ENVIRONMENTAL DIMENSION OF SUSTAINABLE COMPETITIVENESS OF SERBIA AND SELECTED EUROPEAN COUNTRIES

S. CVETANOVIC[1], D. DESPOTOVIC[2], L. ZIVKOVIC[3] and V. NEDIC[4]
[1] *University of Nis, Faculty of Economics, 18000 Nis, Serbia*
[2] *University of Kragujevac, Faculty of Economics, 34000 Kragujevac, Serbia*
[3] *University of Nis, Faculty of Occupational Safety, 18000 Nis, Serbia* [4] *University of Kragujevac, Faculty of Phil. and Arts, 34000 Kragujevac, Serbia*

Abstract

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World Economic Forum promoted Sustainability-Adjusted Global Competitiveness Index along with Global Competitiveness Index (GCI) while respecting the fact that sustainability concept has the central place in examining the long term perspective of economic and social development in the last twenty years or more. Unquestionably, this is an indicator which is of essential importance for incorporation of sustainable development paradigm into the country's competitiveness complex, which will surely become more significant as the time passes.

Using the data from the Global Competitiveness Report 2012-2013, this paper shows a comparative review of the GCl, Sustainability Adjusted GCI (adjusted by social and environmental sustainability dimension) and Environmental sustainability-adjusted GCI (adjusted by environmental sustainability dimension) of Serbia and selected countries: the most competitive ones and the least competitive ones in Europe in 2012.

Key words: sustainable development, sustainable competitiveness, environmental policy, renewable resources, degradation of the environment
JEL Classification: Q01

Introduction

In ecomic science the essence of competitiveness of countries is explained in many different ways (Marginean, 2006). In the widest sense, competitiveness of national economy is based on measuring and comparing key indicators of country's economic success and gained living standard of inhabitants (Golubovic and Dzunic, 2012: 30). Less widely, this concept is defined as country's ability to export its products to world's market, that is, it is identified by its productivity level. It is actually country's ability to produce goods and service by using its own human, financial, natural and other resources.

In practice, there are a large number of methodological approaches of coutry's competitiveness quantification. The most often used approach of country's competitiveness quantification is, by far, model created by World Economic Forum with which global competitiveness index of a coutry is measured, with tradition longer than 30 years. This indicator specially emphasizes importance of sustainability as a factor of country's competitiveness.

Sustainable development concept was created in the ninth decade of 20th century (Zaccai, 2012). The United Nations promoted considerable study about key problems of economic growth and development followed by more and more expressed environmental demands in 1987. In it, the term sustainable development was determined as development which fulfills the needs of the present without risking the possibility for future generations to fulfill their own needs. It was defined for the first time in well known report of World Commission on Environment and Development from 1987 (Our Common Future, 1987). In the base of the idea about sustainability lies an opinion that decisions made today shouldn't endanger perspective of preserving or improving living standard in future (Anderson et al., 2012).

E-mail: slobodan.cvetanovic@eknfak.ni.ac.rs; ddespotovic@kg.ac.rs; ljiljana.zivkovic@znrfak.ni.ac.rs; vnedic@kg.ac.rs

Sustainability means optimization of large number of interactions of economy, nature and society based on the criterion of society's economics as well as ecology (e.g. Lorek, Spangenberg, 2013; Lejano and Stokols, 2013; Hofkes, 1996). Within that context, observed sustainability phenomenon stresses environment as one of the key sustainability aspects (Harris, 2009).

Basic problem of this concept can be seen through the fact that proclamated principles and key categories of sustainability paradigm haven't reached the necessary level of operativity, that is, they could hardly be implemented in immediate process of making and fulfilling all kinds of planned decisions on all levels of economy and society organization. In other words, they needed to be specified in the way that should express the demands and contents of precise historical moment and geographical space to satisfying point to which sustanability concept is related. During last 20 years significant effort has been made in order to create method of sustainability measurement (Pearse and Atkinson, 1993; Stockhammer et al., 1997; Krotscheck and Narodoslawsky, 1996; Barrera and Saldívar, 2002; Ciegis et al., 2009). Triple bottom line accounting, which appeared in the ninth decade of 20th century, presents a serious attempt to expand traditional frame of accounting reports of countries' companies, so that it takes environmental and social performances into consideration, apart from economic ones (Kinsley and Lovins, 1997). Work of Siglitz-Sen-Fitoussi commission in 2008 also reflects significant efforts to expand measurement of countries' prosperity beyond exclusive measures of market activities to quantification of complex of social wellfare (Stiglitz et al., 2009). Numerous international organizations actively participated in these activities. European Commission has, for example, integrated aims of sustainability in its growth strategy 'Europe 2020-strategy for smart, inclusive and sustainable growth' (European Council, Presidency conclusions, 2000). Organisation for Economic Cooperation and Development which promotes structural reforms for more than half of a century in order to initiate economic activities has established initiative for better living with an initial aim to measure quality of living in 34 member coutries. Better Life Index determines 11 indicators among which are income, job, residence, community, education, environment, civic engagement, health, life satisfaction, safety and balance of private and business life (OECD Better Life Index Country Reports, 2013).

All these efforts to understand and, if possible, precisely quantify and integrate environmental and social sustainability dimensions in mainstream perception of development were possible due to current attempts to improve indicators in these fields, which are still not widely available (Hezri and Dovers, 2006). In year 2000 Environmental Sustainability Index was introduced with an aim to contribute to more qualitative creating of future strategies and development plans (Environmental Sustainability Index, 2001). Considering the measures of environmental sustainability only, methodology of Environmental Performance Index-EPI (Environmental Performance Index, 2012) enables identification of key areas in which repairments are needed, while creating environmental protection politics and making decisions about natural resources management, using the practise from the other countries which had significant results in these areas as a model.

In the light of overview of environmental dimension of sustainability it is inevitable to mention Ecological Footprint developed by Global Footprint Network. It represents the area of land needed for food production, energy and other goods necessary for keeping the current way of living which is based on principles of consumer society. It is measured in hectars and it shows which part of the area is needed for each of us, i.e. each town or country to fulfill its needs for food, living, energy, transport or waste storages.

The attempt of World Economic Forum to adjust the indexes of countries' competitiveness for years 2011 and 2012 to requirements of environmental and social dimensions of sustainability represents significant contribution to sustainability concept (The Global Competitiveness Report 2012-2013, 2012). Sustainable competitiveness of countries is a new research area and it is quite sure that a great deal of data relevant for the measuring of its main dimensions is still missing.

Metrics of the sustainable competitiveness is in a phase of getting shape, ad it will certainly be enriched with contents in following years. It is our opinion that there is a word about an approach of quantification of competitiveness complex which is of extremely analitical significance, since it enables valuable scenario of sustainable long-term economic, social and environmental progress of the countries.

In this paper, environmental dimension of global index of sustainable competitiveness of the Republic of Serbia is being researched on one side and on the other side is the global index of sustainable competitiveness of other countries , in accordance to the data from The Global Competitiveness Report from 2012-2013 of World Economic Forum. In shortest, there's a word about indicators of global index of sustainable competitiveness which tells us about environmental politics, the use of renewable resources and the degree of degradation of sustainable environment in the light of understanding the phenomenon of competitiveness of countries. Indicators of environmental dimension of sustainable competitiveness of the Republic of Serbia are compared to identical indicators of selected most and least competitive European countries. The aim is obtaining the most realistic possible image about the condition of the parametre of competitiveness and environ-

mentally adjusted sustainable competitiveness of Serbia, as well as of selected European countries in 2012. The answer to the question whether the incorporating of demands for environmental sustainability affects the increasing of countries' competitiveness was obtained due to the research of interdependence of global competitiveness index and environmental sustainability adjusted global competitiveness index of the Republic of Serbia and selected most and the least competitive European countries in year 2012.

The structure of the paper is adjusted to the defined aim. After the introductory notes, in the second part of the paper short overview of the countries' competitiveness phenomenon is given, which became one of the most exploited issues in macroeconomic research in the last decade. Analytical interpretation of three basic indicators of environmental dimension of the index of sustainable competitiveness of the countries is also given in this part of the paper: environmental politics, the use of renewable resources and degradation of environment. The contents of the third part of the paper include explication of position and value of global competitiveness index and environmentaly adjusted sustainability index for Serbia and two selected groups of European countries. In the fourth part, correlation between global competitiveness index and environmentally adjusted global competitiveness index for the countries with the highest and the lowest competitiveness in 2012 was researched.

About the World Economic Forum's Environmental Dimension of Sustainable Competitiveness

Environmental sustainability implicits the existance of economic system which has high sustainability level as well as the ability to create new existing value as a real source for supporting all forms of consumption (Pokrajac, 2012:146). In shortest, it is about preserving and renewing of biosphere (water, air, temperature etc.), that is, bio-geochemical characteristics within which biosphere functions.

Several approaches for measuring country's competitiveness exist in practise, among which is The Global Competitiveness Report metrics mentioned above developed by World Economic Forum over the last thirty years. The report treats competitiveness as a set of institutions, policies and factors which determine the level of productivity of the country. On the other hand, the productivity level determines prosperity level of an economy, as well as, investments' efficiency level, as basic factor of growth. Therefore, one country is more competitive if it has more expressed rate of growth of average work efficiency.

Global competitiveness index measures the level of an economy's competitiveness. It is a composite index consisted of 12 pillars: institutions, infrastructure, macroeconomic environment, health care and elementary education, high education and specialized training, goods market efficiency, labour market efficiency, financial market development, technological competence, market size, business sophistication and innovations.

World Economic Forum has started activities for creating the analytical frame for quantification of global index of competitiveness in 2011. This concept tends to create the base for the establishing of policies which create the balance between the economic prosperity and social and enviromental development dimensions. Quantification of global competitiveness index's sustainability starts from GCI adjusted by factors which include social and environmental sustainability.

In each country, reaching certain level of economic prosperity is essential presumption of improving the living standard of population. However, ability of countries to generate their citizens' prosperity in a sustainable way is estimated according to this process. In other words, competitiveness is necessary, but not conditions enough for countries' prosperity. Therefore, the demand for relevant competitiveness measure in accordance with social and environmental sustainability is more than evident.

It is not easy to identify the nature of the relation between the competitiveness and sustainability. Measuring the determiners of social and environmental dimension of global competitiveness of the countries is exceptionally hard. There is still not enough evidence of the existance of certain functional relation between these parametres. Therefore, methodology of measurement of global index of sustainable competitiveness is based on the premise of linear effect of environmentally sustainable dimension and socially sustainable dimension of competitiveness.

Social and environmental dimension of sustainability are treated as independent adjustments of a country's performance for global competitiveness index. Aggregation leads to three possible outcomes:
• Environmental sustainability - adjusted index
• Social sustainability- adjusted index
• Overall Sustainability-adjusted index which combines environmental and social dimension of sustainability

Since there are no clear theoretical guidelines for appointing ponders to individual elements, indicators are appointed with the same ponder value within each pillar. Each pillar is transformed into „accordance ratio"ranging from 0.8 to 1.2 which is then being used for GCI results adjustments within this range. This results in an adjusted result which is 20% lower or higher than the basic GCI result, at most.

Due to the fact that some aspects of sustainability are being evaluated within social and environmental sustainability pillars, the results reflect general performance of all the

aspects rather than of one specific element. To a certain extent that means that poor performance in some aspects can be compensated by the good results in other areas. This can result in counterintuitive results.

Instead of 144 economies covered by the report of global competitiveness analysis (GCR 2012-2013), in World Economic Forum's sustainable competitiveness analysis from 2012, there is a subsample of 79 countries. Availability of the data represents the main challenge and restriction in this procedure, because there are no measures for numerous concepts used or the data is available for the limited number of countries only.

Environmental sustainability indicators are grouped in different categories (Table 1), with an aim to comprise the most relevant aspects of environmental sustainability.

Indicators of Environmental Sustainability of Serbia and Selected European Countries

Using the data from 2012 report, this part of the paper firstly gives a comparative overview of the environmental sustainability indicators of the Republic of Serbia and other selected most competitive (Switzerland, Norway, Germany, Denmark, Finland) and least competitive European countries (Greece, FYR Macedonia, Romania, Bulgaria, Croatia).

Environmental policy is the *first area* measured within environmental sustainability pillar (Table 2). Its main purpose is to use regulatory measures to maintain optimal relation between economics and ecology of a country, while respecting the concept of future sustainable development. It consists of

Table 1
Overview of environmental sustainability indicators

Environmental policy	Use of renewable resources	Degradation of the environment
Environmental regulations (stringency and enforcement)	Agricultural water intensity	Level of particulate matter concentration
Number of ratified international environmental treaties	Forest depletion (change in forest cover and loss)	CO_2 intensity
Terrestrial biome protection	Fish stocks' overexploitation	Quality of the natural environment

Source: GCR 2012-2013

Table 2
Environmental policy

	Country	Environmental regulations[1]		Number of ratified international environmental treaties[2]	Terrestrial biome protection[3]
		stringency	enforcement		
1	Denmark	6.15	6.09	24.00	5.11
2	Finland	6.42	6.38	23.00	8.38
3	Germany	6.44	6.21	24.00	17.00
4	Norway	5.93	5.80	23.00	12.66
5	Switzerland	6.31	6.21	22.00	16.67
	Average	6.25	6.14	23.20	11.96
1	Bulgaria	3.37	3.25	22.00	9.05
2	Croatia	4.31	3.53	21.00	12.03
3	Greece	3.71	2.93	24.00	16.28
4	Macedonia	3.73	3.41	16.00	4.79
5	Romania	3.19	3.01	21.00	6.84
6	Serbia	3.43	2.72	18.00	5.95
	Average	3.62	3.14	20.33	9.16

[1] *Based on the strictness of environmental rules in the country (1 = very lax; 7 = among the strictest in the world) and based on the evaluation of application of environmental regulations in a country (1 = very lax; 7 = among the strictest in the world).*
[2] *Total number of ratified environmental treaties among 25 most significant treaties.*
[3] *Extent to which the country achieves the goal of protecting 17% of each terrestrial biome within its borders.*
Source: GCR 2012-2013

measure of strictness and application of environmental regulations (stringency and enforcement), together with the level of land protection, which gives a rating of country's dedication to natural resource protection.These measures directly affect the behaviour of the pollutants, because they have to respect them, or face administrative and legal consequences. They are also used to regulate the behaviour of each pollutant by prescribing the type of technology allowed to be used in production, so that the emission of harmful materials can be reduced, as well as which amount of waste materials ca be emitted and how it can possibly be reduced. Terrestrial biome protection indicator provides one more measure of the policy, which estimates whether, at least 17% of land area of each type of habitat is under official protection. Additionally, another measure is the number of ratified international environmental treaties, of total of 25 treaties ratified by individual countries. This variable shows the levele of engagement of a country in solving specific environmental problems and therefore, in a certain way, it shows its commitment to become a part of international efforts to solve global environmental challenges. When together, these variables scan, to a certain extent, political will of the countries to react to environmental matters in a structured and consistent way and indicate their importance in country's agenda.

Observed characteristics for selected groups of countries were determined as the average results the countries have accomplished in certain fields of environmental sustainability. Visualisation of analysed variables is given in Figures 1, 2 and 3.

Comparative overview in Figure 1, points out that the parametres of environmental policy in expected relations. Group of least competitive countries marks a significant setback in all key performances in the field of environmental policy, especially in the application measures and strictness of European regulations. It can be seen that Serbia is even slightly behind the average of the group of least competitive European countries, and the parametres of terrestrial biome protection show that it is significantly behind the average of the group.

The second area concerns ***use of renewable resources*** (Table 3). These indicators include: water consumption intensity in agriculture, where the focus is on the level of efficiency of agricultural sector in water use; forest exploitation, taking into consideration reports and satellite information for determining the percentage of total deforested or (afforested) area of land over a period of time; as well as data on fish stocks' overexploitation. Declining ability to regenerate is one of the main environmental questions and it is not easy to find a solution to this question. The result of the regeneration's decrease is unadjusted trend between the consumption and natural production of renewable sources.
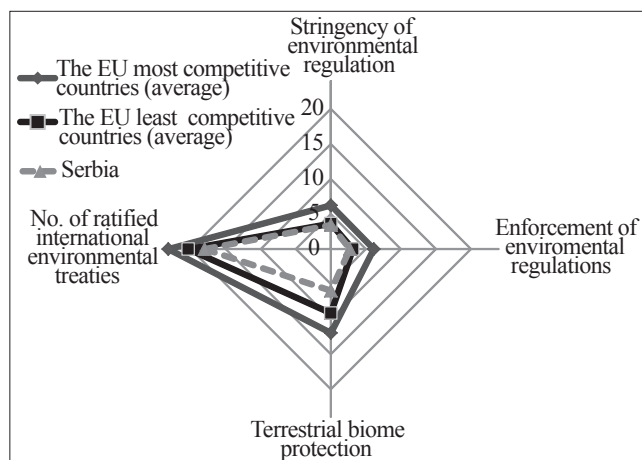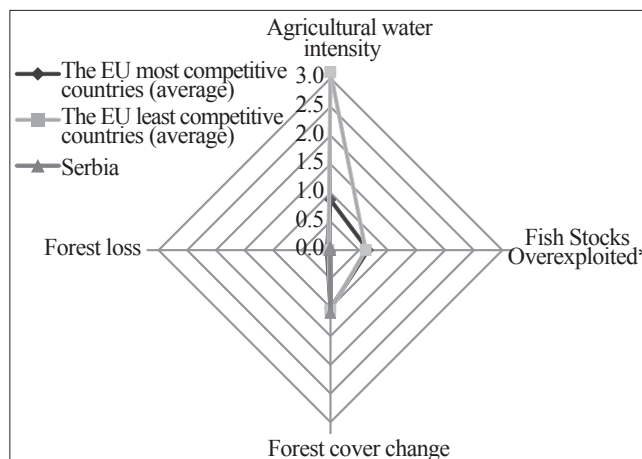

Fig. 1. Comparison of elements of environmental policy

Fig. 2. Comparison in the domain of renewable resources
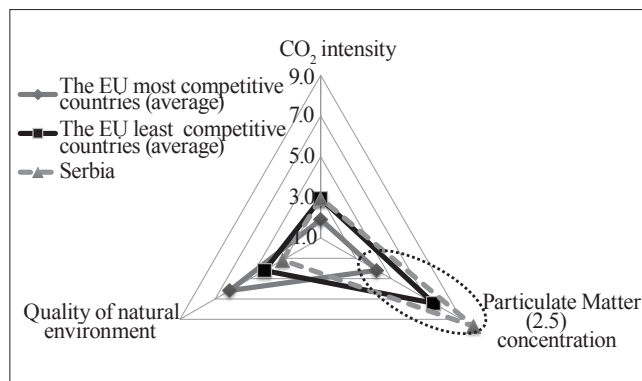* No data for Serbia

Fig. 3. Comparison in the domain of degradation the environment

Despite the fact that it is very difficult to collect and interpret these data, it is essential that a country manages these resources efficiently, in order to prevent exhaustion of resources before the future generations are able to use them. Some resources need to be conserved for this reason.

The parameters in the domain of use of renewable resources show that Greece and Bulgaria stand out in the consumption of agricultural water in the group of least competitive countries, while Denmark stands out in the group of most competitive countries, thus increasing the average of the group, whereas other parameters are mostly the same for both groups of countries (Figure 2).

The third area considers ***degradation of the environment*** (Table 4), which can cause serious damage to human health,

Table 3
Use of renewable resources

	Country	Agricultural water intensity[1]	Forest depletion[2]		Fish stocks' overexploitation[3]
			change in forest cover	forest loss	
1	Denmark	3.97	1.02	0.09	0.68
2	Finland	0.05	1.00	0.10	0.52
3	Germany	0.05	1.00	0.07	0.73
4	Norway	0.22	1.04	0.02	0.70
5	Switzerland	0.09	1.02	0.02	n/a
	Average	0.88	1.02	0.06	0.66
1	Bulgaria	4.68	1.08	0.01	0.80
2	Croatia	0.01	1.01	0.03	0.40
3	Greece	11.39	1.04	0.11	0.34
4	Macedonia	1.97	1.02	0.02	n/a
5	Romania	0.55	1.03	0.04	0.92
6	Serbia	0.05	1.10	0.01	n/a
	Average	3.11	1.05	0.04	0.61

[1] Consumption of agricultural water viewed as the percentage of total amount of available water resources
[2] Change in afforestation degree in the period 1990-2010, forest cover loss in the period 2000-2010, based on satellite data
[3] Evaluation of environemantal quality (1 = extremely scarce; 7 = one of the intact environments in the world)
Source: GCR 2012-2013

Table 4
Degradation of the environment

Country	Level of particulate matter concentration[1]	CO2 intensity[2]	Quality of the natural environment[3]
	Score (1-7)	Score (1-7)	Score (1-7)
Denmark	3.58	2.40	5.54
Finland	0.35	1.60	6.61
Germany	8.40	2.35	5.92
Norway	2.33	1.68	6.34
Switzerland	6.24	1.51	6.49
Average	4.18	1.91	6.18
Bulgaria	7.56	2.56	3.39
Croatia	7.40	2.57	5.60
Greece	5.48	3.22	5.28
Macedonia	5.88	3.92	4.08
Romania	8.52	2.40	3.70
Serbia	9.69	2.95	3.17
Average	7.42	2.94	4.20

[1] Exposure of the population to particles PM2.5 in micrograms per cubic metre, based on satellite data
[2] kg of CO_2 per kg of used oil equivalent
[3] fraction of exclusive economic zone of the state with overused and devastated funds.
Source: GCR 2012-2013

while destroying ecosystem at the same time.Specific indicators which are used for measuring this concept are *particulate substances concentration level*, *quality of the environment* and *CO_2 intensity*. Particulate substance concentration shows air pollution, which proved to have a negative effect to human health. Quality of the environment is evaluation of local environment status, based on perception as a measure of local business leaders' observation.CO_2 intensity is a measure of efficient energy use in relation to emission produced by it. It should be noted that, even though CO_2 intensity also speaks about the influence of individual countries on climate changes, climate changes are not included as a specific factor within this pillar. It is obvious that there is still no compliance about the fact how to allocate the emission to certain countries. For example, in the world of global markets, the questions is whether the emission should be allocated to a country that produces goods that lead to the emission or to the country which is the consumer of those goods. Furthermore, it is still not clear what kind of impact would the effect of climate changes have on particular countries' competitiveness, especially in the absence of international compliance regarding imposition of additional expenses to big emitters.

Figure 3 shows that the parameter *level of concetration of particulate substances*, the most critical factor in the domain of degrading the environment for the group of least competitive countries. Parameters of degrading the environment show Serbia in a very bad position, which is, currently, significantly unfavourable even for the group's average (except for the parameter CO_2 intensity which reaches group's average).

Position and the Value of Global Competitiveness Index and Environmental Sustainability – Adjusted GCI

For the purpose of finding the answer to the given question whether incorporating the demand for environmental sustainability affects the reduction of competitiveness in the work of selected countries, this part of the paper gives the explication of the position and value of global competitiveness index, sustainability-adjusted GCI, environmental sustainability – adjusted GCI for the Republic of Serbia and the two selected groups of European countries (Table 5). Then with the help of the method of statistical analysis a correlation *GCI* and *Environmental sustainability – adjusted GCI* has been determined for the selected countries.

Based on the data given in Table 5 it is clear that the most competitive economies are at the same time highly ranked according to the demands of overall and environmental sustainability.

Figure 4 shows the relation between the rank of environmental sustainability – adjusted GCI and sustainability-adjusted global competitiveness index for European leaders.

Countries like Switzerland, Finland, Germany, are leaders in the ranking judging by both indicators. Switzerland takes the highest place in the ranking according to sustainability-adjusted GCI, it shows good performance in all aspects of sustainable competitiveness and shows that there are no necessarily compensating relations between the tendency to be environmentally sustainable and to be competitive. A certain disbalance is seen only with Denmark.

Table 5
Position and the value of GCI and Environmental sustainability – adjusted GCI (ranked by GCI)

Country		GCI (Global Competitiveness Index)		Environmental sustainability – adjusted GCI		Sustainability adjusted GCI	
		Score (1-7)	Rank (/144)	Score (1-7)	Rank (/79)	Score (1-7)	Rank (/79)
1	Switzerland	5.72	1	6.87	1	6.85	1
2	Finland	5.55	3	6.26	4	6.36	2
3	Germany	5.48	6	5.92	9	6.14	6
4	Denmark	5.29	12	5.25	30	5.73	10
5	Norway	5.27	15	5.98	3	6.15	5
	Average	5.46		6.06		6.25	
1	Bulgaria	4.27	62	3.97	54	3.92	41
2	Romania	4.07	78	3.73	57	3.72	61
3	Croatia	4.04	81	4.20	21	4.02	46
4	Macedonia	4.04	80	3.64	61	3.65	63
5	Serbia	3.87	95	3.71	46	3.59	66
6	Greece	3.86	96	3.82	33	3.71	62
	Average	4.03		3.85		3.77	

Source: Global Competitiveness Report 2012-2013, Environmental sustainability – adjusted GCI rank calculated by the author according to given values

Figure 5 illustrates the relation between the rank of environmental sustainability – adjusted GCI and sustainability-adjusted global competitiveness index for the least competitive European countries encompassed by the report 2012-2013 (GCR). In some countries from this group disbalance of sustainability values is even more evident than in European leaders (Croatia and Greece, for example), while in some countries identical and almost identical positions of overall and environmental sustainability can be seen (FYR Macedonia, Romania).

Having in mind the circumstance that the dimension of environmental sustainability is becoming more and more significant component of the competitiveness of countries, it seems purposeful to show its influence on GCI separately on Figure 6.

With the overview of certain parameters of environmental sustainability of the countries, Serbia's already weak position in global competitiveness is expected to worsen after sustainability paremeters are introduced. Nevertheless, the decline in case of environmental sustainability is slightly smaller than in case of overall sustainability. Diagrams from figure 6 lead to a general conclusion that in the case of leading countries, introducing the environmental dimension of
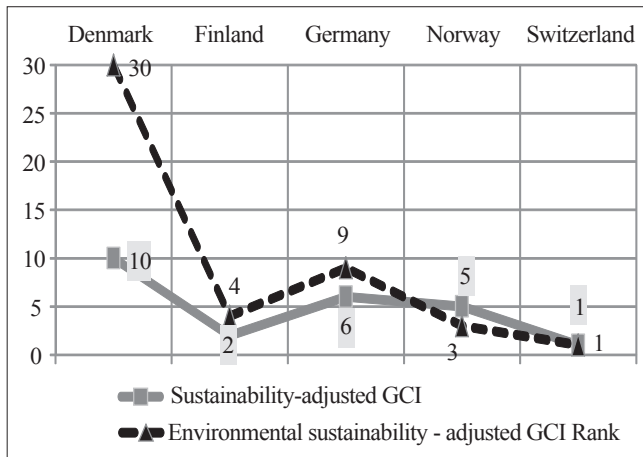

Fig. 4. Environmental sustainability – adjusted GCI and sustainability-adjusted global competitiveness index – rank of competitive countries
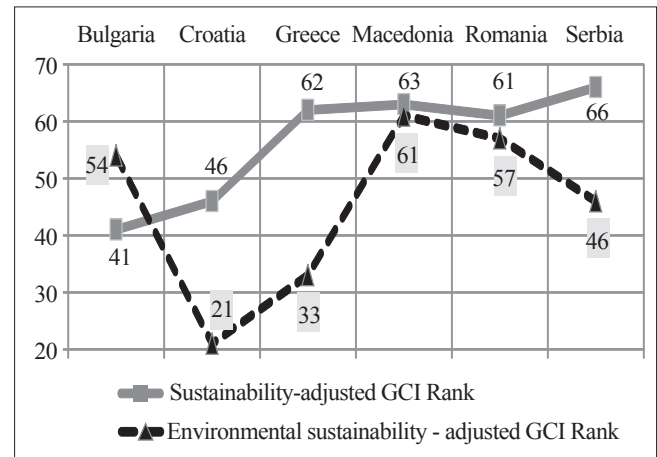

Fig. 5. Environmental sustainability – adjusted GCI and sustainability-adjusted global competitiveness index– rank of Serbia and least competitive countries of selected countries
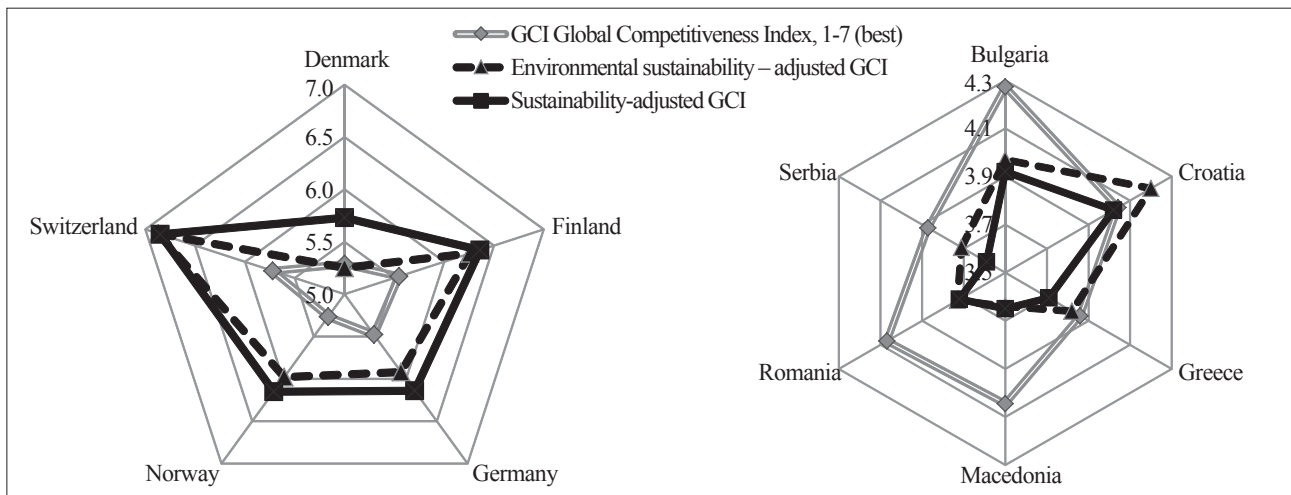

Fig. 6. Comparative overview of levels of GCI and environmental sustainability –adjusted GCI for Serbia and countries from selected groups in 2012

sustainability in global competitiveness index increases *environmental sustainability – adjusted GC*, while the least competitive countries mark a decline in their already modest competitiveness (with the exception of Croatia whose enviromental sustainability –adjusted GCI is increased with the introduction of environmental dimension). Alarming fact is that Serbia is among the bottom placed countries according to the criteria of *environmental sustainability – adjusted GC* even in the group of similar economies (Figure 6).

Relation between Global Competitiveness Index and Environmental Sustainability – Adjusted GCI

With the aim to realize the character of the connection and significance of the relation between the competitiveness and environmental dimension of sustainable competitiveness, that entails environmental aspects such as pollution, lack of resources, water availability and regulatory framework concerning the instruments and measures of environmental policy, a simple regression and correlation analysis has been performed for the variables of *GCI* and *environmental sustainability –adjusted GCI* of Serbia and selected groups of countries. Well-administrated high-quality environment is connected to the complex of country's competitiveness in many ways. It enables efficient use and preservation of all the elements of the environment and it ensures the possibility for future generations to rely on them in order to satisfy their needs. High-quality environment also, provides healthy manpower, avoiding the harmful effects on human capital (such as illness, reduced productivity), to which pollution and other

forms of environmental degradation can lead. In the end, environmental degradation can directly reduce productivity of a sector such as agriculture, which can have further negative implication for the economy, and for food safety matters, as well (especially for the countries where GDP highly depends on agriculture).

Figure 7 presents dispersion diagrams and linear form of codependence between GCI and environmental sustainability –adjusted GCI for tested groups of countries.

Graphic interpretation of data related to variable pair *environmental sustainability –adjusted GCI* and *GCI* for the group of eight most competitive European countries in 2012 shows extremely weak codependence between the variations of observed variables. Adjusting the linear form of codependence and analyses of the components of determined model point to the previously stated visual conclusion, as well. In fact, linear regression function has the following form: $y = 5.120 + 0.053 \cdot x$, with statistics $R^2 = 0.02$ i $R = 0.1414$. Value of the coefficient of determination shows that only 2% of total *GCI* variations can be explained by the variations of *environmental sustainability- adjusted GCI*, while the rest 98% of total variations represents the result of influences of other factors that are not encompassed by this model. Extremely weak codependence is also confirmed by the correlation coefficient of 0.1414. Its value points to the existance of an extremely weak, direct (straight line extends from bottom left to upper right corner on the graph), linear correlation between observed variables for the countries included in the sample. Slope of the line ($b1 = 0.053$) shows that the increase of variable *environmental sustainability – adjusted GCI* by one measure unit leads to the increase of *Global competi-*
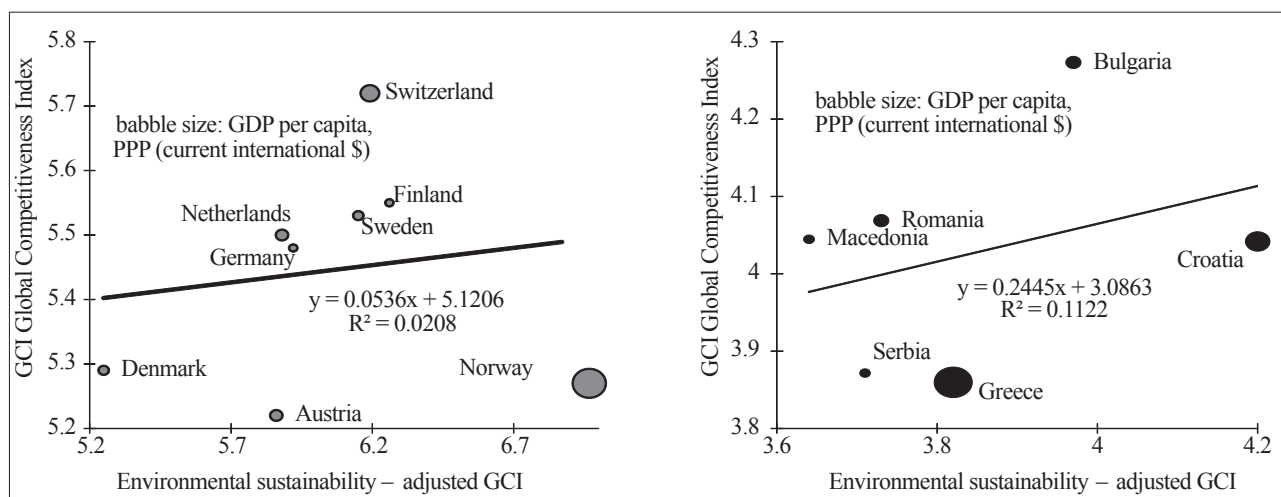

Fig. 7. Dispersion diagrams and linear form of codependence between GCI and environmental sustainability –adjusted GCI for tested groups of countries in 2012

tiveness index by 0.053. Testing the hypothesis about linear codepence of observed variables through corresponding regression coefficient, gives the statistical value of the test of 0.3551. With the probability of test significance rate of 0.05 and test threshold of 2.4469, it can, also, be concluded that there is no statistically significant linear codepence between t*he* variables *environmental sustainability – adjusted GCI* and *GCI*.

Graphic interpretation of data on variable pair *environmental sustainability – adjusted GCI* and *GCI* for the selected group of least competitive countries shows extremely low codepence between the variations of observed variables. Adjusting the linear form of codepence and analyses of the components of determined model point to the previously stated visual conclusion, as well. Actually, linear regression function has the following form: y = 3.086 + 0.244*x, with the statistics R^2=0.112 and R=0.3347. Value of the coefficient of determination shows that only 11.2% of total *GCI* variations can be explained by the variations of *environmental sustainability- adjusted GCI*, while the rest 88.8% of total variations represents the result of influence of other factors that are not encompassed by this model. Extremely weak codepence is also confirmed by the correlation coefficient of 0.3347. Its value points to the existence of an extremely weak, direct (straight line extends from bottom left to upper right corner on the graph), linear correlation between observed variables for the countries included in the sample. Slope of the line (b1=0.244 shows that the increase of variable *environmental sustainability – adjusted GCI* by one measure unit leads to the increase of *Global competitiveness index* by 0.244. Testing the hypothesis about linear codepence of observed variables through corresponding regression coefficient, gives the statistical value of the test of 0.7152. With the probability of test significance rate of 0.05 and test threshold of 2.7764, it can, also, be concluded that there is no statistically significant linear codepence between t*he* variables *environmental sustainability – adjusted GCI* and *GCI*.

Conclusion

The concept of sustainable competitiveness of a country represents a newly created category promoted by the World Economic Forum in 2011. It is a theoretical but also empirical creation, which is in the framing stage and its content will, certainly, be enhanced in the years to come. It bears an extraordinary analytical significance, being that it provides valuable scenarios of long-term sustainable economic, social and environmental progress of the countries. Metrics of sustainable competitiveness index is based on an unrealistic

premise of existance of linear effect of environmental and social dimension of sustainable competitiveness. The result is global competitiveness index adjusted by sustainability as the average of two indices: *sustainability-adjusted GCI* and *environmental sustainability-adjusted GCI*. Our presumption is that the future metrics will adjust its linear form in a more realistic direction in accordance with very complex global environmental-economical-social system.

Research of environmental dimension of sustainable competitiveness of Serbia and selected countries has shown that:

1) Group of least competitive countries is significantly behind the most competitive European countries, as shown by most of the indicators in the domain of environmental sustainability. The comparison showed that the most significant differences are viewed in the measure of *strictness and application of environmental regulations* in the domain of environmental policy and in the parametres that consider the aspect of degradation of environment (*level of particlate matter concentration, quality of environment and CO_2 intensity*). When creating the environmental policy, least competitive countries should pay special attention to identified differences, since they point to the problems that demand intervention.

2) Judging by the elements in the field of environmental policy, Serbia is slightly behind the average of the group of least competitive European countries, while the parameters of terrestrial biome protection show it in a significantly lower position than the average of the group. Furthermore, Serbia is in an unfavourable position according to the criterium of environment degradation, which is significantly less favourable than the average of the group of least competitive European countries (except for CO_2 intensity where it marks average position). Knowing the fact that the category of *environment degradation* entails parameters directly related to the health condition of the population, than this is clear indicator and a warning for leading a more active environmental policy in this field.

3) Based on the analysis of the position and values of *global competitiveness index and environmental sustainability-adjusted GCI* for the Republic of Serbia and selected European countries the existance of *trade–off* between these variables in 2012 has not been determined. In other words, there is no necessary compensation relation between being competitive and being sustainable according to the definitions of World Economic Forum. On the contrary, many countries that belong to the top of competitiveness ranking, are also the best in many aspects of environmental sustainability.

4) Incorporating the demands of environmental dimension in the global competitiveness index deepens the gap of least

competitive countries in comparison to most competitive European countries.

5) Observed groups of European countries in 2012 had more distinct differences in the value of global index of sustainable competitiveness in comparison to documented discrepancies in global competitiveness indices. This fact leads to the conclusion that the value of global competitiveness index is not incompatible with the demands of sustainability. It is our consideration that this result can be useful in the process of creating and practical realization of environmental policy and, in wider sense, sustainable development policy, as well as competitiveness promotion policies of European countries in the years of 21st century.

6) Graphic interpretation of data on variable pair *Environmental sustainability – adjusted GCI* and *global competitiveness index* for the selected countries of the most competitive and the least competitive European countries in 2012, shows an extremely low codependence between the variations of observed variables. Adjusting the linear form of codependence and analyses of the components of determined model, also, leads to that conclusion. In short, there is no statistically significant linear codependence between the variables *Environmental sustainability – adjusted GCI* and *global competitiveness index*. Nevertheless, apart from that, it can be concluded that regardless of low codependence, it is a positive relation between the observed variables. This means that the increase of *Environmental sustainability – adjusted GCI* value potentially increases the value of global competitiveness index and, at the same time, improves the economic performance of observed countries. For a more serious account on their relation, a more complex analysis should be done including the data related to a longer period of time and other forms of functional interdependence. This requires additional research after the application of given metrics in the future.

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