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SUSTAINABILITY–CULTURE INTERFACE IN THE SOCIAL, ENVIRONMENTAL AND ECONOMIC PERSPECTIVE

The issue of sustainability-culture interface is relatively new, because for a long time was not a subject of detailed analysis. In the context of the title some important questions were developed: how to understand the concept of interface sustainability-culture? what are its contemporary examples? are these examples of the interface a determinant of unfavorable fluctuations? On this basis the following three research aims were formulated: define the notion of sustainability-culture interface, identify contemporary types of sustainability-culture interface, test the thesis that identified types of sustainability-culture interface are in unfavorable fluctuation. The basis of the research was the analytical study of international literature and analysis of statistical data. In the paper the author's definitions of interface, sustainability, culture as well as sustainability-culture interface were introduced. The achievement of formulated aims allowed to answer all formulated questions in the context of identifying fluctuations assessed from a social, environmental and economic perspective. For the purpose of analysis performed for the three mentioned areas of sustainable development the following indicators were included: urban population exposure to air pollution by particulate matter, greenhouse gas emissions intensity of energy consumption, total R&D expenditure in % of GDP. The subject of the analysis is the European Union (EU-28) scrutinized in the years 2000-2011. To calculate the fluctuation there was used the index of dynamics. The results of statistical analysis proved the thesis of unfavorable fluctuations within two out of the three identified types of sustainability-culture interface.

Keywords: sustainability–culture interface, sustainability, sustainable development, sustainable development indicators, European Union.

1. INTRODUCTION

Understanding the essence of balance is possible only after indicating the factors for the imbalance. Between these two phenomena occurs bi-directional relationship, which expresses the existence of opposing, dichotomous states and entities. In 1992 the concept of balance and imbalance has become an issue of particular international interest during the Earth Summit in Rio de Janeiro. As a result, the initiatives for worldwide implementation of the sustainability concept have become widespread. These initiatives affect all spheres of human activity, including the sphere of culture. Interest in sustainability led to creation of a specific sustainability–culture interface, which was not a subject of detailed analysis so far. When referring to this research

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problem it is justified to ask a basic question: how to understand the concept of sustainability– culture interface and thus what are its contemporary examples/manifestations as well as whether they solidify the balance or imbalance, reflecting a negative or positive change in the sphere of culture.

In this paper there was formulated thesis that examples/manifestations of sustainability-culture interface reflect the imbalance in socio-economic development. The first aim of this article is to define the notion of sustainability-culture interface. The next aim relates to the identification of contemporary manifestations, in other words the types of sustainability-culture interface. The third aim of the paper is demonstrating whether the identified types of sustainability-culture interface inform on the existence of unfavorable fluctuations, i.e. imbalance. To realize the first two aims the literature study was performed and to realize the third aim the analysis of international statistics was introduced.

The semantic scope of the term interface, presented upon the basis of literature analysis allowed to formulate a general interpretation of this notion in the next chapter. Further sections in the paper discuss the issue of sustainability and culture leading ultimately to define the concept of sustainability–culture interface and identification of its types. In the next chapter the analysis of selected types of sustainability–culture interface was prepared in the social, environmental and economic perspective.

The section presented below has been devoted to the analysis of the interface and led to formulation of the author's definition of that term.

2. PRACTICAL AND THEORETICAL EXAMPLES OF INTERFACE

The concept of interface occurred in the era of computerization and related to the ways of interacting human with a computer. This meaning was exploited many times what indicate the following examples. P. Edwards and B. Broadwell treated interface as device providing compatibility between non-standard devices and standard ones². B. Junor and C. Demontravel emphasize the existence of two most popular types of interface, enumerating the graphical user interface and command line interface and describing them as an image displayed on the screen and the manner of issuing commands to computer³. J. O. Green understands the interface as the sum of the ways and means of contacting between human and computer⁴. Wider analysis of this subject presents L. Manovich. He defined the concept of **human-computer interface** which "describes how a user interacts with the computer"⁵. To illustrate the presented interpretation the author explains that "the interface are input and output devices such as a monitor, keyboard and mouse, it is also a metaphor used in order to bring the user to the organization of computer data"⁶. In the next

⁶ Ibidem.

² Por. P. Edwards, B. Broadwell, *Data processing: computers in action*, Wadsworth Pub. Co., Belmont 1979, s. 47.

³ Por. B. Junor, C. Demontravel, *Internet, the user's guide for everyone*, Branden, 2nd ed., Boston 1995, s. 15.

⁴ Por. J. O Green, Nowa era komunikacji, Prószyński i S-ka, Warszawa 1999, s. 43.

⁵ L. Manovich, *Język nowych mediów*, Wydawnictwa Akademickie i Profesjonalne, Warszawa 2006, s. 140.

parts of the book L. Manovich adds that "interface is a system for machine control³⁷. This approach indicates that interface is both a kind of code language or characters (symbols)⁸, as well as a form of expression or the management of relationships. Similarly P. Reed along with a team sees the interface in terms of software, when characterizing the progress in development of standards and guidelines for human–computer interaction⁹.

A similar interpretation of the interface represent J. Gwizdka and M. Chignell, who understand it as a way of presenting (in the context of tasks realized by e-mail boxes)¹⁰, or S. Trewin, G. Zimmermann and G. Vanderheiden, who describe a selected types of user interface like: UIML, XIML, XForms and URC¹¹. C.V. Copas and E. Edmonds make a research on the so called intelligent human–computer interface in terms of its intelligence, i.e. the ability to interact with the user. To this end they analyze the functions of electronic calendars for ergonomics and management systems¹². J. Kim and J. Yun Moon refer to the interface as the visual elements of electronic business systems, examining their impact on customers' emotions such as feeling of governance, credibility, embarrassment and elegance¹³.

The brief review of the literature presented above allows introducing a generalized definition of interface. In this article, "interface" will be understood as a way or a tool of communication, information exchange method (in every possible dimension, i.e. verbal, visual and tangible), but also as a form of expression or communication. The concept of forms of expression or communication includes: tools, instruments, mechanisms, resources, techniques, technologies, methods, processes/operations, systems. Among the types of expression or transmission are: values, principles, goals, attitudes, feelings, needs, ideas, etc. The formulated interpretation is the basis for the discussion presented in the following chapters.

The subject of the next chapter is analyzing definitions of sustainability in the context of sustainable development concept.

⁷ Ibidem, s. 151.

⁸ A. Vallega, *The role of culture in island sustainable development*, Ocean & Coastal Management 50/5-6 (2007), s. 279–300.

⁹ Por. P. Reed, K. Holdaway, S. Isensee, E. Buie, J. Fox, J. Williams, A. Lund, *User interface guidelines and standards: progress, issues, and prospects*, Interacting with Computers 12/2 (1999), s. 119-142.

¹⁰ Por. J. Gwizdka, M. Chignell, *Individual differences and task-based user interface evaluation: a case study of pending tasks in email*, Interacting with Computers 16/4 (2004), s. 769-797.

¹¹ Por. S. Trewin, G. Zimmermann, G. Vanderheiden, *Abstract representations as a basis for usable user interfaces*, Interacting with Computers 16/3, (2004), s. 477-506.

¹² Por. C.V. Copas, E. Edmonds, Intelligent interfaces through interactive planners, Interacting with Computers, Volume 12/6 (2000), s. 545-564.

¹³ Por. J. Kim, J. Yun Moon, *Designing towards emotional usability in customer interfaces* trustworthiness of cyber-banking system interfaces, Interacting with Computers 10/1 (1998), s. 1-29.

3. THE NATURE OF SUSTAINABILITY

The literature studies by many authors show that by the end of 1970s, the word "sustainability" has been used occasionally, usually in reference to the methods of management of forest resources¹⁴.

It is assumed that sustainability occurs when development policy is conducted in a manner which maintains the original level of natural resources. Such a development is also known as sustainable¹⁵.

Along with development of theory emerged two types of sustainability, weak and strong. Weak sustainability assumes that the current **value of all the changes** in stocks of environmental capital cannot be negative. Strong sustainability implies that **changes** in any of the categories of environmental capital resources cannot be negative regardless of the time¹⁶. This means that the first concept of sustainability allows substituting, i.e. the substitution of natural resources produced by the human resources until the substitution generates added value. The second concept of sustainability disclaims any substitutability of resources due to the assumption that nothing can replace natural resources.

Over time, the interpretation of sustainability became less clear because the concept was adapted to economic, social and environmental objectives. This resulted also from the tendency to integrate the goals of the two above types of sustainability with the sustainable development¹⁷.

For the assessment of sustainability there are used indicators of sustainable development. They are linking mostly to three basic dimensions of sustainable development, namely: social, environmental and economic, recently supplemented by two other dimensions, i.e. institutional¹⁸ and spatial¹⁹.

The definition of sustainable development, determining the contemporary interpretations of this concept was introduced by the World Commission on Environment and Development. In a report from 1987 the authors stated that sustainable development is development that meets the needs of

¹⁴ Por. W. L. Filho, *Dealing with misconceptions on the concept of sustainability*, International Journal of Sustainability in Higher Education 1/1, (2000), s. 9-19.

¹⁵ Por. J. Quiggin, *Discount rates and sustainability*, "International Journal of Social Economics" 24/1-3 (1997), s. 65-90.

¹⁶ Ibidem.

¹⁷ Por. W. Hediger, *Reconciling "weak" and "strong" sustainability*, International Journal of Social Economics 26/7-9 (1999), s. 1120-1143.

¹⁸ Por. C. Labuschagne, A. C. Brenta, R. P.G. van Erck, Assessing the sustainability performances of industries, "Journal of Cleaner Production" 13 (2005), s. 373-385.

¹⁹ Por. M. Burchard-Dziubińska, Rozwój instytucji na rzecz zrównoważonego rozwoju, [w:] Zrównoważony rozwój na poziomie lokalnym i regionalnym, teoria i praktyka, red. M. Burchard-Dziubińska, A. Rzeńca, Wydawnictwo Uniwersytetu Łódzkiego, Łódź 2010, s. 81-105, za: T. Borys, Wskaźniki zrównoważonego rozwoju, Wydawnictwo Ekonomia i Środowisko, Białystok i Warszawa 2005.

today without compromising the ability of future generations to meet their own needs²⁰. This interpretation is commonly identified with the concept of sustainability²¹.

A relatively comprehensive definition of the nature of sustainable development states that it is the concept that integrates the following dimensions of development: social, economic and ecological for the formulation of common goals to protect and make changes²².

Among many other interpretations of sustainable development were also those attributing to it the role of preserving the stability of the human species, maintenance of intergenerational welfare, maintenance of productivity and flexibility of economic systems, maintenance of capital resources – including the resources of natural capital, maintenance of the regenerative capacity of the environment²³.

The concepts which are used interchangeably with the term sustainable development embrace: self-sustaining development, eco-development²⁴, even though by some scientists they are not considered as synonyms. The situation is similar in case of sustainability.

The presented review of the literature shows that the concept of sustainability and sustainable development are often used interchangeably. This is the basis for the adoption of a similar approach in this paper, in which sustainability/ sustainable development is defined as a concept leading to the equivalent meeting of social, environmental and economic needs.

The next chapter will present interpretations of culture as well as the author's definition formulated for the purposes of this article.

4. THE NATURE OF CULTURE

Because of the extensive and thus different connotations, it is justified to define the concept of culture.

Culture was the subject of analyses that focused often on the "norms, customs, values, beliefs, customers, rituals, ceremonies, morals, practices, procedures and other concepts. It is believed, however, that the culture emphasizes these elements, and they are rather the expression of it"²⁵.

 ²⁰ Zob. J. Eppel, Sustainable development and environment: a renewed effort in the OECD, "Environment, Development and Sustainability" 1 (1999), s. 41–53.
²¹ Por. A. Wilkinson, M. Hill, P. Gollan, *The sustainability debate*, "International Journal of Operations

²¹ Por. A. Wilkinson, M. Hill, P. Gollan, *The sustainability debate*, "International Journal of Operations & Production Management" 21/12 (2001), s. 1492-1502.

²² Por. W. Hediger, op. cit.

²³ Por. S. U. O'Hara, *Economics, ethics and sustainability: redefining connections*, "International Journal of Social Economics" 25/1 (1998), s. 43-62.

²⁴ Por. M. Kistowski, Regionalny model zrównoważonego rozwoju i ochrony środowiska Polski a strategie rozwoju województw, Uniwersytet Gdański, Bogucki Wydawnictwo Naukowe, Gdańsk-Poznań 2003; B. Ziółkowski, Ewolucyjne podejście do ekoinnowacji i zrównoważonego rozwoju – ujęcie systemowe, Poligrafia Wyższego Seminarium Duchownego w Rzeszowie, Rzeszów 2012, s. 14.

²⁵ A. M. Nicotera, M. J. Clinkscales, F. R. Walker, *Understanding Organizations through Culture and Structure: Relational and Other Lessons from the African-American Organization*, Lawrence Erlbaum Associates, Mahwah 2003.

Some of these statements shares H. Rickert seeing in the culture the reality which is constituting through the realm of values²⁶.

Culture is seen as a collective programming of mindset, which distinguishes the members of one group or category of persons from others²⁷. It can also be a "negotiated set of a common symbolic systems, which constitute a guide for individual behavior and motivate them to function in the group"²⁸.

In broad terms, culture consists of a sphere of spiritual activity and human civilization²⁹, which emphasizes the importance of tangible and intangible artefacts.

Cultural phenomenon is scientifically analyzed in different configurations, dependent on the adopted criterion of description. Due to the scope, it can relate to the micro - and macroscale which leads to ramification of such concepts as local, regional, national, international and even global culture. The criterion of time determines division of the culture into contemporary and historic one. The approach adopting criterion of the object decides on distinguishing the culture in relation to selected elements/objects of reality that create an audiovisual culture and the whole realm of art. The criterion of subject leads to the formulation of individual and organizational culture.

In this article the culture is considered in a wide range. For the purpose of this paper the culture is defined as any kind of tangible and intangible artifacts of human activity – undertaken in the spatial, time, objective or subjective dimension – that influence the interactions of participants of a community and the way they interact with the environment.

The aim of the next chapter is to define and present relationship between the concepts of sustainability and culture.

5. SUSTAINABILITY-CULTURE INTERFACES

5.1. THE NATURE OF SUSTAINABILITY-CULTURE INTERFACE

When adopting the logic of interpretation made by L. Manovich³⁰ it can be stated, the sustainability–culture interface describes how sustainability interacts with culture. This means that the sustainability–culture interface is a way of communicating between sustainability and culture. When referring to the three notions defined in the previous chapters, it should also be concluded that the sustainability–culture interface is a form of expression that specifies how the information about the sustainable meeting of the social, environmental and economic needs interact with

 ²⁶ Por. A. L. Zachariasz, *Kultura, jej status i poznanie*, Wydawnictwo UMCS, Lublin 1999, s. 25 za: H. Rickert, *System der Philosophie*, Erster Teil, Allgemeine Grundlegung der Philosophie, Tubingen 1928, s. 217.
²⁷ Zob. K. C. Gleason, L. K. Mathur, I. Mathur, *The Interrelationship between Culture, Capital*

²⁷ Zob. K. C. Gleason, L. K. Mathur, I. Mathur, *The Interrelationship between Culture, Capital Structure, and Performance: Evidence from European Retailers*, Journal of Business Research 50, (2000), pp. 185–191, za: G. Hofstede, *Management Scientists Are Human*, "Management Science" 40/1 (1994), s. 4–13.

²⁸ A. M. Nicotera, M. J. Clinkscales, F. R. Walker, op. cit.

²⁹ Por. A. L. Zachariasz, op. cit, s. 28.

³⁰ This applies to the interpretation of the phrase ,, human-computer interface", see: L. Manovich, op.cit., s. 140.

elements that affect the mutual interaction of participants among community and their relationship with the environment. This interface is a way of communicating information on sustainable development to the cultural sphere. It decides how the information on sustainability will be transmitted into the sphere of culture. The interface is a medium/ tool for mutual communication.

Bilateral exchange of information between sustainability and culture is held, inter alia, through sustainable development indicators (these are for example, CO_2 emissions, the number of people without access to drinking water).

Inherent in interaction of sustainability and culture is a specific effect. We can say that the sustainability–culture interface generates effects resulting from the impact of sustainability on the culture. Some consequence of the intended effects are specific results in the form of benefits that affect the culture, leading to its change. This means that the actions taken in order to create the sustainability–culture interface contribute to the implementation of the principles of sustainable development and further induce specific changes in the area of culture. The nature of the cultural changes occurring as a result of even just one kind of actions for sustainability will not always be the same because it is dependent on many factors existing in the environment. An example for this can be initiatives to increase access to safe drinking water.

The lack of drinking water in countries with large deficits is forcing the population to the timeconsuming transportation of this raw material from remote locations or to big expenses for the purchase of small quantities of water. This situation generates one of the two types of costs such as labor costs (associated with the transportation and lost time) and the capital cost (associated with the purchase of water). Due to these costs, the community's entrepreneurial activity to improve its quality of life is limited. This population devotes most of its time on the completion of the basic for life resource like water or on collection of cash needed to acquire this resource. The costs of obtaining water, in the form of invested labor and capital resources does not cause a change in the broader culture. Such a community does not has sufficient resources to invest in the cultivation of the soil nor the education of children. In order to initiate changes in the culture of the community numerous organizations take actions like constructing of deep wells. Thanks to the sustainability– culture interface the generated effect (i.e. a water well) is the basis of results occurring in the form of benefits (such as the availability of drinking water) and consequently the conditional factor of the cultural impact (i.e. changes in culture).

Individual benefits and the resulting cultural changes associated with the availability of drinking water are evident but are not always permanent, as often fade or fluctuate. This appears in situations when the community benefiting from the effects of existing sustainability–culture interface ceases financing³¹ the ongoing costs of maintaining the well, usually its repair costs. The constant impact on the culture, resulting from the construction of well (associated with implementation of the sustainability objectives) may exist in one country but not necessarily appear in the other one.

³¹ The case was described by A. Leszczyński in: *Dziękujemy za palenie. Dlaczego Afryka nie może sobie poradzić z przemocą, głodem, wyzyskiem i AIDS*, Polish Humanitarian Action, Warszawa 2012. www.pah.org.pl/m/2856/DZIEKUJEMY%20ZA%20PALENIE.pdf

The effectiveness of initiatives aimed at increasing access to safe drinking water, and thus their impact on the culture arise in communities with high trust and cooperation. Thanks to this, the change in culture – determined by the sustainability principles – will be constant. The community funding the cost of maintaining the well is solidifying the cultural change, eliminating in parallel the fluctuation of introduced change.

Initiatives aimed at increasing access to potable water, and thus influencing the culture will not be effective in communities with a low level of trust. In such situation, the changes occurred due to the implementation of sustainability principles will be short-term, because they will disappear or fluctuate.

5.2. TYPES OF SUSTAINABILITY-CULTURE INTERFACE

General examples/manifestations of the impact of sustainability on the culture can be defined by means of indicators of sustainable development. Sustainability expresses itself in phenomena which we measure by indicators, sustainability is reflected by indicators.

Methodologies for assessment of sustainable development are formed by countries and organizations on the basis of quantitatively and qualitatively diverse indicators. In case of some bodies or initiatives (like e.g. Global Reporting Initiative, The Institute of Chemical Engineers sustainability metrics) indicators are grouped according to the traditional, three-dimensional model of sustainable development. Therefore, for the assessment of sustainability, the social, environmental and economic indicators are distinguished. However, due to the nature of the concept of sustainable development it is difficult to accurately classify many indicators to one of the three mentioned groups. They enter in fact simultaneously in two and even three dimensions of sustainable development. When answering this tendency Eurostat introduced its own classification which took into account in the year 2009 ten following groups of indicators for assessing the sustainability³²: socio-economic development, sustainable consumption and production, social inclusion, demographic changes, public health, climate change and energy, sustainable transport, natural resources, global partnership, good governance.

When analyzing the nature of the sustainability–culture interface it is reasonable to specify some of its types. They correspond to the specified groups of sustainable development indicators. These types of interface can be formulated as follows: socio-economic development–culture interface, sustainable consumption and production–culture interface, social inclusion–culture interface, demographic changes–culture interface, public health–culture interface, climate change and energy–culture interface, sustainable transport–culture interface, natural resources–culture interface, global partnership–culture interface, good governance–culture interface.

This typology is not complete, because it refers only to the general groups of indicators. A detailed analysis of the composition of each group allows to mention more types of sustainability–culture interface. When taking as an example the sustainable transport–culture interface it would be possible to specify two types of interface, i.e.: transport and mobility–culture interface, impact of

³² Zob. European Communities, Sustainable development in the European Union. 2009 monitoring report of the EU sustainable development strategy, European Communities, Luxembourg 2009.

transport–culture interface. Further analysis leads to the conclusion that the impact of transport– culture interface is divided into many types, namely: emission of greenhouse gases by means of transport–culture interface, number of people killed–culture interface, ozone precursor emissions from transport–culture interface, solid particle emissions by transport–culture interface, average emissions of CO₂/km road by new cars–culture interface.

A similar analysis can be performed for each separate category of indicators and the individual types of culture. This chapter presented just a couple of interface types referred to a wide range of cultures. The next chapter introduces some examples of the effects generated by the sustainability–culture interface.

5.3. SOCIAL, ENVIRONMENTAL AND ECONOMIC PERSPECTIVE OF SUSTAINABILITY-CULTURE INTERFACE

According to the nature of interface, the exchange of information between sustainability and culture is bilateral. This exchange takes place, inter alia, through sustainable development indicators (such as e.g. CO_2 emissions, the number of people without access to drinking water). Evaluation of changes among indicators throughout the years reflects changes in all spheres of culture. Changing values of indicators inform on cultural assimilation of desired or undesired management practices.

The purpose of this chapter is to assess the fluctuation of the three selected indicators of sustainable development, representing the social, environmental and economic sphere. Fluctuation is defined as the deviation from the mean value of every analyzed indicator. The article analyzes the range of fluctuations. When the deviation from the mean value of the indicator is twofold in the sense that suggests the regression, than such deviation is defined as unfavorable fluctuation. The subject of the study were the European Union's countries which were analyzed by means of an index of dynamics for the years 2000-2011.

The first indicator included in the analysis relates to the field of public health, representing the social sphere of sustainable development. This indicator determines the *urban population exposure* to air pollution by particulate matter. The analysis of the available data for the European Union (EU-28) indicates that the averaged dynamics of the mentioned exposure was -0.4 % for the period 2000-2011. The negative value of the indicator of *urban population exposure to air pollution by* particulate matter shows that the development of civilization – which is technologically determined since the information revolution – marginally decreases the negative effects on the environment, and thus on human health. This indicates that the unfavorable impact of technology – which is a source of pollution by solid particles, originating mainly from vehicles – is slightly reduced. When interpreting the research results it is apparent that technological advancement contributes little to the effectiveness of the policy of sustainable development. A very small change of the index is encouraging to the conclusion that there is a lack of significant progress towards improving the quality of the analyzed sphere of human life. It is worth noticing however, that despite the increasing intensity of transport there is no increase in *particulate matter* contamination.

The figure 1 shows the change in the index of dynamics calculated for the *urban population exposure to air pollution by particulate matter*.



Figure 1. Fluctuation of the index of dynamics calculated for the *urban population exposure to air pollution by particulate matter* of the EU-28 between 2000-2011.

Source: own work based on the own research findings.

A negative value of the index indicates a positive trend.

The remarkable in the figure fluctuation of the index of dynamics calculated for the *urban population exposure to air pollution by particulate matter* in subsequent years leads to the conclusion that the variations in the analyzed area are important. The degree and direction of changes of the index of dynamics for *urban population exposure to air pollution by particulate matter* indicate the occurrence of unfavorable imbalance. This demonstrates that *urban population exposure to air pollution by particulate matter* is different in each year (except for the years 2009-2010), both in terms of value and direction. The mentioned imbalance can lead to the conclusion that decreasing emission of *particulate matter* is determined by other factors than technology.

The next indicator introduced to the analysis is the greenhouse gas emissions intensity of energy consumption, representing the environmental realm of sustainability.

The figure 2 shows the changes in the index of dynamics for analyzed indicator. Its value for the EU-28 amounted to 0,71% in 2000-2011.



Figure 2. Fluctuation of the index of dynamics calculated for the greenhouse gas emissions intensity of energy consumption in UE-28 between 2000-2011.

Source: own work based on the own research findings.

A negative value of the index indicates a positive trend.

The above results provide evidence that EU climate policy is effective. The amount of greenhouse gases decreases and the fluctuation of the emission factor is maintained in the range of negative values, which oscillate between similar values. It could be concluded that in case of the analyzed indicator there is no unfavorable fluctuation.

The third indicator introduced to the analysis is the *total R&D expenditure in % of GDP*, which represents the economic sphere of sustainable development.

The figure 3 shows the degree of changes in the index of dynamics reflecting the fluctuation of the analyzed indicator. The average value of this indicator for the EU-28 is 0,91%.



Figure 3. Fluctuation of the index of dynamics calculated for the *total R&D expenditure in % of GDP* for UE-28 between 2000-2011.

Source: own work based on the own research findings.

A negative value of the index indicates a negative trend.

The fluctuation of the index of dynamics for *total R&D expenditure in % of GDP* remained predominantly above the 0X-axis. The extent of imbalance indicates however that we are dealing with unfavorable fluctuation. The increase in spending on research and development is relatively ambiguous, so not constant.

The three presented above indicators reflect the relationships that exist between sustainability and culture. It is worth noticing that not always the identified impact of initiatives for sustainable development is easy to identify. The activity for sustainability in each of its dimensions produces often multiple, interpenetrating results in the area of culture.

The presented researches prove the thesis on the existence of an unfavorable imbalance/ fluctuations within the two identified types of sustainability–culture interface, these are: *urban population exposure to air pollution by particulate matter* and *total R&D expenditure in % of GDP*.

6. SUMMARY

The formulated problem in this publication refers to selected types of sustainability–culture interface analyzed from the social, environmental and economic perspective.

The publication specifies three aims, i.e.: defining the concept of sustainability–culture interface; identifying contemporary examples/manifestations of sustainability–culture interface;

testing the thesis that the currently identified types of sustainability–culture interface indicate unfavorable fluctuation. The basis for the implementation of the first two aims was analytical study of literature. In order to realize the third aim of the paper there were used international statistics of Eurostat for the EU-28 in years 2000-2011.

In the first chapters of the paper there were introduced author's definitions of: interface, sustainability, culture as well as sustainability–culture interface, what enabled the realization of formulated aims. The analyzed statistical data were based on indicators of sustainable development, utilized as an example of the sustainability–culture interface.

The results of statistical analysis have proved the thesis on the existence of unfavorable fluctuations in the two identified types of sustainability–culture interface. This means that in some analyzed cases of the interfaces it is remarkable imbalance during realization of sustainable development objectives. Identified fluctuations indicate the existence of specific barriers like weaknesses or threats to the sustainable development of selected areas. It also shows the ineffectiveness of the development policy and motivates to recommend some initiatives aimed at necessary improvement.

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INTERFEJS ZRÓWNOWAŻONOŚĆ – KULTURA W PERSPEKTYWIE SPOŁECZNEJ, ŚRODOWISKOWEJ I GOSPODARCZEJ

Problematyka interfejsu zrównoważoność - kultura jest stosunkowo nowa, bowiem przez długi czas nie stanowiła przedmiotu szczegółowych analiz. W kontekście tytułu opracowania postawiono istotne pytania o to: jak należy rozumieć pojęcie interfejs zrównoważoność – kultura? jakie są jego współczesne przejawy? czy przejawy omawianego interfejsu wskazują na istnienie czy może brak niekorzystnej fluktuacji? Na tej podstawie sformułowano trzy następujące cele badawcze: zdefiniowanie pojęcia interfejs zrównoważoność – kultura, identyfikacja współczesnych przejawów/ rodzajów interfejsu zrównoważoność - kultura, udowodnienie prawdziwości tezy, iż zidentyfikowane obecnie rodzaje omawianego interfejsu zrównoważoność - kultura charakteryzują się niekorzystną fluktuacja. Podstawę prowadzonych badań stanowiło analityczne studium literatury oraz analiza miedzynarodowych danych statystycznych. W toku przeprowadzonych badań wprowadzono autorskie definicje interfejsu, zrównoważoności, kultury oraz interfejsu zrównoważoność - kultura. Realizacja wyznaczonych celów pozwoliła odpowiedzieć na postawione pytania w kontekście identyfikacji niekorzystnej fluktuacji z perspektywy społecznej, środowiskowej i gospodarczej. Do analizy wspomnianych obszarów zrównoważonego rozwoju właczono następujące wskaźniki: ekspozycja populacji miejskiej na zanieczyszczenia cząstkami stałymi, intensywność emisji gazów cieplarnianych w wyniku zużycia energii, całkowite wydatki na B+R w % PKB. Analizowanym podmiotem była Unia Europejska (UE-28) w przedziale lat 2000-2011. Do obliczenia fluktuacji wykorzystano wskaźnik dynamiki o podstawie zmiennej. Uzyskane wyniki analizy danych statystycznych dowiodły tezy o występowaniu niekorzystnej fluktuacji w obrębie dwóch spośród trzech zidentyfikowanych rodzajów interfejsu zrównoważoność - kultura.

Slowa kluczowe: interfejs zrównoważoność – kultura, zrównoważoność, zrównoważony rozwój, wskaźników zrównoważonego rozwoju, Unia Europejska

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