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Review paper

MANAGING SPATIAL DEVELOPMENT IN ZONES UNDERGOING MAJOR STRUCTURAL CHANGES

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Paper considers different aspects of spatial development management in the zones characterised by significant spatial interventions, whose consequences are structural changes in usage of space, social and economic development, environmental and ambient quality. Those are, above all, big mining regions, zones of big water accumulations and main infrastructure corridors. Paper deals with normative, institutional and organisational assumptions for managing spatial development, planning approaches, construction and spatial arrangement, searching and structuring data basis and development of information system, system of indicators and monitoring system. Special attention is given to balance and synchronisation of activities during compilation of study, planning and technical documentation, as well as procedures of considering and enacting appropriate decisions by competent authorities on national, regional and local level.

Key words: spatial development, management, structural changes, production system, conflicts, planning, indicators

INTRODUCTION REMARKS

Major structural changes in spatial development, excluding the zones with large urban concentrations, i.e. metropolitan areas of big cities, result from the development of big production and infrastructural systems in zones with substantial exploitation of energy, metallic and non-metallic mineral raw materials (mining-energy, mining-metallurgical and oil and gas exploitation systems, etc.) as well as processing and transformation of mineral raw materials (gasification, refineries, steel plants, smelters, etc.), large water accumulations, main infrastructural systems, etc. Large production systems also exist and are developed in cities and zones with high urban concentration, but their production programmes tend towards final products, with lower energy and raw-material consumption, much smaller spatial coverage and different effects on regional development and the environment (Spasić, 1994). This paper will focus more on the first group of production-technological systems, especially in major mining basins, wherein structural changes in spatial development are the most pronounced.

The above-mentioned industrial and infrastructure systems are not a homogenous group, and display certain differences with respect to the structure and scope of their respective production programmes, technologies applied, spatial coverage and the use of the space they occupy, as well as the effects they have on their immediate and wider surroundings. Structural changes resulting from environmental effects of these production and infrastructure systems may be classified into several groups:

- Regional development: concentration of investments, activities and jobs in a relatively small area; population movements oriented towards job supply; development of infrastructure systems in immediate and wider surroundings; small possibility for the dispersion of the production system's plants; transformation of the settlements' network;
- Socio-economic transformations: influence on the process of urbanization and change in the socio-economic structure of the (predominantly rural) population in the immediate vicinity of a production system; change of occupation and (frequently) place of residence; addressing of existential problems of families moving out of zones of production systems' expansion (open pits, accumulations, etc.);
- Economic effects: "positive" and "negative" external effects in immediate and wider surroundings as a result of the development and operation of production and infrastructure systems; positive and/or negative effects in terms of land value changes – influence of location rent, share of social, public utility, ecological and other overhead expenses in the structure of investments and operational costs;
- Arrangement and use of space: lasting or temporary change of land use (especially pronounced in cases of mines with surface

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exploitation and water accumulations); changes in the size and functions of settlements in immediate surroundings; changes in the provision of infrastructure and public utility services to settlements and areas outside settlements: construction of production facilities and the required territorial arrangement;

- Environment: lasting or temporary degradation of natural resources (land, forests, waters, etc.) in the immediate surroundings of production systems; changes in eco-systems, landscape and overall natural ambience; changes in the regime of surface and sub-surface waters, especially in the case of open cast mines, water and other accumulations; soil, water and air pollution, destruction and degradation of vegetation, etc.

The above-mentioned influences on immediate and wider surroundings are typical for zones with substantial exploitation of mineral raw materials, while only some of them are displayed in zones with medium and large water accumulations or main corridors.

Spatial development management in these "special purpose areas" requires specific normative, institutional and organizational solutions, as well as continual research, planning, programming and designing (Spasić, 1988).

STRUCTURAL CHANGES, CONFLICTS AND LIMITATIONS OF SPATIAL DEVELOPMENT

Environmental effects of large economic and infrastructure systems may also be viewed through the prism of identification and relativization of developmental conflicts and the reconciliation of different or opposing interests in the arrangement and use of space:

- Developmental conflicts: opposing national and local, general and special (sectoral), common and individual or group interests, etc.; uneven regional development (conflict between the developed and undeveloped); conflicts between strategic (long-term) and operational (short-term) development objectives (rational-irrational use of resources, etc.); conflicts between positive external effects (materialized in a wider area) and negative external effects (manifested in a relatively smaller area); problems of the social costs of natural resources' exploitation; structure and allocation of capital investments, uneven development, social standards, etc.

- Conflicts of production functions: production function conflicts are essentially the conflicts of interest between mining, manufacturing or energy industry with other economic activities in the environment, such as agriculture, forestry, water management, etc.

- Spatial conflicts (conditionally speaking, since all conflicts unfold in space): changes in land use (temporary or lasting); changes in settlements' network and functions of centres; changes in transportation and other technical infrastructure networks, as well as in the regime and position of water sources; processes of urbanization, socio-economic transformation, etc.

- Use of natural resources and environmental degradation: depletion of non-renewable resources, degradation of other resources in the course of raw-material exploitation; degradation of the natural ambience (landscape); air, water and soil pollution, destruction and degradation of vegetation, etc.

The reconciliation (relativization) of so important and numerous developmental conflicts is difficult to achieve without the institution of planning. First, the planning process allows a comprehensive study of the nature, importance, causes and consequences of individual conflicts as well as their forms, duration and spheres of their manifestation, their intensity and possibilities (means) for their neutralization. Second, the process of (especially spatial) planning gathers numerous social actors, proponents of development and users of space and, within the preparation of planning documents, enables the expression and confrontation of individual interests and their adjustment on the basis of the established wider social priorities, systems of indicators, standards and criteria derived from the research and analytical work and alternative scenarios for the future, including the identification of possible effects related to specific alternatives (Spasić, 1997).

With respect to developmental conflicts, two specific cases may be identified: a) the conflicts already exist, or b) their manifestation is expected some time in the future. This points to a time-wise "distribution" of developmental conflicts, and thereby also of the conflicting (opposed) objectives. Neutralization of certain conflicts is possible by shifting them in time, and by the effects of appropriate spatial arrangements. However, in a situation when developmental conflicts happen in the same time and place, which is not at all infrequent, their reconciliation may be achieved by either a compromise or a selection of priorities. The selection of priorities may be conditioned by "higher" social interests or come as a result of future development optimization, which is a task of the planning (analytical) procedure.

Conflicts arising in the use of space may be the outcome of the limitations (of a specific location) in view of a large number of requirements, or the conflicting (non-cooperative) functions aspiring to that same space.

Conflicting objectives, for the most part, have spatial repercussions, and especially those related to the use of natural resources, environmental degradation, use of space, etc. That is why spatial planning (and planning as a whole) is often referred to as a "precondition for the equalization of opposing objectives" (Spasić, 1988).

Large production systems, addressed in this paper, are zones with relatively high capital investments. The principles of rationality and technological requirements have, at least so far, influenced the concentration of production plants, and thereby also concentration of investments into the construction of such facilities. Relatively large investments in a relatively small space result in the concentration of jobs and thus also of the population. On the other hand, investments into the exploitation and primary processing of raw materials produce a mono-functional economy and its territorialization in a relatively small area (Bor, Majdanpek, Prahovo, Lazarevac, Obrenovac, Obilić, Smederevo, etc.). Only limited possibilities exist for the dispersion of large systems' production plants in the primary transformation of raw materials. Possibilities for the dispersion and diversification of production activities do exist and may be realized through the introduction of higher stages of raw-material processing, and the development of complementary production activities and services (tertiary sector). Monostructural nature of the economy sustained over a longer period of time may, in these areas, produce social irrationalities and diminish the positive economic effects of the production systems concerned.

Although with these capital investments into major production systems only a minor part of overall economic effects is materialized locally, they increase the social productivity and create a more favourable material basis for the growth of the social and living standard, first in a smaller and then also wider area. The development of these systems enables the employment of a relatively large portion of the hitherto agrarian population, changing the economic and social structure of the population, their way of life and social habits.

Several analyses done in Serbia over the past 10-15 years indicate that a larger part of positive external effects of these production systems is materialized extraterritorially, in the process of "production consumption", and that the predominant share of negative external effects is manifested in the production system zone and its immediate surroundings.

Uneven development and arrangement of territory, monostructural nature of economic activities and a relatively high level of conflicting space functions and uses basically characterize the regional development of areas that constitute wider surroundings of large production systems.

Overall degradation of the natural and created environment in zones of influence of large economic and technological systems has already become the limiting factor for their future development. The boundary capacity of the environment, as well as the limited availability of natural resources strengthen the belief in the necessity to harmonize the future development of these systems and the overall economic and social development with environmental protection standards, available natural resources and the criteria for their rational exploitation. That also implies an appropriate concept of organization, arrangement and use of space, as well as revitalization (restoration) of the degraded areas.

Technological, ecological, spatial, social and economic factors are mutually conditioned in the development of large production systems, and in the arrangement and revitalization of space in their surroundings. These factors may be conflicting as well as complementary. Their conflictiveness is to a higher degree manifested in the perception of short-term effects, while a long-term view of overall effects increases their complementarity. Well-being and the quality of life, as the ultimate planning objectives are based on the following basic assumptions: the reaching and maintaining of the desirable economic effects and environmental quality standards, which implies an appropriate social ambience. The protection and promotion of the environment, i.e. revitalization and arrangement of the degraded space may, in a short term, conflict with the attainment of maximum economic effects, but the disregard of negative external effects may in the long run produce substantial irrationalities in overall development.

NORMATIVE, INSTITUTIONAL, METHODOLOGICAL AND ORGANIZATIONAL ASPECTS OF SPATIAL DEVELOPMENT MANAGEMENT

Spatial development management depends on normative and institutional solutions, the quality of planning, investment and technical documentation, existence of appropriate data bases and possibilities for their operationalization, as well as organizational and professional capabilities of the competent state and local bodies and professional institutions to efficiently implement the plan and investment decisions. In zones undergoing large structural changes additional efforts are needed in view of numerous limitations and conflicting interests.

The sphere of spatial (and urban) development, i.e. spatial arrangement and construction in the Republic of Serbia is regulated by the most recent Planning and Construction Law (Official Gazette of the RS, no. 72/09), as well as numerous by-laws, norms and standards. Other spheres and sectors related to spatial development are also legally regulated by specific laws and by-laws. On the whole, there is a substantial degree of disharmony between specific legal regulations in such spheres as development planning, spatial arrangement and construction, environmental protection, infrastructural systems, socio-economic development, etc. In addition to that, numerous legal provisions are insufficiently clear or precise, which leads to ambiguous interpretations and inconsistent implementation of regulations.

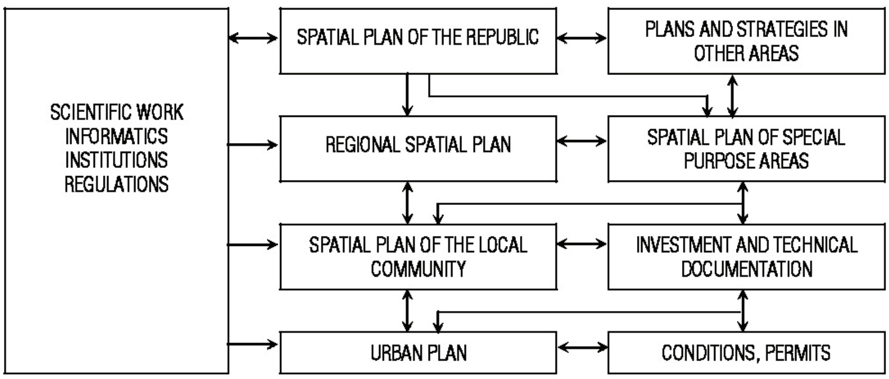
In institutional terms, many departments in the state administration concerned with specific areas and sectors act as small feuds displaying no initiative to establish cooperation with other departments or institutions.

Attempt to synchronize activities and competences for spatial development in all spheres through the institution of spatial planning has limited results. One of the reasons for this outcome is the fact that spatial planning is in many sectors viewed as a "physical" rather than integral development planning.

Under these circumstances, a major advance in institutional support to planning would be the establishment of an inter-ministerial (professional) body attached to the Serbian Government to coordinate and harmonize the process of planning and the adoption of planning and development decisions in different areas and sectors.

Large economic and infrastructural systems in special-purpose areas are particularly important for the state and the adoption of planning, investment and development decisions concerning these systems falls within the competences of the Republic. That is also why institutional support to development is for the most part within the competence of the Republic. A smaller part of competences has been vested in local communities (adoption of urban plans, expropriation of real estate, municipal utility systems, etc.). The management of large economic and infrastructural systems has been

Chart 1: Planning system in Serbia



entrusted to appropriate public enterprises of the republic (power utilities, transportation, water management, etc.).

For the time being, economic and infrastructural systems in these areas are state owned, although this state of affairs will not be necessarily retained. However, in the event of change of ownership relations in the forthcoming period, it will be necessary for the Republic to retain the control mechanisms for the management of spatial and overall development in these areas. That is particularly important for the efficient resolution of problems such as harmonisation of opposing interests, conflict resolution, protection of the environment, relaxation of social tensions, etc.

Key instruments acting as the control mechanism for spatial development management in these areas must be within the sphere of activity of institutions concerned with spatial planning, construction and arrangement.

Legal regulations and institutional support to spatial development in these areas may be improved either by supplementing and harmonizing the existing regulations and/or adopting a special law ("lex specialis") to comprehensively regulate the issues of development, construction, protection, etc. in special purpose areas, e.g. in large mining and especially lignite basins with open cast exploitation (Spasić, Maričić, Džunić, 2009).

The development of open cast mining and plants for lignite transformation in a mining basin, dynamic changes in space and the large scope of natural and created environment degradation give overall development and spatial arrangement and revitalization quite specific features - physical interventions are extensive and dynamic, socio-economic changes are delicate, and intensity and diversity of environmental degradation is great. That is why the activity involving development planning, arrangement and revitalization of space in large lignite basins is quite specific and requires an appropriate adjustment of institutional organization and normative-legal regulations, as well as of the approach, methods, contents, dynamics and other aspects of planning. The specific characteristics of planning in lignite basins are related to the orientation of the overall future development (economic, social, spatial, technological, ecological and other aspects), spatial arrangement and revitalization unfolding at a pace dictated by the development of surface lignite mining.

Chart 2: Synchronization activities in development planning

SPATIAL DEVELOPMENT	ECONOMIC AND TECHNICAL DEVELOPMENT	ENVIRONMENT MANAGEMENT	HARMONIZATION WITH OTHER AREAS
A. NATIONAL LEVEL			
SPATIAL PLAN OF THE REPUBLIC ↔	DOMINANT SECTOR DEVELOPMENT STRATEGY ↔	STRATEGY OF ENVIRONMENTAL PROTECTION (MANAGEMENT) ↔	DEVELOPMENT STRATEGIES IN OTHER AREAS
↓	↓	↓	↓
1) DECISION TO ELABORATE SP* ↔	1) DECISION TO ELABORATE STRATEGY ↔	1) DECISION TO ELABORATE STRATEGY ↔	1) DECISION TO ELABORATE STRATEGY
↓	↓	↓	↓
2) PROGRAMME TASK FOR STRATEGY ELABORATION	2) PROGRAMME TASK FOR STRATEGY ELABORATION	2) PROGRAMME TASK FOR STRATEGY ELABORATION	2) PROGRAMME TASK FOR STRATEGY ELABORATION
↓	↓	↓	↓
3) STRATEGY (CONCEPT) OF THE REPUBLIC SPATIAL PLAN ↔	3) DEVELOPMENT STRATEGY STARTING POINT ↔	3) PROTECTION STRATEGY STARTING POINT ↔	3) DEVELOPMENT STRATEGY STARTING POINT
↓	↓	↓	↓
4) SPATIAL PLAN DRAFT ↔	4) STRATEGY DRAFT ↔	4) STRATEGY DRAFT ↔	4) STRATEGY DRAFT
↓	↓	↓	↓
5) SPATIAL PLAN ADOPTION	5) STRATEGY ADOPTION	5) STRATEGY ADOPTION	5) STRATEGY ADOPTION
↓	↓	↓	↓
6) IMPLEMENTATION PROGRAMME ↔	6) IMPLEMENTATION PROGRAMME ↔	6) IMPLEMENTATION PROGRAMME ↔	6) IMPLEMENTATION PROGRAMME
↓	↓	↓	↓
7) MONITORING ↔	7) MONITORING ↔	7) MONITORING ↔	7) MONITORING
B. REGIONAL LEVEL			
SPATIAL PLAN - SPECIAL PURPOSE AREA (SPSPA) ↔	DEVELOPMENT STRATEGY - ECONOMIC-TECHNOLOGICAL SYSTEM ↔	STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) ↔	DEVELOPMENT PROGRAMMES IN OTHER AREAS
↓	↓	↓	↓
1) AREA SPATIAL DEVELOPMENT CONCEPT ↔	1)STRATEGY STARTING POINT ↔	1) PRELIMINARY SEA REPORT ↔	1) PROGRAMME STARTING POINT
↓	↓	↓	↓
2) SPATIAL PLAN DRAFT ↔	2) STRATEGY DRAFT ↔	2) FINAL SEA REPORT ↔	2) PROGRAMME DRAFT
↓	↓	↓	↓
3) SPATIAL PLAN IMPLEMENTATION PROGRAMME ↔	3) STRATEGY IMPLEMENTATION PROGRAMME ↔	3) GUIDELOINES FOR SEA ↔	3) GUIDELINES FOR PROGRAMME IMPLEMENTATION
C. LOCAL LEVEL			
MASTER (DETAILED) REGULATION PLAN ↔	MEDIUM-TERM DEVELOPMENT PROGRAM ↔	SEA OR EIA ↔	INVESTMENT AND TECHNICAL DOCUMENTATION
↓	↓	↓	↓
PLAN CONCEPT ↔	DEVELOPMENT PROGRAMME MASTER DESIGN, PFS* ↔	PRELIMINARY REPORT ↔	MASTER DESIGN, PFS
↓	↓	↓	↓
PLAN DRAFT ↔	PRELIMINARY DESIGN FS*, EIA* ↔	FINAL REPORT ↔	PRELIMINARY DESIGN, FS, EIA
↓	↓	↓	↓
IMPLEMENTATION PROGRAMME ↔	MAIN DESIGN ↔	IMPLEMENTATION GUIDELINES ↔	MAIN DESIGN

** SP – Spatial plan; PFS – pre-feasibility study; FS – feasibility study; EIA – Environmental Impact Assessment; SEA – Strategic Environmental Assessment*

The planning system is established on the national, regional and local levels. In addition to spatial and urban planning, there are also other forms of planning related to socio-economic development, management of the environment and sustainable development, as well as planning within specific sectors (agriculture, water management, energy, transportation, etc.) and production systems. Synchronisation of all these forms of planning is necessary primarily on the national, and then also other levels.

The Spatial plan of the Republic is a planning document that may represent a platform for the synchronization and harmonization of other planning and development documents on the national level. Ideally, all planning documents should be developed simultaneously, which is practically unfeasible. The planning practice could realistically use the following approach: in the elaboration of the spatial plan all the existing planning documents serve as a research and information basis for the establishment of spatial plan's concepts. Once a spatial plan is adopted, other planning and development documents are harmonized with its positions. A similar approach may also be used for regional level planning, i.e. harmonization of plans for special purpose areas and other planning documents.

Harmonization of planning, investment and technical documentation

Special purpose areas are places where major investments into economic and infrastructural systems are made and where complex technological and engineering systems are formed. The experience acquired so far indicates the need for simultaneous and synchronized elaboration of planning, investment and technical documentation.

Planning, investment and technical documentation has a very important role in the management of spatial, socio-economic and technological development in special purpose areas wherein development triggers extensive degradation of the environment and important structural changes.

Elaboration of a spatial plan for a special purpose area as an important strategic planning document must be harmonized with the elaboration of the master design and preliminary feasibility studies for industrial, technological and infrastructural systems and vice versa. Elaboration of the regulation plan is harmonized with those of the preliminary design and the feasibility study. A component part of the spatial plan (and possibly regulation plan) is a strategic environmental assessment (SEA)[3], while the environmental impact analysis (EIA) is a part of the preliminary design. Regulation plan also includes the programme for relocation of the population and infrastructural, economic, utility and public function facilities (if required for the development of an economic or infrastructural system).

The research and analytical stage in the elaboration of the spatial plan corresponds with those of "preliminary activities" for the master design and status analysis for the strategic environmental assessment.

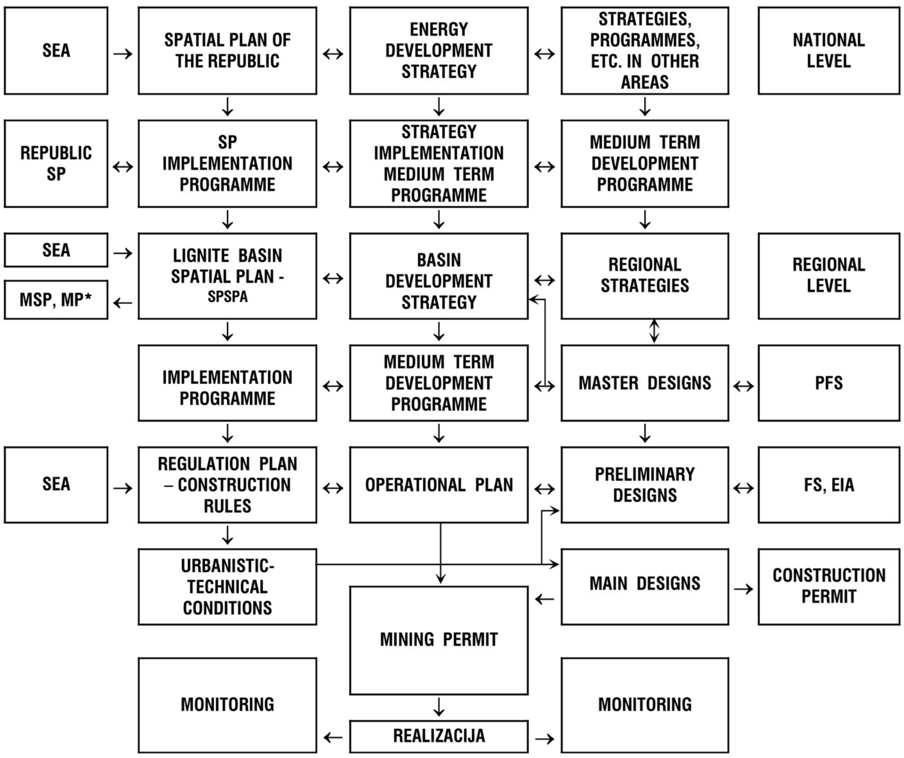
The provision of conditions, views and agreements of competent bodies and organizations should be integrated by stages in the elaboration of planning and technical documentation. Stages and documents of the planning and project elaboration processes are subject to professional and social verification. Participation of local communities and citizens and their influence on decision-making should be ensured both in the elaboration stage of spatial-planning documentation as well as in the development of project documentation for individual production and infrastructure systems and their environmental impact analyses.

Main instruments for the implementation of planning, investment and technical documents are the use permits and post-project analyses of the environmental impact of infrastructural systems, as well as monitoring and post-plan evaluation of the application planning documents (Spasić, Maksin-Mićić, 2003). The stage of monitoring necessitates a more efficient institutional control system and the establishment of a spatial information system.

Comparing the content of individual stages of planning and designing one could easily note similarities in both the contents and methods of work. The formation of joint teams and time-wise adjustment of complementary stages may save a lot of time and assets and simultaneously improve the reliability of planning and designing, i.e. the adoption of planning and investment decisions. Contrary to planning on the national level (where simultaneous elaboration of different plans, programmes and strategies is not realistic) simultaneous and synchronized elaboration of planning, investment and technical documentation with different degrees of detail may, in this case, be possible subject to good organization and timely preparations.

Elaboration of planning, investment and technical documentation is largely based on the results of synchronised scientific research and professional analyses with appropriate institutional and informatic support and respect

Chart 3: Harmonization of the planning process – the case of a large lignite basin



MP – Master Plan; MSP – Municipality Spatial Plan; SPSPA – Spatial Plan of Special Purpose Area

[3] For more details on EIA/SEA application in Serbian land use planning see: Stojanović (2005), and especially for lignite basin see eg. Maričić (2006)

Chart 4. Model system for the planning of primary/main (trans-European and national) infrastructure corridors (Spasić, Maksin-Mićić, 2003)

SPATIAL PLANNING SYSTEM		ENVIRONMENTAL QUALITY PLANNING AND MANAGEMENT SYSTEM		SECTORAL INFRASTRUCTURE PLANNING SYSTEM
Spatial plan of the republic ▪ Network of centres and infrastructure corridors	↔	National strategy/ environmental protection programme	↔	National development strategy for transport and other primary infrastructure networks ▪ Network of primary infrastructure corridors
↓↑		↓↑		↓↑
Regional spatial plan or Spatial plan of a special purpose corridor area ▪ Options for development and use of space for different infrastructure systems siting	↔	Strategic environmental assessment of infrastructure systems sitings	↔	Master design of infrastructure system ▪ Siting options and link with the surroundings of infrastructure systems in the corridor Development strategy/programme of secondary networks of (regional and local) infrastructure.
↓↑		↓↑		↓↑
Regulation plan ▪ Options for the use and organization of space for infrastructure system variants	↔	Infrastructure system environmental impact analysis	↔	Preliminary design ▪ Options for infrastructure systems sections and facilities
↓↑		↓↑		↓↑
Implementation of planning decisions	↔	Implementation of environmental impact analysis	↔	Implementation of investment decisions
↓↑		↓↑		↓↑
Monitoring of corridor space	↔	Monitoring of corridor environment	↔	Monitoring of infrastructure system
↓↑		↓↑		↓↑
Review of plans (regulation and regional or spatial corridor plan) and replanning	↔	Post-project impact analysis and review of strategic environmental assessment	↔	Review of (preliminary and master) designs and redesigning

of existing regulations, technical and other standards. Despite the fact that numerous scientific papers and recommendations for the improvement of legal regulations in Serbia have repeatedly indicated that the successful realization of major projects necessitates synchronised elaboration of planning, investment and technical documents, that problem has not been resolved in a satisfactory manner by the existing legal regulations.

INFORMATION SYSTEM, SYSTEM OF INDICATORS AND MONITORING

Modern planning cannot be envisaged without appropriate background material and information organized in a manner suitable for the process of research, planning and implementation. The global challenge of sustainable development and operationalization of economic, social and environmental components implies an integrated approach to the use, arrangement and protection of space through development plans, programmes and projects, multisectoral coordination, appropriate institutional and organizational arrangements, information and partnership of all participants. Agenda 21 emphasizes the importance of developing and strengthening information systems to support the decision making, assessment of future changes and development management and points to the need to undertake the relevant changes conducive to an improved collection and use of data, methods for their assessment and analysis and increased availability and exchange of information. The Bathurst Declaration on Land Administration for Sustainable Development (1999) indicates the importance of providing access to quality spatial information as a condition for improved land management and use. In brief, efficient spatial management, implementation of development programs and planning of all spatial undertakings require the adjustment, arrangement and modernization of spatial records and data bases, i.e. the establishment of spatial data infrastructure.

The concept of National Spatial Data Infrastructure – NSDI, started to develop in the last two decades of the 20th century. The advancement and development of spatial data information infrastructure include the policies, basic data sets, technical standards, network access (technologies) and human resources (beneficiaries and providers) required for effective collection, management, accessibility, delivery and use of spatial data at different administrative levels. The establishment of spatial data infrastructure is not only a matter of technology, but also of the institutional setup, adoption of regulatory framework and promotion of cooperation (Nedovic-Budic et al, 2007). Namely, the establishment and development of NSDI is a highly complex and time-consuming process and implies the updating of topographic and cadastral sources, digital data bases, creation of numerous administrative and thematic data sets, and a very important segment related to the establishment of institutional arrangements/agreements – norms for the exchange and distribution of spatial data, norms concerning metadata, procedures for data use and maintenance, etc.

Spatial planning is the largest single user of diverse sets of spatial data and has a dual role in spatial data infrastructure and information management in terms of a) providing access to spatial data and their use for planning purposes and b) producing its own sets of spatial data (plans) for incorporation into the spatial data infrastructure (local, regional, national). A formally established NSDI still does not exist in Serbia.[4]

The matter of establishment of a spatial information system, i.e. information basis for the needs of spatial planning and arrangement was brought up on several occasions and various preliminary outlines of appropriate information projects have been developed.[5] These projects address various aspects – review and evaluation of the existing information basis for the needs of planning at all levels, guidelines for the definition of information system's concept, indications concerning institutional and organizational forms, elements for the concept and assumptions for the implementation of the

[4] The Republic Geodetic Institute in cooperation with the Norwegian state mapping and cadastre authority Statens Kartverk drew up a questionnaire for potential partners in the establishment of Serbia's national spatial data infrastructure. In May 2009, a Draft NSDI strategy was presented. See http://www.personalmag.rs/tag/republicki-geodetski-zavod/.

[5] "Preliminary report on the possibilities to develop information systems for the purposes of spatial planning in the SR of Serbia", IAUS, 1989; "Adjustment and use of information systems for the needs of the Republic of Serbia's Spatial Plan", JUGINUS, Planning Institute of the SR of Serbia, IAUS, Beograd, 1990.; "Spatial development management", Faculty of Civil Engineering and IAUS, 1999-2000.

geographic information system, etc. However, a wholly complete project of this kind still does not exist. Informatic support and establishment of information systems are regulated by a specific law.[6] But the information system, as one of the most important preconditions for spatial development management has not been adequately developed so far.

[6] The Law on the Information System of the Republic of Serbia (Official Gazette of the RS, no. 12/96) promotes the establishment of a single information system in the Republic, in the sphere of state functions. This law obliges all public institutions to create digital records in their respective fields and exchange them with others. Information sub-systems are linked to form the republic information system through a joint data base, computer and telecommunications network and the use of single standards for the collection, processing, exchange and use of data and information. However, this law has not been fully applied in practice.

The recently adopted Strategy for the development of information society in the Republic of Serbia (Official Gazette of the RS, no. 87/06) defines the "information system" as a concept denoting social ability based on information, which, as such, includes not only technology, hardware, software and contents, or data, but also organization, initiatives, procedures and people involved in all that.

A series of planning and construction laws adopted since 1995, define the information system differently. The new Planning and Construction Law (OG of the RS 72/09) states that all planning documents are published in electronic form and are accessible on the Internet, and are also entered into the Central registry of planning documents kept by the ministry competent for spatial planning and urbanism, through the Republic Geodetic Institute, within the National infrastructure of geo-spatial data. For the purpose of monitoring the competent body of the local self-administration unit forms a local information system covering planning documents and spatial situation. All planning documents entered into the local information system are available to all concerned in electronic form, via the Internet.

The 2003 Planning and Construction Law (OG of the RS 47/03) defines the competences of the Agency to establish a single information system on the spatial situation in the Republic of Serbia and keep the registry of spatial-planning documents for the territory of the republic. The 1995 Law on the planning and arrangement of space and settlements in the Republic (OG of the RS 44/95) prescribes the formation of an information system for this sphere for the "collection, processing and keeping of data on the use and arrangement of space and settlements on the territory of the Republic, adoption and implementation of spatial and urban plans and other spatial data and information of interest for the exercise of the Republic's rights and duties in the planning and arrangement of space and settlements". It specifies that this information system is incorporated into the single information system of the Republic. It also stresses that special regulations govern the cooperation of the then Republic Spatial Planning Institute (competent for the establishment, organization, maintenance and management of the information system) with the authorized republic state and other bodies, organizations, institutions and public enterprises collecting the spatial data in their respective spheres, on the basis of a special law, i.e. regulation passed on the basis of a law.

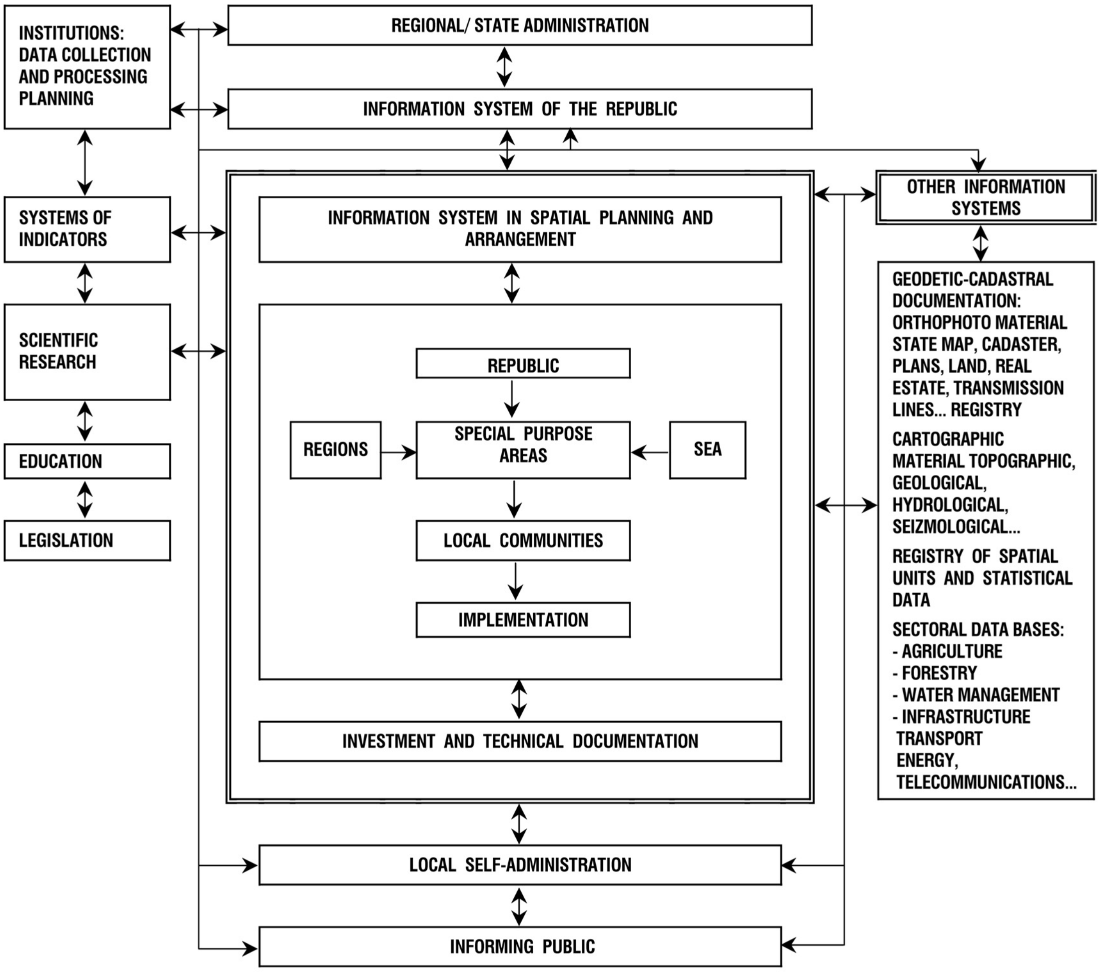
An information system for the needs of spatial planning and arrangement should, as Zakrajšek proposes, be understood as a Super Large Scale Information System, or as "information systems in the sphere of spatial planning and arrangement" (Bazik, 1996, p. 46). Namely, it is a highly complex system essentially intended to create an information base for a whole "complex" of procedures in the sphere of planning, arrangement and protection of space, natural and created resources. This complex system represents: 1) an integral part of the social system of information – simultaneously receiving and conveying information to other components (it is guided by and dependent on external information), 2) it is spatially oriented (geographic information system) – its bases contain entities either indirectly or directly related to locations in space (complex information bases); it creates information relevant for decision making – in addition to a complex information basis it also includes a complex base of procedures/methods with the main purpose to translate the data into a system of indicators most appropriate to assist decision-making, and 4) it is directly intended for and linked with the conduct of specific administrative-clerical procedures.

Over the past few years the use of GIS (geographic information systems) technologies has clearly become increasingly widespread, and they represent a powerful tool in the collection, processing, analysis and synthesis of a large number of data as well as support the process of spatial development planning and management. In addition, an increasing number of digital data bases is coming into circulation. But the main deficiency is still the inferior quality of data, especially in terms of their updatedness, accessibility and level of processing, as well as insufficient coordination of all services from the point of view of their methodology, contents of work, technical equipment and compatibility. This matter has been gaining importance in recent years. Namely, Serbia lags substantially behind the EU countries in the development of an information basis on its territorial development. In view of the country's option to join the EU and its development courses one of its basic priorities is precisely the development of information bases and systems supportive of spatial management at all levels. The relevant activities are not limited to the creation of statistically homogenous data, but include the creation of data bases for spatial monitoring at all levels (national, regional and local).

In that sense the development of informatics background and information system of the Republic, as well as information systems at new management levels requires institutional and organizational changes and adjustments. Modern courses of development necessitate an increasing exchange of good quality information with the collection, processing, systematization and organization of a large number of data and a continuing information process. The development of the information system as the indispensable instrument for continuing monitoring, channelling and management of spatial development requires joint action of administrative, scientific-research, statistical and other relevant institutions engaged in the collection and processing of data, institutions concerned with planning and public participation (Chart 5). Generally speaking, a continuing information process requires a highly organized institutional system, legal support, defined methodology, integration and cooperation. In practical terms this means the establishment of a strong coordinating body on the national level and defined competences in the sphere of information activities at all levels (local, regional and national); establishment of coordination between all relevant institutions; standardization of data collecting and processing procedures and the defining of data and information exchange protocols. A special segment combines matters related to the creation of conditions with respect to equipment, programme environment and human resources (education).

An information system concerned with space, i.e. spatial planning and arrangement is a segment of a single information system established on the state level and an indispensable instrument for the monitoring and promotion of spatial development at all levels – national, regional and local. This system must be linked with other information systems and data bases in the Republic, as well as information systems developed on regional and local levels, which implies the support of modern information technologies. "The relevance, accessibility and transferability of data and information from automated data bases represent the foundation for the development of the information process in the

Chart 5. Concept of information system model in the sphere of spatial development



sphere of spatial planning and arrangement" (Spasić, Dželebdžić, 2004).

The establishment and development of a reliable system of indicators is the most important segment of the information system. Using the system of indicators is obligatory for all planning and implementation levels and forms the basis for the standardization of approaches and methods for the drawing of spatial plans, comparability of planning documents and monitoring of plans' implementation. Namely, the methodology of elaboration of spatial and urban plans requires mutual conformity of information bases from plans of higher to those of lower order and vice versa. This implies that the information system – data bases and systems of indicators – is structured by areas and hierarchical planning levels. The defining of indicators and their mutual links at different levels are attained through a two-way coordination: upward coordination is important for the collection of data, and downward coordination for the analysis of these data and identification of parameters for classification and comparisons (Dželebdžić, Petovar, 2000).

The system of indicators is highly complex and multidimensional and is used to present the state of development and potentials on the basis of which real and attainable development objectives are established, and to formulate the policies for the attainment of these objectives, development scenarios and strategies, as well as for the control of implementation, efficiency of planning measures, monitoring and assessment of the quality of life.

The indicators take a numerical and/or graphical or descriptive form. According to the structure (complexity) there are *source data*, which result from basic measurements and are as such taken over from the conventional data bases (number, surface, length, capacity, etc.); *derived indicators* stemming from empirical generalizations (density, growth rate, proportional share, construction index, land use balance, etc.), and *complex indicators* which include a more general level of interpretation (classification, valuation. Process trends, etc.). Modern information technologies offer the possibility to aggregate the indicators by complexity (Dželebdžić, 1994).

Scientific research is a component part of the planning process. Spatial planning relies on research findings obtained in a number of scientific areas (economy, sociology, demography, environment, ecology, etc.), as well as specific research aimed at the promotion of activities for the planning, arrangement and use of space (research projects financed by the Ministry of Science and Technology of the Republic of Serbia and applied research conducted during elaboration of strategic and specific spatial plans[7]. Furthermore, the promotion of planning activities also necessitates research related to the development of indicator systems for different levels of planning.

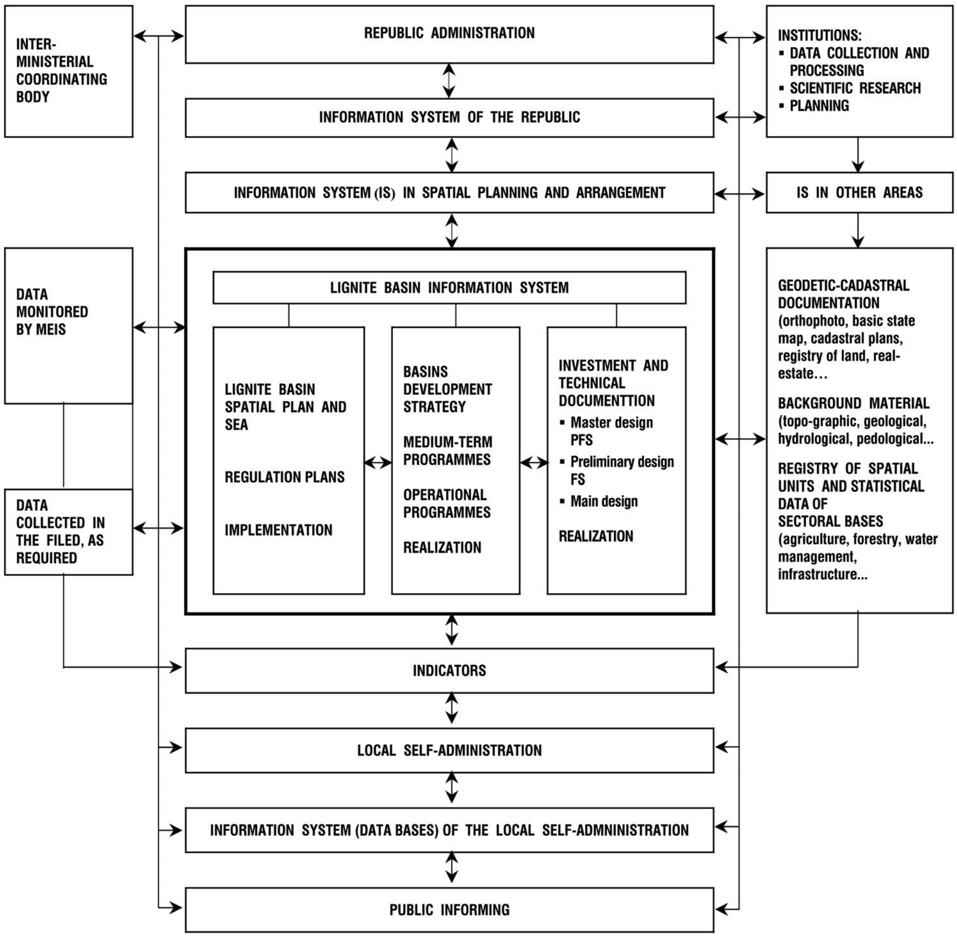
Information system for zones undergoing large structural changes – case of lignite basins

Areas of development of large production and infrastructure systems (extensive exploitation of energy and mineral raw materials – mining-energy and mining-metallurgical systems, large water accumulations, main infrastructural systems, etc.) are characterized by substantial structural changes in spatial development manifested in land use (lasting of temporary change of purpose), socio-economic transformations, concentration of activities and jobs, transformations in settlements network, effects on the environment (degradation of natural resources, changed ecosystems, pollution of air, water, soil, etc.) The scope, forms and dynamics of changes are different, and are the most conspicuous in mining basins.

Dynamic changes in lignite basins caused by the opening of excavation sites and production functions can be channelled through a dynamic and continuous process of planning and research. In that sense, the information system for the purposes of planning and channelling of development must be adjusted to the pace of changes in the basin, i.e. to the dynamic of planning, research, programming, designing and control of spatial arrangement and revitalization.

The creation of the information system for a lignite basin provides a joint framework for the elaboration, implementation and monitoring of spatial and urban plans and implementation of developmental mining-energy plans and programmes and investment-technical documentation (Chart 6). The basis of the system comprises joint data bases and systems of indicators adjusted to relevant specific features, i.e. dynamics. Namely,

Chart 6. Concept of the lignite basin information system



MP – Master Plan; MSP – Municipality Spatial Plan; SPSPA – Spatial Plan of Special Purpose Area

changes in lignite basins must be monitored in a relatively short period of time (year, month) and the use of data commonly collected by statistical and other services has limited possibilities (the problem of updating, level of processing), which is why the joint data base incorporates: a) data from information systems in other areas and b) data specific for lignite basins monitored by MEIS (geodetic, mining-geological, hydro-geological, property-legal, services for the revitalization and recultivation of land, etc.) as well as data collected as required, either by "field" services or organized teams of researchers.

a) Data from information systems in other areas include:

Geodetic-cadastral documentation – background material (digital orthophoto, basic state map 1:5000, cadastral plans 1:2 500, 1:1 000...), land registry (data on surfaces, land uses, cadastral classes and ownership) real-estate registry (buildings, public spaces...) registry of transmission lines (traffic lines and underground installations);

Cartographic material: topographic maps (1:25 000, 1:50 000, 1:100 000), set of maps of natural conditions – a clear geological map, hydro-geological, engineering-geological, hypsometric, pedological and fertility maps, seismological map, etc.

Registry of spatial units (municipalities, cadastral municipalities, settlements, cities, statistical and census circles, local communities)[8] and data processed by

[7] Preparatory work on plans for lignite basins (Mining-energy and Industrial System (MEIS) in Kosovo and Metohija and in Kolubara) included the completion of numerous research activities (studies, surveys and polls).

[8] Propositions set by the Decree on the Establishment of Specific Statistical Surveys (OG of the RS, no. 117/08) within developmental activities refer to work related to the use of GIS technologies – graphical presentation of all spatial units in digital form linked with bases (tables) http://webrzs.statserb.sr.gov.yu/axd/dokumenti/razno/Pregled%20statistickih%20istrazivanja4.pdf

Table 1. List of basic indicators related to lignite basin's spatial development

Thematic areas	Source of data
1.Natural characteristics/conditions	
Morphological characteristics	Sectoral bases, MEIS
Physical-geographical characteristics (relief, inclination, exposition)	Sectoral bases, MEIS
Engineering-geological zoning (stability, strength...)	Sectoral bases, MEIS
Hydro-geological characteristics of the terrain	Sectoral bases, MEIS
Seismic characteristics	Sectoral bases
2. Natural resources	
Lignite – characteristics, degree of exploration, reserves, conditions for exploitation, quality, and sulphur content...	Strategy, research, MEIS
Other mineral resources (metallic and non-metallic) – locations, conditions for exploitation	Sectoral bases, MEIS
Agricultural land –pedological characteristics, fertility class, conditions for use	Sectoral bases; research
Water resources – quantity and quality of water; sources: underground, surface – capacity and abundance; conditions for use	Sectoral bases; research
- water courses – quality, flood risk, relocation	Sectoral bases, projects
- accumulations – locations, dam characteristics, quantity of water in the accumulation...	Sectoral bases, projects
Forests – distribution, types, conditions for exploitation	Sectoral bases research
3. Land use	
Structure by cadastral municipalities: agricultural, forests, construction (areas intended for construction in settlements), mining (excavations, dumps), recultivated, other (arid...)	Geodetic-cadastral documentation MEIS services
Agricultural land by use (fields, orchards, vineyards, meadows, pastures...), by ownership	Geodetic-cadastral documentation
Forrest land (economically exploitable forests, forestation...)	Sectoral bases; research
Construction land (areas intended for construction in settlements, land under structures – economic, non-economic, service; surface area of streets, public built up and non-built up land...)	Planning documents, local self-administration decisions and sectoral bases
Recultivated (by years, surfaces, types – agricultural, forestry, water)	MEIS, research
4. Population	
Demographic characteristics - number of population, natural increment, migrations, age structure, aging index, functional contingents, educational structure, professional structure, sources of income, employment; households - number, size/structure; type of families...	Statistical bureau (census) vital statistics (annual), population registry (municipality); surveys, MEIS professional services
5. Space build-up	
Infrastructure systems:	
Roads – highways, regional, local – quality and characteristics - relocation, new routes, recategorization	Sectoral bases, projects
Railways – passenger, industrial gauge	Sectoral bases, projects
Water supply (reservoirs, pumping stations, drinking and technical water supply, drainage and purification of waste waters	Sectoral bases, projects
Energy infrastructure – sub-stations and long distance transmission lines (by voltage)	Sectoral bases, projects
Heating pipelines (heating plant)	Sectoral bases, projects
Telecommunications (optical cables, exchanges)	Sectoral bases, projects
Public utility facilities in settlements – sewerage, water supply network...	Sectoral bases, local self-administrations
Housing: number of apartments, surface, year of construction, equipment	Statistics, surveys
Public services:	
Health care: facilities (types of hospitals, health centres, health stations, out-patients clinics); net surface, plot surface, year of construction, number of employees, professional staff	Competent municipal services, statistics
Social welfare: facilities, net surface, plot surface, year of construction, number of employees, professional staff; number of beneficiaries (type of aid), welfare programmes...	
Pre-school: facilities, net surface, plot surface, year of construction, number of children, number of employees...	
Elementary schools: facilities, net surface, plot surface, year of construction, number of pupils, classes, employees, equipment	
Secondary schools: facilities, net surface, plot surface, year of construction, number of pupils, classes, employees, equipment, pupils' boarding homes – number of beneficiaries, surface of building...	
Culture: facilities, purpose, net surface, plot surface, year of construction, number of employees	
Physical culture: facilities, purpose net surface, plot surface, year of construction, number of employees	Municipal services, statistics
6. Economy	
By spheres of activities (construction, transportation, trade, SMEs...), social sector, private sector; number, surface, employees, operation...	Registry – municipal services, statistics

Thematic areas	Source of data
7. Cultural heritage and natural values	
Cultural heritage: facilities, category of protection, regime of protection	Spatial plan, Institute for the protection of cultural monuments
Protected natural values	Institute for the protection of nature
8. Quality of the environment	
Registry of pollutants, locations	Republic and local institutions
List of polluters (thermal electric power plants and accompanying industries, other industries, excavation sites)	MEIS
Air: standard pollutants (SO_2, soot, aero sediments)	Measurements of competent services
Specific pollutants (NOx, CO, Pb...	Special research
Water: categories of water courses according to monitored indicators	Measurements of the Hydro-Meteorological Bureau
Situation of waste waters	MEIS services, research
Land (pollution – chemical, biological...)	Research
Secondary influence on health, flora and fauna...	Research
Noise sources and influence	Research
9. MEIS activities	
- development plans and programmes	Strategies, plans, programmes, projects, MEIS area research
- economic indicators of production	
- technological processes – data of importance for the quality of the environment	
- energy facilities (thermal electric power plants)	
Specific indicators – related to narrower spatial units and intermediary development stages (5 years, 1 year, 1 month)	
- data by excavation sites – dynamics of land occupation by years/stages	Strategy, programmes, MEIS services
- changes in water regime	Research
- influence on the stability of terrain	Research
- influence of ash dumps and thermo-electric power facilities on waters (underground and surface – quality)	Research
- regimes of use and construction of land above lignite deposits	Planning documentation, local - administration
- recultivation – preparations, dynamics, type (agriculture, forest, water)	Planning documentation, research
- number of households/population living in settlements in zones of excavation expansion (by five-year periods)	Planning documentation
- population to be moved (number, structure – age, educational, professional...)	Planning documentation, statistics, surveys, programmes
- economic facilities, infrastructure systems, facilities of public services in the excavation expansion zones	Planning documentation
- relocation of settlements/parts of settlements – time of relocation, costs, data on resettling locations	Planning documentation, programmes, MEIS,
- relocation of infrastructure systems – dynamics, costs, technical solutions	Planning documentation, MEIS, local administration

statistical services: Republic Statistical Bureau – population census data (number of permanent residents, migrations, age, economic, professional, educational and national structure...), households (number, size/structure by number of members, sources of income, type of family...), housing units (total number, structure by manner of use, age, existing installations...); vital statistics data (number of births and deaths by years); annual statistical surveys (statistics for industry and mining, agriculture, forestry and water management, transportation, education, culture...); population and households registry (automated data bases at local level); registry of activities – enterprises and organizations (state and private);

Sectoral data bases (formed by competent institutions, bureaus, public enterprises, services, etc.) – agriculture (agricultural zoning, data on soil degradation and pollution...); water management (water management facilities, zones of surface and underground waters, sources of waters – capacity and quality...); infrastructure systems – facilities and networks (transport, energy, telecommunications) in databases on the republic and local levels; data on the climate and state of the environment (quality of air, waters...); natural areas and facilities (protected and proposed for protection); data on the population's health, etc.

b) Data specific for lignite basins include the results of exploration of lignite deposits – level of exploration – explored reserves by categories (geological, balance, exploitable), quality of coal (calorific value, moisture, ashes, sulphur content...), overburden and footwall characteristics, conditions of exploitation which, in line with the planned energy needs, serve to establish the pace of exploitation by years and exploitation fields – long term (rough) for complete exploitation of the lignite basin and the standard long-term horizon (15-20 years). Data continuously monitored by specialized services within the MEIS include: dynamics of land occupation, change in the regime of surface and underground waters; damaged land recultivation, relocation of settlements, economic, transport and other facilities, environmental degradation, etc. The MEIS services are also obliged to keep updated topographic maps and geodetic plans of specified scales, covering the area of exploitation. Certain data are collected by services in the field, while a part of the research is done through a survey of households in the zone of mining expansion or relocation of infrastructure systems.

The system of indicators must be adjusted to different levels of planning and includes:

- indicators at regional level formed according to thematic areas (natural conditions and resources, land use, build-up of space, population and social development, economic activities, MEIS activities, protection...),
- indicators for smaller spatial and production units (groups of excavation sites or individual pits, energy-industrial complex), settlement level and level of part of a settlement or energy-industrial complex),
- indicators required by research in different spheres of planning, designing, construction, revitalization and arrangement of space and dynamics, i.e. time cycles (viewed at the level of intermediate stages of development, programs for time intervals of less than a year in zones of open pit mining). This is also the condition for continuous and dynamic planning (the Spatial plan for the lignite basin offers a concept of future development, arrangement and revitalization of space, in line with the dynamics of expansion and opening of new open pits defined in the Development strategy for the basin for a standard long-term period of 15-20 years, while the intermediate development stages cover a period of five years. This level of planning is operationalized through plans for smaller territorial units – regulation plans for settlements/parts of settlements in the zone of mining expansion, relocation of infrastructure systems and operational plans and programs adopted within MEIS production plans.

A review of the list of basic indicators and data bases related to lignite basin spatial development is given in Table 1.

According to the proposed concept, the information system for the needs of planning in the area of the lignite basin would be within the competence of the republic. In other words, the republic would undertake the responsibility for planning in mining/lignite basins at all levels, which implies the establishment of institutional coordination and regulation of organization and functioning of the information system.

Namely, ensuring the continuation of planning, revitalization and arrangement of space in accordance with the dynamic of ongoing changes requires a single procedure for monitoring the indicators of these changes. In that sense, it would be necessary to precisely define the institutional frameworks for the collection, exchange and processing of indicators. Within the republic administration body an information centre will be established wherein all relevant data will converge to form an aggregated data base. At the same time, promotion of informatic support to development planning and channelling implies the reinforcement of information activities (technical equipment and human resources capabilities) on the local level (modernization of locally kept records – registries and data bases), in view of the fact that local self-administrations, by definition, collect and keep the bulk of the data. MEIS services update the entries in their data bases, which are directly integrated into a single base.

Furthermore, access to sets of indicators must be provided to different groups of authorized users whose activities or interests are linked to the space covered by the plan (local communities, citizens, research teams, etc.).

CONCLUSION

Large production systems are created either in large towns and along development axes, or in zones wherein natural resources, i.e. raw materials that serve as the basis for their production are located. From the point of view of a policy for a more balanced regional development systems located outside the zones of high urban concentration are more important. Relatively big capital investments accompanying the construction and development of these systems enable the appropriation of some funds for the provision of infrastructure and public utilities required for settlements, development of service activities, employment of the population, i.e. increase in the standard of living both in cities and in the rural environment. In addition to positive effects the development of these production systems also has some negative consequences. Numerous production systems, especially those in the spheres of mining, metallurgy, energy and basic chemistry, cause numerous (spatial, ecological, social, etc.) conflicts with their environment during exploitation and processing of raw materials. A relatively high concentration of investments into the development of large production systems results in the movement of the population from the regional towards a more narrowly limited environment of production systems (offer of jobs and improved conditions of life), causing the imbalance in the distribution of activities and population on the regional level. Spatial planning in such circumstances has an irreplaceable role in the identification and relativization of these conflicts, reconciliation of opposing interests and arrangement and use of space, as well as relaxation of regionally uneven development and other adverse influences of large production systems on the environment.

Processes of spatial and sectoral planning of economic and infrastructure systems, preparation of technical documentation for certain facilities or systems and assessment of their influence on environment should be mutually linked and integrated by means of: ensuring mutually comparable and complementary stages of planning, design and impact assessment; forming and using joint data bases, background materials and basic indicators and criteria; coordinating and synchronizing the planning, design and assessment activities, adoption and implementation of planning and investment decisions etc. Adjustment and synchronization of all activities in the process of adoption and implementation of planning and investment decisions have numerous positive effects. The main assumptions for the harmonization of planning activities and the attainment of the expected results include: provision of appropriate legal solutions for spatial development management, construction and protection and the relevant institutional-organisational support in the preparation, adoption, implementation and monitoring of planning and investment decisions related to economic and infrastructure systems in special purpose areas.

The establishment of a single information system – joint data base and systems of indicators, and taking the advantages of modern information technologies, offer substantial support to the integration and synchronization of planning activities in special purpose areas. Areas of large lignite basins are characterized by the dynamic changes in space and large-scope of natural and created environment degradation stemming from the development of open cast exploitation and lignite transformation plants. Dynamic changes in lignite basins may be channelled through the development of a dynamic and continuing process of planning and research. The information system of a lignite basin must be adjusted to the dynamics of change therein, i.e. to the dynamics of planning, research, programming, designing and control of space arrangement and revitalization, which requires appropriate monitoring and updating of data bases. In that sense the information system needed for the planning and channelling of development in a lignite basin is quite specific. The system of indicators is conceived in line with the needs of planning at all levels: a) regional level, b) smaller spatial and production entities (groups of excavations/individual excavation sites, energy-industrial systems), settlements and parts of settlements or energy-industrial systems and c) needs of research by different spheres of planning, designing, construction, revitalization and arrangement of space and the dynamic, i.e. time cycles (level of intermediate development stages). The data base should incorporate: a) data from information systems in other areas (geodetic-cadastral documentation, statistical data, sectoral data bases formed by numerous institutions, public enterprises, etc.); b) specific data monitored by MEIS services (geodetic, mining-geological, hydrological, property-legal, etc.), related to the dynamics of land occupation, change of regime of surface and underground waters, development of damaged land recultivation, relocation of settlements, economic, transport and other facilities, environmental degradation, etc.

Furthermore, informatic support and the use of the established system of indicators may substantially improve and increase the efficiency of plan implementation in segments related to replanning, i.e. continuation of research and planning at all levels, formulation and implementation of different policies for sustainable spatial development, monitoring and control in the application of the plans' premises.

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