Environmental Sustainability in Slovenia

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ABSTRACT

The WEF methodology attempts to reconstruct the missing data just as archaeologists reconstruct the missing fragments from a dig. The evaluation of sustainability, environmental development and especially the evaluation of environmental policies itself, does not have the irreversible consequences and therefore it does not need to be limited to completely information-saturated phenomena. The WEF methodology must therefore be understood as the result of a situation analysis, not taken every country separately, but considering all the relevant countries together.

Direct from the WEF results we can take the following: (1) The average environmental policy ranking (16/25) is worse than the average ranking for the baseline state of the environment and population health (10/25), which means that Slovenia is losing its given potential. (2) The environmental profile of Slovenia, which indicates a clear non-sustainability in reducing air pollution, reducing the burden on the ecosystem, regulations and management, and international commitments.

Using SWOT analysis we can make a detailed analysis and specification of WEF achievements. It is worth pointing out that Slovenia's non-sustainable operation and poor current position compared to other European countries is due to the failure of attempts to reduce air pollution and the burden on water resources and the ecosystem, and due to ineffective regulation and management. In the future we must devote careful attention to opportunities and threats that arise outside Slovenia, i.e. increased pollution and burdening of water sources, migration to regions of protected countryside, the pressures of environmental competition on Slovenian enterprises, harmonisation of energy prices and the abolition of subsidies.

On the basis of research findings we propose the following measures to increase environmental sustainability and close the implementation gap: improve the effectiveness of regulation and management (i.e. introduce RIA, greater integration of environmental policy in sectoral policies, increase the number of environmental strategies, action plans and SEIAs), consistently fulfil of international commitments, activate policies to reduce pressures via different mechanisms (taxes, subsidies, declaring sensitive natural areas, credits, harmonisation of energy prices), and improve monitoring, which would also enable the international comparisons.

An evaluation of dynamics revealed that Slovenia's OTI ranking in 2002 went up by 3.47 percentage points and came within 6.59 percentage points of the best ranked country. Therefore, the environmental sustainability in Slovenia is gradually improving; however viewed structurally the change between the studied years is explicitly unfavorable.

1 Introduction

This paper will present the World Economic Forum methodology of Environmental Sustainability Index (ESI), its first results from 2001 and dynamics in 2002[1].

The Strategy for the Economic Development of Slovenia 2001-2006 (SEDS) is founded on sustainable development. This declaration is based upon the intent to move development policy away from one-sided decisions that do not fully develop all three components of welfare: business, environmental and social. The Strategy's key environmental development task is to optimize the welfare yield of environmental capital, which means better utilization of potentials to create renewable welfare. The large implementation deficit (ID) in environmental policy is, according to SEDS, one of the key obstacles to the full utilization of environmental development potentials. The large ID stems from numerous unimplemented legislative and program policies, which are gradually results in claims against the state because it has not implemented its systemic base.

The comparatively low integration of economic development, with regard to environmental conditions, is the most complex manifestation of environmental policy ID. The SEDS assessment of ID is only empirical and expressed as a one off figure, because so far there has not been a tool for to fully express or even properly measure ID. In its ESI publication the WEF offers one of the first tools for measuring environmental sustainability and perhaps by extension the possibility of measuring implementation deficit.

The methodological originality of ESI lies in its special statistical approach, which might even be described as an **archaeological** approach, i.e. formulating an overall image of a phenomenon from the partial information available. The WEF methodology attempts to reconstruct the missing data on a country's environmental development, just as archaeologists reconstruct the missing fragments from a dig. This required an extensive pre-preparation phase gathering existent national and international statistical publications featuring all the indicators captured in ESI. The evaluation of sustainability, environmental development and especially the evaluation of environmental policies itself, does not have irreversible consequences and therefore need not be limited to completely information-saturated phenomena. The WEF methodology must therefore be understood as the result of a situation analysis, not taking every country separately, but considering all the relevant countries together.

[1] Paper is the result of the research project "Evaluation of environmental sustainability for strengthening the competitiveness – threats and opportunities", which arisen in a frame of Aimed Research Programme: Competitiveness of Slovenia 2001-2006, ordering by IMAD, and financed by MESPE and MSSS.

The key characteristics of the system of ESI indicators are transparency, aggregation, international comparison and political importance, which enable a more complex evaluation of state of environmental sustainability in comparisons among EU and accession countries. Because the environment is an equally ranking factor of economic development, weak ESI estimates can be a macroeconomic indication of a country's low complex competitiveness (SEDS).

ESI consists of five components: environmental systems, reducing stresses, reducing human vulnerability, social and institutional capacity to respond to threats and global stewardship, and is calculated as an average of 22 indicators (Environmental Performance Measurement, 2002, pp. 14), aggregated on three levels. ESI is the result of the highest, third level of aggregation and is calculated as an average of all indicators. The second level of aggregation consists of five ESI components, demonstrating environmental sustainability as a function of five phenomena: (i) he state of environmental systems, such as air, soil, ecosystems, and water; (ii) stresses on those systems in the form of pollution and exploitation levels; (iii) human vulnerability to environmental change in the form of loss of food resources or exposure to environmental diseases, (iv) the social and institutional capacity to cope with environmental challenges; and, finally; (v) the ability to respond to the demands of global stewardship by cooperating in collective efforts to conserve international environmental resources, such as the atmosphere (Environmental Performance Measurement, 2002, pp. 13). The stated components capture 22 indicators (see Table 1).

The lowest, first level of aggregation captures 22 indicators, calculated from 67 variables. Each single indicator includes up to five variables, which are unique to that indicator.

The conclusions made about Slovenia in this article were acquired by comparing of ranks in two samples: the global sample (N_1), which captures all 122 assessed countries in 2001 when the ESI was firstly published, and a basic sample (N_2), which captures EU member states, accession countries, USA, Croatia and Macedonia, a total of 25 states. Slovenia's rank in individual sample is expressed in the form X_i/N_i, where is X_i, i=1.2 rank for Slovenia and N_i, i=1.2: the number of states in individual sample. This is the basic record of Slovenia's rank, which appears through the whole article (see Table 1).

When several countries share the same rank and at the same time this impacts on Slovenia's rank, countries are united into groups and the rank is defined in the form $Z_s/Z/N$, where Z_s is Slovenia's rank or the rank of a group including Slovenia; Z is the number of all groups and N is the number of all states with data. When data is not available, this is marked by a dash (-). For instance in Table 1, "I1/s1, Urban SO_2 concentration (-/21)" means, that in the basic sample data are available for 21 countries, but not available for Slovenia. "I12/s3, Under-5 mortality (2/11/25)" means, that data on all 25 countries in basic sample are available,

however several states has the same rank and are therefore united to groups (11 groups); Slovenia or its group is ranked second among eleven groups.

Table 1: Three-level structure of ESI: components, indicators and variables

KOMPONENTS	LABLE AND NAME OF INDICATOR (SI RANK)	LABLE AND NAME OF VARIABLE	Slovenia's rank
	SYMBOLS: indicator 'I', sequence No. I / sequence No. of his variable 's', name of variable 's'; rank X/ sample N		
ENVIRONMENTAL SYSTEMS	**I1 Air Quality** (15/25)	**I1/s1** Urban SO2 concentration	**-/21**
		I1/s2 Urban NO2 concentration	**-/20**
		I1/s3 Urban TSP concentration	**-/18**
	I2 Water quantity (3/25)	**I2/s1** Internal renewable water per capita Water Quantity	**4/25**
		I2/s2 Per capita water inflow from other countries	**5/25**
	I3 Water Quality (11/25)	**I3/s1** Dissolved oxygen concentration	**-/10**
		I3/s2 Phosphorus concentration	**-/11**
		I3/s3 Suspended solids	**-/9**
		I3/s4 Electrical conductivity	**-/12**
	I4 Biodiverity (16/25)	**I4/s1** Percentage of mammals threatened	**21/25**
		I4/s2 Percentage of breeding birds threatened	**6/25**
	I5 Land (6/25)	**I5/s1** Sevirity of human-induced soil degradation	**-/16**
		I5/s2 Land area impacted by human activities as a percent of total land area	**5/25**
REDUCING STRESSES	**I6 Reducing AirPollution** (18/29)	**I6/s1** NOx emissions per populated land area	**17/25**
		I6/s2 SO2 emissions per populated land area	**16/25**
		I6/s3 VOCs emissions per populated land area	**20/25**
		I6/s4 Coal consumption per populated land area	**17/25**
		I6/s5 Vehicles per populated land area	**15/25**
	I7 Reducing Water Stress (14/25)	**I7/s1** Fertilizer consumption per hectare of arable land	**21/25**
		I7/s2 Pesticide use per hectare of crop land	**17/20**
		I7/s3 Industrial organic pollutants per available fresh water	**10/18**
	I8 Reducing Ecosystem Stresses (17/25)	**I8/s1** Percentage change in forest cover 1990-1995	**-/12**
		I8/s2 Percentage of county with acidification exceedence	**15/25**
	I9 Reducing Waste & Consumption Pressures (8/25)	**I9/s1** Consumption pressure *p.c.*	**9/24**
		I9/s2 Spent nuclear fuel arisings per capita	**5/19**
	I10 Reducing Population Growth (6/25)	**I10/s1** Total fertility rate	**6/25**
		I10/s2 Percentage change in projected pop. between 2000 & 2050	**7/25**

REDUCING HUMAN VULNERABILITY	**I11 Basic Human Sustenance** (8/25)	**I11/s1** Daily p.c. calorie supply as a percent of total requirements	**-/16**
		I11/s2 Percent of pop. with access to improved drinking-water supply	**1/2/10**
	I12 Environmental Health (6/25)	**I12/s1** Child death rate from respiratory diseases	**10/21**
		I12/s2 Death rate from intestinal infectious diseases	**10/22**
		I12/s3 Under-5 mortality rate	**2/11/25**
SOCIAL AND INSTITUTIONAL CAPACITY	**I13 Science and Technology** (12/25)	**I13/s1** Scientists and engineers per million population	**10/25**
		I13/s2 Expenditure for research and development as a percent of GNP	**13/25**
		I13/s3 Scientific and technical articles per million population	**12/20**
	I14 Capacity for Debate (14/25)	**I14/s1** IUCN member organizations per million population	**17/25**
		I14/s2 Civil & political liberties	**2/5/25**
	I15 Regulation and management (25/25)	**I15/s1** Stringency and consistency of environmental regulation	**-/19**
		I15/s2 Degree to which environmental regulations promote innovation	**-/19**
		I15/s3 Percentage of land area under protected status	**22/25**
		I15/s4 Number of sectoral EIA guidelines	**10/10/25**
	I16 Private Sector Responsiveness (8/25)	**I16/s1** Number of ISO14001 certified companies per million $ GDP	**2/25**
		I16/s2 Dow Jones Sustainability Group Index	**-/13**
		I16/s3 Average Innovest EcoValue rating of firms	**-/12**
		I16/s4 World Business Council for Sustainable Development members	**12/12/25**
		I16/s5 Environmental competitiveness	**-/19**
	I17 Environmental information (20/25)	**I17/s1** Availability of sustainable development information at the national level	**11/18**
		I17/s2 Environmental strategies and action plans	**5/6/25**
		I17/s3 Percentage of ESI variables in publicly available data sets	**8/11/25**
	I18 Eco-efficiency (6/25)	**I18/s1** Energy efficiency (total energy consumption per unit GDP)	**12/25**
		I18/s2 Renewable energy production as a percent of total energy consumption	**7/25**
	I19 Reducing public choice distortions (14/25)	**I19/s1** Price of premium gasoline	**8/25**
		I19/s2 Subsidies for energy or materials usage	**-/19**
		I19/s3 Reducing corruption	**13/25**

GLOBAL STEWARDSHIP	**I20 International commitment** (22/25)	**I20/s1** Number of memberships in environmental intergovernmental organizations	**20/25**
		I20/s2 Percentage of CITES reporting requirements met	**8/8/25**
		I20/s3 Levels of participation in the Vienna Convention/Montreal Protocol	**2/2/25**
		I20/s4 Compliance with environmental agreements	**-/19**
	I21Global-scale funding/participation (21/25)	**I21/s1** FSC accredited forest area as a percent of total forest area	**11/11/25**
	I22 Protecting international commons (7/25)	**I22/s1** Ecological footprint »deficit«	**12/23**
		I22/s2 CO_2 emissions (total times per capita)	**5/22**
		I22/s3 Historic cumulative CO_2 emissions	**4/25**
		I22/s4 CFC consumption (total times per capita)	**1/11**
		I22/s5 SO2 exports	**11/25**

Regarding the richness of ESI captured information, the achievement of an individual country may be studied in detail and specified precisely, which was the main purpose of our research. This is useful because the strengths and opportunities of environmental development, as well as weaknesses and threats, can be estimated from the basic series of indicators. This feature was dictated by the requirement that the ESI methodology be used as a support tool for formulating consistent proposals or measures or at least areas of environmental policymaking, primarily the issue of how to reduce environmental ID causally and systematically. Therefore, we break down the ESI result using three evaluation methods of environmental ID: (1) benchmarking, (2) SWOT and (3) dynamics analysis. They will be briefly introduced below.

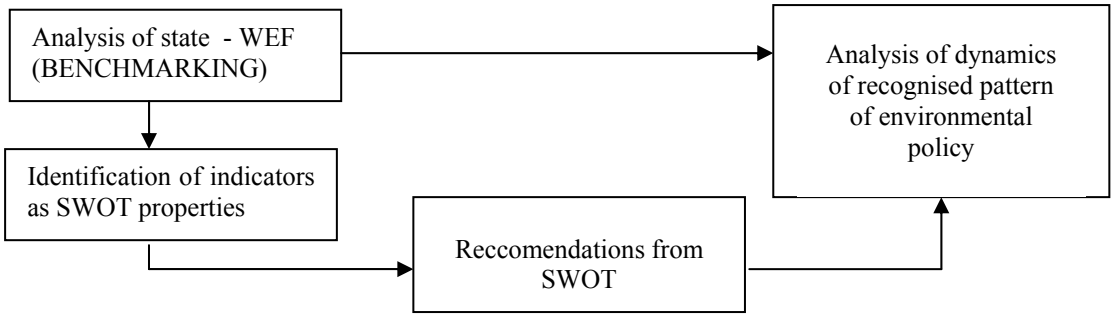
2 Methodology

The ESI method is based on **benchmarking**. The point of this technique is ***assessment of relative success (and effectiveness), where the result is usually a ranking of achievements on a scale*** (see Kovačič, 2001), in our instance the ranking of countries. Analysis of strengths, weaknesses, opportunities and threats or **SWOT analysis** further deepens the insight into the results that benchmarking offers. With help of SWOT analysis we deduce internal characteristics of environmental sustainability in Slovenia (strengths and weaknesses), and establish outside factors in the environment, which influence environmental sustainability (opportunities and threats); and finally we are able to form, from cognitions, the framework recommendations for environmental policy adaptation.

The connection of three types of analysis of initial ESI ranks assessments shows Picture 1. From there it is evident, that results of ESI evaluation are firstly statically processed by

SWOT, after that the SWOT results are compared between years to figure out, if the extremes from SWOT analysis are changing in the right direction, i.e. that strengths and opportunities are deepening and weaknesses and threats are falling.

Picture 1: Sketch of methodological approaches



For this article SWOT analysis was conducted with the aid of standard deviation of Slovenia's rank from the average value for captured countries. For an individual indicator, this comparison is an indication of whether the achievement is ***sustainable or not***, and by what percentage this achievement is above or below the average of the global sample. We continue the SWOT analysis with a comparison of Slovenia's achievements in individual indicators with achievements of selected countries (aggregated benchmarking) and on this base we identify each indicator as ***strength or weakness and/or opportunity or threat.*** We evaluate the selected indicators by putting Slovenia's rank into the basic sample in one of four country groups. A ranking in group A or B marks strengths or opportunity, and ranking in group C or D weakness or threat. Group A is better than group B and group C is better then group D. The four group ranking enables us to distinguish groups of countries with equal values for a certain indicator. Defining the group is also a reasonable when a certain country is clearly acting in an unsustainable manner, and all countries in the sample behave unsustainablely too.

Finally we ***analyze the dynamics of change in Slovenia's environmental sustainability*** in 2002 by comparison with achievements in 2001. The three steps of structural analysis are then introduced in detail.

2.1 Identification of environmental sustainability from SWOT analysis

The purpose of benchmarking in economic analysis is to find out the variance from the best achievements in an investigated series of data. The benchmarking procedure is suitable for environmental sustainability, a field that we still want to improve according to the SEDS and National Programme of Environmental Protection (NPEP). Benchmarking can be an independent method of analysis, but SWOT is not possible without it. Benchmarking is not

always explicitly treated within a SWOT analysis, however it exists as soon as one attempts a comparison between systems (countries, competitive companies, programmes…). The annual monitoring of benchmarking results makes it possible to perceive long-term trends in achieving the environmental sustainability (A Methodology for Benchmarking RTD Organisations and CEE, 2002, p. 36). An individual country's ranking is thus the result of achievements in all captured countries, which are compared. The ***ESI methodology should be understood as the result of an analysis of a country compared to all captured countries together and not of the country individually.***

Benchmarking is conducted over several phases. The essence of the benchmarking technique used in this paper is that the indicator with the top or the average value (analysis of standard deviations) is treated as a criterion, after which the environmental sustainability of all the captured countries is evaluated. This phase is designated as the identification of ***sustainability*** and the identification of ***SWOT properties*** (ranking strength, weakness, opportunity or threat).

The difference, plus or minus, of a country's **standard deviation** $(\pm\sigma)$ in an individual indicator from the average of all countries in the reference sample, is used to make deductions about the developmental sustainability: if the standard deviation is ***positive***, we deliberate the indicator as sustainable, and if the standard deviation is ***negative*** we deliberate it as unsustainable**.**

The global sample of countries is important to the evaluation of Slovenia's environmental sustainability or lack thereof. Higher standard deviation values for an indicator were already understood to represent higher sustainability in the original ESI methodology. The selected procedure for defining the border between sustainable and unsustainable in this paper has already been used many times. This methodological solution is essential when assessing ***"consumption of environmental place"***[2]. This is a synthesis measure of consumption of natural resources in individual country by comparison with the carrying capacity of the planet. It shows the amount of natural resources that can be used each year without compromising the availability of the same quantities and quality of resources to future generations. It is derived from a comparison of (national, regional, local) consumption of natural resources and statistically estimate appurtenant share, defined according to the "global hectare" of planet space (ibid).

An awareness must be maintained that there is no absolute sustainable optimum, neither for the level, nor for the combination of consumed welfare (Radej, 2002, pp. 35), therefore ESI methodology interprets higher values of indicators as more sustainable. So, we can judge that a country with a standard deviation value of zero for an individual indicator has environmental capacities that are within the framework of the global capacity for renewal – in

[2] http://www.foeeurope.org/sustainability/europe/study/quantify.htm

fact, this is not precisely the case because the state of sustainability is used by definition only as a kind of *numerarie*, a measure for all others.

The **ranking a country achieves** for an individual indicator is evaluated in two samples of countries (aggregated benchmarking). ***Allocating Slovenia to a group in the basic sample serves to define its internal strength or weakness, or the external opportunity or threat*** (see Table 2).

Table 2: Ranking the countries by groups A – D in both samples

Group of country	SWOT properties	Global sample of countries (122)	Basic sample of countries (25)
		Achieved ranks	
A	S, O	1-30	1-6
B	S, O	31-60	7-12
C	W, T	61-90	13-18
D	W, T	91-122	19-25

The procedures described above enable Slovenia's achievement to be interpreted as sustainable or unsustainable and as strength/weakness and/or opportunity/threat.

2.2 Evaluation of dynamics

So far two annual ESI evaluations have come out, so we may also study also the first changes in ranks and illustrate the usability of structural analysis of ESI components. For the evaluation of ESI dynamics, we compare the **changes in country rankings** by using simple cross calculus:

$$\Delta u_i^j = \frac{100}{122} \cdot z_{i,t-1}^j - \frac{100}{142} \cdot z_{i,t}^j = 100 \cdot \left(\frac{z_{i,t-1}^j}{122} - \frac{z_{i,t}^j}{142}\right), \qquad \textbf{(1)}$$

where: $z_{i,t}^j$ is the rank of the country *i* at indicator *j* in 2002, at 142 studied countries (for 2002); $z_{i,t-1}^j$ is the rank of the country *i* at indicator *j* in 2001, at 122 studied countries; and Δu_i^j is the change of rank for country *i* at indicator *j* in percentage points.

A positive result means a better placing in 2002 rankings compared with the 2001 placing, and a negative result means a worse placing in 2002 than in 2001, by Δu percentage points.

The **changes in indicator value** are calculated from the difference of value of indicator *j* for country *i* and from the best indicator's value in the 2001 sample ($h_{i,t-1}^j$):

$$h_{i,t-1}^{j} = [1 - (\frac{y_{i,t-1}^{j} - y_{\min,t-1}^{j}}{y_{\max,t-1}^{j} - y_{\min,t-1}^{j}})] \cdot 100, \quad \textbf{(2)}$$

where $y_{i,t}^{j}$ is value of indicator *j* for country *i* in 2001; $y_{\min,t}^{j}$ is the lowest value of indicator *j* in observed sample in 2001; $y_{\max,t}^{j}$ is the highest value of indicator *j* in observed sample in 2001; $h_{i,t}^{j}$ is the difference between the value of indicator *j* for country *i* and the best value of indicator *j* in sample in 2001, as a percentage.

The procedure is repeated on data for 2002:

$$h_{i,t}^{j} = [1 - (\frac{y_{i,t}^{j} - y_{\min,t}^{j}}{y_{\max,t}^{j} - y_{\min,t}^{j}})] \cdot 100, \quad \textbf{(3)}$$

where $y_{i,t}^{j}$ is the value of indicator *j* for country *i* in 2002; $y_{\min,t}^{j}$ is the lowest value of indicator *j* in the 2002 observed sample; $y_{\max,t}^{j}$ is the highest value of indicator *j* in the 2002 observed sample; $h_{i,t}^{j}$ is the difference of value of indicator *j* for country *i* and the best value of indicator *j* in sample in 2002, in percentage points.

Finally, the change of indicators' value is computed, thus the equations (2) and (3) are subtracted to obtain:

$$\Delta h_{i}^{j} = h_{i,t-2}^{j} - h_{i,t}^{j}, \quad \textbf{(4)}$$

Positive result mean an improvement in the indicator value in 2002 compared to the 2001 value, or close to the best value. Negative result means a fall in the indicator's 2002 value compared to 2001, or falling away from the best value, namely in the amount of Δh percentage points.

Finally, the findings from the assessment of changes (**dynamics)** between years **are evaluated by measures** that were proposed in the synthesized SWOT (both SWOT matrices). And from this basis one can deduce how the environmental policy in 2002 responded to the pattern of environmental development set out the year before.

3 Results

In this paper the results are shown in a synthesized manner. First, we **compare the ranks of the initial environmental state with the environmental policy ranks** (Figure 1, Chapter 3.1). After that, Slovenia's environmental profile is evaluated, which based on a direct reading of all Slovenia's values/indicator ranks (Figure 2, Chapter 3.2). Then the results of the SWOT

analysis are given with recommendations in **two synthesized SWOT matrix forms**, which indicate internal sustainable strength and weakness and external opportunity and threat (Table 4 and 5, Chapter3.3). Strengths and weaknesses identified by benchmarking are synthesized and presented in a ***matrix of strengths and weaknesses*** (Table 4, Chapter3.3). The matrix elements are indicators that were identified as strengths or weaknesses. An individual matrix element also contains a recommendation for eliminating weaknesses and using advantages. Identified opportunities and threats are presented in a form of ***matrix of opportunities and threats*** (Table 5, Chapter 3.3). Matrix compares the probability of opportunity/threat performance with their influence on economic development. Elements of matrix are indicators, which were identified as opportunity or threat. An individual matrix element contains also a recommendation for using opportunities and avoiding threats.

Let it be stated, as an aid to reading the results, that the matrix of strengths and weaknesses is based on observing the following combination of properties (i) sustainable/unsustainable and (ii) strength/weakness and/or opportunity/threat, from where we formed four standard recommendations to environmental policy for eliminating weaknesses/avoiding threats and using strengths/opportunities (see Table 3, Section III.): (1) to stop and to rectify unsustainable procedures, to continue with equal pace; (2) to continue in the same direction (2) to continue in the same direction with equal pace, (3) to continue in the same direction accelerated, and (4) to stop and to rectify unsustainable procedures, to continue accelerated. The matrix of opportunities and threats is based on assessing the probability of opportunities/threats appearing and their influence on the country[3]. Probability and influence can be low/small or high/large. Four standard recommendations for using opportunities and avoiding threats were formed on the basis of assessed combination of probability and influence (see Table 3 below – Section IV): (5) to observe intensification of signals, (6) to take measures decisively, (7) to make preventive improvements and (8) to put less effort into improvement than for other indicators.

Table 3: The basic structure of the model

<table>
<tr><td colspan="4">LABEL AND NAME OF INDICATOR</td></tr>
<tr><td colspan="2">I. Sustainability assessment</td><td colspan="2">II Assessment of strengths/weaknesses/opportunities/threats of Slovenia</td></tr>
<tr><td colspan="2">Standard deviation</td><td>Global sample</td><td>Basic sample</td></tr>
<tr><td rowspan="2">Findings: is/is not sustainable</td><td rowspan="2">Findings: level of sustainability – relatively by comparison with the average</td><td colspan="2">Ranking the countries in groups A/B/C/D</td></tr>
<tr><td>External threats and opportunities SWOT</td><td>Internal strengths and weaknesses SWOT</td></tr>
<tr><td colspan="4">III. Standard recommendations: (1), (2), (3), (4)</td></tr>
<tr><td colspan="4">IV. Assessment of eventual opportunity or threat, that arise outside Slovenia</td></tr>
<tr><td colspan="4">Description of opportunities or threats with internal variables</td></tr>
<tr><td>Probability</td><td>Small/Large</td><td colspan="2" rowspan="2">Standard recommendation: (5), (6), (7), (8)</td></tr>
<tr><td>Impact</td><td>Small/Large</td></tr>
</table>

[3] Recognition of opportunities and threats, together with assessment of their probability to appear and influence is based upon the independent estimate of the author, which can be expertly checked in future research projects.

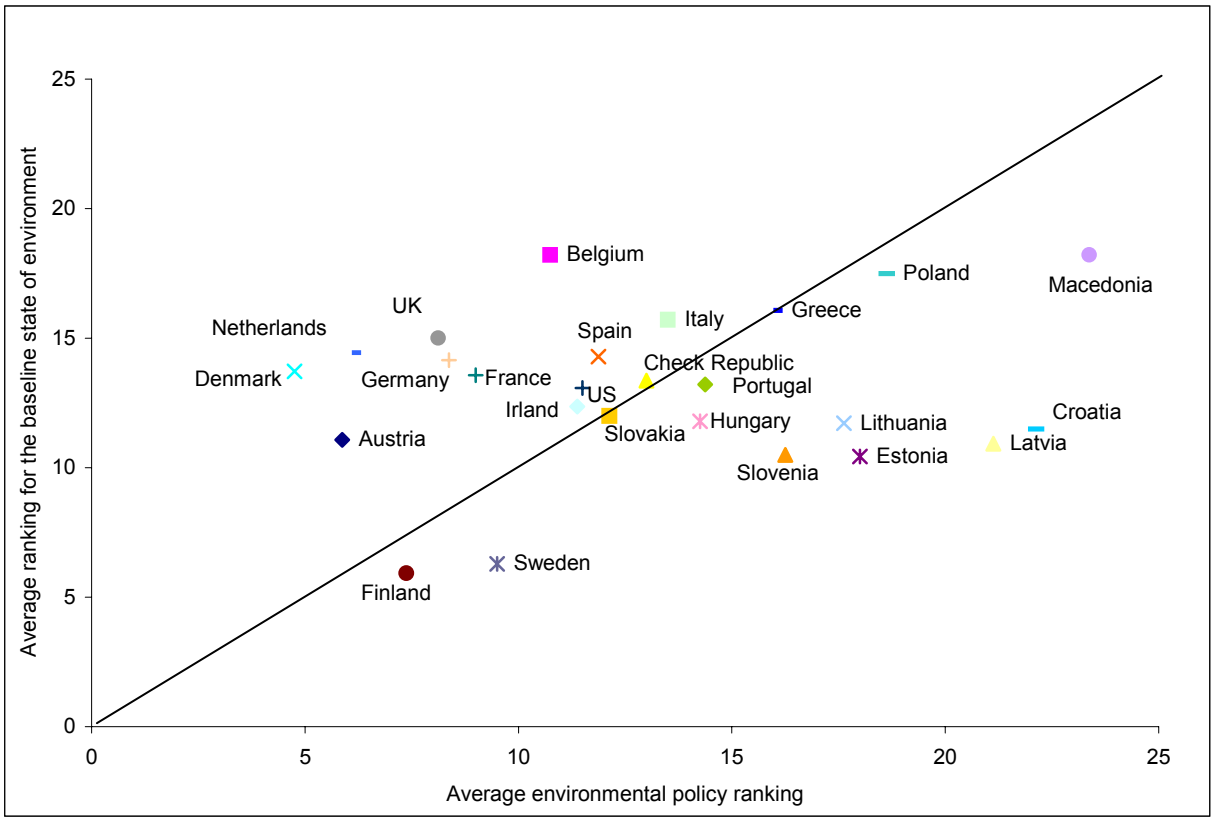
Below we present the results of benchmarking, the results of SWOT with recommendations for improvement of environmental sustainability and competitiveness and finally, the results of the dynamics analysis.

3.1 Comparison of initial state of environment and public health with success of environmental policies

In the transition to higher level of sustainability, countries with progressive sustainable development must have a higher success of environmental policies ranking than baseline state of environment ranking (i.e. above the diagonal in Figure 1). Only for the best rated countries does this rule hot hold true, since they cannot of course be better then the best (i.e. countries, which are extremely left placed in Figure 1: Sweden (6/25 and 10/25), Finland (6/25 and 7/25). Slovakia, Czech Republic and Greece have equal rank of state and of policies (they are placed on diagonal), therefore we can state that they make good use of their given potential. All EU countries (except the best two countries and Portugal) are placed above the diagonal, which means that they improve their environmental development potential by improving their policies, and are therefore countries with progressive sustainable development. All accession countries (except Slovakia and the Czech Republic) are below the diagonal, meaning that they do not adequately utilize their given potential due to bad policies. The worst ranking countries for environmental sustainability overall (on the right of the figure) are Macedonia, Croatia, Latvia and Poland.

Slovenia's environmental policy ranking (16/25) in 2001 was worse than the ranking for the baseline state of environment (11/25), which means, that Slovenia was underutilizing its given potential. Rectangular distance of Slovenia to diagonal is among the largest, which means one of the largest differences between given potential and utilization rate. The same holds true for 2002, when Slovenia's average environmental policy ranking (14/25) was worse than the average ranking for the baseline state of environment (11/25). Its environmental policy ranking is close to its ranking for the baseline state of environment, which suggest that the ID is being reduced. The equalization of the ranks may be interpreted as marking the close of the transition period and the beginning of sustainable development, i.e. improving environmental given potential with improving policies.

Figure 1: Comparison of average ranking for the baseline state of environment and average environmental policy ranking (2001)



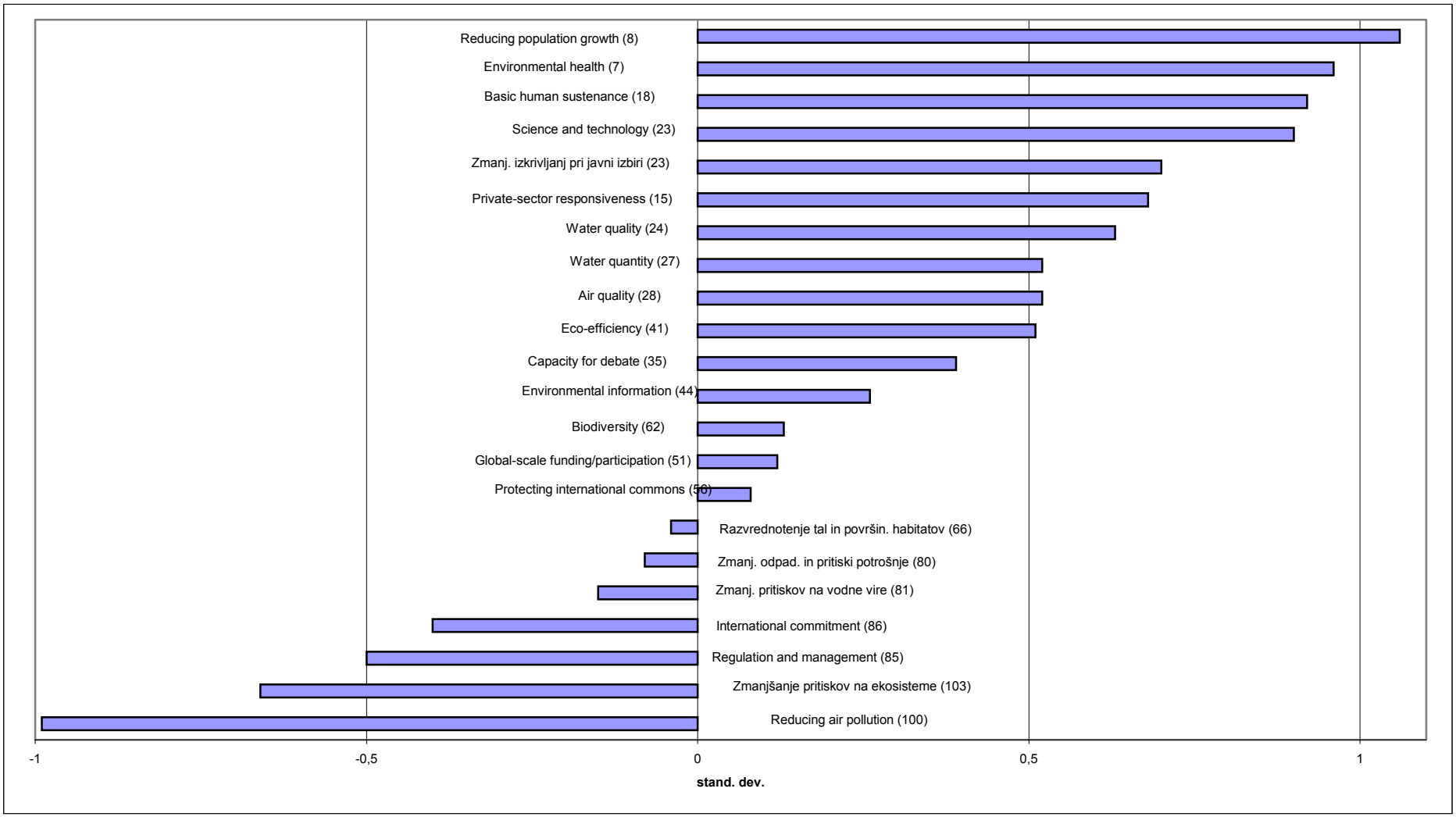
We addressed the evaluation of environmental policies or ID, because the thesis the paper puts forward is that during the transition period, Slovenia lots its special sustainable features of development and its internationally recognized structure environmental welfare, due to the ID effect. Because of environmental ID and its effects, the sustainable adaptation of environmental policy would contribute more to implementing sustainable development than would than changing the environmental protection system. Since this thesis was confirmed, it is clear that Slovenia can achieve greater environmental progress by improving the level to which the existent legal order is implemented, than by additional tightening of environmental requirements in society and economy – a certain amount of tightening will be inevitable in consequence of bad behaviour in the past, however we wish to highlight that ***in Slovenia further tightening of environmental requirements is not necessarily the optimum method for achieving a sustainable increase in environmental welfare.*** As long as environmental policy potentials are not enforced at least comparatively well (i.e. in sample of EU members), it would be impractical from a macroeconomic view to strength the influence of environmental policy by increasing its potentials (personnel and financial).

3.2 The environmental profile of Slovenia

ESI methodology is an environmental development methodology, on the basis of which it is possible to set out Slovenia's environmental profile. Since Slovenia's SEDS makes sustainable development a national policy, the use of ESI methodology represents support for and the realization of this strategic policy with environmental sustainable information.

Figure 2 gives Slovenia's environmental profile. It is read from the centre (standard deviation=0), which is understand as an average of all countries taken individually, for each indicator from the global sample. Slovenia's environmental profile indicates a distinctive non-sustainability in reducing air pollution, reducing the burden on the ecosystems, regulations and management and international commitments. A very sustainable position is found in reducing population growth, environmental health, basic human sustenance and science and technology.

Figure 2: The environmental profile of Slovenia



Source: Environmental Performance Measurement. The Global Report 2001-2002, Oxford : Oxford University Press, 2002, pp. 109-113.

3.3 Matrix of strengths and weaknesses and matrix of opportunities and threats for Slovenia

The SWOT analysis on ESI methodology can be understand as a tool for discussing environmental development, ID, and for finding consistent reasons for proposals to manage environmental development, and above all, understanding how to control and reduce the environmental ID. The matrix of strengths and weaknesses (Table 4) is composed from results of SWOT analysis (see Table 3, Section I and II).

The matrix of strengths and weaknesses is composed of four quadrants. Numbers in the brackets at individual indicator are Slovenia's ranks in the basic sample. Indicators marked with an asterisk were at the same time estimated as strengths or weaknesses and as opportunities or threats.

In summarizing the information from the matrix of strengths and weaknesses it is worthwhile pointing out the combination of two explicitly unfavorable properties: non-sustainable operation and the poor current position of Slovenia compared to other European countries, due to the failure of attempts to reduce air pollution, water stress and ecosystem stresses, and due to ineffective regulation and management. Moreover, it is also worth pointing out other, still unfavorable combinations, i.e. the combination of non-sustainable operations and a positive position for Slovenia compared to other European countries, due to soil degradation and the failure of attempts to reduce waste and consumption pressures.

The matrix of opportunities and threats is composed from results of SWOT analysis. In the future we must devote careful attention to opportunities and threats that arise outside Slovenia, i.e. increased pollution and burdening of water sources, migration to regions of protected countryside, the pressures of environmental competition on Slovenian enterprises, the harmonization of energy prices and the abolition of subsidies for energy and material use.

Table 4: Matrix of strengths and weaknesses

A	I8: Relatively low soil degradation and degradation of habitats in the region (6/25) ***TO STOP AND TO RECTIFY NON-SUSTAINABLE PROCEDURES,TO CONTINUE AT THE SAME PACE!***	I2: High availability of water resources (3/25) I10: Effective reducing of population growth (6/25)* I12: Good environmental health (6/25) I18: High level of eco-efficiency (6/25)* ***TO CONTINUE IN THE SAME DIRECTION AND AT THE SAME PACE!***
B	I9: Effective waste reducing and reducing of consumption pressures (8/25)	I3: Adequate drinking water quality (WEF assessment) (11/25) I11: Effective satisfying of basic human needs (8/25) I13: Favorable state of science and technology (12/25) I16: High responsiveness of private sector (ISO 14001) (8/25)*
C	I6: Ineffective reducing of air pollution in populated land area (18/25) I7: Ineffective reducing of water stresses (14/25)* I8: Ineffective reducing of ecosystem stresses (17/25) ***TO STOP AND TO RECTIFY NON-SUSTAINABLE PROCEDURES, TO CONTINUE ACCELERATED!***	I1: Bad air quality in urban areas (WEF assessment) (15/25) I4: High proportion of threatened species (mammals) (16/25) I14: Inferior role of discussion in society (14/25) I19: Ineffective reducing of public choice distortions (14/25)* ***TO CONTINUE IN THE SAME DIRECTION, ACCELERATED!***
D	I15: Ineffective regulation and management (25/25)	I17: Non-availability of environmental information (20/25)
	SUSTAINABLE	**NON-SUSTAINABLE**

Table 5: Matrix of opportunities and threats

High probability	I18: Eco-efficiency: Development of technologies for using alternative energy sources (I18/s2-7/25) I20: Compliance with international agreements (I20/s4 - /19) ***TO OBSERVE INTENSIFICATION OF SIGNALS (price, tax, consultation…)!***	I7: Increasing the burden on water sources in the future I10 Migrations to regions of protected countryside (I10/s2-7/25) I16: Private sector responsiveness: pressure of environmental competition on Slovenian enterprises (I16/s5 – n.a.) I19: Reducing public choice distortions: harmonization of energy prices (I19/s1 - 8/25) and the abolition of subsidies for energy and material use (I19/s2 - n.a.) I20: Fulfillment of international commitments (I20/s2 – 8/8/25 and I29/s3 – 2/2/25) ***TO TAKE MEASURES DECISIVELY!***
Low probability	I21: Global-scale funding/participation (21/25) I22: Contribution to protecting international commons (7/25) ***TO PUT LESS EFFORTS INTO IMPROVEMENTS THAN FOR OTHER INDICATORS!***	I16: Private sector responsiveness: placing enterprises on international scales of sustainable enterprises (I16/s2,s3 - n.a) ***PREVENTIVE IMPROVEMENTS!***
	Small influence	Large influence

3.4 An evaluation of dynamics 2001-2002

An annual evaluation of dynamics on regular basis is a response to the question of environmental sustainability in Slovenia is changing, i.e. is it improving, worsening or keeping on the same level. A comparison between two successive years is still somewhat risky for such assessments, therefore we devote address it above all with the ambition of illustrating the possible use of ESI methodology as a time series. Evaluating the dynamics of change in environmental sustainability in Slovenia demands the adaptation of primarily ESI structure to a new one[4]. This procedure meant that each indicator was an average of its component variables and that all indicators have equal weight in the ESI.

A positive ranking change means better placing in 2002 in comparison with the placing in 2001, and negative result means a worse placing in 2002 compared to 2001, i.e. by a specific number of percentage points. A positive change in a value means an increase in an indicator's value in 2002 or moving close to the top value, while a negative result means a fall in the indicator's value in 2002 compared to 2001 or a move away from the top value, i.e. by a certain number of percentage points.

Indicators for air quality, water quality, science and technology, eco-efficiency and GHG emission all lost on political importance (moving from sustainable to unsustainable and/or from strength/opportunity to weakness/threat), while there was a gain for indicators of global stewardship, biodiversity and capacity for debate (moving from unsustainable to sustainable and/or from weakness/threat to strength/opportunity).

We have discovered that Slovenia's ESI ranking in 2002 went up by 3.47 percentage points and came within 6.59 percentage points of the best-ranked country (see Chapter 2.2). Slovenia's biggest ranking drop was for the air quality indicator (-28.46) and the land indicator (-28.3). However, Slovenia's biggest move away from the top value was in eco-efficiency, i.e. by 40.51 percentage points. The largest improvement, by rank and by value, was achieved in reducing transboundary pressures, with the rank improving by 44.5 percentage points and value improving by 47.1 percentage points.

[4] The methodology is modified for 2002; more about it see in original research or quoted literature. ESI 2002 composes 20 indicators (before 22), which formed by 68 variables (before 67) and are computed for 142 countries (before 122).

Table 6: Changes in values and ranks for ESI, components and indicators, 2001-2002

Indicator	**Political importance** (non/sustainability, S/W/O/T)		**Ranking change** as No. of acquired places (+) or lost places (-)	**Change in percentage points**	
	2001	2002		Rank	Indicator's value
ESI: Environmental sustainability Index	Sustainability	Sustainability	1	3,5	6,6
K1: Environmental systems	Sustainability	Sustainability	-23	-13,5	-15,0
K2: Reducing stresses	Non-sustainability	Non-sustainability	-17	-1,2	9,4
K3: Reducing human vulnarability	Sustainability	Sustainability	5	4,6	0,2
K4: Social and institutional capacity	Sustainability	Sustainability	2	4,2	-2,5
K5: Global Stewardship	Non-sustainability	Sustainability	41	37,1	20,1
I1: Air quality	Sustainability, S	Non-sustainability, W	-45	-28,5	-22,1
I2: Water quantity	Sustainability, S	Sustainability, S	-14	-6,7	-15,7
I3: Water quality	Sustainability, S	Sustainability, W	3	4,9	3,0
I4: Biodiversity	Sustainability, W	Sustainability, S	9	13,5	17,9
I5: Land	Non-sustainability, S	Non-sustainability, S	-51	-28,3	-17,1
I6: Reducing air pollution	Non-sustainability, W	Non-sustainability, W	-1	12,0	35,9
I7: Reducing water stress	Non-sustainability, W/T	Non-sustainability, W/T	-25	-8,2	2,8
I8: Reducing ecosystem stresses	Non-sustainability, W	Non-sustainability, W	-24	-5,0	-4,1
I9: Reducing waste and consumption pressures	Non-sustainability, S/T	Non-sustainability, S/T	-27	-9,8	2,6
I10: Reducing population growth	Sustainability, S/ T	Sustainability, S/ T	-1	0,2	-2,0
I11: Basic human sustenance	Sustainability, S	Sustainability, S	7	7,0	1,5
I12: Environmental health	Sustainability, S	Sustainability, S	-6	-3,4	0,3
I13: Science and technology	Sustainability, S	Sustainability, W	-12	-5,8	-1,3
I14: Capacity for debate	Sustainability, W	Sustainability, S	3	6,6	10,8
I15: Environmental governance	Sustainability, W/O	Sustainability, W/O	4	9,0	6,1
I16: Responsiveness of private sector	Sustainability, S/O	Sustainability, S/O	6	6,0	0,6
I17: Eco-efficiency	Sustainability, S	Non-sustainability, S	-31	-17,1	-40,5
I18: Participation in international collaborative efforts	Non-sustainability, T	Non-sustainability, T	-33	-15,4	-4,9
I19: Greenhouse gas emissions	Sustainability, O	Non-sustainability, O	-41	-22,4	17,7
I20: Reducing transboundary environmental pressures	Sustainability, O	Sustainability, O	54	44,5	47,1

Finally, the 2001/2002 dynamics can be compared with the measures proposed in the SWOT synthesis to estimate how the environmental policy in 2002 follows the given pattern of environmental development (i.e. recognizable environmental policy pattern according to ESI analysis).

We found a total failure (losing strengths) in 2002 (see Table 7) for indicators for which an unsustainable activity was recognized, but a good current position for Slovenia compared to other European countries. We only found a 25-percent success in indicators, which were recognized as weaknesses on the global and European scale and where Slovenia should react quickly and very decisively. For indicators, where Slovenia was ahead in global and European terms, we calculated that this advantage was mostly being lost (62.5 percent). Slovenia scored an 80-percent success at reducing weaknesses, i.e. at indicators recognized as sustainable, but where Slovenia had a poor current position compared to other European countries. We considered as total failures (loss of opportunities) those indicators where we should have observed the intensification of different signals. Slovenia scored a 50-percent success for indicators now demanding reduced effort for improvement (low probability of opportunity/threat appearing and its small influence). For opportunities and threats that demand decisively taking measures Slovenia scored a 60-percent success and for opportunities that demand preventive improving a 100-percent success.

Table 7: Testing the implementation of recognized environmental sustainability pattern

Comb. SWOT/non(sustainability)	**Recommendation**	**Strengths and weaknesses Indicator**	**Dynamics 2001-02**	
I: A/B/ Non-sustainability	*TO STOP AND TO RECTIFY NON-SUSTAINABLE PROCEDURES, TO CONTINUE AT THE SAME PACE!*	I8: Relatively low soil degradation and degradation of habitats in the region (6/25)	☹ Losing strength	TOTAL FAILURE!
		I9: Effective waste reducing and reducing of consumption pressures (8/25)	☹ Losing strength	
II. C/D/ Non-sustainability	*TO STOP AND TO RECTIFY NON-SUSTAINABLE PROCEDURES, TO CONTINUE ACCELERATED!*	I6: Ineffective reducing of air pollution in populated land area (18/25)	☹ Increasing weakness	25% SUCCESS!
		I7: Ineffective reducing of water stresses (14/25)*	☹ Increasing weakness	
		I8: Ineffective reducing of ecosystem stresses (17/25)	☹ Increasing weakness	
		I15: Ineffective regulation and management (25/25)	☺ Reducing weakness	

III. A/B/ Sustainability	*TO CONTINUE IN THE SAME DIRECTION AND WITH THE SAME PACE!*	I2: High availability of water resources (3/25)	☹ Losing strength	37,5% SUCCESS!
		I10: Effective reducing of population growth (6/25)	☹ Losing strength	
		I 12: Good environmental health (6/25)	☹ Losing strength	
		I18: High level of eco-efficiency (6/25)*	☹ Losing strength	
		I3: Adequate drinking water quality (WEF assessment) (11/25)	☺ Deepening strength	
		I11: Effective satisfying of basic human needs (8/25)	☺ Deepening strength	
		I13: Favorable state of science and technology (12/25)	☹ Losing strength	
		I16: High responsiveness of private sector (ISO 14001) (8/25)*	☺ Deepening strength	
IV. C/D/ Sustainability	*TO CONTINUE IN THE SAME DIRECTION, ACCELERATED!*	I1: Bad air quality in urban areas (WEF assessment) (15/25)	☹ Increasing weakness	80% SUCCESS!
		I4: High proportion of threatened species (mammals) (16/25)	☺ Reducing weakness	
		I14: Inferior role of discussion in society (14/25)	☺ Reducing weakness	
		I19: Ineffective reducing of public choice distortions (14/25)*	☺ Reducing weakness	
		I17: Non-availability of environmental information (20/25)	☺ Reducing weakness	
Comb. Probability/influence	**Recommendations**	**Opportunities and threats Indicator**	**Dynamics 2001-02**	
V. High probability/ Small influence	*TO OBSERVE INTENSIFICATION OF SIGNALS (price, tax, consultation…)!*	I18: Eco-efficiency: Development of technologies for using alternative energy sources (I18/s2-7/25)	☹ Losing opportunity	TOTAL FAILURE!
		I20: Compliance with international agreements (I20/s4 -/19)	☹ Losing opportunity	
VI. Low probability//small influence	*TO PUT LESS EFFORTS INTO IMPROVEMENTS THAN FOR OTHER INDICATORS!*	I21: Global-scale funding/participation (21/25)	☹ Increasing threat	50% SUCCESS!
		I22: Contribution to protecting international commons (7/25)	☺ Increasing opportunity	

VII. High probability/ large influence	*TO TAKE MEASURES DECISIVELY!*	I7: Increasing the burden on water sources in the future	☹ Increasing threat	60% SUCCESS!
		I10 Migrations to regions of protected countryside (I10/s2-7/25)	☹ Increasing threat	
		I16: Private sector responsiveness: pressure of environmental competition on Slovenian (I16/s5 – n.a.)	☺ Increasing opportunity	
		I19: Reducing public choice distortions: harmonization of energy prices (I19/s1 - 8/25) and the abolition of subsidies for energy and material use (I19/s2 - n.a.)	☺ Increasing opportunity	
		I20: Fulfillment of international commitments (I20/s2 – 8/8/25 and I29/s3 – 2/2/25)	☹ Increasing threat	
VIII. Low probability/ large influence	*PREVENTIVE IMPROVEMENTS*	I16: Private sector responsiveness: placing enterprises on international scales of sustainable enterprises (I16/s2,s3 - n.a)	☺ Increasing opportunity	100% SUCCESS!

4 Conclusions with proposals for measures to be taken

From the WEF results we can state that ***Slovenia ranks 24th in the ESI, out of 122 countries.*** In our basic sample (25 countries) Slovenia ranked 15th, due to clear non-sustainability in reducing air pollution, water pollution, waste and consumption pressures, the burden on the ecosystem, regulations and management, international commitments and soil degradation. These indicate ***poor responsiveness in solving the environmental problems.*** Slovenia achieves higher values in reducing population growth, environmental health, basic human sustenance, and science and technology. This is an indication of ***a good state of social and environmental dimensions to development and of stress on science and technology.***

In our sample Finland is in first place, Sweden is second and Austria third. **Finland** is in first place, due to its explicitly sustainable orientation for all environmental fields (except in reducing waste and consumption pressures and in protecting international wealth). At the same time Finland has exceptionally high indicator values for reducing public choice distortions, science and technology, water quality, environmental information, air quality, regulation and management and in fulfillment the international commitments. **Sweden** also has an explicitly sustainable policy for all environmental fields (except again in reducing waste and consumption pressures and in reducing ecosystem stresses). It achieves exceptionally high indicator values in science and technology, international commitments, reducing public choice distortions, air quality and water quality. Otherwise, **Austria** has five unsustainable indicators, i.e. reducing waste and consumption pressures, reducing ecosystem

stresses, reducing air pollution, land degradation and protection of international commons. On the other hand Austria achieves high indicator values in reducing public choice distortions, environmental information, regulation and management, international commons and in reducing population growth.

For all three of the best ranking countries the biggest problem is reducing waste and consumption pressures, which indicates poor consumer behaviour within these societies, which are otherwise explicitly regulated in a sustainable manner, but have still not found the right response to the weaknesses of contemporary consumer society. All three countries have made exceptional achievements in reducing public choice distortions, international commitments, science and technology and in regulation and management. This points to *comprehensive of environmental policy and the extent to which it is built in to the system as well as their emphasis on science and technology.* In the global sample the first three places are held by Finland, Norway and Canada; and similar conclusions can be derived for them.

Slovenia's average environmental policy ranking (16/25) is worse than the average ranking for the baseline state of the environment and population health (11/25), which means that Slovenia is underutilizing its given potential. The same holds true for 2002, when the average ranking for the baseline state of the environment and population health was (11/25) and the average environmental policy ranking (14/25).

1) Slovenia's greatest strength is water quantity, but it has hardly any strengths in the field of science and technology. Most efforts should be put into reducing the weakness of regulation and management. At present the largest opportunity for improvement lies in private sector responsiveness, but more efforts should also be put in to increasing eco-efficiency opportunities.

2) It is worth pointing out that Slovenia's ***non-sustainable operation and poor current position*** compared to other European countries is due to the failure of attempts to reduce air pollution and the burden or stress on water resources and the ecosystem, and due to ineffective regulation and management. Furthermore, Slovenia ***non-sustainable operation and good current position*** compared to other European countries is due to soil degradation, and reducing waste and consumption pressures.

3) In the future we must devote careful attention to ***opportunities and threats*** that arise outside Slovenia, i.e. increased pollution and burdening of water sources, migration to regions of protected countryside, the pressures of environmental competition on Slovenian enterprises, harmonization of energy prices and the abolition of subsidies for energy and material.

An evaluation of dynamics revealed that Slovenia's ESI ranking in 2002 went up by 3.47 percentage points and came within 6.59 percentage points of the best ranked country. Slovenia's rank is worse than most for air quality (-28.46) and soil degradation (-28.3). Slovenia is furthest away from the best indicator value in eco-efficiency, i.e. a gap of 40.51 percentage points. The best improvements in both rankings and values were for reducing crossborder environmental stresses, i.e. the ranking by 44.49 percentage points and the value by 47.14 percentage points. Therefore, the **environmental sustainability in Slovenia is gradually improving**; however viewed structurally the change between the studied years is explicitly unfavorable (see Table 7). Let us confirm this using the ranks achieved: Slovenia ranks 24th in 2001 out of 122 countries, but in 2002 it ranked 23rd out of 142 countries; in our basic sample of 25 countries, Slovenia ranked 15th in 2001 and 9th in 2002. It is a fact, that Slovenia was up six places in the basic sample of 25 industrial developed countries, but only one place in the global sample due to the inclusion of new countries in the global sample (142 countries, previously 122) and due to gaining and improving the data quality in less developed countries. There is no essential change in the EU countries, because the quality and comprehensiveness of their monitoring was already adequate.

It is clear in Slovenia that increasing transparency (wide discussions, public reporting) and democracy (more actors) has led to an increase in the ineffectiveness of public environmental management, because it is harder to integrate all the related sectors. This should just be the case for the short-term and in long-term the opposite should hold true.

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