Development and Spatial Pattern of Industry in Serbia

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In the paper are elaborated the problems of spatial industrial development polices in Serbia in the last time, in the context of the resource use and environmental protection. There are recognised possible environmental consequences of industrial development perspectives in the relation to the Spatial plan of Serbia and to the Development strategy of the Republic of Serbia. Unsustainability trends and processes are identified, as follows: nonefficiency (excessive) using nonrenewal resource in the industry; environmental degradation and quality of locations and development ecologically highly risk and treatment of industrial waste. There are recognised the needs for introduction of the politics of sustainable industrial development in Serbia.

1. Introduction

Industry is one of the most endangering sources of the environmental quality, even than when the production process indicates minimal polluting emissions. The ecological impact of industry, besides the polluting emissions and waste disposal is reflected in the usage of energy sources and raw materials. The ecological consequences of industrial production might be quite essential, especially because of the use of non-renewable resources, emissions of harmful materials and environmental risks.

Analysing some previous trends of spatial 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, we expect an increase in ecological risk.

The initiated processes of socio-economic transformation and privatisation 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 (for example privatisation of the plants for production of cement, roofing tiles in Beocin, Kosjeric i V.Popovac).

2. Environmental Aspects of Industrial Development in Serbia

The war in former FRY left Serbia with towering economic problems, including high inflation, unemployment, depresion, lower GDP and an unfovorable balance of industry.

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 (steel production), energy, non-ferrous metallurgy, metal processing, production and processing of non-metals, coal production, oil production and refineries, basic chemical industry, etc. Since 1990, the industrial production in Serbia has witnessed a tremendous decrease. Thus, in 2001. the production plunged to 35% of the 1990's production. Consequently, the industrial employment decreased (from 1 035 000 in 1990. to 643.300 in 2001.), and therefore the allotment of this activity in the overall economic employment was 40,3 % in 2001. and 31.5% of the GDP. The industrial assets are used only by 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. Serbia's industry is dominated by raw material, energy and intermediary production sector: 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 products' costs per unit [1].

On the basis of the present state of 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 is 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 respected 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 [3], and Law on foreign investments in Serbia [4], 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. According to the same Law, the agreement on foreign investment does not contain propositions on environmental protection, and the agreement on founding an enterprise 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 Republic's department responsible for environmental protection. With the Law on foreign investments in FRY, it is prepared for the foreign investor is allowed 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.

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 capacity 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 were released in all environmental mediums.

3. Planned Development and Spatial Pattern of Industry in Serbia

According to the Spatial Plan of Serbia [6], the model of controlled polycentric and distribution of activities is the basis for long-term spatial planning in Serbia. From the spatial viewpoint, the model is based on existing large and medium-sized industrial/city centres and city/industrial centre development in insufficiently development areas (Figure 1.). This concept entails considerable decentralisation in the development and distribution of industry and will be carried out through the controlled concentration of industry. This approach consist of:

- partial removal of industrial activities from urban areas, particularly selective dislocation from the Belgrade region,
- more balanced regional development and distribution of industry,
- intensifying industrial development in certain zones in the Danube-Sava river belt and in certain large, medium-sized and small industrial/city centres,
- development of more complex and high technology in the Belgrade agglomeration and in certain other industrial centres.

As regards the spatial-ecological goals of industrial development and distribution, favourable locations for the placement and development of industrial facilities have the following features: (the best location-development capacity is the Danube (the European corridor VII) and Sava river-front belt and zones in the valleys of other large rivers (the European corridor X), (b) a number of industrial/city centres have an advantageous transport position and other comparative advantages, as well as certain limitations (insufficient water supply, difficulties in removing and treating waste water, environmental limitations, etc.), (c) primary agricultural-raw materials areas are found in the Pannonian and Peripannonian zones and larger valleys, (d) zones/centres with favourable conditions for the development of smaller, special primary processing facilities (wood industry, food industry,etc.), (e) zone with favourable conditions for the development of extraction industries and power production.

The framework for industrial development consist of these potential belts: (a) the Danube – Sava rivers, (b) the Velika Morava and Juzna Morava rivers (Central and South Serbia), (c) the Zapadna Morava river (Central Serbia), (d) Timok river (East Serbia), (e) Vojvodina region – Drina river basin – Lim river, (f) Kosovo region, (g) direction Belgrade – Pancevo-Vrsac (Romanian border), (h) Tisa river basin (in Vojvodina region), (j) Ibar river, (k) direction Zajecar – Bor –Majdanpek – Pozarevac –Belgrade, (l) the Prahovo –Negotin- Bor – Zajecar –Paracin belt, (m) direction Kraljevo – Kragujevac – Batocina, (n) direction Loznica –Valjevo – Lazarevac, (0) Metohija area and the direction towards Gnjilane and Vranje.

In addition to the existing free (economic) zones (Belgrade, Novi Sad, Nis, Pancevo, Smederevo, Kovin, Lapovo, Prahovo and Sabac), potentials exist in 14 other locations for the formation of new free zones (Subotica, Zrenjanin, Vranje, etc.). In general, the formation of new zones will be limited and will be based on a rigorous analysis of needs, possibilities and restrictions.

The strategy for the development of the Republic of Serbia (Ministry of Science, Technology and Development of the Republic of Serbia), contains an initiative for establishing the technological and Scientific parks in Serbia. The technology parks represent one of the most effective forms of assisting and promoting the development of high-tech small and medium size enterprises (SME), together with the development of new technologies in the given environment. As a rule, technology parks are an integral part of any strategic plan for economic and spatial development of towns, regions and states. The development areas for technological parks are planned in the magisterial infrastructural corridor of Serbia mainly in Belgrade, Nis (South of Serbia) and Vrsac (bordering town near Romania in East Serbia). The main focus is the providing support to a newly founded SME, through various forms of production and technical cooperation, joint ventures and capital investment, the exchange of business experience, abilities and connections with foreign partners in order to optimise the regional potentials. The core objective for the development of SME within the technological parks is the introduction of profitable production, along with the efficient utilisation of limited resources and implementation of the highest environmental standards. From the point of view of local and regional environmental interests, the main priorities in the selection of development activities and business programmes are: (a) harmonisation with resources and capacities, (b) an increase in the employment rate, (c) acceleration of the economic growth rate and GDP, (d) high return rates of investment, (e) contribution to a more even distribution of activities and production facilities, (f) attracting of foreign investors and additional business activities, (g) application of energy efficient and environmental-friendly technologies, (h) an increased share of modern technology and innovation in the region.

The first technology park development area in Republic of Serbia is initiated by pharmaceutical concern “Hemofarm Group” in Vrsac, covering 30 hectares, having a well-equipped infrastructure (roads, railway, waterworks and sewage systems, electrical energy supply, telecommunication networks, gas mains, landscaping and parkings), with a customs outpost and freight companies in the immediate vicinity. The Yugoslav Airlines flight Academy and the airport are also located on the outskirts of Vrsac. The extention of the Vrsac airport is currently in the planning process.

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 black metallurgy capacities in Smederevo;
- Structural transformation and development of non-ferrous metallurgy and copper and tin processing in Bor and Majdanpek, Kosovska Mitrovica, Sevojno, Jagodina and Podrinje;
- Development of energetics, production and processing of coal (lignite on the territory of Obrenovac-Lazarevac, Kostolac, Kosovo basin, Ibar area, Kovin, etc.) and oil;
- Development of basic inorganic chemistry in Prahovo, Novi Sad, Sabac, Krusevac, Cacak, Loznica, Lucani, Kosovska Mitrovica and other minor centres and of basic organic chemistry in Pancevo, Novi Sad, Beograd, Krusevac, Subotica, etc.), and pharmaceutical products (Vrsac, Belgrade, Leskovac, Sabac, etc.);
- Development of metal processing industry, especially the automatisation equipment production in the domain of electric joints, electrical 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, Kosjeric, 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.

4. Expected Environmental Consequences of Industrial Development in Serbia

Keeping the present industrial structure and sustaining the industrial development trend in Serbia from the environmental and resources use standpoint might have the following consequences:

- further excessive use of non-renewable or partially renewable resources – fossil fuels (coal in Kolubara Basin, Kostolac Basin and Ibar Basin (also in Kosovo Basin), oil in the Stig region, copper (RTB Bor, Majdanpek in East Serbia), non-metals, gravel and sand, building stone, water, etc.;
- ineffective use of non/renewable resources with

Figure 1.: Spatial distribution of industry in Serbia

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), ferrous metallurgy (forge in Smederevo), coal and electric energy production in Power plants "Kostolac A and B", "Power plant NT", Power Plant "Kolubara" (also in Kosovo's power plant) and tinted (non-ferrous) metallurgy complexes (RTB "Bor"), etc.;
- Industrial development on the basis of imported (non-renewable) resources: black 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 thequality of the environment, the majority 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 (Kosovo region), Subotica, Baric, Krusevac, Loznica, Lucani, which equate with considerably polluted locations of the II category. To the locations of the category II belong Obrenovac, Kostolac, Prahovo, Kikinda and settlements in the Kolubara basin. 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, environmentally very unfavourable effects might be expected in the future. Furthermore, some negative ecological consequences are possible 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.

5. Possibilities of Sustainable Industrial Development Policy in Serbia

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. 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. 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 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 environmentally acceptable technologies, etc. This concept 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 access and an overall increase of life quality [9].

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 for 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 towards 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: [10] 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 towards achieving the balance between the profit of the enterprises and the long-term effects for the society. This encompasses [11]: (a) Definition of explicit objectives and environmental protection level in this activity; (b) the application of innovations in the industrial strategy, towards enabling an "environmentally friendly" development; (c) the application of the EIA Directive (85/337) and introduction/implementation of the IPPC Directive (96/61) (Integrated Prevention& Pollution Control) for industrial enterprises; (d) a clear responsibility concept for environmental damages; (e) emission standardisation for all industrial sectors, depending on the technology type, etc.; (f) development and use of "clean" technologies and BAT (best available techniques); (g) rational energy use in industry; (h) 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: (a) dialogue with the industry and its associations (chambers, consortiums, etc.); (b) industry distribution management, enhancement of spatial and strategic planning; (c) definition of the role, duties and rights of involved actors; (d) usage of environmental policy instruments and especially the usage of economic instruments; (e) governmental support of the sustainable industrial development concept, but also of responsible ministries, encompassing the financial, fiscal and other assistance.

6. Conclusion

Based on the former industrial development trend, planned development prognosis and further endangering of the environmental quality in Serbia, it is estimated that a change in the approach in spatial management, environment protection and resource use is necessary. Sustainable industrial development implies a definition of development managing modes of this activity (on the national, regional and local and sector level), concerned 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 necessarily based on: (a) implementation of sustainable industrial development strategy and application of the EIA Directive EC and introduction/implementation of the IPPC Directive EC, (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. The implementation of strategic industrial development and foreign investments in Republic of Serbia depends on local/domestic economy potentials in respect to economic restructuring and privatisation, possibilities of attracting foreign capital in forms of mergers or acquisitions and policies and instruments of development management beyond spatial planning (macroeconomic, investment, fiscal, industrial, regional, environmental, land use etc.).

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