

# We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

**6,900**

Open access books available

**186,000**

International authors and editors

**200M**

Downloads

**154**

Countries delivered to

**TOP 1%**

most cited scientists

**12.2%**

Contributors from top 500 universities



**WEB OF SCIENCE™**

Selection of our books indexed in the Book Citation Index  
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?  
Contact [book.department@intechopen.com](mailto:book.department@intechopen.com)

Numbers displayed above are based on latest data collected.

For more information visit [www.intechopen.com](http://www.intechopen.com)



# Implementation of Strategic Environmental Assessment in Serbia with Special Reference to the Regional Plan of Waste Management

Boško Josimović PhD and Tijana Crnčević PhD  
*Institute of Architecture and Urban & Spatial Planning of Serbia  
Serbia*

## 1. Introduction

In Serbia, Strategic Environmental Assessment was introduced in 2004 under the Law on Strategic Environmental Assessment ("Official Gazette of the Republic of Serbia 135/04). Previous experience in the application of this instrument is not recorded as well as the appropriate theoretical background so the introduction of SEA in Serbia was without adequate practical and scientific support. Although the Law on SEA is in line with the basic methodological and procedural framework of the Directive 2001/42/EC of the European Parliament and the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (SEA Directive), that was recognized as the only potential taking into account the implementation while as the difficulties were distinguish non-harmonized legal requirements, time period for adjustment, lack of the necessary guidelines and the expertise (Crnčević, 2005). Therefore, it was expressed concern about the possibility of improvisation in the implementation of the provisions of the Law and thus affecting the quality of SEA (Stojanović, Spasić, 2006).

Some of the first experiences in the implementation of this instrument in practice indicate that the decisions for SEA were usually made automatically and the whole procedure takes a long time (Josimović, Crnčević, 2006). However, even after several years of noticeable results in the practice still the main problem is non-existing of an adequate system of indicators while available Guidelines for SEA from 2007 do not cover all phases of SEA and do not have the connection to the current Law on planning and building (Stojanović, Mitrović, 2007). In addition, what should be pointed that so far has not been done anything significant in terms of strengthening the process where only some results have been achieved in terms of the quality of the SEA Report, what proves that there are tendencies towards the establishment of SEA as an administrative instrument, without important influence to the planning process (Crnčević, 2009).

The results from practice are of the great importance as they steer the development of this instrument towards innovation within methodological and procedural frameworks. Presented overview of practice - the SEA for the Waste Management Regional Plan for 11 Municipalities in Kolubara region represent the continuation of the research results presented in the paper: *Impact evaluation within Strategic Environmental Assessment: The Case Study of the Waste Management Regional Plan for Kolubara region in Serbia* (Josimović, Crnčević, 2009).

Source: Environmental Management, Book edited by: Santosh Kumar Sarkar,  
ISBN 978-953-307-133-6, pp. 258, September 2010, Sciendo, Croatia, downloaded from SCIYO.COM

## 2. Implementation of SEA in Serbia

Within the Law on SEA in 2004 for the first time in Serbia, began implementation one of the most important instrument for the realization of the goals of sustainable development and environmental protection. The Law on SEA defines the procedure (stages in the process of SEA) contents and partly methodological framework.

As for the procedural framework, within the Law on SEA are set out the following phases in the SEA process:

1. Preparatory phase:
  - Deciding on the SEA,
  - Selection of the holder for making the report on SEA,
  - Participation of interested parties - agencies and organizations.
  - Procedures for preparing the SEA report.
2. Decision-making:
  - Participation of interested parties - agencies and organizations,
  - Public participation,
  - Report on the results of the participation of interested parties - agencies and organizations and the public,
  - Assessment of the SEA report,
  - Approval for SEA report.

For each of these phases it is defined who are the participants in the decision making process while the selection of the holder for SEA report is done for each SEA individually. This part of the Law on SEA is clear. That can be said also for the part of the Law related to the content of the SEA the content is divided into nine units:

1. starting points for SEA,
2. general and specific objectives of the SEA and selection of indicators,
3. assessment of potential impacts with the description of measures planned to reduce negative impacts on the environment,
4. guidelines for the SEAs for the lower hierarchy levels and environmental assessment,
5. program of environmental monitoring during the implementation of plans and programs (monitoring),
6. overview of the methodology used as well the difficulties in making SEA,
7. review of the ways of decision making, description of key reasons for the selection of the subject plan and programme of considering variant and presentation of the way how environmental issues are included in the plan or program,
8. conclusions to which were come during the preparation of SEA presented in a way that is understandable to the public,
9. other information relevant to the SEA.

SEA development in Serbia is based on the EU and worldwide experiences and so far little was done to develop the given methodological framework of the Law on SEA. One of the results in this regard so far achieved in Serbia is the result of the project' Methods for SEA in planning spatial development of the lignite basins". The project was done at the Institute of Architecture and Urban Planning of Serbia (IAUS) in Belgrade and funded by the Ministry of Science and Environmental Protection Republic of Serbia in the period from 2005 to 2007. The result of this project is the defined impact assessment methodology that is based on qualitative multicriteria expert evaluation of plan and programme solutions regard to the

environmental quality in the area of the plan, the immediate and wider environment as a basis for evaluation of the area for further sustainable development (Fig. 1).

In the previous practice of SEA in planning, two approaches were dominant:

1. Technical: represent an extension of the environmental impact methodology for the EIA projects to the plans and programs where it is not a problem to apply EIA principles, and
2. Planning: represent a significantly different methodology for the following reasons:
  - plans are more complex than projects, they focus on strategic issues, and carry less detailed information on the environment,
  - plans are based on the concept of sustainable development, and apart from the ecological aspect, they largely focus on social and economic aspects,
  - due to the complexity of structures and processes, and their cumulative effects, planning does not allow sophisticated simulative mathematical methods,
  - decision-making processes involve a greater influence of the interested parties, especially of the public, and therefore the applied methods and assessment results must be comprehensible to the participants in the assessment study.

For the above-stated reasons, in the practice of the SEA, the most frequent expert methods are: control lists and questionnaires, matrixes, multi-criterion analyses, spatial analyses, SWOT analyses, Delphi method, evaluation of ecological capacity, analyses of cause and effect, vulnerability assessment, risk assessment, etc. Matrixes, as resultants of any of the methods, are used to analyze the changes that may be caused by the implementation of plan and chosen options (including the option not to implement the plan). Matrixes are formed by establishing the connections between plan targets, plan solutions and goals of strategic assessment with appropriate indicators.

The methodological approach shown in Fig. 1 is based on planning approach and expert evaluation and as well formation of matrix used to examine and to show changes in the environment. The aforementioned methodological approach has proved its worth by using in practice in the design of some 30 SEA reports for all types of spatial and urban plans that exist in the legislation of the Republic of Serbia. However, in practice, it was showed that matrix display of appearances and changes are often not understandable to the public that is interested to get involved in the process of SEA. This was especially confirmed in the stages of public participation, where participants who are not experts in this field are not able to understand the results that have been screened using the grid. Also, special attention is paid to the selection of relevant indicators and as well the criteria for evaluation of planning solutions, the method for evaluation and the way for presentation of the evaluated of planning solutions in a way that are comprehensible to the public. The research results were used in the SEA process for the first sector SEA for the Regional Waste Management for Kolubarski Region.

### **3. Implementation of SEA for the Regional Waste Management Plan for Kolubara region**

SEA Directive provides that the SEA has to be done for plans and programs in different subject areas, including waste management. This is stated within the propositions of the Law on SEA of the Republic of Serbia. By applying the SEA in the planning of waste management is now possible to consider the consequences of proposed solutions and

planned changes in the region, respecting the environment including defining appropriate measures for protection and monitoring of potentially vulnerable elements of the environment, involving the public in all phases of SEA process, including adoption. In this context, it is evident that SEA contributes to the decision-making process in planning of waste management.

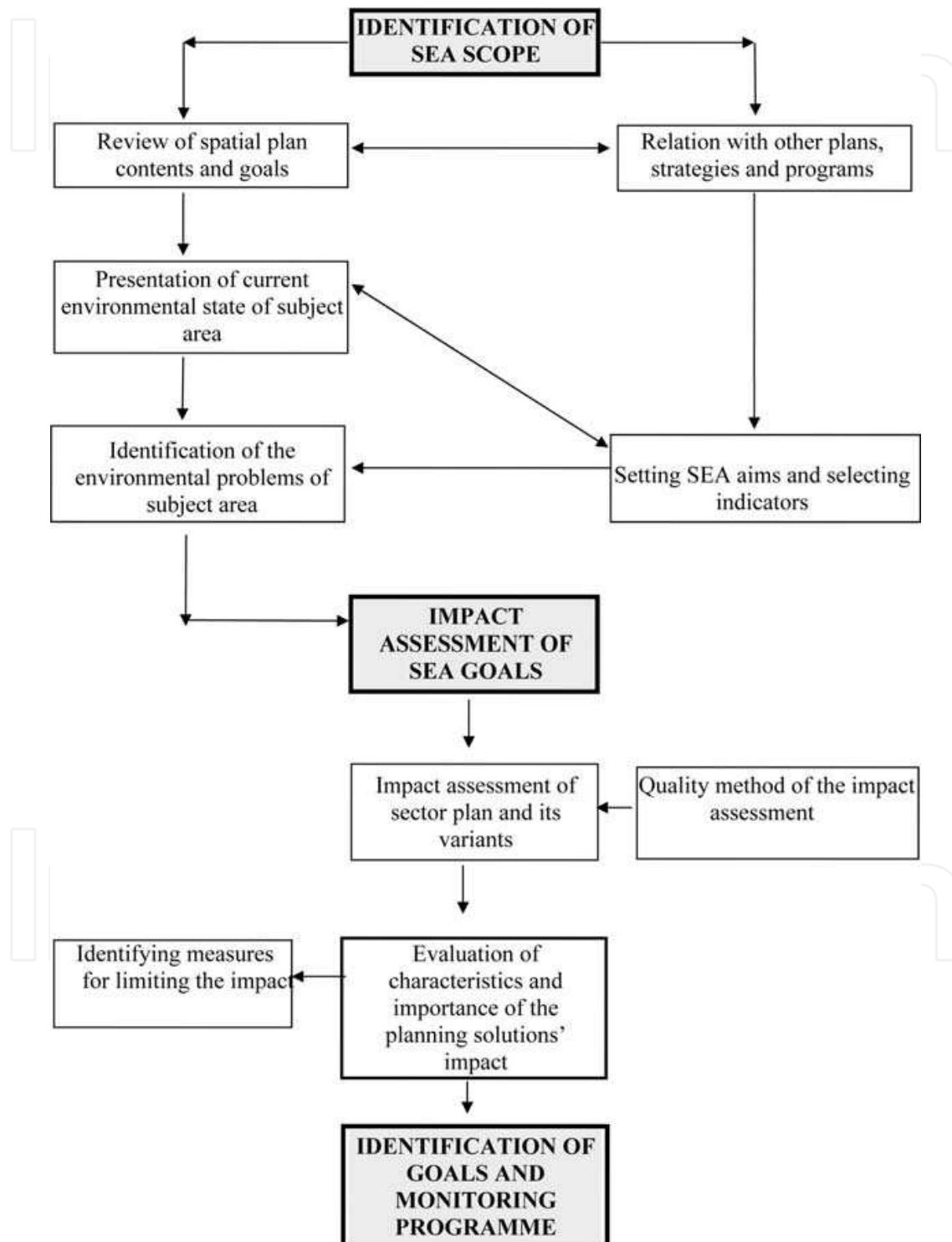


Fig. 1. Procedure and methodology of SEA reports (Stojanović, 2006)

Regional waste management plan for the Kolubara region was first of this kind at the territory of the Republic of Serbia. It was the result of a wide range of activities that have been launched to address issues of treatment of waste and the establishment of a regional waste management concept. The plan covers 11 municipalities with over 380,000 inhabitants (Table 1).

Municipality	Surface (in km <sup>2</sup> )	Population (Census 2002)	Density (inh./km <sup>2</sup> )	Change of the no. inh. in the period '91-'02 (in %)	The number of villages	Number of households	Average household size
Valjevo	905	96761	107	0,2	73	33081	2,9
Ub	456	32104	70	-3,4	38	10056	3,2
Lajkovac	186	17062	92	-2	19	5605	3,0
Ljig	279	14629	52,5	-6,2	27	4757	3,1
Mionica	329	16513	50	-3	36	5091	3,2
Osečina	319	15135	47	-8,1	20	4696	3,2
Vladimirci	338	20373	60	-6,6	29	6687	3,0
Koceljeva	257	15636	61	-5,3	17	4900	3,2
Barajevo	213	26641	125	15,2	13	8646	3,1
Lazarevac	384	58511	152	1	33	18802	3,1
Obrenovac	410	70975	173	4,4	29	22836	3,1
$\Sigma$	<b>4076</b>	<b>384340</b>	<b>94,3</b>	/	<b>334</b>	<b>125157</b>	<b>3,1</b>

Table 1. Main data of the Kolubara Region

After obtaining the decision to work on Regional plan and on SEA for the plan from the competent institutions, started the process. Taking into account that the procedural part of the decision making for SEA was conducted in accordance with the legislation, in the continuation of the paper the emphasis was put on the presentation of the methodological approach that was used for the evaluation of planning decisions.

### 3.1 Methodological approach in SEA

Methodological approach in SEA for the Regional waste management plan is based on:

- analysis of the environment<sup>1</sup>,
- selection of the most important planning decision in respect to the environment,
- defining the aims of the SEA and selection of indicators and criteria,
- assessment of the potential impacts of planning solutions in relation to defined aims and indicators,

<sup>1</sup>In the analysis of the state of the environment, but also in the process of determining of the strategic guidelines presented in the form of specific planning solutions major role is having application of GIS (Geographic Information System). GIS is used to analyze the state and visualization of the space by which in a fast and easy way perceive and shows the appearances of the area. The application of GIS in the subject plan by implementing the system of elimination the negative areas was defined the most important planning solutions - Regional Centre for Waste Management (Josimović, Krunić, 2008).

- defining the measures for protection and monitoring,
- conclusions and recommendations of the SEA.

Each of these steps are particularly important. In relation to the current state of the environment the aims are defined, and in relation to them indicators used when assessing the impacts of planning solutions on the environment and the elements of sustainable development. For the assessment of the impacts could be used qualitative or quantitative methods depending on the specific situation and the possibility of using one or another method. After impact assessment, the necessary protective measures are defined that need to be implemented during the implementation of the strategy for waste management so that possible harmful effects of the plan will be reduced to the limits of acceptability that will not burden the storage capacity and threaten the health of the inhabitants.

A special contribution in decision making at all levels of SEA for the waste management plan, but also for all other plans is the participation of qualified (professional) public. Under a qualified public is consider participation of interested institutions and organizations, non-governmental organizations (NGOs), local communities and professional individuals who can contribute in making key decisions within the selection of specific alternative scenarios in the plan. This does not exclude the participation of the population within the plan area which might be affected and which are not particularly qualified for this issue. Therefore, the implementation of SEA in Serbia is a good starting point for enhancement of public participation in planning where the „Plan for public participation“ could be the way of operationalizing and moving the public towards more active participation (Crnčević, 2007).

When the SEA process is conducted after the main methodological steps and when are consider all alternatives and variant solutions, usually it is possible<sup>2</sup> to choose the best solution and incorporate it in the plan (strategy) of waste management in order to protect the basic elements of the environment and the realization of the goals for sustainable development of the area.

The most important steps in this methodological approach are shown below as (Josimović, Crnčević, 2006):

- defining goals of SEA and selection of indicators,
- assessment of the impacts of the planning solutions to the environment,
- definition of mitigation measures,
- definition of indicators for monitoring the state of the environment (monitoring).

### 3.1.1 Defining SEA aims and indicators

Defining SEA aims is conditioned by the grade of the current state of the environment, a preliminary assessment of possible impacts of planning decisions on the environment, the aims defined in the framework of other programs and strategies relevant to the issue of waste management and environmental protection. Aims are set in relation to environmental receptors, and for each is determined the appropriate indicator that is used to evaluate planning solutions. Selection of SEA aims and targets and the relevant indicators is shown in Table 2.

<sup>2</sup>The implementation of SEA process does not necessarily give the best solution. That was the case within SEA for Waste Management Plan in Salzburg. In this case SEA process was focused on the identification "for" and "against" alternatives without finding the best solution. After analyzing a large number of separate results of SEA, it was not possible to determine which inputs (political) will have some of planning solutions. In this case, final decisions are made at the political level where often are decisive conclusions which were adopted after a process of public participation.

The receptors of the environment	SEA aims	SEA targets	Indicators
Water (surface and underground)	Reducing the pollution of underground waters to the level that the negative impacts do not exist.	<ul style="list-style-type: none"> <li>- Realising of harmful substances from the activities of operating with waste in water has to be in accordance with limited value of the emission (LVE).</li> <li>- Provide that the quality of water downstream from the installation not became worse.</li> </ul>	<ul style="list-style-type: none"> <li>- The number of installations which are crossing LVE in water.</li> <li>- Biological consumption of oxygen (BCO) and chemical consumption of oxygen (CCO) upstream and downstream from the installation for waste management.</li> </ul>
Air and climatic changes	Limit the emission of harmful substances in the air to the level that negative impacts to the quality do not exist.	<ul style="list-style-type: none"> <li>- Realising the harmful substances in the air from the activities of operating with waste has to be in the accordance with LVE.</li> <li>- Increase the scope of collected communal waste</li> <li>- Reduce non controlled burning/disposal of waste.</li> <li>- Maximise potentials for getting energy from the installations for waste management.</li> </ul>	<ul style="list-style-type: none"> <li>- The number of days when is violated LVE of dust, NO<sub>x</sub>, SO<sub>2</sub>.</li> <li>- The number of trash dumps which are the source of air pollution.</li> <li>- The percent of inhabitants covering the system of waste collection.</li> <li>- The estimate amount of not collected waste.</li> </ul>
	Reduce the impacts of gases which are influencing the greenhouse effect.	<ul style="list-style-type: none"> <li>- Reduce the emissions of CH<sub>4</sub> and CO<sub>2</sub> from installations for waste management.</li> <li>- Fulfil national aims for waste management including the using of gas from the landfill.</li> </ul>	<ul style="list-style-type: none"> <li>- The amount of the waste which is recycling, laying down to the landfill or is in the other way treated.</li> <li>- The estimate year emission of gases from the landfill (CO<sub>2</sub>, CH<sub>4</sub>).</li> </ul>
Land	Limit the use of cultivable agricultural land.	<ul style="list-style-type: none"> <li>- The surface and quality of the land which is using for the activities for waste management (per tone of waste) has to be in the accordance with best practice.</li> </ul>	<ul style="list-style-type: none"> <li>- The surface of land taken with the activities of handling with waste.</li> </ul>
	Reduce land pollution.	<ul style="list-style-type: none"> <li>- New installations build to the non sensitive locations.</li> <li>- Minimize the land surface polluted as a result of the activities with waste.</li> <li>- Carry out the rehabilitation of the trash dumps and recultivation of the land.</li> </ul>	<ul style="list-style-type: none"> <li>- Location of new installations and relation of surfaces of existing and planned surfaces under the landfills.</li> <li>- The surface of land polluted because of the activities handling with waste.</li> <li>- The surface of land which is restored.</li> </ul>
Biodiversity	Reduce negative impact to the biodiversity.	<ul style="list-style-type: none"> <li>- Provide measures of compensation for every damage done to the habitat.</li> <li>- New installations built to the non sensitive locations.</li> </ul>	<ul style="list-style-type: none"> <li>- The closeness of new installations for waste management to the sensitive areas.</li> <li>- The percentage of habitats damaged because of the activities of handling with waste.</li> </ul>

The receptors of the environment	SEA aims	SEA targets	Indicators
<b>Landscape population and human health</b>	Protect the landscape and natural properties.	<ul style="list-style-type: none"> <li>- Protect the landscape - carefully choice the location for new installation for waste management.</li> <li>- Maximise rehabilitation of closed trash dumps for landscape protection</li> <li>- Minimise non adequate handling with waste.</li> </ul>	<ul style="list-style-type: none"> <li>- The number of place endanger with installation for waste management.</li> <li>- The surface which is rebuild.</li> <li>- The number of the inspection records of wild dumps and non adequate handling with waste.</li> </ul>
	Protection of human health.	<ul style="list-style-type: none"> <li>- Minimise risks and impacts from accident emissions resulting from the activities handling with waste.</li> <li>- Minimize the level of environmental problems resulting from the activities of waste management.</li> <li>- Establish criteria for landscape protection for choosing the location for installation of waste disposal.</li> </ul>	<ul style="list-style-type: none"> <li>- The number of the inhabitants which became ill from the consequences of non adequate waste disposal.</li> <li>- The number of complaints of citizens because of the environmental problems resulting from the activities handling with waste.</li> <li>- The closeness of the installations for waste management to the inhabitant places.</li> </ul>
	To induce economic development and employment brought in the region.	<ul style="list-style-type: none"> <li>- Inducing opening of new working places within the process waste management.</li> </ul>	<ul style="list-style-type: none"> <li>- The number of new working places.</li> <li>- Profit from the realization of the project.</li> </ul>
<b>Traffic</b>	Minimizing the impacts to the environment from the waste transport.	<ul style="list-style-type: none"> <li>- Reduce the scope of traffic from waste transport.</li> <li>- Include the principle of cleanliness as much as possible for the activities for waste management</li> <li>- Minimize making of waste as a result of reducing the waste transport.</li> </ul>	<ul style="list-style-type: none"> <li>- The number of the crossed km because of the waste transport.</li> <li>- The nearness of the installations for waste management to the inhabitant places.</li> </ul>

Table 2. Receptors, aims, targets and indicators (Josimović, 2010)

In Table 2. are presented the goals and indicators for SEA of Regional Waste Management Plan for 11 municipalities of Kolubara region. Selection of SEA aims and indicators is based on the United Nations (UN) basic set of indicators of sustainable development and defined in relation to the current state of the environment and the basic concept of the plan and planning solutions. In this context, special attention is devoted to analysis and evaluation of basic planning solution in the system of waste management and that is certainly the formation of a regional centre for waste management in which is planned regional landfill with additional objects that are in function to the landfill (waste separation facility, baling, processing waste). In addition to the locating of regional centre for the management of

waste in the SEA are analyzed and evaluated other planning solutions for which area also defined appropriate aims and indicators. These planning solutions are: transfer stations, recycling centres and other facilities for waste treatment, transport costs, the extension includes waste collection, the establishment of companies in whose responsibilities will be activities related to the management system and creating conditions for employment and others.

In relation to defined SEA aims and indicators it was carried out evaluation of the selected planning solutions.

### 3.2 Assessing the impact of planning decisions on the environment

In order to perform the evaluation of the plan in relation to the elements of sustainable development, it is necessary to make the selection of relevant planning solutions that will be evaluated and as well define the evaluation criteria.

Bearing in mind the characteristics of the planned uses, for the need of the evaluation of the Plan are separated planned solutions shown in Table 3.

Mark	Planned solution
Establishing a system of integrated and sustainable waste management	
1.	Waste transport
2.	Construction of transfer stations
3.	Building a recycling yard
4.	Closing and rehabilitation of existing municipal landfills - dumps
Regional Centre for Waste Management	
5.	Regional landfill
6.	Facility for recycling (waste separation)
7.	Composting facility for green waste
8.	Plant for mechanical biological waste treatment
9.	Plant for recycling construction waste

Table 3. Plan solutions included in the evaluation process

Planning solutions that are selected for evaluation are divided into two main groups (Table 3): system planning solutions and planning solutions which are related to the establishment of a regional centre for waste management. Selected planning solutions assume the physical elements of the future of waste management system, or specific facilities to be built in the area of plan coverage. In that context their potential impact on environmental quality may be most evident. Other planned solutions are related primarily to strategic management policies that do not have a significant impact on the quality of the environment.

In order to adequately evaluate the planning solutions in relation to defined SEA aims and indicators, it is necessary to establish adequate criteria for evaluation. In practice with different methods of evaluation and assessment and analytical procedures, it was proven that multicriteria analysis and evaluation gives better results compared to the evaluation with only one criterion. This is logical because with multi-criteria analysis and evaluation are obtained multidimensional results whose synthesis gives more relevant testimony. In this context, in the process of evaluating the selected planning solution it is used multicriteria evaluation criteria defined in Table 4.

Kind of the impact	Spatial dimension of the impact	Probability of the impact	Frequency of impact
<b><u>Very favourable (+3)</u></b>			
<b><u>Favourable (+2)</u></b>			
Positive (+1) Neutral (0) Negative (-1)	<b><u>Regional (R)</u></b> <b><u>Municipal (M)</u></b> Local (L)	Quite sure (Q) Likely (Lk) Possible (Ps) Unlikely (U)	Temporary (T) Long-term (Lt)
<b><u>Unfavourable (-2)</u></b>			
<b><u>Very negative (-3)</u></b>			

Table 4. The criteria for evaluation of impact significance

The importance of the impact of planning solutions is assessed in relation to the size (intensity) and spatial scale where the impact can be achieved. Impacts or effects of planning solutions, by the size of the change are evaluated with numbers from -3 to +3, where the minus sign refers to negative, and a plus sign for positive change. Spatial scale may be regional (R), Municipal (M) or local (L) character. The probability that an estimated impact will happen in reality is also an important criterion for making decisions in the course of the plan making, and in that context impacts can be quite sure (Q), likely (Lk), possible (Ps) or unlikely (U). This system of evaluation is applied both to the individual indicators of impact and, as well to the related categories of the combined indicators. In addition, additional criteria can be derived according to the duration of the impact or consequences. In this sense can be defined as temporary (T) and long-term (Lt) effects.

Based on the criteria of the assessment of the size and spatial scale of the influence of planning solutions at the SEA aims it was carried out a qualitative expert evaluation of the importance of the impacts for achieving these goals. The impacts of strategic importance for the subject plan are those which have a strong or greater (positive or negative) effect on the whole area of the plan or at the municipal level (e.g. in the range of -2, -3, +2, +3, and R or M).

For each of the selected solution is considered approach of evaluation in relation to defined aims, indicators and criteria. Evaluation is done in two phases:

- Creating a chart - where for each planned solution are show trends in relation to the key criteria which classify significant strategic impact and those who do not have strategic importance and
- Forming synthesis table - which determines and rank the strategic impact on the basis of criteria defined in Table 4.

Chart (Figure 2) is formed for each of the nine selected planning solutions. It shows kind of impact (x-axis) and spatial extent of influence (shown in different colours depending on whether the impact is of regional, municipal or local level. Characteristics of impact are defined in relation to the twenty-four defined SEA aims and indicators shown in Table 2. The aims are on the chart shown on the y-axis.

In previous research conducted by the authors, were used instead of a chart a table (matrix) to show the possible impacts of planning solutions. However, practice showed that matrix display is not completely clear to the experts and especially to the public. By formatting the graphs this problem is overcome because at first glance it could be seen the intensity of positive and negative impacts of each plan solutions and as well spatial scale of influence in

relation to each of the defined aims. In fact, all the positive effects are on the right, and negative on the left y-axis, and colour space determines the scale of these impacts. After an evaluation of the impacts of planning solutions presented by charts, starts the identification and evaluation of the impacts of significant strategic planning solutions by synthesizes of the key impacts of the plan to the defined SEA aims and criteria from Table 4. For every planning solution which is designated as of significant strategic importance are presented the rank of impact in relation to the SEA aims and four sets of criteria for evaluation (Table 5).

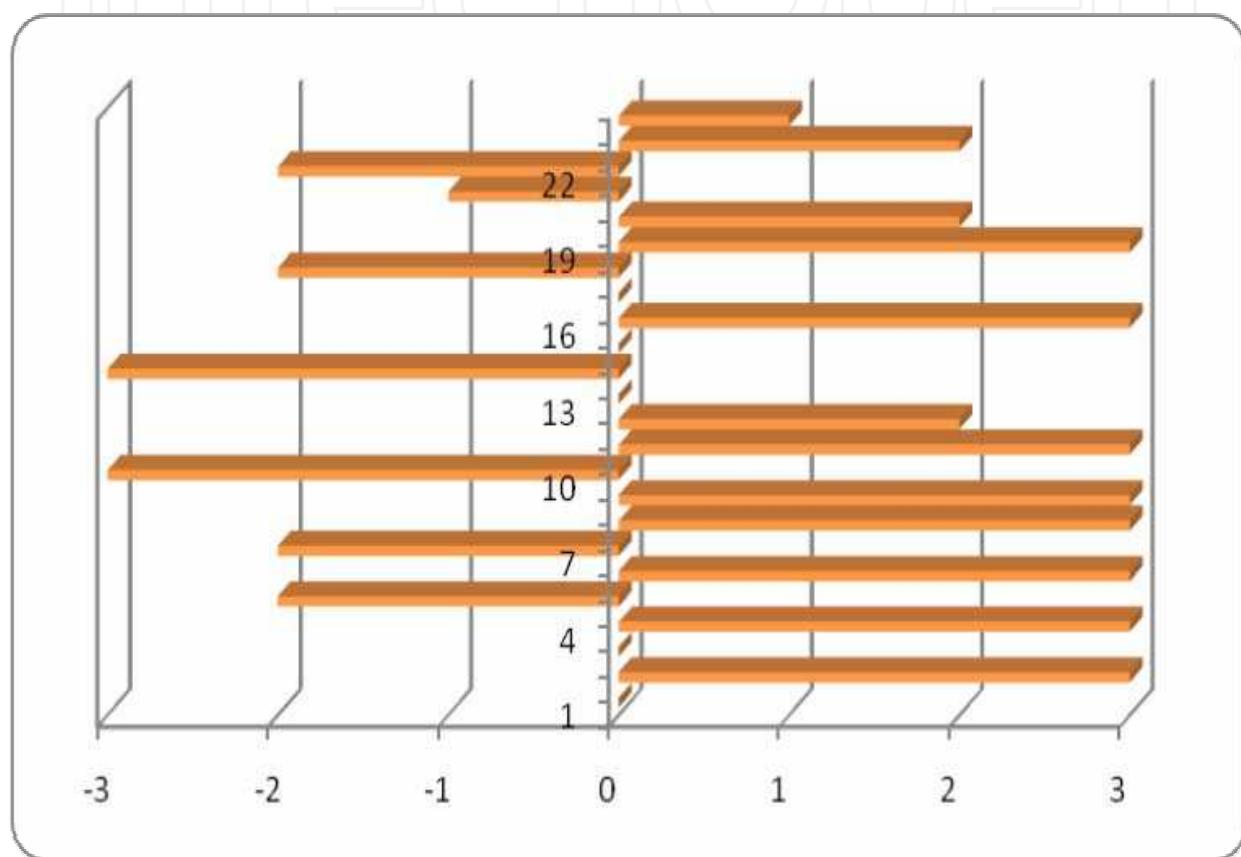


Fig. 2. Chart formed for each of the nine selected planning solutions.

Based on the identification and evaluation of the impacts of significant strategic planning solutions the conclusion is brought on what impacts the implementation of the plan initiates in the planning area and in relation to environmental and socio economic issues. In this context, it is now possible to define appropriate measures for protection and monitoring which allows the effects to be reduced in scope that does not burden the storage capacity.

After identification of significant strategic impacts it is possible to define the cumulative and synergetic effects. Significant effects can occur as a result of interactions between a number of smaller impacts of existing facilities and activities, and various planned activities in the area of the plan. Cumulative effects arise when particular planning solutions have significant impacts, while some single effects together may have a significant effect. Synergetic effects are created in the interaction of individual impacts that produce the overall effect that is greater than the simple sum of individual impacts.

PLAN SOLUTION	IMPACT		EXPLANATION
	SEA aim	Rank	
WASTE TRANSPORT	4	M/+3/Q/Lt	Expansion of the collection of waste will have multiple positive long-term effects on the environment. Possible occasional negative impacts could be of the distance transport.
	8	R/+3/Q/Lt	
	22	R/-2/Ps/Lt	
:	:	:	:
REGIONAL LANDFILL	4	R/+3/Lk/Lt	The regional landfill is among the most significant planned facilities. Its construction will have major positive effects on the environment since it will replace a large number of existing city dumps. Bearing in mind that it will be built in the degraded area and according to the EU Landfill Directive 99/31 its importance for environmental protection of the wider area is very considerable. The occasional negative effects can be expected from the distance transport of municipal waste to the regional landfill with regard that this type of transport has not been implemented yet. Looking at the broader context, the positive effects of the construction of regional landfills are much larger than these occasional adverse effects. Contribution is reflected in job creation. Landfill will be located in a regional centre for waste management.
	5	R/+3/Q/Lt	
	6	O/+3/Q/Lt	
	8	R/+3/Q/Lt	
	11	R/+3/Q/Lt	
	12	R/+2/Q/Lt	
	14	R/+3/Q/Lt	
	16	R/+3/Q/Lt	
	18	R/+2/Q/Lt	
	20	O/+2/Q/Lt	
	22	R/-2/Lk/T	
	23	R/+2/Q/Lt	
:	:	:	:
n	:	:	:

Table 5. Identification of strategic impacts of plan solutions to the environment and elements of sustainable development

Part of the system of waste management	Plan solutions	Consideration of the impact
Collection and waste transport	Transfer station	benefit for the environment, potential negative impacts on the environment, measures to mitigate negative impacts.
	Transport	
Recycling of waste	Recycling plant	
Composting of Waste	Plant for composting	
Mechanical-biological waste treatment	Plant for mechanical biological waste treatment	
Waste disposal	Regional Landfill	
	Closing the landfill	

Table 6. Consideration of the impacts of Plan solutions and the definition of protection measures

Possible effects of all planning solutions are considered including three main aspects: benefits and possible negative effects on the environment, defining measures for mitigation of the negative impacts that may arise as a result of planning solutions. The approach which was used is specific because it is showing as well concrete benefits to the environment of

each of the planning solution, which is especially important for all participants in the planning process for waste management. Thus, for example by implementation of the Regional Waste Management Plan in the area of the Kolubara region instead of 11 non-sanitary landfills and dozens of illegal dump sites in the territory of each municipality will be located just one sanitary landfill, which will thereby be located in the area with completely degraded environment (surface area of coal exploitation). Benefits to the environment are evident in this context and incalculable. As a logical continuation of this process is defining the monitoring program for the key environmental factors (Table 7).

According to the Law on Environmental Protection of Serbia, the quality of the environment is defined as the set of natural and man-made values, whose complex interrelationships make up the environment, actually the space and conditions for living, as the state of environment which is expressed by physical, chemical, biological, aesthetic and other indicators. But, the law does not define the term indicators, and in practice indicators appear with different interpretations and applications. In Serbia, the indicators commonly referred to as data relating to the quality of air, water and soil. However, contemporary approach of the European Environment Agency (European Environmental Agency, EEA)<sup>3</sup> is based on complex DPSIR (driving force-pressure-state-impact-response) concept, which takes into account all the phenomena in a causal chain, including the response in unsatisfactory condition. This concept implies an active attitude toward the changes in the environment, including socio-economic aspects, which are often the driving force of changes. In this way a purely "environmental indicators" are included in the system of indicators of "sustainable development" (Josimović, 2010).

The aforementioned concept is basically used in the phase of formulating of SEA aims and indicators, as a means for monitoring progress in achieving the aims of the plan and SEA. After, it was selected key indicators to be used for monitoring the achievement of SEA aims or the state of the environment during the implementation of the plan. The aims and indicators have been developed during the SEA process in consultation with the authorities responsible for environment and corrected during the process. SEA aims used to evaluate the Plan are having associated indicators, some of which are considered significant such as water quality, air quality, climate change and transport.

Recommendations related to monitoring are:

- it is recommended to establish monitoring of indicators and to report regularly; these information can serve as a basis for future Plan;
- avoiding duplication of activities; most of the indicators are based on existing data – therefore the data are used for comparison and reporting;
- indicators should be compared and monitored annually and integrated into the annual report on the implementation of the Waste Management Plan;
- monitoring is a continuous process and performance indicators should be improved or added over time if required;
- there must be a commitment of the authorities to create the resources available to conduct monitoring for the duration of the Plan;
- to explore opportunities for co-ordination of persons who process data regarding the best utilization of available data;
- indicators include values relating to the waste, as well as tones of non collected waste and the appearance of uncontrolled burning and illegal dumps.

<sup>3</sup> EEA, Technical Report No25, Environmental Indicators:Typology and overview, \*Copenhagen:EEA,1999)

Receptors of the environment	Indicators	Competent authorities for monitoring	The frequency of monitoring	Unexpected negative impacts - require additional measures
Water	<ul style="list-style-type: none"> <li>- Number of facilities that exceed the water LVE.</li> <li>- BCO and CCO upstream and downstream of the plant for waste management.</li> <li>- Number of accidental pollution of water for which there is a report (e.g. plague fish)</li> </ul>	Department of Public health Republic environmental inspections	Annual	<ul style="list-style-type: none"> <li>- 10% of increase</li> <li>- Reducing class of water flows downstream.</li> <li>- 10% increase in reported accidents.</li> </ul>
Air and climate change	<ul style="list-style-type: none"> <li>- Number of days when it exceeded LVE dust, NOx, SO2.</li> <li>- Estimated amount of not collected waste.</li> </ul>	Department of Public Health Department for municipal affairs	Annual	<ul style="list-style-type: none"> <li>- 10% of excess</li> <li>- Increase the amount of non collected waste</li> </ul>
	<ul style="list-style-type: none"> <li>- The amount of waste that is recycled, that goes to the landfill or it is otherwise treated.</li> <li>- The calculated annual gas emissions from landfills (SO2).</li> </ul>	Environmental Protection Agency Department for municipal affairs	Annual	<ul style="list-style-type: none"> <li>- The lack of progress in relation to the objectives of the Plan.</li> <li>- No reduction of gas.</li> </ul>
Land	<ul style="list-style-type: none"> <li>- Area of rehabilitated land.</li> </ul>	Environmental Protection Agency	Every second year	<ul style="list-style-type: none"> <li>- The lack of progress in the implementation of the Plan.</li> </ul>
Biodiversity	<ul style="list-style-type: none"> <li>- Proximity of new waste management facilities for sensitive areas.</li> </ul>	Institute for nature protection	Every second year	<ul style="list-style-type: none"> <li>- Increase in the loss of habitat.</li> </ul>
Region	<ul style="list-style-type: none"> <li>- Number of existence of vulnerable sites.</li> </ul>	Institute for nature protection	Every second year	<ul style="list-style-type: none"> <li>- Increase in the number of endangered places.</li> </ul>
Population and human health	<ul style="list-style-type: none"> <li>- Number of people suffering from the consequences of inadequate waste disposal.</li> <li>- Number of complaints from citizens because of: noise, odours and environmental problems due to the activities of dealing with waste.</li> </ul>	Institute for Public Health	Every second year	<ul style="list-style-type: none"> <li>- Increase the number of infected people.</li> <li>- 10% increase in the number of complaints.</li> </ul>
Traffic	<ul style="list-style-type: none"> <li>- Number of driven km for transportation of waste.</li> <li>- Quantity of waste.</li> </ul>	Department for communal and inspection occupation of the municipalities	Every second year	<ul style="list-style-type: none"> <li>- Set a goal after the first collected data .</li> <li>- Less than 5% in decreasing waste.</li> </ul>
Waste	<ul style="list-style-type: none"> <li>- Number of reported accidents: illegal landfills, burning in the yard, the other.</li> </ul>	Republic environmental inspection	Annually	<ul style="list-style-type: none"> <li>- 10% increase in reported accidents.</li> </ul>

Table 7. Indicators and the authorities responsible for environmental monitoring (Josimović, 2010)

In Table 7. are shown indicators and the competent authorities for monitor the environmental situation in the area covered by Regional waste management plan of the Kolubara region. Monitoring program is developed and key indicators have been established for water, air quality, climate change and transport. These are aspects of the environment in which the implementation plan is likely to have impact. An additional set of indicators includes indicators that are not affected significantly. This refers to biodiversity, landscapes and so on. Additionally to the above mentioned it has to be stated that the presented SEA is found to promote quite balanced sustainability, with the lowest score found within social benefits and the highest in economical (Crnčević, Therivel, 2009).

#### 4. Conclusions

The paper emphasis is put on presenting methodological approach was develop for SEA of the Regional Waste Management Plan for 11 municipalities of Kolubara region, which is made in the Institute of Architecture and Urban and Spatial Planning of Serbia. It was used planning approach where aims and indicators are defined and evaluated in the context of the realization of the plan solution and not technological. The presented methodology is based on the experience of making SEA in developed countries, because even after more than five years after the adoption of the SEA in Serbia still missing the adequate Regulations as well guidelines which would help experts in developing methodological approach for SEA. The presented methodological approach is based on multicriterion evaluation of planning solutions in respect to the defined SEA aims and indicators of sustainable development. It was used qualitative evaluations based on expert knowledge and professional literature. Within the research were defined 24 indicators to evaluate planning solutions that can have an impact on the environment as well the evaluation of existing conditions for the analysis of existing potentials and was made a qualitative assessment of the impacts of planned activities on these potentials. The appropriate protective measures are defined and as well indicators for monitoring of the state of the environment. In SEA presented in this paper were defined 15 indicators for monitoring. The aforementioned methodological approach is broadly applicable to all areas of planning, but the concrete contribution of the presented SEA is seen in the choice of relevant aims and indicators based on the basic principles of waste management plan.

Way of selecting and displaying significant strategic impacts through the chart as presented allows easy access to the results of the evaluation process and make the presentation of the project easier. The results of the assessment of the planning solutions represent a good basis for determining appropriate measures for environmental protection and guiding of planning solutions in the context of achieving the desired goals. That is exactly the main task of SEA and the aforementioned model that will certainly be developed over time. Minor problems have been shown due to the lack of national databases, relevant data about the environment, so their availability varied depending on the measurements which are (not) being done in some municipalities. To overcome this problem it was implemented the program called CORINA - the unique European information base about the environment and the use of space (Fig 3). It is also used the internal informational basis in GIS, formed in IAUS for the needs of spatial plans. The system supported by such information base made it possible relatively high quality and rapid analysis of environmental data on the researched area (Josimović, Ilić, Filipović, 2009).

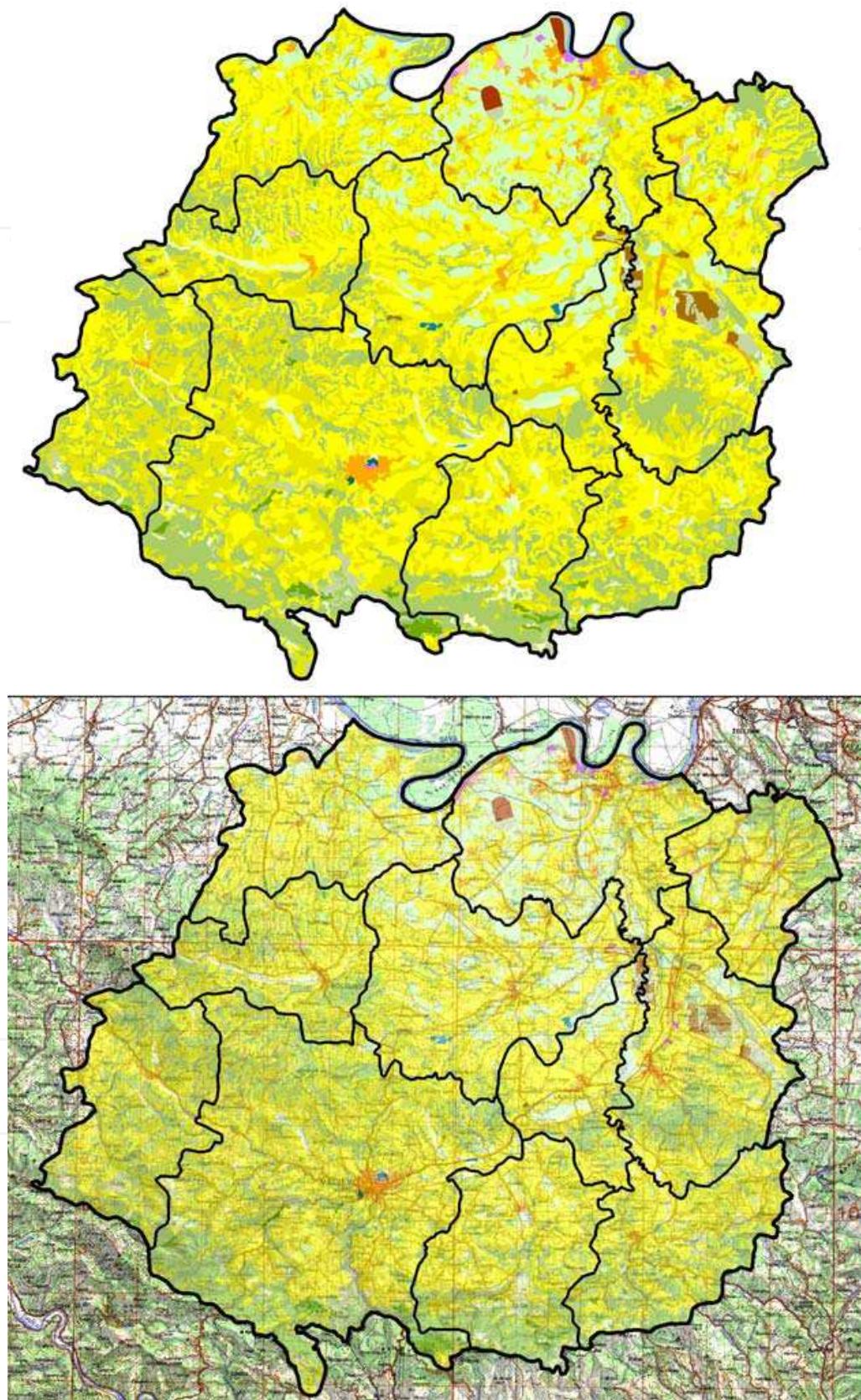


Fig. 3. CORINE map for Kolubara region

Scientific contribution of this work is reflected in the adjustment of SEA methodology (developed in IAUS) for the presented sectoral regional waste management plan where applied methodology can be used for other plans and programs for waste management in different hierarchy levels. Adjustments are primarily related to the selection of relevant strategic aims and indicators in the context of the current state of the environment in the planning area and the possible negative impacts of the plan to the environment, but also how the evaluation is presented using the chart.

Directions for future research in environmental protection in the field of waste management should include following:

- development of information base of the space which will form the basis for effective environmental protection,
- development of indicators adapted to the needs of the SEA,
- development of indicators in the function for monitoring the environment in areas where are established systems of waste management
- the implementation of the education program of the population on contemporary principles and technologies of waste management treatment and waste disposal in order to reduce resistance of the population which is particularly evident in the location of landfill space.

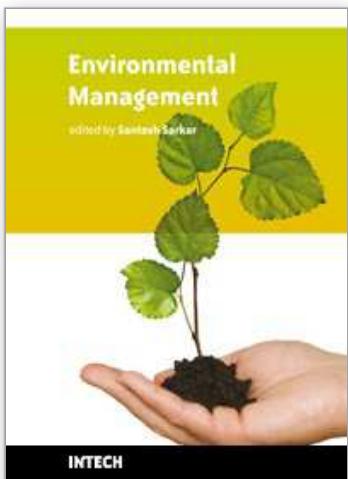
The implementation of these settings would contribute to the systematic and methodological problem solving of environmental management in the planning and development of the SEA and completed the researches of spatial aspects of waste management. So by this way this issue will be seen from the perspective that in the spatial sense enables the establishment of modern waste management system based on a good (effective) organization of space with the protection of all environmental factors.

*This paper was completed as a part of the project "Spatial, social and ecological aspects of development in great mining basins" TP 16008, which has been financed by the Serbian Ministry of Science and Technological Development".*

## 5. References

- Crnčević, T. (2005). The Law on Strategic Environmental Assessment - tool for implementing sustainable development strategy or just another administrative duty, Planning and normative space and environmental protection, pp. 57-67, ISBN 86-82657-53-8, Belgrade, April 2005, Serbian Association of Space Planners and Faculty of Geography, Belgrade.
- Crnčević, T. (2007). Strategic Environmental Assessment as an instrument for enhancement of public participation in planning, SPATIUM Journal, No 15/16, Institute of Architecture and Urban & Spatial Planning of Serbia, pp. 72-78, ISSN 1450-569X.
- Crnčević, T. (2009). Strategic Environmental Assessment in urban planning - support to the development of the theory and practice, Monographic issue No. 60, Sasa Milijic, Jasna Petric (Ed.), pp. 1-183, Institute of Architecture and Urban & Spatial Planning of Serbia, ISBN 978-86-80329-62-8, Belgrade.
- Crnčević, T.; Therivel, R. (2009). Acheiving sustainability in planning: English and Serbian experiences, Spatial Planning and Strategic Governance, pp. 83-106, ISBN 978-86-80329-61-1, Belgrade, December 2009, Institute of Architecture and Urban & Spatial Planning of Serbia, Belgrade.

- European Parliament and the Council. (2001). Council Directive 2001/42/ EC on the Assessment of the Effects of Certain Plans and Programmes on the Environment.
- Josimović, B., Crnčević, T. (2006). Procedures of Strategic Environmental Assessment of the Plan of detailed regulation of the business complexes, Architecture and Urbanism, No.18/19, pp. 113 -117, ISSN 0354-6055.
- Josimović, B. et al. (2010). Strategic Environmental Assessment for Waste Management Regional Plan for 11 Municipalities in Kolubara region in Serbia, pp. 1-102, Institute of Architecture and Urban & Spatial Planning of Serbia, Belgrade.
- Josimović B.; Crnčević, T. (2009). Impact evaluation within Strategic Environmental Assessment: The Case Study of the Waste Management Regional Plan for Kolubara region in Serbia, Environmental Engineering and Management Journal, Vol8, No3, Department of Environmental Engineering and Management-Faculty of Chemical Engineering, IASI, pp.457-462, ISSN 1582-9596.
- Josimović, B.; Ilić, M.; Filipović, D. (2009). Planning of Municipal Waste Management, book, Mila Pucar (Ed.), pp. 1-157, Institute of Architecture and Urban & Spatial Planning of Serbia, ISBN 978-86-80329-59-8, Belgrade.
- Josimović, B.; Krunić, N. (2008). Implementation of GIS in selection of Locations for Regional Landfill in the Kolubara Region, SPATIUM Journal, No 17-18, Institute of Architecture and Urban & Spatial Planning of Serbia, pp. 72-78, ISSN 1450-569X.
- Republic of Serbia. (2004). Law on Strategic Environmental Assessment, Official gazette–Republic of Serbia No 135/04.
- Stojanović, B. (2006). Strategic Environmental Assessment for Valjevo Municipality, pp. 1-65, Institute of Architecture and Urban & Spatial Planning of Serbia, Belgrade.
- Stojanovic, B.; Mitrović, I. (2007). A critical review of the guidelines for the implementation of the Law on strategic environmental assessment, pp. 361-370, ISBN 978-86-82657-54-4, Belgrade, April 2007, Serbian Association of Space Planners and Faculty of Geography, Belgrade.
- Stojanovic, B., Spasic, N. (2006). A critical review of the implementation of the Law on Strategic Environmental Assessment in the Spatial and Urban Planning, Construction - Journal, No.1-2, CEAU, pp. 5-11, ISSN 0350-5421.



## **Environmental Management**

Edited by Santosh Sarkar

ISBN 978-953-307-133-6

Hard cover, 258 pages

**Publisher** Sciendo

**Published online** 12, August, 2010

**Published in print edition** August, 2010

There has been a steady increase in anthropogenic pressure over the past few years due to rapid industrialization, urbanization and population growth, causing frequent environmental hazards. Threats of global environmental change, such as climate change and sea level rise, will exacerbate such problems. Therefore, appropriate policies and measures are needed for management to address both local and global trends. The book 'Environmental Management' provides a comprehensive and authoritative account of sustainable environmental management of diverse ecotypes, from tropical to temperate. A variety of regional environmental issues with the respective remedial measures has been precisely illustrated. The book provides an excellent text which offers a versatile and in-depth account of management of wide perspectives, e.g. waste management, lake, coastal and water management, high mountain ecosystem as well as viticulture management. We hope that this publication will be a reference document to serve the needs of researchers of various disciplines, policy makers, planners and administrators as well as stakeholders to formulate strategies for sustainable management of emerging environmental issues.

### **How to reference**

In order to correctly reference this scholarly work, feel free to copy and paste the following:

Bosko Josimovic and Tijana Crncevic (2010). Implementation of Strategic Environmental Assessment in Serbia With Special Reference to the Regional Plan of Waste Management, Environmental Management, Santosh Sarkar (Ed.), ISBN: 978-953-307-133-6, InTech, Available from:  
<http://www.intechopen.com/books/environmental-management/implementation-of-strategic-environmental-assessment-in-serbia-with-special-reference-to-the-regiona>



### **InTech Europe**

University Campus STeP Ri  
Slavka Krautzeka 83/A  
51000 Rijeka, Croatia  
Phone: +385 (51) 770 447  
Fax: +385 (51) 686 166  
[www.intechopen.com](http://www.intechopen.com)

### **InTech China**

Unit 405, Office Block, Hotel Equatorial Shanghai  
No.65, Yan An Road (West), Shanghai, 200040, China  
中国上海市延安西路65号上海国际贵都大酒店办公楼405单元  
Phone: +86-21-62489820  
Fax: +86-21-62489821

© 2010 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike-3.0 License](#), which permits use, distribution and reproduction for non-commercial purposes, provided the original is properly cited and derivative works building on this content are distributed under the same license.

IntechOpen

IntechOpen