

Toward objectivity in the strategic environmental assessment by applying the territorial performance index. Case study

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Abstract. The present paper offers an analysis of the potential contributions of territorial performance index to the strategic environmental assessment for plans or programs. Considering the fact that one of the most common criticisms of the strategic environmental assessment is represented by its elevated degree of subjectivity, reflecting the views of those who make the assessment, through this paper, the authors study the potential contributions of the territorial performance in the strategic environmental assessment. In this respect, the planning document chosen for the case study was the Local Development Strategy for Bistrita municipality in 2010-2030. The analysis was based on identifying the compatibility of the measures proposed in the Local Development Strategy for Bistrita municipality in 2010-2030 with the environmental factors. For each of the proposed measures in the local strategy, the compatibility with the environmental factors or relevant environmental objectives was established, according to a valuation scale. The compatibility was assessed for each environmental factor or relevant environmental objective and the results were aggregated to provide the final territorial performance index.

Key Words: strategic environmental assessment, territorial performance index, environmental factor, compatibility.

Introduction. The present paper offers an analysis of the potential contributions of territorial performance index to the strategic environmental assessment for plans or programs. Considering the fact that one of the most common criticisms of the strategic environmental assessment is represented by its elevated degree of subjectivity, reflecting the views of those who make the assessment, through this paper, the authors study the potential contributions of the territorial performance in the strategic environmental assessment. In this respect, the planning document chosen for the case study was the Local Development Strategy for Bistrita municipality in 2010-2030 (www.primariabistrita.ro). The analysis was based on identifying the compatibility of the measures proposed in the Local Development Strategy for Bistrita municipality in 2010-2030 (www.primariabistrita.ro) with the environmental factors. For each of the proposed measures in the local strategy, the compatibility with the environmental factors or relevant environmental objectives was established, according to a valuation scale. The compatibility was assessed for each environmental factor or relevant environmental objective and the results were aggregated to provide the final territorial performance index.

SEA - theoretical and procedural approach. The strategic environmental assessment represents a participative decision making process that provides the opportunity of addressing cumulative impacts, alternatives and mitigations at an early stage in the planning process (Caratti et al 2004). SEA usually focuses on maintaining a desired level of environmental quality, reflected into relevant environmental objectives, rather than identifying mitigation measures for the anticipated impacts.

SEA Directive entered into force in 2001, binding the EU member states to transpose its content by July 2004. In Romania, the content of the Directive was

transposed into the legislation through Government Decision no.1076/2004 regarding the environmental assessment for plans and programs. The main purpose of the procedure resides in ensuring that environmental consequences of certain plans and programs are identified and assessed during the preparation stage and before they are adopted. Participation and consultation rights deserve a special attention in this context (Corpade et al 2012).

The Environmental Report represents the document in which the potentially significant environmental effects resulting from the implementation of the plan, strategy or program in question are identified, described and assessed. According to Annex I of SEA Directive (Directive 2001/42/EC), among other aspects, the following information is to be included in the Environmental Report:

- the environmental objectives relevant to the plan or program;
- the relevant aspects of the current state of the environment (biodiversity, population, soil, water, air, cultural heritage, landscape, etc.);
- the assessment of the likely significant effects on the environmental factors;
- analysis of the alternatives;
- aspects regarding the plan implementation monitoring.

The assessment of the likely significant effects of the respective plan, program or strategy on the environmental factors is often criticized for being highly subjective, reflecting the views of those who make the assessment.

Methodology is probably one of the least developed field in SEA research. The analytical methods for undertaking SEA are drawn from EIA and policy appraisal/ plan evaluation.

With some adaptation, many of these have been used successfully already (Abaza et al 2004). There were several attempts in developing appropriate methods in SEA. One of the most relevant methodological studies was developed by Mayer et al (2004) who provided a typology of different types of policy analysis methods and activities each type being related to fostering a specific value, such as scientific validity, argumentative clarity, democratic character of the process, strategic advice (Wallington et al 2007). Sadler & Verheem (1996) underlined that at the beginning of SEA, there was a tendency to use very elaborate methodology, derived from EIA. Further on, arguments have arisen for relatively simple methods to be used in SEA (Abaza et al 2004). For the impact analysis in SEA, various methods can be used : Vulnerability mapping, Environmental indicators and criteria, Policy impact matrix, Predictive and simulation models, GIS, capacity/habitat analysis, Benefit/cost analysis and other economic valuation techniques, Multi-criteria analysis.

Deakin et al (2007) provides with a wide range of methodological approaches that could be applied in SEA. The one proposed in this book for Mondini & Valle was adapted and applied in the present analysis.

At national level, no methodological approach in SEA has been developed so far.

Methodology. The significant effect can be defined as the effect which by its nature, magnitude, duration or intensity alters a sensitive environmental factor. Another definition of the significant effect is the one provided by Rojanschi: environmental effects determined to be important by applying criteria related to the size, the location and the characteristics of the project or on the characteristics of certain plans and programs, taking into account the expected quality of environmental factors (Rojanschi et al 2004).

The assessment of the cumulative environmental effects determined by the implementation of the studied strategy was based on an evaluation method proposed by Mondini & Valle (2007) which consists of calculating the degree of compatibility of the measured proposed in the strategy and the environmental protection objectives. The compatibility was calculated both individually, for each environmental factor, and cumulative, the result representing the territorial performance index, which will highlight the performance of the proposed measure in relation to the environmental objectives, therefore reflecting the extent to which the environmental considerations have been integrated into the strategy.

The conferring of compatibility values was based on the analysis of the proposed measures against a number of criteria set by the evaluator the aim being to identify whether the proposed measure leads directly or indirectly to the achievement of the environmental objective. The criteria determined by the authors are presented in the table below.

Table 1

Evaluation criteria for the compatibility of the local strategy with the environmental factors

<i>Environmental factor</i>	<i>Evaluation criteria</i>
The implementation of the strategy in relation to the existing territorial and socio-economical context	<p>The opportunity for the elaboration of the strategy;</p> <p>The degree to which the strategy creates the framework for subsidiary plans, projects on other future activities;</p> <p>The relevance of the strategy to the accomplishment of a sustainable development;</p> <p>The relation with other plans and programs.</p>
Air quality	<p>Measures for the optimization of traffic in residential areas with the purpose of reducing the greenhouse gas emissions;</p> <p>Measures to reduce the air pollution by stimulating the use of the green transport and public transportation;</p> <p>The management of green areas and of areas covered by protection belts between industrial areas and residential areas.</p>
Water quality	<p>Means for artificial water storage and their implications on the natural dynamics of water;</p> <p>Measures for the decrease of water consumption;</p> <p>Water distribution system in accordance with the current standards;</p> <p>Collection of waste water that allows the efficient control over the composition of discharged waters.</p>
Soil/Subsoil/Land use	<p>The withdrawal of the lands destined for constructions from the pedological circuit;</p> <p>Soil improvement works;</p> <p>Measures for the efficient management of waste in order to reduce the indirect effects on soil, underground water and landscape.</p>
Biodiversity/ Landscape/ Green areas	<p>Territorial relation and possible implications with protected areas;</p> <p>Potential effect on species and habitats in the semi-natural areas subjected to functional changes;</p> <p>Introduction of new plants for decorative purposes;</p> <p>Management of forest covered areas (cuts, reforestation);</p> <p>Ecosystemic fragmentation/reduction;</p> <p>Measures for the reduction of impact on biodiversity;</p> <p>The degree to which the strategy proposes a functional zoning framed within the general aesthetics of the landscape;</p> <p>Changes on the local landscape;</p> <p>Changes on the land use categories;</p> <p>Measures for the reduction of impact on the landscape.</p>
Management of environmental risk	<p>The degree to which the strategy proposes a functioning zoning to reduce the vulnerability to the occurrence of risk events;</p> <p>Proposals to improve the areas affected by adverse risk.</p>

<i>Environmental factor</i>	<i>Evaluation criteria</i>
Social and economical environment	Configuration of the new road infrastructure in relation with the population needs, travel safety and the protection of the sensitive receptors; Impact of transport on the environmental quality and on the comfort of the local population; Use of the existing resources; Proposals for solving the problems related to urban facilities (water distribution, sewage, waste management, etc.); Proposals for recreation and leisure facilities; Social and economical impacts (real estate development, economy, workforce, quality of life, etc.); Proposals for the protection of elements with cultural and historical value.

Based on the criteria previously mentioned, the following compatibility scores have been granted for each of the proposed measures (Mondini & Valle 2007):

Table 2

Values and significance of the compatibility score

<i>Compatibility score</i>	<i>Significance of the compatibility score</i>
+++	Direct and indirect compatibility between the proposed measures and the strategic environmental objectives
++	Direct compatibility between the proposed measures and the strategic environmental objectives
+	Indirect compatibility between the proposed measures and the strategic environmental objectives
NA	The proposed measure does not affect the achievement of the environmental objectives
■	Incompatibility between the proposed measure and the environmental objectives

The degree of compatibility for the proposed measures with the strategic environmental objectives was calculated according to the following formula (Mondini & Valle 2007):

$$\text{Compatibility system} = \text{compatibility indicators} / n_{\text{indicators}}$$

For each system (in this case for each environmental factor) the given scores were summed and the obtained quantity was compared to the highest obtainable score. The percentage value resulted reflects the degree of compatibility of the proposed measure with the respective environmental factor.

In order to determine the territorial performance index, the values obtained for each environmental factor were aggregated to an average score, according to the following formula (Mondini & Valle 2007):

$$\text{TPI} = \text{compatibility systems} / n_{\text{systems}}$$

Case study. In order to study the potential contributions of the territorial performance index, as part of SEA procedure, the authors chose for a case study the Local Development Strategy for Bistrita municipality in 2010-2030, as it represents a strategic document, materialized into a series of short-term, medium-term or long-term measures for the period 2010-2030.

Bistrita municipality is the capital city of Bistrita-Nasaud County, situated in the North-West Development Region in Romania. The city covers a 145.47 km² area and has a population of 85.154. From the administrative point of view, Bistrita municipality consists of the city of Bistrita and 6 component localities. The average population density in the municipality is 585.4 inhabitants/km², 10 times higher than the density in the County, which indicates a higher degree of population in the city, making it the only important urban establishment on a 100 km radius.

In order to study the compatibility of the proposed measures with the environmental factors, each of the measures was analyzed in relation with the strategic environmental objectives established through the Local Environment Action Plan (2007). The Local Environment Action Plan was elaborated and revised in 2007 by the Environmental Protection Agency in Bistrita-Nasaud County and contains an analysis of the environmental situation in Bistrita-Nasaud County in 2007 and establishes a series of objectives to be achieved in the area on short, medium or long term. The objectives considered by the authors to be relevant in the context of local development strategies are listed in the table below:

Table 3

The degree of compatibility between the proposed measures and the strategic environmental objectives

<i>Coding</i>	<i>Strategic environmental objective</i>
O1	Air quality improvement
O2	Reducing the atmosphere pollution with emissions resulting from industrial sources
O3	Access for the entire population of Bistrita-Nasaud County to water distribution facilities
O4	Limiting the pollution of bodies of water
O5	Greening and reintroduction of degraded areas into the natural circuit
O6	Rehabilitation of affected areas
O7	Reducing the impact of waste on the environment and on human health by implementing an integrated waste management system for domestic waste
O8	Proper management and compliance with the strategic principles applied to the sludge resulting from domestic and industrial wastewater treatment; minimization of the environmental impact generated by the sludge
O9	Conservation of the biodiversity - the natural habitats and the wild flora and fauna species
O10	Improvement of the aesthetic, recreational and ecological functions of the green space areas
O11	Increase in the capacity for sustaining an organized tourism
O12	Reducing the human aggressiveness on the forest covered areas
O13	Reducing the biotic aggressiveness on the forest covered areas
O14	Reconsidering the general aspect of the urban areas and ensuring the proper conditions in the residential areas
O15	Rehabilitation of road infrastructure
O16	Easing the traffic flow in inner cities
O17	Stopping the degradation of green spaces due to improper parking
O18	Reducing the risk of flooding, the protection of the human lives and the goods exposed to this kind of risk
O19	Reducing the risk of landslides

The concrete measures proposed in the Local Strategy for the Development of Bistrita in 2010-2030 were assessed in relation to the previously mentioned objectives, according to the described methodology. The results of the evaluation and presented in the table below.

Table 4

Compatibility score of the proposed measures in relation to the environmental objectives

<i>Proposed measure</i>	<i>O1</i>	<i>O2</i>	<i>O3</i>	<i>O4</i>	<i>O5</i>	<i>O6</i>	<i>O7</i>	<i>O8</i>	<i>O9</i>	<i>O10</i>	<i>O11</i>	<i>O12</i>	<i>O13</i>	<i>O14</i>	<i>O15</i>	<i>O16</i>	<i>O17</i>	<i>O18</i>	<i>O19</i>
Air																			
Application of environmental Community and national legislation in order to increase the quality of the air	+++	+++	NA	NA	NA	NA	NA	NA	NA	NA	NA	+	NA	+	NA	NA	NA	NA	NA
Development of policies to increase the public transportation and placement of electrical infrastructure, as well as the increase of bio-fuel used.	+	+	NA	NA	NA	NA	NA	NA	NA	NA	NA	+	NA	+	NA	++	NA	NA	NA
Thermal rehabilitation of residential buildings	+	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	+++	NA	NA	NA	NA	NA
Stimulating the use of alternative energy resources (solar and wind energy)	+++	+++	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	+	NA	NA	NA	NA	NA
Investments for the modernization and optimization of the public transport	+	+	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	+	+++	++	NA	NA	NA
Replacement of old public transport vehicle with new ecological ones	+++	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	+++	NA	+	NA	NA	NA
Rehabilitation of the main transport routes, bridges, intersections, etc.	+	+	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	+++	+++	+	NA	NA	NA
Investments for the expansion of network for natural gas distribution	+	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	+++	NA	NA	NA	NA	NA
Water																			
Rehabilitation and expansion of the water distribution network and sewage collection	+	+	+++	++	NA	NA	NA	NA	+	NA	+	+	NA	++	NA	NA	NA	+	NA
Application of environmental Community and national legislation in order to increase the quality of water resources	NA	NA	+	+++	NA	NA	NA	+++	+	NA	NA	+	NA	+	NA	NA	NA	+	NA

<i>Proposed measure</i>	<i>O1</i>	<i>O2</i>	<i>O3</i>	<i>O4</i>	<i>O5</i>	<i>O6</i>	<i>O7</i>	<i>O8</i>	<i>O9</i>	<i>O10</i>	<i>O11</i>	<i>O12</i>	<i>O13</i>	<i>O14</i>	<i>O15</i>	<i>O16</i>	<i>O17</i>	<i>O18</i>	<i>O19</i>
Soil, subsoil and land use																			
Application of environmental Community and national legislation in order to increase the quality of soil/ subsoil and to improve the land use	+	NA	NA	NA	++	++	NA	NA	+	+	NA	NA	NA	+	NA	NA	NA	+	+
Defining the new General Urban Plan in order to offer a coherent reference document for the future urban development	+	NA	NA	NA	NA	NA	NA	NA	■	+	++	NA	+	+++	+	+	+	+	+
Measures for the optimization of the functional areas of the city, resulting into a decongestion of the central area and the promotion of a multi-centric expansion	+	NA	NA	NA	NA	NA	NA	■	+	++	+	■	NA	+++	NA	+	+	+	+
Biodiversity, landscape and green areas																			
Ecological forest management	+	NA	NA	NA	+++	+++	NA	NA	+++	NA	NA	++	+	NA	NA	NA	NA	+	+
The implementation of national and European norms regarding the biodiversity	+	NA	NA	NA	+++	+++	NA	NA	+++	+++	++	+++	+++	++	NA	NA	NA	+	+
Consistent orientation towards protection, replanting and landscape modeling of forest covered areas within the municipality	NA	NA	NA	NA	NA	NA	NA	NA	++	+++	NA	+++	+++	NA	NA	NA	NA	NA	NA
The implementation of a comprehensive program, in partnership with the housing administrations of the residential areas for the management of green spaces in the peripheral areas	NA	NA	NA	NA	NA	NA	NA	NA	+	+++	NA	++	++	+++	NA	NA	NA	NA	NA
Investment for the rehabilitation of the municipal park in Bistrita, according to the current architectural and sanitary standards with effects in increasing the comfort of the citizens and the tourism activities	NA	NA	NA	NA	NA	NA	NA	NA	++	+++	++	+++	NA	+++	NA	NA	NA	NA	NA

<i>Proposed measure</i>	<i>O1</i>	<i>O2</i>	<i>O3</i>	<i>O4</i>	<i>O5</i>	<i>O6</i>	<i>O7</i>	<i>O8</i>	<i>O9</i>	<i>O10</i>	<i>O11</i>	<i>O12</i>	<i>O13</i>	<i>O14</i>	<i>O15</i>	<i>O16</i>	<i>O17</i>	<i>O18</i>	<i>O19</i>
Biodiversity, landscape and green areas																			
Rehabilitation and expansion of green spaces and vegetation belts and of street alignments	NA	NA	NA	NA	NA	NA	NA	NA	+	+++	+	+++	NA	+++	NA	NA	NA	NA	NA
Investments in the planning of leisure areas at the highest architectural and safety standards offering leisure and increasing the comfort of the citizens of all ages	NA	NA	NA	NA	NA	NA	NA	NA	+	+++	+	+++	NA	+++	NA	NA	NA	NA	NA
The planning of new green spaces, playground areas, squares and public gardens	NA	NA	NA	NA	NA	NA	NA	NA	NA	+++	+	+++	NA	+++	NA	NA	NA	NA	NA
Replanting of trees in residential areas and boulevards	+	NA	NA	NA	NA	NA	NA	NA	NA	+++	NA	NA	NA	+++	NA	NA	NA	NA	NA
Public and private investments in the reforestation of degraded lands	+	NA	NA	NA	+++	+++	NA	NA	+	+++	+	+++	+++	NA	NA	NA	NA	++	++
Environmental risk management																			
The elaboration of a monitoring plan in order to fight against natural risks	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	+++	+++
The implementation of a monitoring system for noise pollution	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	++	NA	NA	NA	NA	NA
Reducing the environmental impact of waste by implementing the integrated waste management system	+	NA	NA	++	NA	NA	+++	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Application of severe fines for polluters	+	++	NA	++	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Improvement of environmental performance by implementing the environmental management systems	+	+++	NA	+++	NA	NA	NA	NA	NA	NA	+++	++	NA	NA	NA	NA	NA	NA	NA

<i>Proposed measure</i>	<i>O1</i>	<i>O2</i>	<i>O3</i>	<i>O4</i>	<i>O5</i>	<i>O6</i>	<i>O7</i>	<i>O8</i>	<i>O9</i>	<i>O10</i>	<i>O11</i>	<i>O12</i>	<i>O13</i>	<i>O14</i>	<i>O15</i>	<i>O16</i>	<i>O17</i>	<i>O18</i>	<i>O19</i>
Environmental risk management																			
Closure of non-compliant landfills	+	NA	NA	++	NA	+++	NA	NA	NA	NA	++	NA	NA	NA	NA	NA	NA	NA	NA
Rehabilitation of contaminated sites	+	NA	NA	++	NA	+++	NA	NA	NA	NA	++	NA	NA	NA	NA	NA	NA	NA	NA
Remediation of former landfills	+	NA	NA	++	NA	+++	NA	NA	NA	NA	++	NA	NA	NA	NA	NA	NA	NA	NA
Social and economical environment																			
Support for the construction of new facilities for cultural purposes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	+++	NA	NA	NA	NA	NA	NA	NA	NA
Investments for the creation of agro-industrial and ecological infrastructure	NA	++	NA	++	NA	NA	NA	NA	NA	NA	++	NA	NA	NA	NA	NA	NA	NA	NA
Education campaigns for the citizens in relation to waste management	NA	NA	NA	++	NA	NA	++	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rehabilitation of the historical buildings	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	+++	NA	NA	NA	NA	NA
Identification of areas with touristic potential	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	+++	NA	NA	NA	NA	NA	NA	NA	NA

+++ - Direct and indirect compatibility between the proposed measures and the strategic environmental objectives, ++ - Direct compatibility between the proposed measures and the strategic environmental objectives, + - Indirect compatibility between the proposed measures and the strategic environmental objectives, NA - The proposed measure does not affect the achievement of the environmental objectives, ■ - Incompatibility between the proposed measure and the environmental objectives.

The following table contains the values resulted by applying the described method in order to evaluate the compatibility with the relevant environmental objectives.

Table 5

Values of compatibility between the strategy and the environmental factors

<i>Environmental factor</i>	<i>Compatibility with the relevant environmental objectives</i>
Air	60.9%
Water	50%
Soil/ Subsoil/ Land use	38.9%
Biodiversity/ Landscape/ Green areas	75.6%
Management of environmental risks	70.5%
Social and economical environment	79.1%

According to Mondini & Valle (2007) the obtained compatibility values should be interpreted as follows:

Table 6

The interpretation of the compatibility values (Mondini & Valle 2007)

<i>Percentage</i>	<i>Level of compatibility</i>
0 – 25%	Not sufficient compatibility
25 – 50%	Low compatibility
50 – 75%	Good compatibility
75 – 100%	Very good compatibility

The value of the territorial performance index of the local strategy, calculated according to the previously mentioned method is 62.5.

By analyzing the results of the evaluation, the following conclusions may be stated:

- for none of the analyzed environmental factors not sufficient compatibility was registered, respectively values between 0 and 25 %;
- the lowest compatibility was registered for the environmental factor soil, subsoil and land use (38.9%), due to the fact that the local strategy implies a series of measures resulting in the expansion of the built-up area with a direct impact on the soil and land use. The authors mention, however, that this reduced value of compatibility does not necessarily reflect a profound negative impact on the environmental factor, but rather a significant change in the use of the terrain as a resource;
- the highest compatibility was calculated for the social and economical factor (79.1%), a testimony to the purpose itself of the strategy, the one to create the premises for the sustainable development of the community for the period 2010-2030;
- another elevated compatibility was obtained for the factor representing the management of the environmental risks (70.5%), with a special focus on measures like the rehabilitation of contaminated sites, the closure and

remediation of landfills conceived in order to mitigate the existing environmental issues.

- with regards to the environmental factor air, in the case of which a 60.9% compatibility score was obtained, the situation is a rather special one. As most of the measures with impact on the quality of air are related to the improvement, rehabilitation and optimization of transport facilities and infrastructure, the implementation and the result of these measures affect in different way the environmental factor. For instance, the rehabilitation of the infrastructure may affect in a positive way the quality of air by creating a better roadway, contributing to the decrease of fine particle emissions that usually occur on poorly designed roads. On the other hand, the same rehabilitation may determine a higher traffic, hence a higher level of emissions of greenhouse gases, resulting from the fuel consumption. In these situations the positive effect was considered to be more important than the potential negative one.
- the value of the territorial performance index (62.5) could be considered a good one, reflecting the fact that, in general, the measures proposed through the Local Development Strategy for Bistrita in 2010-2030 will in fact contribute to the achievement of the desired environmental objectives.

Conclusions. In relation to the elaborated study, the authors note that as part of SEA procedure, the territorial performance index may offer significant benefits in the assessment of strategic measures against the environmental objectives. The applied methodology offers the possibility to put together both the strategic development measures and the environmental factors in order to evaluate their compatibilities and to be able to identify the necessity for adjustments and mitigation solutions.

There are several shortcomings, as not single is the case that one measure may affect both positively and negatively the environmental factors, however, the use of the territorial performance index as instrument within SEA procedure may provide a higher level of objectivity in the assessment of impact.

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Received: 12 February 2015. Accepted: 30 March 2015. Published online: 24 April 2015.

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How to cite this article:

Ionescu-Tămaş C., Corpade A.-M., Petrea D., 2015 Toward objectivity in the strategic environmental assessment by applying the territorial performance index. Case study. AES Bioflux 7(2):240-251.