) theoretical and practical developments on the issues of interaction between nature and society were arranged in the concept of *sustainable development*, which was defined as development which meets the needs of current generations without compromising the ability of future generations to meet their own needs. This definition did not mention the environment, and this aspect of sustainable development was discussed at the United Nations Conference on Environment and Development in Rio de Janeiro in 1992, which resulted in adoption of important decisions. In particular, at this conference, many countries of the world signed a number of program documents establishing the general coordinated policy to ensure sustainable development and save the Earth's ecosystem, including *Agenda 21*, which is a global action plan of all countries with regard to sustainable development (Dikusar, 2007).

Ways and methods for assessing the effectiveness of efforts aimed at sustainable and safe development became the basis of *sustainability* of states. The main instrument of this assessment is sets of indicators of sustainable development. Agenda 21 adopted at the conference contains more than 120 indicators of sustainable development grouped into 40 chapters and characterizing sustainable development of state in all its possible aspects. Division of all the indicators into 4 categories (social, economic, environmental and institutional) allows highlighting the main aspects of sustainable development through a number of comparable indices and ranking countries formally by

their *progress* according to the scale of sustainability both by a certain index and by each individual category of indices (Kodolova, 2013).

The concept of sustainable development moves to a new level after adoption of the *Johannesburg Declaration on Sustainable Development* (2002) as well as the United Nations Conference, Rio+20, from the materials of which it follows that sustainable development is balanced social and economic development implemented in compliance with environmental requirements and standards, taking into account the interests of not only the present but also future generations of people. In the materials of the conferences it was stated that in order to ensure success in the way of sustainable development, all the peoples of the planet should take part in this process, and only in this case people can exist in harmony with the natural environment. The conference Rio+20 had two main themes: formation of a green economy in the context of sustainable development and poverty eradication; strengthening the institutional framework for sustainable development. If the necessary measures are taken to achieve the green economy, it should be accompanied by strengthening of the control carried out by international organizations. This will improve the integration of three components of sustainable development – economic, social and environmental components, lead to better coordination and management ensured by the UN, which will contribute to achieving the goals of sustainable development (Horn, 2013).

Meanwhile, global economic agreements were based on the expectation that rich countries would provide the poorer ones with new sources of funding so that they could achieve these objectives, but this remained unimplemented. The tension between developed and developing countries is still significant and results from the history of colonialism, economic exploitation, military adventurism, nationalism, etc. Developing countries are concerned that their dreams of improving the quality of life give way to the global needs of richer countries facing significant environmental threats (Bryner, 2002).

Therefore, the concept of sustainable development is an issue not so much of preservation of the environment as the issue of development of the economic and social field, maintenance of its functioning, provision of a certain level of life and its quality. On the basis of the mentioned international instruments, the environmental protection is just one of the areas within the framework of which the concept of sustainable development can be implemented. However, in Russian legal science in the discussion of *sustainable development* a rather significant *shift* to its environmental *section* can be observed, though adverse impact on the environment in Russia is not large, while development of the economic and, especially, social area raises concerns. Despite all the undoubted importance of the issues in the field of environmental protection, it is not correct to attach purely

*environmental* content to the concept of sustainable development.

The specified complexity of social relations covered by the concept of sustainable development led to the fact that some researchers count more than 70 different definitions of this term (Lafferty, 1996). The most common one is the statement that *sustainable development* is environmentally sound economic and social development achieved by integrating environmental considerations in the preparation, adoption and implementation of environmentally significant decisions in the interests of the present and future generations (Vershilo, 2008).

This classical definition is often supplemented by other elements necessary according to the authors. For example, E.F. Pushkareva draws attention to the need to preserve peace in the course of social, economic environmental development (Pushkareva, 2008). K. Peters adds *national security* to the triad under consideration (Peters, 2010). Undoubtedly, such views are worthy of attention, however, we will still continue to adhere to the *classical* definition, in which we focus attention on a number of management aspects within the boundaries of SPNAs.

Despite the adopted international instruments, many members of the scientific community consider the idea of sustainable development insufficiently reasoned, since it is rather a vision. Critics often call it a *manipulative and confusing slogan*, a *myth*, a *utopian reformer's fantasy*, or even a *buzzword concealing a threat to roll back existing environmental laws* (Eisen, 1999). Hence it follows that acceptance of *development* and *sustainable growth* will result in approval of previously unprecedented and expanding consumption of scarce resources. But can you agree with it? Karl Marx in his time reasonably believed that *man must prove the truth, i.e. the reality and power, the this-sidedness of his thinking in practice* (Marx, 1845), or, to put it simple: practice is the criterion of the truth. From this perspective, let us ask ourselves: is the concept of sustainable development is implemented in Russia in practice, and how exactly does it manifest itself?

On the one hand, in fact, Russia does not have a separate law which would contain a special mechanism for implementing the concept of sustainable development. On the other hand, all necessary legal rules allowing implementing this concept are dispersed in various regulations. Analysis of judicial practice also leads to this conclusion. As we have no possibility to show the full range of these decisions, we will limit ourselves just to two very illustrative examples. The European Court of Human Rights confirmed the priority of social and environmental rights of citizens over the economic interests of the state in the case of *Burdov v. Russia* related to non-payment of the compensation and social benefits to the participant of the liquidation of the accident at the Chernobyl NPP (Judgement of the ECHR of 07.05.2002). District courts in Russia often face the issues of sustainable

development as well. For example, on April 29, 2013, the Council of Deputies of Boristsevo Rural Settlement adopted a decision on approval of the plan of driving cattle in the villages of Dubrovka, Semenovskoe and Yakutino located in the rural municipal entity *Boristsevo Rural Settlement*. A number of citizens thought that this decision violated their rights because cattle driving was carried out in close proximity to their homes, which had an adverse physical, sanitary and psychological effect on them. The adverse physical effect consisted in the fact that cows damaged elements of street amenities, which were provided by citizens at their own expense. The adverse sanitary effect consisted in the fact that during driving cows left their waste (dung) on the ground of the streets. In this regard, the citizens experienced serious moral discomfort. After consideration on the merits of the case the court made the following decision: to declare the decision of the municipal Council of Deputies of Boristsevo Rural Settlement of April 29, 2013 illegal regarding the approval of the plan of driving cattle (Decision of Torzhok Town Court of Tver Region of August 1, 2013).

It appears that in this case the court actually applied the concept of sustainable development (though it is not mentioned in the text of the very court decision), having performed the reasonable search for a balance of the three groups of interests – economic (cattle grazing), environmental (sanitary condition of the street) and social (the villagers' right to health). Arguments in favor of the found compromise between these three interests are set out in detail in the text of the court decision. There are a fairly large number of such court decisions based on the current laws in Russia, which allows us to speak about not purposeful but *spontaneous implementation* of the concept of sustainable development in Russian law enforcement practice.

From this perspective, we note that the scope of the concept of sustainable development can be both the entire territory of the country and its part. Such an approach does not contradict provisions of the international instruments, but rather, on the contrary, follows directly from them. Meanwhile, a part of the country (even to the extent of one village) can fall within the scope of the concept of sustainable development in two ways: in case of practical problems that require authorization in the territory with the common legal regime; in case of problems in areas where special laws establish a certain legal order.

SPNAs are a typical example of the latter field. Exactly in them the balance of environmental and economic interests is either inclined almost uniquely in favor of the environment (in reserves) or a compromise is formed (in national parks), which allows limited use of especially valuable and protected natural sites for economic or other purposes. At the same time creation of SPNAs should be considered not only within the framework of the concept of sustain-

able development but also as a condition for the exercise of environmental human rights.

## 2. Role of SPNAs in sustainable development

### 2.1. Formulation of the problem or some statistics

Thus, one of the elements of sustainable development (and guarantee of the exercise of environmental human rights) is unique and valuable ecosystems (SPNA) located in the territories which are granted a special legal status. Natural processes which are of interest to science happen there, and this is why they are subject to special protection. Work on creation of SPNAs is carried out in all countries of the world quite successfully. If we consider only large SPNAs of over 1000 ha each, we can observe their greatest number in: the USA (1500), Australia (900), Canada (650), Germany (500) China (470), Indonesia (380), Brazil (280), Republic of South Africa (240), Spain and Sweden (215 each), Russia (200), United Kingdom (190) (Specially protected natural areas of the world, 2016)

The Russian Federation today has over 13 000 specially protected natural areas (SPNA) of federal, regional and local significance, the total area of which comprises over 200 million ha (including the offshore zone), or 11,95% of the area of Russia. The share of SPNAs of regional significance is 90,1% of the total number of SPNAs and 58,3% of the total area, and SPNAs of local significance – 7,6% and 12,6% accordingly (State report On the State and Protection..., 2015).

These figures become more compelling if we look at the area of individual SPNAs. For example, the Putoransky State Nature Reserve covers an area of 1887251 ha; Ust-Lensky Nature Reserve – 1433000 ha. In the central and more populated parts of the country this area is still significant, though smaller. For example, the area of the Caucasus Nature Reserve (Krasnodar Krai, Republic of Adygea, Karachay-Cherkess Republic) is 277076 ha. In national parks we observe a similar situation: Tunkinsky (Republic of Buryatia) – 1183662 hectares; Yugyd Va (Komi Republic) – 1894133 hectares. In the central part of the country the area of national parks is less but also extensive: Paanajärvi (Republic of Karelia) – 104473 hectares; Meschera (Vladimir Region) – 118758 hectares, etc.

Hence it follows that there is a quite clear interrelation between the density of population of the region and the size (area) of SPNAs. At the same time a few years ago it was pointed out that only 28 SPNAs have fully registered boundaries. The total area of SPNAs in which cadastral registration and surveying of boundaries have not been definitely completed comprise more than 26 million ha, including 53 reserves with an area of 17,99 million ha and 24 national parks with an area of 5,02 million ha. The main reason for this situation is the lack of funds to pay for services associated with surveying of bound-

aries (Report On the Situation with the Protection..., 2005).

Thus, in millions of hectares occupied by current Russian SPNAs there are hundreds of settlements, agricultural lands, roads, forests and other natural and man-made objects which belong both to public owners (the Russian Federation, subjects of the Federation and municipalities) and private owners, which constantly face the issues of sales, lease or privatization of their plots.

## 2.2. *Conflicts of economic and environmental interests within the boundaries of SPNAs between citizens and public authorities*

These conflicts include both a list of common issues inherent to any extent to all kinds of SPNAs and special issues that become most apparent within certain types of SPNAs. The common issue consists in the fact that SPNAs occupy thousands of hectares, and for centuries inside their boundaries they have been inhabited by people engaged in various types of economic activity (usually agriculture). Creation of SPNAs takes place without public hearings or other forms of consideration of the opinion of the population that often finds out about the creation of SPNAs within certain boundaries at the moment of adoption of this decision. After that citizens begin to have problems related to the limitation of economic activity, the impossibility to acquire ownership of land plots or lease them, change the type of permitted use of land plots, etc. The need to minimize the economic activities often entails social consequences associated with poverty, unemployment and necessity to migrate to other regions of the country. Here one could argue that even in some areas of the reserve, as follows from Article 9 of the Federal Law *On Specially Protected Natural Areas*, not including especially valuable ecological systems for maintenance of which the reserve was created, it is permitted to carry out activities which aim to support the functioning of the reserve and life of the citizens residing in its territory.

However, this possibility, first, is often not sufficient for the citizens to conduct economic activities to the same extent; second, such a rule contradicts the general principles of land law regarding the need to use land plots for the intended purpose; third, the authorization granted to reserves enabling them to deal with ecotourism leads to the fact that the reserve starts to resemble a national park, also implying a number of ancillary commercial activities (along with protection of valuable natural complexes and research) within its boundaries.

Nevertheless, in our view, the toughest conflict of economic, environmental and social interests in SPNAs can be observed in the following cases:

1) for many years the Russian legislation distinguished resorts among the types of SPNAs. A resort is a town or a city (which are sometimes quite large)

where sanatoriums and natural curative resources are located. This town is inhabited by local residents engaged in business activities (cafes and restaurants for tourists, outlets), they also have houses there, in which they live. For many years legislation and law enforcement practice considered these resort towns and cities not as settlements but as SPNAs. Accordingly, restrictions on some types of construction, privatization of land plots, conclusion of agreements for sale of land plots or lease were imposed in these towns and cities. Until recently, the courts took an extremely tough stance: privatization of land plots within the boundaries of resort towns is impossible, provision of land plots for construction by local authorities is forbidden (because resorts were considered as SPNAs of federal significance, though the federal ownership of land plots in most cases was not legally registered). All attempts of citizens to appeal against the refusal of local authorities to provide them with land plots were not supported by the courts.

For example, the court found that the disputed plot was transferred to the company and the factory as joint property under the sales agreement. Immovable property items belonging to the company and the factory on the basis of the right of ownership are located on the land plot. The land is fully included in the second zone of the sanitary protection district of the resort town of Pyatigorsk. The court considered the materials of the case and came to the conclusion about nullity of the sales agreement dated 12.05.2010, as concluded in respect of a land plot from the lands of specially protected natural areas (resort) which is limited in turnover and not subject to privatization (Decision of the Supreme Commercial Court of the Russian Federation of July 14, 2014).

Dozens of similar examples associated with the courts supporting the refusal of the local administration to sell land plots to citizens and legal entities under the procedure of privatization can be observed in the resort cities of Gelendzhik (Decision of the Supreme Commercial Court of the Russian Federation of November 21, 2011), Kislovodsk (Decision of the Supreme Commercial Court of the Russian Federation of June 26, 2013) and many other cities. The main argument usually boiled down to the fact that a resort was not a town or a city but a SPNA in which (in contrast to a town or a city) land plots were limited in turnover, especially if it was a resort of federal significance. In our view, all these restrictions made no rational sense, because, in order to protect the natural curative resources, it would be rather enough to protect them from development or economic activities by means of urban development legislation, and not to create artificial barriers to residents for living, leisure and business. At the end of 2013 resorts were finally excluded from the list of SPNAs, but even after that many of the old problems in a number of re-

sort towns and cities remained. In addition, the judicial practice went in two ways, according to the federal district where one or another resort is located.

The first way includes the resorts of the Black Sea coast. With respect to these resorts the courts considering (already after the exclusion of resorts from the list of SPNA) cases of privatization of land plots by citizens under the items of immovable property belonging to them noted that since the disputed land plot was located in the second zone of the mountain sanitary protection district of the resort, it related to the lands of specially protected natural areas of federal significance created before the entry into force of the law excluding the resorts from the list of SPNAs. The status of SPNA previously acquired by the resort region was not terminated automatically, and, therefore, alienation of the disputed plot for private ownership contradicted it. 2 of Art. 27 of the Land Code and other legal acts (Resolution of the Commercial Court of the North Caucasian District of November 6, 2015).

The main argument in dozens of similar cases consists in the fact that item 3 of Article 10 of the Federal Law of 28.12.2013 No. 406-FZ *On Amendments to the Federal Law On Specially Protected Natural Areas* and individual legislative acts of the Russian Federation (which excluded resorts from the list of SPNA) established that SPNAs and their protective zones created before the entry of this law into force remained within the same boundaries. On this basis the courts conclude that the status of SPNA acquired by the resort region of the city of Sochi many years ago is not terminated. This allows continuing to prevent citizens in the acquisition of the ownership of the claimed land plots. Meanwhile, the specified item 3 of Article 10 refers to all types of SPNAs (reserves, national parks, etc.) mentioned in the law, and *their boundaries* really, despite some changes in their legal status, remain unchanged. That is what is stated in it. 3 of Art. 10 of Law No. 406-FZ.

Resorts are not a type of SPNAs anymore, though a number of limitations of economic activities are still in force there, and *their boundaries* (boundaries of the sanitary protection districts) are still kept the same. Therefore, the courts' interpretation of the law in the sense that, despite the direct exclusion of resorts from SPNAs, they are still a type of SPNAs, is just very surprising.

Probably, such an unusual interpretation of the provisions of the law by the courts was due to the desire to preserve mainly lease relations within the boundaries of resort towns and cities, which allows local budgets to receive bigger payments from for the use of land plots by citizens. And this is also an example of a conflict of economic and environmental interests now in the ex-SPNA.

We observe the second (and more reasonable) way of interpretation of this law in a number of other regions also including resorts. For example, in Kaliningrad Region a company turned to the court after

the refusal of the local administration to sell the land plot occupied by the company under the procedure of privatization. References of the administration to the fact that the plot was located within the boundaries of the resort were rejected by the court due to the exclusion of resorts from the list of SPNAs in 2013. Moreover, the court specially stated that within the boundaries of settlements the legal regime of land plots is determined by means of zoning. The disputed land plot is located not in specially protected areas but in a residential area, which excludes establishment of the regime of restrictions on the turnover (Resolution of the Thirteenth Arbitration Court of Appeal of February 15, 2016). The number of such decisions grows every day, which gives hope for generalization and explanation of this judicial practice by the Supreme Court of the Russian Federation. 2) While the situation with the search for a balance of economic and environmental interests of citizens and authorities is gradually improving, similar conflicts in natural parks are still not resolved. A natural park is a variety of SPNAs of regional significance, very similar to a national park, but (in contrast to it) financed from the budget of the subject of the Russian Federation. The problems of natural parks under study can be observed for many years in terms of the regional SPNA – the Volga-Akhtuba Floodplain Natural Park located in Volgograd Region. It occupies a huge area – 154 000 hectares, and includes not only unique natural complexes but also settlements, the residents of which carry out various types of economic activities. Moreover, beautiful natural landscapes lead to the high demand for construction of cottages within the boundaries of the natural park. These circumstances led to the quite extensive judicial practice which is in a varying degree inherent in all other natural parks located both within the boundaries of Volgograd Region and in other regions. Let us distinguish the most common categories of land disputes.

1. Attempts of citizens and legal entities to privatize (buy out from state to private ownership) land plots within the boundaries of the natural park as a variety of SPNAs. The standard judicial dispute consists in the fact that a citizen owns one or more immovable property items and he wants to buy out the land plot under them. The local administration refuses, and its wording is supported by courts, which explain this stating that the citizen's land plot is located within the boundaries of the natural park as a variety of SPNAs (usually within the boundaries of a settlement), and lands of SPNAs are limited in turnover and may not be transferred into the private ownership of citizens (Resolution of the Federal Commercial Court of Povolzhsky District of July 23, 2013). At the same time there is an absurd situation: privatization (buy-out) of a land plot implying its transfer into private ownership from state (or municipal) ownership is denied to citizens (legal entities) with reference to the fact that this is a SPNA; former

rights of citizens and legal entities to land are reserved because there is no money in the budget to buy out their buildings and other immovable property items to state ownership. For example, the court stated that within the boundaries of the SPNA of the Moskvoretsky Natural and Historical Park the legal order excluded transfer of the ownership of land plots but did not deprive the applicant of the right to conclude a land lease agreement (Resolution of the Commercial Court of Moskovsky District of July 17, 2015). A simple question follows from this: why the presence of citizens and legal entities – tenants within the boundaries of SPNAs does not violate the regime of special legal protection of SPNAs, while the transfer of the ownership of these plots to citizens will considerably violate it?

2. A big problem for citizens within the boundaries of the natural park is the change of the type of permitted use of their plots, for example, for the purpose of construction of cottage settlements in the natural landscapes. These citizens (and more often non-profit associations established by them) turn to local authorities with applications for provision of land plots for construction of individual houses, but they receive a well-founded refusal, since cottage construction is expressly prohibited by law within the boundaries of SPNAs. Accordingly, in the natural park it is also prohibited to change the type of permitted use of the territory implying this private construction (Resolution of the Federal Commercial Court of Povolzhsky District of January 31, 2012).

3. Citizens, having learned about creation of the SPNA which includes their homes or farmlands, often try to challenge the lawfulness of establishment of the boundaries of the SPNA. Their arguments boil down to the fact that settlements may not be included in the SPNA without their consent, as this entails strong restrictions of their property rights. The defendant's arguments boil down to the fact that the legislation of Russia does not require public authorities creating SPNAs to buy out the property from citizens or to confer with them. Courts always support these arguments and deny citizens' claims (Decision of the Supreme Court of the Russian Federation of September 11, 2013).

### 2.3. *Conflicts within the boundaries of SPNAs with the participation of entrepreneurs*

Millions of hectares of lands occupied by SPNAs may include various natural resources (minerals, fauna, forest, waters, etc.) which are of interest to commercial entities. Moreover, valuable natural resources may be located in the territories surrounding SPNAs, but protective zones limiting economic activities in the territories surrounding SPNAs are provided not for all types of SPNAs. Therefore, threats to SPNAs can be grouped into *external* and *internal* categories (Auslander, 2006).

On the one hand, falling of one or another land plot within the boundaries of SPNAs meaning that identification of new mineral deposits is not carried out and mining licenses are not issued could only be welcomed from the point of view of conservation of ecosystems in their natural state.

On the other hand, the regions, already having a limited list of sources of income due to the specificity of the tax legislation, are deprived of the opportunity to fulfill their economic potential, for example, through lease of the land. As a result, for example, in Kamchatka Krai due to the inclusion of gold deposits in the regional SPNA raw materials at the cost of over 100 billion rubles were withdrawn from the economic turnover. The creation of Tunkinsky National Park in the Republic of Buryatia led to the social and economic degradation of the region, growth of unemployment, financial losses, eliminated the possibility of local residents to use natural resources for their needs (Orlov, Golubinskaya, Davydova, 2010). The lack of any statutory mechanism for the search for a balance of environmental, economic and social interests of local residents, entrepreneurs and authorities representing public interests leads, on the one hand, to violation of the regime of special protection of SPNAs, and, on the other hand, to attempts of *manual control* over the situation, with issue of individual permits for certain types of entrepreneurial activities in SPNAs (for example, those associated with subsurface use), which creates ideal conditions for the growth of corruption. The scientific literature describes dozens of such examples. For instance, in Yugyd Va National Park, the activities relating to exploration and extraction of gold were carried out even before its creation. After the creation of the park this caused conflicts between officials, mining companies and the *greens*. On January 14, 2010 the order of the Ministry of Natural Resources and Environment of Russia approved a new Regulation on this park, as a result of which its territory reduced by almost 2000 ha, and not on the border with unprotected lands but in the depth of the national park. Just a month later, Gold Minerals Company obtained a license for exploration and extraction of gold. On August 21, 2013 the Supreme Court of Russia ruled the gold extraction in Yugyd Va National Park illegal (Vorontsova, 2013). Other examples of economic activities associated with subsurface use within the boundaries of SPNAs are, for instance, development of Talnikovskoe deposit (located within the boundaries of the Kondinsky Lakes Natural Park), construction of the Altai gas pipeline (within the boundaries of the Ukok Quiet Zone and the Uch Enmek Natural Parks) as well as economic activities within the boundaries of wildlife sanctuaries and wetlands. In addition, it is noted that in accordance with the legislation of other countries (Australia) mining operations within the boundaries of SPNAs (national parks, reserves, World Heritage sites) are

also possible, but it focuses on various activities aimed at environmental protection and safety which subsurface users undertake to carry out to avoid (minimize) the negative impact of their activities on the environment (Skibin, 2015).

Similar conflicts of economic and environmental interests are often observed in other countries of the world as well. However, if before, for example, in the USA the threats to SPNAs were quite standard in nature (construction of mine facilities or electric power stations in the territory adjacent to the national park, or other development of the related territories), in recent years the threats to national parks moved to a new level due to the emergence of new technologies of shale oil production (Antolini, 2009). Researchers note that in 2016 in the USA there were 13 national parks where there was active power generation by means of shale oil production carried out within the boundaries of the parks.

In addition, it is supposed that 30 other national parks will probably have the same oil and gas development. While some regulations are designed to protect the environmental value of the park, other instructions on natural resources contain the opposite requirements. In essence, the right to regulate drilling activities in national parks stems from the role of the federal government as the surface landowner. The fact is that in most cases the mineral rights were severed from the property when the land was conveyed to the federal government to create the park. Some SPNAs (national parks) were created in areas long known for oil and gas resources. Other SPNA territories do not have a history of oil and gas usage but are under pressure today due to investments in shale oil and gas production. At the same time, today in the USA there are over 50 old wells in national parks which are out of operation but not closed. Some old wells have not been used for production for over ten years. Many out-of-operation wells pose threat to the safety of park visitors and staff.

Old, decaying equipment often sits idle without any appropriate monitoring or oversight and nobody can guarantee that the wells remain properly capped and no threat to the environmental safety comes from it. Authorities are able only to suspend drilling operations for noncompliance with the requirements, but they are not able to have any impact on wells that are not being used and are not generating revenue. Another problem consists in the fact that shale oil drilling in the parks comes into conflict with the interests of visitors to the park willing to relax. The current policy requires the park administrators to balance the satisfaction of the needs of the owners of mineral rights against the interests of visitors to the park and future generations. As such, the current practice is to encourage locating well pads outside national park borders because such locating eliminates threats to the park and other direct and indirect impacts (Geltman, 2016).

Therefore, the presence of prohibitions itself does not guarantee anything. It appears that the prohibitive ideology of statutory regulation conventional in respect of environmental protection worldwide initially could be explained by the tendency of the state to create favorable conditions for the preservation of unique natural ecosystems in protected areas, but in terms of constant expansion of the SPNA boundaries, which start including settlements and industrial facilities (or sites with high production potential), we get the opposite effect, which boils down only to *freezing* of traditional types of activities and limits the activity of the native population, prevents creation of new jobs, has a negative impact on the revenues of regional and local budgets. The established prohibitions, including those on exploration and extraction of minerals within the boundaries of SPNAs, significantly impede the development of these territories and are often a factor lowering the standard of living of their population, whose interests are not considered during their formation. A striking example of this situation is the Baikal natural territory, which prohibitive regime in respect of certain types of activities (including those carried out in connection with the location of the Baikal Pulp and Paper Mill there) resulted in the excessive limitations of economic activities and the drop in the standard of living of the population.

The tendency to continuous growth of the number of SPNAs in the country and expansion of the boundaries of the already created areas is also a dangerous trend. Planning should take into account all the possible consequences of a fundamental change of the legal regime, especially given the fact that many Russian SPNAs occupy vast spaces often comparable to the areas of individual states and sometimes exceeding their size. In the territory of SPNAs there are very often mineral deposits which have not been taken into account in the course of its establishment as a result of ignoring the expert opinions of geologists. Given the significant mineral resources within the boundaries of SPNAs, we consider it reasonable to expand possibilities for rational subsurface use in them, use of new criteria for identifying individual zones in SPNAs. In addition, a part of the profit from mining operations can be spent on the development of SPNAs (Orlov, Golubinskaya, Davydova, 2010). On the basis of the regime of special protection of SPNAs taking into consideration the practice of economic activities related to subsurface use within the boundaries of SPNAs, it is necessary to find the line between protection of SPNAs and economic activities permissible within its boundaries. We believe that within the boundaries of state natural reserves, natural monuments, as well as dendrological parks and gardens it is not acceptable to carry out any type of subsurface use established by the legislation, except formation of specially protected geological sites. Within the boundaries of national parks the le-



gal regime of subsurface use should include the following prohibitions: geological survey conducted by methods that admit a substantial violation of the integrity of the subsurface and other natural objects, construction and operation of underground facilities not related to mining operations, gathering of mineralogical, paleontological and other geological collection materials. Exploration and extraction of minerals within the boundaries of national parks must be prohibited, except the cases when subsurface use is carried out beyond the border of the national park by means of horizontal drilling under the specially protected zones of the subsurface (Skibin, 2015). It is quite possible to discuss also other options of search for a balance of interests in SPNAs.

### 3. Possible ways out of the situation

1. Transfer to sustainable development implies the search for a compromise between the interests of the environment, economy and social field. At the moment in Russia there is no search for a compromise in respect of the field of creation of SPNAs, and the absolute priority is given to the interests of the environment. This entails an entire complex of economic and social problems. For example, the business bears losses, vast territories where people live become depressed and the residents leave them. The creation of SPNAs does not involve conferring with residents of rural settlements that are included in SPNAs. Public hearings are not held, positive and negative effects of the inclusion of the territories in the SPNAs are not explained to the citizens. At the same time, it is notable that in case of adoption of a general layout or other documents, these hearings are held, and the citizens are considered to be quite competent to participate in them.

In this regard, we should mention that the original version of the Urban Development Code of Russia of 29.12.2004 provided for publication of information about the supposed SPNA and their boundaries in the special territorial planning schemes. Therefore, citizens were informed of the supposed creation of SPNAs in advance and could express their opinion. Later this rule was excluded from the Code, which we consider as an erroneous decision that should be corrected.

2. Our proposal for the need to take into account the economic and social interests of the citizens does not mean ignoring of the interests of the environment, including the protection of valuable natural complexes (SPNA). We refer to the need to search for balance between them, and regulations on anthropogenic load on the environment which are designed yet only for Lake Baikal could serve as its criterion. Until a framework (common) mechanism for consideration of economic, environmental and social interests in SPNAs is created, these issues will be addressed pointwise, as it was done, for example, by Decree of the Government of the Russian Federation

of 23.04.2012 No. 603-r in respect of four biosphere polygons of state reserves, where a number of types of economic activities were permitted to a different extent. We also propose development of a new variety of SPNAs resembling a national park in its inner structure but with another set of functional zones. It appears that partial legalization of subsurface use and other economic activities within the boundaries of this new variety of SPNAs will reduce the risks of corruption, establish clear and transparent legal procedures, as well as the fee for these types of activities, which can be later spent on reconstruction and development of SPNAs. Otherwise, economic activities in SPNAs will still continue, but this will affect the revenues of the budget and residents of the settlements in SPNAs.

4. In order to protect interests of citizens and business, it is necessary to move from today's strategy of *gigantomania*, when SPNAs with an area of tens of thousands of hectares are created, to the cluster approach, and instead of one huge SPNA to create a few small zones which are under the control of a single management and with the same protection regime. This strategy has already been implemented in Orenburg State Reserve, consisting of five isolated zones located in five different municipal districts of the region. Implementation of this approach makes it possible not to include in SPNAs settlements, roads, rivers, and territories surrounding villages where residents are engaged in cultivation of agricultural products and cattle grazing. In fact, if creation of SPNAs involves establishment of the regime of increased protection for especially valuable and unique natural complexes, what is the point to include in SPNAs villages and pastures, where it is clear that no valuable natural complexes can be located in principle? Creating giant SPNAs, we just try to deceive ourselves. It is necessary to withdraw from this practice in favor of consideration of economic and social interests of the population.

Creation of clusters will allow avoiding the problem associated with the need to transfer land from one type of ownership to another one (for example, federal zones of forestry funds included in the boundaries of a regional SPNA to the ownership of a subject of the Federation) as well as charges of misuse of the territories of SPNAs (any road in their territories, settlement, agricultural activities carried out by the reserve staff, etc.). Creation of small SPNAs will also facilitate land management procedures, because at the moment the majority of SPNAs has no clearly fixed boundaries and their establishment on the ground is too expensive.

5. We should specifically mention the exclusion of resorts from the list of SPNAs, which we fully support. A resort is a town or a city where people live. Undoubtedly, curative natural resources must be properly protected (the law establishes sanitary protection districts for this purpose) from construction or the impact of economic activities. However, it is

not reasonable to impose restrictions on land turnover or development in the rest part of a resort town or city. Similarly, it is necessary to withdraw from the restrictions on turnover or consumer (non-industrial) use of land plots in settlements included in natural parks or other large SPNAs. If plots occupied by citizens really have a special value – they should be bought out according to the established procedure to state ownership. If this does not happen – there is no sense to create artificial problems for people. Implementation of this buy-out and relocation strategy can involve use of the experience gained in the course of construction of facilities before the Olympics in Sochi in 2014. Then, the specially adopted law provided for the possibility for citizens – owners of plots and houses withdrawn for location of the Olympic facilities, to obtain the ownership of other land plots. In a similar way, the procedure for granting land plots to citizens in lieu of the withdrawn ones can be applied in case of creation of other types of SPNAs, when citizens acquire plots near the boundaries of SPNAs free of charge.

6. From the point of view of the concept of sustainable development, the strategy for development of ecotourism should be supported in all types of SPNAs including reserves (though the concept of sustainable ecotourism is still to be developed) (Butler, 1999). State funding of creation of the ecotourism infrastructure will lead to the growth of the number of visitors and the increase in funding of environmental programs of SPNAs. For example, in the USA the number of visitors to national parks has almost doubled over the last 30 years, rising from approximately 133 million visitors to almost 270 million, which created a number of problems with tourist services (Fretwell, Podolsky, 2003).

Development of tourism in SPNAs often raises the question of the balance of the interests of tourists and local residents. Putting the needs of tourists before the interests of local residents can lead to unlawful interference with the life of the latter and cause damage to the environment in SPNAs. On the contrary, if no conditions are created for tourists, they will not come to the country (which is especially painful for developing countries), and this country will lose the foreign currency, which is quite necessary for it. A more creative approach should develop ways that allow finding a balance of the interests of both groups, while ensuring protection of the environment (Roberts, 2004). If wildlife can be managed so that local residents receive significant material benefits from this, they are most likely to cooperate with travel agencies and implement environmental protection measures.

7. We should point out that private SPNAs could play a great role in ensuring sustainable development. Now such a possibility is not available in Russia, though there is very interesting international experience. For example, in the USA, private non-governmental organizations are involved in territorial

protection of nature along with state agencies. NATURE CONSERVANCY (NC) manages the largest system of private natural reserves in the world, the size of which ranges from a few to many thousands of hectares. Only in the USA it owns more than 1 600 private reserves. Some republics of the former USSR also have positive experience. For example, according to Article 4 of the Law of the Republic of Uzbekistan *On Specially Protected Natural Areas* of 07.05.1993, especially protected natural areas are the property of the state and are protected by it. Botanical gardens, dendrological and zoological parks can be based on other forms of ownership as well. This experience can be used in Russia and other republics of the former USSR through creation of private resorts, dendrological parks and botanical gardens, which will attract new investments and promote creation of unique collections of plants, tourism business, including due to economic incentives of the state.

## Conclusion

Our proposal to take a new look at the development of the system of SPNAs from the perspective of sustainable development and to create the system for search of a balance of economic, environmental and social interests in SPNAs is not aimed at reduction of the number or the area of SPNAs. We refer to the change in their management system, including creation, modification of the boundaries or termination of operation. It is necessary to embed all types of SPNAs in the system of social and economic relations of the regions and the country in general, withdraw from the current one-sided bias solely in favor of environmental factors. This will help to find the balance of the interests of the local population, business and protection of nature, which is so necessary for the country.

## References

1. ANTOLINI D.E., 2009, National Park Law in the U.S.: Conservation, Conflict, and Centennial Values, in: *William & Mary Environmental Law and Policy Review*, vol. 33, p. 881-882.
2. AUSLANDER J.M., 2006, Reversing the flow: the interconnectivity of environmental law in addressing external threats to protected lands and waters, in: *Harvard Environmental Law Review*, vol. 30, p. 482.
3. BRYNER G.C., 2002, Policy Devolution and environmental law: exploring the transition to sustainable development, in: *Environs*, vol. 26, p. 10-11.
4. BUTLER R.W., 1999, Sustainable tourism: A state-of-the-art review, in: *Tourism Geographies*, vol. 1:1, p. 7-25.
5. *DECISION of the Supreme Commercial Court of the Russian Federation of November 21, 2011*

- No. BAC-14339/11 On Refusal to Transfer the Case to the Presidium of the Supreme Commercial Court of the Russian Federation.
6. DECISION of the Supreme Commercial Court of the Russian Federation of June 26, 2013 No. BAC-7692/13 On the Refusal to Transfer the Case to the Presidium of the Supreme Commercial Court of the Russian Federation.
  7. DECISION of Torzhok Town Court of Tver Region of August 1, 2013 in case no. 2-521/2013, <https://rospravosudie.com/court-torzhokskij-gorodskoj-sud-tverskaya-oblast-s/act-434126673/> (19.01.2017).
  8. DECISION of the Supreme Court of the Russian Federation of September 11, 2013 No. 16-AПГ13-8, in: *Legal Reference System 'Consultant Plus'* (19.01.2017).
  9. DECISION of the Supreme Commercial Court of the Russian Federation of July 14, 2014 z. No. BAC-8722/14 On the Refusal to Transfer the Case to the Presidium of the Supreme Commercial Court of the Russian Federation.
  10. DIKUSAR V.M., 2007, *International legal issues of environmental protection: thesis of the doctor of jurisprudence*, Institute of the state and law of the Russian Academy of Sciences, Moscow, p.152.
  11. EISEN J.B., 2010, Brownfields Policies for Sustainable cities, in: *Duke Environmental Law & Policy Forum*, vol. 9, p.197.
  12. FRETWELL H.L., PODOLSKY M.J., 2003, A Strategy for Restoring America's National Parks, in: *Duke Environmental Law & Policy Forum*, vol. 13:2, p.153.
  13. GELTMAN E.A., 2016, Oil & Gas Drilling in National Parks, in: *Natural Resources Journal*, vol. 56-1, p. 151-175.
  14. HORN L., 2013, Rio+20 United Nations conference on sustainable development: is this the future we want?, in: *MqJICEL*, vol. 9, p. 1-2.
  15. Judgement of the ECHR of 07.05.2002 in the case of Burdov v. Russia (application no. 59498/00), in: *Legal Reference System 'Consultant Plus'* (19.01. 2017).
  16. KODOLOVA A.V., 2013, *Concept of sustainable and safe development of the CIS member states. Society order and modern Russian law / under the editorship of G.S. Pratsko and L.A. Spektor: collection of conference materials*, Moscow, p.578-581.
  17. LAFFERTY W.M., 1996, The politics of sustainable development: global norms for national implementation, in: *Environmental politics*, Vol. 5-2, p. 185-208.
  18. MARX K., 1845, *Theses on Feuerbach*, <http://lugovoy-k.narod.ru/marx/03/01.htm> (19.01.2017).
  19. ORLOV V.P., GOLUBINSKAYA T.E., DAVYDOVA M.V., 2010, Issues of the legal status of specially protected natural areas, in: *Journal of Eurasian Law*, vol. 1, p. 96-100.
  20. PETERS K.A., 2010, Creating a Sustainable Urban Agriculture Revolution, in: *Journal of Environmental Law and Litigation*, vol. 25, p. 217.
  21. PUSHKAREVA E.F., 2008, *International environmental law order and environmental human rights: thesis of the doctor of jurisprudence*, Moscow State Institute of International Relations, Moscow, p.12-13.
  22. REPORT, 2005, *On the Situation with the Protection and the Functioning of Reserves and Natural Parks in 2004*, <http://www.biodat.ru/db/oopt/doc/zap4.htm> (19.01.2017).
  23. RESOLUTION of the Federal Commercial Court of Povolzhsky District of January 31, 2012 in case No. A12-7231/2011, in: *Legal Reference System 'Consultant Plus'* (19.01.2017).
  24. RESOLUTION of the Federal Commercial Court of Povolzhsky District of July 23, 2013 in case No. A12-17227/2012, in: *Legal Reference System 'Consultant Plus'* (19.01.2017).
  25. RESOLUTION of the Commercial Court of Moskovsky District of July 17, 2015 in case No. A40-104878/14, in: *Legal Reference System 'Consultant Plus'* (19.01.2017).
  26. RESOLUTION of the Commercial Court of the North Caucasian District of November 6, 2015 in case No. A32-9917/2015, in: *Legal Reference System 'Consultant Plus'* (19.01.2017).
  27. RESOLUTION of the Thirteenth Arbitration Court of Appeal of February 15, 2016 in case No. A21-6355/2015.
  28. RESOLUTION of the Commercial Court of the North-Western District of June 7, 2016 in case No. A21-6355/2015, etc., in: *Legal Reference System 'Consultant Plus'* (19.01.2017).
  29. ROBERTS J., 2004, *Environmental Policy*, Routledge, Taylor & Francis Group, London and New York, p. 76.
  30. SKIBIN S.S., 2015, *Peculiarities of legal regulation of subsurface use in terms of limited economic activities within the boundaries of specially protected natural areas: abstract of the thesis of the candidate of jurisprudence*, Institute of Legislation and Comparative Law under the Government of the Russian Federation, Moscow, p. 4-22.
  31. SPECIALLY PROTECTED NATURAL AREAS OF THE WORLD, 2016, <http://lektsii.org/3-63641.html> (19.01.2017).
  32. STATE REPORT, 2015, *On the State and Protection of the Environment in the Russian Federation in 2014*, Moscow, p. 29-30.
  33. VERSHILO N.D., 2008, *Environmental legal fundamentals of sustainable development: thesis of the doctor of jurisprudence*, Institute of the state and law of the Russian Academy of Sciences, Moscow, p. 9-10.

34. VORONTSOVA O.V., 2013, Issues of legal regulation arising in the settlement of disputes over establishment of the boundaries of the Federal State Institution 'Yugyd Va National Park' issues of judicial practice, in: *Business in law*, Vol. 5, p.118-122.

## Sustainability, Corporate Community Engagement and Enterprise Development – Lessons from a Case Study in Emu-Ebendo Niger-Delta, Nigeria

### Zrównoważenie, korporacyjne zaangażowanie społeczne i rozwój przedsiębiorstw – lekcja z Emu-Ebendo w delcie Nigru, Nigeria

O.E Ajide\*, P.A. Strachan\*, A. Russell and D.R. Jones\*\*

*\*Aberdeen Business School, Robert Gordon University, UK*

*\*\*Bournemouth University, UK*

*E-mails: o.e.ajide@rgu.ac.uk (corresponding author); p.a.strachan@rgu.ac.uk,  
a.russell@rgu.ac.uk, drjones@bournemouth.ac.uk*

---

#### Abstract

Corporate community engagement remains an under researched area in sustainability debates. Presenting a case study, based on in-depth interviews and site visits, of how one indigenous company Energia Ltd has formed a strong partnership or bond with the Emu-Ebendo community in the oil rich Niger Delta, the dynamics of corporate community engagement are critically discussed. Evidence of how both the company and community has benefited from this relationship is presented. The case analysis concludes that the company has effectively utilised a clearer understanding of the culture of the host community, leading to a transformational relationship. The approach adopted by Energia Ltd in the Emu-Ebendo community is unique in context. The key conclusion reached is that community benefit funds and community enterprise development, as a derivative of corporate engagement, can play a transformational role in societal and economic development.

**Key words:** community engagement, community enterprise development, sustainability, local content, Niger Delta, Nigeria, oil and gas

#### Streszczenie

Kwestia korporacyjnego zaangażowania społecznego nie jest często podejmowana w ramach debat o rozwoju zrównoważonym. Lukę tę uzupełnia niniejsze studium przypadku, oparte na szczegółowych wywiadach i pracy w terenie. Pokazujemy, w jaki sposób kompania Energia Ltd wprowadziła zasadę partnerstwa, w wyniku której nawiązała się silna więź pomiędzy firmą a społecznością Emu-Ebendo zamieszkującą bogatą w ropę Deltę Nigru. Przedstawiono dowody, jakie korzyści odniosły zarówno kompania, jak i społeczność. Przeprowadzono analiza pokazuje, że firma efektywnie wykorzystwała zasady wyznaczające ramy kultury lokalnej społeczności, co prowadziło do pozytywnych zmian odnoszących się do wzajemnej relacji. Podejście przyjęte przez Energia Ltd wobec społeczności Emu-Ebendo jest nowatorskie. Okazało się, że fundusze świadczeń społecznych i społeczny rozwój przedsiębiorstw, będące pochodną zaangażowania korporacyjnego, mogą odgrywać podstawową rolę w przemianach społecznego i ekonomicznego rozwoju.

**Słowa kluczowe:** zaangażowanie społeczne, społeczny rozwój przedsiębiorstwa, zrównoważoność, lokalna wartość, Delta Nigru, Nigeria, ropa i gaz

---

#### Abbreviations

ECCR – Ecumenical Council for Corporate Responsibility; MoU – Memorandum of Understanding;

NOGIC – Nigerian Oil and Gas Industry Content Act; LNG – Liquefied Natural Gas

## 1. Introduction

Businesses and communities, and their impacts on society and environment, are core to sustainability debates. Yet corporate community engagement is an under-researched topic in the sustainability literature. In particular, as Bowen et al. (2010) point out: there is a lack of evidence on the tangible benefits that can flow to companies and communities, from corporate community engagement initiatives. This article responds to their specific call for further research into this issue by presenting how the engagement approach of one company has led to transformational change in shared company-community benefit provision. In the following paragraphs, Nigeria is presented as the national context for this research.

Nigeria is Africa's largest oil producer. According to the United States (US) Energy Information Administration (2015) Nigeria it is also one of the world's major exporters of liquefied natural gas (LNG). While endowed with these vast fossil fuel resources, Nigeria and in particular the Niger Delta, has proven to be a very challenging context for government (national, state and local), foreign oil corporations, and communities alike. Indeed, communities often report that they have failed to benefit adequately from the wealth created from oil and gas extraction, and claims of corruption and nepotism amongst governmental and corporate players has soured relationships (see for example: Kemp, 2010). In such a toxic environment, government-company-community relationships have often been characterised by significant levels of mistrust, antagonism and at times even considerable violence, with this regularly receiving international media coverage.

Attempting to address host community tensions, both government and oil and gas companies have embarked on ambitious stakeholder management programmes. Perhaps the most pressing requirement for Nigeria, given its economic reliance on oil production is to address head-on the issues confronting relationships among local communities, oil companies, and the government in the key oil rich region of the Niger Delta. Consequently, the analysis presented in this article is based on a case study of one particular company, Energia Ltd, and one specific community, the Emu-Ebendo community.

The reason why this case is of interest is that unusually in the context of Nigeria, and for that matter other developing nations where foreign oil companies dominate, Energia Ltd has effectively utilised a clear understanding of the culture of the host community, leading to a transformational relationship or bond between the company and community. Schein (1990), Schein (1985), Schneider (1988) and Weeks and Galunic (2003) have outlined how important it is to use a *cultural lens* when trying to understand companies and communities. Going further they contend that culture accounts for values, beliefs or

practices, with Hoecklin (2000) concluding that companies who do not possess a cultural understanding of their host community will run into multiple problems. In the context of this research, the company's cultural understanding of the host community has been one of the key factors in building an effective relationship, and this comes through in our analysis.

As evidence of this, and again unusually in Nigeria, a formal Memorandum of Understanding (MoU) has been signed between the company and community, which gives cognisance to cultural sensitivities. This stipulates that a share of the proceeds from the sale of oil produced within the Emu-Ebendo community is paid into a (trust) fund. To date this has been used to fund community projects and enterprise development ventures worth many millions of dollars. Drawing an international comparison, the distribution of profits back into local community projects has some similarity with the development of oil resources in say, the Shetland Islands of Scotland. And more recently in the United Kingdom (UK) the provision of community trust funds for renewable energy projects.

The following section of the article provides a review of key theoretical concepts, and further lays out the central focus of the research. In the next section, the case study of Energia Ltd and the Emu-Ebendo community is introduced. In the fourth section the key results around transformational engagement are presented. Conclusions and areas for future research are then reached in the final section.

## 2. Theoretical Perspective

In this article the work of Zimmerman (see for example: Zimmerman, 2000; Zimmerman and Warschausky, 1998; Perkins and Zimmerman, 1995) is particularly helpful in making the argument that community engagement and empowering communities has become necessary in the relationship between business and society, and that corporations' should play an instrumental role in that process. Zimmerman's emphasis on *improvement of the quality of life of host communities*, and the *provision of opportunities for citizen participation* (Zimmerman and Warschausky, 1998; Perkins and Zimmerman, 1995), is drawn upon here as it allows one to think through the ways in which corporate community engagement is initiated and its effects.

To this end Zimmerman's (2000, p. 44) conceptualisation of empowerment as being productive is generative for grasping how corporations' could be transformational in their role in society. It is here also that Zimmerman's attention to the switch in nomenclature of corporations' as social change agents from *client* to *participant* and *expert* to *collaborator* in the empowerment process is of value for informing how to understand how companies as *collaborator* learn about the communities' through *their cul-*

tures, their worldviews and their life struggles in contemporary business and society relationships. Having provided this insight into the theoretical lens that underpins the study, the concepts of community and corporate community engagement are now discussed and explained further.

### 2.1. Corporate Community Engagement

Community engagement has been defined by a number of different authors. Bowen et al. (2008, p. 14) state community engagement is, *the process of working collaboratively with and through groups of people to address issues affecting the well-being of those people*. Similarly, Colombo (2012, p. 2) defined community engagement, *as the process implemented by companies to work collaboratively with and for individual citizens and geographically defined community groups to address issues affecting their social well-being*. For Muthuri et al. (2009) this process helps organizations assess and resolve community needs and creates opportunities with the ultimate aim of contributing to community development.

However, such collaborative intent is often obscured due to a conceptual ambiguity around what in practice constitutes community. For instance, a geographical perspective of community might overlook the interactions amongst members within that geographical space (Bowen et al., 2010). Sama and Aref (2011) assist here by outlining four basic constituents surrounding the concept of community. These are: people; area; interaction; and, interest.

Notwithstanding the difficulties of defining community, there are a number of other difficulties within the academic literature. These are associated with the range of descriptions given to the term community engagement (Boele and Wheeler, 2001). As Bowen et al. (2010, p.299) has outlined several terms are used interchangeably. These include: *community involvement; public involvement; stakeholder engagement; citizen engagement; public engagement; community consultation; community development; community relations; public participation and community capacity building*. The overall effect of the different semantic choices is one of confusion and lack of agreement about what the term *community engagement* actually means, as Sarraimi Fouroushani et al. (2012) have said.

Another problem is the different ways in which the relationship between community engagement and stakeholder theory has been conceptualised. While some commentators perceive *community* as being one of many stakeholders that a firm may have, others depict community engagement as interaction with any or all external stakeholder groups (Kepore and Imbun 2010).

Also, the manner in which the many different definitions have been presented implies that different levels of community engagement might exist. Kepore and Imbun (2010, p. 221) for example indicate that

community engagement, *is any channel of communication purposely set by a business organization in order to receive feedback on its activities from external stakeholders*. This describes a simple, one-way direction of communication, used by the firm for its own (unknown) internal processes and decision-making. On the other hand, the World Bank (2006, p. 12) perceives community engagement as, *a broad, inclusive and continuous process between a company and its stakeholders, such as community members, NGOs, and local/regional government*. This appears to suggest a greater two-way process, with many flows of communication, quite different from the first definition.

Arguably, the most popular model of community engagement is Arnstein's (1969) ladder of citizen participation. The ladder presents a tiered range of interaction with the bottom rung of the ladder being the firm dominating the relationship and acting unilaterally in dictatorial fashion, but nevertheless possibly influencing the education and ambitions of members of the host community. In contrast, at the top rung of the ladder, is a more enlightened relationship with full empowerment of the public, to be equal partners in all aspects of the running of projects, within the local region (Attree et al., 2011; Menon and Stafinski, 2011).

Brenner et al. (2011, p. 87) further refer to a continuum model for community engagement. This starts from, *community consultation, to community participation, and ends in community consent*. A common concept in the community engagement literature is the *continuum of community engagement*, where engagement approaches are set out in a linear format, showing from least engaged to most engaged. Various typologies that form the basis for this continuum exist.

A particularly influential continuum model is that of Bowen et al. (2010, p. 304), which borrows terminology from the leadership literature and describes *transactional, transitional, and transformational* engagement, as three forms of engagement that are typified on a *continuum of community engagement*. According to Sarraimi-Foroushani et al. (2014), the first, *transactional* phase in Bowen et al.'s (2010) model indicates that although the community has a passive role it receives benefits of a tangible and intangible nature. These benefits include philanthropic gifts, people prepared to work for the community part-time on a voluntary basis and of course being kept up-to-date about corporate activities.

The second *transitional* phase is concerned with interactive engagement between the parties. Here this is open and transparent exchanges of ideas and significant levels of co-operation, but much of the interaction will be prompted at the request of the company and undertaken at corporate level. In essence, the community will be treated as a minor stakeholder.

In the final *transformational* phase, joint decision-making is the hallmark that signals a genuine partnership of equals has evolved (Bowen et al., 2010). Transformational engagement concerns purposeful actions taken by the company with the intention of effecting change in society through robust two-way communication and co-creation of value.

The concepts and models outlined above help to evaluate what community, and community engagement is, and this will assist further in the evaluation of the engagement strategy pursued by Energia Ltd. Bowen et al.'s (2010) continuum model is the most helpful here, with it being based on such a rich body of literature. But before moving onto a discussion of the method of analysis that underpins this research, the concept of community enterprise development is explained.

## 2.2. Community Enterprise Development

Sustainability aims to encourage organizations to act responsibly and contribute to the development of their host communities. In this pursuit many oil companies budget and spend huge sums of money on developmental projects. But despite increasing levels of money spent by some of these companies, the contribution made by funds to improve peoples' standard of living remains elusive (see for example: Aghalino, 2011; Lawan, 2008).

For this reason, there is increasing attention given by companies to assist hosting communities create social and business ventures (commonly referred to as community enterprise development) in order to empower citizens, with the aim of reducing poverty. Somerville and McElwee (2011) outline that interest in community enterprise development has arisen for many reasons. Charity, as conceptualised in the West, has not solved the problem of endemic poverty in developing countries (Saiia et al., 2003). Also, the renaissance of the African 'Ubuntu' concept – *the belief in a universal bond of sharing that connects all humanity* – has done little to solve the poverty problem (Newenham-Kahindi, 2009, p. 104). Moreover, communities increasingly realize that governments and corporations have failed to live up to their responsibility to create more egalitarian societies (Frynas, 2005).

Historically, community enterprise has its pedigree in civil society. Public interest promotes these kinds of organizations but such enterprise tends to be autonomous of control from the state (Tracey et al., 2005). Community enterprise, often conceptualized as a division of social enterprise, has been advocated as a tool for societal change in bringing about a common good. Communities have also taken an interest in the strategy of social enterprise business models, as a means to financial sustainability (Haugh, 2012; Nwankwo et al., 2007).

Community enterprises tend to be not-for-profit entities. Profits or monetary are surpluses re-invested

into the actual enterprise or the communities it serves. A clear difference between social enterprises and community enterprises is that community enterprise members participate in the running and overall management of entity. This is often through boards of trustees elected by the community, which may include local representatives. Their role is to help shape a clearer vision and provide strategic direction. In addition, and under this model, assets tend to be held in trust for the community (Nwankwo et al., 2007). In summary community enterprise is, *an enterprise whose social foundation lies in a community of some kind... insofar as they are controlled by their members and have social as well as economic aims* (Somerville and McElwee, 2011, p. 4).

The extant literature presents various forms of community enterprises including *community co-operatives*, where *the emphasis is more on membership control* (Somerville and McElwee, 2011, p. 4) and *community-based enterprise* (CBE) which involves *a community acting corporately as both entrepreneur and enterprise in pursuit of the common good* (Peredo and Chrisman, 2006, p. 4).

Whatever shape community enterprise activity takes, benefits accruing from community enterprise development, such as individual and community aspiration, as well as future economic growth and development, appear to make it one option for developing nations to pursue solutions to reduce poverty.

## 3. The Research Strategy

### 3.1. Research Site

The Emu-Ebendo community is located in the Ndokwa West Local Government Area of Delta State. It is 398 kilometres south of Abuja, the capital of Nigeria. There is no government population consensus data available and so it is estimated that approximately 20,000 people live there. In Nigerian terms, it is a small community.

Energia Ltd is the operator of a marginal oil field, located in the Emu-Ebendo community. Incorporated in 2001, it is an indigenous company. Established by key oil and gas technology services experts, its aim is to exploit the legal requirement that stipulates that only companies owned by Nigerians should be awarded licences to exploit marginal oil fields.

The mission statement of Energia Ltd is to, *exploit, produce and process sustainable energy sources for the development and upliftment of mankind and its environment, in collaboration with the communities in our areas of operation, with a workforce that continuously improves its work methods and technology, while maintaining a healthy balance between our operations and the environment*. The core values of the company are, *transparency responsibility; accountability; commitment; integrity; respectfulness; prudence; and, professionalism* (Energia, 2013).



To avoid any confusion Energia Ltd is not a community enterprise. It has as part of its core business strategy promoted community engagement, and enterprise development initiatives, in its host community.

### 3.2. Data Sources

In total thirty-five interviews (with senior figures in government, regulatory bodies, energy companies, associations and local communities) were undertaken as part of a broader study of corporate social responsibility in the Niger Delta. A purposive sampling strategy (Patton, 1990) was chosen since respondents must have a good knowledge of the corporate community engagement issues in community. In conducting interviews all were held in spoken English, so there were no interpretation or translation issues. In addition, the principal author is a Nigerian citizen, so intricacies of spoken English in Nigerian, and any values, beliefs and wider cultural issues, were navigated sensitively.

In response to information received regarding leaders in the Emu-Ebendo community, the first interviews were held in July 2013 with the community development chair and the public relations officer of the community youth association. Also, to get a different perspective to what those in the community governance structure presented, one youth from the community was also interviewed. With their consent the interviews were recorded and subsequently transcribed and analysed using NVivo 10 software. The forty-five minute to one hour interviews provided important background and contextual information and in-depth details about their perception of Energia Ltd and their community engagement strategy, and effect on the community.

In addition, research site visits were also made to projects executed within the community including the completed ultra-modern market stalls, road-under-construction and vehicles purchased from funds of the oil proceeds. What emerged from the analysis were perspectives (from both corporate and community) on community engagement and community enterprise development. These perspectives show how corporate and community engagement has evolved within the Emu-Ebendo community.

While there are no ethical or other issues in naming the company and the host community here, rightly in order to preserve interviewee anonymity as far as possible, we developed a coding system to identify specific interviews. *Gov* indicates that the interviewee works for the government (officer); *Comp* refers to company; and, *Com* refers to community. The number at the end differentiates interviewees within the same category of respondent.

## 4. Key Findings and Discussion

### 4.1. Emu Ebendo Community Experience Before Energia Ltd's Entry

Prior to the entry of Energia Ltd in Emu-Ebendo, Elf had operated there. In addition, respondents were aware of other oil majors in other localities. However, the community perceptions of these companies were not at all positive. Key community representatives (Com 1 and Com 2) were of the view that the community as a whole had not secured enough advantage or benefit from oil activity in their region, and had not been empowered sufficiently. Illustrating this Com 2 said that,

*We had Elf. And we know about Shell and Chevron. None of these companies give a percentage of oil proceeds that I know about.*

*The most they did is to give out things like scholarships. This is a handout.*

*After the scholarship had elapsed, they may then employ us, but not always. Employment becomes the key benefit to the individual and their families.*

*But other people are cheated. Nothing goes to them, the wider community.*

Comparing the different approaches adopted from these companies, and Energia Ltd Com 2 stated,

*But, now today, we have an indigenous company.*

*They give us a percentage of the proceeds, with the whole community benefiting.*

The type of engagement adopted by the oil and gas majors outlined by Com 2 can be classified as routine practice in Nigeria. Drawing on Bowen et al.'s (2010) typology such engagement can be defined as *transactional engagement*.

In comparison Energia Ltd's approach has been very different. The predominant level of engagement perceived by the Emu-Ebendo community is that their approach has been *transformational*. Not only in terms of the percentage of proceeds given back to the community. But also in terms of the: communication strategies employed; number of community partners involved; community control over processes; and, learning by doing by the company and community (Com 1 and 2).

Presenting specific examples of engagement, the next section details the impact of corporate and community engagement and enterprise development activities on the community. In short, community engagement is achieved in practice through social and enterprise development activities, since the engagement process has produced several initiatives and business activities within the community. Community enterprise development activities here go beyond Bowen et al.'s (2010) *transactional engagement* common within other localities in the Niger Delta.

#### 4.2. Marginal Oil Fields and Impacts of Corporate Community Engagement in the Niger Delta

Following on from Zimmerman's (2000) empowerment concept and its application as a lens for this study, the conclusion reached is that the indigenous firm's engagement strategy processes is an exemplar of transformational engagement. The Nigerian Oil and Gas Industry Content Act (NOGIC) (2010) has been the catalyst for encouraging Nigerian companies to become operators in marginal oil fields, with nine marginal fields now under the management of indigenous companies (Osahon 2013; Ihua et al., 2009).

Given that the oil industry in Nigeria has long been seen as a bastion of male supremacy, it is particularly satisfying to note that the Act has resulted the first indigenous female owner and chief executive officer of a marginal field. Comp 1 highlighted the company's efforts at providing community employment as a core goal,

*How else do you want us to add value?*

*We employ 100 Nigerians. Considering the fact that we are a small company in operation for only 5 years.*

*If oil companies operate that way, more Nigerian people will be in employment.*

Demonstrating community-focused commitment by offering employment to empower the citizens of their host communities Comp 1 continued,

*34% of our employees are indigenes of our host communities. We are the first indigenous company to train five marine employees from our host communities for five months in the USA within our first two years of operation. These five marine employees were the Nigerian crew that brought back a vessel MV Princess Royale from Homma Louisiana to Nigeria.*

Gov 2 confirmed the performance of the indigenous oil company in helping Nigeria to maximise returns from marginal fields,

*Operationally, the performance I would say has been quite phenomenal because one would have thought that those indigenous companies would not have the requisite skill, technologies and expertise to operate those fields.*

*But that has been proven wrong because they have indeed surpassed expectations. They have all met their obligations and more.*

Gov 2 continued,

*But, that is not surprising. They have seen the mistakes their former companies made in the past. They have addressed those and they have learnt to overcome those challenges in operating their (new) fields.*

With respect to community engagement Gov 2 was effusive about the better relationship between the indigenous company operators, compared with the previous oil company operators:

*In terms of community engagement. They have seen the mistakes made by former operators. So now every year a work programme is produced. This details plans and activities for the previous year, current year, and next year.*

*Community comments, observations and recommendations are sought. Engagement. The community feeds into that process as an equal partner.*

This view was echoed by nearly all of the respondents who cared to comment on this issue, with clear and tangible benefits evidenced to both the company and community. A typical set of comments, this time drawn from Gov 1 would be,

*Armed police escorts are no longer required.*

*Unusually there are peaceful relationships between the company and community. This prompted me to ask why? What is the secret? The company has signed an MoU. They (the company) are faithful to the MoU; they benefit directly and indirectly.*

*The community ensures that there is peace and no hostility towards the company...the community is benefiting from a community fund and seeing themselves as principal stakeholder.*

*By ensuring that there is no rancour. The company benefits because there is no disruption to oil production activities.*

Moreover, Gov 3 confirmed that the indigenous company has an excellent working relationship with the host community,

*the marginal field operator is trying hard....they have an excellent relationship with the host community from what I have seen.*

The next section illustrates how social and community enterprise development has become possible in the Emu-Ebendo community.

#### 4.3. Social and Enterprise Development, and Governance Structures

In supporting social and community enterprise development, Energia Ltd has agreed to pay income from oil related activities, as previously outlined. This money is paid into a community trust fund and this is then reinvested into the community via social development activities and the creation of new business ventures. In illustrating this Com 1 stated,

*(The) benefits have accrued to our community have been many. Some of which are:*

- a) Road construction;*
- b) Payment of electricity bills, which has helped educational attainment;*
- c) The purchase of two Toyota Hilux 4WD cars and 2 Toyota mini buses, with only one of these vehicles retained for community use, while the others are leased out and income generated from them; and,*
- d) Monetary contributions are given as a grant in support to business ventures for women who are in farming.*

Some of the other social projects initiated and executed successfully include the:

- Elders' Welfare Programme;
- Educational Remedial Programme;
- Funding of the Emu-Ebendo Vigilante Security Surveillance System;
- Construction of an Ultra-Modern Market;
- Scholarships;
- Youth entrepreneurship;
- Sustainable water supply; and
- Promotion of indigenous capacity through contractors' support.

In order to ensure effective governance of the trust fund, social initiatives and business ventures, an Ebendo Community Trust Fund Board has been set-up. This Board comprises of community members, representatives from Energia Ltd, and a chairperson who is not an indigenous member of the community. Furthermore, the Emu-Ebendo community and Energia Ltd jointly agree who should become a member of the Board. Citizens of the community who do not hold any leadership position in the community are also chosen for Board membership to provide balance and to help with transparency. These measures are designed to prevent corruption or embezzlement of funds (Com 1, 2 and 3).

Finally, and very importantly the approach adopted by the Emu-Ebendo community is also having a broader societal impact on other Nigerian communities. Com 1 states,

*As the first beneficiary of percentage payments of this kind...other communities have been making efforts to imitate us in their discussion...with other oil companies...we are leading on this.*

In summary, this case provides evidence that suggests that empowerment and transformational engagement can generate significant practical benefit for both companies and communities, as conceptualised by Bowen et al. (2010).

#### 4.4. Discussion

The foregoing discussion has set out salient points as per corporate community engagement and community enterprise development activities. Despite the challenging nature of relationship between companies that operate in the Niger Delta and host communities, the case study indicates that there could be a peaceful relationship between companies and communities if the approach, which respects cultural norms, values and beliefs, followed here is adopted elsewhere. However, the issue of respect from the company to the communities' culture, norms and values underpin the peaceful relationship that exists. Since respect is reciprocal, the community also respects the company.

In comparison, this was absent in Shell's relationship with the Ogoni community which led to a series of

high profile conflicts that culminated in the killing of the Ogoni nine including Ken Saro Wiwa (Campbell, 2002; North, 2001). It is relevant to point out that this is not the first time research on the Niger Delta has highlighted the importance of culture in stakeholder relations. For instance, Groves (2009) argued in a related study that understanding the local culture of the host community is crucial for continuous peaceful company business within the region. He asserts that the failure of Shell in understanding the dynamics of local culture led to the breakdown in communication with the Ogoni community from which Shell was eventually banished.

Although Shell's policy was to promote a culture of respect and civil discussion, their introduction of such a policy intervention was too late to remedy the situation. Similarly, the ECCR<sup>1</sup> (2010) concluded that with regards to corporate community engagement in the Niger Delta, it had failed to respect culture and tradition. The ECCR study asserted that the community perceived the community relations officer of Shell as too arrogant, and disrespectful to the host community. Such a scenario strengthened the distrust between Shell and the community. Moreover, Shell's arrest of persons perceived to be stumbling blocks to their operation was seen as disrespect for traditional institutions because these people were actually high status representatives of the community.

Differing from the Shell case, the dynamics of the relationship in the case presented here changes by virtue of the fact that the Emu-Ebendo community has a valuable stake in the Energia Ltd joint oil field.

#### 5. Conclusion

As noted in the introduction, corporate and community engagement is an overlooked issue in sustainability debates. There is not much evidence regarding its effectiveness and practical benefits, particularly in developing nations.

This article has addressed Bowen et al.'s (2010) call for further research into this issue and has provided an example of how one Niger Delta community has benefited from corporate community engagement, and how this has had a significant societal impact. In this case, the relationship between the company and the community is peaceful. Principally, this is because the indigenous oil company took cognizance of the cultural dynamics of the community. This relationship has arisen because the culture of the community has been incorporated into company actions and these have been sympathetic to that community over time.

Funds leveraged for the community have allowed it to undertake developmental projects and run business ventures. This represents a form of transforma-

<sup>1</sup> To clarify the Ecumenical Council for Corporate Responsibility (ECCR) is a church-based investor coalition. Its

role is to: promote economic justice; environmental stewardship; and, corporate and investor responsibility.

tional change since it is a shift in the underlying strategy and processes used previously by oil companies in region and country-wide. Furthermore, the case is an example of transformational engagement because in addition to injecting cash as a share of oil proceeds into the community, the company has also engendered a culture of probity and equity whereby a process of accountability and governance on how funds accruing are approved and disbursed for jointly agreed purposes.

This case has offered a practical demonstration of how community engagement might also play a major developmental role in other developing nations through social and enterprise development. Through learning from this case the oil sector, and for that matter other sectors of the Nigerian economy could learn to replicate this. In addition, it has shown one way to solving wider societal unrest across the Niger Delta could be to grant other communities a principal stake in the work of companies.

While the scenario presented in this article is a good example of how oil companies can engage with Nigerian communities, future research should look to extend the findings to other Nigerian localities and even perhaps to other developing nations.

#### Acknowledgement

Funding: Petroleum Technology Development Fund, Abuja, Nigeria

Ethical approval: *All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.*

Informed consent: *Informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this article.*

#### References

1. AGHALINO S., 2011, Oil and cultural crisis: the case of the Niger Delta, in: *Africana Special Issue: The Niger Delta*, vol. 5 no 1, p. 1-21.
2. ARNSTEIN S.R., 1969, A ladder of citizen participation, in: *Journal of the American Institute of planners*, vol. 35 no 4, p. 216-224.
3. ATTREE P. et al., 2011, The experience of community engagement for individuals: a rapid review of evidence, in: *Health & social care in the community*, vol. 19 no. 3, p. 250-260.
4. BOELE R., FABIG H., WHEELER D., 2001, Shell, Nigeria and the Ogoni. A study in unsustainable development: II. Corporate social responsibility and 'stakeholder management' versus a rights-based approach to sustainable development, in: *Sustainable Development*, vol. 9 no 3, p. 121-135.
5. BOWEN F., NMEWNHAM-KAHINDI A., HERREMANS I., 2008, Engaging the community: A systematic review, in: *Research Network for Business Sustainability*, London, ON, Canada, p. 39.
6. BOWEN F., NEWENHAM-KAHINDI A., HERREMANS I., 2010, When suits meet roots: The antecedents and consequences of community engagement strategy, in: *Journal of Business Ethics*, vol. 95 no 2, p. 297-318.
7. BRENNER B.L., MANICE M.P., 2011, Community engagement in children's environmental health research, in: *Mount Sinai Journal of Medicine: A Journal of Translational and Personalized Medicine*, vol. 78 no 1, p. 85-97.
8. CAMPBELL M., 2002, Witnessing Death: Ken Saro-Wiwa and the Ogoni Crisis, in: *Postcolonial Studies: Culture, Politics, Economy*, vol. 5 no 1, p. 39-49.
9. COLOMBO J., 2012, *Two Essays about Community Engagement*. Unpublished Masters Dissertation, HEC Montreal, Montréal,
10. ECUMENICAL Council for Corporate Responsibility, 2010, *Shell in the Niger Delta: A Framework for Change Five case studies from civil society*, <http://www.eccr.org.uk/ShellintheNigerDelta> (27.08.2013).
11. ENERGIA, 2013, *About Us Energia Ltd.*, <http://new.energiang.com/about-us/> (27.08.2013).
12. FRYNAS J.G., 2005, The false developmental promise of corporate social responsibility: Evidence from multinational oil companies, in: *International Affairs*, vol. 81 no 3, p. 581-598.
13. GROVES A., 2009, Shell and society: securing the Niger Delta. in: *E- International Relations Students*, 10, <http://www.e-ir.info/2009/06/10/shell-and-society-securing-the-niger-delta/> (1.02.2010).
14. HAUGH H., 2012, The importance of theory in social enterprise research, in: *Social Enterprise Journal*, vol. 8 no 1, p. 7-15.
15. HOECKLIN L.A., 2000, *Managing cultural differences for competitive advantage*, Universities Press.
16. IHUA U.B., AJAYI C., ELOJI K., 2009, Nigerian Content Policy in the Oil and Gas Industry: Implications for Small and Medium-sized Oil Services Companies, in: *Proceedings of the 10th Annual Conference, IAABD*.
17. KEMP D., 2010, Community relations in the global mining industry: exploring the internal dimensions of externally orientated work, in: *Corporate Social Responsibility and Environmental Management*, vol. 17 no 1, p. 1-14.
18. KEPORE K.P., IMBUN B.Y., 2011, Mining and stakeholder engagement discourse in a Papua New Guinea mine, in: *Corporate Social Responsibility and Environmental Management*, vol. 18 no 4, p. 220-233.

19. LAWAN A. M., 2008, *The Paradox of Under-development amidst Oil in Nigeria: A Socio-Legal Explanation*, Unpublished doctoral dissertation, University of Warwick, UK.
20. MENON D., STAFINSKI T., 2014, *Role of patient and public participation in health technology assessment and coverage decisions*. Expert review of pharmacoeconomics & outcomes research.
21. MUTHURI J.N., CHAPPLE W., MOON J., 2009, An Integrated Approach to Implementing Community Participation' in Corporate Community Involvement: Lessons from Magadi Soda Company in Kenya, in: *Journal of Business Ethics*, vol. 85 no 2, p. 431-444.
22. NEWENHAM-KAHINDI A., 2009, The Transfer of Ubuntu and Indaba Business Models Abroad A Case of South African Multinational Banks and Telecommunication Services in Tanzania, in: *International Journal of Cross Cultural Management*, vol. 9 no 1, p. 87-108.
23. NORTH M. 2001, Ken Saro-Wiwa's Sozaboy: The Politics of 'Rotten English', in: *Public Culture*, vol. 13 no 1, p. 97-112.
24. NWANKWO E., PHILLIPS N., TRACEY P., 2007, Social investment through community enterprise: The case of multinational corporations involvement in the development of Nigerian water resources, in: *Journal of Business Ethics*, vol. 73 no 1, p. 91-101.
25. OSAHON G., 2013, Marginal Field Development: Best Practices & Lessons Learned, in: *Society Of Petroleum Engineers' 37th Nigeria Annual International Conference & Exhibition*. [http://www.spenigeriacouncil.org/images/13N\\_AICE\\_PRESENTATIONS/MFW/DPRMARGINAL%20FIELD%20DEVELOPMENT\\_MFW.pdf](http://www.spenigeriacouncil.org/images/13N_AICE_PRESENTATIONS/MFW/DPRMARGINAL%20FIELD%20DEVELOPMENT_MFW.pdf) (1.02.2014).
26. PATTON M., 1990, Purposeful sampling, in: *Qualitative Evaluation and Research Methods*, vol. 2, p. 169-186.
27. PEREDO A.M., CHRISMAN J.J., 2006, Toward a theory of community-based enterprise, in: *Academy of Management Review*, vol. 31, no 2, p. 309-328.
28. PERKINS D.D., ZIMMERMAN M.A., 1995, Empowerment theory, research, and application, in: *American Journal of Community Psychology*, vol. 23 no 5, p. 569-579.
29. SAMAH A., AREF F., 2011, The theoretical and conceptual framework and application of community empowerment and participation in processes of community development in Malaysia, in: *Journal of American Science*, vol. 7 no 2, p. 186-195.
30. SAIIA D.H., CARROLL A.B., BUCHOLTZ A.K., 2003, Philanthropy as strategy when corporate charity 'begins at home', in: *Business & Society*, vol. 42 no 2, p. 169-201.
31. SARRAMI FOURUSHANI P. et al., 2012, *Consumer and community engagement: a review of the literature*. Sydney: University of New South Wales, Centre for Clinical Governance Research, Australian Institute of Health Innovation.
32. SCHELL C., 1992, *The value of the case study as a research strategy*, Manchester, UK: University of Manchester, Manchester Business School, p.1-15.
33. SCHEIN E.H., 1996, Culture: The missing concept in organization studies, in: *Administrative Science Quarterly*, p. 229-240.
34. SCHEIN E.H., 1990, Organizational culture, in: *American Psychological Association*, vol. 45 no 2, p. 109-119. <http://dx.doi.org/10.1037/0003-066X.45.2.109> (1.02.2015).
35. SCHEIN E., 1985, *Organizational Culture and Leadership: A Dynamic View*, Jossey-Bass, San Francisco.
36. SCHNEIDER S.C., 1988, National vs. corporate culture: Implications for human resource management, in: *Human Resource Management*, vol. 27 no 2, p. 231-246.
37. SOMERVILLE P., MCELWEE G., 2011, Situating community enterprise: A theoretical exploration, in: *Entrepreneurship & Regional Development*, vol. 23 no 5-6, p. 317-330.
38. TRACEY P., PHILLIPS N., HAUGH H., 2005, Beyond philanthropy: Community enterprise as a basis for corporate citizenship, in: *Journal of Business Ethics*, vol. 58 no 4, p. 327-344.
39. U.S. Energy Information Administration, 2015, *Country Analysis Brief: Nigeria*, [http://www.eia.gov/beta/international/analysis\\_includes/countries\\_long/Nigeria/nigeria.pdf](http://www.eia.gov/beta/international/analysis_includes/countries_long/Nigeria/nigeria.pdf) (18.09.2015).
40. WEEKS J., GALUNIC C., 2003, A theory of the cultural evolution of the firm: The intra-organizational ecology of memes, in: *Organization Studies*, vol. 24 no 8, p. 1309-1352.
41. WORLD BANK, 2006, *World Development Report 2007: Development and the Next Generation*, The World Bank, <http://elibrary.worldbank.org/doi/book/10.1596/978-0-8213-6541-0> (23.02.2015).
42. ZIMMERMAN M.A., 2000, Empowerment theory, in: *Handbook of community psychology*. Springer, p. 43-63.
43. ZIMMERMAN M.A., WARSCHAUSKY S., 1998, Empowerment theory for rehabilitation research: Conceptual and methodological issues, in: *Rehabilitation Psychology*, vol. 43 no 1, p. 3.



## Corporate Environmental Responsibility for a Sustainable Future

### Odpowiedzialność środowiskowa biznesu dla zrównoważonej przyszłości

**Pankojini Mulia\*, Ajit Kumar Behura\*\*, Sarita Kar\*\*\***

*Department of Humanities and Social Sciences,  
Indian Institute of Technology (ISM) Dhanbad,  
Jharkhand-826004, India*

*E-mails: \*pankojinim@gmail.com, \*\*ajitbehura@gmail.com, \*\*\*karsarita@gmail.com*

---

#### Abstract

It is an imperative to find a proper way to maintain a balance between the economic development and natural environment's carrying capacity, which is needed for the wellbeing and sustenance of human as well as non-human world. Balancing the economic growth and environmental quality has always been a challenge for business. In recent years, business has brought immeasurable wealth and prosperity. However, it has also caused unintended environmental degradation. Economic development is necessary to face the need of growing population but it should not add to a deteriorating environment. There is a need for broader ethical responses for environmental sustainability. The search for a sustainable future requires an integration of economic development with ethical objectives and scientific knowledge. Sustainability is a concept of continuance, relationships, and orientations. The paper deals with three interrelated ethical concepts, (1) corporate moral status, (2) corporate moral status to include human beings, (3) corporate moral status to include natural environment as a path of environmental sustainability.

**Key words:** environmental challenges; environmental sustainability; corporate responsibility; corporate moral status; intrinsic and instrumental approach to the environment

#### Streszczenie

Imperatyw nakazujący odnalezienie właściwego sposobu na utrzymanie równowagi pomiędzy rozwojem ekonomicznym a pojemnością środowiska naturalnego jest niezbędny dla dobrostanu i trwania tak ludzkiego, jak i poza ludzkiego świata. Relacje pomiędzy wzrostem ekonomicznym a jakością środowiska stanowiły zawsze wyzwanie dla biznesu. Ostatnie lata oznaczały dla biznesu niemal niezmierzone bogactwo i dobrobyt. Zarazem doprowadzono do istotnej degradacji środowiska. Rozwój ekonomiczny jest niezbędny dla sprostania potrzebom rosnącej populacji ludzkiej, niemniej nie powinien pociągać za sobą ciągłego pogarszania się stanu środowiska. Niezbędne jest uwzględnienie etyki w dyskusji o zrównoważoności środowiskowej. Jeżeli przyszłość ma być zrównoważona, niezbędna jest integracja rozwoju ekonomicznego z nakazami etycznymi i wiedzą naukową. Zrównoważoność to koncepcja kontynuacji, budowania relacji i orientacji. W artykule przedstawiono trzy wzajemnie powiązane koncepcje etyczne: (1) status moralny korporacji, (2) status moralny korporacji uwzględniający człowieka, (3) status moralny korporacji uwzględniający środowisko naturalne jako drogę do zrównoważoności.

**Słowa kluczowe:** wyzwania środowiskowe, zrównoważoność środowiskowa, odpowiedzialność korporacji, status moralny korporacji, wewnętrzne i instrumentalne podejście do środowiska

---

## Introduction

Human being's social, economic, and environmental fabric is getting disturbed by multiple issues such as global warming, acid rain, pollution, poverty, violence, corruption, deforestation, extinctions of various species etc. One of the reasons for such growing environmental issues is increasing number of industries (corporate houses, corporate, businesses etc. are also use synonymously). Corporate houses are responsible for more than one-third of the primary energy consumption and carbon dioxide emissions worldwide (Bajpai & Sachs, 2011). Business is one of the basic social activities necessary for the upkeep and growth of human being. No doubt in past years, business has brought immeasurable wealth and prosperity. However, it has also caused unintended environmental degradation. As a result, we are facing many environmental problems. Economic development is necessary but not at the cost of environment. Nowadays, the relationship between environment and business is a matter of utmost concern for all. Consequently, many companies are getting involved into different environmental and social policies. Researchers proposed different terminologies like Green orientation (Cravens et al., 1987), Ecomarketing orientation (Miles & Munilla, 1993), Enviropreneurial marketing (Menon & Menon, 1997), and Corporate environmentalism (Banerjee, 2002) etc. to address environmental issues. E. F. Schumacher (1999, 34), a famous economist, has warned business organizations that achieving of economic power at the cost of environment will lead towards the path of unsustainability. He said if there would be inequitable distribution of non-renewable resources and the consumption patten will remain the same, then undoubtedly environmental, economic and social destruction becomes inevitable.

The paper mainly aims at environmental sustainability adopted by the corporate houses. It also attempts to provide the need of environmental sustainability from intrinsic value approach and instrumental value approach and in the concluding portion it emphasizes on the intrinsic value approach to maintain integrity, beauty, and stability of the ecosystem. Companies that voluntarily integrate social and environmental objectives in their economic practice are more sustainable.

## Corporate and Environment Challenges

Corporate world is significantly contributing towards unlimited economic growth alter from limited natural resources (Worldwatch, 2014). Globally industries are responsible for one third of primary energy consumption (McKane, Price, & Can, 2008). Industrial revolution grounds its foundation with two

basic notions; first: commodifying the nature and its resources, second: society consists of human beings only. These two concepts have brought an anthropocentric attitude of humans which emphasize only on human existence and existence of all other things in terms of their beneficial values to humans. And this attitude has brought a drastic change in the development process. According to Worldwatch Institute (2003, 8) about one forth of world's mammals is in danger and the biodiversity of the planet is in intense danger. Environmental resources are steadily deteriorating, as are evident from drying of lakes, spreading of deserts, contamination of soil, air and water, extinction of rare species etc.

There are many such instances where business activities are being accused of environmental destruction that directly and indirectly affect human's health. Like, issues related to Bhopal Gas Tragedy: in the year 1984, the world's worst chemical industrial disaster happened in India which caused immediate death of 2500 persons, disability of humans, dangers to many animals and plants (Mishra *et al.*, 2009) it still has a continuous effect, and in the year 1989, Exxon Valdez oil spill on wildlife populations and communities in Prince William Sound, Alaska, USA, almost 11 million gallons of oil spilled and almost 11 miles Alaskan shoreline contaminated, 250,000 seabirds, 2800 sea otters, 300 harbours seals, 250 bald eagles and 22 killers whales were dead instantly after the spill and the effect on water bodies are still there (Peterson *et al.*, 2003) etc. Other increased business environmental issues are extraction of natural resources, accumulation of huge amounts of wastes, and dense concentration of pollutants would limit the carrying capacity of the earth and would lead to poor environmental quality and increase health issues despite of high incomes (Daly, 1991). For example, bamboo has been wiped out miserably for setting paper mills; trees that prevented erosion of soil from direct rain have been removed; rivers have been dried up, rainfall has become erratic, unknown diseases and insects are now attacking the crops.

The relationship between various indicators of environmental degradation and economic development gives rise to an inverted U-shaped figure (see figure: 1) when plotted graphically. This is popularly known as Environmental Kuznets Curve (EKC)<sup>1</sup>. The problem of environment and development can be best illustrated by this Environmental Kuznets Curve (Davies, 2013; Baker, 2006; Cole, 2004). Researchers (Stern, Common, & Barbier, 1996; Stern, 1998), (Panayotou, 2000; Hill & Magnani, 2002; Yandle, Bhattaraj, & Vijayaraghyan, 2004; Galeotti, 2007; Dongfeng, Chengzhi, & Ying, 2013; Keen & Deller, 2015) shows there exists a non-linear relationship between two variables (economic development and

<sup>1</sup> Kuznets Curve is named after Simon Kuznets in 1965 who hypothesized income inequality first rises and then fall as economic development proceeds.



environment) in EKC. At first when economic development is low, environmental impact is too relatively low, and then it tends to increase with early stage of economic growth with environmental degradation. After World War II, the western countries experienced a turning point mostly influenced through the work of Rachel Carson's (1962) *Silent Spring*, Paul Ehrlich's (1968) *Population Bomb*, and Garret Haldin's (1968) *Tragedy of Commons*. Thus there started a movement of balance from the environment to development and from development to environment and that forced different business organizations to think environmental friendly practices.

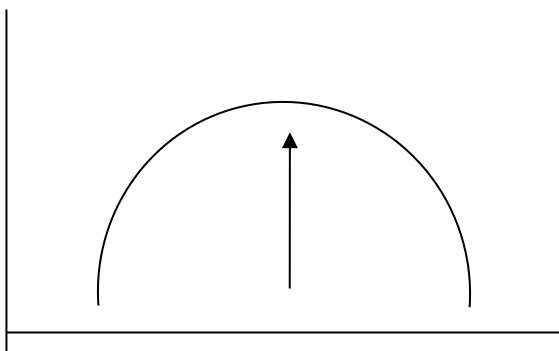


Figure 1. Kuznets Curve, source: Baker 2006, p. 32

Now the fundamental question: that if corporate (business) posing an unbearable stress on the natural environment's carrying capacity, and how a balance can be stricken between the two? It is important to know here that both affect each other and both have to sustain. Again, the question is: how far is it required and how far are corporations ready to make adjustments? To address these questions, here comes the concept of sustainable development.

### Sustainable Development and Environment

The concept of sustainable development was emerged in 1960s as a response against environmental problems and social inequalities generated by industrial revolution. However, was propagated and popularized by the World Commission of Environment and Development (1987) that considers equally the economic, social and environmental aspects. According to this report the development process should meet the needs of the present generation without compromising the options of future generations. It contains within its two key concepts viz., the concept of *need(s)* particularly referring to the poor to whom priority should be given and the idea of *limitation* imposed on current technology and social organization on earth's restoration ability to meet the need of present and future generation. This concept of sustainable development focused on finding strategies to promote economic and social advancement in ways that avoid environmental degradation, over-exploitation or pollution. It emphasized the adoption

of an integrated and coordinated approach towards development planning to ensure its compatibility with the need to protect and improve environment for the benefit of the population.

Barbier (1987) believed that sustainable development is strongly concerned with increasing the material standard of living of the poor at the grass root level by providing secure livelihoods that minimize depletion of resources and environmental degradation, increase income and promote educational services, health care, sanitation, water supply etc.

Agenda 21 (UNCSD, 1992) suggests that the sustainable development strategies should be based on socially and environmentally responsible ways with achievements of economic growth, where concern of government and corporations is equally required. Agenda 21 is a comprehensive plan of action that carried out globally, nationally and locally by organizations of the United Nations System, Governments and those major areas where humans impacts on environment (Peeters, 2003, 198). Rio-Declaration (UNCED, 1992) on Environment and Development discusses, environmental protection should constitute an integral part of the development process and cannot be considered isolated from it.

All definitions of sustainable development required a thinking of the *the world* as a system over time and space. When we realize that, the world is a system or one organized whole over space we realize that people in Europe who use more fuel consuming vehicles can also contribute to climate change in Bangladesh; and pesticides spread in Asia can harm fish stocks in Australia. Boulding (1996) used the term *Spaceship Earth* to describe this problem. It is not that anyone can through wastes that go outside the earth; it remains where it is thrown, there is no open drain system in spaceship. As long as the number of humans was small, technologies were less developed; they could realistically regard earth as an infinite reservoir. However, today we can no longer make this assumption because earth has become a small and overcrowded spaceship. India can't be fully sustainable or environmentally sustainable if the rest of the world is not. For example, the greenhouse gases emitted from other countries will affect India's climate equally as theirs, and the acidification of oceans will affect India's marine ecosystem. Thus, the concept of environmental sustainability for India is partial and is always subject to global action.

Achieving the highest GDP in the world is not the be-all and end-all of development. Both development and environment is required for the country's development. A country cannot be called as *developed* if it concentrates only on economic development and fails to provide proper health care, drinking water, a reliable power supply, sanitation facilities, etc. On the other hand these facilities cannot be provided if there would be no economic development. Thus, development and environment are independent. Sunderlal Bahuguna (1989, 379) has rightly said

that, *one has to decide whether development means affluence or whether development means peace, prosperity, and happiness*. Growth in GDP might be a part of development not overall of a country. Overall development includes economic, social, and environmental aspect. For understanding these concepts of development, we need to include ethics into business practice and need to go little away from hardcore finance practices at least theoretically. Today's challenge to business is adopting environmental sustainable methods by ensuring profit. Business organizations always face criticality when it comes about environmental sustainability, even ethics is said to be inconsistent with business practices. Environmental sustainability is not easy to achieve as it requires information and knowledge that corporate do not possess or only partially possess, do not want to act or less act upon. Sustainability presupposes responsibility, so in order to practically implement corporate environmental sustainability there is a demand of corporate agents to act morally because only science is not sufficient to solve environmental problems (Pawłowski, 2006). The philosophical problem we posed here with moral status of corporate with reference to environmental responsibility. Some moral thinkers (Peter A. French, DesJardins, and Hoffman etc.) attached moral responsibility of corporate as moral agent and its moral status.

### Corporate and the Moral Status

French (1992) argues the moral status of an individual is not its ontological abilities rather it is a functional ability. French believes individual's ability to act intentionally, ability to make rational decisions, considering others interests and changing those behaviors that harm others are considered to be functional abilities. In this aspect, humans are moral beings not because they are humans but because they possess such unique functional capacities. This statement asserts that if any being possesses these functional abilities, then it should be treated equally to a human being. Here, French's view is similar to Kant's view. Immanuel Kant (1785, 4, 394) in his moral theory claims that, *As morality serves as a law for us as we are rational being; and as it must be deduced simply from the property of freedom, it must be shown that freedom is also property of all rational beings*. According to Kant, rationality is a functional capacity and by the virtue of that man is a rational being. Therefore, we can conclude that functional capacities defined by French serve the same purpose as Kantian morality. Kant also mentions that non-human beings are rational beings and such beings are ought to be the subject of moral being. But there is a little difference in Kant and French's concept of non-human moral beings. Kant might be thinking of metaphysical beings, those who are rational but non-human, but French here clearly mentioned about the

*Corporation*. French claims that corporations also possess functional capacities and hence they fall under the category of human beings. Therefore, it is demanded they should act out of morality by considering each and every individual as them. However, intentions of a single individual cannot be thought equivalent to that of a corporation, since it is a collective body. For example, if we say that a corporation is morally responsible for a particular wrong decision that lead to disaster results, and then we mean here a particular member or some members of the corporation is/are responsible for that wrong decision. In the above assertion it is not the corporation who is wrong, rather it is the members of that executive body. In order to address this issue, French (1995, p. 20) justifies that corporate intentions are results of their internal decision makings and internal decisions are product of various individuals' intention who are the essential members of that executive body. Mayors (1992, p. 252-257) by agreeing with French's moral status of corporations explains that corporate intentions, formed by the directors, managers, and supervisors, are morally responsible for company policies, especially those which are in context of individual interests. However, he also maintains that individual members are not morally responsible for any wrong doing. This kind of explanation disposes dilemmatic representation of corporate moral responsibility. He elucidates this dilemma as follows, *either we hold the corporate responsible for immoral conduct and we can exempt its members from accountability, or we condemn the individual members and conceive of the corporation as nothing more than a legal fiction* (Mayors, 1992, p. 257). Corporate and environmentalists were found to be at odds, however the concepts like ethics, corporate environmental practices, corporate moral agency can be aligned together to create a sustainable future. By considering the sustenance and wellbeing of the present and future generation, it is the moral duty of corporate (human agents) to promote environmental sustainability (Mulia et al., 2016). There are no magic solutions to environmental problems, but asking a right question is a step in the right direction finds a solution.

### Morality, Corporate and Environmental Sustainability

The social and environmental aspect of current industrial and organizational practices becomes more questionable. Sustainable development is an integration of different dimensions of human activities based on ethical responsibility towards the natural world (Pawłowski, 2006). When an industry dumps toxic wastes into pure water bodies, estimated solid wastes from mining activities, or release harmful gases to the air, it is counted responsible because that action affect human's health. There are many such instances where business activities are being accused

of environmental destruction that directly affect human's health.

Lack of ethical and moral restraints in corporate practice degrade and deplete the natural and social resources that support it (Ikerd, 2005). Business organizations face criticality when it comes to environmental friendly practices. Traditionally profit maximization was the only responsibility; they were neither concerned nor being encouraged to consider about the protection of environment. Theories and models of business were silent on environmental aspects. However, remaining silent is not a way to attain to environmental sustainability.

Now, even though business can, the question arise does business has any obligation to sustain the environment? This question is answered differently by several researchers like, Friedman (1970, p. 124) answered that profit maximization is the only responsibility of business as long as it engages in open and free competition without deception or fraud. However, business ought to pursue profit within the law and within certain minimal moral constraints. Bowie (1990) argued business has no obligation to protect the environment over and above what is required by the law. The above arguments end with a line of *separation theses* between business and ethics, business and environment. Separation thesis claims that the discourse on business and the discourse on ethics or the discourse on environment cannot put together in one basket as they limit each other's boundary (Wicks, 1996; Marmor, 1999; Harris & Freeman, 2008; Sandberg, 2008). However, Freeman (1994) rejects the claim of separation thesis and argues corporate has a moral responsibility to its stakeholders so the interests of business ought not to be prioritized over and above the interests of other stakeholders. In addition to societies and stakeholders value the companies that stricken balance between development and environment constrains (Gomes et al., 2015) runs for a long time.

Then questions like, could a business, all businesses, any business, survive without the natural environment, how much one business will consume in order to stand, what is the responsibility of business to other humans, to the natural environment?, these questions remain unanswerable often because of different political and global issues. The motto of this section is to make an effort to find answer to these questions. In order to make an attempt to answer the above questions, the paper is argued from two grounds (1) natural environment has *instrumental value*<sup>2</sup>, therefore business industries should protect it; (2) natural environment has *intrinsic value*<sup>3</sup>, therefore business should treat it as an end-in-itself. The

former is the anthropocentric approach whereas the latter is the eco-centric approach.

### (1) *Instrumental Value Approach to Environment*

Instrumental value approach of business to environment tends a responsibility of business to humans and its societies as well as to themselves. The approach stress on human beings autonomy and claims humans should not suffer because of any corporate activities, so environment need to be protected for humans and for their future generations. This responsibility of business stresses on the conservation approach<sup>4</sup>, suggests that environment and its resources should be protected as they have utility or instrumentality. Therefore, a person or business organization should try to avoid pollution or reduce it. Various agreements (like Rio Summit, 1992; Kyoto Summit, 1997) are based on this conservation approach. The ethics implicit in this approach is Utilitarianism. The utilitarianism approach emphasizes on the need to preserve the natural environment as it has instrumental values to humans (both present and future), it provides raw material to many business organizations etc. Hence the instrumental approach stress on the individual's right and act ethically for the happiness of all by business. Worldwatch (1989) institute published an article *doing good by doing well* that gave numerous examples of organizations that prosper because they increase the environmental content of their activities. Researchers like Sarkar (2008), Wahba (2008), Babiak and Lova (2011) mentioned in their research work that companies are now paying more attention towards their impact on environment and adopting management practices that reduce their negative impact on the environment. Like, HCL (HCL Technologies: 2010) launched its range of eco-friendly notebooks, HCL ME 40. HCL claims that this was India's first PVC free and eco-friendly notebook; ITC has constantly striven for environmental goals by adopting low-carbon emission policies, by enhancing the use of renewable energies, and endeavoring reuse and recycling of wastes as raw materials; Idea Mobile, for saving paper, used the concepts like *use mobile and save paper* (Ideas Sustainability Initiative, 2015) and IBM Corporation (2007, 29) saved 4.5 billion kilowatt of electricity, avoided nearly 3 million metric tons carbon dioxide emissions and hence, it saved more than \$290 million.

There is a demerit of this instrumental approach because it is individualistic in approach which tries to maximize its own material good by the extraction of limited stock. Ultimately everyone suffers and it restricts the growth of business as well as society.

<sup>2</sup> Instrumental value of things as per the utility they provide to the human society.

<sup>3</sup> Intrinsic value of things stand for the existential of the things or being regardless of their utility to others (humans).

<sup>4</sup> Conservation approach: biodiversity holds multiple values that directs or indirectly benefited both the humans and the non-humans. Conservation approach was expounded in 1992 Earth Summit in Rio. The aim of conservation of biodiversity is control humans consumerism and conserves the natural environment for future generations.

## (2) *Intrinsic Value Approach to Environment*

Recently, there has been a change in the *business-environment* trend with aiming at providing more and more importance to environmental protection. Deep ecology based social groups like Earth First and Earth Liberation Front (ELF) claim that corporations must go beyond legal regulations to address their ecological footprint. One of the arguments in favor of natural environment goes in terms of intrinsic value. In *Land ethics* Leopold (1966) clearly stated *A thing is right, when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise* (Leopold, 1966, 262). He calls for an extension of ethical consideration to the land or more extensively to the biotic community. He wrote in his extension principle, *The land ethics simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively, the land* (Leopold, 1966, 219). The value of environment in Leopold's *Land Ethics* is just like any being in the ethical community. Thus moral status to environment should be extended on the basis of its intrinsic value and business (human beings) should use that much natural resources what is necessary or use renewable resources, and it can help to promote the intrinsic value of natural environment. This statement goes with the notion of intrinsic value in more holistic ways that include species, habitats, and the ecosystem at large.

We can further argue that the intrinsic approach of natural environment from deep ecology point. Deep Ecology is a normative theory that deals with the place of organisms in their environment bound up with value judgments, principles of living revealed by ecology not with the scientific experiments that revealed the principle (Sylvan, 1985, 43). The term *deep ecology* was first used in 1973 by Arne Naess in his paper entitled, *The Shallow and Deep, Long-Range Ecology Movement* (Naess, 1973). He drew a sharp line of separation between shallow ecology and deep ecology. Shallow ecology is more human centric, of the natural environment is necessary for the goodness of human beings, it concerned with the problems related to pollution, resource depletion in industrialized nations. On the other hand Deep ecologists wanted to preserve the integrity of biosphere for its own sake, irrespective of the possible benefits to human beings (Singer, 2011, 280). Naess (1986) wrote to the deep approach: *Ecologically responsible policies are concerned only in part with pollution and resource depletion. There are deeper concerns which touch upon principles of diversity, complexity, autonomy, decentralization, symbiosis, egalitarianism, and classlessness* (Naess, 1973). The inherent principle of deep ecology states that humans are suggested not to disturb and pollute other species' habitats for the sake of their own safety and comfort (Bennet, 1996, 472). Human beings often disturb non-humans' web-of-life for their own short term

benefits, and in a way they only put their lives in danger. The pollutants released industries and human beings' daily affairs not only affect human beings indirectly however, the toxic pollutants also kill many species directly. The entire chain of life is a subtle balance of interdependence. In fact, human beings are more dependable on other non-humans however, non-humans less depend, or don't depend on humans beings. Therefore, it is not only a necessity, rather an imperative for human beings to perform environmental friendly actions (business).

Ralston (1988) pointed out that environment is more than just air, water or soil. According to him, as environment is an essential element in supporting the life of both humans and non-humans, it cannot be simply treated as an object for humans. Therefore, natural environment has to be treated as an end-in-itself, because of its own uniqueness. This uniqueness tends a moral duty of business (all human beings) towards it. Poul Taylor (1986) provided a more scholarly approach towards the intrinsic value of natural environment. He said respect *all living things*. By living things, he meant individual organisms, species- populations and biotic communities. Taylor argued that humans should treat all living things as an end not as a means (Taylor, 1986).

Two basic duties can be drawn from intrinsic value approach of environment: (1) organizations should not destroy or damage what is of intrinsic worth (2) to maintain of the stability, beauty and integrity of ecosystem. Honoring these duties will treat environment as an end-in-itself. However, values are thought to be personal (DesJardins, 2005). However, the critical implication of this argument is non-human natural objects are valuable only when it serves human's purpose. For example, land is useful if it benefits the person who stays nearby. Nature is equated with *resources* and is called so, if it is used as a resource. As natural environment serves as a resource to humans, therefore it has instrumental value. Those who defend the natural resources from intrinsic value face serious criticisms.

It is important to mention here that these criticisms do not suggest that *environmental sustainability* is useless or is a myth rather it suggests that these approaches are not sufficient to support environmental sustainability. *Doing well by doing good* is fine as long as *doing well is not the motive of 'doing good' but rather follows from 'doing good'*. In fact, it is argued by Hoffman (1991), that longest surviving and most profitable business organizations are the ones that do not rest on only profit maximization as their primary concern. Here, ethics matters and should be promoted as a basic moral requirement, irrespective of profits. A minimalistic principle of responsible business action, or actions forwarded by Hoffman requires business to refrain from causing unwanted harm because failure to do so violates moral rights of non-harm (Hoffman, 1991). Natu-

rally a company which is environmentally sustainable will be less risky than one which is not.

## Conclusion

The challenges of corporate environmental sustainability are a global concern. The corporation must find ways to protect the intrinsic value of natural environment and it may be difficult to practice as our ethical persuasion is dominantly anthropocentric but not impossible. No doubt our present social world is a corporate one. Almost every aspect of human life is greatly influenced as well as dependent on corporate world (Ikerd, 2005), however world as an organic whole; every aspect of it (like human and the natural environment) is interconnected. If we are concerned about the intrinsic properties of natural environment then we should try to find appropriate ways to promote it. In this aspect humans, corporate, and society need to be function more ethically and responsibly towards each other. Practical implementation of sustainable development is not only about adopted strategies but also about choices made by each individual. Apparently, there is nothing wrong with profit making while protecting the environment, In order to promote environmental sustainability, corporate houses should act ethically or morally and should give more emphasis on promoting environmental entrepreneurship. However, some discontentment is still there, not with the principle but with the practice when business faces economic loss at the cost of environmental responsibility. Here lies the problem of conduct of business which affects their decision making. Lack of ethical conduct in business organization results in less practice of environmental sustainability. If money could buy happiness, or solve all problems then there would be no *tragedy of commons*.

## References

1. BABIAK K., LOVA S.T., 2011, CSR and Environmental Responsibility: Motives and Pressures to Adopt Green Management Practices, in: *Corporate Social Responsibility and Environment Management* vol. 18, p. 11-24.
2. BAHUGUNA S., 1989, Environmental Conservation for Survival, in: *Indian Journal of Public Administration* 35 (July-September), cited in: BHAT S., *Natural Resources Conservation Law*, Sage Publications India Pvt. Ltd., New Delhi 2010.
3. BAJPAI N., SACHS J. D., 2011, India's Decade of Development: Looking Back at the Last 10 Years and Looking Forward to the Next 20, in: *Working Paper Series* no. 3, p. 1-31, [http://globalcenters.columbia.edu/files/cgc/pictures/Indias\\_Decade\\_of\\_Development\\_II\\_CG\\_CSA\\_working\\_paper\\_series\\_July\\_2011.pdf](http://globalcenters.columbia.edu/files/cgc/pictures/Indias_Decade_of_Development_II_CG_CSA_working_paper_series_July_2011.pdf) (15.12.2014).
4. BAKER S., 2006, *Sustainable Development*, Rutledge Publishing Co., Abingdon.
5. BANERJEE S. B., 2002, Corporate Environmentalism: The Construct and Its Measurement, in: *Journal of Business Research*, vol. 55, p. 177-191.
6. BARBIER E. B., 1987, The Concept of Sustainable Economic Development, in: *Environmental Conservation*, vol. 14, no 2, p. 101-110.
7. BENNET D. H., 1996, Valuing a Tree, in: *Tropical Rainforest Research-Current Issues*, ed. Edward D. S. et al., Kluwer Academic Publishers, New York, p. 467-475.
8. BOULDING K. E., 1996, The Economics of Coming Spaceship Earth, in: *Baltimore: Jones Environmental Quality in a Growing Economy: Essays from the Sixth RFF Forum*, ed. Jarrett H., Hopkins University Press, New York, p. 3-14.
9. BOWIE N. E., 1990, Morality, Money and Motor Cars, in: *Business, Ethics and the Environment: The Public Policy Debate*, eds. Hoffman W. H., Frederick, R. and Petry Jr. E. S., Quorum Books, New York, p. 89-97.
10. CARSON R., 1962, *Silent Spring*, Penguin Books, London.
11. COLE M., 2004, Trade, the Pollution Haven Hypothesis and Environmental Kuznets Curve: Examining the Linkages, in: *Ecological Economics*, vol. 48, no 1, p. 71-81.
12. CRAVENS D., HILLS D., WOODRUFF R., 1987, *Marketing Management*, Irwin: Homewood.
13. DASGUPTA S., LAPLANTE B., WANG H., 2002, Confronting the Environmental Kuznets Curve, in: *Journal of Economic Perspectives*, vol. 16, p. 147-168.
14. DALY H. E., 1991, *Steady-State Economics*, San Francisco: Freeman & Co., 2nd ed., Island Press, Washington D.C.
15. DAVIES G. D., 2013, Appraising Weak and Strong Sustainability: Searching for a Middle Ground, in: *Consilience: The Journal of Sustainable Development*, vol. 10, no 1, p. 111-124.
16. DESJARDINS J., 2005, Business and Environmental Sustainability, in: *Business and Professional Ethics Journal*, vol. 24, p. 35-59.
17. DONGFENG Y., CHENGZHI Y., YING L., 2013, Urbanization and Sustainability in China: An Analysis Based on the Urbanization Kuznets Curve, in: *Planning Theory*, vol. 12, no 4, p. 391-405.
18. EHRLICH P., 1968, *The Population Bomb*, Buccaneer Books, London.
19. EKINS P., 1997, The Kuznets Curve for the Environment and Economic Growth: Examining the Evidence, in: *Environment and Planning A*, vol. 29, p. 805-830.
20. EKINS P., 2000, *Economic Growth and Environmental Sustainability*, Kluwer Academic Publishers, Dordrecht.

21. ENLIGHTEN, 2010, Green Product Development: A Key for Survival, Current Challenges, in: *HCL Technologies* [http://www.hcl.com/hcl/green\\_product\\_development\\_key\\_for\\_the\\_survival\\_current\\_challenges\\_0.pdf](http://www.hcl.com/hcl/green_product_development_key_for_the_survival_current_challenges_0.pdf) (3.09.2015).
22. FREEMAN R. E., 1994, The Politics of Stakeholder Theory: Some Future Direction, in: *Business Ethics Quarterly*, vol. 4, no 4, p. 409-422.
23. FRENCH P., 1992, The Corporation as a Moral Person, in: *Business Ethics: A Philosophical Reader*, ed. White T., Macmillan Publishing Co., New York, p. 10-12.
24. FRENCH P., 1995, *Corporate Ethics*, Harcourt Brace and Company, New York.
25. FRIEDMAN M., 1970, The Social Responsibility of Business, in: *New York Times Magazine*, vol. 13, September Issue, p. 122-126.
26. GOLEOTTI M., 2007, Economic Growth and the Quality of the Environment: Taking Stock, in: *Environment, Development and Sustainability*, vol. 9, p. 427-454.
27. GOMES C. M., KNEIPP J. M., KRUGLIANSKAS I., ROSA L. A. B., BICHUETI R. S., 2015, Management for Sustainability: An Analysis of the Key Practices According to the Business Size, in: *Ecological Indicators*, vol. 52, p. 116-127.
28. HARDIN G., 1968, The Tragedy of the Commons, in: *Science*, vol. 162, no 3589, p. 1243-1248.
29. HARRIS J. D., FREEMAN R. D., 2008, The Impossibility of the Separation Thesis: A Response to Joakim Sandberg, in: *Business Ethics Quarterly*, vol. 18, no 4, p. 541-548.
30. HILL R. J., MAGNANI E., 2002, An Exploration of the Conceptual and Empirical Basis of the Environmental Kuznets Curve, in: *Australian Economic Paper*, vol. 41, p. 239-254.
31. HOFFMAN W. M., 1991, Business and Environmental Ethics, in: *Business Ethics Quarterly*, vol. 1, no 2, p. 169-184.
32. IKERD J., 2005, Sustainable Capitalism: A Matter of Common Sense, Kumarin Press, Hartford.
33. IBM, 2007, Corporate Social Responsibility Report, [http://www.ibm.com/ibm/environmnet/annual/IBM\\_CorpResp\\_2006.pdf](http://www.ibm.com/ibm/environmnet/annual/IBM_CorpResp_2006.pdf) (20.05.2014).
34. KANT I., 1785, *Groundwork of the Metaphysics of Morals*, trans. and ed. Gregor M. J., 1996, *Groundwork of the Metaphysics of Morals*, Cambridge University Press, Cambridge.
35. KEENE A., DELLER S. C., 2015, Evidence of the Environmental Kuznets' Curve among US Countries and the Impact of Social Capital, in: *International Regional Science Review*, vol. 38, no 4, p. 358- 387.
36. LEOPOLD A., 1996, *The Land Ethic: A Sand County Almanac and Sketches Here and There*, Oxford University Press, New York.
37. MARMOR A., 1999, The Separation Thesis and the Limits of Interpretation, in: *Canadian Journal of Law & Jurisprudence*, vol. 12, no 1, p. 135-150.
38. MCKANE A., PRICE L., CAN S. R., 2008, Policies for promoting Industrial Energy Efficiency in Developing Countries and Transition Economies: Executive Summary, in: *UNIDO-Vienna*, [http://www.unido.org/fileadmin/media/documents/pdf/Energy\\_Environment/ind\\_energy\\_efficiencyEbookv2.pdf](http://www.unido.org/fileadmin/media/documents/pdf/Energy_Environment/ind_energy_efficiencyEbookv2.pdf) (5.12.2015).
39. MENON A., MENON A., 1997, Enviropreneurial Marketing Strategy: The Emergence of Corporate Environmentalism as Market Strategy, in: *Journal of Marketing*, vol. 61(January Issue), p. 51-67.
40. MEYERS C., 1992, The Corporation, Its members, and Moral Accountability, in: *Business Ethics: A Philosophical Reader*, ed. White T., Macmillan Publishing Co., New York, p. 252-259.
41. MILES M. P., MUNILLA L. S., 1993, Eco-orientation: An Emerging Business Philosophy? in: *Journal of Market Theory Practice*, vol. 1, no 2, p. 43-50.
42. MISHRA P. K., SAMARTH R. M., PATHAK N., JAIN S. K., BANERJEE S., MAUDAR K. K., 2009, Bhopal Gas Tragedy: Review of Clinical and Experimental Findings after 25 Years, in: *International Journal Occupational Medicine Environmental Health*, vol. 22, p. 193-202.
43. MULIA P., BEHURA A. K., KAR S., 2016, Categorical Imperative in Defense of Strong Sustainability in: *Problemy Ekorozwoju/ Problem of Sustainable Development*, vol. 11, no 2, p. 29-36.
44. NAESS A., 1973, The Shallow and Deep, Long-Range Ecology Movement: A Summary, in: *Inquiry: An Interdisciplinary Journal of Philosophy*, vol. 16, p. 95-100.
45. NAESS A., 1986, The Deep Ecology Movement: Some Philosophical Aspects, in: *Philosophical Inquiry*, vol. 8, p. 10-31.
46. PAWŁOWSKI A., 2008, How many dimensions does sustainable development have?, in: *Sustainable Development*, vol. 16, no 2, p. 81-92.
47. PETERSON C. H., RICE S. D., SHORT J. W., ESLER D., BODKIN J. L., BALLACHEY B. E., IRONS D. B., 2003, Long-Term Ecosystem Response to the Exxon Valdez Oil Spill, in: *Science* vol. 302, p. 2082-2086.
48. PEETERS H., 2003, Sustainable Development and the Role of Financial World, in: *Environment, Development and Sustainability*, vol. 5, p. 197-230.
49. RALSTON H., 1988, *Environmental Ethics: Duties to and Values in the Natural World*, Temple University Press, New York.

50. SANDBERG J., 2008, Understanding the Separation Thesis, in: *Business Ethics Quarterly*, vol. 18, no 2, 213-232.
51. SARKAR R., 2008, Public Policy and Corporate Environmental Behavior: A Broader View, in: *Corporate Social Responsibility and Environmental Management*, vol. 15, p. 281-297.
52. SSHUMACHER E. F., 1999, *Small is Beautiful: Economics as if People Mattered: 25 Years later ... with Commentaries*, Hartley and Marks Publisher Inc, Vancouver.
53. SHEA C. P., 1989, Doing Well by Doing Good, in: *World-Watch Institute*, vol. 6, no 2, p. 24-30.
54. SINGER P., 2011, *Practical Ethics*, Cambridge University Press, New York.
55. STERN D., 1998, Progress on the Environmental Kuznets Curve, in: *Environment and Development Economics*, vol. 3, no 2, p. 173-196.
56. STERN D., COMMON M. S., BARBIER E. B., 1996, Economic Growth and Environmental Degradation: The Environmental Kuznets Curve and Sustainable Development, in: *World Development*, vol. 24, no 7, p. 1151-1160.
57. *Sustainability: Idea's Sustainability Initiatives*, 2015, <http://www.ideacellular.com/aboutus/sustainability> (23.09.2015).
58. SYLVAN R., 1985, *A Critique of Deep Ecology: Discussion Papers in Environmental Philosophy- 12*, Canberra: Australian National University, Canberra.
59. TAYLOR P., 1986, *Respect for Nature: A Theory of Environmental Ethics*, Princeton University Press, New Jersey.
60. UN, United Nations Conference on Environment and Development-UNCED, 1992, *Rio-Declaration on Environment and Development*, <http://www.jus.uni.no/lm/environmental.development.rio.declaration.1992/portrait.pdf> (25.01.2015).
61. UN, United Nations Conference on Sustainable Development-UNCSD, 1992, Agenda 21, in: *Environment and Development Agenda*, <http://sustainabledevelopment.un.org/content/documents/Agenda21.pdf> (23.12.2014).
62. WAHBA H., 2008, Does the Market Value Corporate Environmental Responsibility? An Empirical Examination, in: *Corporate Social Responsibility and Environmental Management*, vol. 15, p. 89-99.
63. WCED (World Commission on Environment and Development), *Our Common Future*, Oxford University Press, New York 1987, <http://www.un-documents.net/our-common-future.pdf> (23.11.2015).
64. WICKS A. C., 1996, Overcoming the Separation Thesis: The Need for a Reconsideration of Business and Society Research, in: *Business and Society*, vol. 35, no 1, p. 89-118.
65. WORLDWATCH, 2014, *State of the World 2014: Governing for Sustainability*, Worldwatch Institute, Washington.
66. WORLDWATCH, 2003, *State of the World 2003: A Worldwatch Institute Report on Progress Toward a Sustainable Society*, W. W. Norton & Company, New York.
67. YANDLE B., BHATTARAJ M., VIJAYARAGHYAN M., 2004, Environmental Kuznets Curve: A Review of Findings, Methods, and Policy Implications: Research Study Update, No. 02-1, in: *The Property and Environment Research Center*, [http://www.perc.org/sites/default/files/rs02\\_1a.pdf](http://www.perc.org/sites/default/files/rs02_1a.pdf) (23.12.2015).





## Environmental Impact of Application on the Concept of Corporate Social Responsibility in Selected EU Countries

### Środowiskowe konsekwencje wprowadzania koncepcji Odpowiedzialności Społecznej Biznesu w wybranych krajach UE

**Jana Hroncová Vicianová\*, Štefan Hronec\*\***

*\*Faculty of Economics, Matej Bel University in Banská Bystrica, Department of Corporate Economics and Management, Tajovského 10, 975 90 Banská Bystrica, Slovakia*

*E-mail: jana.hroncova@umb.sk*

*\*\* Faculty of Economics, Matej Bel University in Banská Bystrica, Department of Public Economics and Regional Development, Tajovského 10, 975 90 Banská Bystrica, Slovakia*

*E-mail: stefan.hronec@umb.sk*

---

#### Abstract

By now, does not suffice to evaluate companies only from an economic point of view, but it is necessary to look at the business and the social and environmental context. Environmental degradation and depletion of natural resources is also reflected in the growth of interest in the area of environmental and social research in the industry. This fact highlights the concept of corporate social responsibility (CSR), according to which the environmental area, the concept of the same weight as economic and social level. The environmental consequences of the company are in advanced economies communicated not only with experts but becomes of interest to the whole society and an integral part of evaluating the success of socio-economic development. The study aims to quantitatively analyse and confirm the existence of a direct and indirect dependence on the number of businesses in individual EU countries to voluntarily implement environmental concepts of social responsibility in the form of environmental management and audit, EMAS. The object of quantitative analysis are selected EU countries.

**Key words:** Corporate Social Responsibility, company, environmental area, waste

#### Streszczenie

Obecnie nie wystarcza oparcie oceny danej firmy tylko na płaszczyźnie ekonomicznej. Konieczne jest rozpatrywanie biznesu także z perspektyw społecznej i środowiskowej. Degradacja środowiska i kurczące się zasoby surowców naturalnych także przyczynia się do uwzględniania kwestii środowiskowych i społecznych w przemyśle. To także podłoże koncepcji Społecznej Odpowiedzialności Biznesu, według której obszar środowiskowy ma takie samo znaczenie jak ekonomiczny i społeczny. Dyskusja środowiskowych konsekwencji działania danej firmy w ramach zaawansowanej ekonomii odzwierciedla się nie tylko w stanowisku wyrażanym przez ekspertów, ale staje się przedmiotem zainteresowania całego społeczeństwa i integralną częścią oceny rozwoju społeczno-ekonomicznego. Celem niniejszej pracy jest analiza ilościowa i potwierdzenie istnienia bezpośredniej i pośredniej zależności ilości firm w poszczególnych krajach UE od dobrowolnie wprowadzanych idei środowiskowych i społecznej odpowiedzialności w formie zarządzania środowiskowego, audytów i EMAS. Przedmiotem analizy jakościowej są wybrane kraje UE.

**Słowa kluczowe:** Społeczna Odpowiedzialność Biznesu, firma, obszar środowiskowy, odpady

---

## Introduction

Several countries already seriously deal with the issue of sustainable development from a macroeconomic aspect, and with issues of corporate social responsibility from a microeconomic aspect. Sustainable development refers to a way of economic growth which covers the needs of society by creating conditions of well-being in the short, medium, but especially in the long term. It relies on the assumption that development must meet today's needs without jeopardizing the possibilities of continued growth for future generations. On this theory is linked the definition of corporate social responsibility and procedures that replicate the basic concept of sustainable development, but on a closer, specific plane, created especially for organizations, companies as well as society, which decided to implement the concept of corporate responsibility and procedures in their strategic decisions. Carrol (2003) identified Howard Bowen as the founder of the theory of social responsibility, according to whom social responsibility is a commitment to strive for those policies, to make those decisions or execute those activities that are needed from the perspective of the objectives and values of our society. Current CSR definitions are encountered in EU documents and from a historical perspective also undergone some changes. European Commission Green Paper (2001) defines Corporate Social Responsibility (hereinafter CSR) as a concept whereby companies voluntarily incorporate into their business operations and relations with stakeholders social and environmental aspects. A decade later considers corporate social responsibility as *the responsibility of enterprises for their impacts on society*, in order to maximize the creation of shared value for their owners / shareholders, their other stakeholders and society as a whole and to identify and mitigate possible adverse effects or avoid them (Renewed EU strategy for corporate social responsibility, 2011, p. 6).

As part of our scientific studies, we focused mainly on the environmental plane, whereby we examined social responsibility as such. The study aims to quantitatively analyse and confirm the existence of a direct and indirect dependence on the number of businesses in individual EU countries to voluntarily implement environmental concepts of social responsibility in the form of environmental management and audit, EMAS. The object of quantitative analysis are selected EU countries. In line with the studies and formulating the research premise, the subject of research is defined, namely the correlation between the number of environmentally oriented companies and selected indicators in the field of the environment. In the analysis, we assumed that an increasing number of environmentally oriented businesses has positive effects on the selected indicators in the environment and is thus not just a formality. We also assume that the introduction of the concept of environmental

management is rather the domain of large companies and those companies with a significant impact on the environment. Article is supported by project VEGA 1/0405/15 - Program budgeting as part of the New Public Management.

## Theoretical background to the issue

At present, corporate social responsibility is considered a tool that pushes the country towards sustainable development, linking its economic development with social inclusion, environmental capacity and institutional quality. Currently, increased attention for creating conditions for corporate social responsibility is being paid not only on the level of individual companies, but also at the level of entire countries. The activities of any enterprise, organization and society as a whole are, in the terms of the researched concepts, considered in three lines, namely the economic line (Profit), environmental line (Planet) and social line (People), i.e. the so-called Triple Bottom Line, respectively, 3P (Hroncová Vicianová, 2014), whereby the individual lines of approach should be balanced. In addition to, the individual lines appear in the definitions the other aspects. Dahlsrud (2008) by examining the 37 definitions of CSR has defined five basic aspects, which are definitions occurred mainly: economic area (the 86% definitions), social area (88%), and environmental area (59%), stakeholders (88%) and voluntary (80%). Environmental area under the abovementioned statistics smallest representation due to the fact that this area started in the definitions mention only since 1999, when the so-called defined. environmental responsibility, which covers the environmental dimension CSR as part of CSR.

Before that CSR is defined as the notion that corporations have an obligation to constituent groups in society other than stockholders and beyond that prescribed by law or union contract, indicating that a stake may go beyond mere ownership (Jones, 1980) and is concerned with treating the stakeholders of the firm ethically or in a socially responsible manner. Stakeholders exist both within a firm and outside. Consequently, behaving socially responsibly will increase the human development of stakeholders both within and outside the corporation (Hopkins, 1998). The current definition in general, corporate sustainability and CSR refer to company activities – voluntary by definition – demonstrating the inclusion of social and environmental concerns in business operations and in interactions with stakeholders (Marrewijk, 2003).

Responsible behaviour and entrepreneurship in the economic field is monitoring and improving the processes that contribute to the development of the economic environment, and seeks to minimize any potential adverse effects of activities in this area. In the social field, it is monitoring and minimizing the negative effects of the activities of organizations and

companies on the social system in which they operate. In the environmental field, it is monitoring and reducing the negative impacts of organizations and companies on the environment. The most important are: recycling, the use of ecological products, compliance with ISO 14000 and EMAS standards, protection of natural resources, use of alternative energy sources, etc. (Trnková, 2004). The environmental field is underpinned by the international standard ISO 14001, which permits the implementation of the environmental management system (EMS). In Slovakia, it takes the form of STN EN ISO 14001: 2005. The EMS model has five main areas: environmental policy, planning, implementation and operation, inspection, and management review. EMAS III (Eco-Management and Audit Scheme) is a system utility of a community to protect the environment and promote sustainable development, it is an active approach to monitoring and progressively reducing the impact of its activities on the environment. The costs of implementing environmental management, however, are one of the most significant barriers to their implementation. However, some environmental measures have significant economic effects in the form of savings (Marková et al., 2015).

A number of EU strategic documents concerning the environment point to the transition of countries to a green economy (Jeck, 2012). In a green economy, many challenges can be transformed into economic opportunities, not only reversing negative environmental trends, but to encourage the use of cost-effective tools to address environmental problems, thereby also becoming a source of investment. One possibility is a so-called Eco-business. The priority of an eco-business at all levels (individual, organizational, regional) are not only financial benefits, but above all environmental care and people's health. Ecological initiative is one of the key elements which is dependent on active, innovative actions in an eco-market aimed at obtaining income through satisfying social needs in ecologically friendly living conditions.

Waste can also be a valuable resource, however, incorrect disposal entails many risks to the environment and to health. Proper waste management minimizes environmental impacts such as greenhouse gas emissions, promotes efficient use of resources and provides a new source of recycled materials. (The Ecoinnovation action plan, 2011). Environmental investment in actions that bring positive effects on the environment are thus an opportunity to be beneficial to both the business, organizations as well as for society as a whole. The set is also related to the fact, that increasing public environmental protection expenditure brings not only positive results for environment but has also positive impact on economy.

### Research methodology

The study aims to quantitatively analyse and confirm the existence of a direct and indirect dependence on the number of businesses in individual EU countries to voluntarily implement environmental concepts of social responsibility in the form of environmental management and audit, EMAS. The object of quantitative analysis are selected EU countries.

The key methods of the scientific research are methods of classification analysis, comparison and abstraction in the development of theoretical and methodological framework for dealing with; methods of quantitative analysis using statistical methods of processing and evaluation of information and methods of synthesis and partial induction in drawing research conclusions.

In line with the studies and formulating the research premise, the subject of research is defined, namely the correlation between the number of environmentally oriented companies and selected indicators in the field of the environment. In the analysis, we assumed that an increasing number of environmentally oriented businesses has positive effects on the selected indicators in the environment and is thus not just a formality. We also assume that the introduction of the concept of environmental management is rather the domain of large companies and those companies with a significant impact on the environment. The number of these companies is identified as  $x$  - independent variable, and dependent variables as

- $x$  - indicator is the number of EMAS registered companies (Eco-Management and Audit Scheme). It is a voluntary environmental management system implemented by businesses and other organizations from all areas of economic activity.
- $y_1$  - represents the development of basic indices of greenhouse gas emissions based on 1990 levels.
- $y_2$  - represents the amount of sulphur dioxide produced by individual countries in tonnes.
- $y_3$  - represents the amount of nitrogen oxide produced by individual countries in tonnes.
- $y_4$  - expresses the volume of waste production for all economic activities NACE and households in tonnes in selected EU countries.
- $y_5$  - represents the evolution of the volume of expenditure on environmental protection for the private and public sectors in terms of a % share of GDP.

The theoretical basis was the work of domestic and foreign authors (many mentioned in the theoretical background) who have dealt with the issue of corporate social responsibility and their selected concepts (Carrol, Schwartz, 2003; Carrol, Buchholtz, 2012; Dahlsrud, 2008; Hopkins, 1998; Jones, 1980; Maráková, Lament, Wolak-Tuzimek, 2015; Musová,

Table 1. Number of EMAS registered companies (Eco-Management and Audit Scheme), source: Eurostat, 2016

| Country/year   | 2005  | 2006  | 2007  | 2008  | 2009  | 2010  | 2011  | 2012  | 2013  | 2014  |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Czech Republic | 19    | 18    | 26    | 28    | 34    | 26    | 25    | 24    | 24    | 25    |
| Germany        | 1,619 | 1,499 | 1,490 | 1,443 | 1,402 | 1,337 | 1,296 | 1,240 | 1,205 | 1,229 |
| Spain          | 445   | 528   | 666   | 924   | 1,060 | 1,217 | 1,217 | 1,258 | 992   | 1,072 |
| France         | 20    | 17    | 17    | 13    | 12    | 17    | 20    | 21    | 26    | 19    |
| Italy          | 258   | 412   | 570   | 779   | 965   | 1,035 | 1,103 | 1,190 | 1,124 | 1,017 |
| Hungary        | 1     | 2     | 8     | 14    | 18    | 21    | 20    | 20    | 22    | 23    |
| Austria        | 253   | 261   | 257   | 252   | 259   | 255   | 261   | 249   | 254   | 249   |
| Poland         | 0     | 1     | 6     | 10    | 12    | 20    | 20    | 26    | 36    | 45    |
| Portugal       | 25    | 43    | 52    | 60    | 78    | 76    | 76    | 68    | 59    | 58    |
| Finland        | 41    | 43    | 42    | 41    | 42    | 24    | 24    | 8     | 6     | 4     |
| Sweden         | 118   | 100   | 84    | 71    | 75    | 75    | 75    | 76    | 57    | 19    |
| United Kingdom | 61    | 64    | 62    | 69    | 69    | 62    | 56    | 59    | 51    | 48    |

Table 2. Regression analysis of the correlation of the number of environmentally oriented companies and production of greenhouse gases (base index), source: author's own according to Eurostat, 2016

| y1             | coeff. R | reliability value | value P reg. coeff. | value P lok. const. | reg. coefficient | lok. const. |
|----------------|----------|-------------------|---------------------|---------------------|------------------|-------------|
| Czech Republic | 0.2769   | 0.0767            | 0.4386              | 0.0000151           | -0.2706          | 77.56       |
| Germany        | 0.7582   | 0.5749            | 0.0110              | 0.0000212           | 0.0152           | 56.28       |
| Spain          | 0.8256   | 0.6816            | 0.0033              | 0.0000001           | -0.0418          | 174.85      |
| France         | 0.3595   | 0.1292            | 0.3076              | 0.0000016           | -0.4843          | 103.39      |
| Italy          | 0.8452   | 0.7144            | 0.0021              | 0.0000000           | -0.0275          | 121.79      |
| Hungary        | 0.9198   | 0.8461            | 0.0002              | 0.0000000           | -0.8349          | 83.39       |
| Austria        | 0.3214   | 0.1033            | 0.3651              | 0.9237608           | 0.4725           | -12.39      |
| Poland         | 0.6153   | 0.3785            | 0.0583              | 0.0000000           | -0.0889          | 86.06       |
| Portugal       | 0.6972   | 0.4860            | 0.0250              | 0.0000013           | -0.5403          | 155.69      |
| Finland        | 0.7501   | 0.5627            | 0.0125              | 0.0000000           | 0.4448           | 86.52       |
| Sweden         | 0.8207   | 0.6736            | 0.0036              | 0.0000001           | 0.1971           | 72.19       |
| United Kingdom | 0.6597   | 0.4352            | 0.0379              | 0.0615712           | 0.7061           | 37.35       |
| total          | 0.764    | 0.583             | 0.010               | 0.000               | -0.01085         | 134.38      |

Table 3. Regression analysis of the correlation of the number of environmentally oriented companies and production of sulphur oxides in tonnes, source: author's own according to Eurostat, 2016

| y2             | coeff. R | reliability value | value P reg. coeff. | value P lok. const. | reg. coefficient | lok. const.   |
|----------------|----------|-------------------|---------------------|---------------------|------------------|---------------|
| Czech Republic | 0.3725   | 0.1388            | 0.2891              | 0.0026              | -2,390.7434      | 228,982.51    |
| Germany        | 0.8806   | 0.7755            | 0.0008              | 0.0123              | 195.9184         | 165,722.73    |
| Spain          | 0.9015   | 0.8127            | 0.0004              | 0.0000              | -1,207.6156      | 1,764,168.12  |
| France         | 0.3633   | 0.1320            | 0.3021              | 0.0146              | -9,220.9574      | 482,495.62    |
| Italy          | 0.9526   | 0.9075            | 0.0000              | 0.0000              | -289.0242        | 496,581.67    |
| Hungary        | 0.9147   | 0.8367            | 0.0002              | 0.0000              | -482.8131        | 40,720.61     |
| Austria        | 0.2763   | 0.0763            | 0.4397              | 0.5717              | 283.5337         | -52,440.39    |
| Poland         | 0.8639   | 0.7463            | 0.0013              | 0.0000              | -10,933.6205     | 1,210,982.72  |
| Portugal       | 0.8157   | 0.6653            | 0.0040              | 0.0003              | -2,636.3868      | 241,660.91    |
| Finland        | 0.8569   | 0.7342            | 0.0015              | 0.0000              | 723.1595         | 43,822.01     |
| Sweden         | 0.9276   | 0.8604            | 0.0001              | 0.0000              | 136.7435         | 20,269.43     |
| United Kingdom | 0.4588   | 0.2105            | 0.1822              | 0.8951              | 8,833.4595       | -49,783.72    |
| total          | 0.883    | 0.779             | 0.001               | 0.000               | -1,815.16337     | 10,273,029.12 |

2013; Morgan, Ryu, Mirvis, 2009; Waddock, 2004, Wood, 1991, etc.), Sustainable Development (Pawłowski, 2008) and research studies which examined the relationship between public spending on environmental protection and economic growth of the countries (Ada, 2014; Barman, Gupta, 2010).

The complexity of the object of study in the field of the world economy implies a high degree of abstraction in the research of a secondary nature. The secondary collection of information from available statistics of the regional databases of the Statistical Office and Eurostat databases is realized through constructive methods of scientific observation. The information obtained is processed and evaluated by means of statistical methods with emphasis on correlation regression analysis where:

For y dependent on x, the relationship is:

$$a = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}, \quad (1)$$

constant b is in the form:

$$b = \bar{y} - a\bar{x} \quad (2)$$

For x dependent on y, the relationship is:

$$a = \frac{\sum (y - \bar{y})(x - \bar{x})}{\sum (y - \bar{y})^2}, \quad b = \bar{x} - a\bar{y}. \quad (3)$$

We made the selection according to the complexity of the data over the entire time period.

## Results and discussion

The results of correlation and regression analysis were the inputs of assessment of the impact of corporate social responsibility in the environmental field in individual EU countries. As independent variables, we selected a number of EMAS registered companies (Eco-Management and Audit Scheme). It is a voluntary environmental management system implemented by businesses and other organizations from all areas of economic activity. The studied period is 10 years from 2005 to 2014. The largest number of registered firms were recorded for Germany, Spain and Italy, due to the size of their own economies (table 1).

In analyzing the impact of corporate social responsibility in the environmental field (table 2), we investigated the correlation of the number of environmentally oriented companies and greenhouse gases. For four countries studied, the relationship between these two variables could not be explained. The expected positive impact of the number of such companies was confirmed in only some countries. The strongest positive effect was observed in the case of Hungary, which was evidenced by a strong linear dependence with a value of the correlation coefficient of 0.919 and a high level of reliability of 0.84. The regression coefficient reached a desired negative

level - 0.8349. Relatively high values were also obtained in the case of Italy. Negative development occurred in the case of Portugal and Finland. However, in this case the value of the reliability reached a low value, which means that other factors have a significant impact on the development of the relevant indicator. The value of the common regression coefficient reached -0.01. The reliability value reached a low level (0.58), meaning other factors significantly influenced the development of the dependent variable. The regression line has the form  $y_1 = -0.0108x + 134.38$ .

The second researched area was the analysis of the dependence of the number of companies on the production of sulphur oxide (table 3). Again, there is no explanation for, in four countries, development of the dependent variable from the independent owing to the fact that the value of regression coefficients P reached values higher than 0.05. The countries with a significant positive impact on the production of sulphur oxide included Italy, Spain and Hungary. In these cases, a high correlation coefficient as well as the values of reliability, which ranged over 80% (the highest in the case of Italy - 90.7%) were demonstrated. The countries with negative effects include Germany, Finland and Sweden. The value of the common regression coefficient reached -1,815.16. The value of the reliability reached a relatively high level - 0.779, which means that the development of the dependent variable is influenced by other factors. The regression line has the form  $y_1 = -1,815.16x + 10,273,029.12$ .

In the case of the analysis of the dependence of the variable of the production of nitrogen oxide (table 4), the situation was similar. For the same four countries, we were unable to identify any correlation. The countries with a significant positive impact on the production of nitrogen oxide include again Italy, Spain and Hungary. The countries with a negative impact were again Germany, Finland and Sweden. In terms of the overall impact, a group of a strong linear relationship with relatively high reliability was identified (impact of other factors is also assumed). The value of the common regression coefficient reached -1,858.96 and the regression line has the form  $y_3 = -1,858.96x + 14,648,246.4$ .

For the analysis of dependent variable on waste production (table 5) it was not possible to prove any correlation in the case of seven countries. The country with the highest positive impact is Hungary, where high dependence - 0.95 as well as a high value of reliability - 0.915 were identified. Poland was the only country with a negative impact. For the other countries, a high value of reliability was not achieved and in most cases, there was only a moderately strong linear dependence. Correlation was more often than not identified as positive. In the case of the total value, the relationship of dependency could not be explained.

Table 4. Regression analysis of the correlation of the number of environmentally oriented companies and the production of nitrogen oxide in tonnes, source: author's own according to Eurostat, 2016

| y3             | coeff. R | reliability value | value P reg. coeff. | value P lok. const. | reg. coefficient | lok. const.   |
|----------------|----------|-------------------|---------------------|---------------------|------------------|---------------|
| Czech Republic | 0.2571   | 0.0661            | 0.4734              | 0.0058              | -2,270.6887      | 283,942.94    |
| Germany        | 0.9373   | 0.8785            | 0.0001              | 0.2007              | 844.5951         | 214,066.66    |
| Spain          | 0.8736   | 0.7633            | 0.0010              | 0.0000              | -691.4705        | 1,730,109.62  |
| France         | 0.3247   | 0.1054            | 0.3600              | 0.0010              | -14,481.1497     | 1,395,612.62  |
| Italy          | 0.9192   | 0.8450            | 0.0002              | 0.0000              | -439.3569        | 1,374,767.76  |
| Hungary        | 0.9124   | 0.8325            | 0.0002              | 0.0000              | -1,956.7913      | 170,450.89    |
| Austria        | 0.3342   | 0.1117            | 0.3453              | 0.5322              | 2,093.7697       | -347,569.26   |
| Poland         | 0.8051   | 0.6482            | 0.0049              | 0.0000              | -2,605.3703      | 875,432.41    |
| Portugal       | 0.7487   | 0.5605            | 0.0127              | 0.0000              | -1,608.1885      | 291,181.11    |
| Finland        | 0.8558   | 0.7324            | 0.0016              | 0.0000              | 1,187.8347       | 137,696.54    |
| Sweden         | 0.8360   | 0.6989            | 0.0026              | 0.0000              | 545.8597         | 116,196.01    |
| United Kingdom | 0.5689   | 0.3237            | 0.0861              | 0.9297              | 19,822.3945      | 55,758.09     |
| total          | 0.839    | 0.703             | 0.002               | 0.000               | -1,858.96971     | 14,648,246.45 |

Table 5. Regression analysis of the correlation of the number of environmentally oriented companies and waste production in tonnes (businesses in all NACE classifications and households), source: author's own work according to Eurostat, 2016

| y4             | coeff. R | reliability value | value P reg. co-eff. | value P lok. const. | reg. coefficient | lok. const.      |
|----------------|----------|-------------------|----------------------|---------------------|------------------|------------------|
| Czech Republic | 0.2226   | 0.0495            | 0.5366               | 0.0000              | -61,209.10       | 25,916,011.50    |
| Germany        | 0.5690   | 0.3238            | 0.0860               | 0.0000              | -31,503.82       | 413,305,916.76   |
| Spain          | 0.7721   | 0.5961            | 0.0089               | 0.0000              | -49,818.21       | 184,657,022.87   |
| France         | 0.2125   | 0.0452            | 0.5555               | 0.0000              | -895,560.29      | 351,750,402.00   |
| Italy          | 0.3334   | 0.1112            | 0.3465               | 0.0000              | 8,742.26         | 154,601,493.60   |
| Hungary        | 0.9569   | 0.9156            | 0.0000               | 0.0000              | -306,300.20      | 22,750,964.25    |
| Austria        | 0.0927   | 0.0086            | 0.7989               | 0.6248              | -197,743.61      | 97,361,002.98    |
| Poland         | 0.9007   | 0.8112            | 0.0004               | 0.0000              | 755,669.79       | 143,516,650.62   |
| Portugal       | 0.7911   | 0.6258            | 0.0064               | 0.0001              | -370,090.70      | 42,340,848.60    |
| Finland        | 0.6556   | 0.4298            | 0.0396               | 0.0000              | -460,574.88      | 100,578,609.73   |
| Sweden         | 0.7033   | 0.4947            | 0.0233               | 0.0001              | -869,985.09      | 185,909,205.68   |
| United Kingdom | 0.4694   | 0.2204            | 0.1711               | 0.0307              | 1,589,988.45     | 167,356,295.42   |
| total          | 0.1000   | 0.0100            | 0.784                | 0.000               | 4,091.38         | 1,728,284,880.36 |

Table 6. Regression analysis of the correlation of the number of environmentally oriented companies and spending on environmental protection, source: author's own work according to Eurostat, 2016

| y5             | coeff. R | reliability value | value P reg. co-eff. | value P lok. const. | reg. coefficient | lok. const. |
|----------------|----------|-------------------|----------------------|---------------------|------------------|-------------|
| Czech Republic | 0.2873   | 0.0825            | 0.4210               | 0.0001              | -0.0073          | 1.47        |
| Germany        | 0.4115   | 0.1694            | 0.2374               | 0.0000              | 0.0000           | 0.89        |
| Spain          | 0.6358   | 0.4043            | 0.0482               | 0.0000              | -0.0002          | 0.66        |
| France         | 0.0202   | 0.0004            | 0.9559               | 0.0000              | -0.0002          | 0.59        |
| Italy          | 0.5380   | 0.2894            | 0.1087               | 0.0000              | -0.0001          | 1.65        |
| Hungary        | 0.1968   | 0.0387            | 0.5857               | 0.0000              | -0.0047          | 1.14        |
| Austria        | 0.3599   | 0.1295            | 0.3070               | 0.4450              | 0.0130           | -2.44       |
| Poland         | 0.7347   | 0.5398            | 0.0155               | 0.0000              | 0.0057           | 1.17        |
| Portugal       | 0.0308   | 0.0010            | 0.9326               | 0.0001              | 0.0001           | 0.72        |
| Finland        | 0.9226   | 0.8512            | 0.0001               | 0.0000              | -0.0042          | 1.12        |
| Sweden         | 0.9265   | 0.8585            | 0.0001               | 0.0000              | 0.0015           | 0.57        |
| United Kingdom | 0.7591   | 0.5762            | 0.0109               | 0.0036              | 0.0087           | 0.65        |
| total          | 0.3200   | 0.1030            | 0.367                | 0.0000              | -0.00002         | 1.03        |

Table 7. Development of the indicator of independent and dependent variables in all the monitored countries, source: author's own according to Eurostat, 2016

|      | x     | y1     | y2        | y3        | y4            | y5   |
|------|-------|--------|-----------|-----------|---------------|------|
| 2005 | 2,860 | 102.94 | 5,142,129 | 9,446,334 | 1,717,689,259 | 1.00 |
| 2006 | 2,988 | 103.04 | 4,993,619 | 9,167,063 | 1,740,281,300 | 1.01 |
| 2007 | 3,280 | 101.76 | 4,721,500 | 8,881,857 | 1,745,660,140 | 0.97 |
| 2008 | 3,704 | 98.47  | 3,553,286 | 8,175,098 | 1,751,038,973 | 0.92 |
| 2009 | 4,026 | 91.76  | 3,066,830 | 7,492,095 | 1,738,254,016 | 0.99 |
| 2010 | 4,165 | 94.16  | 3,110,929 | 7,429,427 | 1,725,469,053 | 0.97 |
| 2011 | 4,193 | 90.96  | 2,989,521 | 7,149,261 | 1,729,936,085 | 0.97 |
| 2012 | 4,239 | 88.39  | 2,884,637 | 6,900,417 | 1,734,403,110 | 0.99 |
| 2013 | 3,856 | 86.28  | 2,568,018 | 6,589,944 | 1,762,129,410 | 0.97 |
| 2014 | 3,808 | 83.35  | 2,322,773 | 6,247,872 | 1,789,855,701 | 0.95 |

Table 8. Regression analysis of the correlation of the number of environmentally oriented companies and dependent variables in all the monitored countries, source: author's own according to Eurostat, 2016

|    | coeff. R | reliability value | value P reg. coeff. | value P lok. const. | reg. coefficient | lok. const.      |
|----|----------|-------------------|---------------------|---------------------|------------------|------------------|
| y1 | 0.764    | 0.583             | 0.010               | 0.000               | -0.01085         | 134.38           |
| y2 | 0.883    | 0.779             | 0.001               | 0.000               | -1,815.16337     | 10,273,029.12    |
| y3 | 0.839    | 0.703             | 0.002               | 0.000               | -1,858.96971     | 14,648,246.45    |
| y4 | 0.100    | 0.010             | 0.784               | 0.000               | 4,091.38833      | 1,728,284,880.36 |
| y5 | 0.320    | 0.103             | 0.367               | 0.000               | -0.00002         | 1.03             |

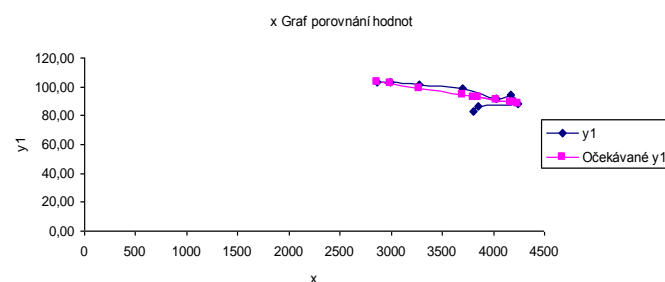
The last researched area was dependence of the number of environmentally oriented companies and spending on environmental protection from both the private and public sectors (table 6). It presents a direct impact of the environmental strategy of a company. In the case of seven countries it was not possible to prove the relationship, since the value of P far exceeded the required limit of 0.05. A positive relationship was able to prove only for Sweden. Correlation between dependent and independent variables was not proved even for the values for the entire group.

In the group, the analysis was based on an independent variable that was the sum of all the companies of the research sample and dependent variables that were the sum of the values of each country, or the average for all countries in the above group (table 8). The absolute and relative values are presented in the table 7.

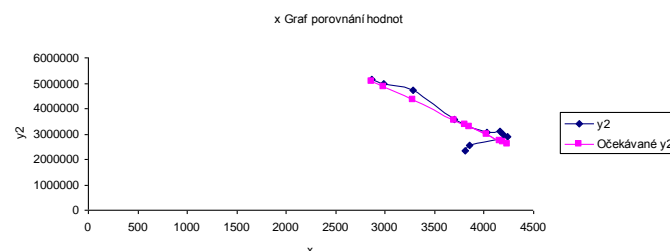
The results of the regression analysis revealed only correlation between the number of environmentally oriented companies and the production of greenhouse gases, producing of sulphur oxide and nitrogen oxide. In the other two cases, the correlation could not be proved. The highest dependence was found mainly for the volume of emissions of SO<sub>x</sub> and NO<sub>x</sub>. In both cases, a fairly strong linear dependence to a relatively high value of reliability was identified. In the case of greenhouse gases, the value of reliability was low and therefore the development is influenced by other factors at a relatively large strength. In all three cases, however, it is noted that the independent variable has some influence on the de-

Figure 1. Regression lines of dependent variable y1 to y3, source: author's own work

$$a) y_1 = -0.0108 x + 134.38$$



$$b) y_2 = -1,815.16 x + 10,273,029.124$$



$$c) y_3 = -1,858.97 x + 1,728,284,880.36$$

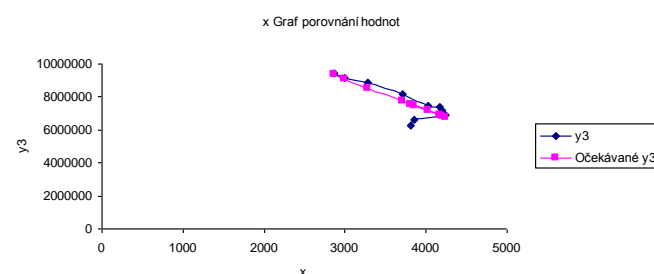
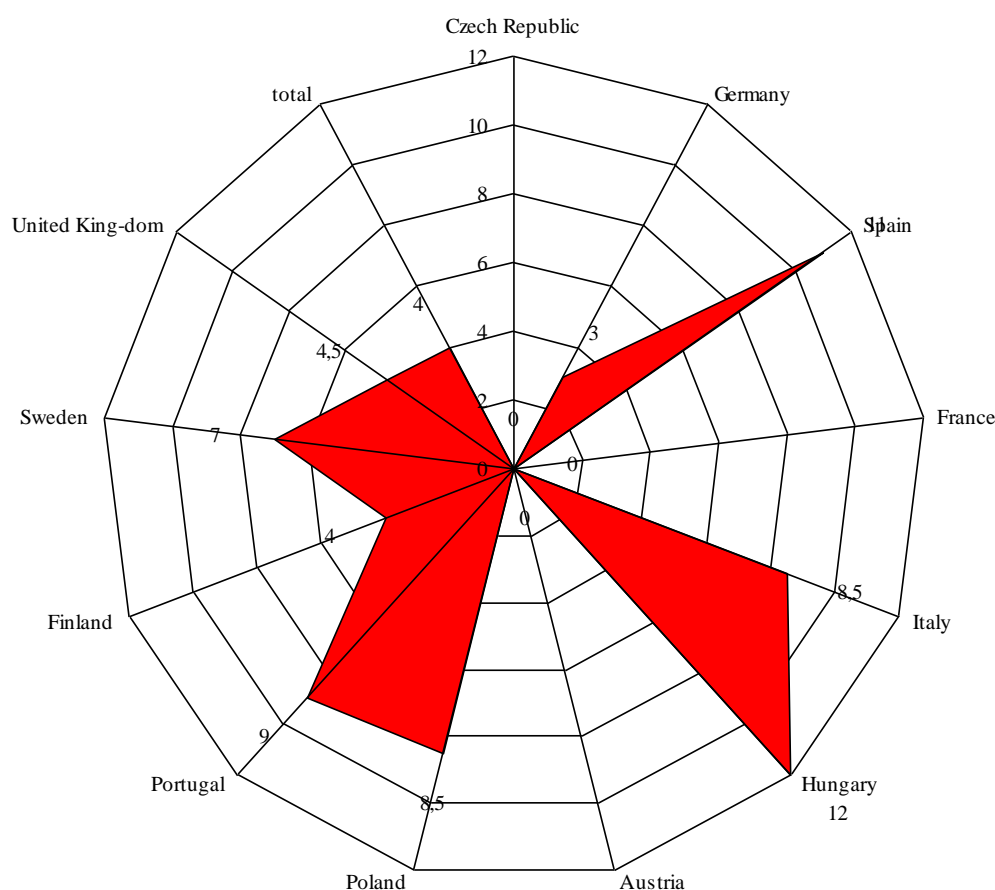


Table 9. Results of assessment of the impact of corporate social responsibility in the environmental field, source: author's own work

|                | y1  | y2  | y3  | y4  | y5  | sum  | ranking |
|----------------|-----|-----|-----|-----|-----|------|---------|
| Czech Republic | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0  | 9.0     |
| Germany        | 0.5 | 1.0 | 1.0 | 0.0 | 0.5 | 3.0  | 8.0     |
| Spain          | 2.5 | 3.0 | 3.0 | 2.5 | 0.0 | 11.0 | 2.0     |
| France         | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0  | 9.0     |
| Italy          | 2.5 | 3.0 | 3.0 | 0.0 | 0.0 | 8.5  | 4.0     |
| Hungary        | 3.0 | 3.0 | 3.0 | 3.0 | 0.0 | 12.0 | 1.0     |
| Austria        | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0  | 9.0     |
| Poland         | 0.0 | 2.5 | 2.5 | 1.0 | 2.5 | 8.5  | 4.0     |
| Portugal       | 1.5 | 2.5 | 2.5 | 2.5 | 0.0 | 9.0  | 3.0     |
| Finland        | 0.0 | 0.5 | 0.5 | 2.0 | 1.0 | 4.0  | 7.0     |
| Sweden         | 0.5 | 1.0 | 0.5 | 2.0 | 3.0 | 7.0  | 5.0     |
| United Kingdom | 1.5 | 0.0 | 0.5 | 0.0 | 2.5 | 4.5  | 6.0     |
| total          | 0.5 | 3.0 | 0.5 | 0.0 | 0.0 | 4.0  | 7.0     |

Figure 2. The final ranking of the countries surveyed in the field of application of the concept of corporate social responsibility, source: author's own work



pendent. However, other factors simultaneously operate thereby.

The graphs (figure 1) show a graphical representation of the regression functions and their respective formulas.

As the figure 1 illustrates, all cases result in a desirable effect. Its strength, however, is different, and

more or less in each case impacts on their development and other factors.

### Conclusion

The study aims to quantitatively analyse and confirm the existence of a direct and indirect dependence on



the number of businesses in individual EU countries to voluntarily implement environmental concepts of social responsibility in the form of environmental management and audit, EMAS. The object of quantitative analysis are selected EU countries. The key methods of the scientific research are methods of classification analysis, comparison and abstraction in the development of theoretical and methodological framework for dealing with; methods of quantitative analysis using statistical methods of processing and evaluation of information and methods of synthesis and partial induction in drawing research conclusions. In line with the studies and formulating the research premise, the subject of research is defined, namely the correlation between the number of environmentally oriented companies and selected indicators on the environment. In the analysis, we assumed that an increasing number of environmentally oriented businesses has positive effects on the selected indicators in the environment and is thus not just a formality.

In the analysis on the impact of corporate social responsibility in the environmental field, we investigated the correlation of the number of environmentally oriented companies and production of greenhouse gases. The strongest positive effect was observed in the case of Hungary, where a strong linear dependence with a correlation coefficient value of 0.919 and a high reliability value of 0.84 were recorded. Relatively high values were also obtained in the case of Italy. Negative development occurred in the case of Portugal and Finland. The second was to analyse the study areas depending on the number of enterprises from production of sulphur oxides. The countries with a significant positive impact on the production of sulphur oxide included Italy, Spain and Hungary. In these cases, a high correlation coefficient as well as the values of reliability, which ranged over 80% (the highest in the case of Italy - 90.7%) were demonstrated. The countries with negative effects include Germany, Finland and Sweden. In the case of the analysis of the dependence of the variable of the production of nitrogen oxide, the situation was similar. The countries with a significant positive impact on the production of nitrogen oxide include again Italy, Spain and Hungary. The countries with a negative impact were again Germany, Finland and Sweden. In terms of the overall impact, a group of a strong linear relationship with relatively high reliability was identified (impact of other factors is also assumed). For the analysis of dependent variable on waste production it was not possible to prove any correlation in the case of seven countries. The country with the highest positive impact is Hungary, where high dependence - 0.95 as well as a high value of reliability - 0.915 were identified. Poland was the only country with a negative impact. For the other countries, a high value of reliability was not achieved and in most cases, there was only a moderately strong linear dependence. Correlation was

more often than not identified as positive. In the case of the total value, the relationship of dependency could not be explained. The last researched area was dependence of the number of environmentally oriented companies and spending on environmental protection from both the private and public sectors. It presents a direct impact of the environmental strategy of a company. In the case of seven countries it was not possible to prove the relationship, since the value of P far exceeded the required limit of 0.05. A positive relationship was able to prove only for Sweden. Results of the analysis were used to determine the overall ranking of the positive impact of the number of environmentally oriented companies to the selected indicators in the environmental field. For countries with no identified dependence the value 0 was allocated; in the case of countries with high values of correlation coefficient and reliability, they were assigned the value 1; for intermediate values, it was 0.5, and for low values, it was 0. In the case of the regression coefficient, in terms of the desired positive or negative value, it was assigned the value 1, and in the case of an unwanted value, it was -1. The concluding summary presents the highest value at the same time as the maximize efficiency of the concept of corporate social responsibility in the environmental field.

The second figure presents the final country ranking in the area of application of the concept of corporate social responsibility in the environmental field.

As the figure shows, the countries with positive effects of the concept of corporate social responsibility include Hungary, Spain and Portugal. On the contrary, the countries with low, respectively, minimal impact include the Czech Republic, France and Austria.

## References

1. *A Renewed EU Strategy for Corporate Social Responsibility for the period 2011-2014*, 2011, European Commission, Brussels.
2. ADA A. A., 2014, Environmental protection Expenditure and Economic growth: A panel Data Analysis for the EU and Turkey, in: *British Journal of Economics, Finance and Management Sciences*, vol. 9, no 2, p. 11-23.
3. BARMAN T. R., GUPTA M. R., 2010, Public Expenditure, Environment, and Economic Growth, in: *Journal of Public Economic Theory*, vol. 12, no 6, p. 1109-1134, doi:10.1111/j.1467-9779.2010.01487.x
4. CARROLL A. B., SCHWARTZ M. S., 2003, Corporate Social Responsibility A Three-Domain Approach, in: *Business Ethics Quarterly*, vol. 13, no 4, p. 503-550.
5. CARROLL A. B., BUCHHOLTZ A. K., 2012, Ethics, Sustainability and Stakeholder Management, in: *Business and Society*, p. 691.

6. DAHLSTRUD A., 2008. How CSR is defined: an Analysis of 37 definition, in: *Corporate Social Responsibility and Environment Management*, vol. 15, p. 1-13, DOI: 10.1002/csr.
7. *Green Paper, 2001, Promoting a European framework for corporate social responsibility*, European Commission, Office for Official Publications of the European Communities, Luxembourg.
8. HOPKINS M. 1998. *The Planetary Bargain: Corporate Social Responsibility Comes of Age*. Macmillan, London.
9. HRONCOVÁ VICIANOVÁ J., 2014, *Uplatňovanie koncepcie spoločensky zodpovedného podnikania vo vybraných odvetviach národného hospodárstva na Slovensku*, Belianum, Ekonomická fakulta UMB v B. Bystrici, Banská Bystrica, p. 168.
10. *Innovation for a sustainable Future – The Eco-innovation Action Plan (Eco-AP)*, 2011, European Commission, <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52011DC0899> (21.6.2016).
11. JECK T. 2012. *Ekologické inovácie: Teoretické a hospodársko-politické súvislosti*, Ekonomický ústav SAV, [http://ekonom.sav.sk/uploads/journals/216\\_wp42\\_tomas\\_jeck\\_2012.pdf](http://ekonom.sav.sk/uploads/journals/216_wp42_tomas_jeck_2012.pdf) (20.3.2016).
12. JONES T.M., 1980, Corporate Social Responsibility revisited, in: *California Management Review*.
13. MARÁKOVÁ V., LAMENT M., WOLAK-TUZIMEK A, 2015, Reporting standards in socially responsible enterprises, in: *Ekonomičnij časopis-XXI*, vol. 20, no 9-10, p. 56-59.
14. MARKOVÁ I., ZELENÝ J., DRIMAL M., JAĎUŠOVÁ J., 2015, Environmental assessment of technologies applying powder fire extinguishers. in: *Production management and engineering sciences. Proceedings of the international conference on engineering science and production management (ESPM 2015)*, Taylor & Francis Group, CRC Press, London, p. 191-196.
15. MORGAN G., RYU K., MIRVIS P., 2009, Leading corporate citizenship: governance, structure, systems, in: *Corporate Governance*, vol. 9, no 1, p. 39-49.
16. MUSOVÁ Z., 2013, *Spoločenská zodpovednosť v marketingovej praxi podnikov*, Univerzita Mateja Bela, Ekonomická fakulta, Banská Bystrica, p. 228.
17. NELSON J. 2008. CSR and Public Policy. New forms of Engagement between Business and Government, in: *Working paper 45*, [http://www.hks.harvard.edu/mrcbg/CSRI/publications/workingpaper\\_45\\_nelson.pdf](http://www.hks.harvard.edu/mrcbg/CSRI/publications/workingpaper_45_nelson.pdf) (20.5.2016).
18. PAWŁOWSKI A., 2008, How many dimensions does sustainable development have?, in: *Sustainable Development*, vol. 16, no 2, p. 81-92.
19. TRNKOVÁ J., 2004, *Spoločenská zodpovednosť firem – Kompletní průvodce tématy a závěry z pruskumu v ČR*, Business Leaders Forum, Praha.
20. VAN MARREWIJK M., 2003, Concepts and definitions of CSR and corporate sustainability: between agency and communion, in: *Journal of Business Ethics.*, vol. 44, p. 95-105.
21. WADDOCK, S., 2004, Parallel universes: companies, academics, and the progress of corporate citizenship, in: *Business and Society Review*, vol. 109, no 1, p. 5-24.
22. WOOD, D., 1991, Toward improving corporate social performance – building 'the good society', in: *Business Horizons*, Vol. 34, no 4, p. 66-73.

## Wellbeing versus Sustainable Development – Conceptual Framework and Application Challenges

### Dobrostan a zrównoważony rozwój – struktura koncepcyjna oraz wyzwania wdrożeniowe

Anna Dłużewska

*Uniwersytet Marii Curie Skłodowskiej, Wydział Nauk o Ziemi i Gospodarki Przestrzennej,  
Al. Kraśnicka 2 cd, 20-718 Lublin, Poland  
E-mail: dluzewska.a@gmail.com*

---

#### Abstract

The idea of sustainable development introduced the strong connection between human wellbeing and the state of natural environment. In the Millennium Ecosystem Assessment (MA) perspective, wellbeing is correlated with sustainable development and with ecosystem services, both seen as inextricable elements of one global process, necessary to lead properly *Our common future*. An important consequence of MA is the necessity for wellbeing strategies to be implemented by governments of many countries, including member states of the European Union. In spite of appearances, this is not an easy task not as much with regard to the difficulties in application (obvious for every type of activity) as with regard to the specific mess in defining what wellbeing is.

The aim of this paper is to contribute to wellbeing and sustainability research by presenting a relational conceptualization of wellbeing. The paper is divided into three sections. The author begins with the presentation of wellbeing conceptual background, including Gross National product (GDP), Human Development Index (HDI), Genuine Progress Indicator (GPI) monetary valuation, Concept of Capabilities, Societal Indicators, QoL and ecosystems wellbeing theory. The second section focuses on subjective wellbeing conceptual framework, including *hedonic* and *eudaimonic* accounts, the Self Determination Theory, the Theory of Subjective Wellbeing Homeostasis and finally the Responsible Wellbeing one. The third section discuss how wellbeing is presented in official directives and policies such a Millennium Ecosystem Assessment 5 dimensions valuation and its implementations in different countries.

**Key words:** wellbeing, societal indicators, subjective wellbeing, responsible wellbeing, sustainable development

#### Streszczenie

Koncepcja zrównoważonego rozwoju jako pierwsza dostrzegła istnienie znaczących wzajemnych zależności między dobrostanem człowieka (wellbeing) a jakością środowiska naturalnego. W dokumentach Millennium Ecosystem Assessment (MA) dobrostan człowieka, zrównoważony rozwój oraz świadczenia ekosystemów postrzegane są już jako ściśle ze sobą związane, nierozłączne składowe większego, globalnego procesu. Ich dobre funkcjonowanie uznane zostało za konieczne do właściwego pokierowania *Naszą wspólną przyszłością*. Ważną konsekwencją publikacji dokumentów milenijnych jest konieczność wdrażania ustalonych wytycznych dotyczących dobrostanu człowieka, do narodowych strategii rozwoju wielu państw, w tym państw członkowskich Unii Europejskiej. Wbrew pozorom nie jest to zadanie łatwe, nie tyle ze względu na trudności aplikacyjne (typowe dla wszelkiego typu dyrektyw), co ze względu na brak zgodności, co do tego, czym właściwie jest rzeczony dobrostan, a co za tym idzie – jak należy go zdefiniować.

Celem artykułu jest przedstawienie struktury koncepcyjnej pojęcia *dobrostan*. Artykuł podzielony został na trzy części. W pierwszej zaprezentowane zostały podstawy koncepcyjne pojęcia, w tym koncepcje Produktu Krajowego Brutto (PKB), Indeksu Rozwoju Społecznego (HDI), Materialnych Wskaźników Postępu Genuine (GPI), Koncepcja Zdolności, Koncepcja Wskaźników Społecznych, Teoria QoL oraz Teoria Dobrostanu Ekosystemów. Druga część skupia się na strukturze koncepcyjnej dobrostanu subiektywnego, w tym na ujęciu *hedonicznym* i

*eudaimonicznym*, Teorii Samookreślenia, Teorii Homeostazy oraz na Teorii Dobrostanu Odpowiedzialnego. W ostatniej, trzeciej części, dyskutowane jest, jak dobrostan rozumiany w wybranych dyrektywach i strategiach na szczeblu międzynarodowym, w tym w 5 płaszczyznowej koncepcji opublikowanej w dokumentach Millennium Ecosystem Assessment, oraz jak prezentuje się polityka wdrożeniowa w tym zakresie w wybranych krajach.

**Słowa kluczowe:** dobrostan, wskaźniki społeczne, dobrostan subiektywny, dobrostan odpowiedzialny, zrównoważony rozwój

## Introduction

It would be an understatement to claim that the term *wellbeing* is reaching its peak of popularity nowadays. The term is used on daily basis in academic papers of numerous disciplines (e.g. medical sciences, psychology, economy, environmental sciences or tourism geography) in numerous supranational and national policies, and found its way even into mass culture.

Wellbeing gained momentum in 2003-2005, following the Millennium Ecosystem Assessment (MA) (2003, 2005) that opened the field for interdisciplinary researches. In the MA perspective, wellbeing is correlated with sustainable development and with ecosystem services, both seen as inextricable elements of one global process, necessary to lead properly *Our common future*<sup>1</sup>.

However, the most important consequence of MA (2003, 2005) is the necessity for wellbeing strategies to be implemented by governments of many countries, including member states of the European Union. In spite of appearances, this is not an easy task not as much with regard to the difficulties in application (obvious for every type of activity) as with regard to the specific mess in defining what wellbeing is.

Paradoxically, despite its growing popularity, the term *wellbeing* is still becoming more and more ambiguous. There is no consensus to what wellbeing really is or to what imprecisely means. For this reason, it is even more difficult to designate indices pinpoint and measuring wellbeing. An important question is, if the wellbeing is an objective state, measurable with objective indicators, or maybe – it's rather subjective perception of individuals (exemplified in the statement that the glass is half full instead of being half empty)? Also what are the factors influencing the wellbeing? Personal predisposition of being happy? Welfare? Good health? Good social relations? Individuals predisposition of being happy or *outside* life events and circumstances?

It can be only stated that wellbeing has a positive connotation. It is something worth striving for, something desired by each and every individual (Tuula, Tuuli, 2015).

Sustainable development – in a very simplified way – can be defined as an idea steeped in principles of intergenerational equity and basic human needs. It says that we should govern our resources in a manner that does not compromise *the ability of future generations to meet their own needs* (WCED, 1987, p. 43). The three pillars of sustainability revolve around the economy, society and the environment thus have very much in common with the wellbeing and ecosystem services looking at the same problems but from a different perspective. The community wellbeing (*to maintain and build local community wellbeing including social infrastructure, resource access, comfort and environmental quality and avoid social corruption and exploitation*) is one of four social pillars of sustainable tourism (UNEP & WTO, 2005). Also other pillars contain elements that are linked to the wellbeing of host, guest and the environment, thus we may state that the wellbeing is one of crucial elements of sustainability. The ideology of sustainable development introduced the strong connection between human wellbeing and the state of natural environment (WCED, 1987).

Ecosystems offer services for human wellbeing but most of all ecosystems are precondition for human existence. The relation ecosystem – human wellbeing must be seen as mutual: the wellbeing relies on ecosystems, but same time the pursuit of wellbeing affects them (Naess, 1995; Giddings, Hopwood & O'Brien, 2002; Haila, 2009; Tuula, Tuuli, 2015). Following Tuula, & Tuuli (2015) *The way needs are met has inevitable social and ecological consequences* (p. 170). The type and quality of human activity has a significant influence on both: wellbeing and sustainable development.

The integration of sustainability into wellbeing research would lead to a more holistic view on wellbeing (Kjell, 2011). Moreover, clarifying the concept of wellbeing will help to further sustainability research and goals. Wellbeing research could be then of service to sustainability science. Consequently, the term requires a more precise definition from the perspective of sustainability sciences. In addition, the inclusion of wellbeing in sustainability sciences will also lead to a more holistic perception of wellbeing itself (Tuula, Tuuli, 2015, p. 169).

<sup>1</sup> The notion of *Our common future* comes from WCED publication introducing the philosophy of sustainable development: *Our common future*, Oxford University Press, Oxford 1987.

The aim of this paper is to contribute to wellbeing and sustainability research by presenting a relational conceptualization of wellbeing. The paper is divided into three sections. The author begins with the presentation of wellbeing conceptual background, including Gross National product (GDP), Human Development Index (HDI), Genuine Progress Indicator (GPI) monetary valuation, Concept of Capabilities, Societal Indicators, QoL and ecosystems wellbeing theory. The second section focuses on subjective wellbeing conceptual framework, including *hedonic* and *eudaimonic* accounts, the Self Determination Theory, the Theory of Subjective Wellbeing Homeostasis and finally the Responsible Wellbeing one. The third section discuss how wellbeing is presented in official directives and policies such a Millennium Ecosystem Assessment 5 dimensions valuation and its implementations in different countries.

### Wellbeing – conceptual background

A sort of chaos in defining what wellbeing means is a reflection of the perspective of numerous scientific disciplines dealing with this term from their own point of view.

This term derives from economic sciences. For the first time it was used in the 1930s when the term Gross National Product (GNP) was introduced. According to then requirements, GNP was supposed to depict the value of assets and services provided by each country (Shea, 1976). Soon, GNP evolved into the presently used Gross Domestic Product (GDP). From GDP perspective, the higher the income and the expenditure in a specific community, the higher the *goodness* of citizens of such a state is. Economic sciences were perceived as best adapted to studying the wellbeing according to the logic that the quality of life of every individual must be determined by the level of income earned by such an individual (Wilson, 1972). To some extent this is real. Affluent countries recording high GDP levels can invest in the development of culture, allocate more funds to health care and to development of social space available to all citizens etc. (Lai, 2000).

However, a high GDP does not reflect the full complexity of the phenomenon even if wellbeing is perceived solely in terms of material prosperity. First, GDP does not provide information about the distribution of profits generated in the specific country among respective citizens. It does not reveal anything about social disparities connected with age, education, place of residence etc. It is no secret that many countries with high GDP levels have very large social disparities. Many inhabitants of the so-called wealthy countries simply live in poverty. Another drawback of using the GDP indicator in wellbeing measurement is the fact that it does not take into account the actual costs of maintenance in a specific country related to the accomplishment of

basic needs (accommodation, food, clothing, health care) and supplementary needs (going out to the cinema and restaurants, expenditure on leisure, buying a car, going on holiday etc.). It is obvious that an amount that in some countries is sufficient to ensure very affluent life will cover only the basic needs in other countries. As a consequence the subjective wellbeing perceived by individuals will be different. Thirdly, GDP does not make a distinction between expenditure to serve the holistic concept of wellbeing and expenditure that is harmful to wellbeing. From the GDP perspective, every financial transaction (e.g. buying drugs, tobacco) is assumed to have a positive nature (Redefining Progress, 1995). GDP is guided by simple logic – the more, the better.

The deficiency of information given by the GDP indicator led to the search for additional, supplementary indicators to measure the wellbeing of individuals. For example, Human Development Index (HDI), next to GDP, takes into account the level of education and lifespan of the citizens of the specific country (UNDP, 2003). The Genuine Progress Indicator (GPI) also derives from economic sciences. It makes a distinction between positive expenditure which improves wellbeing and negative expenditure which is harmful to wellbeing (Halstead, 1998; Hamilton, 1998).

The *concept of capabilities* by the economist A. Sen (1985) is also an attempt to look at the wellbeing from a wider perspective. This concept takes into account economic and social as well as political factors. It has become very popular in surveys into the social and economic development of different areas of the world. However, it is puzzling that although the so-called *value* is a central term here, literature based on the *concept of capabilities* only mentions values (that they are important). However, it does not investigate them, more – it does not distinguish them. It is commonly assumed that specific values are equally significant irrespective of their social or cultural context. Perhaps, it is the greatest weakness of this method. S. Deneulin and J.A. McGregor (2009) argue that *capability approach needs to pay greater attention to the different groups which construct the value frameworks from which people derive their values* (p. 1).

There is also another weakness of wellbeing measurements based on economic ratios, which is more and more often emphasized in literature (Gardner, Oswald, 2007). Irrespective of whether we talk about having money, material assets, making expenditure on good or harmful products, fair or unfair distribution of GDP – the obvious effect of high economic ratios on high wellbeing perceived by individuals is more and more often contested (Gardner, Oswald 2007, p. 3). Most examples come from the so-called western countries where GDP is particularly high. What is characteristic, the level of subjective wellbeing (SWB) is not equally high there either (Shea, 1976; Cummins et al., 2003). In turn, the results of

studies on Wellbeing in Developing Countries (WeD) carried out by the University of Bath Research Group indicate that in the least affluent developing countries (e.g. Bangladesh or Ethiopia) subjective wellbeing and happiness (SWB) is frequently very high (Blackmore, 2009; Copestake, 2009; Copestake, Campfield, 2009; Deneulin, McGregor, 2009; White, 2009). Of course, these results can be referred to Appadurai's (2004) *capacity to aspire*, concluding that inhabitants of poor countries have less knowledge and lower aspirations, thus they do not realize that their wellbeing is low (White, 2009, p. 6). However, they lead to extensive thinking about the adequacy of the measures used.

Allowing a perspective that is not purely economic resulted in introducing numerous Societal Indicators (SI) (Cummins et al., 2003). The function of the SI was to cover multiple areas of life (including moral standards) in order to capture all factors affecting the wellbeing. Attempts were taken at selecting indices suitable on a world scale, irrespective of the context. However, it is difficult to determine the indices in arbitrary terms and even more importantly – to assign specific weights to such indices. Thus, wellbeing level measurements can provide different and even mutually exclusive results, depending on which indices are adopted and how the weights are distributed. An example can be the results of surveys involving US residents carried out by Becker, Denby, McGill and Wilks (1987). Diener and Suh (1996, p. 197) emphasize that the main weakness of SI is their subjective nature.

Societal indicators (SI) focus attention on measuring. Such indices were not adapted however, to measure how people feel about their lives – what is their subjective wellbeing. This requires the use of subjective social indicators. Moreover such a distinction is important *since objective indicators generally are very poor predictors of subjective quality of life* (Cummins, 1998).

An attempt at taking a very broad look on the diversity of indices affecting human wellbeing can be the index of life quality based on values (QoL) proposed by Diener (1995). QoL is created on the basis of a set of 45 universal values defined by Schwartz (1994), focusing on a two-dimensional circular structure consisting of 7 *pie-shaped value regions*: Intellectual Autonomy, Affective Autonomy, Mastery, Harmony, Hierarchy, Conservatism and Egalitarian Commitment. To ensure balance in assessment, for the purposes of analysis QoL takes into account two factors from each 7 *value regions*. QoL index has two versions – Basic – adapted to wellbeing measurement in developing countries and Advanced – adapted to wellbeing measurement in affluent developed countries.

A variant on this view is the proposition of Marmot (2004) stating that human's status and autonomy are more important in the wellbeing than wealth or objective income shown in metrics. Also Kahneman,

Krueger, Schkade, Schwarz and Stone (2006) raise questions over the influence of income on individual wellbeing.

Again – despite a very wide spectrum of measures used in QoL studies, the most emphasized weak point of this method and of other methods based on SI, is the fact that even the best selection of objective indices not always matches individual assessment of wellbeing. Likewise a high level of income and wealth is not always reflected in subjective feeling of happiness, other (societal) indicators (having a family, children) objectively considered positive and improving individual wellbeing in reality are not always reflected in subjectively perceived happiness. What is more, even if we assume in advance that some indicators just *must* contribute to improved wellbeing (e.g. winning a prize in a lottery), it must be admitted that improvement of subjective wellbeing will be perceived differently by different people. In an identical situation one can be extremely happy while someone else will feel slight satisfaction. Numerous surveys prove that an objectively high or low level of wellbeing (determined based on objective measures) to a slight extent coincides with the wellbeing as felt by people (Andrews & Withey, 1976; Campbell et al., 1976; Diener, Suh, 1996).

Since the birth of sustainable development ideology (WCED, 1987), wellbeing has been associated with the status of natural environment. From this perspective, the better the status of the environment, the better the wellbeing of the inhabitants of the globe is (Hall et al., 2013).

It was proved that the good state of natural environment is leading to the good health (Pretty et al., 2011; Völker & Kistemann, 2011; Rodrigues & Kastenholz, 2010). The links between wellbeing, health and landscape are frequently recognized (Velarde et al., 2007). The problem of environment-wellbeing relationship was studied in biological sciences, in the sociology (Pretty et al., 2007), but also on disciplines related to leisure (recreation and tourism) (Yang et al., 2013). The relationship of wellbeing and landscape have been studied in regard to so called blue spaces (e.g. Völker and Kistemann, 2011) and the green spaces (e.g. Maas et al., 2006; Pretty et al., 2007; Barbosa et al., 2007).

On the other hand, it is forgotten that the accomplishment of some postulates to support wellbeing (e.g. limitation of air travel due to excessive emission of gases (Peeters et al., 2009, de Bruijn et al., 2010; Dwyer et al., 2010, Pearce-Nielsen et al., 2010; Scott et al., 2008, 2010) is prejudicial to other divisions of sustainable development – in this case e.g. limiting transcontinental tourism and depriving inhabitants of many destinations of income from tourism.

The most far-reaching perception of the role of natural environment is postulated by Prescott (2001), the author of the term *ecosystem wellbeing*. It was defined as *a condition in which the ecosystem maintains its diversity and quality – and thus its capacity*

*to support people and the rest of life – and it's potential to adapt to change and provide a wide range of choices and opportunities for the future. Prescott (2001) assigns identical weights to human and ecosystem wellbeing and claims that The underlying hypothesis of wellbeing assessment is that a sustainable development is a combination of human wellbeing and ecosystem wellbeing. Human wellbeing is a requirement for sustainability because no rational person would want to perpetuate a low standard of living. Ecosystem wellbeing is a requirement because the ecosystems supports life and makes possible any standards of living. Although trade-offs between the needs of people and the needs of ecosystems are unavoidable, they must be limited (p. 4).*

### Subjective wellbeing – conceptual background

The concept of wellbeing was also covered by social sciences. Here, three main approaches can be distinguished (Brock, 1993; Diener, Suh, 1996). The first one associates wellbeing with norms following from the specific culture or religion. In this context wellbeing can even result in sacrificing one's own good for the sake of other people since the individual considers such behaviour adequate and morally reasonable (Diener, Suh, 1996, p. 189). The second approach is based on individual preferences of respective people. It emphasizes the diversity of feelings – a thing making someone happy does not have to make another person happy at all. On the other hand, the third approach focuses on individual evaluation – from this perspective, if someone thinks highly of their wellbeing, it must be assumed that it is true – irrespective of objective circumstances (Land, 1996).

SWB research is focussed on individuals' subjective estimation about their lives, in terms of hedonic feelings or cognitive satisfactions. SI and SWB approaches are based on different understanding of quality of life. But as Diener and Suh (1996, p. 192) argue, scientific approaches to wellbeing need to incorporate both perspectives: SI and SWB, despite the conceptual and methodological differences between them.

SWB research raises the key question about the source of wellbeing. Is it an effect of individual predispositions of a person (cognitive & intrinsic components) or is it influenced by external factors (affective & extrinsic components)? If so, what are they? Is it more about things that happen to us or about things we give to others? The answer leads us to the most common division into *hedonic* and *eudaimonic* accounts, introduced by Waterman (1993) and used in the reference literature.

The hedonic approach focuses on the happiness of given individual. Here, the wellbeing is perceived as reaching the maximum of one's own happiness and pleasure, while limiting pain and sadness to the min-

imum. Still, hedonic approach should not be equalized with egoism. More often than not, pro-social activities, gaining responsibilities elevate one's self confidence, and as a result bring a higher SWB (Thoits, Hewitt, 2001; Brown, Kasser, 2005; Blackmore, 2009). So the question remains unanswered – which factors make us happy? Is it the cognitive features (individual abilities) or rather affective factors, e.g., winning a lottery (Gardner, Oswald, 2007), having offspring (Condon, Boyce & Corkindale, 2004), faith (Fry, 2000) and so on. And if it is a mixture of the cognitive and affective, then what is the relation between them?

The *eudaimonic* approach considers the quality of social life to be important. It is assumed that SWB is connected with the realization of one's own potential and involvement in good relations with others, and even more – involvement in world events (Ryan and Deci 2001). The high positive significance of social behaviours was emphasized e.g. in the multidimensional model of wellbeing by Ryff and Keyes (1995). Wellbeing is based on six elements necessary to ensure positive mental condition of an individual. These include: *Purpose in Life, Environmental Mastery, Self-Acceptance, Personal Growth, Autonomy and Positive Relations with Others*.

Another example of the eudaimonic approach is the Self-Determination Theory (SDT) proposed by Ryan and Deci (2000). For the purposes of analysis, SDT takes into account affective & extrinsic components that can either motivate or demotivate an individual as well as cognitive & intrinsic components having influence on the person's individual responses to external events (Ryan, Deci, 2000, p. 68.). According to this theory, some external events lead to increasing or decreasing internal motivation so they transform intrinsic components. Extrinsic and intrinsic components are mutually correlated. According to SDT the basis is three key needs of every individual: competence, autonomy and relatedness. If any of these key needs is not satisfied, it can lead to ill-being or even to pathologies.

However, sociologist Erik Allardt (1993) claims that the basic needs of every individual underlying their wellbeing are *having, loving and being*. *Doing* forms part of being. In turn, Tulla and Tuuli (2015) consider *Doing* as the fourth, independent pillar of the need-based theory. Both Allardt (1993) and Tuulla and Tuuli rely on the basic division by Allardt and Uusitalo (1972, p. 11) into material – non-material needs, and interpersonal – intrapersonal ones.

An attempt at measuring the extrinsic and intrinsic factors in human wellbeing is also undertaken by the Theory of Subjective Wellbeing Homeostasis developed by Cummins and Nistico (2002). Homeostasis takes place at an abstract level. It can be illustrated by a classic question *How satisfied are you with your life as a whole?* Comparing oneself to others is essential here. Thus, the respondent can feel better,

worse, wealthier or more decent only by comparing their situation with the situation of other individuals. The theory of subjective wellbeing homeostasis opened the call for new – place focused – researches, having in mind how people feel comparing with others. The theory will be of a high utility in sustainable development research, especially in regard to sustainable tourism. The theory of subjective wellbeing homeostasis proposes that: *in a manner analogous to the homeostatic maintenance of blood pressure or temperature, subjective wellbeing is actively controlled and maintained by a set of psychological devices that function under the control of personality. The operation of these devices is most evident at the level of general, personal wellbeing* (Cummins et al., 2003, p. 162).

Chambers (1997) introduced the term of *responsible wellbeing* (RW) in order to depict the impact of an individual on the sustainable development. As such RW allows individual perspective, and agrees that this perspective is rooted in cultural and social context. Equity and sustainability are the two most important elements of RW. However, they are not understood as limitations, but rather as appreciation of the environment, other people, and the feeling of responsibility for the future of Earth. In turn they increase each individual's self-esteem and enhance their SWB.

In nearly all concepts of wellbeing the perspective of affluent developed countries is predominant. Determining the components of wellbeing based solely on the western world perspective as generally applicable throughout the globe, is more and more often criticized by people who acquired experience from research carried out in developing countries (White, 2009; Copestake, Campfield, 2009).

The results of research by a group of scientists exploring Wellbeing in Developing Countries (WeD) indicate that factors having influence on SWB are much differentiated and largely determined by the cultural context. Wellbeing will be perceived differently by an inhabitant of Western Europe than by an Egyptian or a Pakistani. It is emphasized that wellbeing dimensions are not easy to capture as they are always context-oriented. The strongest differences occur between developed countries where material status is very important and developing countries where good life is understood as other people's respect, family happiness or believing in God (White, 2009). S. White (2009, p. 4) proposes two separate schemes of wellbeing:

*doing well* → *feeling good*, for western communities, and

*doing good* → *feeling well*, for the so-called developing countries.

These schemes are very significant in relation to sustainable tourism.

## Wellbeing versus application policies

Since Millennium Ecosystem Assessment (2005) administrative measures concerning wellbeing have been obligatory for many countries, including the member states of the European Union that were obligated to develop relevant strategies.

In regard to application policies at national & regional level, an adequate understanding is supposed to be based on MA (2005) guidelines. In order to measure human wellbeing, the MA uses combined five dimensions indicators such:

- 1) *Basic material for a good life* (economic)
- 2) *Health* (medical)
- 3) *Good social relations* (social)
- 4) *Security* (social and political)
- 5) *Freedom of choice and action* (social and political).

Poverty is considered to be an extreme deprivation of wellbeing.

The findings of MA (2005) led to the *revised* interpretation of sustainable development and activities whose name includes a *sustainable* component. For example, the World Tourism Organization among its seventeen new priorities of sustainable tourism developed in 2016 in the first place mentions *no poverty* and *zero hunger* in response to the first guideline of MA – *basic material for a good life*. Other pillars of sustainable tourism are *peace, justice and strong institutions* (that is security).

According to the MA perspective (2005), wellbeing is a very holistic term comprising economic, medical and political components. Despite this, the lack of agreement in the theoretical framework in academic level, results in the disorder of national application policies. Same as academic literature, particular national policies are mostly looking only at some aspects of wellbeing (like health or welfare) and in consequence, giving responsibilities for the ministries corresponding for chosen, selected understanding, and neglecting all others ([www.tobewell.eu](http://www.tobewell.eu)).<sup>2</sup>

Unfortunately, when MA was introduced in many EU countries it became distorted, because the health factor evolved into the sole element of wellbeing; hence, all other characteristics were lost. Such an approach is visible in national policies around Europe especially in those countries where English is not a native language and *wellbeing* was first translated into national languages before applying any solutions. As a consequence, domestic healthcare institutions deal with wellbeing understood mainly as absence of illnesses ([www.tobewell.eu](http://www.tobewell.eu)).

Even in English speaking countries the wellbeing is often understood on purely economic terms, from medical/ health point of view or in socio-psychological way (as needs fulfilment or happiness). When going to translation to other languages, the term be-

<sup>2</sup> The statement is based on comparative countries research done in a frame of COST project Tourism, Wellbeing and Ecosystem Services, working group 4 (Toward research

informed policies). A meta-analysis, comparing application policies of participating countries will be published in an individual article.



comes even more inexact and confusing, exposing some aspects of wellbeing only and rejecting all others. An example of this can be *wellness*. While in English literature wellness is always related to the wider understanding of wellbeing, in most of European countries it gained a kind of *independent life*, being mostly related to SPA, luxury hotels and beauty treatments, not with spiritual life, happiness or welfare. An example for this can be the literature in Polish. From 300 hundreds reviewed articles containing the term of *wellness* in the title, 76 % is automatically joined with SPA (SPA & wellness) and all of them describe different activities in a frame of SPA or health product (Dłużewska, 2016b).

By the same token, wellbeing is studied in a similar way in relation to tourism. They are connected by the concept of ecosystem services or cultural ecosystem services. Unfortunately, the subject matter is studied by academics not specializing in tourism; hence, there are major interpretation gaps, e.g., activities that do not constitute basic elements of tourism are often listed as such (Dłużewska, 2016a).

The term *wellbeing* has also been incorporated in mass culture. Here, it is understood as goodness, happiness, feeling that life makes sense etc. Once it was fashionable to be *eco* or *fit* (the generated behaviour was not always related to the main ideology of these concepts), and now the terms *being well* or *wellness* have become popular.

## Conclusions

Undoubtedly, wellbeing is a complex term. Numerous discussions on multiple fora of various scientific disciplines confirm the complexity and multilayers of the term. To some authors wellbeing is a concept of meaning that can be never defined.

It is very difficult to determine the components of wellbeing. In addition, it must be remembered that even when indicators are defined, significant challenges still remain to be researched.

Beyond any doubt, narrowing this term in any way, either with regard to adopting the perspective of a scientific discipline or only the wealthy western countries, leads to numerous misrepresentations and abuses. Wellbeing must be perceived in very broad terms. It requires the liaison of multiple disciplines: economy, psychology, cultural anthropology and – without any doubt – natural environmental sciences. We cannot talk about a policy to foster the wellbeing of individuals when natural environment is not given due care. Multiple authors (cf. Allardt, 1993; Prescott, 2001; Hall, Scott & Gössling, 2013; Tuula, & Tuuli, 2015) notice the need to research wellbeing holistically, to include the state of natural environment related to adequate ecosystem services.

To improve the understanding of wellbeing same as with cultural ecosystem services the interdisciplinary approaches are needed. We should take into account the dynamic nature of human – environment

interactions, possible trade-offs and synergies between given ecosystem services and human wellbeing. Following Carpenter et al. (2009) and Prescott (2001) quantification of trade-offs among ecosystem services and their interactions with human wellbeing are among the most persistent areas for research.

Tuula and Tuuli, (2015) talking about links between wellbeing and sustainable development state that *wellbeing is something that all humans recognize and wish to attain in their lives. Wellbeing is always related to the fulfilment of needs, and to say that something is needed implies an end that is considered good* (p. 170). They argue that the wellbeing and sustainability must be seen, researched and applied jointly.

Wellbeing, just like sustainable tourism, has been used in abundance in administrative policies of various levels. However, it must be emphasized that in application policies the only adopted perspective is the perspective of wealthy western countries.

Western world standpoint dominated the understanding of wellbeing and its constituents in relation to the whole globe; however, this approach was already challenged by researches who conduct studies in developing countries (White, 2009; Copestake, Campfield, 2009). As already told, WeD indicates that factors influencing SWB are quite diverse and they depend on the cultural context to a large extent. Wellbeing will be perceived in a completely different fashion by a citizen of West Europe, by an Egyptian, or by a Pakistani. It is stressed that wellbeing dimensions are not easy to capture as they are always context-oriented.

This seems to be tremendous abuse of power by the rich countries, which *know* better what is good for poor and uneducated masses populating the Earth. This negative impact caused by applying only the Western perspective is stressed by numerous researches, e.g., WeD group, who conduct studies in developing countries.

To conclude – the main gaps in both scientific research and application activities regarding wellbeing are the lack of an interdisciplinary approach and attempts at applying the western perspective to the whole world.

## References

1. ALLARDT E., 1993, Having, loving, being: An alternative to the Swedish model of welfare research, in: *The quality of life*, ed. Nussbaum M., Sen A., Clarendon, Oxford, p. 88-94.
2. ALLARDT E., UUSITALO H., 1972, Dimensions of welfare in a comparative study with the Scandinavian societies, in: *Scandinavian Political Studies*, vol. 7, p. 9-26.
3. ANDREWS F. M., WITHEY S. B., 1976, *Social indicators of well-being: American's perceptions of life quality*, Plenum Press, New York.

4. APPADURAI A., 2004, The capacity to aspire: Culture and the Term of Recognition, in: *Cultural politics in a Global Age. Uncertainty, Solidarity and Innovation*, ed. Rao V., Walton M., Oneworld Publications, Oxford, p. 29-35.
5. BECKER R. A., DENBY L., MC GILL R., WILKS A. R., 1987, Analysis of data from the Places Rated Almanac, in: *The American Statistician*, vol. 41, no 3, p. 169-186.
6. BLACKMORE S., 2009, Responsible wellbeing and its implications for development policies, *WeD Working Paper* 09/47.
7. BRADBURN N. M., 1969, *The structure of psychological well-being*, Aldine, Oxford.
8. BROCK D., 1993, Quality of life in health care and medical ethics, in: *The quality of life*, ed. Nussbaum M., Sen A., Clarendon Press, Oxford, p. 95-132.
9. BROWN K. W., KASSER, T., 2005, Are psychological and ecological well-being compatible? The role of values, mindfulness, and lifestyle, in: *Social Indicators Research*, vol. 74, no 2, p. 349-368.
10. CAMPBELL A., P. E., CONVERSE, RODGERS, W. L., 1976, *The quality of American life: Perceptions, evaluations, and satisfactions*, Russell Sage Foundation, New York.
11. CONDON J. T., BOYCE P., CORKINDALE C. J., 2004, The first-time fathers study: A prospective study of the mental health and wellbeing of men during the transition to parenthood, in: *Australian and New Zealand Journal of Psychiatry*, vol. 38, no 1-2, p. 56-64.
12. COPESTAKE J., 2009, Development and wellbeing in Peru: Comparing global and local views, *WeD Working Paper* 09/48.
13. COPESTAKE J., CAMPFIELD L., 2009, Measuring subjective wellbeing in Bangladesh, Ethiopia, Peru and Thailand using a personal life goal satisfaction approach, *WeD Working Paper* 09/45.
14. CUMMINS R. A., 1998, The second approximation to an international standard of life satisfaction, in: *Social Indicators Research*, vol. 43, no 3, p. 307-334.
15. CUMMINS R. A., ECKERSLEY R., PALLANT J., VAN VUGT J., MISAJON R., 2003, Developing a national index of subjective wellbeing: The Australian Unity Wellbeing Index, in: *Social Indicators Research*, vol. 64, no 2, p. 159-190.
16. DE BRUIJN K., DIRVEN R., EIJGELAAR E., PEETERS P., 2010, *Travelling Large in 2008. The Carbon Footprint of Dutch Holidaymakers in 2008 and the Development since 2002*. NHTV Breda University of Applied Sciences, NRIT Research, NBTC-NIPO Research: Breda, The Netherlands.
17. DENEULIN S., MCGREGOR J. S., 2009, The capability approach and the politics of the social conception of wellbeing, *WeD Working Paper* 09/43.
18. DIENER E., 1995, A value based index for measuring national quality of life, in: *Social Indicators Research*, vol. 36, no 2, p. 107-127.
19. DIENER E., SUH E. M., 1996, Measuring quality of life: Economic, social and subjective indicators, in: *Social Indicators Research*, vol. 40, no 1, p. 189-216.
20. DŁUŻEWSKA A. 2016A. Cultural ecosystem services – Framework, Theories and Practices, in: *Problemy Ekorozwoju/ Problems of Sustainable Development*, vol. 12, no 1, p. 101-110.
21. DŁUŻEWSKA A., 2016B, Wellbeing – Conceptual Background and Research Practices, in: *Društvena istraživanja*, vol. 25, no 4, p. 547-567.
22. DWYER L., FORSYTH P., SPURR R., HOQUE S., 2010, Estimating the carbon footprint of Australian tourism, in: *Journal of Sustainable Tourism*, vol. 18, p. 355-376.
23. FRY P. S., 2000, Religious involvement, spirituality and personal meaning for life: Existential predictors of psychological wellbeing in community-residing and institutional care elders, in: *Aging & Mental Health*, vol. 4, no 4, p. 375-387.
24. GARDNER J., OSWALD A. J., 2007, Money and mental wellbeing: A longitudinal study of medium-sized lottery wins, in: *Journal of Health Economics*, vol. 26, no 1, p. 49-60.
25. GIDDINGS B., HOPWOOD B., O'BRIEN G., 2002, Environment, economy and society: fitting them together into sustainable development, in: *Sustainable Development*, vol. 10, p. 187-196.
26. HAILA Y. 2009, Mutual interdependence of humanity and the rest of the nature, in: *Perspectives to Global Social Development*, ed. Perkiö M., Tampere University Press: Tampere, Finland, p. 165-176.
27. HALL C. M., SCOTT D., GÖSSLING S., 2013, The primacy of climate change for sustainable international tourism, in: *Sustainable Development*, vol. 21, no 2, p. 112-121.
28. HALSTEAD T., 1998, The science and politics of new measures of progress: a United States perspective, in: *Measuring progress: Is life getting better?* ed. Eckersley R., CSIRO Publishing, Melbourne, p. 53-68.
29. HAMILTON C., 1998, Measuring changes in economic welfare: The genuine progress indicator for Australia, in: *Measuring progress: Is life getting better?* ed. Eckersley R., CSIRO Publishing, Melbourne, p. 69-92.
30. KAHNEMAN D., KRUEGER A. B., SCHKADE D., SCHWARZ N., STONE A. A., 2006, Would you be happier if you were richer? A focusing illusion, in: *Science*, vol. 312, no 5782, p. 1908-1910.
31. KJELL O., 2011, Well-being: a potential synergy between sustainability and well-being research, in: *Review of General Psychology*, vol. 15, no 3, p. 255-266.

32. LAI D., 2000, Temporal analysis of human development indicators: Principal components approach, in: *Social Indicators Research*, vol. 51, no 3, p. 331-366.
33. LAND K. C., 1996, Social indicators and the quality of life: Where do we stand in the mid-1990s?, in: *SINET*, vol. 45, p. 5-8.
34. MARMOT M., 2004, *Status syndrome*, Bloomsbury, London.
35. MILLENNIUM ECOSYSTEM ASSESSMENT, 2003, Ecosystems and human well-being: A framework for assessment. Island Press, Washington, DC.
36. MILLENNIUM ECOSYSTEM ASSESSMENT, 2005, Ecosystems and human well-being: synthesis/ current state and trends/ scenarios/ policy responses/ multiscale assessments, Island Press, Washington, DC.
37. NAESE A., 1995, Self-realization. An ecological approach to being in the world, in: *Deep Ecology for the Twenty-First Century*, MA Sessions G, ed. Shambhala: Boston, p. 225-245.
38. PEETERS P, GÖSSLING S, LANE B., 2009, Moving towards low-carbon tourism: new opportunities for destinations and tour operators, in: *Sustainable Tourism Futures: Perspectives on Systems, Restructuring and Innovations*, eds. Gössling S, Hall CM, Weaver D., Routledge, London, p. 240-257.
39. PERCH-NIELSEN S, SESARTIC A, STUCKI M., 2010, The greenhouse gas intensity of the tourism sector: the case of Switzerland, in: *Environmental Science and Policy*, vol. 13, p. 131-140.
40. PRESCOTT A. R., 2001, *The wellbeing of nations*, Island Press, Washington.
1. REDEFINING PROGRESS, 1995, What's wrong with the GDP as a measure of progress?, in: *The Genuine Progress Indicator: Summary of Data and Methodology*, p. 2-9.
41. RYAN R. M., DECI E. L., 2000, Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being, in: *American Psychologist*, vol. 55, no 1, p. 68-78.
42. RYAN R. M., DECI E. L., 2001, On happiness and human potentials: A review of research on hedonic and eudaimonic well-being, in: *Annual Review of Psychology*, vol. 52, no 1, p. 141-166.
43. RYFF C. D., KEYES C. L. M., 1995, The structure of psychological well-being revisited, in: *Journal of Personality and Social Psychology*, vol. 69, no 4, p. 719-727.
44. SHEA W.R., 1976, Introduction: The quest for a high quality of life, in: *Values and the quality of life*, eds. Shea W.R., King-Farlow J., Science History Publications, New York, p.1-5.
45. SCHWARTZ S. H., 1994, Beyond individualism and collectivism: New cultural dimensions of values, in: *Individualism and Collectivism: Theory, Method, and Applications*, eds. Kim U., Triandis H.C., Kagitcibasi C., Choi C., Yoon G., CA: Sage, Thousand Oaks, p. 85-102.
46. SCOTT D, AMELUNG B, BECKEN S, CERON J-P, DUBOIS G, GÖSSLING S, PEETERS P, SIMPSON M., 2008, *Technical report. In Climate Change and Tourism: Responding to Global Challenges*. UNWTO: Madrid; UNEP: Paris; WMO, Geneva; p. 23-250.
47. SCOTT D, PEETERS P, GÖSSLING S., 2010, Can tourism deliver its 'aspirational' emission reduction targets? in: *Journal of Sustainable Tourism*, vol. 18, p. 393-408.
48. SEN A., 1985, Well-being, agency and freedom: The Dewey lectures 1984, in: *The Journal of Philosophy*, vol. 82, no 4, p. 169-221.
49. THOITS P. A., HEWITT L. N., 2001, Volunteer work and well-being, in: *Journal of Health and Social Behavior*, vol. 42, no 2, p. 115-131.
50. TUULA H., & TUULI H., 2015, Wellbeing and sustainability: A relational approach, in: *Sustainable Development*, vol. 23, no 3, p. 167-175.
51. UNDP, 2003, Human Development Report 2003: *Millennium Development Goals: A Compact among Nations to End Human Poverty*, UNDP, New York.
52. WATERMAN A. S., 1993, Two conceptions of happiness: Contrasts of personal expressiveness (eudaimonia) and hedonic enjoyment, in: *Journal of Personality and Social Psychology*, vol. 64, no 4, p. 678-691.
53. WHITE S., 2009, Analysing wellbeing: A framework for development practice, *WeD Working Paper 09/44*.
54. WILSON J., 1972, The industrial process and the quality of life, in: *Technology assessment and quality of life*, eds. Stober G.J., Schumacher D., Proceedings of the 4th General Conference of SAINT. Elsevier Scientific Publishing Company, Salzburg, Austria, p. 131-146.
55. WCED, 1987, *Our Common Future*, Oxford University Press, New York.



## Understanding Farmers' Adoption Decisions for New Cash Crops: Evidence from Xishuangbanna in Tropical China

### Uwarunkowania zainteresowania rolników nowymi uprawami komercyjnymi: przykład rejonu Xishuangbanna w Chinach

Le Zhang<sup>\*</sup>, Yasuyuki Kono<sup>\*\*</sup>, Xiaobo Hua<sup>\*\*\*</sup>, Lin Zheng<sup>\*</sup>, Rui Zhou<sup>\*\*\*\*</sup>

*<sup>\*</sup>School of Geography and Environment, Jiangxi Normal University,  
Nanchang 330022, China*

*<sup>\*\*</sup>Center for Southeast Asian Studies, Kyoto University, Kyoto 6068501, Japan*

*<sup>\*\*\*</sup>Graduate School of Asian and African Area Studies, Kyoto University,  
Kyoto 6068501, Japan*

*<sup>\*\*\*\*</sup>Institute for Urban Studies, Shanghai Normal University, Shanghai  
200433, China*

E-mails: \*zhangle9527@gmail.com, \*\*huaxiaobo1988@gmail.com

---

#### Abstract

On a global basis, cash cropping is usually identified as an important enterprise undertaken by farmers to increase incomes. However, the responses of farmers to these new enterprises vary greatly. Through a case study of a Dai village in Xishuangbanna, China, this paper examines how farmers make decisions about adopting new cash crops by focusing on the farm economy and land conditions. The results show that farmers did not adopt watermelons due to poor irrigation and accessibility conditions, and then they did not adopt bananas due to a transient collapse of banana market, induced by a rumor suggesting that eating bananas causes cancer. Consequently, although these non-adopters benefited from commercial exchanges with external businessmen in terms of ecological experiments and management diversification, and leasing lowlands to external businessmen is a livelihood choice that is based on the outcome of the farmer's trade-off between profitability and risk, they missed opportunities to substantially increase incomes through cash cropping, as evidenced by the success of the farmers who adopted the cash crops. These findings suggest that the government ought to design tailored extension programs for villages, implement efficient refutation strategies to prevent rumor-induced market collapse and promote extension services as early as possible in the initial stages of transition to cash cropping.

**Key words:** land use, crop choice, livelihood transition, tropical agriculture, farmland leasing

#### Streszczenie

Patrząc z perspektywy globalnej za uprawy komercyjne uznaje się istotne działania podejmowane przez rolników w celu zwiększenia swoich dochodów. Jednakże zainteresowanie rolników nowymi rozwiązaniami jest bardzo zróżnicowane. Niniejszy artykuł na przykładzie doliny Dai w należącym do Chin rejonie Xishuangbanna pokazuje jakie czynniki finansowe i środowiskowe wpływają na podjęcie przez rolników decyzji odnoszących się do nowych upraw komercyjnych. Otrzymane wyniki pokazują, że za odrzuceniem arbuzów stały ograniczone możliwości nawadniania i ograniczony dostęp, a za odrzuceniem bananów chwilowe załamanie rynku zbytu tych owoców, związane z szerzącą się pogłoską, jakoby konsumpcja bananów mogło być przyczyną nowotworów. Konsekwentnie, chociaż rolnicy odrzucający nowe uprawy korzystali z wymiany handlowej z zewnętrznymi przedsiębiorcami pod kątem eksperymentów ekologicznych i dywersyfikacji zarządzania, a ponadto biorąc pod uwagę, że przeznaczanie pól dla zewnętrznych przedsiębiorców jest decyzją opartą na ocenie możliwych zysków i strat, ci rolnicy

stracili szansę na znaczące zwiększenie przychodów z upraw komercyjnych. Pokazuje to przykład rolników, którzy jednak zdecydowali się na nowe uprawy. Uzyskane rezultaty wskazują, że rząd powinien przygotować dostosowane do potrzeb rolników programy i strategie odnoszące się do tych zagadnień.

**Słowa kluczowe:** zagospodarowanie terenu, wybór uprawy, przekwalifikowywanie, rolnictwo tropikalne, leasing pól uprawnych

## 1. Introduction

Adopting cash crop plantation, as one new agricultural practice, has become an expanding global phenomenon (Evans et al., 2011; Li and Fox, 2012; Klasen et al., 2013; Su et al., 2016; Vongvisouk et al., 2016), and cash cropping systems offer opportunities to increase farm incomes substantially (Hossain, 1998; Van den Berg et al., 2007). Focusing on the responses of farmers to these new enterprises, some empirical studies have found that smallholder farmers who can overcome barriers, either on their own or with support from outside their village, have achieved unprecedented wealth from growing new cash crops (Fox and Castella, 2013; Zhang et al., 2014). However, others have argued that a *safety first* principle often prevails for subsistence-oriented farmers (Rigg and Salamanca, 2009), and they hesitate to adopt new agricultural practices from the larger societies that have embraced them (Joseph and Richard, 2002). The reasons why these new practices are adopted by some socioeconomic groups but not others are multi-factorial, reflecting a complex combination of individual and environmental factors and events (Linguist et al., 2007; Rerkasem et al., 2002). Thus, Cramb (2000) emphasized that a detailed, *all things considered* case history approach is needed to understand the mechanisms behind the diffusion of agricultural innovations.

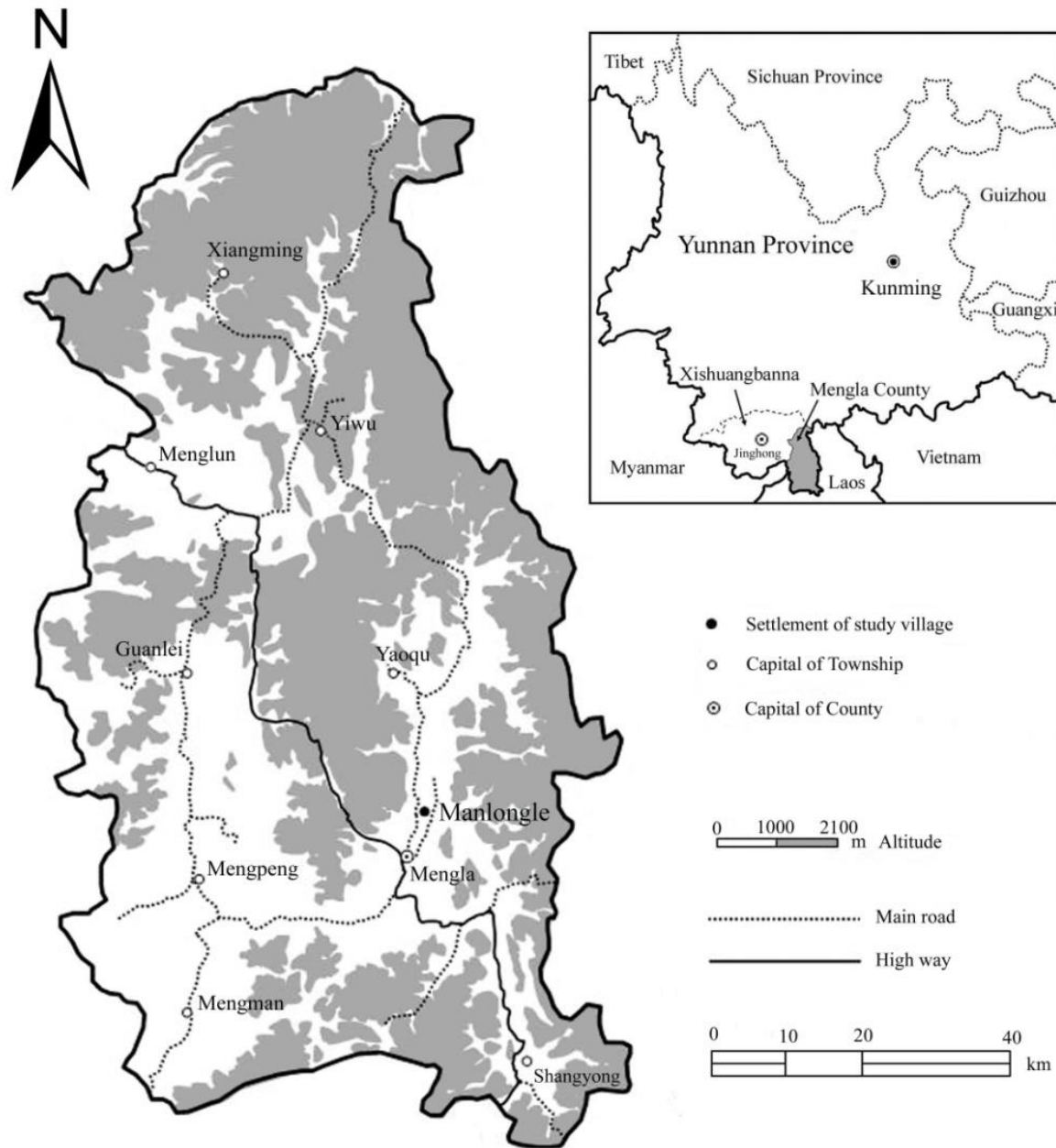
A number of studies have examined the factors influencing the adoption decisions (Dercon, 1996; Seo and Mendelsohn, 2008; Ruf and Schroth, 2015; Lee, et al., 2016;). As past experiences show, constraints to the adopting new agricultural practices include insufficient human capital, lack of credit, inadequate farm size, limited access to technology and poor transportation infrastructure (Feder et al., 1985; Sheikh et al., 2003; Mazvimavi and Twomlow, 2009). Most importantly, the inaccessibility of marketing networks is an often-mentioned variable, which has been influential in determining the adoption of an agricultural innovation (Zeller et al., 1998). Rumors associating products with undesirable or even bizarre characteristics are threatening to sales, and have frequently resulted in sizeable losses for farmers (Tybout et al., 1981; Xu et al., 2013). However, few empirical studies have treated the spread of such rumors as a strong impediment to the adoption of new agricultural practices. There is general agreement in the literature that risk aversion is an important factor explaining the adoption behaviors of

farmers towards new agricultural practices (Feder et al., 1985; Burger et al., 1993). Risk, interpreted as the uncertainty of outcomes, presents in all agricultural decisions as a result of price, yield and resource uncertainty (Hardaker, 2000; Lee, et al., 2016). Weir and Knight (2000) indicated that if a potential adopter faces uncertainty about the outcomes, there is an incentive not to adopt new practices. Moreover, the performance of pioneers who experiment with an innovation at the village level can deeply affect the behaviors of other farmers (Trung, 2002; Jiang et al., 2006). Farmland leasing is commonly considered a straightforward way to avoid agricultural risk (Quibria and Rashid, 1984). Studies of farmland leasing focus on the conditions under which leasing arrangements develop and the economic motivations of the parties (Boumtje et al., 2001). Many literatures have stated that the introduction of new cash cropping can enhance farmers' desire to manage farms (Zhang et al., 2014; Zhang et al., 2015), while low farming profits of subsistent crops push farmers into the off-farm sector and trigger farmland leasing (Jiang et al., 2013). However, cash cropping usually requires high and risky capital costs, and its expansion usually triggers wide spread farmland leasing in developing countries (Yang and Liang, 2008; Hall, 2011; Friis and Nielsen, 2016). Thus, a debate regarding incentives to engage in farmland leasing ensued and remains largely unresolved.

Xishuangbanna borders Laos and Myanmar and is an autonomous prefecture of the Dai people at the southern tip of Yunnan Province, China. This prefecture is separated from historically more advanced areas by numerous mountains and has often been considered a poor and backward area in China (Xu et al., 2005). The Dai ethnic group is in the majority and occupies almost all the lowland fields in Xishuangbanna. The development of China's economy has increased demand for tropical products and natural resources. In this context, Xishuangbanna, a tropical area of China, has been experiencing a rapid expansion of cash cropping (Guo et al., 2002; Li et al., 2007; Sturgeon, 2010; Fox et al., 2014; Xu et al., 2014).

This study focuses on lowland management in a Dai village, Xishuangbanna. Watermelon farming was initiated in this village in the early 1980s, and the growing of commercial banana crops was introduced in the late 2000s. However, farmers did not adopt these new enterprises. This paper examines the factors that led to the differentiation to adopt these new cash cropping systems by focusing on farm economy

Figure 1. Location of the study village in Xishuangbanna, China



and land conditions. The objective of this study is to understand why these farmers do not adopt new cash crops. Specifically, the following questions were addressed: (a) how did the differences in the lowland systems of these villages influence the adoption of new cash cropping systems? (b) how did farmers make decisions involving the tradeoff between profitability and risk? and (c) how did institutional settings affect the adoption of new cash cropping systems? This study mainly aims to contribute to filling the knowledge gap concerning the crop choices at household and land plot level.

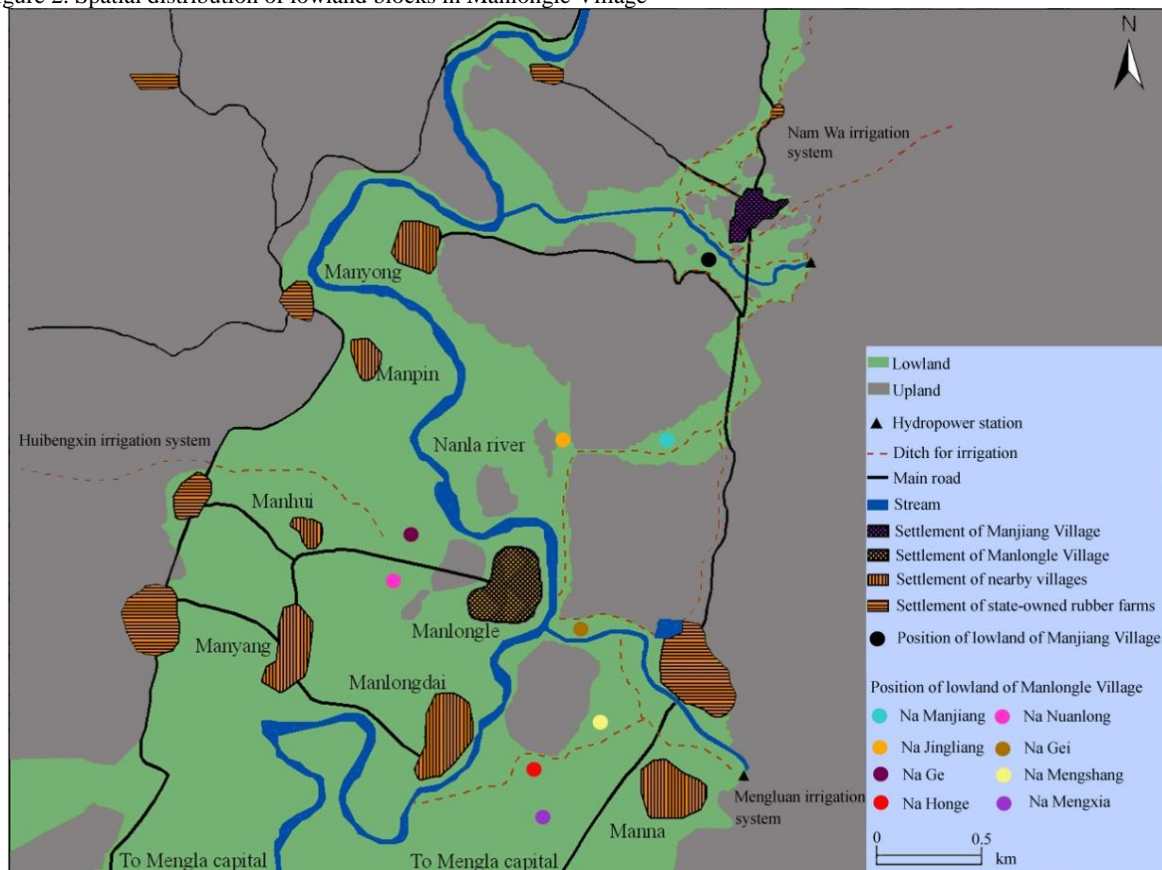
## 2. Materials and methods

### 2.1. Study village

The Manlongle Village is located in Mengla County, Xishuangbanna Dai Autonomous Prefecture, Yunnan Province, China (Fig. 1). This area has a tropical climate with an average annual temperature and precipitation of 22.5 °C and 1,420 mm, respectively. Manlongle was established in 1879 when nine households moved to this location from present-day Laos, and 76 Dai households have inhabited this village since 2001 (Zhang et al., 2015). The lowland fields in Manlongle are spatially dispersed, and some of the fields are separated from the residential area



Figure 2. Spatial distribution of lowland blocks in Manlongle Village



by long distances and/or a river. Therefore, it is not convenient for farmers to manage all of the lowland fields.

## 2.2. Data collection

Four rounds of field surveys were conducted in the study area in September-October 2010, January-February 2011, July-August 2011 and February-March 2012. In-depth interviews were conducted with all household heads, the present and former members of the village committee in Manlongle. The content of the household interview covers demographic (birth, death, health, age, education and marriage), land (size, quality, acquisition and leasing), agricultural system (land farming, forestry, livestock breeding, aquaculture, economic return and access to technology, labor, sales channels and credit), and off-farm system (workplace, work content, economic return and access to the acquisition of employment opportunities) information. All inputs and outputs, including any output retained for farmers' own consumption, were valued at market prices. After a prior investigation, we found that a farmer's assessment of whether he or she benefitted from adopting a new cash cropping system was based only on a comparison of the *real* inputs, such as cash, fertilizer, fuel and pesticide, relative to the outputs. Therefore, we did not consider labor as an input cost in this study.

## 3. Results

### 3.1. Lowland system of the study village

The lowland fields of Manlongle are divided into 8 blocks (Fig. 2). Two blocks, Na Nuanlong and Na Ge, are located close to the settlement and are irrigated by the Huibengxin irrigation system. The remaining six blocks are located on the opposite side of the Nanla River, of which Na Mengshang, Na Hongge and Na Mengxia are irrigated by the Mengluan irrigation system; Na Jingliang and Na Manjiang are irrigated by the Nam Wa irrigation system; and Na Gei is located in the downstream region of the Nam Wa irrigation system and is fed by a pond. The irrigation of the three blocks irrigated by Nam Wa was classified as good as a result of the sufficient water supply. Meanwhile, the irrigation of the three blocks irrigated by Mengluan was classified as good or average, while that of Na Hongge was classified as bad due to its poor drainage. Finally, the irrigation of the two blocks of Huibengxin was classified as average or bad because of insufficient water supply (Table 1).

The farmers acquired the lowland fields mainly through official allocation procedures. The Household Responsibility System was implemented in the study village at the end of 1982. Each farmer received 2.25 mu (1 ha is equivalent to 15 mu), and



Table 1. Attributes of the lowland blocks of Manlongle Village in the early 2000s (1 ha is equal to 15 mu)

| Lowland blocks | Area (mu) | Field conditions |  |                            |          | Land quality       |
|----------------|-----------|------------------|--|----------------------------|----------|--------------------|
|                |           | Road access      | Irrigation                                   |                            | Drainage |                    |
|                |           |                  | Water availabil-<br>ity in the dry<br>season | Water quality              |          |                    |
| Na Nuanlong    | 298.5     | good             | no   | good                       | good     | average or bad     |
| Na Ge          | 39.0      | good             | no   | good                       | poor     | bad                |
| Na Mengshang   | 79.5      | good             | yes  | warm and<br>slightly salty | good     | good or<br>average |
| Na Honge       | 25.5      | good             | yes  | warm and<br>slightly salty | poor     | bad                |
| Na Mengxia     | 184.5     | good             | yes  | warm and<br>slightly salty | good     | good or<br>average |
| Na Gei         | 16.5      | good             | yes  | salty                      | good     | good               |
| Na Jingliang   | 45.0      | poor             | yes  | good                       | good     | good               |
| Na Manjiang    | 147.0     | good             | yes  | good                       | good     | good               |
| Total          | 835.5     |                  |  |                            |          |                    |

Note: we defined *field conditions* and *land quality* in 1982 based on farmers' perception.

834 mu of lowland fields were allocated in total. Only 1.35 mu, accounting for 0.16 percent of the total lowland area, was claimed spontaneously by farmers and was not involved in the allocation process. The area of the lowland is approximately 10.5 mu per household and ranges from 0.18 to 19.5 mu. Only 4 households possess 6 mu or less of lowland, and 6 households possess at least 15 mu. The lowland-upland border at Manlongle has not changed since the early 1980s.

### 3.2. Adoption decision for watermelon farming

Under the collective farming system (from the mid-1950s to the early 1980s, when agrarian production in China was mainly managed by collective units, such as People's communes), most of the lowland fields were single-cropped with paddies in the rainy season. In 1982, the Administration of Agricultural Scientific Research of Mengla County set up a program to promote watermelon farming by providing seeds and instruction. The government also promised to purchase products after harvest at a price of 0.10-0.14 yuan/kg. The elder farmers of Manjiang village, a neighboring Village, reported that the watermelon yield was approximately 1500kg/mu. In contrast, the yield of farm-gate unhusked rice was approximately 200 kg/mu and its price was only 0.09 yuan/kg. Therefore, the return from growing watermelon could reach 4.2-5.8 times that of paddy farming. The farmers of Manlongle also received inaccurate information regarding inputs and returns. In this context, several farmers in Manlongle started growing watermelon at Na Nuanlong and Na Ge in 1983. Unfortunately, most of the watermelon seedlings died before reaching maturity because irrigation water was not available in the dry season. This discour-

aged the farmers in the other lowland blocks from growing watermelon because they perceived this crop to be high-risk.

In 1985, a Han businessman from Anhui Province rented land in Na Mengshang, Na Hongge and Na Mengxia to grow watermelon, but more than one-third of the watermelon seedlings died before blossoming. The Han businessman told farmers that watermelon could not be grown in these blocks because the water of Mengluan was slightly salty and too warm due to its small runoff contribution and long-distance transportation. In 1986, a Manjiang villager rented land in Na Gei to grow watermelon but ultimately failed because the pond water was too salty. Although Na Jingliang and Na Manjiang had suitable water for growing watermelon, the conditions of the road from the settlement of Manlongle to these blocks was poor, and tractors could not access the fields. Hence, these farmers gave up growing watermelon and rented out Na Manjiang to Manjiang farmers in the dry season because of its good accessibility from Manjiang Village. The Manjiang farmers then grew watermelon in Na Manjing in the dry season.

### 3.3. Adoption decision for commercial banana farming

By 2004, all the households of Manlongle were engaged in paddy growing. In 2005, a Han businessman (Mr. A in Table 2) visited the village. He was a farmer in Sichuan Province before moving to the study area. This businessman first contacted the village headman and expressed his wish to rent lowland fields of Na Nuanlong for growing bananas. The headman coordinated the negotiation between the businessman and farmers and allowed all landhold-

Figure 3. Lowland lease contract in Manlong Village

| Lowland blocks | 2005                 | 2006                 | 2007  | 2008                              | 2009                       | 2010                  |
|----------------|----------------------|----------------------|---|-----------------------------------|----------------------------|-----------------------|
| Na nuanlong    | 500 yuan/mu<br>← A → |                      |   | 1000 yuan/mu<br>← F, G, H and J → |                            |                       |
| Na mengxia     |                      | 700 yuan/mu<br>← A → |   |                                   | 900 yuan/mu<br>← D and I → |                       |
| Na mengshang   |                      |                      | 1000 yuan/mu<br>← A and B → ← B and K → ← E and K → |                                   |                            |                       |
| Na manjing     |                      |                      | 1000 yuan/mu<br>← L →                               |                                   |                            |                       |
| Na jingliang   |                      |                      |   | 1000 yuan/mu<br>← M →             |                            |                       |
| Na gei         |                      |                      |   | 1000 yuan/mu<br>← C →             |                            |                       |
| Na ge          |                      |                      |   |                                   |                            | 1000 yuan/mu<br>← C → |

ers to reach a consensus with respect to renting out the whole block. All Na Nuanlong landholders agreed to rent out the fields for three years at a rate of 500 yuan/mu per year. The lease contract had a typical format, including the location of the land, the rental period, the rent, the responsibility of each side, and conflict resolution measures, and was signed and fingerprinted by the businessman, landholders and village headman.

After successful commercial banana growing in Na Nuanlong, Mr. A proposed expanding banana farming to Na Mengxia in 2006 and Na Mengshang in 2007 and offered higher rent, i.e., 700 yuan/mu in 2006 and 1,000 yuan/mu in 2007 (Fig. 3). The landholders accepted. In 2007, the staff of a nearby state-owned rubber farm (Mr. L in Table 2) rented Na Manjiang and started growing bananas. In 2008, Mr. A set up a new banana farm in another village, and his banana farm at Na Nuanlong was succeeded by several newcomers (Fig. 3).

Table 2. Attributes of banana businessmen in Manlong Village

| Name | Original location | Former occupation | Ethnicity |
|------|-------------------|-------------------|-----------|
| A    | Sichuan           | farmer            | Han       |
| B    | Sichuan           | retired staff     | Han       |
| C    | Sichuan           | farmer            | Han       |
| D    | Sichuan           | farmer            | Han       |
| E    | Sichuan           | farmer            | Han       |
| F    | Guangdong         | driver            | Han       |
| G    | Guangdong         | farmer            | Han       |
| H    | Guangdong         | farmer            | Han       |
| I    | Guangdong         | farmer            | Han       |

Land suitability for banana growing differs slightly from that for paddy-based cropping. Na Hong was

not rented out in 2010, against the wishes of the landholders. Na Ge was rented out, but only in 2010, later than the other blocks. These findings suggest that poor drainage was the major constraint for banana growing, whereas insufficient water supply in the dry season and poor water quality were not.

During the process, 13 businessmen rented lowland fields for banana growing, of which 12 businessmen were Han people. The sole Dai businessman (Mr. M in Table 2) was a farmer at a village close to the county capital and married a Manjiang woman.

Considering both profitability and risks, the Manlong farmers chose to rent out their lowland fields rather than grow banana themselves. Economic incentives explain why farmers agreed to rent out their fields: the income from renting out lowland fields was higher than that from paddy-based farming in the previous year despite the omission of labor input from the cost of lowland farming (Table 3, Fig. 3). Furthermore, the farmers did not need to concern themselves with production uncertainties or sale procedures. As a result, only 5 out of 76 households were engaged in double paddy cropping systems in 2010.

Inspired by the Han businessman (Mr. A in Table 2), the village headman bought hybrid banana seedlings, learned the techniques from Mr. A and grew 10 mu of bananas at Na Gei in 2006. However, the Chinese media reported banana Panama disease as *banana cancer* in 2007, fueling a rumor that eating bananas caused cancer, which in turn resulted in panic, a nationwide avoidance of banana consumption and price collapse. In 2007, the village headman failed to sell all his produce. When Mr. C proposed taking over the banana farm after the 2008 harvest, the village headman unhesitatingly accepted. This headman only earned approximately 300 yuan/mu per year by growing banana (as cited in the headman's note), which is much less than the return of paddy farming. Consequently, other farmers quickly abandoned the idea of growing bananas.

Table 3. Returns for traditional cropping patterns in the lowland blocks of Manlongle Village (unit: yuan/mu, parentheses indicate SE)

| Lowland blocks | 2004            | 2005            | 2006            | 2007            | Traditional cropping pattern<br>(before the introduction of banana farming) |            |
|----------------|-----------------|-----------------|-----------------|-----------------|---|------------|
|                |                 |                 |                 |                 | Rainy season  | Dry season |
| Na Nuanlong    | 475.5<br>(15.1) | -               | -               | -               | paddy   | maize      |
| Na Mengxia     | 572.0<br>(7.7)  | 603.9<br>(8.2)  | -               |                 | paddy   | paddy      |
| Na Mengshang   | 564.6<br>(10.5) | 595.4<br>(11.0) | 639.6<br>(12.0) | -               | paddy   | paddy      |
| Na Manjiang    | 466.5<br>(2.0)  | 523.2<br>(2.0)  | 575.4<br>(2.0)  | -               | paddy   | rented out |
| Na Jingliang   | 564.0<br>(13.8) | 595.7<br>(14.8) | 639.0<br>(15.8) | 776.0<br>(19.3) | paddy   | paddy      |
| Na Gei         | 489.7<br>(24.5) | 515.7<br>(26.4) | 554.5<br>(29.4) | 671.0<br>(33.8) | paddy   | paddy      |
| Na Ge          | 195.1<br>(16.9) | 204.8<br>(18.0) | 219.9<br>(19.1) | 266.7<br>(22.7) | paddy   | fallow     |
| Na Honge       | 604.2<br>(7.73) | 638.6<br>(10.0) | 684.5<br>(7.7)  | 827.6<br>(8.2)  | paddy   | paddy      |

### 3. Discussion and conclusion

This study describes the introduction of government-promoted watermelon farming and market-initiated banana cropping into the study village. However, the study shows an apparent gap between incentives from cash crop and farmers' responses, which vary greatly. Manlongle farmers did not adopt watermelon farming in the early 1980s due to poor irrigation and accessibility conditions, and they also did not adopt banana farming in the late 2000s due to the collapse of banana market, induced by a rumor suggesting that eating bananas causes cancer. However, the expansion of banana cultivation rapidly changed the lowland cropping pattern of the study village, as observed in other parts of Xishuangbanna, to banana monoculture. Moreover, almost all banana farms were managed by external businessmen rather than Manlongle farmers.

In the early 1980s, the Household Responsibility System reallocated collective land to individuals and provided autonomy over decisions with respect to crop choice and land use (Krusekopf, 2002). Under this system, Chinese farmers were responsible for the losses of their enterprises. Moreover, the Chinese government initiated a transition from a planned economy to a market economy in the late 1970s, and this reform has facilitated the flow of people and goods between the production and consumption areas in all regions of China. Under this background, the external businessmen provided Manlongle farmers with the opportunity to serve as the landowners of watermelon farms to hedge the risk of the ecological experiments and to generate higher income without the risks of banana cultivation. Thus, the farmers benefited from interacting with these external businessmen.

The failure of the Manlongle headman to adopt banana farming was mainly the result of a rumor. Consequently, the idea of self-supporting banana farms was quickly abandoned, and they accepted their role as landowners. This rumor essentially originated from the limited science literacy of the public and the dangerous status of food safety in China. Cyert and March (1963) indicated that an understanding of reality is necessary before a rational decision can be made. In 2010, China Association for Science and Technology reported that only 3.27 percent of the total population of China had basic scientific literacy. Many people may not be able to identify these rumors as false. Furthermore, Chinese consumers lack confidence in food safety due to an increase in food poisoning incidents (Bai et al., 2007). Modern communication media, especially the internet and mobile phone text messages, can spread these rumors widely and rapidly, promoting panic. The experience in Manlongle is not an isolated phenomenon, and such rumors are increasingly common in China (Xu et al., 2013). Therefore, the government should design more efficient refutation strategies for preventing the rumor-induced collapse of the agricultural produce market.

Feder et al. (1985) indicated that adoption behaviors differ across socioeconomic groups and that immediate and uniform adoption behaviors are quite rare. Although the replacement of previous cropping patterns with banana cultivation across all village fields gives the impression of collective action under the instruction of the village authority, the change was undoubtedly the aggregate result of the decision processes of each household. It is also true that the decision-making processes of households within a village are interdependent in many ways. Zhang et al. (2015) noted that Dai village has interactive deci-

sion-making customs, and once a proposal receives support from most farmers, dissidents have to abide by this decision. Poor farm layouts might also constrain the independent crop selection of a household. A few farmers worried that banana cultivation might be harmful to their land, but once the cropping patterns of surrounding fields changed, these farmers had to follow suit due to the low density of farm roads and ditches.

This study suggests that irrigation conditions and land accessibility differentiate lowland use among villages in the study area. The daily life of Dai people is closely linked to water, which has contributed greatly to the development of traditional irrigation systems. However, the Lancang River and its tributaries do not irrigate most of the lowland fields. Consequently, most farmers in this area must rely on small streams adjacent to their villages, and access to water for irrigation frequently plays a key role in their livelihoods (Gao, 1999). Manjiang Village is located at the foot of high mountains, and river flow is available throughout the year. The lowland fields of this village feature good accessibility and irrigation conditions (Fig. 2). This village successfully adopted watermelon farming in the early 1980s and refused to rent their land to Han businessmen because the return from a double cropping system (paddy and watermelon) was 1.7-3.2 times the rent offered during 2005-2007. After three years, many banana farms were established by external businessmen in neighboring villages, and local farmers became familiar with this new enterprise. In 2008, the Manjiang farmers initiated banana farming and were successful (Zhang et al., 2014). In 2010, the household income of Manjiang Village was 2.2 times higher, on average, than that of Manlongle due to varying lowland management practices.

The failure in adopting watermelon farming demonstrates that the government ought to consider contextual conditions, which may vary from village to village, and promote tailored extension programs for each village. On the other hand, Manlongle was the first village to introduce banana farming to its neighbors, and all local farmers and commercial agents lacked experience in banana farm management. Although the local government dispatched staff to the study village to teach farming techniques each year, they did not teach banana farming techniques until 2011. Dai farmers commonly lack social connections to Han businessmen and cannot obtain assistance from them. In this context, banana growing is a high-risk choice, and farmers' perceptions of this enterprise as high-risk were enhanced by the headman's failure, induced by a rumor suggesting that eating bananas causes cancer. Thus, the government should implement efficient refutation strategies to prevent rumor-induced market collapse and provide extension services as early as possible in the initial stages of transition to cash cropping.

## Acknowledgments

We deeply appreciate the local villagers, who provided valuable information. This research was financially supported by Grant-in-Aid *Livelihood Transition in Rural Southeast Asia* (Grant number 22241058), Japan Society for the Promotion of Science, National Natural Science Foundation of China (Grant number 41401200 and Grant number 41661114).

## References

1. BAI L., MA C., GONG S., YANG Y., 2007, Food safety assurance systems in China, in: *Food control*, vol. 18, no. 5, p. 480-484.
2. BOUMTJE P.I., BARRY P.J., ELLINGER P.N., 2001, Farmland lease decisions in a life-cycle model, in: *Agricultural Finance Review*, vol. 61, no. 2, p. 167-179.
3. BURGER K., COLLIER P., GUNNING J.W., 1993, *Social learning: an application to Kenyan agriculture*. Centre for the Study of African Economies.
4. CRAMB R.A., 1999, Processes affecting the successful adoption of new technologies by smallholders. In *Working with farmers: the key to the adoption of forage technologies*, ACIAR proceedings no. 95; Australian Centre for International Agricultural Research: Cagayan de Oro City, Philippines.
5. CYERT R.M., MARCH J.G., 1963, *A behavioral theory of the firm*, Prentice Hall, Englewood Cliffs, NJ.
6. DERCON S., 1996, Risk, crop choice, and savings: Evidence from Tanzania, in: *Economic Development and Cultural Change*, vol. 44, no. 3, p. 485-513.
7. EVANS T.P., PHANVILAY K., FOX J., VOGLER J., 2011, An agent-based model of agricultural innovation, land-cover change and household inequality: the transition from swidden cultivation to rubber plantations in Laos PDR, in: *Journal of Land Use Science*, vol. 6, no. (2-3), p. 151-173.
8. FEDER G., JUST R.E., ZILBERMAN D., 1985, Adoption of agricultural innovations in developing countries: A survey, in: *Economic Development and Cultural Change*, vol. 33, no. 2, p. 255-298.
9. FOX J., CASTELLA J.-C., 2013, Expansion of rubber (*Hevea brasiliensis*) in Mainland Southeast Asia: what are the prospects for smallholders?, in: *The Journal of Peasant Studies*, vol. 40, no. 1, p. 155-170.
10. FOX J., CASTELLA J.C., ZIEGLER A.D., 2014, Swidden, rubber and carbon: can REDD+ work for people and the environment in Montane Mainland Southeast Asia?, in:

- Global Environmental Change*, vol. 29, p. 318-326.
11. FRIIS C., NIELSEN J.Ø., 2016, Small-scale land acquisitions, large-scale implications: Exploring the case of Chinese banana investments in Northern Laos, in: *Land Use Policy*, vol. 57, p. 117-129.
  12. GAO L., 1999, *On the Dais' Traditional Irrigation System and Environmental Protection in Xishuangbanna*, Yunnan Nationality Press, Kunming.
  13. GUO H., CHRISTINE P., KEVIN C., CHEN A., FU Y., 2002, Economic development, land use and biodiversity change in the tropical mountains of Xishuangbanna, Yunnan, Southwest China, in: *Environmental Science & Policy*, vol. 5, no. 6, p. 471-479.
  14. HALL D., 2011, Land grabs, land control, and Southeast Asian crop booms, in: *Journal of Peasant Studies*, vol. 38, no. 4, p. 837-857.
  15. HARDAKER J.B., 2000, *Some issues in dealing with risk in agriculture*, University of New England, Graduate School of Agricultural and Resource Economics, <http://ageconsearch.umn.edu/bitstream/12912/1/wp000003.pdf>.
  16. HOSSAIN M., 1998, Sustaining food security in Asia: economic, social, and political aspects. *Sustainability of rice in the global food system*. Davis, Calif.(USA), Pacific Basin Study Center, and Manila (Philippines), International Rice Research Institute, p. 19-44.
  17. JIANG H.W., UMEZAKI M., OHTSUKA R., 2006, Inter-household variation in adoption of cash cropping and its effects on labor and dietary patterns: a study in a Li hamlet in Hainan island, China, in: *Anthropological Science*, vol. 114, no. 2, p. 165-173.
  18. JIANG L., DENG X., SETO K.C., 2013, The impact of urban expansion on agricultural land use intensity in China, in: *Land Use Policy*, vol. 35, p. 33-39.
  19. JOSEPH H., RICHARD M., 2002, Are peasants risk-averse decision makers?, in: *Current Anthropology*, vol. 43, no. 1, p. 172-181.
  20. KLASSEN S., PRIEBE J., RUDOLF R., 2013, Cash crop choice and income dynamics in rural areas: evidence for post-crisis Indonesia, in: *Agricultural Economics*, vol. 44, no. 3, p. 349-364.
  21. KRUSEKOPF C.C., 2002, Diversity in land-tenure arrangements under the household responsibility system in China, in: *China Economic Review*, vol. 13, no. 2-3, p. 297-312.
  22. LEE H., BOGNER C., LEE S., KOELLNER T., 2016, Crop selection under price and yield fluctuation: Analysis of agro-economic time series from South Korea, in: *Agricultural Systems*, vol. 148, p. 1-11.
  23. LI H., AIDE T.M., MA Y., LIU W., CAO M., 2007, Demand for rubber is causing the loss of high diversity rain forest in SW China, in: *Biodiversity and Conservation*, vol. 16, no. 6, p. 1731-1745.
  24. LI Z., FOX J. M., 2012, Mapping rubber tree growth in mainland Southeast Asia using time-series MODIS 250 m NDVI and statistical data, in: *Applied Geography*, vol. 32, no. 2, p. 420-432.
  25. LINQUIST B., TROSCH K., PANDEY S., PHOUYNINYAVONG K., GUENAT D., 2007, Montane paddy rice: Development and effects on food security and livelihood activities of highland Lao farmers, in: *Mountain Research and Development*, vol. 27, no. 1, p. 40-47.
  26. MAZVIMAVI K., TWOMLOW S., 2009, Socioeconomic and institutional factors influencing adoption of conservation farming by vulnerable households in Zimbabwe, in: *Agricultural Systems*, vol. 101, no. 1-2, p. 20-29.
  27. QUIBRIA M.G., RASHID S., 1984, The puzzle of sharecropping: A survey of theories, in: *World Development*, vol. 12, no. 2, p. 103-114.
  28. RERKASEM K., YIMYAM N., KORSAMPHAN C., THONG-NGAM C., RERKASEM B., 2002, Agrodiversity lessons in mountain land management, in: *Mountain Research and Development*, vol. 22, no. 1, p. 4-9.
  29. RIGG J., SALAMANCA A., 2009, Managing risk and vulnerability in Asia: A 25-year village study from Thailand, in: *Asia Pacific Viewpoint*, vol. 50, no. 3, p. 255-270.
  30. RUF F., SCHROTH G., 2015, *Economics and ecology of diversification: The case of tropical tree crops*, Springer, The Netherlands.
  31. SEO S.N., MENDELSON R., 2008, An analysis of crop choice: Adapting to climate change in South American farms, in: *Ecological Economics*, vol. 67, no. 1, p. 109-116.
  32. SHEIKH A., REHMAN T., YATES C., 2003, Logit models for identifying the factors that influence the uptake of new 'no-tillage' technologies by farmers in the rice-wheat and the cotton-wheat farming systems of Pakistan's Punjab, in: *Agricultural Systems*, vol. 75, no. 1, p. 79-95.
  33. STURGEON J.C., 2010, Governing minorities and development in Xishuangbanna, China: Akha and Dai rubber farmers as entrepreneurs, in: *Geoforum*, vol. 41, no. 2, p. 318-328.
  34. SU S., ZHOU X., WAN C., LI Y., KONG W., 2016, Land use changes to cash crop plantations: crop types, multilevel determinants

- and policy implications, in: *Land Use Policy*, vol. 50, p. 379-389.
35. TRUNG D.D., 2002, *Coffee and subsistence production: complementarity or competition? A case study from an Ede (Rhade) village in Vietnam*, 46<sup>th</sup> Annual Conference of the Australian Agricultural and Resource Economics Society, Canberra.
  36. TYBOUT A.M., CALDER B.J., STERNTHAL B., 1981, Using information processing theory to design marketing strategies, in: *Journal of Marketing Research*, vol. 18, no. 1, p. 73-79.
  37. VAN DEN BERG M.M., HENGSDIJK H., WOLF J., VAN ITTERSUM M.K., WANG G., ROETTER R.P., 2007, The impact of increasing farm size and mechanization on rural income and rice production in Zhejiang province, China, in: *Agricultural Systems*, vol. 94, no. 3, p. 841-850.
  38. VONGVISOUK T., BROEGAARD R.B., MERTZ O., THONGMANIVONG S., 2016, Rush for cash crops and forest protection: Neither land sparing nor land sharing, in: *Land Use Policy*, vol. 55, p. 182-192.
  39. WEIR S., KNIGHT J., 2000, *Adoption and diffusion of agricultural innovations in Ethiopia: the role of education*. University of Oxford, Institute of Economics and Statistics, Centre for the Study of African Economies.
  40. XU J., FOX J., VOGLER J.B., YONGSHOU Z.P.F., YANG L., QIAN J., LEISZ S., 2005, Land-use and land-cover change and farmer vulnerability in Xishuangbanna prefecture in southwestern China, in: *Environmental Management*, vol. 36, p. 404-413.
  41. XU J., GRUMBINE R.E., BECKSCHAFER P., 2014, Landscape transformation through the use of ecological and socioeconomic indicators in Xishuangbanna, Southwest China, Mekong Region, in: *Ecological Indicators*, vol. 36, p. 749-756.
  42. XU J., LI X., TU T., BAO Y., 2013, Study on emergence organizational model of farmer' s risk in emergency of fresh agricultural product, in: *Journal of Huazhong Agricultural University (Social Science Edition)*, vol. 105, no. 3, p. 64-70.
  43. YANG X., LIANG B., 2008, Development of Banana Plantation in Xishuangbanna, in: *Tropical Agricultural Science and Technology*, vol. 31, p. 30-31.
  44. ZELLER M., DIAGNE A., MATAYA C., 1998, Market access by smallholder farmers in Malawi: Implications for technology adoption, agricultural productivity and crop income, in: *Agricultural Economics*, vol. 19, no. 1, p. 219-229.
  45. ZHANG L., KONO Y., KOBAYASHI S., 2014, The process of expansion in commercial banana cropping in tropical China: A case study at a Dai village, Mengla County, in: *Agricultural Systems*, vol. 124, p. 32-38.
  46. ZHANG L., KONO Y., KOBAYASHI S., HU H., ZHOU R., QIN Y., 2015, The expansion of smallholder rubber farming in Xishuangbanna, China: A case study of two Dai villages, in: *Land Use Policy*, vol. 42, p. 628-634.

## Development Aid as a Gift of Love: Re-inventing Aid on a Spiritual Foundation

### Pomoc rozwojowa jako dar miłości: oparcie pomocy na duchowości

Rohana Ulluwishewa

*Massey University, Palmerston North, New Zealand*  
*Email: ulluwishewa@xtra.co.nz*

---

#### Abstract

Love, when viewed from quantum perspectives, is an outer manifestation of our interconnectedness at the quantum level. As revealed by recent discoveries in neuroscience, it is hardwired in our brain as a need to connect with others, serve others and act for others' well-being. It is empowered to guide our actions only when we grow spiritually. Otherwise, we are mostly driven by self-centeredness, greed and fear soft-wired in the brain. This study points out that development aid is driven, not by love, but by self-centeredness, greed and fear in the minds of elites who control the global economic system. However, evidence show a spiritually developed population is slowly rising and alternative forms of aid driven by love are emerging. This study highlights the significance of re-inventing development aid on a spiritual foundation and presents some necessary policy measures.

**Key words:** love, spirituality, greed, poverty, development aid

#### Streszczenie

Miłość, patrząc z perspektywy kwantowej, jest zewnętrzną manifestacją naszej wzajemnej łączności właśnie na poziomie kwantowym. Jak pokazały ostatnie odkrycia neurologiczne, jest wbudowana w nasz mózg jako potrzeba łączenia się z innymi, służenia innym i działania dla dobra innych. Jest uprawniona do kierowania naszymi działaniami tylko wtedy, gdy rozwijamy się duchowo. W przeciwnym wypadku kieruje nami samoświadomość, chciwość i strach. Niestety, obecnie realizowana pomoc rozwojowa jest przeprowadzana nie z uwagi na miłość, ale na samoświadomość, chciwość i strach, które charakteryzują elity kontrolujące globalny system ekonomiczny. Jednocześnie powoli przybywa ludzi rozwijających się duchowo, dzięki którym powstają alternatywne formy pomocy, których podstawą jest miłość. W tej pracy przedstawiamy konieczność transformacji pomocy rozwojowej w taką, która oparta będzie na duchowości, a także omawiamy przykłady niezbędnych działań z zakresu polityki, które należy podjąć.

**Słowa kluczowe:** miłość, duchowość, chciwość, ubóstwo, pomoc rozwojowa

---

#### Introduction

Despite heavy investments in economic development in low-income countries, poverty, inequality, hunger and malnutrition still plague those countries. There is now a general consensus development has failed to achieve its goals in bringing prosperity, peace and joy to the world. For its failure, while some critiques blame Eurocentrism, injustice and in unequal power relationships in the practice of development (Ferguson, 1990; Rahman, 1993; Amin,

2009; Smith and Max-Neef, 2011), others blame the uncritical transfer of modern science and technologies from rich to poor countries (Peet and Watts, 1993; Escobar, 1995). Ignorance of environmental sustainability in development projects is also mentioned as a reason for the failure (Brudtland, 1989; Reid, 1995; Overton and Scheyvens, 1999; Adams, 2001; Ikerd, 2005). All these views focus only on external factors, assuming the root cause of the failure lies in the external material world. However, there is now a tendency in some circles to look into ourselves

in order to find the root cause of the failure. Korten (1995) and Reid (1995), emphasize the significance of inner changes in achieving development goals. Further emphasizing the significance of inner changes, Ikerd (2005), in his book *Sustainable Capitalism*, points out rules and regulations will not lead to people behaving in a sustainable manner and it should come from their inner selves. *Deep Sustainability*, a concept emerged as an alternative to the external changes-based sustainable paradigm, highlights the significance of altering human relationships with each other and with nature (Ikerd, Gamble, Cox, 2014).

The present author, in his book *Spirituality and Sustainable Development* (2014), recognizes self-centeredness in relationships with our fellow human beings and with nature as the root cause of the failure of development, and highlights the significance of incorporating spirituality – an inner transformation from self-centeredness to selflessness – into development. The present study focuses on development aid, the main source of financing for development, with the intention of exploring how self-centeredness, greed and fear in the mind of donors contribute to the failure of development. Self-centeredness, greed and fear, as shown in this study with the help of recent discoveries in neuroscience and transpersonal psychology, are not intrinsic to human beings; we are intrinsically selfless, altruistic and generous. Our apparent self-centeredness and greed are temporary signs of our spiritual underdevelopment and are replaced by love as we grow spiritually. Evidence show such a spiritual transformation is now unfolding across world. As it unfolds, some spiritually elevated philanthropists donate sizable shares of their wealth to the well-being of the poor. This trend is now identified by some as the *philanthropic revolution* (Schervish, 2007). Some of them want not only to donate money, but also to initiate their own poverty alleviation projects and actively take part in these projects. Parallel to this trend, as will be pointed out later in this study, some spiritually elevated community leaders in poor developing countries initiate spirituality-based community development projects. The emerging spirituality-based alternative aid systems and their development initiatives offer valuable lessons for the existing official aid system and aid-driven development activities. The present study is an attempt to explore this trend and to provide the policy recommendations required to re-invent the existing official aid system on a spiritual foundation.

### Spirit, Spirituality and Love

The English word *spirit* has come from the Latin word *spiritus*, which means breath or that which gives life or vitality to a system (Zohar and Marshall, 2005). Spirituality literally means the state of being in unity with spirit. All beings, including ourselves,

are living systems. If spirit is the source of life of all living beings, what we call spirit must be deathless. Is there such a deathless entity within us? In order to find out whether there is, we can look into our body with the help of a powerful microscope. If we do so, we will discover the energy which fills each atom of our body. That energy is deathless. Therefore, spirit is the energy which fills each and every atom of our body. According to quantum physics, the same energy fills the whole universe. In spite of its vastness, this mass field of energy functions as an inseparable and indivisible single field of energy, *a single undivided whole* (Bohn, 1980). According to recent discoveries in quantum physics, *the single undivided whole* is conscious and *can think*. A theoretical physicist, Freeman Dyson, believes this is the *mental component of the universe* (Quoted in: Elgin, 2015). Since the energy is conscious and fills the whole universe, it is called Universal Consciousness.

From the perspective of Universal Consciousness, all living beings and non-living objects in nature are its integral parts. It is an interconnected single entity. The body of any living organism can be taken as an analogy to understand its interconnectedness or oneness. The body consists of various organs and limbs, but all are interconnected and interdependent. No matter how big or small, whatever happens to any one part is instantly felt by the whole body. In the same way, Universal Consciousness feels pains in all beings. Hence, it wishes all beings to be happy, to be healthy, to be peaceful and to be joyous. This is love; pure, universal, unlimited, and unconditional. Recent discoveries in neuroscience reveal Universal Consciousness love is hardwired in our brain. Lieberman (2013), a social neuroscientist, points out our need to connect with others is hardwired in our brain. Pfaff (2007), an American neuroscientist, says the human brain is hardwired to act according to Golden Rule – One should treat others as one would like others to treat oneself. In his recent book, *Altruistic Brain: How We are Naturally Good*, Pfaff (2015) demonstrates that human beings are hardwired to behave altruistically and that spontaneous kindness is our default behaviour. The view that spiritual qualities are hardwired in our brain is further supported by the discovery of what neuroscientists call *Mirror Neurons*, which enable us to experience others' pain and be empathetic (Rizzolatti, 2007). From this perspective, love is an outer manifestation of our inner interconnectedness, or oneness at the quantum level. Interconnectedness at the quantum level is expressed through us as a need to connect with others, help others and reduce their pain and suffering, and act for others' well-being. Love manifests itself in various forms such as acceptance, forgiveness, compassion, kindness, tolerance, generosity, sharing, empathy and selfless service. The foundation of love is, not our feelings or emotions towards others, but our inner interconnectedness or oneness with others.



However, most of us do not demonstrate such pure and unconditional love in our ordinary life. Instead, our actions are often driven by self-centeredness, greed and fear. This is because, when we interact with the external world, the brain's neuroplasticity – the ability of the brain to change itself in response to our interactions with the external world – allows these lower qualities prevalent in society to be soft-wired in our brain, preventing us from being guided by the hardwired love. Therefore, we remain spiritually underdeveloped. But the good news is the same neuroplasticity allows us to dissolve the soft-wired lower qualities and to develop spiritually if we want to do so. Research findings in neuroscience reveal we have the capacity to re-wire our brain and change it permanently and transform ourselves (Begley, 2007; Arden, 2010; Newberg and Waldman, 2015). Achieving this inner transformation is known by various names: Self-actualization (Maslow, 1997), Self-realization (Whitmore, 1997) and Enlightenment (Newberg and Waldman, 2015). Such an inner transformation allows us to be guided by the hardwired love. Newberg and Waldman (2015) show how it changes our brain permanently. Their findings suggest most religious and non-religious spiritual practices are potentially capable of leading us toward Enlightenment. Concluding their study, they state that [T]he human brain is primed for Enlightenment. All we need to do to unlock this process is find the right combination of practices, life experiences, and beliefs that will illuminate our path toward Enlightenment. Enlightenment is a gift for all humanity. It is in your body and your brain, and it is waiting to be released in everyone (p. 248).

#### **Official Aid System and Conventional Development: Aid without a Spiritual Foundation**

The origin of the activity we call *development* is often placed in the speech by United States President Henry S. Truman (1945-1953), in which he perceived the poverty in poor nations as a handicap and a threat to the poor as well as to the rich countries (Truman Library, 2016). He used the term 'underdeveloped areas' to describe what later came to be known as *Third World*, *Developing Countries* and *The South*. According to him, the key to prosperity was greater production and the key to greater production was wider application of modern scientific knowledge and technology. The strategy he suggested was to transfer capital, technology and knowledge from rich to poor countries. Then, initiatives were taken by the US-led western countries to invent *development*. Development aid system was subsequently invented in order to provide the capital, technology and knowledge required for economic growth in *underdeveloped areas*. Development aid focused on two goals: (1) Creating markets for the US by reducing poverty and increasing production in developing countries, and (2) Diminishing the threat

of communism by helping countries prosper under capitalism (USAID History 2016).

It was the time when the western capitalist world was facing the challenge of the communist Soviet Union. It was considered important for the US and its western alliance to prevent *underdeveloped areas* from falling into communism. Besides this, fast-growing western industrial economies were in need of more resources and markets for their products. Therefore, it was considered necessary for the western world to keep the 'underdeveloped areas' on their side. As *New Internationalist* (1992) pointed out, *Clothing self-interest in generosity*, Truman outlined a program of technical assistance designed to 'relieve the suffering' of these people through 'industrial activities' and 'a higher standard of living'. Concluding their study on donor motives for foreign aid, Bandyopadhyay and Vermann (2013) states:

*As many poorer nations started on their path of development in the postcolonial period, former colonial powers tried to facilitate this process through provision of resources in the form of foreign aid. This motive was central in foreign aid flows throughout the 1960s and still remains one of the multiple objectives that determine aid. In addition to pure altruism, strategic interests have always been relevant. In the Cold War era, aid was used as an instrument to buy allegiance. More recently, aid has focused substantially on security concerns, marked especially by the watershed event of September 2001 (p. 334).*

Thus, the true motive behind development aid seems to be, not love but the self-centeredness, material greed and fear, the fear of losing their control over rest of the world to their perceived enemy – the Soviet Union.

In the official aid system, a small percentage of government income from tax is allocated by policy makers for development aid and is transferred to the poor countries either directly (bilateral aid) or through aid agencies (multilateral aid). This process is administered by a stream of agencies in both donor and recipient countries. In the official aid system, which functions as a bureaucratic mechanism, there is no form of direct contact between the donors – the tax payers in rich countries, and the recipients – the poor people. Therefore, there is hardly any space for love to exchange between the givers and the recipients and grow. In aid-driven conventional development practices, *development* means *to develop others* – the elites at all levels, global, national and local, act collaboratively to develop *others* – the poor. When the elites give aid and develop the poor, if they do not draw from a spiritual basis but rather from a selfish and greedy mindset, they give aid and develop the poor in such a way that it benefits themselves rather than the poor, who are supposed to receive the benefits. Before aid is given and development activity is undertaken, the questions that naturally arise in a

selfish mind are, for example (1) What kind of aid should we give if we are to benefit from it? (2) To what countries should we give aid if we are to benefit from it? (3) In what way are we to develop them if we are to benefit from that development? (4) What development models are we to impose on them if we are to benefit from that development? and (5) What sort of technology are we to introduce to them in aid programmes if we are to benefit from it? When answering these questions from this perspective, the mind will recommend answers which benefit the donors rather than the recipients.

For instance, selfish mindset will propose a kind of aid, recipient countries and development strategies which benefit themselves, which generate demand for their capital, their technologies, their knowledge and their expertise; provides them with easy access to others' resources; popularizes their culture among others which generates demand for their consumer goods and services; links others to their (global) economic system in such a way that a substantial portion of the other's increased income will end up in their hands; make others dependent on them so they can dominate others and get others to deal on their terms when they deal with them, trap others in permanent dependence which provides them with power over them; and destroy the others' local cultures and values which act as a source of resistance to their domination to them. Therefore, not surprisingly, development carried out from those with a selfish mindset benefits the elites and fails to benefit the others, widening the gap between the rich and the poor.

A casual observation of the development policies, strategies and projects commonly adopted in the developing countries supports the above argument. For example:

- Where there is a choice between two recipient countries, the donors choose the country strategically important to them, the country whose leadership is willing to co-operate with them and support their exploitive foreign policies.
- Where there is a choice between the centrally-controlled development and the development controlled by the local people, the donors adopt the former which enables them to exploit the others' resources.
- Where there is a choice between a large-scale development project requiring external resources such as western technologies, knowledge and capital, and a small-scale project which can be managed with locally available resources, they choose the former because it benefits themselves as the people who control the export-import business.
- Where there is a choice between capital-intensive technologies and labour-intensive technologies, they choose the former because it benefits themselves, since they

control the institutions which provide capital, such as banks and various other funding agencies.

- Where there is a choice between a development strategy which adversely affects local cultures and makes local communities dependent on the donors, and a development strategy which strengthens local cultures and makes local communities independent, they choose the former, because it strengthens their power and superiority.

Thus, most aid programmes and aid-driven development projects are designed and implemented in such a way that the resulting development delivers profits for the donors, the powerful who control development rather, than to the powerless poor who are supposed to receive its benefits. Each project induces a variety of changes in the powerless poor; economic changes, socio-cultural changes, and environmental changes. While these changes clearly deliver only positive results to the powerful, they bring a mixture of positive and negative consequences to the powerless. This is because the projects are aimed at raising the production of the powerless, ignoring their possible social, cultural and environmental consequences, or assuming there are no such negative consequences. The powerful provide aid and loans for development and design the projects. They do it in such a way that if the development generates wealth for the poor, a substantial portion of the increased wealth is transferred into the hands of the powerful. As Venkataraman (2010) puts it *At the macro level, wealth generation is never altruistic and invariably involves exploitation of various kinds, some very evident and others not so evident and happening via an invisible chain* (p. 17). The evidence provided in this section with regard to donors' the motives and how the official aid system operates suggest development aid is not a gift of love, but a product of self-centeredness, greed and fear in the mindset of the global elites.

### Spiritual Revolution and Growing Generosity

There is a growing consensus among academics, philosophers and intellectuals that an inner transformation, or a kind of spiritual awakening, is unfolding across the world. Brian L Weiss, a psychiatrist, a bestselling author and a spiritual teacher in the US is convinced a spiritual revolution is occurring. In his *Mirrors of Time* published in 2002 he states that

*A spiritual revolution is occurring. It seems to me that people who read my books, attend to my lectures, or write to me are trying to do far more than solve mere physical and emotional problems. They are seeking a pathway to endow their lives with more meaning, fulfilment, and joy, and they are transcending the mundane* (p. 72).

Similarly, Tacey (2004) in his book *Spirituality Revolution: The Emergence of Contemporary Spirituality* identified a new trend emerging across the western world, what he called a spirituality revolution. The spirituality revolution is

*a spontaneous movement in society, a new interest in the reality of spirit and its healing effect on life, health, community and well-being. It is our secular society realizing that it has been running on empty, and has to restore itself at a deep primal source, a source which is beyond humanity and yet paradoxically at the very core of our experience (p. 1).*

In his book, he recognized the growing interest in spirituality among students and youth. There is a trend that suggests they have withdrawn themselves from traditional religious institutions but have engaged themselves in exploring spirituality and the meaning of life. In order to explore this, they are beginning to move beyond the narrow confines of any one religion and orthodoxy. Tolle (2005), an internationally renowned spiritual writer and speaker, in *A New Earth: Create a Better World* called it the transformation of human consciousness, and predicts that

*A significant portion of the Earth's population will soon recognize, if they haven't already done so, that humanity is now faced with a stark choice: Evolve or die. A still relatively small but rapidly growing percentage of humanity is already experiencing within themselves the breakup of the old egoic mind pattern and the emergence of a new dimension of consciousness (p. 21).*

It is evident that altruism, which is a sign of emerging spirituality, is growing and the population of altruists is rising. It has been found altruists make up about 15 percent of western populations (Cited in: Ricard, 2011, p. 206-207). It can be believed altruists will grow in number in the future. Because, if altruists live in isolation they will soon diminish, whereas if they live together in groups, they will further evolve. What could happen in the modern interconnected world is that altruists would get in touch with each other and act collaboratively for the well-being of the humanity. Evidence suggests the number of organizations involved in collecting charity and the amount of wealth they collect are on the rise. The rich class is now beginning to find that giving is more satisfying than accumulation and consumption. For instance, Schervish (2007), a researcher on philanthropy, has revealed that the share of wealth given for charity by philanthropists in the US increases as the wealth is transferred from the old to the younger generation. *Giving USA 2015*, a report of the Giving USA Foundation, noticed an upward trend in donations for charity (Giving USA, 2015). According to the report, the amount given by Americans in 2014 is 7.1 percent higher than that in 2013 – the fifth year in row where giving went up. *Chronicle of Philanthropy* (2014) noticed a significant increase of giving

among poor and middle class Americans. A similar trend has been recognized in the United Kingdom by the Centre for Charitable Giving and Philanthropy (CGAP, 2011). A positive growth in charitable regular giving in UK has been noticed by the charity sector's annual benchmark report for charity direct debit donations. The 2011 report states that despite the recession, *charitable giving is proving robust with growth that demonstrates the generosity of the British people and the resilience of the charity sector (The Guardian, 2011)*. In recent years, private philanthropic foundations have emerged in rich societies as a potentially effective force in the fight against poverty, with their financial contribution to poverty alleviation substantially higher than that of official aid. The Hudson Institute (2013) revealed how private financial flows have surpassed official aid, how new forms of giving are redefining foreign aid and development and how the philanthropic movement is spreading from rich western countries to emerging economies such as China, Russia, India, and Brazil. Kinsman (1990) quotes a news report based on Britain's Charity Commissioner's report, which identified not only the growing generosity among the public in donating to charities, but also the new trend of getting involved in service activities.

*Last year Britain's charities collected a record three million pounds in donations from the public, over 10% more than ever before. The annual report of the Charity Commissioner emphasizes the trend towards personal commitment in charitable concerns. 'Just signing a cheque is not enough', says the report's introduction, 'people want to get involved as well' (Cited in: Whitmore, 1997, p. 171).*

John Low, chief executive of the Charities Aid Foundation said *UK giving is now bigger and better, looking far beyond the financial side of being charitable to explore the who, what, how and why of our support for charities across the country (EFC, 2016)*. The growing interest in getting involved in voluntary work has been identified as a common trend in rich societies. A study in the US found volunteering continues to rise in momentum and impact (*Examiner*, 2014). BBC recently reported a dramatic rise in volunteering among youths across the UK (BBC, 2016). Numerous studies have found most volunteers feel better or healthier after helping out (Howlett, 2004). People want to make use of their free time for some life-fulfilling activity, and they find that making themselves available for alleviating others' suffering is most fulfilling. A trend of volunteering to work in poor societies for the benefit of the poor has also been noticed in rich societies.

### Emerging Spirituality-Based Alternatives

As the aid and development programmes without a spiritual base fail, spiritually evolved people and

their organizations driven by love begin to take their own initiatives. They begin to act in cooperation with the poor in order to reduce their suffering. Cooperation is emerging between the spiritually evolved rich people and the poor. Initial signs of this cooperation are now clearly visible. At first, the cooperation appears to take the form of donations to charities and then it develops to direct involvement in service projects. As already pointed out, the number of charities and the amount of money collected by them are on the rise and the interest in getting involved in voluntary work is growing. While some join international development agencies and non-government organizations as volunteers, other like-minded individuals form their own small organizations to help the poor. Still others prefer to serve a few handpicked poor families individually. Such people establish close personal relationships with the selected families and help them regularly according to their needs and priorities. Some other individuals help through local non-government organizations of poor communities.

It has been evident religious institutions in rich societies are increasingly involved in various forms of poverty alleviation. As Whitmore (1997) noted, Christian-based charitable outreach to the poor, the needy and oppressed is world-wide and is a significant manifestation of cooperation with humanity at large. Other religions, sects and even individual churches each have their forms of humanitarian cooperation. Involvement of mosques and churches in helping the poor is quite common. In a way, such religious institutions act as mediators that facilitate cooperation between the rich and the poor. Some rural development projects initiated and coordinated by religious institutions have been reported to be highly successful. For instance, Suksamran (1988) provides evidence of the success of local-level development initiatives taken by Buddhist monks in Thailand; and Scheyvens (1993) highlights successful development initiatives taken by local church women's groups in the Solomon Islands. *Swadhyaya* and *Manavodya* are two grassroots movements in India involved in small-scale rural development projects. Both have emphasized the importance of spirituality in linking inner transformation to community well-being. As pointed out by Wilson (1996) and Vidyarthi and Wilson (2008) the *Swadhyaya* is based on the belief that God is within each person and one must discover God within in order to be empowered. Acting on this basis, the *Swadhyaya* has generated great material wealth with no external assistance. *Manavodya* is based on self-awakening, self-discipline, love and awareness of the unity of all life.

Large projects of this kind have also been reported in India. For example, the International Sathya Sai Service Organization (ISSSO) is a spiritual organization inspired by a renowned spiritual teacher, Sathya Sai Baba, who attracts both the rich and the poor (Satyasai, 2014). The ISSSO, with the financial

contribution of the devotees of Sathya Sai Baba, has completed a number of large-scale development projects for the benefit of the poor. A few of them are: (1) Sathya Sai Water Project, a large-scale project which provides drinking water to five million families in the Chennai District of South India; (2) Sathya Sai Super Speciality Hospitals, two large super specialty hospitals equipped with all modern facilities, which provide specialist treatment free of charge; and (3) Sathya Sai Universities, three recognized university campuses which providing undergraduate and postgraduate programmes in general subjects free of charge. All these projects are financed by donations, mainly from the devotees from rich western countries. Apart from these large-scale service projects, the ISSSO regularly conducts small-scale rural development projects under its *Grama Seva* programme. This programme involves short-term as well as long-term projects. Under this programme, devotees who belong to the rich and middle classes, including overseas visitors, visit selected poor villages and undertake various service activities such as providing basic necessities including food, and healthcare, helping the poor with some material they need for their livelihood, helping them with labour and equipment for household and income-generating activities. There are Sathya Sai Service Organizations in 180 countries and each has a service wing which facilitates cooperation between the rich and the poor in order to promote the well-being of the poor.

### **Re-Inventing Development Aid on a Spiritual Foundation**

Unlike the official aid-system which has been deliberately designed by some elites and professionals backed by elites with self-centred hidden agendas in mind, the above discussed spirituality-based alternatives are a natural response to the growing love, compassion and empathy in the human mind. They can be seen as an offshoot of the unfolding spiritual revolution, the next step of human evolution. Unlike the official aid system, in this alternative aid system, donors are motivated, not by self-centeredness, greed and fear, but by love which is unconditional and selfless. Therefore, they do not have any hidden agenda. All they want is to ensure the well-being of recipients. In the alternative aid system, there is a direct contact between the donors and the recipients. Therefore, there is a reasonably adequate space for love to exchange and grow between the two parties and it contributes to spiritual growth of both parties. Therefore, donors are in a better position to offer what the recipients really need to alleviate their suffering. Both parties are able to work in a spirit of trust, candid communication and transparency, which are manifestations of selfless love. Furthermore, both parties are able to learn from each other's experience to develop meaningful strategies.

When re-invented, the official aid system should not be based on the old assumptions listed below which are not aligned with the principles of spirituality.

- Development means material growth, and material growth alone can alleviate poverty and bring happiness and well-being to the world.
- Development can be achieved by changing the world externally; physical and institutional infrastructural changes, technological advances, social reforms, and advances in knowledge and skills.
- There is only one form of happiness; sensual pleasure. To experience pleasure, people need material wealth. Hence, material wealth is the only source of happiness. So, the wealthier are happier.
- Self-centeredness and greed are justified as motives for economic growth.
- Self-centeredness and greed are genetically fixed and permanent, intrinsic characteristics of the human race. Hence, trying to change these inner characteristics by spiritual means is unwise.
- What matters, is the flow of material resources from the donor to the poor. Establishing a loving relationship between the donor and the recipient is not important.

It is evident all these assumptions are wrong. It is widely accepted that development is not synonymous with economic growth, and growth should accompany equality, clean and healthy environment, peace and happiness. This goal cannot be achieved only by external changes. The external changes economic growth brings generate more material wealth, but as the self-centeredness and greed within us remain unchanged, we fail to generate wealth in an environmentally friendly manner and to distribute the wealth equally. The world is now witnessing the consequences of trying to achieve development goals solely by external changes. As it has been pointed out with the help of empirical evidence, the root cause of widespread poverty lies within us and it is our self-centeredness and greed (Ulluwishewa, 2014). Both conventional development and official aid systems ignore this truth and attempt to change almost everything in the external world except ourselves. All great religions advocate reduction of self-centeredness and greed for material wealth, and modern scientific discoveries suggest that self-centeredness and greed are temporary signs of our spiritual underdevelopment. As we grow spiritually these characteristics are replaced by selfless love, altruism and generosity.

Without achieving these inner changes in mankind, conventional development also fails to deliver happiness to all. It is now evident material wealth does not necessarily give happiness. Material wealth is re-

quired to meet the poor's basic needs and thereby to alleviate their suffering. But as recent findings of research on happiness and economic growth suggest, its capacity to generate happiness will fade as one's income increases (Layard, 2005; Frey, 2008). Furthermore, contrary to the widely held belief sensual pleasure is the only one form of happiness, it is now clear there is another form of happiness. This is the kind of happiness we experience when our mind is calm, pure, peaceful, un-aroused and in a state of contentment; or in other words, when we become one with the spirit which is our inner reality. Hence, it is called *spiritual happiness*. We can also experience spiritual happiness through loving relationships with others and with nature. We have inherited this by birth and it always remains deep within. This view is supported by scientific evidence in neuroscience, transpersonal psychology and scientific studies on near-death experience (Ulluwishewa, 2015, 2016). All great religions want us to seek spiritual happiness. As we develop spiritually, we begin to seek spiritual happiness instead of sensual pleasure. When it is re-invented, the official aid system should be based on these scientifically proven spiritual values.

It is suggested here that poverty alleviation be viewed as a means to an end; not as an end in itself as it is viewed in the existing official aid system. The end should be spiritual growth in all parties and all individuals involved in the aid system, including donors, aid administrators, the grass-root level aid workers and the poor. Spiritual growth in all those involved will enhance the effectiveness of aid as well as the long-term sustainability of the projects. It has been pointed out with the help of empirical evidence that as people grow spiritually, they grow in love, compassion, honesty, integrity, transparency, and commitment to work – the qualities crucially important for the success of aid programs. Gopalakrishna (2006), with the help of empirical evidence, points out how *Vipassana* meditation improves personal effectiveness, interpersonal effectiveness and professional effectiveness of managers and employees. Van Eijk (1999), a professional development consultant, points out how the practice of transcendental meditation could enhance the professional capacity of development workers. On the other hand, as it has been evident in spiritually oriented community development projects, the success of such projects and the spiritual qualities demonstrated by the individuals involved in them would inspire many others to support the projects in variety of ways (Wilson, 1996; Vidyarthi and Wilson, 2008). This is confirmed by a decade of experience of the author with spiritually oriented small service projects. Thus, seeing economic growth, not as an end in itself, but as means to an end, which is spiritual growth, can make aid programs self-sustaining and more effective.

It is useful to offer spiritual training programs along with the conventional training provided for aid workers and project-beneficiaries. Such spiritual training can significantly increase the capacity of aid programmes to contribute to the already unfolding spiritual revolution. Spiritual training programs can be based on religious as well as science-based non-religious spiritual practices such as psycho-spiritual therapy, meditation, past-life regression therapy, hypnotic therapy, music therapy, and spiritually oriented sports and recreational activities. Spiritually oriented service activities have been proved to be very effective in reducing self-centeredness and greed. Such service activities can be interpreted as *love-in-action* and are already in place in many religious institutions. They are also practiced in some spiritually oriented community development projects. Service, in this context, contributes to the spiritual growth of those who serve while rendering material benefits to those who are served. When the projects are monitored and evaluated, attention should also be given to their contribution to the spiritual growth of all parties involved. Parallel to conventional Environmental Impact Assessment, a Spiritual Impact Assessment is necessary to assess the possible spiritual impacts of proposed projects and to suggest measures to mitigate their negative impacts on people's spiritual growth. When professionals and aid workers are recruited for aid programs, as well as their professional qualifications and experiences, their level of spiritual attainment, their adherence to spiritual values such as love and compassion should also be taken into account. The same should be used as criteria when their performances are assessed.

### Conclusion

The world has changed since the emergence of official development aid and the invention of aid agencies. Apart from the tangible changes in socio-economic, political and environmental arenas, some intangible inner changes have also occurred. This paper focussed on an inner change, the growing altruism, compassion and generosity evident in some sectors of humanity, which offers beneficial effects on aid. However, the existing official aid system is not a product of love, the pinnacle of spiritual growth, but of self-centeredness, greed and fear which are symptoms of spiritual underdevelopment. Hence, it fails to meet the need of spiritually developed people to connect with others, serve others and act for others' well-being. To do so, alternative aid systems are emerging. Evidence show that alternatives often succeed in meeting the real needs of the poor, and reveal the significance of re-inventing the official aid system on a spiritual foundation.

### Acknowledgements

The author wishes to thank Richard Wallis and Ray Watchman for their editorial assistance.

### References

1. ADAMS W. M., 2001, *Green Development: Environment and Sustainability in the Third World*, Routledge, London.
2. AMIN S., 2000, *Eurocentrism*, Monthly Review Press, New York.
3. ARDEN J. B., 2010, *Rewire Your Brain: Think Your Way to a Better Life*, John Wiley & Sons, New Jersey.
4. BANDYOPADHYAY S., VERMANN E. K., 2013, *Donor Motives for Foreign Aid*, <https://m.research.stlouisfed.org/publications/review/13/07/bandyopadhyay.pdf> (20.07.2016).
5. BBC, 2016, *Dramatic Rise in 16 to 25 Year Olds Volunteering Across the UK*, <http://www.bbc.co.uk/newsbeat/article/36012388/dramatic-rise-in-16-to-25-year-olds-volunteering-across-the-uk> (20.07.2016).
6. BOHN D., 1980, *Wholeness and the Implicate Order*, Rutledge & Kegan Paul, London.
7. BRUNDTLAND G. H., 1989 Sustainable Development: An Overview, in: *Development* vol. 2 no 3, p. 13-14.
8. BEGLEY S., 2007, *Train Your Mind Change Your Brain: How a new science reveals our extraordinary potential to transform ourselves*, Ballantine Books, New York.
9. CALDRISI R., 2007, *The Trouble with Africa: Why Foreign Aid isn't Working?* Yale University Press, New Haven, Connecticut.
10. CGAP, 2011, *How Generous is the UK*, <http://www.cgap.org.uk/uploads/Briefing%20Papers/CGAP%20BN7%20How%20generous%20is%20the%20UK.pdf> (20.07.2015).
11. *Chronicle of Philanthropy*, 2014, <https://philanthropy.com/article/As-Wealthy-Give-Smaller-Share/152481> (20.7.2016).
12. EASTERLY W., 2006, *The White Man's Burden: Why the West's Effort to Aid the rest Done So Much Ill and So Little Good*, Penguin Press.
13. EFC, 2016, *The Latest UK Giving Report Shows that Half of British Men Do Nothing for Charity*, <http://www.efc.be/news/the-latest-uk-giving-report-shows-that-half-of-british-men-do-nothing-for-charity/> (20.07.2016).
14. ESCOBAR A., 1995, *Encountering Development: Making and Unmaking of Third World*, Princeton University Press, Princeton, New Jersey.
15. EXAMINER, 2014, *New Study Results Volunteering Countries to Rise Momentum and Impact*, <http://www.examiner.com/article/new-study-results-volunteering-continues-to-rise-momentum-and-impact> (20.07.2016).
16. van EIJ T., 1998, *Farming System Research and Spirituality: An Analysis of the Foundations of Professionalism in Developing Sustainable Farming Systems*, PhD Thesis, Wageningen Agricultural University, The Netherlands.

17. van EIJK T., 1999, Science and Spirituality, in: *COMPAS Newsletter for Endogenous Development*, February No. 1, ETC Foundation, Lausden, The Netherlands, p. 36-37.
18. ELGIN D., 2015, *We Live in a Living Universe. Working with universe*, <http://www.workingwithuniverse.org/articles/we-live-living-universe> (3.03.2015).
19. FERGUSON J., 1990, *The Anti Politics of Machine: 'Development', Depoliticization and Bureaucratic Power in Lesotho*, Cambridge University Press, Cambridge.
20. FREY B. S., 2008, *Happiness: A Revolution in Economics*, The MIT Press, Cambridge.
21. *Gates Foundation*, 2014, <http://www.gatesfoundation.org/> (9.09.2014).
22. *GIVING USA*, 2015, <http://givingusa.org/giving-usa-2015-press-release-giving-usa-americans-donated-an-estimated-358-38-billion-to-charity-in-2014-highest-total-in-reports-60-year-history/> (20.06.2016).
23. GOPALAKRISHNA G., 2006, *Buddhism and Contemporary Management with Special Reference to Vipassana Meditation*, The Buddhist Cultural Centre, Dehiwala, Sri Lanka.
24. HOOVELT A., 1997, *Globalization and the Postcolonial World: The New Political Economy of Development*, Macmillan Press Ltd, London.
25. HOWLETT S., 2004, Volunteering and mental health: a literature review, in: *Voluntary Action*, no 6 vol. 2, p. 55-72.
26. HUDSON INSTITUTE, 2013, *The Index of Global Philanthropy and Remittances*, Hudson Institute: Center for Global Prosperity, Washington: Hudson Institute, [http://www.hudson.org/content/researchattachments/attachment/1229/2013\\_indexof\\_global\\_philanthropyand\\_remittances.pdf](http://www.hudson.org/content/researchattachments/attachment/1229/2013_indexof_global_philanthropyand_remittances.pdf) (12.09.2014).
27. IKERD J. E., 2005, *Sustainable Capitalism: A matter of Common Sense*, Kumarian Press, Bloomfield.
28. IKERD J. E., GAMBLE L., COX T., 2014, *Deep Sustainability: The Essentials*, <https://sites.google.com/site/sustainabilitydeep/> (22.07.2016).
29. KORTEN D. C., 1995, *When Corporations Rule the World*, Kumarian Press, West Hartford San Francisco.
30. LAYARD R., 2005, *Happiness: Lessons from a New Science*, Penguin, New York.
31. LIEBERMAN M., 2013, *Social: Why Our Brains are Wired to Connect*, Crown Publishers, New York.
32. NEWBERG A., WALDMAN M.R., 2016, *How Enlightenment Changes Your Brain: The New Science of Transformation*, Hay House, New York.
33. NEW INTERNATIONALIST, 1992, *Development: Guide to the Ruins*, <https://newint.org/features/1992/06/05/keynote/> (9.06.2016).
34. OVERTON J., SCHEYVENS R., 1999, *Strategies for Sustainable Development: Experience from the Pacific*, UNSW Press, Sydney.
35. PEET R., WATTS M., 1993, Development Theory and Environment in an Age Market Triumphalism, in: *Economic Geography*, vol. 69, p. 227-253.
36. PFAFF D., 2007, *The Neuroscience of Fair Play: Why We (Usually) Follow the Golden Rule*, Dana Press, New York.
37. PFAFF D., 2015, *The Altruistic Brain: How We are Naturally Good*, Oxford University Press, Oxford.
38. RAHMAN A., 1993, *People's Self-Development: Perspectives on Participatory Action Research*, Zed Books, London and New York.
39. REID D., 1995, *Sustainable Development: An Introductory Guide*, Earth Scan Publication Limited, London.
40. RICARD M., 2011, *The Art of Happiness*, Atlantic Books, London.
41. RIZZOLATTI G., SINIGAGLIA C., 2007, *Mirror Neuron in the Brain: How Our Minds Share Actions and Emotions*, Oxford University Press, Oxford.
42. SATYASAI, 2014, <http://sathyasai.org/sainstservise.htm> (9.09.2014).
43. SCHERVISH P. G., 2007, *America's Looming Philanthropic Revolution*, [https://www.bc.edu/content/dam/files/research\\_sites/cwp/pdf/philanthropicrevolution.pdf](https://www.bc.edu/content/dam/files/research_sites/cwp/pdf/philanthropicrevolution.pdf) (13.09.2014).
44. SCHEYVENS R., 1993, Quite Revolution: Church Women's Groups in the Solomon Islands, in: *Development that Work: Development Studies Monographs 3*, ed. Walsh A.C., Massey University, Palmerston North.
45. SMITH P.B., MAX-NEEF M., 2011, *Economics Unmasked: From Power to Greed to Compassion and Common Good*, Green Books, Devon.
46. SUBHAYU BANDYOPADHYAY, VERMANN E. K., 2013, *Donor Motives for Foreign Aid*, Federal Reserve Bank of St. Louis Review. July/August, p. 327-336.
47. SUKSAMRAN S., 1988, A Buddhist Approach to Development: The Case Study of 'Development Monks' in Thailand, in: *Reflections in Development in Southeast Asia*, ed. Ghee I.T., Institute of Southeast Asian Studies, Singapore.
48. TACEY D., 2004, *The Spirituality Revolution: The Emergence of Contemporary Spirituality*, Beuner-Routledge, New York.
49. THE GUARDIAN, 2011, *Voluntary Sector Network*, <http://www.theguardian.com/voluntary-sector-network/2011/may/18/uk-charity-giving-on-the-rise> (20.07.2016).

50. TOLLE E., 2005, *A New Earth: Create a Better Life*, Penguin Books, Victoria, Australia.
51. TRUMAN LIBRARY, 2016, [https://www.trumanlibrary.org/whistlestop/50yr\\_archive/inagural20jan1949.htm](https://www.trumanlibrary.org/whistlestop/50yr_archive/inagural20jan1949.htm) (9.06.2016).
52. USAID, 2016, *USAID History*, <https://www.usaid.gov/who-we-are/usaid-history> (9.06.2016).
53. ULLUWISHEWA R., 2014, *Spirituality and Sustainable Development*, Palgrave Macmillan, Hampshire, London.
54. ULLUWISHEWA R., 2015, *Spirituality Demystified: Understanding Spirituality in Rational Terms*, Sairon Books, Palmerston North.
55. ULLUWISHEWA R., 2016, Spirituality, Sustainability and Happiness: A Quantum-Neuroscientific Perspective, in: *Spirituality and Sustainability: New Horizons and Exemplary Approaches*, eds. Dhiman S., Marques J., Springer International Publishing, Switzerland.
56. VENKATARAMAN G., 2010, The Four M's: Man, Money, Myth, and Morality, in: *Satya Sai Baba Newsletter* August, The Satya Sai Service Organization of New Zealand, p. 12-18.
57. VIDYARTHI V., WILSON P., 2008, *Development from Within: Facilitating Collective Reflection for Sustainable Change*, Apex Foundation, Herndon.
58. WEISS B.L., 2007, *Mirrors of Time: Using Regression for Physical, Emotional and Spiritual Healing*, Hay House Inc., Carlsbad, CA.
59. WHITMORE J., 1997, *Need, Greed or Freedom: Business Changes and Personal Choices*, Dorset: Element, Shaftsbury.
60. WILSON P., 1996, Empowerment: Community Economic Development from Inside Out, in: *Urban Studies* vol. 33 no 4-5, p. 617-630.
61. ZOHAR D., MARSHALL I., 2004, *Spiritual Capital: The Wealth We Can Live By*, Berrett-Koehler, Inc., San Francisco.



## Where Science Fails, *Outdated* Religion Provides Clues

### Gdzie nauka zawodzi, *niemodna* religia daje szansę

Venkatesh G.

*Department of Engineering and Chemical Sciences, Karlstad University, Sweden*

*E-mail: Venkatesh.govindarajan@kau.se*

---

#### Abstract

Solutions to challenges, and answers to questions are often to be found in what we normally overlook, downplay and reject and deny. The *Ask and it will be given to you; seek and you will find; knock and the door will be opened to you* of the Holy Bible refers to seeking there where one normally would not expect to find anything. The caste-system which prevailed in ancient Hindu society (and still does, though not as prominently as before) does have some hidden lessons for the modern Hindu (in India or in the wider Indian diaspora), which could be very valuable for sustainable development.

**Key words:** science, religion, Holy Bible, Hindu caste-system, sustainable development

#### Streszczenie

Rozwiązania problemów i odpowiedzi na pytania można odnaleźć w tym, co się zwykle pomija, odrzuca, lub czemu zaprzecza. Wskazania Pisma Świętego *Proście, a będzie wam; szukajcie, a znajdziecie, kołaczcie, a otworzą wam* odnoszą się do poszukiwań tam, gdzie zwykle nie spodziewamy się niczego znaleźć. Także system kastowy, który przeważał w starożytnym społeczeństwie hinduskim (i nadal odgrywa istotną rolę, choć mniejszą niż niegdyś) zawiera ukryte przesłanie dla współczesnych Hindusów (w Indiach lub szerzej w diasporze indyjskiej), które są niezwykle wartościowe z perspektywy rozwoju zrównoważonego.

**Słowa kluczowe:** nauka, religia, Pismo Święte, Hinduski system kastowy, rozwój zrównoważony

---

#### Introduction

Biofuels powered the very first automobiles that plied on the surface of the Earth. When gasoline and fossil-diesel flooded the global marketplace, they were forgotten. Before the First World War, Frank Shuman demonstrated the efficacy of concentrated solar power in the Sahara Desert. The war broke out and the idea was buried. Coal, oil and gas got well-entrenched. Coal, as readers know, had replaced wood as a source of fuel, when rapid deforestation motivated the switchover to coal. Forward-thinking scientists and mathematicians who never got to be in the limelight when they were alive, suddenly became very prominent posthumously, when their theories and theorems were found to be useful and applicable. Now, poised on the brink of undeniable climate change, we are harking back to biofuels, the Sun and bio-based alternatives to just about everything. And just as has been written in Innventia AB (2016),

Homo Sapiens is going back to where he came from – at least mentally; to the forests and the biosphere that is. He is remembering his Homo Sylvanus days nostalgically, almost with an atavistic urge to understand his roots. And he is of course going further... transcending beyond the terrestrial realm and understanding the indispensability of the Sun to everything on the earth. The Sun has been revered as a God (or a deity) in pagan times – as Apollo, Helios, Ra, Surya etc. Modern man is being compelled to get back there, to the Basics, and learn the history he seems to have conveniently rejected as outdated (literally so), and irrelevant to life in the 21<sup>st</sup> century. *Time* for man is certainly not the same as *Time* for the Universe or for God for that matter! History when studied seriously into the long-bygone past, has religion as a necessary component. Even though many in the present-day world would like to dismiss the role of religion and spirituality in sustaining the well-being of humans: socially, economically and

Figure 1. Life-cycles; understanding with analogies, source: Venkatesh, 2017

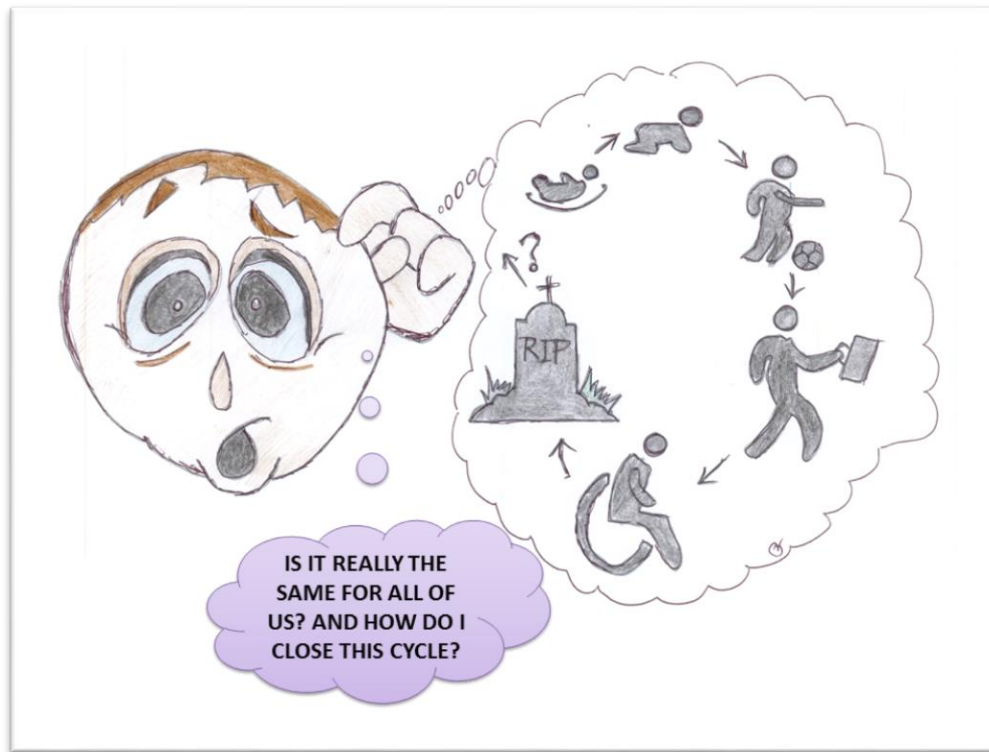
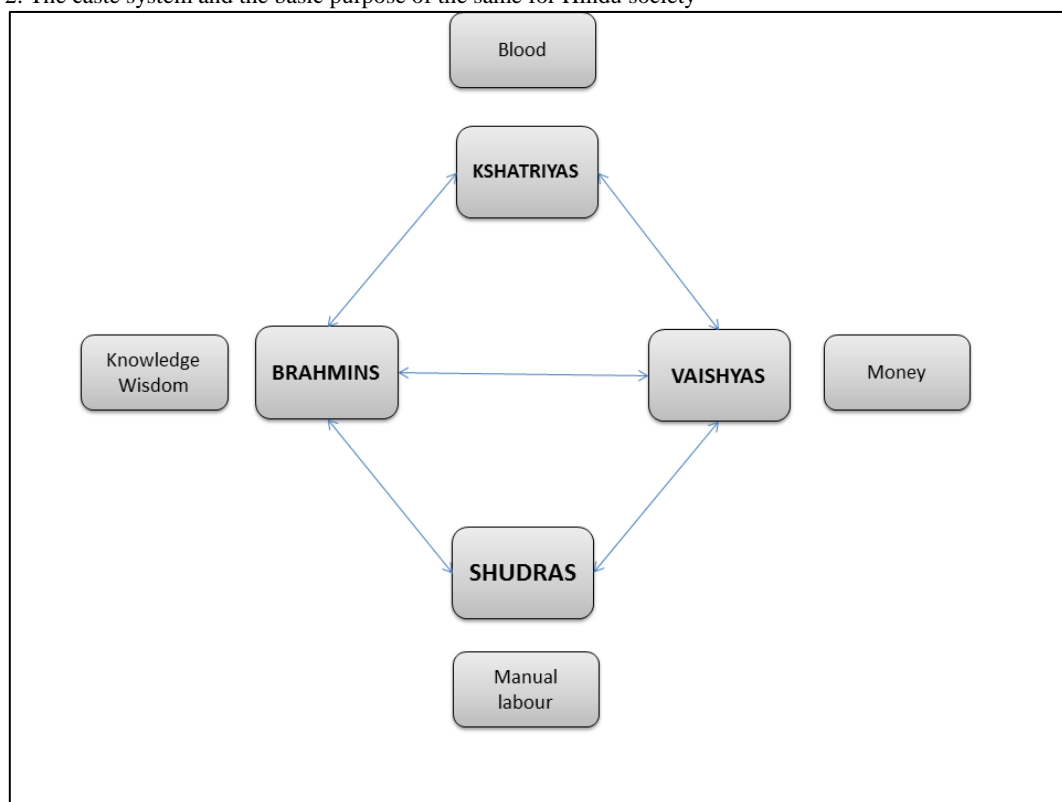


Figure 2. The caste system and the basic purpose of the same for Hindu society



environmentally; and thereby physically, mentally/emotionally/intellectually and spiritually (Venkatesh, 2010) solutions to challenges, and answers to

questions are often to be found in what we normally overlook, downplay and reject and deny. The *'Ask and it will be given to you; seek and you will*

*find; knock and the door will be opened to you'* of the Holy Bible refers to seeking there where one normally would not expect to find anything.

### Life-cycle thinking and deeper insights

We read about *circular economy*, *closing the loop*, *life-cycle thinking* and appreciate the indispensability of these for what we call and understand as sustainable development. *Ashes to ashes, dust to dust*, is what the priest says, when the coffin is lowered down beneath the soil. Closing the loop? Here is an interesting analogy to religious practices, which at once will make one realise that the way we handle and understand our own life-cycles is the same as what we ought to know about the life-cycles of resources we consume – the stock and fund resources which Mother Earth has blessed us with (Refer Figure 1).

Recall that no two human life-cycles can be exactly the same, have never been and will never be. But, the end-of-life handling is dictated by religion and is similar to people professing the same faith. *Cradle-to-grave* thinking – a common term in environmental life-cycle analysis – has its origins here. We also talk of *cradle-to-cradle* and *recycling / reuse* and interestingly even that has a parallel with the way proponents of a religion handle their dead. Now, the Moslems and Christians bury their dead. Think of land-filling. The Hindus and Buddhists cremate their dead. Think of incineration. The Parsis (or Zoroastrians) leave their dead as food for vultures. Think of recycling. Now, interestingly, these are three ways in which we handle products in the anthroposphere at the end of their lifetimes! If burying merges the mortal remains with the soil, cremation followed by the way in which the ashes are disposed, merges mortal man with the pedosphere (and indirectly with the biosphere), atmosphere and hydrosphere. Leaving the dead to be eaten by vultures, recycles a substantial portion back to the biosphere directly, leaving the remaining to eventually become a part of the pedosphere. Now, what about the *immortal remains*? Different religions have different viewpoints but none knows for sure. This is a significant known-unknown which must make man pine for transcendental knowledge to understand the purpose of his existence and his real role among living beings on earth.

### Caste-system of early Hindu society

This has often been looked upon as a blot or a shame on a great religion – and the oldest one at that! Older a religion and its tenets are, the more outdated one would consider them to be. Let us try to debunk this natural attitude which modernists assume for the sake of toeing the 'modern line'. Many Hindus would not wish to label Hinduism as a religion (as one cannot be proselytised to become a *Hindu*, for

that matter), but rather cite *Vedanta* as the philosophy they adopt. Well, be that as it may, the caste system was conceived by man for a purpose, which was degraded over time, misinterpreted and ended up as a scar on the face of a profound religion. Think of *jihad* from the Quran being misinterpreted so badly in recent times. Of course, anything and everything which is anthropogenic – religion included – gets degraded over time just like economic assets depreciate in value and need some *refurbishment* from time to time to uphold the value. If the caste system scarred Hinduism, is that all to it? Can we learn something by going *back to godhead*, as they say? Perhaps yes, if we heed apostle Mathew's advice to *Seek, Ask and Knock*. One would, in the olden days, depict the castes hierarchically – vertically in other words – from *mouth to feet* of God, as it stands in the Manusmriti (1500 BC). However, let us cast aside this hierarchy in the interest of equality of human beings in the eyes of God, and depict them horizontally as interacting and interdependent sections of Hindu society (refer Figure 2).

According to the Manusmriti, *But for the sake of the prosperity of the worlds, He caused the Brahmana, Kshatriya, Vaisya and Shudra to proceed from his mouth, arms, thighs and feet*. The *He* refers to the Infinite God... and of course, you will all agree that what originates from His feet is as precious as what originates from His mouth, thighs and shoulders! So, how can one say that one caste is superior to the others? But sadly, that was what happened over time, and the true purpose and the hidden significance was conveniently forgotten by the interpreters, though there were several spiritualists in India who strove hard to make Hindus understand the real import. If the caste system is followed today, the Brahmins who originated from God's mouth, would be expected to contribute to the world through speech – as priests, preachers, scientists, writers, lecturers and journalists. The Kshatriyas would be expected to protect society from crimes – as soldiers, watchmen, policemen, gatekeepers and security guards, while the Vaishyas would be expected to keep the economy chugging along by being good traders, shopkeepers and businessmen and as they originate from God's thighs, they represent the comfort a child feels seated on his father's lap. The Shudras would be entrusted the responsibility of keeping society clean and commit themselves to jobs requiring hard manual labour – sanitation, solid waste management, etc. Tracing their origins back to God's feet, they represent the very pillars of human society. Now, knowledge, security, health and safety, and a thriving economy are all essential for sustainable development. Would any reader wish to disagree with this? And if the Shudra is looked down upon, as that is what the corruption of the caste system led to eventually, will not that mean that we are razing the pillars of our society to the ground, and handicapping ourselves?

There are four types of generosity (or giving without expecting anything in return) prescribed by the sacred Hindu texts of yore. These are represented in Figure 2: Knowledge/Wisdom, Money, Blood and Manual Labour. At once, readers will realise that these are also the roles prescribed by the Manusmriti to the four castes! Now, in the modern world, a Brahmin may become a businessman, a Kshatriya may decide to work in the solid waste management sector, a Shudra may become a school teacher and a Vaisya may get recruited in the army. Yes, by choosing the callings of their choice, they are earning their livelihoods and supporting their families and also contributing through their work. But if the individual would hark back to the caste system, he/she may be prompted to devote himself/herself in his/her spare time to the role assigned by the age-old caste system. The businessman Brahmin may opt to conduct evening classes for free, to educate some of those left out of the formal education system and contribute to the education aspect of the dimension of social sustainability. The Kshatriya who, in olden days, would have considered spilling his blood and martyring himself to defend his fellowmen, could decide to donate blood to blood banks on a regular basis, thus contributing to the health aspect of the dimension of social sustainability. The Vaishya would donate some money to charitable causes/projects and contribute to socio-economic development, while the Shudra could organise campaigns to keep cities/towns clean and motivate fellow-citizens to close the loop and support recycling and contribute to environmental sustainability. Thus, the fact that Brah-

mins, Kshatriyas, Vaisyas and Shudras form the soul, heart, mind and body of the corpus of Hindu society can be understood from the Manusmriti for those who would care to *see and not just look and read and listen and not just hear*.

### Closing note

It would be apt to close with a message from that great 19<sup>th</sup> century Indian philosopher and spiritualist – Swami Vivekananda, *We have to bear in mind that we are all debtors to the world. The world does not owe us anything. It is a privilege for any of us to be able to do something for the world*. That sums it all up.

### References

1. BUHLER G., 1886, *Manusmriti: The Laws of Manu (1500 BC)*, translated from the original Sanskrit.
2. G VENKATESH, 2010, Triple bottom line approach to individual and global sustainability, in: *Problemy Ekorozwoju/ Problems of Sustainable Development*, vol 5, no 2, p. 29-37.
3. G VENKATESH, 2017, *Environmental LCA – a primer*. Accepted for publication by BookBoon, Copenhagen, Denmark, <http://www.bookboon.com>.
4. INNVENTIA AB, 2016, Innventia Global Outlook: A cellulose-based society, in: *Innventia Report no. 747*, Stockholm, Sweden.
5. THE HOLY BIBLE, *Mathew 7.7*.

## The Shaping of Sustainable Landscape in the Context of the European Landscape Convention and the Encyclical *Laudato Si'*

### Kształtowanie zrównoważonego krajobrazu w kontekście Europejskiej Konwencji Krajobrazowej i encykliki *Laudato Si'*

**Sebastian Bernat, Małgorzata Flaga, Wioletta Kałamucka**

*Maria Curie-Skłodowska University,  
Faculty of Earth Sciences and Spatial Management,  
Al. Kraśnicka 2 CD, 20-718 Lublin, Poland  
E-mails: sebastian.bernat@umcs.pl, malgorzata.flaga@umcs.pl, wkalamuc@umcs.pl*

---

#### Abstract

The article discusses the rational and responsible shaping of landscapes that takes into account the moral aspects of the relationship between human beings and landscape. This subject matter is presented in the light of two ideas striving to achieve similar goals and similar approaches to achieving them.

The first reflection refers to the concept of sustainable development, according to which the management of landscape regarded as part of the environment where people live should seek to ensure the best possible conditions for the existence of contemporary and future generations. Landscape satisfies many material and spiritual needs, thus enhancing the quality of human life. The attainment of a high quality of life by people is the fundamental objective of sustainable development.

The second point of reference is the teaching of the Catholic Church with regard to the relationship between human beings and the natural environment, as presented in the Encyclical *Laudato Si'* by Pope Francis. This text presents the Holy Father's stance on the contemporary ecological crisis and its impact on the living conditions and ethical attitudes of people. The Pope observes that the provision of decent living conditions is necessary for every human being to properly exist and develop. Thus Francis indicates the necessity of looking for solutions to the currently common moral dilemmas, including the problem of reconciling environmental protection, including landscape preservation, with human development needs. The reflections in the encyclical are not only a manifestation the Pope's concern for the Earth but they can also provide guidelines and an effective stimulus for shaping sustainable landscape.

**Key words:** papal encyclical, sustainable development, environmental preservation, landscape, quality of life

#### Streszczenie

Artykuł podejmuje temat właściwego, tj. racjonalnego i odpowiedzialnego kształtowania krajobrazów, uwzględniającego moralne aspekty zależności człowiek-krajobraz. Problematyka ta jest przedstawiona w świetle dwóch idei, dążących do zbliżonych celów i posiadających wspólne płaszczyzny, jeśli chodzi o ich realizację.

Pierwsza refleksja odwołuje się do koncepcji zrównoważonego rozwoju. Wedle niej, zarządzanie krajobrazem jako elementem środowiska życia człowieka, powinno zmierzać do zapewnienia zarówno współczesnym, jak i przyszłym pokoleniom jak najlepszych warunków do egzystencji. Krajobraz zaspokaja wiele materialnych i duchowych potrzeb ludzi, przez co wpływa na jakość ich życia. Z kolei osiągnięcie wysokiej jakości życia ludzi jest zasadniczym zamysłem zrównoważonego rozwoju.

Drugi punkt odniesienia stanowi nauczanie Kościoła katolickiego w zakresie relacji człowiek-środowisko przyrodnicze, którego wyrazem jest encyklika *Laudato Si'* Papieża Franciszka. Dokument prezentuje stanowisko Ojca

Świętego wobec kwestii współczesnego kryzysu ekologicznego i jego wpływu na warunki życia i postawy moralne ludzi. Papież zwraca uwagę, iż dla właściwego bytu i rozwoju każdego człowieka niezbędne jest zapewnienie mu godziwych warunków życia. Wskazuje tym samym na konieczność poszukiwania rozwiązań dla powszechnych obecnie dylematów moralnych, jak pogodzić ochronę środowiska, w tym krajobrazu i potrzeby rozwojowe człowieka. Refleksje zawarte w encyklice są nie tylko przejawem troski Papieża o Ziemię jako o *wspólny dom* wszystkich ludzi, ale mogą stanowić wskazówki i skuteczny impuls do kształtowania zrównoważonego krajobrazu.

**Słowa kluczowe:** encyklika papieska, rozwój zrównoważony, ochrona środowiska, krajobraz, jakość życia

---

## 1. Introduction

The intensive global economic development seen in the last two centuries has led to a considerable disruption of ecological and economic balance. It has caused a dangerous depletion of natural resources and, in the human environment, has given rise to several threats to the life and activity of contemporary and future generations. A broadly understood philosophical and ethical crisis of societies has emerged along with the development of civilisation. In a *world of surfeit* and continuous change, people have started yearning for something constant: some lasting values giving a sense of purpose and direction in the world. Therefore, the revision of human lifestyle, change of awareness and embarking on a new development path leading towards quality rather than quantity, have become a necessity.

There is no doubt that the satisfaction of human material needs should be accompanied by spiritual and ethical growth. The rationale behind such a conclusion can be found, among the multitude of contemporary development concepts, in the idea of sustainable development. As Pawłowski (2008) observes, sustainable development is multidimensional and should be examined on seven levels: ethical, ecological, social, economic, technological, legal and political. The first level, i.e. the ethical reflection, is the basis for the remaining ones. The philosophical character of sustainable development is also underlined by Papużiński (2008) who defines it in terms of quality of life, justice, rationality and progress. Regardless of the approach, ensuring an adequate, the highest possible quality of life for people is regarded as the primary goal of sustainable development (Dobrzańska et al., 2008). A high quality of life is mainly related to the return to the lost values, opportunity to stay in a clean natural environment and friendly social environment, and to positive aspects of the current economic growth, but it is also discussed in the context of enabling the future generations to satisfy various needs. The attainment of a high quality of life by society is recognised as a measure of the effectiveness of sustainable development implementation (e.g. Dobrzańska et al., 2008).

According to the sustainable development concept, the progress of civilisation, which seeks to improve the quality of life of the present and future generations, may not occur at the expense of our environment. The preservation of the resources of this envi-

ronment in such a condition that subsequent generations can use them is a key objective of the concept. From the ecological perspective, there is a call for limiting the pressure on the natural environment and for the fullest possible protection of natural resources, including various natural landscapes. As Antrop (2005) notes, we are currently witnessing not just a gradual but revolutionary transformation and degradation of landscape. These phenomena are related primarily to the streamlining of operations to achieve greater productivity, the pursuit of quick profits, disappearance of the culture of nature that is being replaced by virtual or technological culture, and a tendency to view non-market values in monetary terms (Landscape and sustainable development, 2006). Given the fact that landscape, similarly to the environment, should be treated as strategic resources, people must learn to protect and properly use it.

It should be stressed, however, that the principles of sustainable development are applied to people's surroundings viewed holistically, which means that they regard the natural and cultural environment as equal (Antrop, 2005; Naveh, 2001). Therefore, it is necessary to correlate the objectives of sustainable development with the management of cultural landscape as well (Myga-Piątek, 2012).

At present, one can observe an intensification of efforts to identify and preserve cultural landscape values. There is a growing awareness of their significance for the tangible quality of life, the preservation of the identity of regions and communities inhabiting them as well as the continuation of cultural legacy. All these aspects are reflected in the European Landscape Convention (2000). However, being a public good and basis for the future existence of societies, the preservation of landscape also requires broad civic participation and involvement of local communities among which the principles of sustainable development should be propagated (Myga-Piątek, 2012).

The comprehensive and systemic management of landscape according to the paradigm of sustainable development plays a significant role in the shaping of the relationship between people and landscape (Bielińska et al., 2015). As Pink (2016) claims, the Judeo-Christian tradition is the source of the paradigm mentioned above. It is the basis for the teaching of the Catholic Church, particularly of popes John Paul II and Benedict XVI who strongly emphasise

the necessity of the responsible development of societies (Niechwiej, 2015). The recent encyclical *Laudato Si'* by Pope Francis is an important and clear voice in the global discourse on the relationship between people and the environment (landscape). The encyclical, consistent with the social teaching of the Church, presents the most serious and pressing threats to the natural environment which constitutes the *common home* for all people. Pointing out the fundamental causes of the ecological crisis, the pontiff suggests ways of solving it. While it calls for pro-environmental action that requires taking care of nature, the encyclical is also a call for love and concern for other human beings.

This article presents the reasons for shaping contemporary landscapes based on the concept of sustainable development, as discussed in the encyclical *Laudato Si'* by Pope Francis. Thus the encyclical is analysed with regard to the relationship between people and landscape. The main part of the article is preceded by a theoretical introduction explaining the concept of landscape and presenting its correlation with the quality of life and sustainable development.

## 2. Quality of life and landscape vis-à-vis sustainable development

Given the broad spectrum of issues that *quality of life* encompasses, there is no commonly accepted definition of the term. It is most frequently used to denote the degree to which the material and non-material needs of individuals, families and groups are satisfied. Depending on the research approach, its objective or subjective aspects are stressed (Campbell et al., 1976; Kuz, 1978; Allardt, 1993).

Interest in researching the quality of life arose when large economic surpluses enabling the satisfaction of the basic needs of a considerable part of the population in highly developed countries (Scandinavian countries, United Kingdom, France, United States) were attained in the 1960s, a period of very fast technological progress and economic growth. However, material welfare did not automatically ensure satisfaction with life because the non-material needs were not satisfied. The excessive involvement of people in increasing prosperity has caused a painful loss of not easily measurable values that are no less important for achieving satisfaction in life. When starting the discussion on the new paradigm of development, it was concluded that it should be measured by a category reflecting not only the material aspects but also the subjective feelings of people regarding their physical and social circumstances and the degree to which their non-material needs are satisfied. Quality of life was adopted as such a category. A number of various human needs, making up the quality of life, are satisfied based on the resources of the surrounding environment, including landscape. Landscape, interpreted as broadly as quality of life, functions both in colloquial usage and in numerous

scientific disciplines. In everyday life, landscape is typically understood as the scenery we perceive but in science, it is interpreted in many different ways. The term *landscape* is used, for example, to describe the multi-layered reality surrounding people, a set of actually existing objects, a system of interrelated processes, a set of stimuli perceived by various human senses (including a set of views), a set of values and a system providing actual and potential services for various groups of users (Richling, Solon, 2011). Myga-Piątek (2014) describes landscape as an image of space: *cut out*, identified, named and perceived by humans in mental, sensual and emotional behaviour. According to Krzymowska-Kostrowicka (1993), on the other hand, every landscape forms an environmental and cultural whole and constitutes a synthesis of four kinds of space: permanent (land relief, buildings, ways of land use, etc.), semi-permanent (changing during the year), temporary (episodic) and the space of interpersonal contacts (distances).

Landscape is part of the tangible and intangible cultural heritage and thus a manifestation of the identity of a specific place (*genius loci*), reflecting the natural and cultural history of an area over a certain period of time (Myczkowski, 1998). The aesthetic values of landscape are significant for the formation of a special emotional bond between a person and a place based on a sense of belonging or ownership (Pawłowska, 2001). The landscapes of native places shape people's perception habits, the perspective through which they perceive reality. One can also talk about the familiarity of landscape, a quality specific to spaces perceived as giving a sense of safety and comfort. The specific image of familiarity accompanies people throughout their lives, as they move with this image inscribed in their memory and *domesticate* new places.

Because it is universally experienced, landscape is also a source of symbols and associations referring to what is perceived. Meining (1979) regards landscape as text that can be translated in terms of values and meanings ascribed to it by residents. Characteristic elements of landscape that often have a symbolic significance foster an emotional bond with landscape, a sense of familiarity and rootedness. Landscape is experienced not only as an impersonal objective space but also as places that evoke certain subjective emotions (Bernat, Kałamucka, 2008). The sense of belonging to a specific place helps us define our own identity in the world and influences the quality of our lives.

Myga-Piątek (2012) mentions the following values of landscape: symbolic (symbolism, *sacrum*, *genius loci*), emotional (familiarity, tradition, identity), aesthetic (grandeur, beauty, harmony, natural state, variety), source of information (content, antiquity, historic nature, authenticity, representative nature, uniqueness, otherness) as well as the economic and utilitarian value. According to Dąbrowska-Budziło (2013), the value of landscape is usually associated

with the characteristics of form and substance (tangible value), and content, meaning and significance (intangible value). It should be stressed that the aesthetic values of landscape constitute a very significant component of the quality of life (perceived at all times), and play an important role in the shaping of several significant spiritual qualities of a human individual (Wojciechowski, 1986). The richness of positive experiences coming from landscape enriches the human psyche, then it strengthens the cognitive and creative passion and, finally, enhances the joy of life.<sup>1</sup> whereas ugliness, chaos, littering and degradation of the environment frequently result in poverty of spiritual life, and can even lead to violence, aggression or apathy (Bernat, Kałamucka, 2008).

Among the values of cultural landscape, Kopczyński and Skoczylas (2008) also distinguished the therapeutic value linked with the positive influence of harmonious<sup>2</sup> landscape on human psyche. The contemplation of a beautiful landscape allows one to forget about everyday worries and can provide relaxation and restoration of energy. Thus landscape can be an environment where people can recuperate, where their physical and mental state can be improved and their stress levels can be reduced (Chwalibóg, Wolski, 2015).

Although experiencing landscape is an individual matter, it is a point of reference for social interactions. Satisfaction with life in a harmonious landscape can be a significant factor shaping positive relations among people. Harmonious landscapes also contribute to an increase in civic engagement and a stronger sense of belonging to a particular place (Chwalibóg, Wolski, 2015). A great number of local associations are established in areas characterised by high-quality landscape, often with the aim of preserving it. The appropriate shaping of landscape protects society against losing its roots and fosters the creation of interpersonal ties (Landscape and sustainable development, 2006).

### 3. Sustainable landscape in the light of the European Landscape Convention

The European Landscape Convention (ELC) defines landscape as *an area, as perceived by people, whose*

*character is the result of the action and interaction of natural and/or human factors*. It is regarded as a key element of the welfare of the entire society and individuals, and its preservation and planning imply certain duties for every person. Landscape is experienced universally; hence it impacts the quality of people's life wherever they might live: in towns, cities and rural areas, in environmentally valuable and degraded areas, in special and ordinary places. As the reports supplementing the European Landscape Convention show, the perception of landscape has a multisensory character. The sound and smell as well as the touch and taste contribute to a positive or negative overall assessment of landscape by people, and influence the quality of life (Landscapes and individual and social well-being, 2003; Landscape and sustainable development, 2006).

Pursuant to the Convention, each of its signatories is obliged to take actions aimed at the legal recognition of landscapes as a significant component of the human environment and as the basis of human identity. The provisions of the Convention were a result of the desire to achieve development based on balanced and harmonious relationships between social needs, economic activity and the environment. The management of landscape was aimed at their lasting maintenance and preservation as well as the harmonisation of their changes resulting from social, economic and natural processes. The protection of landscape was given a pre-emptive character as it was concluded that preventing threats is better than responding to them when they materialise.

The Convention recognises that it is necessary to include all inhabitants in pro-landscape actions and to raise the awareness of the society as well as private and public organisations with regard to the value and role of landscapes and changes introduced in landscapes. Article 11 of the Convention provides for a special distinction: the Landscape Award of the Council of Europe for actions concerning the protection, management or planning of landscape that show long-term effectiveness and thus can serve as an example for other local and regional authorities in Europe. The award is also an incentive to its recipients to continue and ensure the durability of pro-landscape actions. Sustainable territorial development is one of the criteria for the award (Klonowska-Matynia, Sasin, 2015).

<sup>1</sup> Studies conducted in rural areas in Poland show that even the landscapes in one's immediate neighbourhood are perceived as pretty and are strongly correlated with life satisfaction declared by respondents (Kałamucka, 2002). Experiencing landscape enhances life satisfaction (the surveyed residents declared a high level of satisfaction with life)

<sup>2</sup> According to Bartels (1969), harmony can be understood as a purely aesthetic aspect of landscape and natural scenery, the level of excellence, equilibrium, perfection of self-regulating mechanisms of geographic systems or, more broadly, as the mutual adjustment of the natural environment with the way of it is used or developed by people.

Wojciechowski (1986) defines the harmony of landscape as the manner of coexistence of specific components of landscape regarded by an observer as the most proper and adequate to the accepted standards and ideals, and having a beneficial influence on the entirety of the observed scenery. The harmony of landscape, constituting an attribute of landscape, consists of the harmony of content, harmony of forms and proportions, harmony of colours and texture. All that is sanctified by a long tradition of coexistence is what makes landscape harmonious. The bond between a specific place and its residents plays an important role in the achievement of harmony in landscape (Bernat, 2013).



The convention has opened up broad prospects for shaping sustainable landscape, i.e. a multidimensional idea combining natural, economic, social, ethical, spatial and institutional aspects. Being an object of everyday use, sustainable landscape<sup>3</sup> should provide society with a high standard of living in a healthy and aesthetic environment while respecting the rights of nature and maintaining interference (including the exploitation of natural resources) within reasonable limits. A similar stance is presented Antrop (2006) who claims that there are two aspects of the sustainability of landscape. The first aspect is securing landscape values and continuation of actions that preserve and organise space. The second aspect is maintaining balance as the basis for shaping landscapes in the future through appropriate planning and management, particularly in agricultural areas. Because the co-occurrence of the natural and cultural components of landscape is one of its fundamental properties, the shaping of sustainable landscape must equally take into account natural and cultural factors, their mutual relations and influence on the life of people (Antrop, 2006; Goudie, 2000; Heines-Young, 2000).

Contributing to the development of high-quality landscapes in order to improve the quality of life of European citizens was recognised as the basic objective of the European Landscape Convention (Landscape and sustainable development, 2006). Thanks to this, it is consistent with global efforts to improve the physical and spiritual well-being of individuals and entire societies by, for example, ensuring fair access to high-quality landscape. The components and characteristics of landscape thanks to which the basic human needs according to Maslow's hierarchy (1954), i.e. biological and social needs, can be satisfied include: healthy conditions, e.g. adequate quality of green areas, existence of recreation areas, possibility of reducing noise and pollution, suitable conditions for enhancing the sensory and emotional apparatus, conditions inspiring creative activity and conducive to emotional experiences, potential to build and strengthen the identity of individuals (Wojciechowski, 2004).

#### 4. *Laudato Si'* about landscape

The encyclical *Laudato Si'* by Pope Francis is the continuation of the teaching of his predecessors on the relationship between human beings and the environment. St. John Paul II repeatedly emphasised that the aesthetic values manifested in the natural beauty of nature give people inner peace and enrich their souls yearning for harmony (Pociask-Karteczka, 2007). According to the teaching of John Paul II, landscape, or certain components of nature, facilitate

inner concentration, inspire thinking and artistic creativity, are a source of emotional experiences, and help people to be closer to God. He also believed that ecological issues were among the key challenges facing humanity. He often condemned the civilisation of greedy consumption, the lack of due respect for nature, the chaotic exploitation of natural resources and gradual deterioration of the quality of life. He urged that the despotic style of managing nature should be abandoned and the consumerist behaviours should be controlled and replaced with ethical principles, simplicity of spirit and improved environmental protection law (Sebesta, 2007). Pope Francis developed his predecessor's ideas about the environment and landscape. However, while John Paul II stressed the value of natural landscape, Pope Francis pays more attention to threats related to human activity and emphasises the value of cultural landscape, particularly urban landscape.

Most of the six chapters of *Laudato Si'* contain some references to landscape. Already in Chapter 1, the pontiff draws out attention to changes in landscape related to the increasing amount of waste littering our environment. He also indicates the *disproportionate and unruly growth of many cities, which have become unhealthy to live in, not only because of pollution caused by toxic emissions but also as a result of urban chaos, poor transportation, and visual pollution and noise*. Further on, Pope Francis mentions the overcrowded and neglected urban neighbourhoods with an insufficient number of green areas. His assessment of this situation is unequivocally negative because it causes the deterioration of people's quality of life. Presenting his disconcerting vision of the world, the pontiff indicates the necessity of counteracting the degradation of the natural environment resulting from excessive urbanisation. The encyclical also mentions the changes in landscape caused by, among other reasons, global climate change related to the intensive exploitation of fossil fuels and high carbon dioxide emissions. The climate change results in the unfavourable transformation of vegetation landscapes: general depletion of areas covered by vegetation and expansion of agricultural areas at the expense of the decreasing woodland cover. Pope Francis indicates the loss of biological diversity and its consequences in landscape, i.e. the gradual deterioration of people's quality of life, which can ultimately threaten the very foundations of human existence.

However, the pontiff not only presents the negative consequences of the development of civilisation but also indicates pro-landscape actions such as the purifying rivers, restoring native tree stands or preserving and restoring the beauty of landscapes by tidying them up and carrying out construction projects of

<sup>3</sup> Although sustainability is a utopia, as Papuziński (2008) observed, it does not contradict the rational character of sustainability in the environment, including landscape.

high aesthetic value. According to the pontiff, these actions do not solve problems on a global scale but they prove that people are still able to make a positive impact on landscape: *For all our limitations, gestures of generosity, solidarity and care cannot but well up within us, since we were made for love.* In the pages that follow, Pope Francis elaborates on the problems indicated at the beginning. In Chapter 2, he observes that *the natural environment is a collective good, the patrimony of all humanity and the responsibility of everyone.* People administer just a piece of the patrimony constituted by the Earth but they are responsible for preserving this piece for the modern and future generations. Otherwise, the equality and the equal right of all people to use the natural resources and assets are compromised. In the context of the quality of life, the encyclical recognises the role of landscape in satisfying the needs at the top of the hierarchy such as admiration of beauty. From this perspective, we can regard as beautiful and admirable not only natural landscape but also those components of landscape that result from human creativity serving the common good. *Technoscience, when well directed, can produce important means of improving the quality of human life, from useful domestic appliances to great transportation systems, bridges, buildings and public spaces. (...) Who can deny the beauty of an aircraft or a skyscraper? (...) So, in the beauty intended by the one who uses new technical instruments and in the contemplation of such beauty, a quantum leap occurs, resulting in a fulfilment which is uniquely human.*

In Chapter 3, Pope Francis observes that human beings, with their anthropocentrism and desire to *rule the world* must slow down their frantic pursuit of modernity that deprives them of the sense of the value and profundity of life. The progress of humanity may not boil down to the constant accumulation of technological novelties supposed to ensure a happy and better future. It must also encompass *values and great goals*, including an effort to limit the harm done to nature as a result of that progress. The pontiff stresses that humanity must properly understand its role of *master of the universe* as one of a *responsible administrator*.

Chapter 4 contains many references to landscape. The pontiff writes in it that, alongside the patrimony of nature, there is also historical, artistic and cultural patrimony that is under threat even though it is part of the identity of a given place and forms the basis for the development of habitable cities. Thus the history, culture and architecture of every area has to be taken into account in its design and development. Pope Francis devotes a considerable part of his reflections to the *human ecology of daily life*. A comprehensive development requires an integral improvement in the quality of human life, the pontiff asserts. The condition of our environment influences the way *we think, feel and act*. On the one hand, we try to adapt to the environment; on the other hand,

*when it is disorderly, chaotic or saturated with noise and ugliness, such overstimulation makes it difficult to find ourselves integrated and happy.*

The Holy Father recognises and strongly emphasises the role of individuals and social groups that, despite their limitations resulting from their social circumstances, are able to take care of the environment where they live. This applies not only to the natural environment but also, to an even greater extent, to the cultural and social environment. Pope Francis stresses the importance of positive human attitudes based on good deeds despite unfavourable circumstances in life, e.g. seemingly uninhabitable conditions. He particularly admires poor people who, their *feeling of asphyxiation brought on by densely populated residential areas* notwithstanding, are able to create a harmonious and beautiful living environment thanks to close human relationships. At the same time, Pope Francis warns that the lack of harmony, open spaces and opportunity for integration can lead to antisocial and criminal behaviours. Thus he draws our attention to the strong correlation between a friendly living environment, including urban space, and the morality of people.

Taking the above relationships into account, the pontiff emphasises the important role of those who design public spaces in the shaping of the relationship between human beings and the environment and, consequently, human relationships. He appeals to the designers of public spaces to consider various needs, not only the aesthetic ones, of each social group in the process of urban planning. They should not only ensure appropriate visual effects but, above all, give inhabitants a sense of rootedness and belonging to a particular place, and allow them to participate in the life of the city. Therefore, the contribution of local residents to urban planning, e.g. in the form of expressing their opinion about the space they live in, is of crucial importance. The pontiff also stresses that every landscape, whether urban or rural, consists of a set of closely interrelated components that together form a coherent whole. That is why, *it is helpful to set aside some places which can be preserved and protected from constant changes brought by human intervention.* Summing up his contemplation of the relationship of human beings with the surrounding environment, the Holy Father refers to the Apostolic Exhortation *Evangelii Gaudium* from 2013 and points out that the beauty and value of architectural design lies in the fact that they help people connect and guarantee decent living conditions to everybody. In Chapter 5, the pontiff calls for transparency and dialogue in questions concerning the management of natural resources and landscape. He believes that an environmental impact assessment should be carried out simultaneously with plans for the use of natural resources, establishment of manufacturing plants, and all kinds of economic activity, etc. What is more, this assessment must not be subject to any political or economic pressure because short-term economic

interest should not obfuscate the future consequences of interference with the environment. According to Pope Francis, *decisions must be made based on a comparison of the risks and benefits foreseen for the various possible alternatives*. Such an approach is particularly important in a situation when a project can lead to considerable negative changes in landscape. Unless some projects are sufficiently analysed, they *can profoundly affect the quality of life of an area* due to such factors as *unforeseen noise pollution, the shrinking of visual horizons, the loss of cultural values*.

In Chapter 5, the pontiff re-emphasises the necessity of taking into account the public opinion about the planned projects and undertakings related to the environment. He indicates the privileged status of the residents of a particular area or region who should have the right to say what they want for themselves and their children. Pope Francis thus stresses that all parties concerned should participate in the decision-making processes and that they have the right to be *fully informed about such projects and their different risks and possibilities* related to the environment.

In Chapter 6, the pontiff writes about the necessity of ecological education and shaping of new environmentally friendly habits. Indicating elements of Christian spirituality that translate into an attitude of responsibility for the natural environment, Francis encourages people to strengthen their passion to show *concern about the world*. However, informing about the threats or legal norms should not be the only task of ecological education. Its key objectives should be, firstly, to propose and motivate people to adopt new environmentally friendly behaviours, and then to shape an environmentally friendly lifestyle. Pope Francis refers to the family as a key place where ecological attitudes are formed because the family has the earliest, strongest and most integral impact on every individual. An important role is played by other areas of education alongside the family, i.e. the school, the media and the Church. Furthermore, the pontiff emphasises the significance of various associations working for the common good constituted by the natural and urban environment. He appreciates any kind of activity, e.g. showing concern for public places (buildings, fountains, neglected monuments, landscapes, squares) in order *to protect, restore, improve or beautify it as something belonging to everyone*. He regards such every day, sometimes trivial actions an important manifestation of civic concern and commitment to the protection of the environment. This kind of lifestyle change makes it possible to develop or restore ties around which a new local social fabric is born and a high quality of life is built.<sup>4</sup>

## 5. Conclusions

The encyclical *Laudato Si'* is an example of the most recent universal document discussing the causes and effects of anti-ecological actions, and stressing the necessity for remedial actions (Gruchelski, Niemczyk, 2015). By making a clear statement, heard around the world, on global environmental threats, Pope Francis highlights the great importance of problems related to the proper management of landscape today. The progress of modern civilisation causes an increasing degradation of landscapes that constitute the living environment for people, thus leading to a deterioration in the quality of human life. Therefore, it is crucial to shape landscape based not only on aesthetic principles or practical goals but also on ethical values.

On the one hand, the encyclical encourages us to conduct an ethical reflection about the relationship between human beings and the environment. On the other hand, it expresses the pontiff's concern about relations between people themselves and indicates the threats to these relations posed by the ecological crisis. The Holy Father writes with a full conviction, and is seconded by other authors, e.g. Mirek (2015), that the condition of the landscape of human hearts and the natural-cultural landscape complement each other and are mutually dependent.

He also recognises a close relationship between the degradation of our living environment and our convictions and ethical attitudes to other people. Therefore, Pope Francis promotes a culture of concern: directly, concern for the natural and cultural environment and, indirectly, concern for preserving values and improving the quality of life of every human being.

According to the encyclical, the development of human conscience is a condition for the effectiveness of actions related to landscape preservation. On the other hand, the protection of landscape awakens and strengthens people's sense of responsibility and solidarity as well as respect for nature and other human beings. People today should be aware of their moral responsibility for landscape because, as Schweitzer remarked, we are responsible for everything that we can do to people and for people (Marek-Bieniasz, 2006). We should also remember that landscape is a public good and its protection and rational management is an important task for public institutions. Although all kinds of decision makers, particularly local governments and investors, have the greatest influence on landscape, the responsibility for landscape rests on the entire society.

In the light of the encyclical, it can be concluded that human life should be the principal value in land-

<sup>4</sup> It should be noted that Sztumski (2015) also indicates the necessity of protecting the social environment in response

to its degradation caused by economic, political and ideological activity.

scape-shaping processes. It should be strictly protected and the deterioration of its quality should be prevented. Therefore, we need to look for solutions to the currently common moral dilemmas, how to reconcile landscape preservation with human development needs. As the Holy Father proposes, it can be achieved by an ethical assessment of human actions in landscape and then by formulating the norms and principles of human behaviour towards the surrounding landscape while developing people's sensitivity to landscape and sense of responsibility of its condition. The teaching of Pope Francis about protecting the living environment of people is thus in harmony with the principles of sustainable development while the encyclical *Laudato Si'* lays solid foundations and opens up the path to the universal propagation of the idea of shaping sustainable landscapes.

## References

1. ALLARDT E., 1993, Having, Loving, Being: An Alternative to the Swedish model of Welfare Research, in: *The Quality of life*, eds. Nussbaum M., Sen A., Clarendon Press, Oxford, p. 88-94.
2. ANTROP M., 2006, Sustainable landscapes: contradiction, fiction or utopia?, in: *Landscape and Urban Planning*, vol. 75, no 3-4, p. 187-197.
3. BARTELS D., 1969, Die Harmonie Begriff in der Geographie, in: *Die Erde*, no 2-4, p. 124-137.
4. BERNAT S., 2013, Topofonofilia. W poszukiwaniu harmonii krajobrazu dźwiękowego, in: *Ethos*, vol. 26, no 4(104), p. 235-251.
5. BERNAT S., KAŁAMUCKA W., 2008, The 'landscape experienced' in empirical research conducted by Lublin scholars, in: *Methods of landscape research*, eds. Plit J., Andreychouk V., *Prace Komisji Krajobrazu Kulturowego PTG*, no 8, p. 21-33.
6. BIELIŃSKA E. J., FUTA B., BARAM S., ŻUKOWSKA G., PAWŁOWSKA M., CEL W., ZHANG T., 2015, Integrating role of sustainable development paradigm in shaping the human landscape relation, in: *Problemy Ekorozwoju/ Problems of sustainable development*, vol. 10, no 2, p. 159-168.
7. CAMPBELL A., CONVERSE P. E., RODGERS L. W., 1976, *The Quality of American Life: Perceptions, Evaluations and Satisfactions*, Russel Sago Foundation, New York.
8. CHWALIBÓG K., WOLSKI P., 2015, To co ważne dla przeciwdziałania destrukcji krajobrazu, in: *Krajobraz kulturowo-przyrodniczy z perspektywy społecznej*, eds. Ratajski S., Ziółkowski M., Polski Komitet ds. UNESCO, Narodowe Centrum Kultury, Warszawa, p. 71-95.
9. DĄBROWSKA-BUDZIŁO K., 2013, *Forma i treść krajobrazowej kompozycji*, Wydawnictwo Politechniki Krakowskiej, Kraków.
10. DOBRZAŃSKA B., DOBRZAŃSKI G., KIEŁCZEWSKI D., 2008, *Ochrona środowiska przyrodniczego*, PWN, Warszawa.
11. EUROPEAN LANDSCAPE CONVENTION, 2000, <http://www.coe.int/en/web/landscape> (1.10.2015).
12. FRANCIS, 2015, *Encyclic Laudato Si'*, Vatican.
13. GOUDIE A., 2000, *The Human Impact on the Natural Environment*, Blackwell Publishers, Oxford.
14. GRUCHELSKI M., NIEMCZYK J., 2015, Zrównoważony rozwój społeczno-gospodarczy: idea a uwarunkowania realizacji (w świetle encykliki Papieża Franciszka Laudato Si' in: *Postępy Techniki Przetwórstwa Spożywczego*, no 2, p. 151-155.
15. KAŁAMUCKA W., 2002, Styl życia społeczności wiejskich. Wyniki badań empirycznych z Lubelszczyzny, in: *Kultura jako przedmiot badań geograficznych*, ed. Orłowska E., Oddział Wrocławski Polskiego Towarzystwa Geograficznego, Uniwersytet Wrocławski, p. 219-233.
16. HAINES-YOUNG R., 2000, Sustainable development and sustainable landscapes: defining a new paradigm for landscape ecology, in: *Fennia*, vol. 178, no 1, p. 7-14.
17. KLONOWSKA-MATYNIA M., SASIN M., 2015, Zrównoważony rozwój krajów Unii Europejskiej. Typologia krajów w kontekście Strategii Europa 2020, in: *Rocznik Ochrona Środowiska/ Annual Set Environment Protection*, vol. 17, p. 771-791.
18. KOPCZYŃSKI K., SKOCZYLAS J., 2008, Krajobraz przyrodniczy i kulturowy. Próba ujęcia interdyscyplinarnego, in: *Badania Interdyscyplinarne UAM w Poznaniu*, no 13, UAM, Poznań.
19. KRZYMOWSKA-KOSTROWICKA A., 1993, Krajobraz jako przedmiot badań w ujęciu aksjologicznym, in: *Ekologia krajobrazu w badaniach terytorialnych systemów rekreacyjnych. Materiały z ogólnopolskiej konferencji naukowej*, ed. Pietrzak M., Wydawnictwo Krajowego Instytutu Badań Samorządowych, Poznań-Błażewko, p. 73-75.
20. KUZ T. J., 1978, Quality of life, an objective and subjective variable analysis, in: *Regional Studies*, vol. 12, no 4, p. 409-418.
21. LANDSCAPE AND INDIVIDUAL AND SOCIAL WELL-BEING, EUROPEAN LANDSCAPE CONVENTION REPORT ON THEME OF THE 2003 WORKSHOP, Council of Europe Publishing, Strasbourg 2003.

22. LANDSCAPE AND SUSTAINABLE DEVELOPMENT: CHALLENGES OF THE EUROPEAN LANDSCAPE CONVENTION, Council of Europe Publishing, Strasbourg 2006.
23. MAREK-BIENIASZ A., 2006, Kategoria odpowiedzialności w myśli Alberta Schweitzera, in: *Problemy Ekorozwoju/ Problems of Sustainable Development*, vol.1, no 2, p. 115-118.
24. MASLOW A. H., 1954, *Motivation and personality*, Harper, New York.
25. MEINING W., 1979, *The Interpretation of Ordinary Landscapes*, Oxford University Press, New York.
26. MIREK Z., 2015, Kulturowe podstawy oraz motywy ochrony przyrody w kontekście współczesnych wyzwań cywilizacyjnych, in: *AURA*, no 5, p. 4-8.
27. MYCZKOWSKI Z., 1998, Zintegrowana ochrona dziedzictwa przyrodniczego, kulturowego i krajobrazowego – wejściem Polski w XXI wiek, in: *Teki Krakowskie*, vol. 8, p. 81-90.
28. MYGA-PIĄTEK U., 2012, *Krajobrazy kulturowe. Aspekty ewolucyjne i typologiczne*, Uniwersytet Śląski, Katowice.
29. MYGA-PIĄTEK U., 2014, O wzajemnych relacjach przestrzeni i krajobrazu kulturowego. Rozważania wstępne, in: *Prace Komisji Krajobrazu Kulturowego PTG*, no 24, p. 27-44.
30. NAVEH Z., 2001, Ten major premises for a holistic conception of multifunctional landscapes, in: *Landscape Urban Planning*, vol. 57, p. 269-284.
31. NEWBY P.T., 1979, Towards and understanding of landscape quality, in: *Landscape Research*, vol. 4, no 2, p. 11-15.
32. NIECHWIEJ A., 2015, Religion versus sustainable development. The problem of human eco-development in the teachings of John Paul II and Benedict XVI, in: *Problemy Ekorozwoju/ Problems of Sustainable Development*, vol.10, no 10, p. 31-40.
33. PAPUZIŃSKI A., 2008, The philosophical dimension to the principle of sustainable development in the Polish scientific literature, in: *Sustainable Development* vol. 16 no 2, p. 109-116.
34. PAWŁOWSKA K., 2001, Idea swojskości krajobrazu kulturowego, in: *Krajobraz kulturowy. Idee, problemy, wyzwania*, ed. Myga-Piątek U., Wydział Nauk o Ziemi Uniwersytetu Śląskiego, Oddział Katowicki PTG, Sosnowiec, p. 95-101.
35. PAWŁOWSKI A., 2008, How Many Dimensions Does Sustainable Development Have?, in: *Sustainable Development* vol. 16 no 2, p. 81-90.
36. PINK M., 2016, The judaeo-christian tradition as a source of a paradigm of sustainable development, in: *Problemy Ekorozwoju/ Problems of Sustainable Development*, vol. 11, no 2, p. 55-66.
37. POCIASK-KARTECZKA J., 2007, Przyroda w nauczaniu Jana Pawła II, in: *Przyroda, geografia, turystyka w nauczaniu Jana Pawła II*, eds. Ostrowski M., Soljan I., *Materiały XV Seminarium Sacrum i przyroda*, Kraków, p. 65-86.
38. RICHLING A., SOLON J., 2011, *Ekologia krajobrazu*, Wydawnictwo Naukowe PWN, Warszawa.
39. SEBESTA A., 2007, Ekoetyka w nauczaniu Jana Pawła II, in: *Ks. Karol Wojtyła - Jan Paweł II miłośnik gór i przyrody*, ed. Wójcik W. A., *Studia i Monografie AWF w Krakowie*, no 40, AWF, Kraków, p. 125-136.
40. WOJCIECHOWSKI K. H., 1986, *Problemy percepcji i oceny estetycznej krajobrazu*, UMCS, Lublin.
41. WOJCIECHOWSKI K. H., 2004, Miejsce postrzeganego krajobrazu w całościowym ujęciu jakości życia, in: *Annales UMCS, Sec. B*, vol. 59, no 13, p. 213-228.



## Sustainable Development in the Russian Federation – Indicator-based Approach

### Zrównoważony rozwój w Federacji Rosyjskiej – podejście wskaźnikowe

**Bartosz Bartniczak\*, Andrzej Raszkowski\*\***

*Wrocław University of Economics  
Faculty of Economics, Management and Tourism in Jelenia Góra  
3 Nowowiejska Street, 58-500 Jelenia Góra  
\*E-mail: bartosz.bartniczak@ue.wroc.pl  
\*\*E-mail: andrzej.raszkowski@ue.wroc.pl*

---

#### Abstract

The presented study discusses problems referring to the concept of sustainable development in the Russian Federation in the period 2004-2013. The first part presents, e.g. the importance of creativity, good space governance, the significance and reasons for sustainable development in Russia. Next, sustainable development indicators, selected for the analysis, are characterized in accordance with the approach to sustainable development level measurement adopted by the European Union. The synthetic measure of development (SMD) was applied as the research method, the data for calculations were collected from The World Bank resources. The research results presenting values of particular indicators in the studied years and the values of SMD constitute the core of the study. Despite relatively unfavourable or moderate results a gradual improvement of the situation was observed in the context of sustainable development concept implementation in Russia over the studied years.

**Key words:** sustainable development, economy, society, environment, linear ordering, Russia

#### Streszczenie

W niniejszym opracowaniu poruszone zostały zagadnienia odnoszące się do koncepcji zrównoważonego rozwoju w Federacji Rosyjskiej w latach 2004-2013. W pierwszej części poruszona została, m.in. problematyka znaczenia kreatywności, dobrego rządzenia przestrzenią, istotności i przesłanek zrównoważonego rozwoju w Rosji. W dalszej części scharakteryzowano wskaźniki zrównoważonego rozwoju wybrane do analizy, zgodne z przyjętym przez Unię Europejską podejściem do mierzenia poziomu zrównoważonego rozwoju. Zastosowaną metodą badawczą był syntetyczny miernik rozwoju (SMR), dane do obliczeń pozyskano ze źródeł Banku Światowego. Rdzeń opracowania stanowią wyniki badań, pokazujące wartości poszczególnych wskaźników w badanych latach oraz wartości samego SMR. Pomimo relatywnie niekorzystnych lub umiarkowanych wyników, zauważono sukcesywną poprawę sytuacji w kontekście implementacji koncepcji zrównoważonego rozwoju w Rosji na przestrzeni badanych lat.

**Słowa kluczowe:** zrównoważony rozwój, gospodarka, społeczeństwo, środowisko, porządkowanie liniowe, Rosja

---

#### 1. Introduction

The implementation of sustainable development concept at the country or regional level should, on the one hand, facilitate taking advantage of the emerging development opportunities and, on the other, support overcoming the occurring problems.

The concept itself is expressed by ensuring harmony between economic growth, in terms of economy, and the improvement of natural environment condition, taking into account the extensive social aspects and supporting good governance (Baker, 2006; Giorgetta, 2002). The aforementioned good governance

is gaining popularity as the subject of research carried out in recent years. It essentially depends, to a great extent, on the effectiveness of managers, with particular emphasis on public managers, who should be characterized by strong leadership and present the skill of e.g. inspiring others to implement the set goals, using both intellectual and organizational potential at their disposal (Gelder, 2005; Gibney, 2012). It is also crucial to have the features of a good manager, which usually represent the compilation of inborn qualities (charisma, intelligence, creativity) and the acquired ones (knowledge, experience), supplemented by the strong orientation towards the implementation of the set goals (Cohen et al., 2008; Green, 2010; Eden and Ackermann, 2013; Diamond, 2012). The focus on the role of human factor is important due to the fact that it is the particular people who are responsible for the implementation of sustainable development concept and thus should understand it well and also have adequate tools to put it into practice.

Beyond any doubt, Russia is the country holding an enormous social and economic potential, it is the largest country in the world with all the natural resources. The changes in the natural environment of Russia have impact on the entire global ecosystem. Russia, along with all its social and economic imperfections, represents a military and political superpower. It is in the interest of the global public opinion to implement the concept of sustainable development in this country.

The implementation of the discussed concept, in accordance with the standards known in the West, comes across numerous difficulties and obstacles. One of them is the Russian mentality and political culture, which did not fully develop the respect for environment in the society. It is rather referred to as the source of simple exploitation than the common good which should be taken care of in the context of future generations. In the Russian political culture the ideas related to sustainable development are frequently approached as a type of formation resulting from the strategies of the broadly understood West, i.e. in simple terms, as a foreign or unfavourable element for Russia. The hierarchy of country developmental priorities is also significant here. For the Russians strengthening the foundations of their Federation, the protection of borders, the construction of a strong army and state power are the most important factors. The concept of sustainable development seems unclear and sometimes even strange. The concerns of Russian society about foreign influence and imposing specific external solutions are deeply felt. While taking care of the population life quality or effective economy is well understood, the protection of environment is not observed in the categories of equal significance. In modern Russia the major assumptions of sustainable development concept are being gradually, although to a limited extent, taken into consideration, which is a moderately optimistic

symptom. Improvement is required in all areas, however, it is the natural environment which experienced the most extensive devastation and many failures (Szady, 2009).

On the other hand, having read the Russian reports on sustainable development problems it seems that all processes are heading in the right direction. The following sustainable development challenges are recognized in Russia as the key ones, both currently and in a long-term perspective: higher competitiveness on global markets by implementing innovative systems; population aging as a burden on the social system; migration processes; climate changes; air pollution; degradation of ecosystems; securing food resources on the global scale; increasing demand for electric power in Russia and worldwide; increasing amount of hazardous waste; the disposal of accumulated waste (Report on implementing..., 2012; Bobylev and Perelet, 2013). In the light of the above mentioned arguments the presented study offers yet another voice in the discussion and an attempt to provide an objective assessment of the situation regarding the sustainable development concept implementation in Russia.

The implementation of sustainable development concept should be supported by human creativity, predominantly in the social area and in the area of good governance. These elements are deficient in Russia, particularly in terms of civil liberties or the freedom of expression. At this point it is worth recalling the concept of 3T (Technology, Talent, Tolerance) as one of the more interesting ideas related to creativity in the context of socio-economic development of territorial units (towns, regions, countries). This concept is based on approaching human creativity as the main source of the aforementioned development. Territorial units which aspire to be creative and thus develop more dynamically, to be competitive and attractive on domestic and international markets should concentrate on modern technologies, innovations, education and community development in the spirit of respect for diversity and tolerance. In accordance with the discussed concept, creativity, unlike the classic factors of production, represents an inexhaustible, constantly improving and renewable resource (Florida, 2002; Florida, 2005; Florida, 2012; Mellander et al., 2012).

The purpose of this study is to present and analyse the position of the Russian Federation in terms of sustainable concept implementation in the period 2004-2013. The selection of indicators and the period under analysis were determined by the availability of reliable public statistics. The presented indicators are also consistent with the approach adopted by the European Union to measure the level of sustainability. Due to the complexity of this concept and diverse research approaches, the selected indicators should be referred to as one of measurement proposals. The synthetic measure of development (SMD) was applied as the research method in



order to assess the implementation of sustainable development standards in Russia and the data for calculations were collected from The World Bank resources. The measure itself is used in linear ordering of objects characterized by many diagnostic variables, later substituted by one diagnostic value.

## 2. Research methodology, sustainable development indicators of the Russian Federation

Indicators represent quantity specific tools which synthesize or simplify the data crucial for the assessment of certain phenomena. These tools are useful in communicating, assessing and making decisions (Geniaux et al., 2009). Indicators are the basic instruments used in sustainable development monitoring since they present such concept of development in a rational and measurable way (Borys, 2005). Sustainable development indicators can be defined as a statistical measure that gives an indication on the sustainability of social, environmental and economic development (Handbook of National Accounting..., 2003).

For the purposes of the conducted analyses these indicators were used which allow for the analysis of progress in the implementation of the discussed development concept in terms of the selected territorial units (country level in this case), in accordance with the approach to sustainable development level measurement adopted by the European Union<sup>1</sup>. The list of the selected indicators is presented in tab. 1.

The presented analysis and the framework of sustainable development concept implementation represent the general assessment of the selected aspects, meeting which has impact on an overall implementation of the concept. In the selection of variables for the study each of the presented sustainable development sphere was taken into account, i.e. social, economic and environmental sphere.

While assessing the level of sustainable development standards implementation it is crucial to define the set of indicators describing major aspects related to each sphere of sustainable development and to define the indicators from the perspective of their importance for sustainable development.

It is equally important to specify quantitative targets to be achieved in order to indicate to what extent the concept of sustainable development is being implemented. Specifying such quantity oriented targets requires identifying the nature of each variable i.e.: a stimulant, a destimulant or a nominant.

In order to assess the implementation of sustainable development standards in Russia the synthetic measure of development (SMD) method was applied (Jajuga et al., 2003). SMD is used in linear ordering of objects characterized by many diagnostic variables, which are later substituted by one diagnostic value.

The procedure of SMD construction is carried out in several stages:

- 1) the selection of diagnostic characteristics (indicators) and identifying the nature of variables in terms of sustainable development concept implementation: a stimulant, a destimulant or a nominant;
- 2) for indicator comparability the normalization of diagnostic characteristics was conducted using zero unitarization method in line with the following formula:

$$z_{ij} = \frac{x_{ij} - \min_i x_{ij}}{\max_i x_{ij} - \min_i x_{ij}},$$

where:  $z_{ij}$  – value of the  $j$ -th diagnostic characteristics (indicator)  $j = 1, 2, \dots, k$  in the  $i$ -th object  $i = 1, 2, \dots, N$  after unitarization,  $x_{ij}$  – realization of the  $j$ -th diagnostic characteristics in the  $i$ -th object,  $\min_i x_{ij}$  ( $\max_i x_{ij}$ ) – the lowest (the highest) value of the  $j$ -th diagnostic characteristics  $x_{ij}$  (Dziechciarz et al., 2001). Normalization was carried out for the matrix covering data from the period 2004-2013. It allowed defining the joint development pattern. As a result of unitarization the values of characteristics were included in the interval  $<0;1>$  with 0 value for the year in which the indicator took the lowest (minimal) value in the years 2004-2013 and 1 – the highest value. Having applied zero unitarization method the variable was measured on an interval scale with zero minimum;

- 3) defining the coordinates of the object-pattern. The top development pattern was adopted as the model, i.e. maximum values were considered the most favourable values of diagnostic characteristics in case of stimulants, whereas for destimulants – minimum values and for nominants – the lowest absolute value of the difference between the value of the characteristics and the optimal one. An object-pattern was made up of the most favourable indicator values obtained jointly in the period 2004-2013,
- 4) determine the distance of objects from the object-pattern using the Euclidean distance and the synthetic measure of development (SMD) for the  $i$ -th object according to the below formula:

$$SMR_i = 1 - \frac{d_{i0}}{d_0}$$

where:  $d_{i0}$  – Euclidean distance between the  $i$ -th object in the  $t$ -th period and 0 object-pattern,  $d_0$  – distance between the pattern and anti-pattern (Lausen et al., 2013).

<sup>1</sup> Sustainable development in the European Union, 2015 - monitoring report of the EU Sustainable Development Strategy, Eurostat Statistical Books, Luxembourg 2015.

Table 1. Sustainable development indicators selected for the analysis, source: authors' compilation based on: The World Bank data; *Indicators of Sustainable Development*, Central Statistical Office; *Indicators of Sustainable Development...*, 2007; *Defining a Sustainable Transport...*, 1996; Taniguchi et al., 2010; Raszkowski, 2014; Raszkowski, 2015; Kaufmann et al., 2010.

| SDI theme                              | Indicator   | The importance of an indicator for sustainable development   |
|--|---|--|
| Socio-economic development             | GDP per capita (current thousand US\$)                        | Gross domestic product (GDP) represents the basic measure of economic growth which, in a synthetic form, presents the most complete picture of national economy and changes in economic structure. It is the value against which the level of other phenomena is compared, e.g. public deficit and public debt. GDP per 1 resident is a very important indicator of economic growth level and its long-term growth remains the primary objective of the state economic policy.   |
|  | Research and development expenditure (% of GDP)               | Socio-economic development depends, to a great extent, on the technological level of economy. Research and development activities represent its driving force. Increased R&D expenditure results in higher innovation and economy competitiveness. The investment in research and development (R&D) is a part of investment activities focused on knowledge accumulation, the creation and implementation of innovative solutions (products, services, organizational or marketing solutions) and subsequently higher capital productivity and also aimed at offering products meeting social/market needs much better. Such activities are focused on ensuring long-term economic growth along with developmental processes strengthening, including enhanced competitiveness of economies. They offer opportunities for changing the development directions through the implementation of innovative and socially desirable solutions, e.g. pro-ecological, less energy consuming or material absorptive, but also through the development of human friendly, health protecting technologies, resulting in the implementation of sustainable development idea. R&D expenditure against GDP show the scale of GDP redistribution into the activities aimed at economy transformation towards knowledge-based economy. |
|  | Unemployment, total (% of total labour force)                 | Low unemployment rate, by principle, represents one of the conditions influencing dynamic economic growth in a long-term perspective. Unemployment has impact on the level of population life quality, increases the risk of poverty and remains one of the reasons of social exclusion. Employment policy aims at promoting full employment and higher employment rate in the groups facing the highest risk of unemployment. The goal of employment policy is to improve employees' and employers' adaptability, effectiveness of job market policies, job placement processes and vocational consultancy. Institutional solutions, within the framework of tax system and social security system aim at ensuring protection against poverty, as well as influencing the incentives for taking up occupational activity.   |
| Sustainable production and consumption | Combustible renewables and waste (% of total energy)          | Using energy from waste and energy from renewable sources contributes to saving non-renewable resources. Reducing the consumption of non-renewable resources represents one of the sustainable development goals. This concept is also successfully implemented in developmental processes of territorial units, e.g. in the area of urban logistics.  |
|  | Electric power consumption (kWh per capita)                   | The indicator is used to assess the effectiveness of sustainable electric power policy pursued with regard to energy conservation and environmental issues. The reduction of electric power consumption in economy means that less electric power is needed to produce the same GDP value and results in higher energy efficiency.   |
|  | Fertilizer consumption (kilograms per hectare of arable land) | Excessive use of fertilizers has negative impact on soil and the organisms living in it. Runoff water from the fields with fertilizer remains causes the contamination of surface waters. Therefore the volume of used fertilizers should be limited. In other words, both economy and agriculture should be characterized by adequate balance between the indispensable quantity of used fertilizers and the respect for natural environment and sustainable development principles.  |
| Social inclusion                       | Poverty gap at national poverty lines (%)                     | This indicator describes the phenomenon of poverty and social exclusion, representing one of the major challenges for sustainable development. Fighting poverty and social exclusion should be based, in simplified terms, on economic growth and employment and also on effective social care. Owing to these activities those at risk of poverty and social exclusion will be able to live in dignity and participate actively in social life.   |
|  | Long-term unemployment (% of total unemployment)              | The long-term unemployed, as a result of lasting exclusion from professional life, lose motivation to take up attempts aimed at their situation improvement and thus remain passive. Long-term absence on the job market results in social exclusion. The chances for returning to work by the long-term unemployed are relatively small, which means their and their families poverty advancement.  |
| Demographic changes                    | Birth rate, crude (per 1,000 people)                          | It shows the number of live births per 1,000 population. It illustrates the quality of health care and the living conditions of a community. It is used to assess the population health situation.   |

|                           |   |  |
|---------------------------|---|--|
| Demographic changes       | Population ages 65 and above (% of total)                             | Changes in population number of retirement age population have impact on e.g. the functioning of the national social security system. Incorrect proportion between the group of working population and elderly population is of significant importance for an effective socio-economic functioning of the state. Changing the proportions consisting in an increased retirement age population number (along with the decreasing working population number) shall result in the reduction of labour resources and a burden for the state budget with expenditure on retirement and disability pensions, it generates additional costs to support the unemployed population, related e.g. to increased medical care costs and other expenditure on health care. |
|                           | Age dependency ratio (% of working-age population)                    | This indicator is one of the measures illustrating the capacity of social security system and the productivity of society, especially in the current conditions of advancing reduction in the number of working-age population. High percentage of non-productive age population leads to imbalance in the number of working and producing population and those living at the expense of the working population (children, students, pensioners).  |
| Public health             | Life expectancy at birth, total                                       | It is one of the key indicators to assess population health, it shows the quality of life of the entire population, the quality of health care and living conditions of the community. It is used to assess health situation of the population.  |
|                           | Mortality rate, infant (per 1,000 live births)                        | This indicator allows the synthetic assessment of the population health condition and (indirectly) health care situation. It can also be referred to as a kind of civilisation development measure of societies, in the least developed countries it presents high values.   |
|                           | Health expenditure, total (% of GDP)                                  | One more indicator showing, to an extent, the situation of health care. Basically, it is expected that the values of this indicator will be increasing. Another issue is the efficiency of expenditure on health care.   |
| Climate change and Energy | CO <sub>2</sub> emissions (kt)  | The reduction of carbon dioxide and other greenhouse gasses emissions to the atmosphere is crucial for preventing excessive climate warming. Counteracting climate changes remains one of the objectives of sustainable development.   |
|                           | Renewable energy consumption (% of total final energy consumption)    | This indicator characterizes the level of obtaining energy from renewable sources. The increasing demand for energy resulting from civilization progress, along with the depleting traditional resources – mainly fossil fuels (coal, crude oil, natural gas) and the advancing natural environment pollution, resulting from their consumption, causes an increased interest in energy from renewable sources.  |
|                           | Total greenhouse gas emissions (% change from 1990)                   | This indicator informs about the relationship between domestic energy consumption and greenhouse gas emissions (i.e. environmental impacts of energy industry). The consumption of fossil fuels is the primary source of carbon dioxide (CO <sub>2</sub> ) emissions. Due to the demand for energy this source is the driving force of greenhouse gas emissions. The transition to low-carbon fuels is an important means towards achieving the objectives of sustainable development.   |
| Sustainable transport     | CO <sub>2</sub> emissions from transport (% of total fuel combustion) | Transport sector is largely responsible for CO <sub>2</sub> emissions. In order to achieve the projected CO <sub>2</sub> reduction it is imperative to decrease the emissions from transport sector. The reduction of carbon dioxide and other greenhouse gasses emissions to the atmosphere is extremely important to prevent an excessive climate warming. Counteracting climatic changes remains one of the sustainable development goals.  |
|                           | Railways, passengers carried (million passenger-km)                   | The concept of sustainable transport refers, among others, to the increased importance of public transport, including higher share of railroad carriage in transporting passengers. Moreover, one of the main solutions in the context of fighting pollution caused by vehicles is the promotion of the increased usage of public transport.   |
|                           | Railways, goods transported (million ton-km)                          | The concept of sustainable transport predominantly refers to the reduction of goods transportation by vehicles and taking advantage of railroads, waterways and sea transportation.  |
| Natural resources         | Forest area (% of land area)  | Forests represent an integral part of natural environment, they have positive influence on climate, water balance, maintain the biological potential of species and prevent soil erosion processes. They also play important production and social functions. There are extensive needs and possibilities to increase the volume of domestic forest cover through the afforestation of productively inefficient or undeveloped arable land.  |
| Good governance           | Voice and Accountability  | This indicator reflects the extent to which a given country population is capable of participating in the election of their authorities. Additionally, freedom of speech and expression level, the functioning of free media or the freedom of association are taken into account. The particular elements of good governance are extremely important in an overall perception of sustainable development concept implementation.  |
|                           | Rule of Law   | Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.  |
|                           | Control of Corruption   | Control of corruption capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as <i>capture</i> of the state by elites and private interests.   |

The values of the synthetic measure of development were normalized in the interval  $<0;1>$  and the pattern value equals 1. The higher the discussed phenomenon level the higher the value of the measure of development. The values of synthetic measures of development (SMD), specified based on the Euclidean distance, allowed identifying the positions regarding the implementation of sustainable development in the particular years. Lower than 1 SMD values, in terms of sustainable development, refer to the following situations in particular years:

- $<0,0 - 0,2>$  very unfavourable,
- $<0,2 - 0,4>$  unfavourable,
- $<0,4 - 0,6>$  moderate,
- $<0,6 - 0,8>$  favourable,
- $<0,8 - 1,0>$  very favourable.

### 3. Sustainable development in Russia in the period 2004-2013

The values of synthetic measure of development (SMD) in the years 2004-2013 were determined based on the set of indicators listed in tab. 2. The table also presents the nature (interpretation) of indicators and the coordinates (values) of an object-pattern in the years 2004-2013.

The values of individual indicators in the years 2004-2013 and the average annual change rate are presented in tab. 3. The dynamics measures represent an important type of indicators applied in assessing progress in achieving the specific goals. They allow measurement and evaluation of changes occurring over time. Therefore the average annual change rate was calculated for each of the indicators.

The analysis of individual indicator values and the dynamic analysis allow drawing the following conclusions regarding the situation of Russia characterised using the indicators of sustainable development in the period 2004-2013:

- the value of GDP per 1 resident presented an ongoing increase in each consecutive year (except for 2009), the average annual change rate was 15%,
- the indicator of expenditure on research and development was characterized by slight changes,
- the share of unemployed population in labour force resources presented the most unfavourable changes in 2009 against 2008, when the indicator value went up by 2,1 percentage point,
- the decline in the share of energy from renewable sources and waste in the total annual average energy by 1,15 was an unfavourable phenomenon,
- the electric power consumption was growing year by year, the annual average increase was 1,7%,

- the consumption of fertilizers in kg per hectare of arable land went up by 3,2%,
- the share of population living below poverty level declined by almost 8%,
- the share of long-term unemployment rate in total unemployment ranged from 28,7% in 2009 up to 42,3% in 2006,
- the annual average increase by 2,7% of birth rate was a positive factor,
- the share of population aged 65 and over presented the same level,
- slight differences can be observed in the value of age dependency ratio,
- life expectancy at birth was systematically increasing in the years 2004-2011 and remained at this level in subsequent years,
- the annual average decrease in infant mortality rate by 5,9% was a positive phenomenon,
- the share of expenditure on health care was from 5,2% up to 7,4%,
- the annual average increase in CO<sub>2</sub> emission by 1,9% was a negative occurrence,
- the indicator of energy consumption from renewable sources was characterized by slight changes,
- the indicator of greenhouse gas emissions presented an overall improvement,
- CO<sub>2</sub> emissions from transport sector did not show any significant changes,
- the annual average decrease of railway passengers by 1,4% was a negative phenomenon,
- the annual average increase by 2,4% of goods transported by railways was a positive change,
- the share of forest area against the total country area did not change significantly,
- the annual average increase of Voice and Accountability indicator by 6,2% was a positive fact,
- the annual average decrease of the Rule of law indicator value by 1,9% was a negative phenomenon,
- the annual average increase in the value of Control of Corruption indicator proved a positive change.

SMD values in the years 2004-2013 are presented on fig. 1.

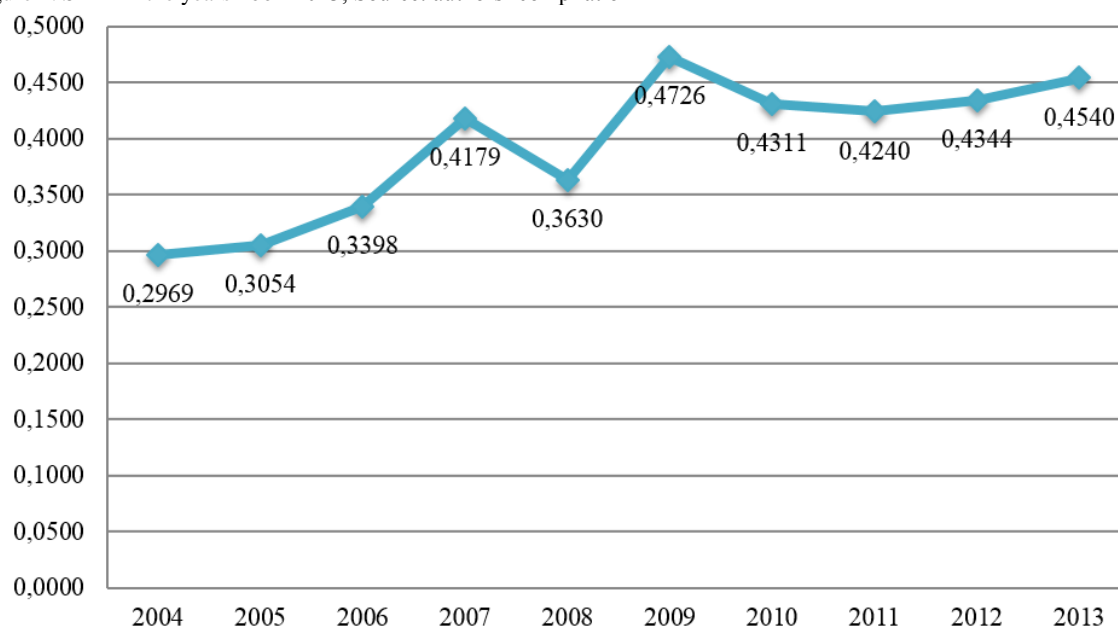
The situation in Russia in terms of sustainable development implementation in particular years can be defined as unfavourable or moderate. An unfavourable situation occurred in four analysed years, whereas in six of them it can be referred to as moderate. In the first three analysed years it was unfavourable, next moderate in 2007, in 2008 unfavourable and again moderate in the period 2009-2013.

The assessment of the situation in Russia, regarding the implementation of sustainable development standards, can be considered as positive having taken

Table 2. The set of indicators included in the analysis covering the situation in Russia from the perspective of sustainable development concept implementation, source: authors' compilation based on The World Bank data

| SDI theme                              | Indicator   | Indicator nature | Reference value |
|--|---|------------------|-----------------|
| Socioeconomic development              | GDP per capita (current thousand US\$)                                | stimulant        | 14487,3         |
|  | Research and development expenditure (% of GDP)                       | stimulant        | 1,25            |
|  | Unemployment, total (% of total labour force)                         | destimulant      | 5,5             |
| Sustainable production and consumption | Combustible renewables and waste (% of total energy)                  | stimulant        | 1,12            |
|  | Electric power consumption (kWh per capita)                           | destimulant      | 5633,9          |
|  | Fertilizer consumption (kilograms per hectare of arable land)         | destimulant      | 11,4            |
| Social inclusion                       | Poverty gap at national poverty lines (%)                             | destimulant      | 0,9             |
|  | Long-term unemployment (% of total unemployment)                      | destimulant      | 28,7            |
| Demographic changes                    | Birth rate, crude (per 1,000 people)                                  | stimulant        | 13,3            |
|  | Population ages 65 and above (% of total)                             | destimulant      | 13,1            |
|  | Age dependency ratio (% of working-age population)                    | destimulant      | 38,8            |
| Public health                          | Life expectancy at birth, total                                       | stimulant        | 70,4            |
|  | Mortality rate, infant (per 1,000 live births)                        | destimulant      | 8,9             |
|  | Health expenditure, total (% of GDP)                                  | stimulant        | 7,4             |
| Climate change and Energy              | CO <sub>2</sub> emissions (kt)  | destimulant      | 1574367,78      |
|  | Renewable energy consumption (% of total final energy consumption)    | stimulant        | 3,7             |
|  | Total greenhouse gas emissions (% change from 1990)                   | destimulant      | -32,8           |
| Sustainable transport                  | CO <sub>2</sub> emissions from transport (% of total fuel combustion) | destimulant      | 14,9            |
|  | Railways, passengers carried (million passenger-km)                   | stimulant        | 175800          |
|  | Railways, goods transported (million ton-km)                          | stimulant        | 2400000         |
| Natural resources                      | Forest area (% of land area)  | stimulant        | 49,8            |
| Good governance                        | Voice and Accountability  | stimulant        | -0,59           |
|  | Rule of Law   | stimulant        | -0,74           |
|  | Control of Corruption   | stimulant        | -0,74           |

Figure 1. SMD in the years 2004-2013, Source: authors' compilation



into account the occurring trend. The conducted analysis showed that the situation changed from an unfavourable in the initial analysed years (2004-2007) into a moderate one (2007-2013 except for 2008). Therefore it can be concluded that Russia is in the process of ongoing progress regarding the implementation of the discussed development concept.

#### 4. Conclusions

The final remarks and conclusions should refer to the impact of the global crisis (2008) on the discussed concept implementation, however, this situation did reflect the global tendencies occurring at that time. As it has already been mentioned, the general trend

Table 3. The values of indicators in the years 2004-2013 and the average annual change rate, source: authors' compilation based on The World Bank data

| SDI theme                              | Indicator   | 2004      | 2005      | 2006      | 2007      | 2008    | 2009      | 2010      | 2011    | 2012      | 2013      | Average annual change rate |
|--|---|-----------|-----------|-----------|-----------|---------|-----------|-----------|---------|-----------|-----------|----------------------------|
| Socio-economic development             | GDP per capita (current thousand US\$)                                | 4102,4    | 5323,5    | 6920,2    | 9101,3    | 11635,3 | 8562,8    | 10675     | 13323,9 | 14078,8   | 14487,3   | 115                        |
|  | Research and development expenditure (% of GDP)                       | 1,15      | 1,07      | 1,07      | 1,12      | 1,04    | 1,25      | 1,13      | 1,09    | 1,13      | 1,13      | 99,8                       |
| Sustainable production and consumption | Unemployment, total (% of total labour force)                         | 7,8       | 7,1       | 7,1       | 6         | 6,2     | 8,3       | 7,3       | 6,5     | 5,5       | 5,5       | 96,2                       |
|  | Combustible renewables and waste (% of total energy)                  | 1,09      | 1,06      | 1,12      | 0,99      | 0,91    | 0,98      | 1,01      | 0,98    | 1         | 0,99      | 98,9                       |
|  | Electric power consumption (kWh per capita)                           | 5633,9    | 5770,1    | 6098,5    | 6286,1    | 6399,7  | 6095,4    | 6409,9    | 6485,8  | 6617,1    | 6539,2    | 101,7                      |
|  | Fertilizer consumption (kilograms per hectare of arable land)         | 11,4      | 11,8      | 12,5      | 14,3      | 15,9    | 15,6      | 16,1      | 16,4    | 15,7      | 15,2      | 103,2                      |
| Social inclusion                       | Poverty gap at national poverty lines (%)                             | 2,1       | 2,1       | 1,6       | 1,3       | 1,3     | 1,2       | 1,2       | 1,2     | 0,9       | 1         | 92,1                       |
|  | Long-term unemployment (% of total unemployment)                      | 39,2      | 39        | 42,3      | 40,6      | 35,2    | 28,7      | 30        | 32,9    | 30,9      | 31        | 97,4                       |
| Demographic changes                    | Birth rate, crude (per 1,000 people)                                  | 10,4      | 10,2      | 10,4      | 11,3      | 12      | 12,3      | 12,5      | 12,6    | 13,3      | 13,2      | 102,7                      |
|  | Population aged 65 and above (% of total)                             | 13,8      | 13,8      | 13,8      | 13,6      | 13,4    | 13,2      | 13,1      | 13,1    | 13,1      | 13,2      | 99,5                       |
|  | Age dependency ratio (% of working-age population)                    | 41,7      | 40,8      | 40,3      | 39,7      | 39,1    | 38,8      | 38,8      | 39,2    | 40        | 41        | 99,8                       |
|  | Life expectancy at birth, total                                       | 65,4      | 65,5      | 66,6      | 67,5      | 67,8    | 68,6      | 68,9      | 69,7    | 70,4      | 70,4      | 100,8                      |
| Public health                          | Mortality rate, infant (per 1,000 live births)                        | 15,4      | 14,4      | 13,3      | 12,4      | 11,6    | 10,9      | 10,3      | 9,8     | 9,3       | 8,9       | 94,1                       |
|  | Health expenditure, total (% of GDP)                                  | 5,2       | 5,2       | 5,3       | 5,4       | 6,2     | 7,4       | 6,8       | 6,6     | 6,9       | 7,1       | 103,5                      |
|  | CO <sub>2</sub> emissions (kt)  | 1602955,7 | 1615687,5 | 1669618,1 | 1667597,6 | 1715639 | 1574367,8 | 1742540,1 | 1808073 | 1900844,3 | 1896122,6 | 101,9                      |
| Climate change and Energy              | Renewable energy consumption (% of total final energy consumption)    | 3,6       | 3,6       | 3,5       | 3,7       | 3,3     | 3,6       | 3,3       | 3,2     | 3,2       | 3,3       | 99,0                       |
|  | Total greenhouse gas emissions (% change from 1990)                   | -32,8     | -29,7     | -23,5     | -27,5     | -16,6   | -28,7     | -27,6     | -22,7   | -22       | -26,4     | 97,6                       |
| Sustainable transport                  | CO <sub>2</sub> emissions from transport (% of total fuel combustion) | 14,9      | 14,9      | 14,9      | 15        | 15,8    | 15,8      | 16        | 15,6    | 15,3      | 15,4      | 100,4                      |
|  | Railways, passengers carried (million passenger-km)                   | 164272    | 164262    | 173699    | 173411    | 175800  | 153500    | 139028    | 139842  | 144612    | 144612    | 98,6                       |
|  | Railways, goods transported (million ton-km)                          | 1801600   | 1801601   | 1950000   | 2090337   | 2400000 | 1865305   | 2011308   | 2127212 | 2222388   | 2222388   | 102,4                      |
| Natural resources                      | Forest area (% of land area)  | 49,4      | 49,4      | 49,5      | 49,5      | 49,6    | 49,7      | 49,8      | 49,8    | 49,8      | 49,8      | 100,1                      |
| Good governance                        | Voice and Accountability  | -0,59     | -0,68     | -0,9      | -0,9      | -0,85   | -0,9      | -0,88     | -0,87   | -0,98     | -1,01     | 106,2                      |
|  | Rule of Law   | -0,86     | -0,91     | -0,93     | -0,95     | -0,93   | -0,77     | -0,77     | -0,74   | -0,82     | -0,78     | 98,9                       |
|  | Control of Corruption   | -0,74     | -0,78     | -0,85     | -0,95     | -1,05   | -1,09     | -1,06     | -1,04   | -1,02     | -1        | 103,4                      |

remained positive, but having analysed the individual indicators in detail it is visible that in many cases the results were far from satisfying. All indicators referring to good governance adopted unfavourable values and in this respect urgent remedial actions are necessary. The area of forests against the total country area did not improve within the discussed decade, however, the absence of further degradation is a positive factor in this regard. The indicator of infant mortality rate was still quite high, if compared against the Western European countries. R&D expenditure (% of GDP) was definitely lower (1,13% in 2013) against e.g. China (2,01%). The indicator of renewable energy consumption (% of total final energy consumption) was low (3,3% in 2013) comparing to the European Union average (above 14%). Practically, in each of the studied respects the particular indicators can or should be improved.

It is crucial that the idea of sustainable development is extensively and effectively popularized in the Russian Federation. Beyond any doubt, this largest country in the world constitutes a very important component of the global ecosystem. It is in the interest of the Russian society, the international community, as well as the future generations to cooperate at an international scale for the benefit of solving environmental, social or economic problems faced by Russia and to promote the idea of sustainable development.

## References

1. BAKER S., 2006, *Sustainable Development*, Routledge introductions to environment series, Routledge, New York 2006, p. 17-48.
2. BOBYLEV S., PERELET R. (eds.), 2013, *Sustainable Development in Russia*, Russian-German Environmental Information Bureau, Berlin-Sankt Petersburg.
3. BORYS T., 2005, *Indicators for sustainable development – polish experiences*, Ekonomia i Środowisko, Warszawa-Białystok.
4. COHEN S., EIMICKE W., HEIKKILA T., 2008, *The effective public manager. Achieving success in a changing government*, John Wiley and Sons, San Francisco 2008, p. 33-34.
5. *Defining a Sustainable Transport Sector*, UK Roundtable on Sustainable Development 1996.
6. DIAMOND J., 2012, Leadership and the voluntary and community sector, in: *Leadership and Change in Sustainable Regional Development*, eds. Sotarauta M., Horlings L., Liddle J., Regional Studies Association, Regions and Cities, Routledge, New York, p. 80-102.
7. DZIECHCIARZ J., STRAHL D., WALESIAK M., 2001, Data Set Normalisation for Banks Performance Assessment, in: *Econometrics 8, Research Papers of Wrocław University of Economics*, no 915.
8. EDEN C., ACKERMANN F., 2013, *Making Strategy. The journey of Strategic Management*, SAGE Publications, London, p. 13-19.
9. FLORIDA R., 2002, *The Rise of the Creative Class: and How It's Transforming Work, Leisure, Community and Everyday Life*, Basic Books, New York.
10. FLORIDA R., 2005, *Cities and the creative class*, Routledge, New York, p. 27-46.
11. FLORIDA R., 2012, *The Rise of the Creative Class. Revisited*, Basic Books, New York, p. 228-265.
12. GELDER S., 2005, The new imperatives for global branding. Strategy, creativity and leadership, in: *Brand Management*, vol. 12, no 5, p. 396-398.
13. GENIAUX G., BELLON S., DEVERRE C., POWELL B., 2009, *Sustainable Development Indicator Frameworks and Initiatives*, System for Environmental and Agricultural Modelling, Linking European Science and Society, Report no. 49, SEAMLESS integrated project, EU 6<sup>th</sup> Framework Programme.
14. GIBNEY J., 2012, Leadership of place and the dynamics of knowledge, in: *Leadership and Change in Sustainable Regional Development*, eds. Sotarauta M., Horlings L., Liddle J., Regional Studies Association, Regions and Cities, Routledge, New York, p. 20-36.
15. GIORGETTA S., 2002, The Right to a Healthy Environment, Human Rights and Sustainable Development, in: *International Environmental Agreements: Politics, Law and Economics*, no 2, p. 173-194.
16. GREEN A., 2010, *Creativity in Public Relations*, Fourth Edition, Kogan Page Publishers, London, p. 4-6.
17. *Indicators of Sustainable Development: Guidelines and Methodologies*, 2007, Economic & Social Affairs, United Nations Publications, New York.
18. JAJUGA K., WALESIAK M., BĄK A., 2003, On the General Distance Measure, in: *Exploratory Data Analysis in Empirical Research*, eds. Schwaiger M., Opitz O., Springer-Verlag, Berlin, Heidelberg.
19. KAUFMANN D., KRAAY A., MASTRUZZI M., 2010, *The Worldwide Governance Indicators: Methodology and Analytical Issues*, Draft Policy Research Working Paper, World Bank, Washington.
20. LAUSEN B., VAN DEN POEL D., ULTSCH A. (eds.), 2013, *Algorithms from and for Nature and Life*, Springer, New York.
21. MELLANDER C., FLORIDA R., RENTFROW J., 2012, The creative class, post-industrialism and the happiness of nations, in: *Cambridge Journal of Regions Economy And Society*, no 5(1), p. 31-43.

22. RASZKOWSKI A., 2015, The strategy of local development as the component of creative human capital development process, in: *Local and Regional Economy in Theory and Practice*, eds. Sobczak E., Bal-Domańska B., Raszkowski A., *Research Papers of Wrocław University of Economics* 394, Publishing House of Wrocław University of Economics, Wrocław, p. 135-143.
23. RASZKOWSKI A., 2014, Place marketing in the process of territorial identity creation and strengthening, in: *Journal of European Economy*, vol. 13, no 2, Published by Ternopil National Economic University, p. 197-198.
24. *Report on implementing the principles of sustainable development in the Russian Federation. Russian outlook on the new paradigm for Sustainable development. Preparing for 'Rio + 20'*, Moscow 2012.
25. *Sustainable development in the European Union, 2015 monitoring report of the EU Sustainable Development Strategy*, 2015, Eurostat Statistical Books, Luxembourg.
26. SZADY M., 2009, Teoretyczne i praktyczne aspekty implementacji idei zrównoważonego rozwoju w Rosji, in: *Wschodnioznawstwo*, no 3, Instytut Studiów Międzynarodowych Uniwersytetu Wrocławskiego, p. 113-134.
27. TANIGUCHI E., THOMPSON R., YAMADA T., 2010, Recent advances in modelling city logistics in: *City Logistics II*, eds. Taniguchi E., Thompson R., Institute of Systems Science Research, Kyoto.
28. THE WORLD BANK, <http://data.worldbank.org/country/russian-federation> (20.12.2016).
29. *Handbook of National Accounting: Integrated Environmental and Economic Accounting* 2003, United Nations, European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, World Bank, *Studies in Methods*, Series F, no 61, rev.1, New York.
30. *Wskaźniki zrównoważonego rozwoju*, Główny Urząd Statystyczny, <http://wskaznikizrp.stat.gov.pl>, (20.12.2016).



## Twenty-five Years of Independent Ukraine: Is there a Way to Sustainable Healthy Development?

### Dwadzieścia pięć lat niepodległej Ukrainy: czy jest na drodze zrównoważonego rozwoju?

**Viktoriya Pantyley\*, Roman Lozynskyy\*\*, Roman Slyvka\*\*\***

*\*Department of Socio-Economic Geography, Faculty of Earth Sciences and Spatial Management, Maria Curie-Skłodowska University in Lublin, Kraśnicka 2 cd, 20-718, Lublin, Poland*

*E-mail: wiktoria.pantylej@poczta.umcs.lublin.pl*

*\*\*Department of Geography of Ukraine, Faculty of Geography, Ivan Franko National University of Lviv, Doroshenko Str., 40, 79-000, Lviv, Ukraine*

*E-mail: lrm3@ukr.net*

*\*\*\*Department of Geography and Natural Sciences, Faculty of Natural Sciences, Vasyl Stefanyk Precarpatian National University, Galycka Str., 201, 76-008, Ivano-Frankivsk, Ukraine*

*E-mail: romanslyvka@i.ua*

---

#### Abstract

The article is dedicated to the analysis of problems and perspectives of sustainable and inclusive development of Ukraine, at the present state of its functioning. The main pillars of sustainable development, such as political, socio-economic, ecological, health and demographic were analyzed in space-time dimension. Ukraine declares compliance with the sustainable development principles and aims to change towards the implementation of this social ideology, however, in reality the implementation of sustainable development concepts is occurring very slowly and unsystematically. Therefore, Ukraine on its way to sustainable development and inclusive development is facing a complex range of typical and untypical social problems. A certain uniqueness of the situation and the geopolitical importance of Ukraine constantly puts in the spotlight the question of its support on the way to sustainable development on behalf of democratic countries. However, this support should be encouraged by the Ukrainian population consolidation towards the democratic choice and the decisive actions of the Ukrainian government towards the reforms recently implemented in the countries of Central and Eastern Europe to overcome the legacy of the authoritarian regimes.

**Key words:** sustainable development, inclusive development, Ukraine

#### Streszczenie

Artykuł poświęcony jest analizie problemów oraz perspektyw rozwoju zrównoważonego i inkluzywnego na Ukrainie, na obecnym etapie funkcjonowania państwa. Przeanalizowano główne filary rozwoju zrównoważonego na Ukrainie w ujęciu przestrzenno-czasowym, takie jak polityczny, społeczno-ekonomiczny, ekologiczny oraz zdrowotno-demograficzny. Ukraina deklaruje dotrzymanie zasad stałego rozwoju i zamiar wdrożenia ich założeń do różnych sfer życia społecznego, jednak realizacja koncepcji rozwoju zrównoważonego przebiega w sposób bardzo powolny i nieusystematyzowany. Na drodze do stałego rozwoju Ukraina napotkała na szereg typowych i nietypowych problemów społecznych. Pewna unikatowość sytuacji oraz geopolityczne znaczenie Ukrainy powodują zainteresowanie wsparcia Ukrainy na jej drodze do stałego rozwoju ze strony państw demokratycznych. Jednak wsparcie to powinno opierać się na konsolidacji wewnętrznej ludności Ukrainy w jej wyborze na rzecz demokracji oraz zdecydowanym działaniu władz ukraińskich w kierunku reform, które przeprowadziły nie tak dawno inne kraje Europy środkowo-wschodniej na rzecz wygaszenia wpływów panowania reżimów autokratycznych.

**Słowa kluczowe:** rozwój zrównoważony, rozwój inkluzywny, Ukraina

## Introduction

Despite the number of initiatives undertaken at improvement of the well-being of a society, the European community continues to face polarization of the society by increasing political, socioeconomic, ecological and health inequalities at international, national and local levels. The concept of sustainable development is more than just sustainability (Harris et al., 2001; Harding, 2006). Sustainable development should be understood as a process towards a new normative horizon and implies a paradigm shift from the development based on inequality and over-exploitation to one that requires new forms of responsibility, solidarity and accountability (Shiva, 2005; Kjærgård et al., 2013). According to A. Pawłowski (2008) environmental, social and economic pillars of sustainable development should be complemented by the moral pillar.

Inclusive development emphasizes the social and environmental aspects of sustainable development. Inclusive development first appeared in 2007 in publications of the Asia Development Bank (Gupta et al., 2015). It is as a strategy towards equity based on poverty decreasing, human capital development, social capital development, gender development and social protection (Rauniyar & Kanbur, 2010).

Inclusive development should be defined as development that includes marginalized people, sectors and countries in social, political and economic processes for increased human well-being, social and environmental sustainability, and empowerment (Gupta et al., 2015, p. 545).

One of the indicators of the development of the country is a wealthy and healthy society. In different international policy documents concerning sustainability, a notion of health is mentioned as a part of social sustainability and one of the basic human needs among housing, water supply, and sanitation (WCED, 1987; p. 55). The Adelaide Statement on Health in All Policies (WHO and the Government of South Australia, 2010) emphasises the need for a new social contract between all sectors to achieve human development, equality and sustainability, as well as to improve health status of the population.

Health is simultaneously an outcome and precondition of sustainable development and relates to all four pillars of sustainable development: economic, social, environmental and governance. The Hancock approach (1993) shows a link between health and social, economic, and environmental wellbeing with sustainability aspect.

According to the Kickbusch (2010), the interaction between the three pillars of sustainable development (economy, society and the environment) is a key determinant for creating healthy and sustainable communities.

The concept of sustainable development existed in Europe for a long time already (2001) and the majority of European countries take sustainable development principles into account in their countries' and certain regions' development strategies (Europe-2020). Five main aims which each country should achieve till 2020 has been defined by EU countries. These aims involve such priority areas as employment, innovation development, education, social integration, climate/energy sector. Five main factors have been defined as success indicators, including the following: 75% of population aged 20-64 have to be employed; 3% of EU countries' GDP has to be invested in research and development projects; achievement of the aim 20-20-20 i.e. 20% reduction of green-house gases emission in comparison with 1990; to 20% of the share of renewable energy increase in EU energy consumption; increase of energy efficiency by 20%; percentage of people with primary education should be higher than 10% and no less than 40% of young people should have higher education; the amount of people living below the poverty line should decrease by 20 million.

Strategy of sustainable development *Ukraine-2020* that aims at introducing European life standards and Ukraine's achievement of world's top position was signed by Presidential Decree No. 5 only on January 12th, 2015. Strategy *Ukraine-2020* established four directions of development for the country and implementation of 62 reforms, as well as designated 25 key indicators that will be used in evaluation of the implementation of anticipated reforms and programs.

However, introduction of sustainable development principles in all areas of Ukrainian life faced a range of problems and challenges. Twenty-five years ago Ukraine gained its independence and began its way towards democratic changes and market economy. However, political and socio-economic reforms in the country were chaotic, slow, and did not bring expected results. Socio-economic crisis that started in Ukraine at the beginning of 1990s was of protracted nature and created great challenges on the way to achieving higher standards and life quality of the population. When analyzing main indicators of socio-economic development of the country over a period of 1991-2016, it is possible to distinguish two periods of crisis culmination: 1996 and 2014. The first period – 1996 – is connected with the climax of post-Soviet economic crisis when after the USSR collapsed, the economy recess reached its bottom, and according to the Human Development Index Ukraine descended from 45<sup>th</sup> place in 1992 to 102<sup>nd</sup>. The second period – 2014 – is connected with the annexation of Crimea and military actions in the East of the country.

Socio-economic transformations in the country during the last 25 years drastically strengthened social

and spatial polarization of society. The social stratification reached an enormous scale and created a huge gap between the rich and the poor. The wealth gap between the poorest layers of the society and the rich population is estimated at 1:47 or 1:50 (Korostelina, 2013, p. 60), while in EU countries this index is 1:5.7. Spatial differences are especially noticeable when comparing the capital region which during the years of independent Ukraine reached a comparatively high level of socio-economic development, the Eastern industrial regions, though less transformed after the USSR collapse, which are now under a constant war threat, and Western regions of Ukraine, which are less industrialized, but benefit in their development from a near-border position with EU countries.

During the years of its independence, Ukraine gained a status of post-communist country, but quarter of a century later, it still remains in a transitional phase, still unable to build a genuine democracy, functioning according to sustainable development pillars. In fact, the effective implementation of sustainable development principles in a country is only possible under two main preconditions: orientation towards other leading European states, as well as existence of proper democratic institutions working towards sustainable and inclusive development of the state, involving all components of this development. However, there are still no distinct norms of democracy in Ukraine, which are possible only by involving in state building process all layers of the society, not just economic elites, who are interested only in profit maximization.

The Revolution of Dignity in Ukraine in the fall of 2013/winter of 2014 became a clear indicator of formation of the Ukrainian nation's political subjectivity. However, subjectivity of Ukraine is being weakened now by external factors (pressure of Russia) and internal factors (absence of the nation's consolidation). This situation creates fragmentariness of sustainable development which is apparent in the priority development of some of its components and a distinct discrimination of other spheres. Military and state sectors become the priority spheres in the conditions of combat actions. Insufficient attention is paid to the support of vulnerable social groups, as well as to the healthcare problems.

The main goal of the paper is to analyze problems and possibilities of Ukraine's sustainable development under the current circumstances in the country, to provide a detailed spatio-temporal analysis of the crucial aspects of political, socio-economic, health, demographic and ecological components of the sustainable development.

#### Indicators of sustainable development of Ukraine and its regions: time-space analysis

As a starting point in the research of the level and problems of sustainable development in Ukraine

serves the analysis of the dynamics of Sustainable Society Index (SSI). It is combined indicator, set in compliance with the methods of the Sustainable Society Foundation, which has been calculated every two years since 2006. As of today, there are previous data for 2014. The index is elaborated at the initiative of Dutch researchers Geurt van de Kerk and Arthur Manuel. When the index is calculated, statistical and analytical materials of international organizations are considered, representatives of research centers and independent experts are involved. The audit of the index is carried out by Joint Research Centre of the European Commission. Altogether, it involves 24 indicators divided into 3 groups: economic, human, and environmental. The scale ranges from 0 – the lowest to 10 – the highest level of sustainability. Ukraine's SSI was the highest in 2008 – 4.5, by 2012 it dropped to 4.4 (Table 1). All the neighboring countries of Ukraine which are EU members have a drastically higher SSI in comparison to Ukraine. It is also a bit higher in Moldova and Belarus. Only in Russia, this Index was the same as in Ukraine, and in 2012 was even lower than in Ukraine despite higher GDP figures. Apparently, this could be explained by worse social and ecological factors, as well as the resource-based economy of Russia. For the majority of Ukraine's neighboring countries which are EU members, over a period of 2006-2012, the SSI got higher or stayed at the same level (except Hungary). At the same time, it got lower in Russia and Belarus.

Table 1. Sustainable Society Indexes in Ukraine and its neighbors in 2006-2012, based on *Sustainable Society Foundation*

| Countries | 2006 | 2008 | 2010 | 2012 |
|-----------|------|------|------|------|
| Belarus   | 5.0  | 5.0  | 5.0  | 4.9  |
| Moldova   | 4.5  | 4.6  | 4.6  | 4.9  |
| Poland    | 5.2  | 5.5  | 5.4  | 5.5  |
| Russia    | 4.4  | 4.4  | 4.4  | 4.3  |
| Romania   | 4.8  | 5.2  | 5.4  | 5.5  |
| Slovakia  | 6.0  | 6.2  | 6.2  | 6.0  |
| Hungary   | 5.6  | 5.3  | 5.4  | 5.3  |
| Ukraine   | 4.4  | 4.5  | 4.4  | 4.4  |

Researchers of sustainable development draw attention to the importance of democratic governance implementation on the way to achieving it. Sustainable development presupposes neutralization of globalized capital involvement, which does not care about states, environment and social problems of its functioning. It is possible to overcome the impact of globalized capital by leveling it with influence of the general public, public opinion, public's involvement in a decision-making process. Thus, the sustainable development is only possible under the condition of a compromise. A compromise presupposes democratization of the social relations. Democratic governance is possible on the basis of a social partnership. In this context, a special importance goes to a well-known Democracy Index, which has been calculated by The Economist magazine since 2006 (by its re-

Table 2. Democracy Indexes in Ukraine and its neighbors in 2006, 2008, 2010-2015, based on *Economist Intelligence Unit*

| Countries | 2006 | 2008 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|-----------|------|------|------|------|------|------|------|------|
| Ukraine   | 6.94 | 6.94 | 6.30 | 5.94 | 5.91 | 5.84 | 5.42 | 5.70 |
| Russia    | 5.02 | 4.48 | 4.26 | 3.92 | 3.74 | 3.59 | 3.39 | 3.31 |
| Belarus   | 3.34 | 3.34 | 3.34 | 3.16 | 3.04 | 3.04 | 3.69 | 3.62 |
| Poland    | 7.30 | 7.30 | 7.05 | 7.12 | 7.12 | 7.12 | 7.47 | 7.09 |
| Slovakia  | 7.40 | 7.33 | 7.35 | 7.35 | 7.35 | 7.35 | 7.35 | 7.29 |
| Hungary   | 7.53 | 7.44 | 7.21 | 7.04 | 6.96 | 6.32 | 6.90 | 6.84 |
| Romania   | 7.06 | 7.06 | 6.60 | 6.54 | 6.54 | 6.54 | 6.68 | 6.68 |
| Moldova   | 6.50 | 6.50 | 6.33 | 6.33 | 6.32 | 6.96 | 6.32 | 6.35 |

search department: The Economist Intelligence Unit, EIU). It involves 60 indicators divided into 5 categories. The index can vary from 0 to 10, with 0-4 being an authoritarian regime, 4.01-6 – a hybrid regime, 6.01-8 – a flawed democracy, 8.01 and higher – a full democracy. Index was initially calculated once in two years, since 2010 it has been calculated every year.

As we can see from the table 2, only in 2006, under President V. Yushchenko, according to the Democracy Index, Ukraine was only a little behind than the neighboring EU member countries, which placed it in the group of flawed democracies. However, after V. Yanukovych and the *Party of Regions* came into power, democracy started to shrink, and Ukraine became a state with a hybrid regime. Russia, in its turn, changed from a hybrid regime to an authoritarian regime. Only in 2015, the Democracy Index in Ukraine grew again. But now it is much lower than in Slovakia, Poland, Hungary, and Romania.

The comparison of both Indexes – the Sustainable Society and the Democracy – provides interesting insights. Five countries with the highest SSI in 2012 (Switzerland – 7.4, Sweden – 6.7, Latvia – 6.5, Austria – 6.6, Norway – 6.4) are at the same time full democracies. The countries with the lowest SSI (Yemen – 3.0, Iraq – 3.1, Qatar – 3.2, Oman – 3.3, Turkmenistan – 3.2, Uzbekistan – 3.4, Libya – 3.4) – currently are, or used to be an authoritarian regime. Either way, it seems obvious that in the countries with no full democracy, there is a certain limit in the movement towards sustainable development. Upon reaching this limit, there arises an urgent need for democratic transformations. However, an authoritarian regime or a non-democratic hybrid regime are likely to opt for the avoiding of the sustainable development. Apart from that, *fragmentariness* of sustainable development will most probably be characteristic for non-democratic and hybrid regimes. It will not be evident in all the areas, not on all the territory, because there will be no society-wide compromise about sustainable development, instead there will be local compromises and agreements.

Several studies were carried out in Ukraine whose task was to find regional peculiarities of sustainable development. There are several centers in the country that research problems of sustainable development. The most significant results in the research of this problem were obtained by National Technical University of Ukraine Igor Sikorsky Kyiv Polytech-

nic Institute. Problems of sustainable development are studied by the Institute for Applied System Analysis of the Ministry of Education and Science of Ukraine and the National Academy of Science of Ukraine created in the Technical University in 1996. The World Data Center for Geoinformatics and Sustainable Development (WDC-Ukraine) was also created in 2006. These institutions conduct analysis of sustainable development processes in Ukraine and in the world. Integral indicators of sustainable development of Ukraine's regions were calculated for the years 2006 and 2013. These studies were based on different methodologies, that is why there are significant differences in their results. However, one should also take into consideration that in the period between the two studies, the global financial crisis of 2008-2009 significantly affected Ukraine's sustainable development. Ukraine was among the states which suffered from the crisis the most, its GDP decreased by almost 15% during one year.

The Sustainable Development Gauging Matrix (SDGM) was used in the research of sustainable development of Ukraine's regions as of 2006, with the traditional calculation of three sustainable development components: economic, environmental and human. Integrated indicator could vary between 0 and 1. According to the result of the research, the regions were divided into six clusters: superhigh, very high, high, average, low, very low. Kyiv had a superhigh SSI (more than 0.60). Charków, Dnipro, Lviv regions had very high SSI (0.55-0.60). Kyiv, Sumy, Kropyvnytskyi regions and the Autonomous Republic of Crimea had a very low SSI (lower than 0.47). No distinct territorial division was found. The same high index was obtained, for example, by the over urbanized industrial Donetsk region in the East (due to the economic component of the Index) and by the agrarian Transcarpathia in the West (because of the environmental component of the Index). The same was for Luhansk and Ternopil regions, they were in a group with average development (Fig. 1).

Significantly different results were obtained after the SSI calculation in 2013. Statistical data from 2011-2012 was mostly used. Sustainable development was calculated based on safety indicators and people's life quality. Population's life quality was traditionally defined by economic, environmental and human components. The life safety component was defined as an integrated score of the overall impact of threats on a region's sustainable development. On the basis

Figure 1. Level of Sustainable Development in Ukraine, 2006, source: own elaboration based on *Stalyj rozvytok re-gioniv...*(2009)

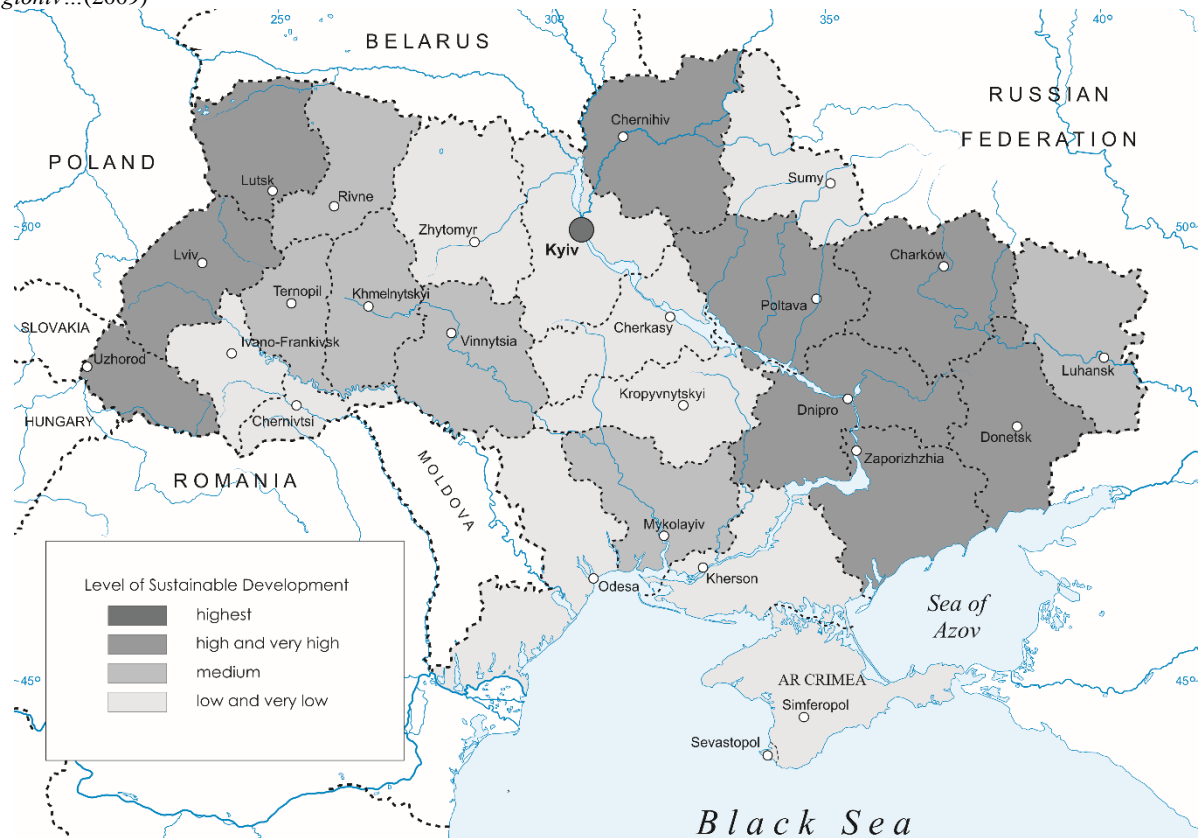
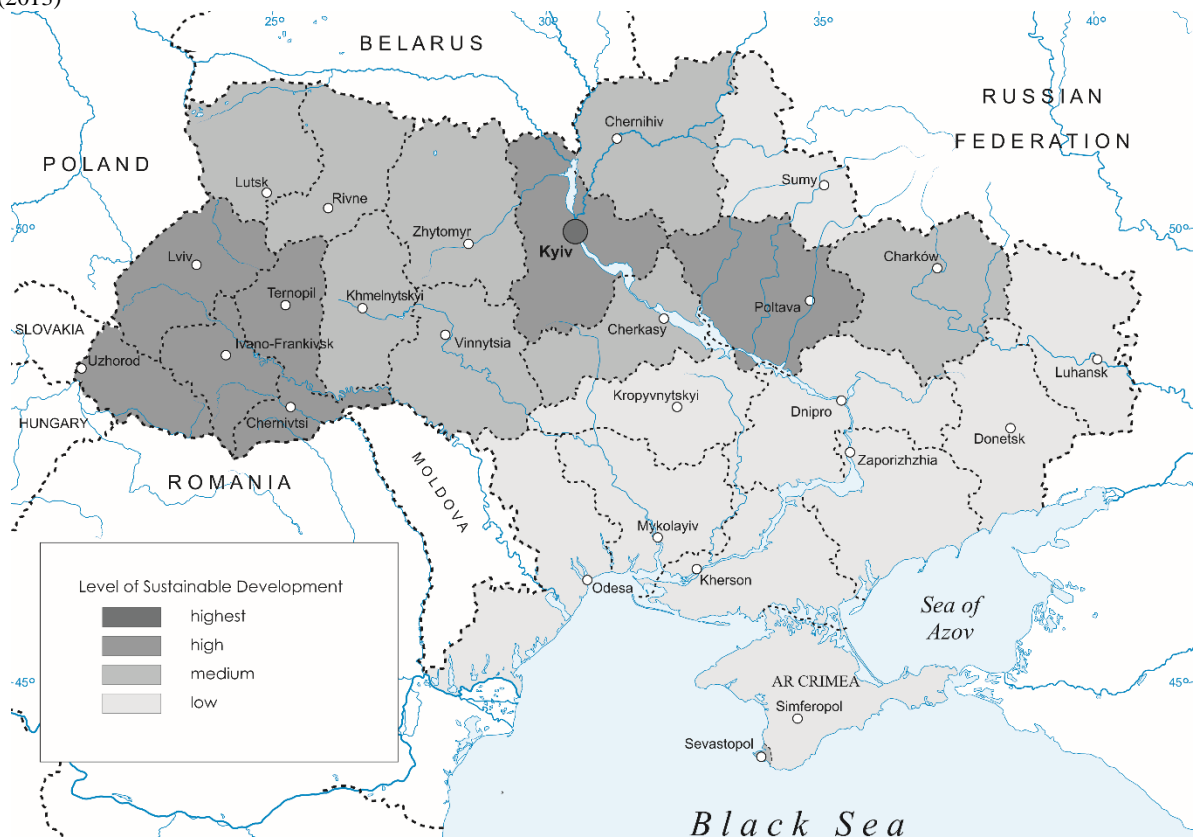


Figure 2. Level of Sustainable Development in Ukraine, 2013, source: own elaboration based on *Analiz stalogo rozvytku...* (2013)



of this score, the Index of Region Vulnerability to the impact of threats was found. It showed the level of proximity of this region simultaneously to all threats in the space, which was defined by the Min-kowski norm. The indicator could be higher than 1. According to the results of the research, the regions were divided by the level of sustainable development into four clusters: the highest, high, average, low (Fig. 2). In 2006, Kyiv got the highest indicator (1.34) because of the developed infrastructure and a high level of population's income. However, territorial peculiarities were distinctly seen in the further research. Thus, the group with a high level of sustainable development (0.97-1.05) included all South-Western regions of Ukraine and, in addition to them, Kyiv and Poltava regions. The group of an average level of sustainable development (0.90-0.97) included Central and Northern regions, and the low level group (up to 0.90) consisted mostly of Southern and Eastern regions of Ukraine.

Ukraine's political choice to pursue association with the European Union, the annexation of Crimea by Russia in 2014 and military actions in the East of the country most probably intensified even more the peculiarities of sustainable development in Ukraine. Because in the context of these events the safest and the most sustainable were the Western regions of Ukraine, while the Eastern regions ended up on the opposite end of the scale.

### Problems of political pillar of sustainable development

According to the data by O. Sushko and O. Prystayko (2016), the events following the annexation of Crimea and the de facto, occupation of the East of Ukraine by Russia, cost Ukraine in 2014 10% of the overall number of its population and around 9% of its GDP. As of 2015, the inflation was more than 43%. Ukraine paid and is still paying a very high price for its European choice and the reasons for it are both external and internal political factors.

The role of the external factor is defined, first and foremost, by a geopolitical position of Ukraine between the East and the West and the peculiarities of its historical development, which were summed up in the publications by J. Matlock and F. Jack (2000), who defined Ukraine as a *nowhere nation*. Ukraine is still on the road to a better life, or it is now in the midst of a transition to Western European democracy and market economy. Even before the beginning of the transition period, as was cleverly remarked by S. Huntington (1996, p. 168), *Ukraine is divided between the Uniate nationalist Ukrainian-speaking West and the Orthodox Russian-speaking East*.

A lot of works by both Ukrainian and foreign researchers (D'anieri, 2012; Kuzio, 2012; Kudelia, 2012; Riabčuk, 2012; Korostelina, 2013; Lomaka,

2013; Minienkova, 2013; Kuzio, 2014) are focused on a question of a democratic transition and political transformation in Ukraine. According to I. Lomaka (2013), the present-day Ukraine can partly be defined as a country which is modernizing, and partly as a country which is in a state of a political transition. According to the theory of *political transitology*, there are two main preconditions for the democracy: a presence of a certain level of national integrity and a wish for a democratic transition and genuine struggle for democracy. For more than two decades those preconditions were not present in Ukraine, accordingly, as was emphasized by P. D'anieri (2012, p. 458), Ukraine did not experience a genuine revolution either in 1991 (the year of gaining independence), or in 2004 (the year of the Orange Revolution). However, contemporary geopolitical events in 2013-2016 eventually demonstrated the presence of these two preconditions in Ukraine. A democratic transition presupposes three stages: liberalization, democratization and consolidation. The first stage is liberalization, that is introduction of certain civil freedoms without changing the government apparatus, which began in Ukraine back in the times of the USSR. Transition to the second stage – democratization – began along with gaining independence in 1991, and this transition has lasted for decades. During the time of transition in 1991-2016 one can define periods of euphoria and excitement, and periods of disappointment and social depression. The Orange Revolution (2004) and The Euromaidan Revolution (2014) belong to the periods of excitement, but very soon those periods were followed by the state of social apathy and pessimism. Lengthy and crisis-full transition process in Ukraine led to increasing social dissatisfaction, doubts and disappointment among the Ukrainian population in both South-Eastern and in Western and Central regions. According to T. Kuzio (2012) up till recently there were four main factors which caused Ukrainian state's immobility, in addition to the corruption in the country: political culture, weak political will and civil society, absence of institutions capable of effectively fighting corruption, weak ideology and mutual dependence between political parties and business. Challenges and peculiarities of the democratic transition in the country were also described in details by N. Minienkova (2013). The author emphasizes that at the beginning of the 1990-s, after gaining independence, the state of the majority of social areas in Ukraine was rather unfavorable. Post-soviet structure of economy, which was based on an unfinished cycle of production, total absence of civil society, multiparty system, checks and balances between the branches of state government, weak political consciousness and consolidation of the nation were the luggage inherited by the young country. All these factors, together with a long-lasting history of its ungovernance and foreign reign in Ukraine, led to quite a slow transition to democracy. In the 1990-s, the rul-

ing of former party nomenclature, a permanent weakness of national-democratic forces and immaturity of the middle class led to the appearance and rise of oligarchs who were very far from democratic principles and cared only about the satisfaction of their own interests. By the 2000s, the oligarchic class did not wish to remain in the business boundaries, started to interfere actively in politics, bringing a dominance of the state over the society, bureaucracy, corruption and a clan system, hindering the birth of a new economically and socially developed democratic society in Ukraine (Minienkova, 2013).

The studies conducted by K. V. Korostelina (2013) are valuable for a deeper analysis of how the transition happened in Ukraine. The researcher conducted a survey among 48 Ukrainian and 10 foreign experts from Europe and the USA about the development vectors of Ukraine. All 100% of Ukrainian and foreign experts considered Ukraine a state without a common national identity, national idea; according to this conception national image evolved around the ideas of *fence around the house* that praises individualism, and the idea of *good life* or *being in Europe* that concentrates on economic wellbeing. Ukrainians gave power to oligarchs, people representing success, in the hope that they would know how to build the country and change life for the better. But current government and oligarchs have not been motivated by national principles, and cared little about Ukraine and its future (p. 55). The process of unfinished transition led to a steady degradation of Ukrainian state, society and economy. Experts mentioned such areas which are in the state of recess and degradation: economic decline (72% of respondents), corruption (72% of respondents), failing state (68% of respondents), decreased level of education and culture (65% of respondents), degradation of agriculture (30% of respondents). 47% of Ukrainian and 50% of foreign experts deemed Ukraine as a divided state, with diametrically different moral values of the population, wealth inequality and different national identities. Ukraine was named a colonial state of oligarchs by 42% of Ukrainian experts and 80% of foreign experts. This being said, Ukrainian experts concentrated on structural factors and analysis of the oligarchy in Ukraine, whereas foreign experts focused on the differences between the Ukrainian and the contemporary Western society.

Presently, Ukraine is too weak to get its place in the world system, it is in a state of a permanent war threat from Russia and is so far unable to join the EU because of the absence or low efficiency of the reforms which should have approximated Ukraine to the European standards. However, after the 2014 events, the conditions for the transition to the stage of democratic consolidation eventually appeared, as well as for the stage of development under which the absolute majority of the population and all influential politicians agree that democracy is a general social norm. After freezing of the conflict in the East

of Ukraine, the political life in 2015-2016 got stabilized and there has been progress in implementing reforms of local governance, launching of judicial reforms, a gradual increase of economic indicators. However, the real campaign against corruption and low professionalism in courts and prosecutor's offices, as well as against other negative social phenomena, is still ahead (Nations in transit...2016).

### Problems of socio-economic pillar of sustainable development

According to the UN data, Ukraine with the result of 0.747 points at Human Development Index (HDI) got 81<sup>st</sup> place among 187 world countries in 2014. In 2013, Ukraine was on 78<sup>th</sup> place. Quite a high position of Ukraine in the world rating is first of all determined by the high educational level of the Ukrainian society. The index of GDP per capita as well as the average life expectancy still remains low, compared with developed countries of the world. Dynamics of GNP changes, household incomes and also the share of informal sector in GNP formation show certain discrepancies between Ukraine's development vectors and lack of efficiency of the implemented reforms (table 3).

According to the World Bank data, the Gini coefficient in 2014 was 24.1% which is a better indicator in comparison with a lot of neighboring countries, some EU countries are among them. However, according to experts' estimations (for previous years) its actual figure (including hidden income) was one and a half times higher (Bobuch, 2013; Gatskova, 2013).

A share of the population with equivalent cash income per capita each month was lower than a subsistence rate which was 11.1% in 2015 (with critical index 7.0%). Especially noticeable territorial differentiation of this indicator is on the level of big cities – small cities – rural areas, with 6.6%, 15.0% and 16.2% accordingly. The ratio of general incomes of the most and the least wealthy 10% of population was 4.4 times in 2015.

According to the UN data, the state can be deemed poor if its population spends more than 50% of its total expenditure on food. At the beginning of the 1990-s this indicator in Ukraine was on the level of 33%, but then it started growing rapidly to the level of 65.2% in 2000. Self-estimation of income levels by Ukraine's households indicates a significant level of impoverishment: in 2015, only 8% of the households had enough income to save, 41% could not spend money on anything but food, 4% of the households could not afford even food. A share of the so-called middle class in a society social structure is very low. According to different sources, this figure in Ukraine varies from 5% to 25%, while in developed countries the middle class is 50-60%.

The poverty problem is closely connected with the presence of children in households. According to ab-

Table 3. Dynamics of certain economic indicators in Ukraine, 1990-2012/2014, source: calculated according to the data: *WHO Data Base 'Health for All' for different years; Center for Social and Economic Research; Vytraty i resursy domogospodarstv for different years*

| Years     | GNP per capita, USD according to purchasing power parity (PPP) | Average monthly average household incomes per one person, USD | Average monthly household incomes per one person, USD according to purchasing power parity (PPP) | Shadow economy share in GNP, % | Share of expenses on meals and non-alcoholic beverages in general household expenses, % |
|-----------|--|---|--|--------------------------------|---|
| 1990      | 5433   | 18.2  | ...  | 15.5                           | 32.8  |
| 1995      | 2400   | 29.2  | 44.9   | 46.6                           | 57.0  |
| 2000      | 3816   | 26.5  | 127.3  | 45.0                           | 65.2  |
| 2012/2014 | 8788   | 195.6   | 444.1  | 40-60*                         | 51.9  |

\* estimated data; ... - absent data

solute and relative criteria, high poverty risks threaten households with two or more children, with children under three, with children and unemployed adults. Even higher risks exist for multiple children families. According to self-estimation, among multiple children families 73.4% consider themselves poor, among all families with children – 66.5% (Cili rozvytku...2015). In fact, every third Ukrainian family with children and every fifth working adult is poor. Presence of one child raises poverty risks according to relative criteria by 17%, while presence of three and more children – as much as by 42%. According to UN minimal criteria of 5 USD per day, 99% of pensioners are below the poverty line.

In spite of generally low standards of job remuneration (average salary in 2015 was 4195 hryvnias, which is 192 USD), income from work comprises 50% of the general population income, income from entrepreneurial activities, property and agricultural product sale makes up only 10%. In the private sector a so called *salary in envelopes* is widely spread, that is a salary paid in cash and not declared to state tax administrations. In 2009, 21% of respondents of employable age received unofficial salary, at the same time 7% of the respondents evaded to answer this question (Balakirieva & Černenko 2009). Special apprehension is brought by the increasing share of social benefits in the total structure of households' income, such as pensions, scholarships, financial aid, allowances and subsidies as well as other compensation expenses. Its share in 1990 was only 13.4%, in 2014 – almost 31%.

Living in rural area raises the risk of monetary poverty by 2.5 times. Because of the lack of money for medication even slight illness can lead to a sudden poverty. Due to this another 16% to 36% of the population are at risk of ending up poor. Village dwellers suffer more often from a lack of quality medical, educational and other types of services. Every second village household is deprived of an ambulance service and does not have institutions which provide domestic services. Every fourth village is significantly remote from the nearest medical institution or pharmacy, does not have a regular daily transport con-

nection with a populated area with a more developed infrastructure (Cili rozvytku...2015).

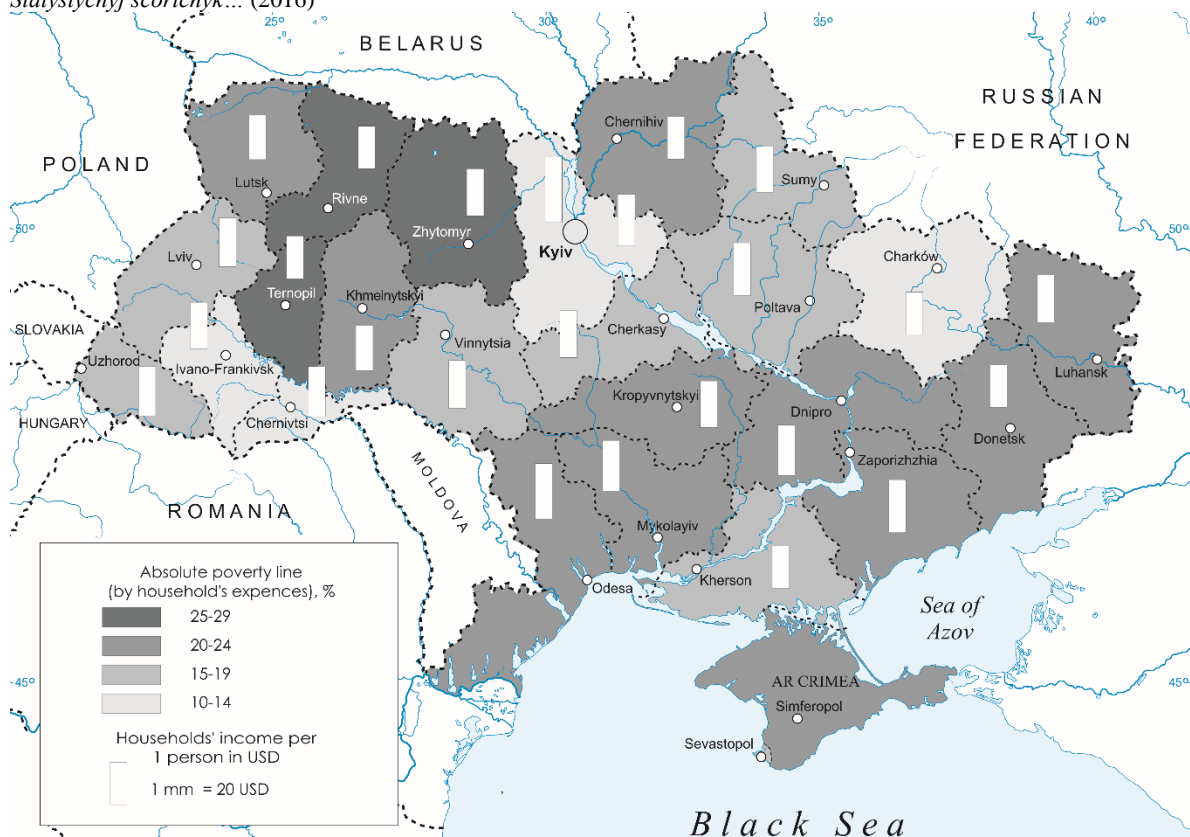
Corruption is common for Ukraine as well as for the other post-communist states. Transparency International study in 2014 showed that Ukraine is one of the most corrupted states of the post-Soviet area. A Ukrainian constantly faces a so-called daily corruption, which is informal bribes for gaining access to needed goods and services. According to Corruption Perceptions Index 2015, Ukraine was on the 130th place among 168 surveyed world countries by the level of corruption, with the corruption index 27 (the scale ranging from 0 – the highest level of corruption, to 100 – the lowest level of corruption). Worse situation than in Ukraine among other countries of post-Soviet area was only in Turkmenistan, Uzbekistan, Kirgizstan and Tajikistan (Corruption Perceptions...2015). The highest level of day-to-day corruption is observed in Ukrainian medical institutions (in 2011 66% of questioned respondents and members of their families gave bribes on demand and 36% gave voluntarily bribes in health protection institutions) and in schools (61% of respondents paid required bribes and 62% paid voluntary bribes) (Ukrains'ke suspilstvo..., 2013, p. 259).

The introduction of a real estate tax should have played an important role in bridging the gap between rich and poor strata of the society. However, the Ukrainian version of this taxation (Article 265 of the Tax Code of Ukraine) did the opposite. It raised a social tension in the society since it presupposes taxation not for the cost of a real estate (as it is in the developed countries), but for the living space. As was promptly said by I. Bobuch (2013; p. 76), *they should have introduced a luxury tax in Ukraine, instead they introduced a poverty tax*.

According to O. Makarova (2011), extent of social benefits reaching the poorest population is only 56.4%, which shows its alienation from a social benefits system. This problem specifically applies to multiple children families: 58% of those with no right for social benefits are in fact in need of help. A share of the non-government sector in the social benefits scheme in Ukraine is only 10% and it is not able to satisfy the needs of vulnerable social groups.



Figure 3. Households' income and the poverty line of the population in Ukraine, 2014, source: own elaboration based on *Statystyczny Źródło...* (2016)



Significant disproportions between the household income of the capital area and peripheral rural areas, as well as various state regions, are also a problem for Ukraine (fig. 3). Difference in a poverty level between the richest and the poorest regions according to the absolute criteria was 9.5 times in 2013, and 6 times according to the relative criteria.

Significant territorial inequality of the country's economic development was caused by historical and geographical peculiarities of the development of Ukraine regions as a part of different states, their labour resources potential, and geographical position. As of the end of the 1980s, the most developed regions were the Donbas (Eastern regions) and the Industrial Prydniprovya (Central-Eastern). Western Ukraine was the least developed. Such falling behind in the economic development was due to its peripheral geographic position as part of the states to which it used to belong. Consequences of the economic recess due to the USSR collapse and the transition from command-and-control to the market economy were significantly different in the various regions. The Eastern regions suffered the least, they partly preserved their economic relations with the rest of the former USSR. Apart from that, metallurgic products found market outlets in the world. *Exorbitant* privatization of the biggest and the most effective enterprises of the Donbas and the Industrial Prydniprovya took place in the 1990-s. Modern Ukrainian billionaire oligarchs formed their capital

on this basis. However, the production remained ineffective, stayed active because of the subventions from the state budget, especially the coal industry. Apart from that there were almost no investments in productive capacities renewal.

But breaking free of the Iron Curtain created new opportunities for Western Ukraine, which had the most convenient position from the Eurointegration point of view. Rebuilding of the economic relations system was going on there. Development of the small businesses got faster, tourism and resorts became the leading spheres. Western Ukraine sent the biggest amounts of labor migrants to Poland, Italy, Portugal, Spain and other European countries. Thus, accordingly, the biggest were the amounts of money that labor migrants sent back home (Petroje & Vasijev, 2015). In other words, Western Ukraine integrated in Europe in different ways, whereas Eastern Ukraine tried to preserve its *archaic* quasi-Soviet economy. A gradual fall of Eastern regions economic role also took place. By the official statistical index of GRP and the population's average salary, they were ahead. But by the population's life quality indicators, which were calculated by international methodologies, the Western regions constantly took first places, while the Eastern regions, especially Luhansk and Donetsk, were on the last places. Military actions in the Donbas which began in May 2014 caused an economic catastrophe in the East. The consequence of the combat actions in the East of

Ukraine was appearance of a so-called sudden poverty among the population: out of 6 million of ATO area and nearby territories' inhabitants more than 5 million ended up either in the group of suddenly impoverished or in the group of poverty vulnerable (Cili rozvytku...2015). Value of the Western regions in Ukraine's economy and politics rapidly grew.

### Problems of the environmental pillar of sustainable development

The current environmental situation in Ukraine is characterized: first, by multiple unsolved environmental issues inherited from the former USSR; second, by the inconsistent environmental policy of the state up till recently because of the unstable political-economic situation in the country, corruption, low environmental culture of the population; third, by a certain improvement of some environmental indicators due to Ukraine's deindustrialization in the process of transition from the control-and-command to the market economy, and the decline of many industrial enterprises.

The period of 1990-2015 is generally characterized by the improvement of basic indicators of environmental pollution (table 4). The biggest environmental problem for Ukraine remains the emission of carbon dioxide into the atmosphere and high amount of polluted sewage water in a general sewage system.

Analyzing the most recent statistical data from 2015, one should take into account that they do not include the annexed territory of AR Crimea, Sevastopol and anti-terroristic operation area (ATO area) in the East of Ukraine. This is why the pollution significantly decreased according to the absolute indicators.

The military conflict in the Donbas had a significant impact on the environmental state of the whole territory of Ukraine. The Donbas is an industrially developed region, and combat actions on its territory create an increased environmental risk. As of September 2015, almost 65% of industrial enterprises in the ATO area were known to have been destroyed, demolished or stopped operation. Hazardous wastes and chemicals which were kept at the enterprises could have been released into the environment. During 2014-2015, coal mining reduced by 62%, the majority of mines stopped operating. Huge damages were inflicted to the large nature protection areas, national nature park *Holly mountains* and regional landscape park *Donetsk range*. Unique heath landscapes suffered from shootings and fires. There is no proper environmental monitoring in the ATO area.

The main environmental problem inherited from the 1980 is overcoming the aftermath of the Chernobyl disaster. It led to radioactive pollution by Cesium-137 on almost 25% of Ukraine's territory (12 regions, 78 administrative districts and over 2000 settlements, the majority of them in Kyiv, Zhytomyr, Chernihiv regions, fewer in Vinnytsia, Cherkasy, Rivne, Ternopil and Ivano-Frankivsk regions).

According to the data of the National Research Center for Radiation Medicine of NAMS of Ukraine, 2.13 million of people are currently living on radioactively polluted areas, 2.08 million of people have the official status of the Chernobyl power plant disaster survivors, 22 % – children. Among the survivors was noticed a growth of oncological diseases (especially leukemia, thyroid and breast cancer, as well as lungs and urinary tract cancer), growth of non-tumor illnesses (diseases of cardiovascular system, digestive tract, respiratory track, nervous system and sense organs, endocrine, musculoskeletal and genitourinary systems). Growth of thyroid cancer is the most dangerous. Overall, the amount of thyroid cancer cases is 33 times higher annual than it was before Chernobyl, for children under 14 years old it is 60.0 times higher.

At the same time during the last 25 years radiation state of the adjacent to the power plant has significantly improved: populations of endangered animals have been restored, and the Ukrainian authorities even started considering the possibility of reducing the exclusion zone around the Chernobyl nuclear power plant.

Decrease of the forest index and a low share of nature protection areas in the general territory of Ukraine, which on January 1<sup>st</sup>, 2016 was not higher than 6.30%, should also be indicated among other current environmental problems. Ukraine belongs to sparsely forested countries: the forest covers only 1/6 part of its territory. But even in view of that, the export of wood from Ukraine is 2.5 times higher than the import. Consumerist forest management leads to the fact that forests are not renewing and lose their biological stability (the territory of forests suffering from diseases and vermin is constantly growing). At the same time valuable tree species (oak, beech and pine) are replaced with less valuable (horn beech, birch, sedge). The most difficult situation is in the Carpathians and Crimea where soil erosion and landslides are caused by the forestland degradation.

One of the most critical indicators of the environmental policy and state of Ukraine is the Environmental Performance Index (EPI). This index was developed from the Pilot Environmental Performance Index, first published in 2002, and designed to supplement the environmental targets set forth in the United Nations Millennium Development Goals. During the last 10 years there has been a certain progress in government's and civil society's realization of Ukraine's environmental problems, accordingly the EPI in Ukraine is growing. However, it is falling behind the majority of post-socialistic countries (table 5). The main reason is quite a low cost of the ecosystem vitality index which includes air and water pollution, biodiversity and habitat, productive natural resources and climatic changes.

Also for analysis of the environmental component of Ukraine's sustainable development changes of the World Risk Index were analyzed. This index was

Table 4. Dynamics of Environment Pollution in Ukraine in 1990-2015, source: own elaboration based on *Statystychny ščoričnyk...* (2016); *Dovkillja Ukrajiny...* (2016)

| Indicators   | Years |      |      |      |      |      |
|--|-------|------|------|------|------|------|
|  | 1990  | 1995 | 2000 | 2005 | 2010 | 2015 |
| Emission of polluted agents in the air, thousand tons                                  | 15549 | 7484 | 5909 | 6616 | 6678 | 4521 |
| Carbon dioxide emission, million tons  | ...   | ...  | ...  | 152  | 198  | 139  |
| Disposal of polluted sewage water in surface water bodies, million metres <sup>3</sup> | 3199  | 4652 | 3313 | 3444 | 1744 | 875  |
| Share of polluted sewage water in a general sewage system, %                           | 15.8  | 31.1 | 30.2 | 38.7 | 21.0 | 15.7 |
| Waste production of the I-III grades of danger, thousand tons                          | ...   | 3563 | 2613 | 2412 | 1660 | 587  |

... - absent data.

Table 5. EPI dynamics in Ukraine in 2012-2016 compared to other post-socialistic countries, source: own elaboration based on *Global Metrics for the Environment...* (2016)

| Countries | World EPI rating in years |      |      | EPI, 2016 | Environmental Health, 2016 | Ecosystem Vitality, 2016 | EPI rating among post-socialistic countries in 2016 | Progress in 2016 during the last 10 years |
|-----------|---------------------------|------|------|-----------|----------------------------|--------------------------|---|---|
|           | 2012                      | 2014 | 2016 |           |                            |                          |   |   |
| Slovakia  | 12                        | 21   | 24   | 85.42     | 83.77                      | 87.07                    | 6   | 10.4                                      |
| Hungary   | 45                        | 28   | 28   | 84.6      | 81.89                      | 87.30                    | 8   | 11.54                                     |
| Russia    | 106                       | 73   | 32   | 83.52     | 87.06                      | 79.98                    | 10  | 24.34                                     |
| Bulgaria  | 53                        | 41   | 33   | 83.4      | 85.18                      | 81.62                    | 11  | 12.01                                     |
| Romania   | 88                        | 86   | 34   | 83.24     | 81.19                      | 85.28                    | 12  | 28.93                                     |
| Belarus   | 65                        | 32   | 35   | 82.3      | 87.37                      | 77.24                    | 13  | 3.77                                      |
| Poland    | 22                        | 30   | 38   | 81.26     | 80.54                      | 81.98                    | 15  | 8.12                                      |
| Ukraine   | 102                       | 95   | 44   | 79.69     | 85.74                      | 73.63                    | 16  | 25.38                                     |
| Moldova   | 108                       | 74   | 55   | 76.69     | 78.08                      | 78.03                    | 20  | 9.09                                      |
| Georgia   | 47                        | 101  | 111  | 64.96     | 78.12                      | 51.81                    | 26  | 11.77                                     |

Table 6. Dynamics of the World Risk Index (WRI) in Ukraine and other post-soviet countries in 2011-2015, source: own elaboration based on *World Risk Report...* (2014)

| Countries | 2011 |      | 2012 |      | 2013 |      | 2014 |      | 2015 |      |
|-----------|------|------|------|------|------|------|------|------|------|------|
|           | WRI  | Rank | WRI  | Rank | WRI  | Rank | WRI  | Rank | WRI  | Rank |
| Ukraine   | 3.02 | 148  | 3.19 | 149  | 3.14 | 149  | 3.11 | 145  | 3.09 | 144  |
| Poland    | 3.42 | 143  | 3.53 | 140  | 3.46 | 141  | 3.28 | 141  | 3.27 | 139  |
| Lithuania | 2.89 | 151  | 3.23 | 148  | 3.18 | 148  | 3.01 | 146  | 2.98 | 147  |
| Belarus   | 2.98 | 149  | 3.32 | 145  | 3.31 | 145  | 3.12 | 144  | 3.07 | 145  |
| Russia    | 3.56 | 139  | 3.83 | 130  | 3.78 | 133  | 3.28 | 128  | 3.84 | 128  |

Table 7. Dynamics of certain indexes of the demographic situation in Ukraine in 1990-2015, source: own elaboration based on the data of the *State Statistics Service of Ukraine*

| Indexes                                     | 1990 | 1995 | 2000 | 2005 | 2009 | 2015 |
|---|------|------|------|------|------|------|
| Birth rate, ‰                               | 12.6 | 9.6  | 7.8  | 9.0  | 11.1 | 10.7 |
| Death rate, ‰                               | 12.1 | 15.4 | 15.4 | 16.6 | 15.3 | 14.9 |
| Natural increase index, ‰                   | 0.5  | -5.8 | -7.6 | -7.6 | -4.2 | -4.2 |
| Infant mortality rate per 1,000 live births | 12.8 | 14.7 | 11.9 | 10.0 | 9.4  | 7.9  |
| Marriage rate per 1,000 people              | 9.3  | 8.4  | 5.6  | 7.1  | 6.9  | 7.8  |
| Divorce rate per 1,000 people               | 3.7  | 3.8  | 4.0  | 3.9  | 3.2  | 3.3  |

calculated by the United Nations University for Environment and Human Security firstly in 2011 and consists of four components: exposure to natural hazards such as earthquakes, storms, floods, droughts and sea level rise; susceptibility as a function of public infrastructure, housing conditions, nutrition and the general economic framework;

coping capacities as a function of governance, disaster preparedness and early warning, medical services, social and economic security; adaptive capacities to future natural events and climate change. In the World Risk Index Ukraine holds quite good positions even in comparison with other post-socialistic countries, which proves that its population is less

vulnerable to natural disasters, is more ready to counteract dangerous natural phenomena and takes measures to prevent them (table 6).

In addition to the indices mentioned above, one of the most popular and most recently criticized indices in terms of the analysis of the current environmental situation is the ecological footprint. The ecological footprint is a measure of human impact on the Earth's ecosystems. It is typically measured in the area of wilderness or the amount of natural capital consumed each year. For the first time, the ecologic footprint accounting method was described at the national level in the Ecological Footprint Atlas (2010). The biggest part of the ecological footprint in Ukraine consists of a carbon footprint. Its share makes up from 33% to 65 % in different countries, in Ukraine it is 52.7%. In Ukraine's regions an ecological footprint was calculated by L.A. Nekrasenko according to the 2007-2012 data. The data about yearly CO<sub>2</sub> emissions were used, as well as the data about carbon dioxide absorption, forested territory, volumes of forest harvesting. The highest carbon absorption is in the forests of the Ukrainian Carpathians and in the area of mixed forests, the lowest absorption is in the heath area (Mykolayiv, Zaporizhzhia and Odesa regions). The biggest carbon footprint is registered in Charków region (11.2 million of hectares of 2013), and also in Zaporizhzhia and Odesa regions. The lowest carbon footprint was in the Western region of Ukraine, in some Central and Northern regions.

Ukraine's transformation is impossible without new approach to the environmental problems. Ukrainian government's priority in the sphere of environmental policy should be the compliance of the Ukrainian environmental law with the EU directives (among them the directives on air quality, on waste, on water protection and management, on biodiversity protection, on environmental impact assessment, on access to environmental information, on public involvement in environmental issues, on the environmental assessment of plans and programmes, on industrial emissions). The following tasks hold a special priority: institutional reforms of the state environmental protection area; development of national climate policies; integration into regional strategic and program documents of the EU Directives and of the Strategy of State Environmental Policy for 2020; expanding the network of nature protection areas.

### **Problems of the demographic pillar of sustainable development**

The second demographic transition which started in highly-developed countries in the 1960s which meant the decrease of the total figures of birth rate lower than the level of a simple population reproduction, delaying the decision of having a first child, increase of out-of-wedlock births, changes of the family forms and increase of an average life expectancy (Lest-

haeghe & Neels, 2002; van de Kaa, 2004), came to Ukraine with a 30-year delay (Prybytkova, 2000). However, the progression of the second demographic transition in Ukraine is quite different from the other European states, because it was accompanied with some situational factors, brought about by the political and socio-economic changes in the country.

Starting from the 1990s, Ukraine has suffered a major demographic crisis, caused by the decrease of the birth rate index, growth of the death rate index, especially among working age men, decrease in the marriage index and increase in the divorce index, quick pace of population's aging and migration outflow (table 7). Many of the mentioned problems also apply to the other developed world countries but they did not cause a demographic crisis. In Ukraine, degradation of the population quality turned the demographic situation into a crisis (Stešenko, acc.to: Bobuch, 2013, p.73). The major reasons for the degradation are unstable political and socio-economic situation, sharp decrease of living standards, especially in rural areas, high divorce rate, unsatisfactory state of the women's reproductive health, social tension, growth of a secondary infertility as a result of abortions, etc.

Because of the demographic crisis Ukraine's population dropped from 52 million people in 1992 (maximum amount) to less than 43 million people as of January 1st, 2016. This depopulation is especially noticeable in the rural areas. During 1990-2015, the amount of population in villages decreased almost by 3 million people, or by 17%. There have been no newborn babies in approximately 5% of Ukrainian villages during the last 5 years, in 6% of the villages there have been no young people. Share of the population at the age of more than 60 in villages is almost twice as high as the amount of children at the age of 0-14.

The highest population loss was in two Eastern regions: Luhansk and Donetsk (almost millions of people by the beginning of 2016), whereas seven Western regions of Ukraine lost only 0.5 million of people. Thus, in the population structure of the state the share of the Western region is growing and the share of the Eastern region is decreasing. The main reason for this is the best demographic situation in the Western Ukraine where the majority of population is still living in rural areas, people are generally more religious, the environmental situation is better. While in the Eastern Ukraine demographic indexes were constantly worsening due to industrialization hyper-urbanization, difficult environmental situation. Military actions in the Donbas, which began in May 2014, caused a demographic disaster in the area. According to the UN estimations, more than 1.5 million people fled the conflict zone, up to 600 thousand among them went abroad. As a result of this, the demographic role of the Eastern regions decreased even more.

One of the main factors for the state's demographic decline is a systematic and sharp birth rate decrease. In 2015, the birth rate quotient was 10.7% with a critical point at 22% required to maintain a simple reproduction of the population. The total index of female fertility in Ukraine showed a positive dynamics in comparison with 2001. However, in 2015 it was only 1.506 children per woman of reproductive age. Experts at Kyiv Institute of Sociology found out that a desired amount of children in Ukrainian city families is 1.9, and in village families it is 2.0. However, this family model is realized only in 68% of cases. The obstacles are low household income (this reason was indicated by 54 % of the respondents) and unsatisfactory living conditions (39%). Families' fear about their financial situation is well-grounded: a poverty level among families with children is 25-30% higher than the level of all the households. Poverty risk is growing after a birth of a second child (by 52%), a third (by 59%) and so on (Socialno-demografični charakterystyky..., 2016).

A significant raise of social maternity benefits in 2007 made the birth index in Ukraine spike, especially in the rural areas (because of the values and childbearing mindset of village women, and also because of the higher importance of the financial aid for village dwellers). But this growth was short-lived. Apart from that, total insignificant rise of the birth rate in the period of 2007-2015 can be explained not only by government allowances (41,280 UAH, or more than 1,600 USD), but also by reaching the reproductive age by women born in the 1980s, when the demographic policy of the former USSR which offered benefits to families with children caused a birth climax in Ukraine.

The data of different sociologic surveys show that modern Ukrainian families are oriented at having few children (Šlub, simja... 2008), mostly because of the current political and socio-economic crisis. There is an ongoing transformation of a Ukrainian family from the model 2+2 to 2+1, or even 2+0, there is a growth of single-parent families, single mothers who bring up children and out-of-wedlock births (from 12.4% off the total number of all the births to 20.6% in 2015). An average maternity age grew significantly: in 2014 it was almost 26: a first child – 23, a second – 28, and a third – 31.

One of the main demographic problems for the Ukrainian state is population aging. Share of the population older than 60 was 19% in 1991, in 2015, it was already over 22% (in rural areas this figure was even higher – nearly 25%). Ukraine was trapped in a vicious circle: the depopulation causes the population aging, and the population aging strengthens the depopulation. The most powerful accelerator of the population aging is the birth rate decrease. Because of the population aging, losses of demographically reproductive and employment potential are growing, and the economic burden on productive population is increased by the retired population.

A distinctly different characteristic of Ukraine compared to other countries in the second phase of the demographic transition is the high population death rate, especially among working age men. The population general death rate was 14.9% in 2015, so it was twice as high as in 1970. The main causes of the high population death rate are cardiovascular diseases and malignant tumors. Together they cause almost 72% of the deaths. Share of the death rate caused by cardiovascular diseases in 1990-2015 grew by almost 50%, and this growth concerned mainly men. During 1990-2015, the death rate among working age men grew by over 3 times and surpassed by almost 50% the death rate among women of the same age group. This is connected with men's inclination to alcohol, tobacco and unhealthy life style, as well as with men working in more hazardous conditions in comparison with women.

An average life expectancy in Ukraine is significantly lower than in other countries of the European region. In 2015, it was 71.4 years (76.3 years for women and 66.4 years for men). Significant inter-gender disproportions of this index are connected first and foremost with a super high death rate of men caused by cardiovascular diseases, malignant tumors and also external causes of mortality. Still on the high level is mortality from AIDS and active tuberculosis. For instance, mortality from tuberculosis is 26 times higher than the corresponding average index for the countries of the *old* EU.

Another important factor of the state's demographic crisis is the current migration situation. According to experts, labor migration from Ukraine is estimated at 1.5-7 million people (International Migration Report..., 2013). According to the data of Oleksandr Yaremenko Ukrainian Institute for Social Research and the Center *Social monitoring* collected in spring 2015, 20.7% of respondents answered positively to the question *Would you like to emigrate from the country?* (Monitoryng gromads'koji dumky..., 2015). Among the motives for leaving the country the prevailing were wish to pay for children's education (86%), building of a house or improvement of living conditions (72%), providing a decent living for their families (69%), wish to pay off debts (59% of the surveyed). The majority of migrants were women. The deepening of economic crisis in 2014-2015 led to an abrupt worsening of the situation on the labor market, and devaluation of the national currency caused a critical lowering of an average salary to the equivalent of 200 USD as of November 2016. It gave a new incentive to migration.

### **Problems of the health pillar of sustainable development**

Analysis of population's health condition indicators is a proof of the degradation of Ukraine's population quality because of the permanent demographic cri-

sis. The research carried out in 188 countries in 2015 measuring the health-related Sustainable Development Goals indicated that Ukraine is only on the 118<sup>th</sup> place in the rating of world countries by the total value of health related SDG indicators. For the estimation of the total index of population's health condition in the context of sustainable development goals, altogether 33 indicators were chosen, they included *indicators for health services, health outcomes, and environmental, occupational, behavioral, and metabolic risks with well-established causal connections to health* (GBD, 2015; SDG Collaborators, 2016, p. 3). The value of the estimated indicator changes in different countries from 85 (the best situation, the first place in the rating is Iceland) to 20 (the worst situation, 188th place in the rating is the Central African Republic). In Ukraine, the indicator's value was 54 as of 2015. A considerably better situation could be observed in other post-socialistic countries, such as Poland (indicator 85, 39<sup>th</sup> place in the world countries' rating), Czech Republic, Hungary, Slovakia, Lithuania, Latvia, Romania. By the total value of the health-related sustainable development indicator Ukraine is in a worse situation than other post-Soviet countries, such as Uzbekistan, Turkmenistan, Kazakhstan and other countries.

Table 8. Health-related SDG index in Ukraine compared to other post-socialistic countries in 2015, source: based on *GBD 2015 SDG Collaborators* (2016)

| Countries      | Health-related SDG index | Rank |
|----------------|--------------------------|------|
| Ukraine        | 54                       | 118  |
| Poland         | 72                       | 39   |
| Czech Republic | 74                       | 34   |
| Hungary        | 73                       | 36   |
| Slovenia       | 76                       | 25   |
| Lithuania      | 68                       | 48   |
| Latvia         | 69                       | 45   |
| Uzbekistan     | 67                       | 55   |
| Turkmenistan   | 66                       | 60   |
| Armenia        | 61                       | 86   |
| Kazakhstan     | 62                       | 85   |
| Tajikistan     | 59                       | 99   |

Poor population health and related social exclusions are connected first of all with the existing financial limits in access to quality medical service. Share of healthcare expenses in % of the GDP in 2014 was 7.4% in Ukraine, whereas in the majority of European countries it was at the level of 10%. By the ratio of the available number of physicians and hospital beds, Ukraine is on the level, or even surpasses, European countries. However, the problem is in the financial access to quality medical services and limited access of village inhabitants to emergency medical aid. There is a scarcity of medical institutions and staff in rural areas (around 9 thousand of Ukrainian villages do not have medical institutions at all; staff scarcity is estimated at 20%). Another crucial problem is the village roads' condition and lack of

ambulance vehicles. Despite the guaranteed by the Constitution of Ukraine the right to free medical aid in state and communal medical institutions, in many cases patients have to pay for medical services out of their own. Results of the research conducted in June 2012 among the population of Bulgaria, Romania, Lithuania, Poland, Hungary and Ukraine concerning informal payments in health protection institutions, revealed that in Ukraine 53% of the respondents made informal payments in such institutions, and 58% of the respondents gave presents to the medical staff for the rendered services (Stepurko et al., 2015). According to the data of Ukrainian households' survey conducted in October 2015, 29.3% of the households which needed medical assistance failed to receive it due to the different reasons (Samoocinka naseleennjam...2016). The biggest difficulty was to buy medication (was indicated by 25.4% of the households from the total number of those who needed medical assistance), doctor's house call and medical tests (15.3% for each reason), getting medical assistance at an in-patient clinic (13.2%). Moreover, the difficulty with purchasing medications did not depend on the place of residence.

An epidemiologic transformation in Ukraine also follows its own path completely different from other European countries, in particular, there is a shift in the main death causes from contagious to chronic and civilization diseases (such as cardiovascular diseases, malignant tumors (Murray et al., 2013). Analysis of the main health condition indicators of the Ukrainian population for the period of 1990-2015 showed that the country lives in a permanent crisis in view of the constant growth of population incidence, prevalence, and death rate caused by social and civilization diseases (table 9).

The incidence rate among the village population increased significantly. Nearly 35% of rural population suffer from chronic illnesses which last 6 months and more (Terešchenko & Moroziuk, 2014). According to households' sociological research, the most wide-spread are hypertension and heart diseases – correspondingly 43.6% and 26.4% of village inhabitants reported living with these chronic diseases (Samoocinka naseleennjam...2016). During 1990-2015 the number of diseases of blood and hematopoietic organs, endocrine system, diet and metabolic disorders, cardiovascular diseases increased twice among the rural inhabitants; 1.5 times increase was noticed in tumors, diseases connected with pregnancy and labor, congenital development defects.

Indicators of self-estimation of population's health are not only significant indicators of the social health state, but they also provide verification of the existing statistical information about the sickness rate for various illnesses. According to the sampling inquiry of households' life conditions in Ukraine in October 2015, people who estimated their health as satisfactory prevailed, whereas in the EU counties people with good health dominated. Almost every second

Table 9. Dynamics of certain indicators of the population's health in Ukraine in 1990-2015, source: based on *Pokaznyky zdorovja naseleennja...* (2015)

| Indices  | Ukraine |       |       |                   |       |
|--|---------|-------|-------|-------------------|-------|
|  | 1990    | 1996  | 2002  | 2009              | 2015  |
| Death rate due to circulatory system diseases per 100,000 people | 641.5   | 879.0 | 965.4 | 1002.1            | 946.0 |
| Death rate due to malignant neoplasms per 100,000 people         | 195.4   | 192.4 | 197.2 | 191.0             | 186.0 |
| Death rate due to external death causes per 100,000 people       | 107.2   | 158.0 | 158.3 | 106.5             | 80.8  |
| Death rate due to respiratory system diseases per 100,000 people | 71.8    | 86.0  | 66.0  | 45.9              | 32.6  |
| Tuberculosis incidence rate per 100,000 people                   | 31.9    | 45.8  | 75.6  | 72.7              | 56.0  |
| AIDS incidence rate per 100,000 people                           | 0.002   | 0.293 | 2.790 | 12.8 <sup>1</sup> | 19.9  |
| Incidence rate of malignant tumors per 100,000 people            | 301.2   | 309.4 | 322.0 | 331.5             | 314.2 |

<sup>1</sup> data as of 2010.Table 10. Population's distribution according to health self-estimation in Ukraine and EU-countries, source: based on the data of *Eurostat, Samoocinka naseleennjam...* (2016)

| Administrative unit | Share of the people at the age of 18 and older who estimated their health as |              |      | Share of the population aged 16 and older who reported having chronic illnesses or health problems |
|---------------------|--|--------------|------|--|
|                     | good   | satisfactory | bad  |  |
| Ukraine             | 43.3   | 45.0         | 11.7 | 41.8   |
| EU                  | 66.8   | 23.3         | 9.9  | 32.6   |

person in Ukraine at the age of 16 and older suffers from chronic illnesses, or health problems which last 6 months and longer (table 10). It is important to note that the rural population estimates their health more optimistically. However, there is a higher death rate among rural inhabitants. And apart from that their representatives often die from neglected forms of diseases.

## Conclusion

Ukraine as a European country declares compliance with the sustainable development principles and aims to change towards the implementation of this social ideology. However, in reality the implementation of sustainable and inclusive development concepts is occurring slowly and unsystematically, and it almost stopped during the last years.

Difficulties in the transition to the sustainable and inclusive development are caused by a whole range of factors culminating in the unfinished democratic transition of Ukraine, particularly in the delay of its last stage – a democratic consolidation, as a result of the formation of the oligarch class in the state. It started actively interfering with politics which slowed down democratic reforms, strengthened the corruption and the clan system, caused degradation of the Ukrainian state, society and economy. The movement towards the sustainable development for Ukraine is significantly determined by its geopolitical location between the democratic European Union and the authoritative Russia, the internal division of the country into two parts with considerable differences of identity and values of the population.

A complex combination of internal and external factors led to the acute political crisis in Ukraine in 2004 and 2014. The last one, on the one hand, caused the annexation of Crimea and a de facto occupation of the East of Ukraine by Russia, economic recess, lower living standards, on the other hand it caused a swift population consolidation in the face of external threat and, hopefully, the final choice of the democratic way of development. In 2015-2016, the political and economic situation stabilized, started the implementation of reform aimed at solving the problems that have been hindering the sustainable development for many years.

Among such problems of economic and social development of Ukraine one should first of all emphasize a large-scale corruption on all levels, low salary standards, the poverty problem, closely connected with children's presence in the households, increased risks of sudden poverty, low coverage of the poorest population with social benefits, significant disproportion between the income in the households of the capital region and peripheral rural areas.

In the implementation of sustainable development component, the most prominent are the problems of the aftermath of Chornobyl nuclear disaster, the decrease of the index of forest density, a small share of nature protection areas compared to the total territory of the country, compliance of the nature preservation laws of Ukraine with the EU directives, environmental risks that occur in a connection with the military conflict in the East of the country.

A combination of situational factors brought about by unsolved political, socio-economic and environmental problems led to a significantly different de-

mographic transition in Ukraine to other European countries. The country, in fact, ended up in a severe demographic crisis caused by decrease of the birth rate index, increase of the death rate index, especially among working age men, decrease of the marriage rate and increase of the divorce rate, fast pace of population aging and population migration outflow.

As a result of a permanent demographic crisis the degradation of Ukraine's population quality could be observed which could be proved by the analysis of the population health indicators. The population health decline and other health-related social exclusions are caused, first of all, by the problem of financial access to qualified health services and a limited access of village dwellers to emergency medical aid. The growth of incidence and death rate indicators caused by social and civilization illnesses is still ongoing. Therefore, Ukraine on its way to sustainable development and inclusive development is facing a complex range of typical and untypical social problems. A certain uniqueness of the situation and the geopolitical importance of Ukraine constantly puts in the spotlight the question of its support on the way to sustainable development on behalf of democratic countries. However, this support should be encouraged by the Ukrainian population consolidation towards the democratic choice and the decisive actions of the Ukrainian government towards the reforms recently implemented in the countries of Central and Eastern Europe to overcome the legacy of the authoritarian regimes.

## References

1. ADEF-UKRAJINA, 2008, *Šlub, Sim'ja Ta Ditorodni Orijentaciji V Ukrajinu*, Kyjiv 2008.
2. BALAKIRIEVA O.M., ČERNENKO S.M., 2009, Nerivnomirnist' dochodiv naselennja Ukrainy jak socialno-ekonomična problema, in: *Ukrajins'kyj socium*, vol. 3 no 30, p. 49-64.
3. BOBUCH I.M., 2013, Formuvannja luds'kogo potencijalu v Ukrajinu: analitičny zistavlennja i naprjamky udoskonalennja, in: *Demography and Social Economy*, vol. 2, no. 20, p. 70-79.
4. CILI ROZVYTKU TYSIAČOLITTJA. UKRAJINA: 2000-2015. *Nacionalna dopovid'*. Kyjiv 2015.
5. D'ANIERI P., 2012, Conclusion: Nowhere nation or better life? Ukraine's past and future, in: *Communist and Post-Communist Studies*, vol. 45, p. 457-459.
6. DERŽAVNA SLUŽBA STATYSTYKY UKRAJINY, 2016, *Samoocinka Naselennjam Stanu Zdorov'ja Ta Rivnja Dostupnosti Okremych Vydiv Medyčnoji Dopomogy U 2015 Roci*, Kyjiv.
7. DERŽAVNA SLUŽBA STATYSTYKY UKRAJINY, 2016, *Dovkillja Ukrainy Za 2015 Rik, Statystyčnyj zbirnyk*, Kyjiv.
8. DERŽAVNA SLUŽBA STATYSTYKY UKRAJINY, 2017, *Socialno-demografični Charakterystyky Domogospodarstv Ukrainy U 2016 Roci*, Kyjiv 2017.
9. DERŽAVNA SLUŽBA STATYSTYKY UKRAJINY, 2016, *Statystyčnyj Ščoričnyk Ukrainy Za 2015 Rik*, Kyjiv.
10. DERŽAVNA SLUŽBA STATYSTYKY UKRAJINY, *Vytraty I Resursy Dogospodarstv* for different years, Kyjiv.
11. *ECONOMIST INTELLIGENCE UNIT*, <http://www.eiu.com/> (2.01.2017).
12. *EUROPE-2020 targets*, [http://ec.europa.eu/europe2020/pdf/targets\\_en.pdf](http://ec.europa.eu/europe2020/pdf/targets_en.pdf) (2.01.2017).
13. *EUROPEAN HEALTH FOR ALL DATABASE (HFA – DB)*, 2016, <http://www.euro.who.int/en/data-and-evidence/databases/european-health-for-all-database-hfa-db> (1.12.2016).
14. FREEDOM HOUSE, 2016, *Nations in Transit*, <https://freedomhouse.org/report/nations-transit/nations-transit-2016> (25.11.2016).
15. GATSKOVA K., 2013, Distributive justice attitudes in Ukraine. Need, desert or social minimum? in: *Communist and Post-Communist Studies*, vol. 46, p. 227-241.
16. GBD 2015 SDG COLLABORATORS, 2016, Measuring the health-related Sustainable Development Goals in 188 countries: a baseline analysis from the Global Burden of Disease Study, in: *The Lancet*, vol. 388, no. 10053, p. 1813-1850.
17. GLOBAL FOOTPRINT NETWORK, 2010, *Ecological Footprint Atlas*, Oakland.
18. *GLOBAL METRICS FOR THE ENVIRONMENT*, 2016, The Environmental Performance Index ranks countries' performance on high-priority environmental issues, [http://epi.yale.edu/sites/default/files/2016EPI\\_Full\\_Report\\_opt.pdf](http://epi.yale.edu/sites/default/files/2016EPI_Full_Report_opt.pdf) (10.10.2016).
19. GUPTA J., POUW N.R.M., ROS-TONEN M.A.F., 2015, Towards an Elaborated Theory of Inclusive Development, in: *European Journal of Development Research*, vol. 27, p. 541-559.
20. HANCOCK T., 1993, Health, human development and the community ecosystem: three ecological models, in: *Health Promotion International*, vol. 8, p. 41-47.
21. HARDING R., 2006, Ecologically sustainable development: origins, implementation and challenges, in: *Desalination*, vol. 187, p. 229-239.
22. HARRIS J.M., WISE T.A., GALLAGHER K.P., GOODWIN N.R., *A Survey of Sustainable Development, Social and Economic Dimensions*, Island Press, Washington, Covelo, London 2001.
23. HUNTINGTON S.P., *The Clash of Civilization and the Remaking of World Order*, Simon & Schuster, New York 1996.
24. KJÆRGÅRD B., LAND B., BRANSHOLM PEDERSEN K., 2013, Health and sustainabil-



- ity, in: *Health Promotion International*, <http://heapro.oxfordjournals.org/> (4.04.2016).
25. KOROSTELINA K.V., 2013, Ukraine twenty years after independence: Concept models of the society, in: *Communist and Post-Communist Studies*, vol. 46, p. 53-64.
  26. KUDELIA S., The sources of continuity and change of Ukraine's incomplete state, in: *Communist and Post-Communist Studies*, vol. 45, p. 417-428.
  27. KUZIO T., 2012, Twenty years as an independent state: Ukraine's 10 logical inconsistencies, in: *Communist and Post-Communist Studies*, vol. 45, no. 3-4, p. 429-438.
  28. KUZIO T., 2014, Crime, politics and business in 1990s Ukraine, in: *Communist and Post-Communist Studies*, vol. 47, p. 195-210.
  29. LESTHAEGHE R., NEELS K., 2002, From a first to a second demographic transition – An interpretation of the spatial continuity of demographic innovation in France, Belgium and Switzerland, in: *European Journal of Population*, vol. 18, p. 325-360.
  30. LOMAKA I., 2013, Teoretyko-metodologični aspekty polityčnoji transformaciji ta modernizaciji v sučasnij Ukraini, in: *Visnyk Prykarpats'kogo Universytetu, Politologija*, vol. 6-7, p. 43-49.
  31. MAKAROVA O. V., 2011, Socialne vidtorgnennja v Ukraini: specyfika projaviv ta metodologija ociniuvannja, in: *Demography and Social Economy*, vol. 1, p. 57-68.
  32. MATLOCK JR., JACK F., 2000, *The Nowhere Nation*, New York review of Books, p. 41-44.
  33. MINIENKOVA N., 2013, Specyfika demokratyčnogo tranzytu v Ukraini u konteksti procesiv systemnoji transformaciji, in: *Visnyk Prykarpats'kogo Universytetu, Politologija*, vol. 6-7, p. 63-66.
  34. MINISTERSTWO OCHORONY ZDOROV'JA UKRAJINY (Centr Medyčnoji Statystyky), 2016, Pokaznyky Zdorov'ja Naseleennja Ta Vykorystannja Resursiv Ochorony Zdorov'ja V Ukraini za 2015 rik, 2016, MOZ Ukrainy, Kyjiv.
  35. MONITORING GROMADS'KOJI DUMKY NASELENNJA UKRAJINY: BEREZEN'-KVI-TEN', 2015, Ukrain's'kyj Instytut Socialnych Doslidžen' im. O. Jaremenka, Centr 'Socialnyj monitoring', [http://www.uisr.org.ua/img/upload/files/2015%2004%2009%20PR\\_SMC&UISR.pdf](http://www.uisr.org.ua/img/upload/files/2015%2004%2009%20PR_SMC&UISR.pdf) (4.05.2016).
  36. MURRAY C.J.L., ABRAHAM J., ALI M.K., ALVARADO M., ATKINSON C., BADDOUR L.M., et al. 2013, The state of US health, 1990-2010: burden of diseases, injuries, and risk factors, in: *JAMA*, vol. 310, p. 591-006.
  37. NEKRASENKO L.A., 2014, Vuglecevyj slid jak instrument ekologicznego menedžmentu v Ukraini, in: *Ekonomični problemy stalogo rozvytku*, ed. Prokopenko O. V., SumDU, Sumy, p. 25-26.
  38. PANTYLEJ W., *Przemiany społeczno-gospodarcze a stan zdrowia ludności Ukrainy w latach 1990-2002*, Wydawnictwo UMCS, Lublin 2008.
  39. PAWŁOWSKI A., 2008, How many dimensions does sustainable development have?, in: *Sustainable Development*, vol. 16, no. 2, p. 81-90.
  40. PETROJE O.M., VASILJEV V.T., 2015, Mižnarodna trudova migracija: analiz situaciji ta naslidkiv dla Ukrainy, in: *Visnyk NAPA*, vol. 4, p. 93-100.
  41. PRYBYTKOVA I., 2000, Demografičnyj rozvytok Ukrainy u 1999-h rokach, in: *Sociologija: teorija, metody, marketyng*, vol. 3, p. 69-85.
  42. RAUNIYAR G., KANBUR R., 2010, *Inclusive development: Two papers on conceptualization, application, and the ADB perspective*, <http://www.kanbur.dyson.cornell.edu/papers/ADBCompendiumInclusiveDevelopment.pdf> (30.06.2016).
  43. RIABCHUK M., 2012, Ukraine's 'muddling through': National identity and postcommunist transition, in: *Communist and Post-Communist Studies*, vol. 45, no. 3, p. 439-446.
  44. SHIVA V., *Earth Democracy: Justice, Sustainability, and Peace*. Zed Books Ltd., London 2005.
  45. STEPURKO T., PAVLOVA M., GRYGA I., MURAUŠKIENE L., GROOT W., 2015, Informal payments for health care services: the case of Lithuania, Poland and Ukraine, in: *Journal of Eurasian Studies*, vol. 6, no. 1, p. 46-58.
  46. SUSHKO O., PRYSTAYKO O., 2016, *Ukraine – Freedom House*, [https://www.freedomhouse.org/sites/default/files/NIT13\\_Ukraine\\_1stProof.pdf](https://www.freedomhouse.org/sites/default/files/NIT13_Ukraine_1stProof.pdf) (25.11.2016).
  47. *SUSTAINABLE SOCIETY INDEX – your compass to sustainability*, <http://www.ssindex.com/> (2.01.2017).
  48. TEREŠČENKO V.K., MOROZIUK N.V., 2014, Problemy formuvannja ta perspektyvy vykorystannja luds'kogo potencialu sils'kyh terytorij, in: *Visnyk Dnipropetrovs'kogo Universytetu. Serija Ekonomika*, vol. 22, no. 8(4), p. 53-59.
  49. TRANSPARENCY INTERNATIONAL, 2015, *Corruption perceptions index*, <http://www.transparency.org/cpi2015> (27.11.2016).
  50. UN, Department of Economic and Social Affairs Population Division, *International Migration Report*, 2015, 2016, <http://www.un.org/en/development/desa/population/migration/publications/migrationreport/docs/MigrationReport2015.pdf> (5.01.2017).

51. VAN DE KAA D.I., 2004, The true commonality: In reflexive societies fertility is a derivative, in: *Population Studies*, vol. 58(1), p. 77-80.
52. VORONA V.M., ŠULGA M. (eds.), 2013, *Ukrajins'ke Suspilstvo 1992-2013. Stan Ta Dynamika zmin. Sociologičnyj Monitoring*, Instytut Sociologiji NAN Ukrainy, Kyjiv.
53. WCED, 1987, *Our Common Future*, Oxford University Press, Oxford.
54. WHO and the Government of South Australia, 2010, The Adelaide Statement on Health in All Policies: moving towards a shared governance for health and well-being, in: *Health Promotion International*, vol. 25, p. 258-260.
55. WORLD RISK REPORT 2014, United Nations University, Institute for Environment and Human Security, <https://i.unu.edu/media/ehs.unu.edu/news/4070/11895.pdf> (10.10.2016).
56. ZGUROVSKYJ M.Z. (ed.), 2013, *Analiz Stalogo Rozvytku: Globalnyj I Regionalnyj Konteksty. Častyna 2: Ukrajina V Indykatorach Stalogo Rozvytku*, NTUU 'KPI', 'Politechnika', Kyjiv.
57. ZGUROVSKYJ M.Z. (ed.), 2009, *Stalyj Rozvytok Regioniv Ukrainy*, NTUU 'KPI', 'Politechnika', Kyjiv.

## Youth Attitudes Towards Goals of a New Sustainable Development Agenda

### Postawy młodzieży wobec celów Nowej Agendy na rzecz zrównoważonego rozwoju

**Tatjana Borojević\*, Matjaž Maletič\*, Nataša Petrović\*\*,  
Jelena Andreja Radaković\*\*, Marjan Senegačnik\*, Damjan Maletič\***

*\*University of Maribor, Faculty of Organizational Sciences, Slovenia*

*\*\*University of Belgrade, Faculty of Organizational Sciences, Serbia*

*Corresponding Author: Nataša Petrović,*

*University of Belgrade, Faculty of Organizational Sciences*

*Center for Environmental Management and Sustainable Development,*

*Jove Ilica 154, 11040 Belgrade, Serbia*

*E-mail: petrovicn@fon.bg.ac.rs*

---

#### Abstract

The whole world adopted a global strategy as the only possible one – a global development strategy based on the principles of sustainability. This strategy includes not only all types of politics, economies and societies, but is also an integral part of life and wellbeing of all people. A new sustainable development agenda for the period 2015-2030 identifies youth not only as a category much more sensitive to sustainability, but in each of its 17 goals of sustainable development emphasizes the role of young people and the need for their active participation in the promotion and realization of these objectives and its targets. Bearing this in mind, the research presented in the paper deals with young people's knowledge on sustainable development, the strategy of sustainable development, and their attitudes towards the goals of sustainable development in the context of what they themselves find most important. Obtained results in the case study of the Republic of Serbia, not only show the results of the analysis of young people's viewpoints on these crucial issues but also of a good way to continue research in this area not only by the authors of the paper but other researchers who are engaged in activism and participation of youth in sustainable development as well.

**Key words:** youth, youth attitudes, sustainable development, sustainability, sustainable development goals

#### Streszczenie

Spółeczność międzynarodowa przyjęła strategię rozwoju globalnego opartą na zasadach zrównoważoności. Uwzględnia ona nie tylko wszystkie występujące typy polityk, ekonomii i społeczeństw, ale także dobrostan wszystkich ludzi. Nowa Agenda dla zrównoważonego rozwoju obejmująca lata 2015-2030 wskazuje na młodzież jako na grupę bardziej wrażliwą na zagadnienie zrównoważoności. W każdej z 17 grup celów zrównoważonego rozwoju podkreśla rolę, jaką powinni w tych ramach odgrywać młodzi ludzie i wskazuje na potrzebę ich aktywnego uczestnictwa w promocji i realizacji założonych celów. Niniejsza praca prezentuje wyniki badań odnoszących się do wiedzy młodych ludzi o zrównoważonym rozwoju, strategii zrównoważonego rozwoju, a także ich postaw odnośnie celów zrównoważonego rozwoju i ich własnych przekonań. Badania przeprowadzone w Republice Serbii omawiają opinie młodzieży na te ważne tematy, a ponadto wskazują na ważny kierunek badań nie tylko dla autorów tego artykułu, ale także innych naukowców zaangażowanych we włączenie młodych ludzi w pracę dla zrównoważonego rozwoju.

**Słowa kluczowe:** młodzież, postawy młodzieży, rozwój zrównoważony, zrównoważoność, cele rozwoju zrównoważonego

---

## 1. Introduction

In 1992, the governments participating at the Earth Summit made a historic agreement on sustainable development, indicating it as an economic system that promotes the health and survival of both people and all ecosystems (Roseland, 2005; Wheeler & Beatley, 2009). The definition of sustainable development which is commonly used, gave Lester Brown, founder of the Worldwatch Institute. This definition can be found in the report *Our Common Future: Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs* (WCED, 1987).

On this definition lie all the efforts of international policies, not only in relation to the environmental protection, but also in relation to the global sustainability of all societies (Borojević, Petrović, & Vuk, 2014). The concept of sustainable development was proclaimed in 1989 at the Ministerial Conference (Bergen Convention) organized by the Government of Norway in cooperation with the United Nations Economic Commission, the following year (1990) the concept of sustainable development was adopted by the European Union. In 1993 United Nations Commission for Sustainable Development was founded with the principal aim to oversee the implementation of the adopted documents and other acts. Then, after a series of conferences, in August 2002 the World Summit on Sustainable Development in Johannesburg (Earth Summit, 2002) was organized. At this Summit, the participating states agreed that they will in the shortest time possible approach the formulation and adoption of national strategies for sustainable development. Then the definition of sustainable development was last amended by gaining a new dimension – the environmental protection, the first time economic and social goals on the road to achieving development at the local and global levels were added. Thus laying the foundations for the development of a framework, value systems and indicators with the aim of understanding, motivating and evaluation of sustainability (Berg, 2009; Roseland, 2000; Roseland, 2005).

Later on, these frameworks are improved with values that refer to natural, physical, economic, human, social and cultural capital (Roseland, 2005) in which an important, if not crucial, role play the young people, because not only that there was an understanding of the necessity of increasing the democratic decision-making and public involvement in all issues of vital importance for sustainability, but also to test various mechanisms for introducing this process into daily decision making that will actively involve young people (Borojević, Petrović, & Vuk, 2015; UNECE, 1998). When it comes to young people it should be emphasized that *there is no universally accepted and one definition of 'youth', thus, youth may be defined as a relatively particular ensemble which*

*each society identifies as such, and generally represents the age group, the so-called young generation ranging from 14 to 30 years of age* (Borojević, Vuk, Petrović, & Slović, 2015).

Further on, *sustainability is heralded worldwide as an idea, a process, a strategy and/or an objective that allows to address the current situation of concatenated ecological, social and economic crisis, labeled together as 'global change'* (Biggs, Biggs, Dakos, Scholes, & Schoon, 2011; Hugé, Block, Waas, Wright, & Dahdouh-Gueba, 2016). Also, there is much discussion about how one defines sustainability, and related concepts (Costanza, 1991; Costanza and Patten, 1995; Hugé et al., 2016; Pearce and Atkinson, 1993; Pezzey, 1989; WCED, 1987). Besides that, it is important to note that sustainability is a multidimensional concept that involves the consideration and integration of economic, social and environmental aspects (e.g. Pawlowski, 2010; WCED, 1987). Also, all definitions of sustainability must meet the following criteria (Sustainable Measures, 2016):

- *Living within the limits.*
- *Understanding the interconnections among economy, society, and environment.*
- *Equitable distribution of resources and opportunities.*

Some definitions of sustainability are:

- *Sustainability refers to improving the quality of human life while living within the carrying capacity of supporting eco-systems* (IUCN and WWF, 1991).
- *Sustainability is the as long-term health and vitality of a region, including the cultural, economic, environmental and social aspects as one whole* (Sustainable Seattle, 2016).
- *Sustainability calls for a decent standard of living for everyone today without compromising the needs of future generations* (UN, 2016a).
- *Sustainability is based on a simple principle: Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. To pursue sustainability is to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations* (EPA, 2016).
- *Sustainability is comprehensive and systemic concept with goal to maximize the welfare of environment, economy, and society* (Maletič, Maletič, Dahlgaard, Dahlgaard-Park, & Gomišček, 2014; Vallance, Perkins, & Dixon, 2011).
- *Sustainability is development that meets the needs of the present while safeguarding Earth's life-support system, on which the welfare of current and future generations depends* (Griggs et al., 2013).

It should be noted that *recently, literature has paid attention to developing an integrative framework to*

*define and evaluate sustainability practices* (Amini and Bienstock, 2014; Ilyana et al., 2015; Maletic, Maletic, Dahlgaard, & Dahlgaard-Park, 2015).

## 2. The role of youth participation in sustainable development

The importance of youth participation in issues of importance for sustainable development, and the need for active participation of young people in solving the problems of environmental sustainability is reflected in the fact that in 1983, in Stockholm formed an organization of the Youth and Environment Europe – YEE. This organization is a platform of many European youth organizations, dealing with the nature or ones that are active in environmental protection. Within YEE participate organizations from 28 countries. Activities of this platform include two main areas (YEE, 2016):

1. Support the work of member organizations through the promotion of exchange of information, ideas and experiences through publications and European coaching courses (eg. sustainable development, ecology and economy, sustainable tourism, energy, climate change...).
2. Coordination of member organizations' activities through the promotion of direct cooperation between individuals on topics of common interest and to the European working group, as well as through the organization of joint actions and campaigns related to environmental problems of European importance. These campaigns are campaigns on climate, campaigns on energy campaigns on sustainability, ozone (such as the following big campaign: Climate Campaign, Green Energy Go Campaign, Sustainability Campaign, Ozone Campaign).

The participation of youth stands out as a significant factor in achieving the goals of sustainable development set out in *Agenda 21* (UNSD, 1992), with an emphasis on openness, participation and democracy, while stressing its importance in the sustainability (Beatley, 1998; Berg, 2009; Chavis and Wandersman, 1990; Conroy and Berke, 2004; Granvik, 2005; Innes and Booher, 2001; Roseland, 2005; UNCHS, 1996). Also, the participation of young people must be one of the key approaches in the development of sustainability, bearing in mind that on the one hand, their involvement in the solution of sustainable development is not only important for their healthy growth, but also for more successful and better functioning of any society (Borojević, Petrović, & Vuk, 2015), on the other hand young people are the present and the future of every society, as well as the source of innovation and driving force of development (MOS, 2015).

In addition, in the *World development report 2007: Development and the Next Generation* it is emphasized that the youth represents the next generation of environmental, economic and social participants

(UN, 2007; World Bank, 2006) in the achievement of the Millennium development goals (UN, 2015a), and the Sustainable development goals (UN, 2015b). Thus, six of the eight Millennium Development Goals that were in force until 2015, are directly related to the standard of living of young people: Eradicate extreme poverty and hunger, Achieve universal primary education, Promote gender equality and empower women, Combat HIV/AIDS, malaria and other diseases, Develop a global partnership (UN, 2015b). Goals that Reduce child mortality and Improve maternal health are directly about young people.

## 3. Youth attitudes towards goals of the 2030 Agenda for Sustainable Development: A case study

The General Assembly of United Nations adopted a new sustainable development agenda *Transforming our world: the 2030 Agenda for Sustainable Development* for the period 2015-2030 on 25th of September 2015. The new agenda has 17 sustainable development goals and 169 targets which are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental (UN, 2015c).

The new 17 Sustainable development goals are (UN, 2015c):

- Goal 1: End poverty in all its forms everywhere.
- Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture.
- Goal 3: Ensure healthy lives and promote well-being for all at all ages.
- Goal 4: Ensure inclusive and quality education for all and promote lifelong learning.
- Goal 5: Achieve gender equality and empower all women and girls.
- Goal 6: Ensure access to water and sanitation for all.
- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all.
- Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all.
- Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation.
- Goal 10: Reduce inequality within and among countries.
- Goal 11: Make cities inclusive, safe, resilient and sustainable.
- Goal 12: Ensure sustainable consumption and production patterns.
- Goal 13: Take urgent action to combat climate change and its impacts.
- Goal 14: Conserve and sustainably use the oceans, seas and marine resources.

- Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss.
- Goal 16: Promote just, peaceful and inclusive societies.
- Goal 17: Revitalize the global partnership for sustainable development.

When it comes to the 2030 Agenda for Sustainable Development and the new 17 set objectives, it should be said that they are all directly related to young people and their essential role in their achievement because *children, young women and men are critical agents of changes and will find in the new Global Goals a platform to channel their infinite capacities for activism into the creation of a better world* (UN, 2015c).

### 3.1. Methodology

During the October of academic year 2016/2017, solely in scientific and academic purposes, an online research was conducted in the organization of the Centre for environmental management and sustainable development of the Faculty of Organizational Sciences – University of Belgrade, the Republic of Serbia. The starting point of research was the fact that the very concept of sustainable development is a relatively new concept in the Republic of Serbia (Milošević, 2016). Although the National strategy of sustainable development of the Republic of Serbia was adopted in 2008, there is not enough data, and not enough research in regards of the public, let alone the youth's attitudes and perception about this crucial issue (Borojevic, Petrovic, & Vuk, 2014; Borojević, Petrović, & Vuk, 2015; Borojević, Vuk, Petrović, & Slović, 2015). For these reasons, and taking into account all of the above, the aim of our research was to explore the youth's views on sustainable development, the National strategy of sustainable development of the Republic of Serbia, and new sustainable development goals. This survey included respondents from the following official statistical regions of the Republic of Serbia: Belgrade Region, Region of Vojvodina, Region of Sumadija and Western Serbia, and Southern and Eastern Serbia (Statistical Office of the Republic of Serbia, 2013).

For the purpose of this study, an electronic questionnaire was used on a sample of youth aged from 15 to 30 years old. The questionnaire consisted of 23 questions in total. The first four questions were general. From question five to question six, the examinees were asked to give their response on their views on sustainable development and the Strategy of sustainable development of the Republic of Serbia. From question seven to 23, the examinees were asked to rank the listed 17 sustainable development goals by using a five point scale (1 – the most significant, 2 – very significant, 3 – significant, 4 – not so significant, 5 – the least significant/insignificant). These questions fall into the category of the most significant

ones because they directly refer to the main goals of our research.

Main goals of the study were to gain answers to these three research questions:

- RQ1: Whether or not the youth is familiar with the term *sustainable development*?
- RQ2: Whether or not the youth is familiar with the goals of the Strategy of sustainable development of the Republic of Serbia?
- RQ3: How do young people evaluate the importance of sustainable development goals according to the new sustainable development agenda for the period 2015-2030?

In order to evaluate results of the questionnaire, we used statistical software package SPSS 24. Descriptive statistics have been used in order to analyze the characteristics of the sample. The relationship between categorical variables has been explored by Chi-Square test. The p value is used to indicate if the differences between particular groups that were in this research are statistically significant (where  $p < 0.05$  is considered statistically significant at the 95% confidence level).

### 3.2. Results and discussion

The representative sample included 1,586 respondents, and out of that number:

- female – 69 percent,
- male – 31 percent.

Age of respondents is the following:

- from 15 to 19 years – 17 percent,
- from 20 to 25 years – 41 percent,
- from 26 to 30 years – 42 percent.

Current status of education of respondents is:

- high school students – 16 percent,
- four-year high school completed – 27 percent,
- occupational school completed – 5 percent,
- college completed – 7 percent,
- students – 32 percent,
- faculty completed – 13 percent.

It must be noted that our sample was representative, except for the females/males ratio, because of the significantly larger number of female respondents. The reasons for this lies in the fact that (even though in the Republic of Serbia 51.3 percent out of the total youth population is comprised of women, (Statistical office of the Republic of Serbia, 2014a; Statistical office of the Republic of Serbia, 2014b) which makes the number of females in our sample for 17.7 percent higher) previous research showed that females are more likely to participate in surveys than males (Curtin, Presser, & Singer, 2000; Moore and Tarnai, 2002; Singer, van Hoewyk, & Maher, 2000; Smith, 2008). Also, knowing the fact that patterns in willingness to answer on surveys vary, however, depending on the survey topic (Amundsen and Lie, 2013) and that environmental and social pillars are the two of three pillars of sustainable development

and that females generally stressed that the protection of nature and the environment is an important aspect of human existence as well as females' behavior and beliefs focus more than males on social context (Eisler, Eisler, & Yoshida, 2003), resulting in an increased interest in the topic by women proved by the results of our research which found that 87.4 percent of female respondents are acquainted with the term sustainable development as opposed to males in which case this percentage is 77.3 (10.1 percent less), and that is what leads to a greater share of female respondents in our sample. In addition, although the goal of our research was not to deal with gender issues and sustainable development, such a large number of interested female respondents speaks of the need to continue this type of research, especially bearing in mind that previous research in this area is rather fragmented from a gender perspective because they are only focused on empowering women, achieving gender equality, and maximizing the economic, social and environmental role of women (Eisler, Eisler, & Yoshida, 2003; OECD, 2008; UNDP, 2017). For these reasons, in our research special attention was paid to the analysis of the results relating to the responses of females and males.

According to the goals and gained results of our research, we highlight the following observations:

1. Results of the responses to the question whether or not the youth are familiar with the term *sustainable development* are given in Table 1.

Table 1. Are you familiar with the term *sustainable development*?

| Answer                | %     |
|-----------------------|-------|
| Yes, I know it well   | 29.1  |
| I have heard of it    | 55.1  |
| No, never heard of it | 15.8  |
| Total                 | 100.0 |

A third of the respondents believe that they are well acquainted with the term *sustainable development*, more than a half of them stated that they have heard of it, and 15.8 percent of participants have never heard of the term. This last group of respondents who never heard of the concept of sustainable development is further analyzed and the results are that there is no significant difference in responses by gender, age and regions, and that when it comes to the education of the respondents, the results are as follows: secondary vocational schools – 27.8 percent, university students – 38.8 percent, graduates – 33.4 percent. These results, that do not associate the level of education with the correct answer to the research question, lead to a previous research related to environmental education in the Republic of Serbia, in which it was concluded that the data about educational curriculum and programs has shown an evident lack of formal and permanent environmental education at all levels of formal education. (Klemenovic, 2004; Pavlovic, 2011; Petrovic, 2010;

Petrovic, Jeremic, Petrovic, & Cirovic, 2014; Sakac, Cveticanin, & Sucevic, 2012; Trumic, Petrovic, & Radojicic, 2009). This is particularly important to point out, bearing in mind that environmental education programs contribute to educational reform in the sense of sustainability and sustainable development (Reilly, 2008; UNSD, 1992).

2. Results of the responses to the question whether or not they are familiar with the goals of the Strategy of sustainable development of the Republic of Serbia are given in Table 2.

Table 2. Are you familiar with the goals of the Strategy of sustainable development of the Republic of Serbia?

| Answer  | %     |
|---|-------|
| Yes, I know them well                             | 17.7  |
| I have heard of them, but know nothing about them | 46.8  |
| No, never heard of them                           | 35.4  |
| Total   | 100.0 |

As it can be clearly seen from the answers gained, more than a third of respondents do not know anything about the goals of the Strategy of sustainable development of the Republic of Serbia, while 46.8 percent have heard of them but are not informed as to what they are about. Only 17.7 percent of respondents are familiar with these goals. The results show that there is no significant difference in responses by gender, age, region and education level. Unfortunately this percentage is more than poor since it shows that nearly 80 percent of respondents are not familiar with the goals of sustainable development, and it shows, like in the case of the research question 1, the need for adequate formal and informal education, whose main theme must be sustainable development and the goals of sustainable development. It should be noted that when education for sustainable development is in question, it must be directed to some of the many existing sustainability issues (e.g. biodiversity, climate change, equity, and poverty). Ideally, efforts to reorient education will be based on national or local sustainability goals. A properly re-oriented curriculum will address local environmental, social, and economic contexts to ensure that it is locally relevant and culturally appropriate (UNESCO, 2012)

3. In the context of this study, subjects were asked to rank the 17 goals of sustainable development formed by the United Nations as a new global development Agenda for Sustainable Development, for the period until 2030, by importance. The results of their evaluation are presented in Table 3.

Based on the answers of respondents the following can be concluded:

- The most important sustainable development goals were found to be: End hunger, achieve food security and improved nutrition and promote sustainable agriculture; Ensure healthy lives and promote well-being for all at all ages

Table 3. The results of evaluation of sustainable development goals

| Sustainable development goals   | Arithmetic mean ( $t_n$ ) | Rank |
|---|---------------------------|------|
| End hunger, achieve food security and improved nutrition and promote sustainable agriculture                  | 2.07                      | 1    |
| Ensure healthy lives and promote well-being for all at all ages   | 2.14                      | 2    |
| Achieve gender equality and empower all women and girls   | 2.19                      | 3    |
| Promote inclusive and sustainable economic growth, employment and decent work for all                         | 2.27                      | 4    |
| End poverty in all its forms everywhere   | 2.33                      | 5    |
| Ensure access to water and sanitation for all   | 2.34                      | 6    |
| Ensure sustainable consumption and production patterns  | 2.34                      | 6    |
| Ensure inclusive and quality education for all and promote lifelong learning                                  | 2.34                      | 6    |
| Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss | 2.37                      | 9    |
| Take urgent action to combat climate change and its impacts   | 2.40                      | 10   |
| Ensure access to affordable, reliable, sustainable and modern energy for all                                  | 2.40                      | 10   |
| Build resilient infrastructure, promote sustainable industrialization and foster innovation                   | 2.44                      | 12   |
| Reduce inequality within and among countries  | 2.47                      | 13   |
| Make cities inclusive, safe, resilient and sustainable  | 2.51                      | 14   |
| Conserve and sustainably use the oceans, seas and marine resources  | 2.56                      | 15   |
| Revitalize the global partnership for sustainable development   | 2.61                      | 16   |
| Promote just, peaceful and inclusive societies  | 2.77                      | 17   |

and Achieve gender equality and empower all women and girls with marks of high importance: 2.07, 2.14 and 2.19. It can be said that these results were expected, bearing in mind that they are in the most direct connection with youth. Unfortunately the goals End hunger, achieve food security and improved nutrition and promote sustainable agriculture and Ensure healthy lives and promote well-being for all at all ages, are logically separated by high marks of significance considering that the Republic of Serbia belongs to poor countries, according to the data relating to economic indicators: gross domestic product (GDP) per capita, and level of actual individual consumption (AIC) *per capita*. These data are calculated by Eurostat for following

countries: the 28 EU Member States, three EFTA Member States (Iceland, Norway, and Switzerland), five EU candidate countries (Montenegro, the former Yugoslav Republic of Macedonia, Albania, Serbia and Turkey) and one potential candidate (Bosnia and Herzegovina) for 2012, 2013, 2014 and 2015. When taking into account both the above economic indicators, the Republic of Serbia takes up an unenviable place – 35 out of 37 countries (Eurostat, 2016). In addition, knowing that the Republic of Serbia is a postmodern traditional patriarchal society in transition in Southeast Europe, as well as looking at the position of women and gender roles that distinguish this society (Brunnbauer, 2002; Stojanović-Jovanović and Jovanović, 2015), and bearing in mind that a larger number of respondents are female (69 percent) it was to be expected that the goal Achieve gender equality and empower all women and girls got a mark of high importance.

- The least essential objectives of sustainable development were found to be: Conserve and sustainably use the oceans, seas and marine resources; Revitalize the global partnership for sustainable development and Promote just, peaceful and inclusive societies with marks of importance: 2.56, 2.61 and 2.77. When it comes to the relatively small relevance score assigned to the goal Conserve and sustainably use the oceans, seas and marine resources, this is quite understandable since the Republic of Serbia has no outlet to the ocean or the sea. What is worrying is that young people are assigning the lowest ratings to the goals relating to Revitalize the global partnership for sustainable development and Promote just, peaceful and inclusive societies. On the other hand, this is understandable bearing in mind that the results showed that 15.8 percent of participants have never heard of sustainable development. Furthermore, these results may lead to similarities with the results of the research related to youth activism – a case study of Belgrade region. A representative sample of 1,427 respondents showed *that more than a half of the respondents do not like to deal with social problems and more than one-third showed a mainly passive attitude towards issues of personal and social activism* (Borojević, Vuk, Petrović, & Slović, 2015).

Further on, one of the issues raised in this research is whether gender influences the series of questions asked. As for the first two set research questions: Are you familiar with the term *sustainable development*? and Are you familiar with the goals of the Strategy of sustainable development of the Republic of Serbia? our results showed that no difference occurred in the issue of familiarity by gender with the goals of the Strategy of sustainable development of the Republic of Serbia ( $p > 0.05$ ): 61 percent of male re-



Table 4. Answers by gender on question Are you familiar with the term *sustainable development*?

|       |  |  | Yes, I know it well | I have heard of it | No, never heard of it | Total  |
|-------|--|--|---------------------|--------------------|-----------------------|--------|
| Sex   | Male   | Count  | 177                 | 203                | 112                   | 492    |
|       |  | % within Sex   | 36.0%               | 41.3%              | 22.8%                 | 100.0% |
|       |  | % within Are you familiar with the term <i>sustainable development</i> ? | 38.3%               | 23.2%              | 44.8%                 | 31.0%  |
|       |  | % of Total   | 11.2%               | 12.8%              | 7.1%                  | 31.0%  |
|       | Female   | Count  | 285                 | 671                | 138                   | 1094   |
|       |  | % within Sex   | 26.1%               | 61.3%              | 12.6%                 | 100.0% |
|       |  | % within Are you familiar with the term <i>sustainable development</i> ? | 61.7%               | 76.8%              | 55.2%                 | 69.0%  |
|       |  | % of Total   | 18.0%               | 42.3%              | 8.7%                  | 69.0%  |
| Total | Count  | 462  | 874                 | 250                | 1586                  |        |
|       | % within Sex   | 29.1%  | 55.1%               | 15.8%              | 100.0%                |        |
|       | % within Are you familiar with the term <i>sustainable development</i> ? | 100.0%   | 100.0%              | 100.0%             | 100.0%                |        |
|       | % of Total   | 29.1%  | 55.1%               | 15.8%              | 100.0%                |        |

spondents are acquainted with the goals of the Strategy of sustainable development (24.4 percent know it well, 36.6 percent have heard of it) while 39 percent never heard of it; 64.6 percent of females are acquainted with these goals of the National strategy of sustainable development (15.6 percent know it well, 49 percent have heard of it) and 35.4 percent never heard of it. In contrast to these results, in terms of the responses by gender to the question *Are you familiar with the term sustainable development?* our results showed a difference (Pearson Chi-Square=58.473, df=2,  $p<0.01$ ). Answers by gender to the question whether or not they are familiar with the term *sustainable development* are given in Table 4. Analysis of the results shows that when it comes to males: 77.3 percent of respondents are acquainted with the term sustainable development of which – 36.8 percent of the respondents is well acquainted with the concept and significance of sustainable development, 41.3 percent had heard of sustainable development, while 22.8 percent, or one quarter had never heard of the concept of sustainable development. When it comes to females, the results are as follows: 87.4 percent is acquainted with the term sustainable development (10.1 percent more than males), 26.1 percent is well acquainted with the concept of sustainable development (which is 9.9 percent less than males, and speaks of the need to strengthen gender knowledge needed to achieve sustainable development and its goals, UN, 2016b), the highest percentage – 61.3 has heard about the sustainable development which corresponds to the research by Eisler, Eisler, & Yoshida (2003) that speak of the interest of women for the two pillars of sustainable development and for the environment and its protection as well as the social component because females' behavior and beliefs focus more on social context, and *traditionally females take more*

*responsibility for social needs and are more oriented towards the everyday social and physical environment* (Archer, 1996; Bussey and Bandura, 1999; Eisler, Wester, Yoshida, & Bianchi, 1999; Eisler, Eisler, & Yoshida, 2003; Maccoby and Jacklin, 1974; Moller and Serbin, 1996). In the end, only 12.6 percent of females never heard of the concept of sustainable development which is almost twice less than the percentage of males.

Analysis of the results of males and females in relation to their ranking of the 17 goals of sustainable development by their importance, showed differences ( $p<0.01$ ) occurred in the importance of the two sustainable development goals: Build resilient infrastructure, promote sustainable industrialization and foster innovation; and Conserve and sustainably use the oceans, seas and marine resources. These results indicated that the validity of these two goals dependent on the category of gender. The results showed following: males better ranked the goal Build resilient infrastructure, promote sustainable industrialization and foster innovation (2.14) than females (2.74); females better ranked the goal Conserve and sustainably use the oceans, seas and marine resources (2.41) than males (2.71). These differences could be explained in the case of the first goal with the results of previous research that speak about the traditional model of the gender division of labor within society which is based on a clear separation between gender in which, unlike women, men are primarily concentrated in productive activity (Barrientos, Kabeer, & Hossain, 2004), as well as the fact that the Republic of Serbia is a postmodern traditional patriarchal society in transition in which in the population of economically active population, males makes up 73.9 percent and females only 26.1 percent (Statistical office of the Republic of Serbia, 2016) which speaks of the reason why men assigned greater importance

to this objective in particular as regards to sustainable industrialization. When it comes to the other sustainable development goal, the results show that the females ranked it much better according to importance than males. This can be explained with the study results of the authors Eisler, Eisler, & Yoshida (2003) which speaks of gender differences in the perception of nature and the environment in favor of females, and particularly females perceived better the sea, than the males.

Further object of our analysis was the age of respondents. For the division of respondents into three groups the valid division of the Republic of Serbia was used (Tomanović and Stanojević, 2015): from 15 to 19 years, from 20 to 25 years and from 26 to 30 years. Our results showed that no difference occurred in the issues of familiarity with the term sustainable development by age and the goals of the Strategy of sustainable development of the Republic of Serbia ( $p > 0.05$ ). The respondents most acquainted with the concept of sustainable development is the category of respondents aged 20 to 25 years – 37.9 percent, while the least familiar is the category aged 15 to 19 – 16 percent; when it comes to the goals of the Strategy for Sustainable Development of the Republic of Serbia, the category of respondents aged 20 to 25 years knows them the best – 21.1 percent, while they are completely unknown for the category of respondents aged 15 to 19 years – 58.3 percent. Bearing in mind that respondents from the category of 15 to 19 years old were high school students, and that they demonstrated the worst results, it can be concluded that in the Republic of Serbia it is necessary to integrate education for sustainable development into primary and secondary schooling. Education Development Strategy in Serbia until 2020 speaks of this as well (*Sl. glasnik RS*, no. 107/2012, 2012) stating that the quality of teaching and learning at all levels of education must be established based on modern forms of work with the aim of developing the country on the principles of smart, sustainable and inclusive development. This is certainly possible because *reorienting a curriculum to address sustainability can take place at a classroom or national level* (UNESCO, 2006, 2012).

Further, analysis of the ranking marks by age of respondents of the 17 goals of sustainable development by their importance, showed differences ( $p < 0.01$ ) occurred in the importance of the three sustainable development goals: Ensure inclusive and quality education for all and promote lifelong learning; Take urgent action to combat climate change and its impacts; and Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss. In other words, the validity of these three goals dependent on the category of age, while the validity of the other goals did not depend on age categories. The results showed following:

- Respondents in the group of 15 to 19 years have given the lowest mark of importance – 2.49 to the goal Ensure inclusive and quality education for all and promote lifelong learning, while the respondents from 20 to 25 years assigned a rating 2.48, and those from the group of 26 to 30 years gave it the highest score of 2.04. It is expected that the results, especially for the second part of the objective, show that the group of respondents aged 15 to 19 years lower valued promotion of lifelong learning as opposed to the oldest group of respondents with the highest rating.
- When it comes to the goal Take urgent action to combat climate change and its impacts, assessment by groups of respondents are relatively approximate: 2.42, 2.39 and 2.39. Although, on this question the lowest mark of importance was given by the subjects of groups of 15 to 19 years, which once again confirms the need for the introduction of education for sustainable development into formal education in primary and secondary schools.
- The goal Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss got a mark of 2.35 from the group of 15 to 19 years old, by a group of 20 to 25 years it got a grade 2.43 (which is the lowest score), and those from the group of 26 to 30 years gave it 2.32 mark, again the highest one.

When it comes to the sizes of the places of residence, according to the Law on Territorial Organization of the Republic of Serbia territory of the Republic of Serbia is divided into municipalities, cities and the city of Belgrade (*Sl. glasnik RS*, no. 129/2007, 2007; no. 18/2016, 2016). Surveyed respondents, depending on the place of residence, were divided into two groups: city and municipality. Within the division of cities there are all cities together with the city of Belgrade. Our results showed that no difference occurred in the issues of familiarity with the term sustainable development and the goals of the Strategy of sustainable development of the Republic of Serbia ( $p > 0.05$ ) by the sizes of the places of residence of the respondents.

The analysis of the ranking score of respondents by the sizes of their places of residence of the 17 goals of sustainable development by their importance, showed a difference ( $p < 0.01$ ) that occurred in the importance of only one sustainable development goal: Build resilient infrastructure, promote sustainable industrialization and foster innovation. The results showed that the validity of this goal dependent on the category which refers to the place of residence. Respondents whose place of residence are cities allocated to this goal the average score of 2.51, while respondents whose residence are municipalities assigned to this objective the average score of

2.37, which argues that residents of the municipality due to its underdevelopment in relation to the cities, however, attach greater importance the construction of infrastructure, sustainable industrialization and innovation.

Analysis of the obtained results has opened up many issues of crucial importance for the development of sustainability and the role of young people in its achievement, and justifies the need to continue with this kind of research in the future, with a larger number of participants (especially male) and use of broader and more detailed research. This implies the use of expanded and enhanced methodology and questionnaire in this crucial area of youth development and of the entire Republic of Serbia, with the necessary consideration of gender issues.

#### 4. Conclusion

On one hand, youth represents a valuable resource in achieving sustainability goals in any society, and should be viewed as such:

- With their participation, they are able to develop and reach their own potential, while the emphasis would be on their contribution in the field of creativity and innovation.
- Active youth participation in decision making and actions, both on local and state levels, is of essential importance if we want to build a democratic, open, richer and sustainable society.

On the other hand, based on our research, several issues came to attention as urgent discussion topics:

- 15.8 percent of participants stated that they have never heard of sustainable development.
- More than a third of respondents do not know anything about the goals of the Strategy of sustainable development of the Republic of Serbia, while 46.8 percent have heard of them but are not informed as to what they are about.
- Obtained marks for youth attitudes towards goals of a new sustainable development agenda singled out the following goals as the most important ones according to young people: End hunger, achieve food security and improved nutrition and promote sustainable agriculture; Ensure healthy lives and promote well-being for all at all ages and Achieve gender equality and empower all women and girls had marks of high importance: 2.07, 2.14 and 2.19. While the least important goals were: Conserve and sustainably use the oceans, seas and marine resources; Revitalize the global partnership for sustainable development and Promote just, peaceful and inclusive societies with marks of importance: 2.56, 2.61 and 2.77.
- Gender roles are significant predictors of perception of sustainable development and sustainable development goals.

From this we can conclude that it is necessary to work on the development of formal and informal education of the youth in the Republic of Serbia, especially when it comes to terms like sustainable development, sustainable development goals and sustainability strategy, having in mind that *a basic premise of education for sustainability is that just as there is a wholeness and interdependence to life in all its forms, so must there be a unity and wholeness to efforts to understand it and ensure its continuation* (UNESCO, 2012), as well as fact that moving towards the goal of sustainability is critically dependent on education. This conclusion coincides with the fact that sustainability has attracted increasing attention in education since the Brundtland report from 1987 was published (WCED, 1987) which criticized the existing educational systems that do not teach about sustainability issues, emphasizing the need for educational programs that must incorporate education for sustainable development and sustainable society (Figueiró and Raufflet, 2015). Also, this education has to provide the knowledge and skills for promotion of sustainable development, sustainable lifestyles, human rights, gender equality, culture of peace and non-violence and global citizenship.

Further on, the youth should not only be informed and educated in the field of sustainable development, sustainable development goals and sustainability, but they should gain an opportunity to actively participate, which is at the same time, a goal of sustainable development itself. Youth participation is not just about developing active citizens or building democracy for the future. If participation is to be meaningful for young people, it is crucial that they can influence and shape decisions and actions when they are young and not only at some later stage in life. This means among other things that the views, attitudes of young people must be respected and be included in all decisions, particularly those of relevance to the implementation of sustainable development which *supports inclusive globalization* (Pawłowski, 2010). By carrying and encouraging youth participation, we contribute to the integration of the younger generation into the society, by helping them to not only cope with the challenges and pressures of being young, but with the problems of modern society and strategies of sustainability and sustainable development as well. Finally, *when youth are engaged, particularly when empowerment and development opportunities are provided, there are multiple benefits for society* (Ho, Clarke, & Dougherty, 2015; Maconachie, 2014; Powers and Tiffany, 2006).

#### References

1. AMINI M., BIENSTOCK, C.C., 2014, Corporate sustainability: an integrative definition and framework to evaluate corporate practice and

- guide academic research, in: *Journal of Cleaner Production*, 76, p. 12-19.
2. AMUNDSEN B., LIE E., 2013, *Fewer willing to participate in surveys*, <https://phys.org/news/2013-06-surveys.html> (21.01.2017).
3. ARCHER J., 1996, Sex differences in social behavior: Are the social role and evolutionary explanations compatible?, in: *American Psychologist*, 51, p. 909-917.
4. BARRIENTOS S., KABEER N., HOSSAIN N., 2004, *The Gender Dimensions of Globalization of Production*, [http://www.ilo.int/wcmsp5/public/---dgreports/---integration/documents/publication/wcms\\_079121.pdf](http://www.ilo.int/wcmsp5/public/---dgreports/---integration/documents/publication/wcms_079121.pdf) (22.01.2017).
5. BEATLEY T., 1998, *The Vision of Sustainable Community, Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities*, USA, Joseph Henry Press.
6. BERG P.G., 2009, *Timeless City land – Building the sustainable human habitat*, Uppsala.
7. BIGGS D., BIGGS R.O., DAKOS V., SCHOLES R., SCHOON M., 2011, Are we entering an era of concatenated global crises?, in: *Ecological Society*, 16(2), p. 27.
8. BOROJEVIĆ T., PETROVIĆ N., VUK D., 2015, Aktivizam mladih i zaštita životne sredine, in: *Zbornik radova simpozijuma SYM-OP-IS 2015: XLII Simpozijum o operacionim istraživanjima*, Srebrno jezero. (In Serbian)
9. BOROJEVIĆ T., PETROVIĆ N.B., VUK D., 2014, Youth and Environmental Education for Sustainable Development, in: *IJSR.NET*, 3(9), September 2014, p. 57-62.
10. BOROJEVIĆ T., VUK D., PETROVIĆ N., SLOVIĆ, D., 2015, The level of youth activism: Case study of the city of Belgrade, in: *Management*, 76, p. 23-30.
11. BRUNNBAUER U., 2002, From equality without democracy to democracy without equality? Women and transition in Southeast Europe, in: *SEER*, 03, p. 151-168.
12. BUSSEY K., BANDURA A., 1999, Social cognitive theory of gender development and differentiation, in: *Psychological Review*, 106, p. 676-713.
13. CHAVIS D.M., WANDERSMAN A., 1990, Sense of Community in the Urban Environment: A Catalyst for Participation and Community Development, in: *American Journal of Community Psychology*, vol. 18 no 1, p. 55-81.
14. CONROY M.M., BERKE P.R., 2004, What makes a good sustainable development plan? An analysis of factors that influence principles of sustainable development, in: *Environment and Planning A*, 36, p. 1381-1396.
15. COSTANZA R. (Ed.), 1991, *Ecological Economics: The Science and Management of Sustainability*, Columbia University Press, New York, NY.
16. COSTANZA R., PATTEN B.C., 1995, Defining and predicting sustainability, in: *Ecological Economics*, vol. 15 no 3, p. 193-196.
17. CURTIN R., PRESSER S., SINGER, E., 2000, The effects of response rate changes on the index of consumer sentiment, in: *Public Opinion Quarterly* 64, p. 413-428.
18. EARTH SUMMIT, 2002, <http://www.earthsummit2002.org/Es2002.pdf> (30.10.2016).
19. EISLER A.D., EISLER H., YOSHIDA M., 2003, Perception of human ecology: cross-cultural and gender comparisons, in: *Journal of Environmental Psychology*, vol. 23 no 1, p. 89-101.
20. EISLER A.D., WESTER M., YOSHIDA M., BIANCHI G., 1999, Attitudes, beliefs, and opinions about suicide: A cross-cultural comparison of Sweden, Japan, and Slovakia, in: *Latent contribution to cross-cultural psychology*, p. 176-191, Amsterdam, Swets & Zeitlinger.
21. EUROSTAT, 2016, *GDP per capita, consumption per capita and price level indices*, [http://ec.europa.eu/eurostat/statistics-explained/index.php/GDP\\_per\\_capita\\_consumption\\_per\\_capita\\_and\\_price\\_level\\_indices](http://ec.europa.eu/eurostat/statistics-explained/index.php/GDP_per_capita_consumption_per_capita_and_price_level_indices) (30.10.2016.).
22. FIGUEIRÓ P.S., RAUFFLET E., 2015, Sustainability in higher education: a systematic review with focus on management education, in: *Journal of Cleaner Production*, 106, p. 22-33.
23. GRANVIK M., 2005, *Implementation of the Habitat-agenda in local communities: Late modern living conditions and residents' interest, time for and real action in citizen participation, in a Swedish and Russian context*, Uppsala.
24. GRIGGS D., STAFFORD-SMITH M., GAFFNEY O., ROCKSTROM J., OHMAN M.C., SHYAMSUNDAR P., STFFEN W., GLASER G., KANIE N., NOBLE I., 2013, Sustainable development goals for people and planet, in: *Nature*, 495, p. 305-307.
25. HO E., CLARKE A., DOUGHERTY I., 2015, Youth-led social change: Topics, engagement types, organizational types, strategies, and impacts, in: *Futures*, 67, p. 52-62.
26. HUGÉ J., BLOCK T., WAAS T., WRIGHT T., DAHDOUN-GUEBA F., 2016, How to walk the talk? Developing actions for sustainability in academic research, in: *Journal of Cleaner Production*, 137, p. 83-92.
27. ILYANA A., HASRULNIZZAM W., MAHMOOD W., FAZLI M.H., FAUADI M., RAHMAN N., FATHIYAH A., 2015, Sustainability in Malaysian Palm Oil: A Review on Manufacturing Perspective, in: *Polish Journal of Environmental Studies*, vol. 24 no 4, p. 1463-1475.
28. INNES J.E., BOOHER D.E., 2001, Indicators for Sustainable Communities: A Strategy Building on Complexity Theory and Distributed

- Intelligence, in: *Planning Theory & Practice*, vol. 1 no 2, p. 173-186.
29. IUCN, U., WWF, 1991, *Caring for the Earth: a strategy for sustainable living*, IUCN, UNEP, WWF, Gland.
  30. KLEMENOVIC J., 2004, Činioci ekološkog vaspitanja i obrazovanja, in: *Pedagoška stvarnost*, vol. 50 no 5-6, p. 366-381.
  31. MACCOBY E.E., JACKLIN C.N., 1974, *The psychology of sex differences*, Stanford University Press, Stanford, CA.
  32. MACONACHIE R., 2014, Disposassions, exploitation or employment? Youth livelihoods and extractive industry investment in Sierra Leone, in: *Futures*, vol. 62 Part A(0), p. 75-82.
  33. MALETIC M., MALETIC D., DAHLGAARD J., DAHLGAARD-PARK, S.M., 2015, Do corporate sustainability practices enhance organizational economic performance?, in: *International Journal of Quality and Service Sciences*, vol. 7 no 2-3, p. 184-200.
  34. MALETIĆ M., MALETIĆ D., DAHLGAARD J.J., DAHLGAARD-PARK S.M., GOMIŠČEK, B., 2014, Sustainability exploration and sustainability exploitation: From a literature review towards a conceptual framework, in: *Journal of Cleaner Production*, 79, p. 182-194.
  35. MILOŠEVIĆ M., 2016, *Analiza stanja i perspektiva ekološkog koncepta održivosti u regijama Republike Srbije, master rad*, Beograd, Univerzitet u Beogradu – Fakultet organizacionih nauka, Univerza v Ljubljani – Fakulteta za upravo.
  36. MINISTRY OF YOUTH AND SPORTS (MOS), 2015, *National Youth Strategy –for the period 2015–2025*, <http://www.mos.gov.rs/wp-content/uploads/download-manager-files/NSMpercent202015-2025percent20ENGLISHpercent20.pdf> (04.10.2016).
  37. MOLLER L.C., SERBIN L.A., 1996, Antecedents of toddler gender segregation-cognitive consonance, gender-typed toy preferences and behavioral compatibility, in: *Sex roles*, 35, p. 445-460.
  38. MOORE D.L., TARNAI J., 2002, Evaluating nonresponse error in mail surveys, in: *Survey Nonresponse*, eds. Groves R.M., Dillman D.A., Eltinge J.L., Little R.J.A., John Wiley & Sons, New York, p. 197-211.
  39. OECD, 2008, *Gender and sustainable development: maximizing the economic, social and environmental role of women*, <https://www.oecd.org/greengrowth/40881538.pdf> (21.01.2017.).
  40. PAVLOVIC V. (ed.), 2011, *Univerzitet i održivi razvoj*, Fakultet političkih nauka, Beograd.
  41. PAWŁOWSKI A., 2010, The role of environmental engineering in introducing sustainable development, in: *Ecological Chemistry and Engineering S*, vol. 17 no 3, p. 263-278.
  42. PEARCE D.W., ATKINSON G.D., 1993, Capital theory and the measurement of sustainable development: an indicator of ‘weak’ sustainability, in: *Ecological Economics*, 8, p. 103-108.
  43. PETROVIC N., 2010, Development of higher environmental education program, in: *Management – Časopis za teoriju i praksu menadžmenta*, vol. 15 no 56, p. 35-41.
  44. PETROVIC N., JEREMIC V., PETROVIC D., CIROVIC M., 2014, Modeling the Use of Facebook in Environmental Higher Education, in *Social Classroom: Integrating Social Network Use in Education*, ed. G. Mallia Information Science Reference, Hershey, PA, p. 100-119).
  45. PEZZEY J., 1989, *Economic Analysis of Sustainable Growth and Sustainable Development. Environment Department Working Paper No. 15*, The World Bank, Washington, DC.
  46. POWERS J., TIFFANY J., 2006, Engaging youth in participatory research and evaluation, in: *Journal of Public Health Management and Practice*, vol. 12, suppl. 6, p. S79-S87.
  47. REILLY S., 2008, *Environmental Education's Role in Sustainable Development: Three Case Studies from India, South Africa & the United States. NR 523 – International Resource Management*, <http://www.uwsp.edu/forestry/StuJournals/Documents/IRM/Reilly.pdf> (04.11.2016).
  48. ROSELAND M., 2000, Sustainable community development: integrating environmental, economic, and social objectives, in: *Program Planning*, vol. 54 no 2, p. 73-132.
  49. ROSELAND M., 2005, *Toward Sustainable Communities: Resources for Citizens and Their Governments*, New Society Publishers, Gabriola Island, Canada.
  50. SAKAC M.D., CVETICANIN S., SUCEVIC V., 2012, Mogućnosti organiziranja odgojno obrazovnog procesa u cilju zaštite životne sredine, in: *Socijalna ekologija*, vol. 21 no 1, p. 89-98.
  51. SINGER E., VAN HOEWYK J., MAHER M.P., 2000, Experiments with incentives in telephone surveys, in: *Public Opinion Quarterly* 64, p. 171-188.
  52. SMITH G., 2008, Does gender influence online survey participation?: A record-linkage analysis of university faculty online survey response behavior, in: *ERIC Document Reproduction Service No. ED 501717*.
  53. STATISTICAL OFFICE OF THE REPUBLIC OF SERBIA, 2014a, *Population*, <http://webzrzs.stat.gov.rs/WebSite/Public/PageView.aspx?pkEy=162> (20.01.2017).

54. STATISTICAL OFFICE OF THE REPUBLIC OF SERBIA, 2014b, *Women and men in the Republic of Serbia*, Statistical office of the Republic of Serbia, Igam, Belgrade.
55. STATISTICAL OFFICE OF THE REPUBLIC OF SERBIA, 2016, *Municipalities and regions in the Republic of Serbia, 2012*, Statistical office of the Republic of Serbia, Belgrade.
56. STATISTICAL OFFICE OF THE REPUBLIC OF SERBIA, 2016, *Popis u Srbiji 2011*, [http://popis2011.stat.rs/?page\\_id=2162&lang=lat](http://popis2011.stat.rs/?page_id=2162&lang=lat) (23.01.2017).
57. STRATEGIJA RAZVOJA OBRAZOVANJA U SRBIJI DO 2020. GODINE, 2012, *Sl. glasnik RS*, no. 107/2012, <http://www.vtsnis.edu.rs/StrategijaObrazovanja.pdf> (26.01.2017).
58. SUSTAINABLE MEASURES, 2016, *Definitions of Sustainability*, <http://www.sustainablemeasures.com/node/35> (15.10.2016).
59. SUSTAINABLE SEATTLE, 2016, *Vision & Mission*, <http://www.sustainableseattle.org/about-us/vision-mission/> (15.10.2016).
60. TOMANOVIĆ S., STANOJEVIĆ D., 2015, *Mladi u Srbiji 2015. Stanja, opažanja, verovanja i nadanja*, Friedrich Ebert Stiftung, SeConS grupa za razvojnu inicijativu, Beograd.
61. TRUMIC M., PETROVIC N., RADOJICIC Z., 2009, Ekološka svest u formalnom osnovnom obrazovanju Republike Srbije, in: *XXXVII Symposium on Operation Research, SYM-OP-IS 2009*, Ivanjica, p. 3-6.
62. UN, 2007, *World Youth Report 2007: Young People's Transition to Adulthood: Progress and Challenges*, [http://www.un.org/esa/socdev/unyinn/documents/wyr07\\_complete.pdf](http://www.un.org/esa/socdev/unyinn/documents/wyr07_complete.pdf) (6.11.2016).
63. UN, 2015a, *Millennium development goals*, <http://www.un.org/millenniumgoals/> (7.10.2016.).
64. UN, 2015b, *Sustainable development goals*, <http://www.un.org/sustainabledevelopment/sustainable-development-goals/> (07.10.2016).
65. UN, 2015c, *Transforming our world: the 2030 Agenda for Sustainable Development*, <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf> (03.11.2016).
66. UN, 2016a, *What is sustainability?*, <http://www.un.org/en/sustainablefuture/sustainability.shtml> (15.11.2016.).
67. UN, 2016b, *The Role of Gender-based Innovations for the UN Sustainable Development Goals Toward 2030: Better Science and Technology for All*, edition 1, <https://sustainabledevelopment.un.org/forum/download.php?doc=472> (22.01.2017).
68. UNCHS, 1996, *Sustainable Human Settlements Development in an Urbanizing World*, The Habitat Agenda and the Istanbul Declaration, Section IVC, New York.
69. UNDP, 2017, *Gender and sustainable development*, <http://www.undp.org/content/undp/en/home/ourwork/gender-equality/gender-and-sustainable-development.html> (21.01.2017).
70. UNECE, 1998, *Aarhus convention: Convention on access to information, public participation in decision making and access to justice in environmental matters*, <http://www.unece.org/env/pp/treatytext.html> (20.11.2016).
71. UNESCO, 2012, *Education for Sustainable Development: Sourcebook*, UNESCO, Paris.
72. UNESCO, 2006, *Education for Sustainable Development Toolkit*, in: *Learning & Training Tools, No. 1*, <http://www.esdtoolkit.org> (28.01.2017).
73. UNESCO, 2012, *Education for sustainable development*, <http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/education-for-sustainable-development/> (22.01.2017).
74. UNSD, 1992, *Agenda 21*, United Nations Conference on Environment & Development, Rio de Janeiro, Brazil, 3 to 14 June 1992, <http://sustainabledevelopment.un.org/content/documents/Agenda21.pdf> (12.11.2016).
75. EPA, 2016, *Sustainability*, <http://www.epa.gov/sustainability/learn-about-sustainability#what> (20.10.2016).
76. VALLANCE S., PERKINS H.C., DIXON J.E., 2011, What is social sustainability? A clarification of concepts, in: *Geoforum*, vol. 42 no 3, p. 342-348.
77. WHEELER S.M., BEATLEY T., 2009, *The Sustainable Urban Development Reader*, Routledge.
78. WORLD BANK, 2006, *World development report 2007: Development and the Next Generation*, Washington, DC.
79. WCED, 1987, *Our Common Future*, Oxford, Oxford University Press.
80. YOUTH AND ENVIRONMENT EUROPE – YEE, 2016, <http://www.yeenet.eu> (15.11.2016).
81. ZAKON O TERITORIJALNOJ ORGANIZACIJI REPUBLIKE SRBIJE, 2007, 2016, *Sl. glasnik RS*, no. 129/2007; no. 18/2016, [http://www.paragraf.rs/propisi/zakon\\_o\\_teritorijalnoj\\_organizaciji\\_republike\\_srbije.html](http://www.paragraf.rs/propisi/zakon_o_teritorijalnoj_organizaciji_republike_srbije.html) (27.01.2017).

## Utilitarian Technological Solutions to Reduce CO<sub>2</sub> Emission in the Aspect of Sustainable Development

## Utylitarne rozwiązania technologiczne ograniczające emisję CO<sub>2</sub> w aspekcie zrównoważonego rozwoju

**Tomasz P. Olejnik\*, Elżbieta Sobiecka\*\***

*\*Politechnika Łódzka, Wydział Biotechnologii i Nauk o Żywności,  
Instytut Technologii i Analizy Żywności, ul. Stefanowskiego 4/10, 90-924 Łódź*

*\*\*Politechnika Łódzka, Wydział Biotechnologii i Nauk o Żywności,  
Instytut Podstaw Chemii Żywności, ul. Stefanowskiego 4/10, 90-924 Łódź  
E-mail: tomasz.olejnik@p.lodz.pl*

---

### Abstract

The state of the environment is an important element of sustainable development. Emissions of greenhouse gases, including carbon dioxide, are monitored. Observed rise in CO<sub>2</sub> emissions is forcing us to search for process solutions, which will significantly reduce its emissions, while meeting the economic criteria for the operation of the installation. EU legislation requires Member States to undertake research and implementation on industrial CO<sub>2</sub> capture and processing. Filed under development refers to the guidelines of the European Commission, expressed in the document *Towards an Integrated Strategic Energy Technology (SET) Plan: Accelerating the European Energy System Transformation*. There are many innovative solutions related technologies CCS (Carbon Capture and Storage) operating on a laboratory scale and pilot plant. The most common methods that have found use in the binding of CO<sub>2</sub> produced during the combustion process appropriate amine solvents, aqueous ammonia capture, absorption, ionic liquids, adsorption and membrane. Some of the above mentioned technology has been used application on the industrial scale after earlier financial calculations for their use and possible scenarios with process calculations based on value-to-cost criterion.

**Key words:** carbon capture and storage, sustainable development, green houses emission,

### Streszczenie

Stan środowiska naturalnego to ważny element zrównoważonego rozwoju. Poziom emisji gazów cieplarnianych, w tym ditlenku węgla, jest monitorowany, a zaobserwowany wzrost emisji CO<sub>2</sub> zmusza do poszukiwań rozwiązań procesowych, znacząco zmniejszających jego emisję, przy jednoczesnym spełnieniu ekonomicznych kryteriów funkcjonowania instalacji. Ustawodawstwo UE wymusza na państwach członkowskich podejmowanie prac badawczych oraz wdrożeniowych dotyczących przemysłowego wychwytywania i przeróbki CO<sub>2</sub>. Zakres tematyczny opracowania nawiązuje do wytycznych Komisji Europejskiej, wyrażonych w dokumencie *Towards an Integrated Strategic Energy Technology (SET) Plan: Accelerating the European Energy System Transformation*. Istnieje wiele innowacyjnych rozwiązań związanych z technologiami CCS (Carbon Capture and Storage) funkcjonujących w skali laboratoryjnej i półtechnicznej. Najbardziej popularne metody, które znalazły zastosowanie w wiązaniu CO<sub>2</sub> powstającego podczas procesu spalania to zastosowanie rozpuszczalników aminowych, przechwytywanie wodą amoniakalną, absorpcja, ciecze jonowe, adsorpcja oraz membrany. Część ww. technologii znalazła zastosowanie aplikacyjne w skali wieloprzemysłowej po wcześniejszych finansowych kalkulacjach ich stosowania oraz możliwe scenariusze uwzględniające kalkulacje procesu w oparciu o value-to-cost kryterium.

**Słowa kluczowe:** wychwytywanie i składowanie węgla, zrównoważony rozwój, emisja gazów cieplarnianych

---

## Introduction

Pollution of the atmosphere with greenhouse gases, especially carbon dioxide, is a threat to the climate and the whole biosphere and consequently, to the sustainable development of present and future generations.

Assessment of CO<sub>2</sub> capture and storage calls for a comprehensive delineation of CO<sub>2</sub> sources. The attractiveness of a particular CO<sub>2</sub> source for capture depends on its volume, concentration and partial pressure, as well as integrated system aspects, and its proximity to a suitable reservoir. Emissions of CO<sub>2</sub> arise from a number of sources, mainly fossil fuel combustion in the power generation, industrial, residential and transport sectors. In the power generation and industrial sectors, many sources have large emission volumes that make them amenable to the implementation of CO<sub>2</sub> capture technology (Azar et al., 2003). Large numbers of small point sources and, in the case of transport, mobile sources characterize the other sectors, making them less favourable for capture at present. Technological changes in the production and nature of transport fuels, however, may eventually allow the capture of CO<sub>2</sub> from energy use in this sector. Over 7,500 large CO<sub>2</sub> emission sources (over 0.1 MtCO<sub>2</sub> yr<sup>-1</sup>) have been identified (McCarthy, 2013). These sources are distributed geographically around the world, but four clusters of emissions can be observed: in North America (the Midwest and the eastern coast of the USA), Europe, South East Asia (eastern coast) and Southern Asia (the Indian sub-continent). Projections for the future (up to 2050) indicate that the number of emission sources from the power and industry sectors is likely to increase, predominantly in Southern and South-Eastern Asia, while the number of emission sources suitable for capture and storage in regions like Europe may decrease slightly (Dooley and Wise, 2003). Carbon capture and storage (CCS) is widely seen as a critical technology for limiting atmospheric emissions of carbon dioxide (CO<sub>2</sub>) – the principal *greenhouse gas* linked to the global climate change – from power plants and other large industrial sources.

The goal of engineering activities is to provide a realistic assessment of prospects for improved, lower-cost technologies for each of the three approaches to CO<sub>2</sub> capture, namely, post-combustion capture from power plant flue gases using amine-based solvents such as monoethanolamine (MEA) and ammonia; precombustion capture (also via chemical solvents) from the synthesis gas produced in an integrated coal gasification combined cycle (IGCC) power plant; and oxy-combustion capture, in which high-purity oxygen rather than air is used for combustion in a pulverized coal (PC) power plant to produce a flue gas with a high concentration of CO<sub>2</sub> amenable to capture without a post-combustion chemical process (Munasinghe and Swart, 2005). Currently, post-combustion and pre-combustion capture technolo-

gies are commercially available and widely used for gas stream purification in a variety of industrial processes. Several small-scale installations also capture CO<sub>2</sub> from power plant flue gases to produce CO<sub>2</sub> for sale as an industrial commodity. Oxy-combustion capture, however, is still under development and is not currently commercially available.

## Scale up processes

There are certain key areas that might be converted from the laboratory and bench scales at the early stage of process development into successfully constructed and operated in a controlled environment. The conceptual design stage of a CO<sub>2</sub> capture process is one for which the basic science has been developed, but no physical prototypes exist yet.

## Post-Combustion Capture

The most advanced systems today employ amine-based solvents, while the processes at the earliest stages of development utilize a variety of novel solvents, solid sorbents, and membranes for CO<sub>2</sub> capture or separation (Edmonds et al., 2001). The amine systems can be installed at power plants (burning coal). The CO<sub>2</sub> captured at these power plants might be sold e.g. to food processing facilities, which use it for the production of dry ice or carbonated beverages. The oldest and largest commercial CO<sub>2</sub> capture system operating on such a way is the IMC Global soda ash plant in California. Here, the mineral trona is mined locally and combined with CO<sub>2</sub> to produce sodium carbonate (soda ash), a widely used industrial chemical. All these products soon release the CO<sub>2</sub> to the atmosphere (e.g., through carbonated beverages). Certain Polish cities possess power plants to produce heat or chemical plants treated with soda.

Amine-Based Capture Processes use solvents called amines (more properly, alkanolamines) are a family of organic compounds that are derivatives of alkanols (commonly called the alcohols group) that contain an *amino* (NH<sub>2</sub>) group in their chemical structures. These processes are limited by the energy cost required for solvent regeneration, which has a major impact on process costs. In order to employ A-B CP in full industrial scale a certain financial mechanism can be applied to lower the overall cost of installation and maintenance (Beecy and Kuuskraa, 2005).

Ammonia-Based Capture Processes seem to be very promising due to the overall cost of an ammonia-based system would be substantially less than an amine-based system for CO<sub>2</sub> capture. Since ammonia could potentially capture multiple pollutants simultaneously (including CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>), the overall plant cost could be reduced even further. Ammonia-based systems are attractive in part because ammonia is inexpensive, but also because an ammonia-based process could operate with a fraction of the en-



ergy penalty of amines. The use of CCS technology in laboratory scale has been summarized in Table 1 (Rubin et al., 2012).

Table 1. Post-Combustion Capture Approaches Being Developed at the Laboratory or Bench Scale

| Liquid Solvents     | Solid Adsorbents      | Membranes                  |
|---------------------|-----------------------|----------------------------|
| Advanced amines     | Supported amines      | Polymeric                  |
| Potassium carbonate | Carbon-based          | Amine-doped                |
| Advanced mixtures   | Sodium carbonate      | Integrated with absorption |
| Ionic liquids       | Crystalline materials | Biomimetic-based           |

Table 2. Technical Advantages and Challenges for Post-Combustion Solvents

| Description  | Advantages   | Challenges  |
|--|--|---|
| Solvent reacts reversibly with CO <sub>2</sub> , often forming a salt. The solvent is regenerated by heating (temperature swing), which reverses the absorption reaction (normally exothermic). Solvent is often alkaline. | Chemical solvents provide fast kinetics to allow capture from streams with low CO <sub>2</sub> partial pressure.<br><br>Wet scrubbing allows good heat integration and ease of heat management (useful for exothermic absorption reactions). | The large amount of steam required for solvent regeneration degrades the power plant significantly.<br><br>Energy required to heat, cool, and pump non-reactive carrier liquid (usually water) is often significant.<br><br>Vacuum stripping can reduce regeneration steam requirements but is expensive; bad economy of scale. Multiple stages and recycle stream may be required. |

Liquid Solvents (typically a mixture of a base and water) selectively absorb CO<sub>2</sub> through direct contact between the chemical solvent and the flue gas stream. In general, the aim of solvent research is to identify or create new solvents or solvent mixtures that have more desirable characteristics than the currently available ones. Such properties include increases in CO<sub>2</sub> capture capacity, reaction rates, thermal stability, and oxidative stability, along with decreases in regeneration energy, viscosity, volatility, and chemical reactivity. The main advantages and challenges associated with liquid solvent-based approaches to post-combustion CO<sub>2</sub> capture have been

presented in table 2 (U.S. Department of Energy, 2010).

Examples of promising solvents include new amine formulations, carbonates, certain blends of amines and carbonates, and ionic liquids. For example, piperazine is a promising new amine which is now receiving increasing attention. This solvent, currently being studied at the University of Texas, has been shown to exhibit faster kinetics, lower thermal degradation and lower regeneration energy requirements than MEA in experiments thus far. Further characterization studies are in progress.

Potassium carbonate solvents, which have been used successfully in other gas purification applications, absorb CO<sub>2</sub> through a relatively low-energy reaction, but the process is slow. Researchers are attempting to speed up absorption by blending potassium carbonate with various amines, yielding promising results (Cullinane and Rochelle, 2004).

### Solid Sorbent Absorption (SSA)

Solid sorbents can absorb CO<sub>2</sub> on their surfaces. Then, they release CO<sub>2</sub> through a subsequent temperature or pressure change, thus regenerating the original sorbent. Solid sorbents have the potential for significant energy savings over liquid solvents, in part because they do not require large quantities of water that must be repeatedly heated and cooled to regenerate the solvent solution. Sorbent materials are also characterized by lower heat capacity than solvents and thus require less regeneration energy to change their temperature.

Table 3. Technical Advantages and Challenges for SSA to Post-Combustion CO<sub>2</sub> Capture

| Description   | Advantages   | Challenges   |
|---|--|--|
| Sorbent pellets are contacted with flue gas, CO <sub>2</sub> is absorbed onto chemically reactive sites on the pellet. Pellets are then regenerated by a temperature swing, which reverses the absorption reaction. | Chemical sites provide large capacities and fast kinetics, enabling capture from streams with low CO <sub>2</sub> partial pressure. Higher capacities on a per mass or volume basis than in relation to similar wet scrubbing chemicals.<br><br>Lower heating requirements than for wet scrubbing in many cases (CO <sub>2</sub> and heat capacity dependent). | Heat required to reverse chemical reaction (although generally less than in the case of wet scrubbing).<br><br>Heat management in solid systems is difficult. This can limit the capacity and/or create operational issues for exothermic absorption reactions.<br><br>Pressure drop can be large in flue gas applications. Sorbent attrition may be high. |

The key aim of solid sorbent research is to reduce the cost of CO<sub>2</sub> capture by designing durable sorbents with efficient materials handling schemes, increased CO<sub>2</sub> carrying capacity, lower regeneration energy requirements, faster reaction rates and minimum pressure drops. The main areas in which optimistic results could be achieved by employing post-combustion CCS are presented in table 3 (U.S. Department of Energy, 2010).

### Membrane-Based Approaches (MBA)

The main and key challenges to use MBA in commercial scale include the need for large surface areas to process power plant flue gases, limited temperature ranges for operation, low tolerance to flue gas impurities (or requirements for additional equipment to remove those impurities) and high parasitic energy requirements to create a pressure differential across the membrane. Advantages and topics to be solved in that matter are presented in table 4.

*Table 4. Technical Advantages and Challenges for MBA to Post-Combustion CO<sub>2</sub> Capture*

| Description  | Advantages                             | Challenges   |
|--|--|--|
| Uses permeable or semi-permeable materials that allow for the selective transport and separation of CO <sub>2</sub> from flue gas. | No steam load.<br>No chemicals needed. | Membranes tend to be more suitable for high-pressure processes such as IGCC.<br>Tradeoff between the recovery rate and product purity (difficulty to meet both at same time).<br>Requires high selectivity (due to CO <sub>2</sub> concentration and low pressure ratio).<br>Good pre-treatment.<br>Poor economies of scale.<br>Multiple stages and recycle streams may be required. |

The researchers are investigating the development of ultra-high surface area porous materials for CO<sub>2</sub> capture. These materials are known as metal organic frameworks (MOFs, discussed earlier), zeolytic imidizolate frameworks, and porous organic polymers. These materials have pore sizes, surface areas, and chemistries that are highly *tunable*, meaning that the molecules can, in principle, be designed and fabricated by chemists and materials scientists to maxim-

ize CO<sub>2</sub> capture performance. Because the CO<sub>2</sub> capture research in this area is relatively new, very little work has thus far been done to assess these materials under realistic capture conditions or to incorporate them into workable capture technologies.

### Industrial and semi-industrial plant's examples

Post-combustion CO<sub>2</sub> capture systems have been in use commercially for many decades, mainly in industrial processes for purifying gas streams other than combustion products. The use of amines to capture CO<sub>2</sub> was first patented 80 years ago and since then has been used to meet CO<sub>2</sub> product specifications in industries ranging from natural gas production to the food and beverage industry. A number of vendors currently offer commercial amine-based processes, including the Fluor Daniel Econamine FG Plus process, the Mitsubishi Heavy Industries KM-CDR process, the LummusKerr-McGee process, the Aker Clean Carbon Just Catch process, the Cansolv CO<sub>2</sub> capture system, and the HTC Purenergy Process (McCarthy, 2013). Although several CO<sub>2</sub> capture systems have operated commercially for nearly two decades on a portion of power plant flue gases, no capture units have yet been applied to the full flue gas stream of a modern coal-fired or gas-fired power plant. Thus, one or more demonstrations of post-combustion CO<sub>2</sub> capture at full scale are widely regarded as crucial for gaining the acceptance of this technology by electric utility companies, as well as by the institutions that finance and regulate the power plant construction and operation. Several years ago, for example, the European Union called for 12 such demonstrations in Europe, while in the United States there have been calls for at least 6 to 10 full-scale projects (Tarr et al., 2013). One of the plants operating in full scale installation, that has 9,000 hours of operational experiences, is the carbon capture pilot plant at E.ON's Staudinger power plant near Hanau/Germany. The pilot plant started operation in 2009. During the first three years of operation, the process was tested and its technical features were proven and further optimized, e.g. with respect to operability and energy demand, by using a slip stream from the flue gas of a coal-fired power plant. In 2012 a gas burner was installed as an alternative source for CO<sub>2</sub>, and the pilot plant was operated for approx. 3.500 h on a flue gas composition equal to a gas turbine power plant. In this period of time a Technology Qualification Program (TQP) for the Carbon Capture Mongstad project in Norway was completed together with Statoil/Gassnova to prove the maturity for a full scale implementation (Horn et al, 2015).

One of the key reasons why the full-scale operating installations to CCS processes do not operate yet, is the overall cost of installation. The cost of each project in developing phase, is estimated at roughly \$1

billion for CO<sub>2</sub> capture at a 400 MW unit operating for five years (EIA, 2014).

For most large sources of CO<sub>2</sub> (e.g., power plants), the cost of capturing CO<sub>2</sub> is the largest component of overall CCS costs. Capture costs include the cost of compressing CO<sub>2</sub> to a pressure suitable for pipeline transport (typically about 14 MPa). However, the cost of any additional booster compressors that may be needed is included in the cost of transport and/or storage. The total cost of CO<sub>2</sub> capture includes the additional capital requirements, plus added operating and maintenance costs incurred for any particular application. For current technologies, a substantial portion of the overall cost is due to the energy requirements for capture and compression. A large number of technical and economic factors related to the design and operation of both the CO<sub>2</sub> capture system, and the power plant or industrial process to which it is applied, influence the overall cost of capture. For this reason, the reported costs of CO<sub>2</sub> capture vary greatly, even for similar applications.

The most widely studied systems are new power plants based on coal combustion or gasification. For a modern (high-efficiency) coal-burning power plant, CO<sub>2</sub> capture using an amine-based scrubber increases the cost of electricity generation (COE) by approximately 40 to 70% while reducing CO<sub>2</sub> emissions per kilowatt-hour (kWh) by about 85%. The same CO<sub>2</sub> capture technology applied to a new natural gas combined cycle (NGCC) plant increases the COE by approximately 40 to 70%. For a new coal-based plant employing an integrated gasification combined cycle (IGCC) system, a similar reduction in CO<sub>2</sub> using current technology (in this case, a water gas shift reactor followed by a physical absorption system) increases the COE by 20 to 55%. The lower incremental cost for IGCC systems is, in large part, due to the lower gas volumes and lower energy requirements for CO<sub>2</sub> capture relative to combustion-based systems. It should be noted that the absence of industrial experience with large scale capture of CO<sub>2</sub> in the electricity sector means that these numbers are subject to uncertainties.

Studies indicate that, in most cases, IGCC plants are slightly higher in cost without capture and slightly lower in cost with capture than similarly sized PC plants fitted with a CCS system. On average, NGCC systems have a lower COE than both types of new coal-based plants with or without capture for base-load operation. However, the COE for each of these systems can vary markedly due to regional variations in fuel cost, plant utilization, and a host of other parameters. NGCC costs are especially sensitive to the price of natural gas. Therefore, comparisons of alternative power system costs require a particular context to be meaningful. For the existing, combustion-based power plants, CO<sub>2</sub> capture can be accomplished by retrofitting an amine scrubber. However, a limited number of studies indicate that the post-combustion retrofit option is more cost-effective

when accompanied by a major rebuild of the boiler and turbine to increase the efficiency and output of the existing plant by converting it to a supercritical unit. For some plants, similar benefits can be achieved by repowering with an IGCC system that includes CO<sub>2</sub> capture technology. The feasibility and cost of any of these options is highly dependent on site-specific circumstances, including the size, age and type of unit, and the availability of space for accommodating a CO<sub>2</sub> capture system. There has not yet been any systematic comparison of the feasibility and cost of alternative retrofit and repowering options for existing plants, as well as the potential for more cost effective options employing advanced technology such as oxyfuel combustion. The high cost of CO<sub>2</sub> capture is mainly due to the cost of CO<sub>2</sub> compression, since separation of CO<sub>2</sub> is already carried out as part of the H<sub>2</sub> production process. Recent studies indicate that the cost of CO<sub>2</sub> capture for current processes adds approximately 5 to 30% to the cost of the H<sub>2</sub> product. In addition to fossil-based energy conversion processes, CO<sub>2</sub> could also be captured in power plants fuelled with biomass. At present, biomass plants are small in scale (<100 MWe). Hence, the resulting costs of capturing CO<sub>2</sub> are relatively high compared to fossil alternatives. For example, the capturing of 0.19 MtCO<sub>2</sub> yr<sup>-1</sup> in a 24 MWe biomass IGCC plant is estimated to be about 82 USD/tCO<sub>2</sub> (300 USD/tC), corresponding to an increase of the electricity costs due to the capture of about 80 USD MWh<sup>-1</sup> (Audus and Freund, 2004). Similarly, CO<sub>2</sub> could be captured in biomass-fuelled H<sub>2</sub> plants. The cost is reported to be between 22 and 25 USD/tCO<sub>2</sub> avoided (80-92 US\$/tC) in a plant producing 1 million Nm<sup>3</sup> d<sup>-1</sup> of H<sub>2</sub> (Makihira et al., 2003). This corresponds to an increase in the H<sub>2</sub> product costs of about 2.7 US\$ GJ<sup>-1</sup> (i.e., 20% of the H<sub>2</sub> costs without CCS). The competitiveness of biomass CCS systems is very sensitive to the value of CO<sub>2</sub> emission reductions, and the associated credits obtained with systems resulting in negative emissions. Moreover, significantly larger biomass plants could benefit from economies of scale, bringing down the costs of CCS systems to broadly similar levels as those in coal plants. However, there is too little experience with large-scale biomass plants as of yet; hence, their feasibility has still not been proven and their costs are difficult to estimate. CCS technologies can also be applied to other industrial processes. Since these other industrial processes produce off-gases that are very diverse in terms of pressure and CO<sub>2</sub> concentration, the costs range vary widely. In some of these non-power applications where a relatively pure CO<sub>2</sub> stream is produced as a by-product of the process (e.g., natural gas processing, ammonia production), the cost of capture is significantly lower than in the case capture from fossil-fuel-fired power plants. In other processes like cement or steel production, the capture costs are similar to, or even higher than the capture from fossil-

fuel-fired power plants. New or improved technologies for CO<sub>2</sub> capture, combined with advanced power systems and industrial process designs, can significantly reduce the cost of CO<sub>2</sub> capture in the future. While there is considerable uncertainty about the magnitude and timing of future cost reductions, studies suggest that improvements to current commercial technologies could lower the CO<sub>2</sub> capture costs by at least 20-30%, while new technologies currently under development may allow for more substantial cost reductions in the future. Previous experience indicates that the realization of cost reductions in the future requires sustained R&D in conjunction with the deployment and adoption of commercial technologies.

### Sustainable development of CCS technologies

Key drivers for the deployment of CCS Energy and economic models are increasingly being employed to examine how CCS technologies would deploy in environments where CO<sub>2</sub> emissions are constrained (i.e., in control cases). A number of factors that drive the rate of CCS deployment and the scale of its ultimate deployment in modeled control cases have been identified:

1. The policy regime; the interaction between CCS deployment and the policy regime in which energy is produced and consumed cannot be over-emphasized; the magnitude and timing of early deployment depends very much on the policy environment; in particular, the cumulative extent of deployment over the long term strongly depends on the stringency of the emissions mitigation regime being modeled; comparatively low stabilization targets (e.g., 450 ppmv) foster the relatively faster penetration of CCS and the more intensive use of CCS (where *intensity of use* is measured both in terms of the percentage of the emissions reduction burden shouldered by CCS, as well as in terms of how many cumulative gigatonnes of CO<sub>2</sub> are to be stored) (Gielen and Podanski, 2004);
2. The reference case (baseline); storage requirements for stabilizing CO<sub>2</sub> concentrations at a given level are very sensitive to the choice of the baseline scenario. In other words, the assumed socio-economic and demographic trends, and particularly the assumed rate of technological change, have a significant impact on the application of CCS (Riahi et al., 2003).
3. The nature, abundance and carbon intensity of the energy resources/fuels assumed to exist in the future (e.g., a future world where coal is abundant and easily recoverable would use CCS technologies more intensively than a world in which natural gas or other less carbon intensive technologies are inexpensive and widely available).
4. The introduction of flexible mechanisms such as emissions trading can significantly influence the extent of CCS deployment. For example, an emissions regime with few, or significantly constrained, emissions trading between nations entails the use of CCS technologies sooner and more extensively than a world in which there is an efficient global emissions trading and, therefore, lower carbon permit prices (Scott et al., 2004). Certain regulatory regimes that explicitly emphasize CCS usage can also accelerate its deployment.
5. The rate of technological change (induced through learning or other mechanisms) assumed to take place with CCS and other salient mitigation technologies (Edmonds et al., 2004). For example, Riahi et al. (2003) indicate that the long-term economic potential of CCS systems would increase by a factor of 1.5 if it assumed that the technological learning for CCS systems would take place at rates similar to those observed historically for sulphur removal technologies when compared to the situation where no technological change is specified.

Methodologies for incorporating CCS into national inventories, and accounting schemes are under development. CCS can be incorporated in different ways and data requirements may differ depending on the choices made.

The following gaps in knowledge and need for decisions by the political process have been identified:

- Methodologies to estimate physical leakage from storage, and emission factors (fugitive emissions) for estimating emissions from capture systems and from transportation and injection processes are not available.
- Geological and ocean storage open new challenges regarding uncertainty on the permanence of the stored emissions and the need for protocols on transboundary transport and storage, as well as accounting rules for CCS, and insight on issues such as emission measurement, long term monitoring, timely detection and liability/responsibility.
- Methodologies for reporting and verification of reduced emission under the Kyoto Mechanisms have not been agreed upon.
- Methodologies for estimating and dealing with potential emissions resulting from system failures, such as sudden geological faults and seismic activities or pipeline disruptions have not been developed.

To summarize, the sustainable development of the described processes concerning the Combustion Capture Technologies using different approaches should answer the following questions:

1. What are the prospects for any of these projects to result in a viable new process for CO<sub>2</sub> capture?

2. How much improvement in the performance or reduction in cost can be expected relative to current or near-term options?
  3. How long will it take to see these improvements?
- These answers allow to choose the best technology based on the value-to-money criteria as well as the environmental impact.

## References

1. AUDUS H., FREUND P., 2004, Climate change mitigation by biomass gasification combined with CO<sub>2</sub> capture and storage, in: *Proceedings of 7<sup>th</sup> International Conference on Greenhouse Gas Control Technologies. Volume 1: Peer-Reviewed Papers and Plenary Presentations*, IEA Greenhouse Gas Programme, eds. Rubin E.S., Keith D.W., and Gilboy C.F., Cheltenham, UK.
2. AZAR C., LINDGREN K., ANDERSSON B.A., 2003, Global energy scenarios meeting stringent CO<sub>2</sub> constraints – cost-effective fuel choices in the transportation sector, in: *Energy Policy*, 31, p. 961-976.
3. BEECY D.J., KUUSKRAA V.A., 2004, Basic Strategies for Linking CO<sub>2</sub> enhanced oil recovery and storage of CO<sub>2</sub> emissions, in: *Proceedings of the 7th International Conference on Greenhouse Gas Control Technologies (GHGT-7)*, eds. Rubin E.S., Keith D.W., Gilboy C.F., Vancouver, Canada, Volume I: Peer Reviewed Papers and Overviews, Elsevier Science, Oxford, UK, p. 351-360.
4. CULLINANE J. T., ROCHELLE G. T., 2004, Carbon Dioxide Absorption with Aqueous Potassium Carbonate Promoted by Piperazine, in: *Chemical Engineering Science*, vol. 59, p. 3619-3630.
5. DOOLEY J.J., WISE M.A., Retention of CO<sub>2</sub> in Geologic Sequestration Formations: Desirable Levels, Economic Considerations, and the Implications for Sequestration R&D, in: *Proceedings of the 6th International Conference on Greenhouse Gas Control Technologies*, eds. Gale J. and Kaya Y., Elsevier Science, Amsterdam 2003, p. 273-278.
6. EDMONDS J.A., FREUND P., DOOLEY J.J., 2001, The role of carbon management technologies in addressing atmospheric stabilization of greenhouse gases, in: *Proceedings of the 5<sup>th</sup> International Conference on Greenhouse Gas Control Technologies*, eds. Williams D., Durie B., McMullan P., Paulson, Smith C.A., CSIRO, Australia, p. 46-51.
7. EDMONDS J., CLARKE J., DOOLEY J.J., KIM S.H., SMITH S.J., 2004, Stabilization of CO<sub>2</sub> in a B2 world: insights on the roles of carbon capture and disposal, hydrogen, and transportation technologies, in: *Energy Economics*, vol. 26 no 4, p. 501-755.
8. EIA, 2013, *Annual Energy Outlook 2014 Early Release*, December 2013.
9. GIELEN, D., PODKANSKI J., 2004, The Future Role of CO<sub>2</sub> Capture in the Electricity Sector, in: *Proceedings of 7th International Conference on Greenhouse Gas Control Technologies. Volume 1: Peer-Reviewed Papers and Plenary Presentations*, eds. Rubin E.S., Keith D.W. and Gilboy C.F., IEA Greenhouse Gas Programme, Cheltenham, UK, 2004.
10. HORN M., REICHL A., SCHLIEPEDIEK T., SCHRAMM H., 2015, *Piloting of Siemens Post-Cap<sup>TM</sup> Technology, 9.000 hours of Operational Experience including Mongstad Technology Qualification Program*, Siemens AG, Germany.
11. MAKIHIRA A., BARRETO L., RIAHI K., 2003, *Assessment of alternative hydrogen pathways, Natural gas and biomass, IIASA Interim Report*, IR-03-037, Luxembourg, Austria,
12. MCCARTHY J.E., 2013, EPA Standards for Greenhouse Gas Emissions from Power Plants, in: *Many Questions, Some Answers*, November 15.
13. MUANSINGHE M., SWART R., 2005, *Primer on Climate Change and Sustainable Development – Facts, Policy Analysis, and Application*, Cambridge University Press, Cambridge.
14. RIAHI K., RUBIN E.S., SCHRATTENHOLZER L., 2003, *Prospects for carbon capture and sequestration technologies assuming their technological learning*, in: *Greenhouse Gas Control Technologies: Proceedings of the Sixth International Conference on Greenhouse Gas Control Technologies*, eds. Gale J. and Kaya Y., Kyoto, Japan, Elsevier Science, Oxford, UK, p. 1095-1100.
15. RUBIN E.S. et al., 2012, The outlook for improved carbon capture technology, in: *Progress in Energy and Combustion Science*, doi:10.1016/j.pecs.2012.03.003.
16. SCOTT M.J., EDMONDS J.A., MAHADENAN N., ROOP J.M., BRUNELLO A.L., HAITES E.F., 2004, International emission trading and the cost of greenhouse gas emissions mitigation and sequestration, in: *Climatic Change*, 63, p. 257-287.
17. TARR J.M., JONAS M., PROFETA T.N., 2013, *Regulating Carbon Dioxide under Section 111(d) of the Clean Air Act: Options, Limits, and Impacts*, <http://nicholasinstitute.duke.edu/climate/policydesign/regulating-carbon-dioxide-undersection111d> (2.01.2016).
18. U.S. DEPARTMENT OF ENERGY, 2010, *DOE/NETL Carbon Dioxide Capture R&D Annual Technology Update, Draft*, National Energy Technology Laboratory, Pittsburgh, PA.
19. U.S. DEPARTMENT OF ENERGY, *NETL Carbon Capture and Storage Database*, [http://www.netl.doe.gov/technologies/carbon\\_seq/database/index.html](http://www.netl.doe.gov/technologies/carbon_seq/database/index.html) (10.06.2016).



## Environmental Risks Related to the Recovery and Recycling Processes of Waste Electrical and Electronic Equipment (WEEE)

### Ryzyka ekologiczne związane z procesami odzysku i recyklingu zużytego sprzętu elektrycznego i elektronicznego (ZSEE)

**Agnieszka Generowicz, Ryszarda Iwanejko**

*Instytut Zaopatrzenia w Wodę i Ochrony Środowiska, Politechniki Krakowskiej,  
ul. Warszawska 24, 31-155 Kraków, Poland*

*E-mail (corresponding author): agnieszka@generowicz.org*

---

#### Abstract

The idea of sustainable development imposes waste management tasks that can be solved only using a systemic approach. It requires that municipal waste management is carried out in a technically correct manner, is economically efficient, socially acceptable, with no negative effect to the natural environment and takes into account economy of all waste streams, including electrical and electronic waste (E-waste). A relentless pursuit of comfort, quality of life as well as rapid technological changes result in products of a shorter life cycle, which quickly become just electro scraps. There are many of them with a different composition. E-waste may include e.g. toxic metals, which if released to the environment may pose a threat to human life and health. At the same time, recovery of valuable secondary raw materials complies perfectly with implementation of the principles of sustainable development. In recent decades, the risk assessment for the natural environment and decision-making strategies have become a target of intense and complex research undertaken also in the waste management area. The main objective of risk assessment is providing a rational basis to make unbiased decisions about the system. The article attempts to identify and assess risks of an environmental impact resulting from negligence or operational disturbances in a system of recovery and recycling of electrical and electronic waste.

**Key words:** electrical and electronic waste, WEEE, risk analysis, waste management, e-waste, environmental pollution

#### Streszczenie

Filozofia zrównoważonego rozwoju narzuca gospodarce odpadami zadania, które mogą być rozwiązane tylko w przypadku traktowania jej w sposób systemowy. Ujęcie systemowe wymaga zapewnienia aby gospodarka odpadami komunalnymi była rozwiązana w sposób technicznie poprawny, ekonomicznie efektywny, społecznie akceptowany i nie oddziałujący negatywnie na środowisko przyrodnicze oraz uwzględniała gospodarkę wszelkimi strumieniami odpadów, w tym również zużytym sprzętem elektrycznym i elektronicznym. Nieustające dążenie do komfortu, poprawy jakości życia oraz gwałtowny postęp technologiczny, powodują powstawanie produktów o coraz krótszym cyklu życia, które stają się właśnie elektrośmieciem. Poza faktem, że jest ich dużo istotne znaczenie ma również ich skład. Elementy elektrośmieci zawierają m.in. metale toksyczne, których uwolnienie do środowiska może wpłynąć na jego skażenie, co w rezultacie będzie stanowić zagrożenie dla zdrowia i życia ludzi. Równocześnie odzysk tych cennych surowców wtórnych wpisuje się w realizację zasad zrównoważonego rozwoju. Ocena ryzyka dla środowiska naturalnego i strategii podejmowania decyzji w ciągu ostatnich kilkudziesięciu lat stają się celem intensywnych i złożonych badań, podejmowanych również w zakresie gospodarowania odpadami. Zasadniczym celem oceny ryzyka jest dostarczenie racjonalnych podstaw do podejmowania wyważonych decyzji dotyczących danego systemu. W artykule podjęto próbę rozpoznania i oszacowania ryzyk oddziaływania na środowisko naturalne wynikających z zaniedbań lub nieprawidłowości funkcjonowania systemu odzysku i recyklingu odpadów elektrycznych i elektronicznych.

**Słowa kluczowe:** odpady elektryczne i elektroniczne, zużyty sprzęt elektryczny i elektroniczny, ZSEE, analiza ryzyka, gospodarka odpadami, elektroodpady, skażenie środowiska

## 1. Introduction

Waste electrical and electronic equipments (WEEE) also called e-waste or electro waste has become a quickly growing group of waste in developed countries. A permanent pursuit of comfort, quality of life as well as rapid technological changes result in products with a shorter life cycle, which quickly become just electro scraps. In the EU, approx. 8 million tons of e-waste is produced each year while about 20-50 million tons worldwide. The wastes are diverse in nature, both in terms of their quantity and composition. They contain e.g. non-ferrous and noble metals as well as rare earth elements. Their recovery, recycling and reuse provides valuable and expensive secondary raw materials and disregarding these activities would show both lack of economic awareness and care for the environment (2008/98/EC). On the other hand, toxic elements electric waste may pose a threat to people and the environment in case of their uncontrolled release into the environment (Hora, 1996; Ongondo, 2011).

The paradigm of sustainable development formulated in the report *Our Common future* and defined by the World Commission on Environment and Development, as *development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs* (Pawlowski, 2008) presents a new challenge to the e-waste economy. The growing consumerism, manufacturers that continuously push for a purchase of new equipment as well as production of less and less reliable electrical and electronic equipment result in faster depletion of natural resources, while recycling (reprocessing) the used ones. Once secondary raw materials, not properly recovered from e-waste, get into the environment, they may worsen its conditions, strengthening harmful ecological effects and generating economic losses. Therefore, an analysis of environmental risks for processes of recovery and recycling of waste electrical and electronic equipment is clearly justified; negligence in these area accompanied by an excessive consumerism may not only pose a threat to the environment but also deplete resources, which are a base for development of future generations. The article highlights the different types of risks related to e-waste and concerning the quality of the environment. It is necessary to manage these risks against the real threats.

## 2. Risk management

Today it has been a popular notion that no human activity, no installation nor any object is risk-free. Colloquially, risk is defined as the possibility of occurrence of a harmful (dangerous, undesirable) event causing losses (e.g. financial), damages (e.g. health,

environmental) or any other negative effects. To reduce the chance of harmful scenarios and to ensure the minimization of losses it is necessary to manage risk.

A comprehensive risk management process is based on two main processes, which then comprise other sub-processes (IEC 60300-3-9, EN ISO 14121-1, EN 1050: 1999). These are:

- risk assessment which consists of risk analysis (a scope of risk or a plan of analysis, identification of threats and risk assessment) and determination of a possible risk (whether risk reduction is necessary),
- risk control, i.e. the process of making rational decisions about choosing means and methods for risk reduction and monitoring.

Identification of threats helps to recognize what bad could happen and what are the possible causes and effects of such event. The analysis should take into account events that had occurred in the past (based on a historical knowledge) and the ones that have not happened yet but are potentially possible (Iwanejko, 2005; Rak, 2005, 2008).

A risk assessment requires selection of risk measures, which have to be developed with a proper method. The classic and most commonly used measure of risk is  $R = P \cdot S$ , where  $P$  is a probability that a fault and some losses occur while  $S$  is a magnitude of losses. Depending on the needs also other measures can be introduced, suitable for the particular problem. These can be numbers (e.g. the average loss  $R = ES$ , the maximum loss  $R = \max S$  or probability of occurrence of the loss  $R = P$ ) or functions (e.g. probability that certain profits cannot be achieved), single or complex (including a number of risk factors). There are 3 main groups of the risk assessment methods. They include the following methods:

- quantitative (accurate), used when a large number of reliable data is available; the resulting  $R$  is *accurate* in the sense that it is the real value (e.g. probability  $P$  is a number between 0 and 1, losses are defined with some accuracy in monetary units); the methods include statistical and probabilistic methods as well as reliability methods,
- quality (semi-quantitative), used when a small number of unreliable data is available; the result is a relative value within a generally accepted range of values (e.g. probability is 6 on a scale of 1 to 9); these methods include e.g. matrix methods, preliminary hazard analysis PHA (Preliminary Hazard Analysis), a risk graph, FMEA (Fault Mode and Effects Analysis),
- quantitative – quality, which, depending on the available information, needs and an application mode can be considered and used as quantitative



or qualitative methods; they include e.g. methods of logic tree: the event tree method ETA (Event Tree Analysis) and the fault tree method FTA (Fault Tree Analysis).

The final risk assessment is based on the recognition of risk acceptance criteria. Development of these criteria is one of the most difficult tasks, because they play a crucial role in a decision-making process and therefore various aspects have to be considered (e.g. technical, economic, social, environmental and philosophical-ethical) that require value judgments. Risk can be:

- acceptable (RA) – or small with no need for reduction,
- tolerable (controlled) (RT) – or average; it can be accepted conditionally if costs of its reduction are too high comparing to the possible profits after risk reduction; the ALARP principle applies (As Low As is Reasonably Practicable) i.e. a risk level as low as reasonably justified. It should be noted that sometimes the maximum risk reduction may be not only too expensive but also technically unfeasible; the RT level depends on the society well-being (Rak, 2005, 2008).
- unacceptable (RN) - that is high; such risk must be reduced at all costs (system modernized or put out of operation).

The best way to reduce risk is to eliminate possible hazards and prevent occurrence of harmful events. Another method, once an event took place, is to minimize its effects (i.e. medical, technical, chemical emergency, etc.). Each way of risk reduction is associated with certain measurable costs. Therefore, the decision must always be a compromise between possible costs (investment, operational) and other residual risks. Regardless of a size of real risk, it should be monitored. Risk management process (i.e. identification of hazards, risk assessment, evaluation, possible reduction and tracking/monitoring of risk) is a continuous and cyclic process.

Risk may be considered and tested in various aspects. Its negative effects may be different (human life and health, environment, finance, etc.). Risk can be studied at a micro level (local e.g. for one community, one plant) or at a macro scale (global e.g. regions, countries). It can be associated with an event, action or an object.

### 3. Environmental risks associated with e- waste management

In terms of environmental risk, the following risks should be considered:

- environment pollution through careless ways of e- waste disposal: illegal waste dumps, containers for municipal waste (if not properly separated WEEE will end up at landfills or in incinerators) and unprofessional dismantling (to recover valuable raw materials, e.g. copper but

without recovery or recycling of other hazardous materials); such actions release dangerous or toxic substances to air, soil or groundwater,

- need for recovery of raw materials, that had not been recovered from e- waste; in extreme cases it could violate the principles of sustainable development (too intense and unnecessary *depletion* of natural resources) and rules of closed circuit economy (Pawłowski, 2008; Bielińska at al., 2014; Generowicz, 2014),
- demand for an early closure of landfills due to a slow biomass reduction and pointless storage of bulky waste; in a long term a new landfill has to be open that may severely change the landscape,
- risk for the human health and life of people engaged in unprofessional collection, dismantling and recovery of raw materials with primitive methods and no professional equipment and premises; risk for local dwellers subjected to harmful effects of such activities (e.g. melting or burning of cables or dismantling of refrigerators).

### 4. Impact of harmful substances on the environment

E-waste that has not been recovered and recycled usually goes to landfills where it is mixed with other waste and not always separated at segregation units. A poor segregation *at source* may pose a risk to the natural environment and therefore for humans (Kiddee, 2013; Kowalski et al., 2015; Neri et al, 2003; Robinson, 2009; Tsydenova, 2011; Widmer, 2005; Mikosz et al., 2014). Heavy metals, which constitute electrical and electronic waste, if placed in a long term/small dose mode can harm the environment and cause chronic poisoning in humans. The hazardous stream in municipal waste includes: fluorescence lamps (mercury lamps, etc.), accumulators, batteries, paints and varnishes and used up electrical and electronic equipment. In Table 1 (Oguchi et al., 2013; Laskowski, 2004) a content of heavy metals in circuit boards of various electrical or electronic equipment is shown.

Toxic metals highlighted in the table above include toxic, noble and base metals.

Toxic metals:

Barium (Ba) – enters surface water with industrial waste or can be flushed from geological formations. It can be found in many products, which is why a lot of waste with barium passes to the environment. In 2002, the Environmental Protection Agency (US) reported that about 100 million kg of barium compounds were legally released into the air, lakes, rivers, wells and landfills. Today, public water supplies are almost everywhere contaminated with barium. An excessive exposure to this element can cause: breathing difficulties, high blood pressure, arrhyth-

Table 1. Metals in circuit boards of various used up electrical or electronic equipment (Oguchi et al., 2013)

| Equipment                | No | Metals in circuit boards (mg/kg) |    |     |      |       |      |        |        |        |       |        |                 |     |     |
|--------------------------|----|----------------------------------|----|-----|------|-------|------|--------|--------|--------|-------|--------|-----------------|-----|-----|
|                          |    | Toxic metals                     |    |     |      |       |      | Metals |        |        |       |        | Precious metals |     |     |
|                          |    | Ba                               | Be | Cd  | Cr   | Pb    | Sb   | Al     | Cu     | Fe     | Sn    | Zn     | Ag              | Au  | Pd  |
| Refrigerator             | 1  | 82                               | -  | 85  | 27   | 21000 | 2700 | 16000  | 170000 | 21000  | 83000 | 17000  | 42              | 44  | -   |
| Washing machine          | 1  | 65                               | -  | -   | 39   | 2200  | 150  | 1000   | 70000  | 95000  | 9100  | 2400   | 51              | 17  | -   |
| Air-conditioner          | 1  | 320                              | -  | 3   | 11   | 5800  | 310  | 6900   | 75000  | 20000  | 19000 | 4900   | 58              | 15  | -   |
| TV Cathode-Ray Tube      | 5  | 2400                             | -  | 12  | 57   | 14000 | 3200 | 62000  | 72000  | 34000  | 18000 | 5300   | 120             | 5   | 20  |
| TV plasma display panel  | 2  | 3900                             | -  | -   | 100  | 7100  | 800  | 38000  | 210000 | 20000  | 15000 | 12000  | 400             | 300 | -   |
| LCD TV                   | 1  | 3000                             | -  | -   | -    | 17000 | 1800 | 63000  | 180000 | 49000  | 29000 | 200000 | 600             | 200 | -   |
| PC desktop               | 8  | 1900                             | 1  | 9   | 270  | 23000 | 2200 | 18000  | 200000 | 13000  | 18000 | 2700   | 570             | 240 | 150 |
| Notebook PC              | 2  | 5600                             | 32 | 2   | 610  | 9800  | 1300 | 18000  | 190000 | 37000  | 16000 | 16000  | 1100            | 630 | 200 |
| Video Cassette Recording | 2  | 1200                             | -  | 9   | 150  | 20000 | 1300 | 35000  | 160000 | 38000  | 18000 | 16000  | 210             | 23  | 50  |
| DVD player               | 3  | 4300                             | -  | 2   | 320  | 12000 | 1200 | 54000  | 220000 | 11000  | 22000 | 26000  | 710             | 150 | 20  |
| Mobile CD player         | 2  | 8600                             | -  | -   | 770  | 12000 | 1400 | 68000  | 200000 | 46000  | 50000 | 20000  | 3700            | 370 | 10  |
| Remote player            | 2  | 19000                            | 60 | -   | 4000 | 9300  | 1200 | 27000  | 330000 | 45000  | 48000 | 11000  | 3400            | 940 | 550 |
| Video game               | 6  | 5100                             | -  | 1   | 800  | 13000 | 2900 | 40000  | 190000 | 77000  | 26000 | 12000  | 740             | 230 | 43  |
| Microwave                | 1  | 2000                             | -  | -   | 860  | 17000 | 5800 | 14000  | 320000 | 400000 | 15000 | 28000  | 2000            | -   | -   |
| Popcorn maker            | 1  | 340                              | -  | -   | 530  | 5400  | 2600 | 20000  | 350000 | 200000 | 29000 | 39000  | 840             | -   | -   |
| Electric pot             | 1  | 1800                             | -  | 220 | 850  | 22000 | 9700 | 40000  | 230000 | 74000  | 33000 | 30000  | 2500            | -   | -   |

mia, stomach irritations, muscle weakness, nerve tricks, damage of brain, liver, kidneys and heart ([www.era-zdrowia.pl/](http://www.era-zdrowia.pl/)). The toxicity of barium increases with its solubility.  $\text{BaSO}_4$  is practically non-toxic, while  $\text{BaCl}_2$ ,  $\text{Ba}(\text{NO}_3)_2$ ,  $\text{BaCrO}_4$ ,  $\text{BaCO}_3$  and  $\text{Ba}(\text{CH}_3\text{COO})_2$  are highly toxic. A toxic dose of  $\text{BaCl}_2$  is 0.2-0.5 g while the lethal dose is 0.7-0.9 g; a toxic dose for  $\text{BaCO}_3$  is 0.6-0.9 g while the lethal dose is 1.2-2.0 g. For the remaining compounds the lethal dose is 2-4 g. Poisoning usually involves ingestion and shows symptoms of acute poisoning. The dose is determined per 1 kg of body weight (Seńczuk, 1994).

Beryllium (Be) – toxicity of beryllium compounds depends on their physical and chemical properties. Soluble beryllium compounds are more toxic than poorly soluble and insoluble ones. Highly dispersive beryllium dust produced during recovery and recycling processes is very toxic. The soluble compounds show both acute and chronic toxicity, while others produce toxic effects after a long-term exposure and cumulation (Madej, 1999).

Cadmium (Cd) – one of the most dangerous environmental poisons, it is highly toxic. It can be found in fuel oil, diesel oil, it is added to alloys, brazes, or as a pigment in production of paint, glazes, ceramic, or as an additive for plastics. It is also used in production of batteries and can be often found in electrical and electronic equipment. It can be harmful in any form and its lethal oral dose is 30-40 mg. Cadmium accumulation takes place primarily in the kidneys; accumulation above the threshold level of 0.2 mg/l g of kidney weight results in severe poisoning. Once in the environment, cadmium is generally not recoverable, it accumulates in the natural environment, enters the food chain and then with food is taken up by living organisms. Due to a good solubility cadmium salts penetrate to plants, which consume up to 70% of cadmium from soil and 30% from the air. Especially dangerous are fungi and lettuce, both cadmium reservoirs. A large supply of iron and vitamin D in the diet may prevent cadmium absorption. It is extremely difficult to excrete cadmium from the body; a period of half-excretion is 20 years.

Severe poisoning with cadmium was observed in Japan, where in the 60s of the last century zinc mine polluted the Jintsu river with cadmium and water used to irrigate rice plantations was contaminated (rice and wheat intensively accumulate cadmium). Within 15-30 years over 150 people died of chronic toxicity. The disease is manifested by atrophy of bone tissue (softening and brittleness) and known as the Itai-Itai (ouch-ouch) disease (faculty.virginia.edu; Seńczuk, 1994).

Chromium (Cr) – chromium compounds damage a respiratory system, digestive tract and cause skin changes; they also show carcinogenic, mutagenic, embryotoxic and teratogenic effects. Toxic effects are associated with the oxidizing properties of hexavalent chromium. Formation of stable complexes with proteins and ability to precipitate proteins was considered as a mechanism of local, adverse effects of chromium on skin and mucous membranes. During acute poisoning both kidney and digestive tract may suffer. Chronic poisoning cause disorders of the respiratory system, skin changes and gastrointestinal disorders. In plants, chromium disrupts uptake of other components necessary for a proper plant growth. The excess of this element causes chlorosis, which results in a disturbed water circulation and damage of growth cones and root systems (Laskowski, 2004; Seńczuk, 1994).

Lead (Pb) – has a very wide range of applications; it is present in antiradiation screens, in covers of electric cables, in production of wires, batteries, etc. The amount of lead absorbed from the environment to a human body depends on its form, absorption pathways, human metabolic activity, sex and age. Lead in humans can cause a synthesis of hemoglobin and anemia because it inhibits enzymes involved in hematopoiesis. In addition, it builds in bones; at certain concentrations it may impair growth, hearing and intellectual development of children. At higher doses, it is followed by weight loss, anemia, damage of vital organs and even death. The excessive amounts of cadmium adversely affect the essential life processes of plants such as: photosynthesis, cell division, nitrogen metabolism and water management. The toxic effects include lower yield, small dark green or red leaves, occasionally with necrotic spots, and shortened roots with a lower trichomes density (Seńczuk, 1994). Mobility of lead in plants is very limited; in general more than 90% of the element is accumulated in the roots. Uptake of Pb from the soil by plant roots is small and therefore the total Pb content in the soil above 500 mg/kg is referred to as toxic to plants. (Munoz et al., 1998).

Antimony, (Sb) – antimony compounds are absorbed slowly from a digestive tract and are deposited in a liver, kidneys and thyroid gland. Trivalent antimony compounds accumulate in red blood cells while pentavalent in plasma. Symptoms of poisoning are rarely reported. The oral lethal dose for humans is 500 mg/g of body weight; the lethal concentration

of antimony for mice is 100 mg/m<sup>3</sup> of the air. Symptoms of acute poisoning include headache, weakness, dizziness, vomiting and diarrhea. Chronic poisoning can damage heart functions and is usually associated with an occupational exposure. The concentration of antimony in the air is strongly related to man activity. Thus, the concentration of antimony in the air of a less polluted southern hemisphere is 0.001 ng/m<sup>3</sup>, while at a more polluted northern hemisphere is about 0.1 ng/m<sup>3</sup>. Concentrations in soils are in range of 0.3-1.8 µg/g. Antimony passes to groundwater with humic acids. Its concentration in natural water ranges from tenths of ng to 1 ng/mL. In waters polluted by municipal sewage or a landfill leachate its concentration may increase to few ng/mL, so it may be a monitoring parameter. Antimony compounds are readily taken up by plants, particularly when in a dissolved form. An increased content of antimony in plants, due to easy assimilation, can be expected at contaminated sites. (Niedzielski, 2000; Seńczuk, 1994).

Mercury (Hg) – (not listed in the table since, as a liquid metal, is not used in printed circuit boards; it can be found in e.g. energy-efficient light bulbs, thermometers, rectifiers and electrical contractors) enters human body mainly through a respiratory system and a digestive tract, but also through skin. About 80% of metallic mercury vapor inhaled is then retained in the human body; it enters a blood stream and is oxidized. Mercury is one of the highly toxic heavy metals. It shows teratogenic and mutagenic effects in living organisms and paralyzes a nervous system (ekologiapraca.wordpress.com).

#### Base metals

Aluminum (Al) – its absorption occurs by inhalation or ingestion. A daily dose of aluminum introduced with food is 10-100 mg. Gastrointestinal absorption in humans is small – less than 1%. In a healthy human body there is 50-150 mg of aluminum, half of which in bones and ¼ in lungs. Most of aluminum salts is converted to phosphates in a digestive tract and then excreted. Aluminum compounds in a living organism interfere with a number of metals and non-metals changing their bioavailability. In the human body aluminum competes with other elements such as zinc, iron, calcium and chromium. A mechanism of a neurotoxic process has not been well examined. Currently, it is believed that aluminum is toxic for humans mainly as a result of an occupational exposure (absorption of fumes and dusts). An occupational exposure may cause bronchopneumopathy, in a form of chronic nonspecific respiratory syndrome, lung fibrosis and pneumothorax. Vapors and fumes of aluminum as well as dust generated in production of aluminum powder are very dangerous, if inhaled. The fibrous weave pulmonary changes caused by a metallic aluminum powder are called pneumoconiosis aluminum. Aluminum dust in the alveoli is converted to hydrolyzed aluminum hydro-

xide causing cell divisions and couples with tissue proteins to form a colloidal complexes resulting in tissue hypertrophy and thickening of alveolar walls. Fibrous changes undergo cirrhosis, which in turn can lead to a large emphysema. The most common symptoms of silicosis are dry cough (mainly at night) and progressing exertional dyspnea. The period of the disease exposure lasts from several months to several years. Aluminium is also toxic for people with a renal failure, undergoing hemodialysis. In patients with a renal failure and peptic ulcer, symptoms associated with a lack of phosphate (anorexia, muscle weakness, osteomalacia) were observed after a long term treatment with aluminum compounds. People living in areas contaminated with aluminum get such symptoms mostly from soil and drinking water. Low concentrations of calcium and magnesium in water contribute to enhanced aluminium absorption from a digestive tract and its accumulation in a nervous system of humans. The studies on the impact of bioavailability of aluminum for fauna and flora and associated toxicity are of great importance in terms of an environmental exposure of the general population. Acid rains increase significantly an aluminum level in water used for food purposes (Seńczuk, 1994).

Copper (Cu) – is necessary for a proper functioning of humans body. It takes part primarily in oxidation-reduction processes as a coenzyme, regulates metabolism and transport of iron as well as collagen metabolism. The excess of copper in a human diet results in health impairment, it reduces hemoglobin, causes liver and kidney damage. Acute poisoning with copper salts are very rare. The toxic symptoms include damage to liver, kidneys, capillaries, pains and intestinal cramps. Death may occur after several hours of cardiac contraction, hypothermia and respiratory paralysis. Chronic poisoning results in congestion of nasal mucous membranes, gastritis and toxic symptoms, similar to those caused by zinc. Copper compounds act on skin causing itching, inflammation, they cause conjunctivitis, corneal ulceration and itching of the mucosa of the nose and throat. A surplus copper slows down chlorophyll biosynthesis in plants, however it is essential for a proper plant growth. Copper is found in enzymes and proteins involved in generative processes of plants, photosynthesis, respiration, and metabolism of nitrogen compounds. (Laskowski, 2004).

Iron (Fe) – is essential for living organisms. An adult organism has 4-5 g of iron in his body. Iron is a component of a hemoglobin molecule and is found in many enzymes involved in intracellular breathing. It influences enzymes, red blood cells, cell respiration, heart function, cell division, hormonal metabolism, development of muscle tissue, immune system and oxygen supply for cells. Its shortage leads to anemia and hair, skin and nails damages. Another symptoms include insomnia, fatigue, impaired concentration and memory, lack of appetite, pallor of

skin, cold hands and feet syndrome, tinnitus, dizziness, frequent fainting, atrophic changes of tongue, gums and mucous membranes of the throat and stomach, muscle strength loss ([www.ujk.edu.pl](http://www.ujk.edu.pl)). A surplus of iron, as a result of improper diet or metabolism, can be very dangerous for humans. (<http://bonavita.pl>). It accumulates in the liver or pancreas poisoning the body.

Tin (Sn) – experiments on animals showed disturbances of hem biosynthesis and anemia. Organic tin compounds inhibit respiratory processes. The main symptoms of acute poisoning after drinking fruit juices stored in tin cans are: nausea, vomiting, diarrhea, general exhaustion and headache. Chronic poisoning occurs when people inhale tin; it manifests as skin rushes and conjunctival irritations. Inorganic compounds of tin show low toxicity (Seńczuk, 1994).

Zinc (Zn) – plays an important role in plant metabolism. Both deficiency and surplus of this element impair the plants growth. Zinc deficiency in plants is generally observed when its content is below 20 mg/kg, while toxic effects when it exceeds 300 ÷ 400 mg/kg. Zinc deficiency disturbs metabolism of proteins, phosphates, carbohydrates and synthesis of RNA and DNA (impaired growth and reproduction of plants). An excess of Zn in soil and its intensive uptake by roots, as well as its deficiency, limit plant growth. The symptoms of high Zn concentrations in plant biomass include: chlorotic and necrotic changes in leaves, reduced photosynthesis, resulting in wrinkling of leaves and thus their slower growth. Zinc in most cases is taken up by plants proportionally to its content in soil, though both soil properties and plant species substantially affect its accumulation. Although zinc is an essential element in a human body its excess can cause metabolic disorders, disorders of a circulatory system and mental disorders. Acute poisoning with zinc compounds is rare, but people facing a long time exposure to zinc dust and zinc oxide may suffer: respiratory tract irritation, fever, dysfunction of the gastro-intestinal tract and anemia (Seńczuk, 1994).

Noble metals are inert to the human body and show bactericidal properties. They can be used to fill cavities, e.g. in bones, teeth or used in cosmetic and pharmaceutical industries.

#### 4.1. Risk of environmental pollution



In studies on an environmental pollution risk quantitative methods can be used only if a large and reliable database is available. If there is no a proper database, qualitative/quantitative or qualitative methods should rather be used instead. The group of qualitative/quantitative methods includes the logic trees methods (ETA, FTA). These are group methods in which possibility of overlooking any relevant fact is small. However, they require a good knowledge of the system. It should be noted that trees constructed by different people/teams may vary

depending on an assumed level of detail, system understanding and available information. Below there are examples of applications of ETA and FTA methods as well as a qualitative matrix method.

### FTA Method

The method of a fault tree (Fault Tree Analysis, FTA) is used to identify the causes leading to a specific undesirable event (fault). The event, known as a developing event, should be broken down to so-called basic causes. Therefore, starting from the fault, i.e. top event, using the method of top-down one descends down the tree to the original basic events. Logic gates (e.g. simultaneity gate AND, alternative gate OR, inhibit gate XOR, see Tab. 2) allow to specify the relationship between primary events (causes), which may lead to the undesirable event (fault).

Table 2. Logic gates used in the case study

| Gate             | Graphic symbol  | Description                                | Probability of occurrence of an event (fault)                      |
|------------------|---|--|--|
| alternative OR   |  | the output occurs if any input occurs      | Sum of probabilities of input events (if they are independent)     |
| simultaneity AND |  | the output occurs only if all inputs occur | Product of probabilities of input events (if they are independent) |

The following is a proposed fault tree diagram for the top event Z0: contamination of soil and groundwater by e-waste deposited at a landfill. The method was first used as a qualitative method (Fig. 1). The developing events in the diagram were denoted as Z0, Z1, Z2 and Z3 while and the base events as B1, B2, ... B6. If municipality does not have incinerators, contamination of soil and/or groundwater may result from deposition of WEEE at illegal (Z1) or legal landfills (Z2). Contamination by a legal landfill (sealed, controlled) takes place only when the digestate from a composting plant will include WEEE (Z3) that releases dangerous substances (B5), and at the same time (AND gate) the site proves to be leaking (B6). The digestate will contain WEEE only when e-waste ends up in a container with a mixed fraction (B3), as not separated during earlier processes (B4).

FTA can also be used as a quantitative method. If probabilities of base events are known (at the bottom of the tree) then using the *down-top* method and

Boolean algebra probability of events located at higher levels of problem decomposition can be found. At the final stage, the probability of occurrence of a top event would be determined, which can be assumed as a risk measure  $R = P(Z0)$ . For a quantitative method the following risk ranges can be proposed: RA (acceptable) if  $R \leq 0,005$ ; RT (tolerable) if  $0,005 < R \leq 0,02$  and RN (unacceptable) if  $R > 0,02$ . Below, the actual probabilities of base events were assumed:  $P(B1)=0,2$ ;  $P(B2)=P(B5)=1$ ;  $P(B3)=0,2$   $P(B4)=0,05$  and  $P(B6)=0,01$ . The *top-down* methods give the following probabilities of occurrence of developing events:

$$P(Z1) = P(B1) \cdot P(B2) = 0,2$$

$$P(Z3) = P(B3) \cdot P(B4) = 0,01$$

$$P(Z2) = P(Z3) \cdot P(B5) \cdot P(B6) = 0,0001$$

Finally, the risk assumed as probability of occurrence of the top event is

$$P(Z0)=P(Z1)+P(Z2)=0,2001,$$

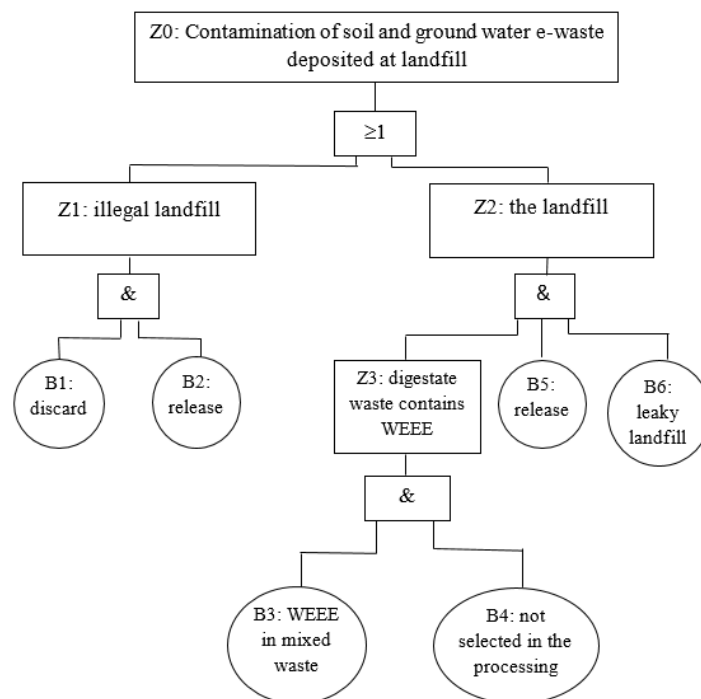
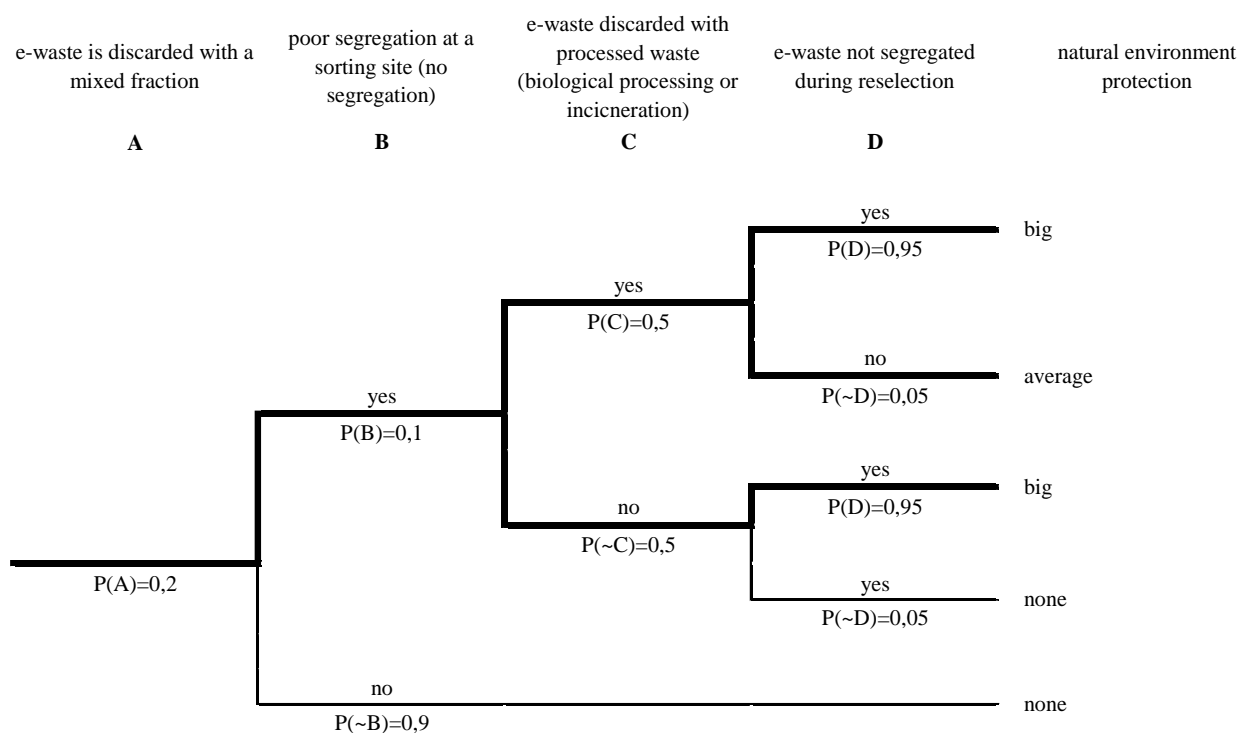
while the same risk for a safe landfill (Z2) is acceptable.

As can be seen, the resulting risk  $R = P(Z0)$  is high. This result was influenced by the fact that high probability  $P(B1)$  was assumed (deposition of e-waste at illegal dumps). Reduction of risk can be achieved by raising environmental awareness (especially of rural populations), improving a WEEE collection system (e.g. a free pick-up of e-waste from households) and high fines imposed for abandoning waste at illegal sites (e.g. trenches, forests).

### ETA Method

The event tree method (Event Tree Analysis, ETA) is used to identify scenarios (sequence of events) that can lead to undesired outcome as a result of the initiating event. Assuming that such an event took place, subsequent events and developments are analyzed; their occurrence (or not) in a specific order results in losses and lower security. After scenarios are identified, their outcomes can be predicted (qualitative method). If probability of occurrence of the initiating event and all developing events are known, probability of all scenarios can be determined as well as probability of a particular scenario (quantitative method). Probability of each scenario is determined by multiplying the probabilities of events present in this scenario.

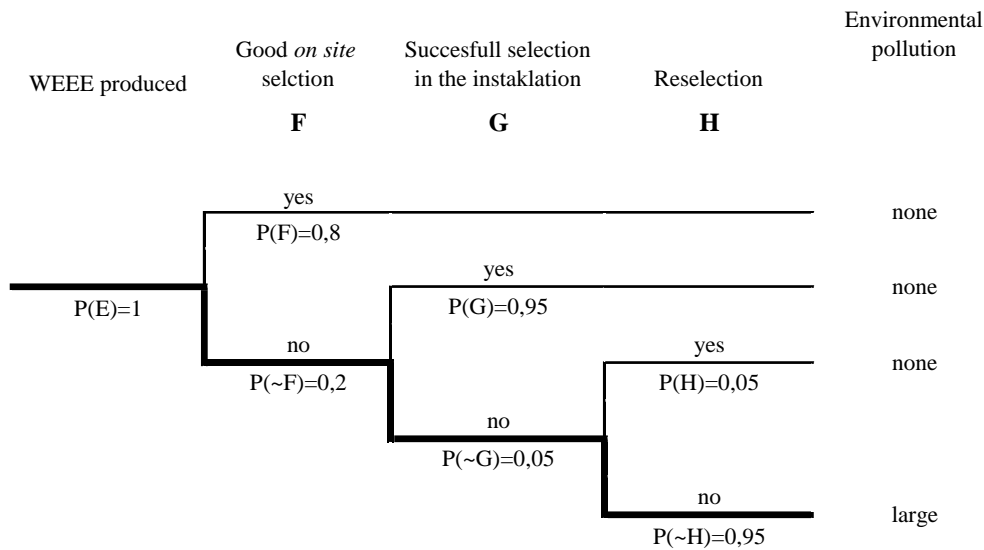
In the study, the ETA method was applied for the initiating event: e-waste is discarded into a blue container with mixed fractions (event A, Fig. 2). As subsequent developing events the authors assumed: B-WEEE is not separated at a sorting site (e.g. metal separator is broken or lack thereof), C-WEEE is composted, D-WEEE is not separated from digestate (after composting) or slag, or filters did not remove harmful substances (after incineration). It can be seen that 3 out of 5 scenarios lead to environmental pollution. To determine the risk as probability of the

Figure 1. Fault tree for the top event *contamination of soil and groundwater by e-waste deposited at a landfill*, author's own workFigure 2. Event tree for the initiating event *e-waste gets discarded into a blue container with mixed fraction*, author's data

environment pollution three accident scenarios should be considered. Hence,  
 $R = P\{ABCD\} + P\{ABC\sim D\} + P\{AB\sim CD\}$ ,  
 where  $\sim$  means an opposite event. The risk was  $R = 0,2 \cdot 0,1 \cdot 0,5 \cdot (0,95 + 0,05 + 0,95) = 0,0195$ . It can be seen that the determined probability (risk) of the environment pollution if e-waste gets mixed with other fractions, although small, is not negligible and

cannot be unconditionally accepted. In real life, the only way to reduce it is to reduce the probability of the initiating event. This can be done primarily by raising environmental awareness of people while simplifying the e-waste collection system. A different tree of events can be created for each problem that can be differently targeted and have different applications. Below, the authors analyzed the

Figure 3. Tree of events for evaluation of efficiency of ee waste selection levels, author's data



impact of different levels of WEEE selection (Fig. 3); *selection completed successfully* means that WEEE is separated from mixed waste. It was assumed that e-waste is generated with probability of  $P(E) = 1$  and a primary selection can be done *at source* (by the e-waste owner). In this analysis it was assumed that e-waste did not end up at illegal dumps nor at a scrap metal collection site. Due to environmental awareness of the WEEE user a proper action is taken and e-waste is turned over to municipal services with probability  $P(F) = 0.8$ . However, if electro waste ends up with mixed waste, so it is highly probable  $P(G) = 0.95$  that it can be separated with magnetic metal separators. If not separated, then along with other waste it goes to the installation of mechanical-biological processing or to incinerators, and from there to a landfill. If during processing it will not decompose, it still may be captured (a very low probability  $P(H) = 0.05$ ) during reselection in a mechanical-biological installation or can be finally disposed in incinerators (removed on filters or separated from slag). These three scenarios do not pollute the environment, as a result of initiation of one of selection levels. Pollution may occur if none of the above three selection works. Then, assuming risk as probability of the environment pollution,  $R = P\{E \sim F \sim G \sim H\}$  or  $R = 1 \cdot 0,2 \cdot 0,05 \cdot 0,95 = 0,0095$ . It can be seen that in spite of high probability values assumed for electro waste separation at levels  $P(F)$ ,  $P(G)$  and  $P(H)$ , the final risk cannot be ignored. If probability of the initial selection *at source* increased to 0.9 due to better environmental awareness, risk would drop to 0.00475. The above method of selection evaluation is based on *analysis of protection layers* (AWZ) [PN-EN ISO 14121-1: 2008; IEC 60300-3-9; BS EN 1050: 1999] used in solving another risk problems. As it can be seen, a construction of the tree structure and scenarios (Fig. 3) is aimed at activation of some safety measures. In

contrast, the first tree (Fig. 2) has been focused on the security damage and losses.

### Matrix methods

A qualitative matrix method allows to estimate and evaluate risk by assigning it into one of the categories RA, RT or RN. Following the adoption of appropriate risk measures (e.g.  $R = P \cdot S$ ) the actual range of each of the risk parameters ( $P$ ,  $S$ ) is divided into  $k$  classes; usually  $k = 3, 4$  or  $5$  are assumed. Each class gets: rank (weight), descriptive term (qualitative e.g. rare event, large losses) and detailed specification (quantitative, e.g. frequency once every 3 years, losses over 100 thousand PLN). The principle is that more frequent events and more severe effects have higher ranks, while specifications should be defined individually for each event, according to the actual conditions. Then a risk matrix is prepared and the values for which risk is acceptable, tolerable and unacceptable are determined. When analyzing the particular problem, the risk measure is determined by multiplying the numbers (ranks) of the parameters. This is a relative value in a conventionally accepted scale (from 1 to  $k^2$ ). After the risk evaluation, a plan to reduce risk for the range of RN and RT (if ALARP) is prepared or monitoring of RT and RA risks is planned.

The authors used the method to assess risk of environment pollution by bulbs, which were not delivered to a waste collection site (proper disposal) but were discarded into a blue container for mixed waste. The energy-saving light bulb contains about 4 to 5 milligrams of mercury, which is highly toxic. In addition, the bulb usually breaks in a bulk container and if so, once released mercury cannot be separated during further waste processing and is likely to be released to the environment despite all security measures (filters, seals, protective installations).



Here the classic risk measure  $R = P \cdot S$  was adopted. For two risk parameters (P, S)  $k = 3$  were assumed (Tab. 3, Tab. 4).

Table 3. Ranks of events that a not properly segregated bulbs pollute the environment [authors data]

| class | frequency | detailed specification                                 |
|-------|-----------|--|
| 1     | Low       | less that once every 3 years                           |
| 2     | average   | less than once every 3 years but more than once a year |
| 3     | High      | more than once a year                                  |

Table 4. Ranks of results [authors data]

| class | results | detailed specification                          |
|-------|---------|---|
| 1     | small   | up to 10 bulbs discarded to the mixed waste     |
| 2     | average | 10-30 bulbs discarded to the mixed waste        |
| 3     | large   | more than 30 bulbs discarded to the mixed waste |

Then a risk matrix was prepared (Tab.5) with the following assumptions:

- Acceptable risk RA when  $R=1$
- Tolerable risk RT when  $2 \leq R \leq 3$
- Unacceptable risk RN when  $R > 3$  or the highest class of results  $S=3$ .

Table 5. Risk matrix for the bulb discarded with mixed waste [authors data]

|   |   | S |   |   |
|---|---|---|---|---|
|   |   | 1 | 2 | 3 |
| P | 1 | 1 | 2 | 3 |
|   | 2 | 2 | 4 | 6 |
|   | 3 | 3 | 6 | 9 |

Then two risks were evaluated arising from bulbs discarded to a blue container for the mixed fraction. These are:

- 1) risk R1, if the bulbs come from only one household; other city residents discard bulbs following utilization guidelines,
- 2) risk R2, if bulbs from the entire city; all citizens behave in the same way and only about half of bulbs is properly utilized.

The analysis was performed for a small city. It was assumed that:

- city population is approx. 60 thousand with 15 thousand households,
- on average, 6 bulbs are burned in each household over 4 years, including car bulbs,
- on average, half of bulbs is discarded to a blue container for mixed waste (i.e. 3 bulbs in 4 years in a single household and 11,250 bulbs each year throughout the city).

For the assumed classes of frequency and effects the following results were calculated:

- $R1 = P1 \cdot S1 = 1 \cdot 1 = 1$  – risk is acceptable RA,
- $R2 = P2 \cdot S2 = 3 \cdot 3 = 9$  – risk is unacceptable RN.

Risk of environmental pollution with used bulbs from a single household may be subjectively considered as small; an individual decision will not matter to the environment because the effects of such event in e.g. a large city will be negligible. If, however, such decisions make a large number of people throughout the city, the result will be significant but only on a local scale. Though, if inhabitants of all the cities, towns and villages follow, the outcome will be of a global scale and environmental pollution will increase with time, which means that the burden of many individual, inappropriate actions can lead to a large, irreversible environmental changes. Such mechanism of a humans impact on the environment is called *the tyranny of small decisions* (Odum, 1982). Practically, the only way to reduce risk is to raise an environmental awareness of the population.

## Conclusions

- Waste management systems and installations, including WEEE management, are subjected to risk as they are a possible source of harmful (dangerous, undesirable) events causing losses, damages or other adverse effects. To reduce a chance of serious scenarios or ensure losses minimization it is necessary to define risk, estimate its occurrence and then manage it in a proper way. The basic steps of risk management are: hazard identification, risk assessment, its evaluation and reduction, when risk is too high.
- With regard to the environment, the following risks can be discussed: pollution risk (chemical or landscape), risk of violation of the sustainable development principles and health risk.
- The article analyzes and assesses risk of the environmental impact in case of poor recovery and recycling of WEEE due to negligence or system malfunctions. Determination and assessment of risk in terms of sustainable development is an extremely important multi-faceted problem. It addresses the environmental threats and losses as well as the problem of depletion of natural resources, as a source for future generations.
- To prevent irreversible environment pollution some environmentally friendly rules of conduct should be promoted, beginning from early childhood. Additional work on promotion of anti-consumerism and environmental friendly policies should be carried out. Actions resulting from the lack of environmental awareness or problems with utilization of e-waste may be damaging to the environment. Accumulation of their individual effects of low significance may prove to be very harmful in the long run.



- The examples presented in the article have been simplified and the data have been estimated by experts, as the authors did not carry out a risk analysis for specific situations and objects but rather tried to propose the risk assessment methods.
- The analyses indicate that the problem of environmental pollution with e-waste is an important one and is becoming more and more urgent. Therefore, the risk problems highlighted in the article should be further explored.

## References

1. BIELIŃSKA E., J., BARAN ST., PAWŁOWSKI L., FUTA B., JÓŹWIAKOWSKI K., FUTA B., BIK-MAŁODZIŃSKA B., MUCHA Z., GENEROWICZ A., 2014, Theoretical aspects of the integrated protection of suburban areas, in: *Problemy Ekorozwoju/ Problems of Sustainable Development* vol. 9, no 1, p. 127-139.
2. BONAVITA, 2016, *Nadmiar żelaza we krwi*, <http://bonavita.pl/nadmiar-zelaza-we-krwi-przyczyny-objawy-skutki-i-odpowiednia-dieta> (13.07.2016).
3. ERA ZDROWIA, 2016, *Bar – trucizna o której nikt nie mówi*, <http://www.era-zdrowia.pl/strefa-toksyczna/przemysl/bar-trucizna-o-ktorej-nikt-nie-mowi.html> (13.07.2016)
4. *DIRECTIVE 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.*
5. VIRGINIA EDU, 2016, *Rasnake*, <http://faculty.virginia.edu/metals/cases/rasnake1.html> (13.07.2016)
6. GENEROWICZ A., 2014, Multi-criteria analysis of waste management in Szczecin, in: *Polish Journal of Environmental Studies* vol. 23, No. 1, p. 57-63.
7. HORA S. C., 1996, Aleatory and epistemic uncertainty in probability elicitation with an example from hazardous waste management, in: *Reliability Engineering & System Safety* vol. 54 no 2-3, p. 217-223.
8. IWANEJKO R., 2005, O praktycznym stosowaniu jakościowych metod szacowania ryzyka w systemach zaopatrzenia w wodę, in: *Czasopismo Techniczne PK*, x.8-Ś.
9. KIDDEE P., NAIDU R., WONG M. H., 2013, Electronic waste management approaches: An overview, in: *Waste Management*, 33, p.1237-1250.
10. KOWALSKI Z., GENEROWICZ A., MAKARA A., KULCZYCKA J., 2015, Evaluation of municipal waste landfilling using the technology quality assessment method, in: *Environment Protection Engineering*, vol. 41, no. 4.
11. LASKOWSKI R., MIGULA P., 2004, *Ekotoksykologia: od komórki do ekosystemu*, PWRiL.
12. MIKOSZ J., MUCHA Z., 2014, Validation of Design Assumptions for Small Wastewater Treatment Plant Modernization in Line with New Interpretation of Legal Requirements, in: *Ochrona Środowiska*, vol. 36 no 1, p. 45-49.
13. MUNOZ, C., GARBE, K., LILIENTHAL, H., WINNEKE, G., 1988, Significance of hippocampal dysfunction in low level lead exposure of rats, in: *Neurotoxicol. Teratol.* 10, p. 245-253.
14. MADEJ M., 1999, Beryl i jego związki – występowanie, zastosowanie i ocena narażenia, in: *Bezpieczeństwo pracy nauka i praktyka* 5.
15. NERI M., FUCIC A., KNUDSEN L.E., LANDO C., MERLO F., BONASSI S., 2003, Micronuclei frequency in children exposed to environmental mutagens: a review, in: *Mutation Research* 544, p. 243-254.
16. NIEDZIELSKI P., SIEPAK M., SIEPAK J., Występowanie i zawartości arsenu, antymonu i selenu w wodach i innych elementach środowiska, in: *Rocznik Ochrona Środowiska/ Annual Set Environment Protection*, [http://old.ros.edu.pl/text/pp\\_2000\\_015.pdf](http://old.ros.edu.pl/text/pp_2000_015.pdf) (1.03.2016).
17. ODUM W. E., 1982, Environmental Degradation and the Tyranny of Small Decisions, in: *Bioscience* vol. 32 no 9, p. 728-729.
18. ONGONDO F.O., WILLIAMS I.D., CHERRETT T.J., 2011, How are WEEE doing? A global review of the management of electrical and electronic wastes, in: *Waste Management* vol. 31 no 4, p. 714-730.
19. OGUCHI M., SAKANAKURA H., TERAZONO A., 2013, Toxic metals in WEEE: Characterization and substance flow analysis in waste treatment processes, in: *Science of the total environment*, 463-464, p. 1124-1132.
20. PAWŁOWSKI A., 2008, How many dimensions does sustainable development have?, in: *Sustainable Development*, vol. 16, no. 2, p. 81-90.
21. *PN-EN ISO 14121-1:2008 Bezpieczeństwo maszyn. Ocena ryzyka Część 1; Zasady.*
22. *PN-IEC 60300-3-9, Zarządzanie niezawodnością. Przewodnik zastosowań. Analiza ryzyka w systemach technicznych.*
23. *PN-EN 1050:1999, Maszyny. Bezpieczeństwo. Zasady oceny ryzyka.*
24. RAK J., 2008, Metoda trójwarstwowa matrycy ryzyka dla bezpieczeństwa systemu zaopatrzenia w wodę, in: *Ekotechnika* vol. 2 no. 30, p. 8-10.
25. RAK J., 2005, Podstawy bezpieczeństwa systemów zaopatrzenia w wodę, in: *Monografie Komitetu Inżynierii Środowiska PAN*, vol. 28, Lublin.
26. ROBINSON B., H., 2009, E-waste: An assessment of global production and environmental impact, in: *Science of The Total Environment*, vol. 408 no 2, p. 183-191.

27. SEŃCZUK W. (ed.) 1994, *Toksykologia – podręcznik dla studentów farmacji*, Wydawnictwo Lekarskie Państwowy Zakład Wydawnictw Lekarskich, Warszawa.
28. TSYDENOVA O., BENGTSSON M., 2011, Chemical hazards associated with treatment of waste electrical and electronic equipment, *Waste Management*, vol. 31, p. 45-58.
29. UJK, 2016, *Metale ciężkie w środowisku przyrodniczym* <http://www.ujk.edu.pl/org/sknkalcyt/ourworks/14.pdf> (13.07.2016).
30. WIDMER R., OSWALD-KRAPF H., SINHA-KHETRIWAL D., SCHNELLMANN M., BÖNI H., 2005, Global perspectives on e-waste, in: *Environmental Impact Assessment Review*, vol. 25 no 5, p. 436-458.

# INSTRUCTIONS FOR AUTHORS

## NOTA DO AUTORÓW

---

*Problemy Ekorozwoju/Problems of Sustainable Development* is a scientific journal published under the auspices of the European Academy of Science and Arts (Salzburg, Austria).

Annually two issues are published.

*Problemy Ekorozwoju/Problems of Sustainable Development* represents social sciences. Every paper should refer to the basic paradigms of sustainable development. We also prefer international comparisons than local studies.

Scope of the journal:

- Ecophilosophy.
- Philosophical aspects of sustainable development.
- Social-political aspects of sustainable development.
- Earth resources management from the viewpoint of sustainable development.

The magazine publishes original papers not longer than 20 pages (40 000 characters) as well as reviews and letters no longer than 5 pages (10 000 characters).

Text pages should be of the A4 size, double line spacing, left and right margin of 2.5cm, 12-point *Times New Roman* font. The text should be organized as follows:

- Title of the article,
- Name and surname of the author(s),
- Address,
- e-mail,
- Abstract,
- Key words,
- References.

References quoted in the text should be given in parentheses and include the author's surname and the publication year e.g. (Tyburski, 2004).

The reference list should be given at the article end, arranged alphabetically by surnames of the first authors.

Reference should be listed as the following:

- Journal:  
Surname and name initials of the author(s), year, article title, magazine title in italic, volume, issue, pages: from - to.  
Example:  
KOZŁOWSKI S., 2006, The Position of Poland in Europe, in: *Problemy Ekorozwoju/Problems of Sustainable Development*, vol. 1, no 2, p. 93-98.

*Problemy Ekorozwoju/Problems of Sustainable Development* są czasopismem naukowym publikowanym pod patronatem Europejskiej Akademii Nauki i Sztuki (Salzburg, Austria).

Rocznie publikowane są dwa zeszyty.

*Problemy Ekorozwoju/Problems of Sustainable Development* reprezentują nauki społeczne. Każdy artykuł powinien odwoływać się do paradygmatów rozwoju zrównoważonego. Preferujemy prace podejmujące dyskusję w kontekście międzynarodowym.

Zakres tematyczny czasopisma obejmuje:

- Ekofilozofię.
- Filozoficzne aspekty zrównoważonego rozwoju i ekofilozofii.
- Społeczno-polityczne aspekty zrównoważonego rozwoju.
- Uwarunkowania gospodarki zasobami Ziemi w aspekcie zrównoważonego rozwoju.

W czasopiśmie publikowane są prace oryginalne i artykuły przeglądowe o objętości ok. 20 stron (40 000 znaków) oraz recenzje i listy do redakcji o objętości do 5 stron (10 000 znaków).

Teksty należy przygotować w formacie A4 z podwójną interlinią, lewy i prawy margines 2,5 cm, czcionka *Times New Roman* 12 pkt., z zachowaniem następującego układu:

- tytuł w języku angielskim i polskim,
- imię i nazwisko,
- adres,
- e-mail,
- streszczenie i słowa kluczowe w języku polskim
- abstract (streszczenie w jęz. angielskim),
- key words (słowa kluczowe w jęz. angielskim),
- literatura.

Literatura w treści powinna być cytowana poprzez podanie w nawiasie nazwiska i roku publikowania pracy np. (Tyburski, 2004).

Zestawienie cytowanej literatury powinno być zamieszczone na końcu artykułu, uporządkowane alfabetycznie wg nazwiska pierwszego z autorów.

Wykaz literatury powinien zostać sporządzony według następujących zasad:

- Czasopismo:  
Nazwisko i inicjały imion, rok, tytuł artykułu, nazwa czasopisma (kursywą), vol., numer, strony od-do. Przykład:  
KOZŁOWSKI S., 2006, Miejsce Polski w Europie, in: *Problemy Ekorozwoju/Problems of Sustainable Development*, vol. 1, no 2, p. 93-98.

- **Book:**  
Surname and name initials of the author(s), title in italic, publishers' name, publication year. Example:  
KOZŁOWSKI S., 2005, *The Future of Sustainable Development*, KUL, Lublin.
- **Publication in collective works (monographs):** Surname and name initials of the author(s), article title, title of the monograph (in italic font), surname and name initials of the monograph editor, publisher's name, publication year. Example:  
PAPUZINSKI A., 2004, Philosophical Aspects of Sustainable Development Principle, in: *Philosophical, Social and Economic Aspects of Sustainable Development*, ed. Pawłowski A., Lublin University of Technology, Lublin, p. 25-32.
- **Internet:**  
Name of the web site, address, date of access. Example:  
*Problemy Ekorozwoju/Problems of Sustainable Development*,  
ecodevelopment.pollub.pl (2.01.2014).
- **Książka:**  
Nazwisko i inicjały imion autora, tytuł (kursywą), nazwa wydawnictwa, rok wydania. Przykład:  
KOZŁOWSKI S., 2005, *Przyszłość ekorozwoju*, KUL, Lublin.
- **Prace wydane w monografiach zbiorowych:**  
Nazwisko i inicjały imion autora, tytuł artykułu, tytuł monografii (kursywą), nazwisko i inicjały imion redaktora monografii, nazwa wydawnictwa, rok wydania.  
PAPUZIŃSKI A., 2004, Filozoficzne aspekty zasady zrównoważonego rozwoju, in: *Filozoficzne, społeczne i ekonomiczne uwarunkowania zrównoważonego rozwoju*, ed. Pawłowski A., Politechnika Lubelska, Lublin, p. 25-32.
- **Źródła Internetowe:**  
Nazwa strony, adres, czas dostępu. Przykład:  
*Problemy Ekorozwoju/Problems of Sustainable Development*,  
ekorozwoj.pollub.pl (2.01.2014).

Additional footnotes should be consecutively numbered and given at the bottom of each page.

**Articles to be published should be e-mailed to:**  
**ekorozwoj@wis.pol.lublin.pl**

Przypisy powinny być numerowane, a ich treść umieszczana na dole każdej ze stron.

**Prace do druku proszę przysyłać drogą elektroniczną na adres:**  
**ekorozwoj@wis.pol.lublin.pl**