

POSSIBILITIES OF SUSTAINABLE INDUSTRIAL DEVELOPMENT IN SERBIA

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Abstract. *Industry is one of the most endangering sources of the environmental quality, even in case when the production process indicates minimal polluting emissions. The ecological consequences of industrial production might be quite essential, especially because of the use of non-renewable resources, emissions of damaging materials and environmental risks.*

1. INTRODUCTION

The ecological impact of industry, beside the polluting emissions and waste disposal is reflected in the use of energy sources and raw materials. Analysing some previous trends of industrial development, planning-developmental perspectives and development strategies of particular sectors, it might be assumed that in the oncoming period, in certain parts of the Republic of Serbia, an increase of ecological risk is expected.

2. ENVIRONMENTAL ASPECTS OF SERBIAN INDUSTRIAL DEVELOPMENT

Although there has been an industrial decrease and stagnation, during the 80s, industry is the leading production activity in Serbia, performing a dominant part in the GDP, in the employment ratio and the investments in the production funds. From the environmental and resource usage standpoint, the extensive character of the industrial development is also reflected in reproducing the present unfavourable industrial structure and the employment of outdated technologies. Industrial development, until the 80s, shows an investment intensive character, bound by the choice of some dominant branch structures: ferrous metallurgy, energy, non-ferrous metallurgy, metal processing, production and processing of non-metals, coal production, etc. Since 1990, the industrial production in Serbia has witnessed a tremendous decrease. Thus, in 1998, the production plunged to 35% of the 1990's production. Consequently, the industrial employment decreased (from

1 035 000 in 1990 to 760 091 in 1998), and therefore the allotment of this activity in the overall economic employment was 41.2 % in 1998 and 31.5% of the GDP. The industrial assets are used only with 31%, however with substantial branch differences. The above average level of assets usage is perceivable in the resource-intensive branches such as raw materials, energy and intermediary production, whereas in the processing sector it is only average. Such a trend in the utilisation of assets is unacceptable from the viewpoint of sustainable industrial development.

From the environmental and spatial protection standpoint, some main industrial problems in Serbia are: irrational usage of existing industrial locations and equipment; materially intensive production character with an immense utilisation of raw materials, energy, water, and land. Furthermore, there are massive consequences on the environmental quality; conflicts with the environment and particular settlements structures; exceeded emissions of pollutants in the air, water and soil; endangered biodiversity; industrial waste, agricultural, forest and construction land degradation; negative impacts on the life quality, housing and health, etc. Raw material, energy and intermediary production sector dominates in Serbia's industry: production of electric energy, coal, oil and oil derivatives, ferrous and non-ferrous metallurgy, production and processing of non-metals, building materials, basic chemical industry, etc. Because of the outdated technology in numerous production branches, Serbia's industry is very extensive in terms of energy sources and resources usage, often very wasteful, with a quite costly participation of energy, raw materials and water in the produce's costs per unit [1].

On the basis of the met state of the art of the environment in Serbia (1990), according to the "EU Programme on the environment and sustainable development" [2], it is estimated that the environmental quality in the Danube Basin, Vojvodina, Sava valley and Eastern Serbia are among the most endangered in Europe. Bearing in mind that Yugoslavia is a signatory country of the Declaration on Sustainable Development (1992) imposes several questions: Has the planned industrial development of these areas accepted devised environmental demands? Did this encompass respective environmental aspects in governing the industrial spatial development in our regulations on the construction of investment facilities, foreign investments, free zones, and concessions?

The existing legal acts in the domain of environmental protection and development regulate the duties and responsibilities of economic actors rather insufficiently. For example, correspondent to the Law on foreign investments in FRY (~1.13 and 14) [3], the import of equipment and other basic production means which represent the foreign investor's deposit is tax-free. From the environmental point of view, a free technology transfer could have negative consequences. In the same Law, the agreement on foreign investment (~1.19) does not contain propositions on environmental protection, and the agreement on founding an enterprise (~1.20) contains only a general proposition on the environmental protection. The consent for foreign investment is issued by the Ministry of economic relations with foreign countries, with no obligation to consult the responsible Republic's department for environmental protection (~1.21 and 22). With the Law on foreign investments in FRY (1996) [4], it is prepared for the foreign investor to acquire a concession for facility, plant or plant section construction, utilisation of natural or generally used goods under the condition not to endanger the environment. According to the federal Law, in the concession agreement there are no propositions on the conditions of environmental protection. With the Law on concessions, the conditions, modalities and procedure

of granting concessions for using natural and generally used goods in the Republic's property are determined.

During the NATO aggression, many industrial assets have been destroyed or damaged. Especially heavily damaged were sections of the chemical industry, oil complexes, metal-processing complexes, power plants and power installations. During the aggression, in Serbia, some 25% of the overall industrial capacities were damaged. According to the accessible data [5], in the bombardment, some 80 industrial enterprises, employing 150 000 workers were damaged. By destroying capital equipment of the petrol-chemical, chemical and oil complexes, a considerable share of highly hazardous and dangerous substances was released in all environmental mediums. Besides enormous economic damages and destruction, this also caused unforeseeable, long-term local and regional environmental consequences, measureless by sensible scientific and technical methods.

3. PLANNED DEVELOPMENT AND ECOLOGIC CONSEQUENCES OF INDUSTRY IN SERBIA

In the Spatial Plan of the Republic of Serbia [6] and "The development strategy of the Republic of Serbia" [7], the development and concentration of immovable industry on current industrial sites has been foreseen:

- Revitalisation of ferrous metallurgy capacities in Smederevo;
- Structural transformation and development of non-ferrous metallurgy and tinted metals processing in Bor and Majdanpek, Kosovska Mitrovica, Sevojno, Jagodina and Podrinje;
- Development of energetic, production and processing of coal (lignite) and oil (on the territory of Obrenovac-Lazarevac, Kostolac, Kosovo basin, Ibar area, Kovin, etc.);
- Development of basic inorganic chemistry in Prahovo, Novi Sad, Sabac, Krusevac, Cacak, Loznica, Lucani, Kosovska Mitrovica and other minor centres and basic organic chemistry in Pancevo, Novi Sad, Beograd, Krusevac, Subotica, etc.)
- Development of metal processing industry, especially the automatization equipment production in the domain of electric joints, electric machines, processing equipment, goods (freight) and special vehicles, vessels, motors, measuring and precise instruments;
- Exploitation and processing of non-metals (in the area of Ibar and Kopaonik, Gornji Milanovac, Mladenovac, Arandjelovac, Beocin, V. Popovac, Kraljevo, Uzice, etc.)
- Development of food processing industry;
- Production of building materials (the area of Vojvodina);
- Sand and gravel extraction (several sites in the Danube Basin and Morava Basin), etc.;

From the environmental and resources-use standpoint, keeping the present industrial structure and sustaining the industrial development trend in Serbia, might have are following consequences:

- further excessive use of non-renewable or partially renewable resources – fossil fuels (coal in Kosovo Basin, Kolubara Basin, Kostolac Basin and Ibar Basin, oil in Stig), tinted metals (RTB Bor, Majdanpek), non-metals, gravel and sand, building stone, water, etc.;
- Ineffective use of non/renewable resources with global ineffectiveness of production factors;

- Development of environmentally highly hazardous industrial capacities and branches: chemical industry (Belgrade, Pancevo, Novi Sad, Sabac, Subotica, Krusevac, Kosovska Mitrovica, Cacak, Prahovo, Lucani, etc.), production and processing of oil and oil derivatives (Novi Sad, Pancevo, and Belgrade), black metallurgy (forge in Smederevo), coal and electric energy production in Kosovo's power plants, Power plants "Kostolac" A and B, Power plant "NT", Power Plant "Kolubara" and non-ferrous metallurgy complexes (RTB "Bor"), etc.;
- Industrial development on the basis of imported (non-renewable) resources: ferrous metallurgy (around 3 million tons of imported iron ore), refineries (annual oil refining volume in refineries of Belgrade, Novi Sad and Pancevo ranges from 3.34 million to 5.35 million tons, out of which 2.04 million tons are imported [8], chemical industry, non-metal processing, etc.;
- Development of locationally and techno-economically demanding industries, extensively using huge quantities of water, energy, massive land areas, a large scope of freight transport;
- Increasing problems of industrial waste deposition, etc.

According to the Spatial Plan of Serbia [6], in the planned state of the environment, most of settlements and Serbia's areas are classified as category IV and V in terms of polluted sites (a better quality environmental zone). The exception is Pancevo, Bor, Sabac, Kosovska Mitrovica, Subotica, Baric, Krusevac, Loznica, Lucani, which equate with considerably polluted locations of the II category. Obrenovac, Kostolac, Prahovo, Kikinda and settlements in the Kolubara basin belong to the locations of the category II. The planned environmental protection measures are mostly in the sphere of previous effects revitalisation or protection, without preventive actions concerning future development.

If the current trend of global ineffectiveness of production factors persists, concurrently with ineffective use of natural resources in industry and the realisation of proposed development policies in this field, very environmentally unfavourable effects might be expected in future. Furthermore, some negative ecological consequences are foreseeable in respect to the planned development strategies and perspectives, economically uncertain development results and outcomes, together with socially unacceptable spatial resource usage. Therefore, it is essential to define a strategy of sustainable industrial development within the spatial planning.

4. POSSIBILITIES OF SUSTAINABLE INDUSTRIAL DEVELOPMENT IN SERBIA

Objectives and approach

Main objectives in planning the sustainable industrial development are a) economic growth and development by respecting local ecological criteria and capacities (industrial restructuring), b) enhancing the life quality, c) protection of environmental resources.

The general objective of sustainable industrial development is the development of economically profitable production, with products, which are environmentally friendly (i.e. fundamental environmental sector restructuring). Furthermore, the decrease of polluting substances in air, water and soil, waste decrease, efficient use of (non) renewable

resources, suspension of certain production types would meet this end. From the named objectives, it arises that "ecological modernism" in industry is primarily an economic and not an environmental objective.

In order to accomplish general environmental protection objectives and the goal of sustainable industrial development, it is indispensable to determine the temporal dimension of objectives. In that regard, three levels of objectives might be discerned: strategic, long-term objectives, mid-term and short-term objectives. General strategic objectives encompass: employment increase, production restructuring leading towards a bigger share of processing industries, development of small enterprises (as "regional catalysts" of development), development and application of more advanced technologies, co-ordinated territorial distribution of industry (in urban and regional context), rational use of non-renewable resources, a more efficient use of renewable resources, decrease of polluting emissions from industry, minimisation of industrial waste, substitution of certain resources, etc.

Industrial development scenarios

In this paper, an effort has been made to assess a preliminary framework, with hypothesis, perspectives and spatio-environmental effects of potential industrial development scenarios in Serbia (Table 1). Starting from basic trends of the reform process, the privatisation, foreign investments dynamics and the structure of future industrial development, three scenarios have been identified: a) The scenario "without" change, b) The modest development scenario and c) The sustainable development scenario. Each of them has certain implications in the institutional domain, the industrial structure, societal development, environment and land use.

Table 1. Scenarios of industrial development in Serbia – the framework, hypothesis, perspectives and environmental assessment of spatial impacts

SCENARIO "WITHOUT CHANGE"	MODEST DEVELOPMENT SCENARIO	SUSTAINABLE INDUSTRIAL DEVELOPMENT SCENARIO
<ul style="list-style-type: none"> • Conservation of the branch structure • Application of existent technologies • Weak employment effects • Financial output of industrial development in further devastation of local environment • Additional pressures on the environment in respect to the resource utilisation and polluting • Production planning with a strong political support • Confusion about an array of indicators and restrictions 	<ul style="list-style-type: none"> • Usage of local and regional potentials • Decline of the raw materials and energy sources sector • Strategic branch development through the management of technical and financial aspects (without the environmental) • The risks of abandoning certain production segments • A modest increase of employment • Adaptation to the centralised approach in decision making on the industrial development 	<ul style="list-style-type: none"> • Production deinvestment in the raw materials and energetics sector and co-ordination with the capacities of the local environment • Consumption and production (de) stimulation of particular industrial produces • Founding the industrial development on sustainable visions and the control of environmental capacities • Preventive approach in environmental management in industry • Creating competitive advantages and the promotion of the local and regional environmental potentials and life quality • Efficient application of the environmental impact assessment for all industrial projects (<i>ex post, ex ante</i>)

<ul style="list-style-type: none"> • Maintaining the existent spatial structure of industry • Increase of production and transport costs • Societal inertia in the planning-application of new technologies and knowledge • Deficiency of specific infrastructure capacities for the development of new and existent productions • Information deficit for initiating different production possibilities and modalities • Deficiency of specialised research centres and innovative industrial enterprises • Ineffective use of soil, energy, water • Conflicts with the surrounding areas and functions 	<ul style="list-style-type: none"> • Growth of economy of scale, instead of economy of "effects" • Location incompatibility of particular productions • Aggravation of the environment • Restriction of industrial development consequences and certain "excessive" effects upon environment • Restricted role of the environmental protection and output effects • Short-term projects within existent industrial capacities and locations • Further spatial concentration instead of "spatial organisation" • Contingent pressures of urbanisation in certain towns • Conflicting potentials with settlements contents • Considerable risks of endangering tourism potentials by industrial development • Services development directly linked to the production • Further jeopardising of the environmental quality 	<ul style="list-style-type: none"> • Promotion of new industrial production based on local environmental capacity • Environmental factors inclusion to all phases of the industrial project-ecomangement • Strengthening the communication network and the infrastructure quality • Modest employment increase • Industrial development in rural and lagging areas • Increasing role of environmental factors in the local development policy, development and spatial plans, industrial projects and decisions on industrial development • Co-ordination of industrial programmes with the planned land use • Training programmes for industrial ecomangement • Creation of the national centre for promoting a "clean" production • Development and co-operation promotion of small enterprises • Creation of a small enterprises consortium for reducing business costs • Acceptance of the Business charter on sustainable development (as a non-governmental investment instrument) • Public participation on location decisions • Decrease or elimination of negative effects on the quality of environmental elements • Mixed land use and a better spatial organisation • Industrial location dispersion • Possibilities of production location in resident parts of the settlements
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The strategy of industrial eco-restructuring entails the decrease of the relative importance of particular branches of the basic and intermediary sector (e.g. energetic, ferrous and non-ferrous metallurgy, non-metals, production of building materials, etc.). Furthermore, it entails the increase of the importance of materially intensive branches, high-tech production, with the revitalisation of existent plants effects upon the environment. The sustainable industrial development scenario adopts the application of the preventive approach: involvement of the spatio-environmental criteria, optimisation of the material input use, minimisation of polluting substances, restructuring of the production pattern towards an environmentally acceptable technologies, etc. This scenario leads towards the

decentralisation and decrease of global developmental disparities, development of small urban centres, balance provision between socio-economic and spatio-environmental objectives, a more rational land use, better infrastructural and communication access and an overall increase of the life quality. The initiated processes of socio-economic transformation with attracting portfolio and direct foreign investments might have significant environmental consequences upon the Republic's territory, and therefore a sustainable industrial development strategy is indispensable.

Sustainable industrial development policy

The aim of the industrial policy is the creation of conditions for the development of an innovative and market competitive industrial sector, which should provide an environmentally sustainable production. In planning the sustainable development, the industry ought not to perform as an environmental problem, but to act as an active party in solving developmental problems. Sustainable industrial development entails the definition of a framework of the general and sector industrial policy. The first is directed at a better use of production factors and the creation of a unanimous ambience for all production branches, and the second has a sector and territorially bound character.

For the sustainable industrial development, the synchronisation of various elements is indispensable: [9] location; better use of technology; control of polluting emissions; management of the industrial waste and the prevention of its creation; resource management; industrial risk management.

The sustainable industrial development policy ought to be directed at achieving the balance between the short-term profit of the enterprises and the long-term effects for the society. This encompasses [10]:

- Definition of explicit objectives and environmental protection level in this activity;
- The application of innovations in the industrial strategy, towards enabling an "environmentally friendly" development;
- The application of the "integral pollution control" concept in enterprises;
- A clear responsibility concept for environmental damages;
- Emission standardisation for all industrial sectors, depending on the technology type, etc.;
- Development and use of "clean" technologies;
- Rational energy use in industry;
- Fiscal reductions and support for enterprises which acknowledge environmental demands in practice.

The sustainable industrial development policy, which treats the market competition and the environmental protection as a unanimous process, embodies the application of an integral measure package:

- Dialogue with the industry and its associations (chambers, consortiums, etc.)
- Industry distribution management, enhancement of spatial and strategic planning;
- Definition of the role, duties and rights of involved actors;
- Usage of environmental policy instruments and especially the usage of economic instruments;

- Governmental support of the sustainable industrial development concept, but also of responsible ministries, encompassing the financial, fiscal and other assistance.

5. CONCLUSION

Based on the former industrial development trend, planned development prognosis and further endangering of the environmental quality in Serbia, it is estimated that an approach change in spatial management, environment protection and resource use is necessary. Sustainable industrial development implies the definition of development managing modes of this activity (on the national, regional and local and sector level), concerted with the principles of sustainable development. The environmental management of industrial development is not possible without envisaging the impact of plans and projects upon the environment, socio-economic segments, and the identification of duties and responsibilities regarding the environment. The definition of a sustainable development strategy is necessary based on: (a) sustainable industrial development strategy, (b) strategy of non-renewable and renewable resources use, (c) integral spatial planning, (d) principles of democratic spatial planning, (e) productive eco-restructuring of the existent industry with regard to eco-efficiency of material inputs, (f) public participation in planning and decision-making on industrial development /location, etc.

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MOGUĆNOSTI ODRŽIVOG RAZVOJA INDUSTRIJE U SRBIJI

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Industrija je jedan od važnih izvora ugrožavanja kvaliteta životne sredine, čak i onda kada proizvodni proces ima minimalne emisije zagađujućih materija. Ekološke konsekvence industrijske proizvodnje mogu da budu veoma značajne, posebno zbog upotrebe neobnovljivih resursa, emisija štetnih materija i rizika po okruženje.