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THE USE OF MINERAL RESOURCES AND ISSUES OF HARMONISATION BETWEEN SPATIAL PLANS FOR THE MINING AREAS IN SERBIA WITH OTHER STRATEGIC DOCUMENTS

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Growing development needs and requirements for mineral resources endorsed by the contemporary society reopen the issues of mineral resources finitude and effects that mineral industry imposes on the global scene. Mining is certainly among the activities which raise numerous environmental and social concerns being enhanced by continuous demand for new exploitation areas. Experience supports the need for continuous process of planning in the mining areas and development of extensive research, both fundamental and applied. With particular focus on spatial plans for the mining areas in Serbia, this paper addresses current mining regulatory framework and issue of harmonisation between spatial plans for the mining areas with other pertinent strategic documents on environmental and social protection. Regardless they have been prescriptive or legally binding, fundamental principles of these strategic documents serve as guidance towards sustainable development in the mining sector under the new institutional, organisation and economic settings.

Key words: ***mineral resources, spatial planning, Serbia, environmental and social protection, strategic documents.***

INTRODUCTION

Mineral resources' use is an integral part and one of the key premises of development worldwide. With population growth and increase in society's development needs, the requirements for minerals have grown and diversified. Despite certain opposing views, mineral resources are *conditio sine qua non* of the contemporary production. These 'stock resources' are claimed to be exhaustible or finite, which means that their present (excessive) use may affect their availability in the future. There are views that mineral resources (excluding those which are used for the energy production) are not necessarily exhaustible if there is a potential for their recycling or successive use in exploitation, primarily concerning the ores with less abundant contents. However, the attempts to recycle or substitute mineral resources based on their multiple use will only prolong the period till their lack reoccurs and becomes reopened issue in the future. In any case, having that mining has followed and is likely to pursue with the role of a vital companion for the development of a society, actors involved in planning and exploitation of the mineral resources should seek for a balance between maximising the economic use of these resources with minimum degradation to the environment, and minimum of adverse social impacts.

In opposite to other types of development activities, mineral industry is rather location dependent, i.e. mineral resources can be produced only in places where they are naturally deposited. Yet, the actual activation of a potential location for these resources' exploitation depends on a number of conditions - economic, environmental as well as the social ones.

Spatial planning in the mining areas is faced with numerous issues, such as: dynamic spatial changes, large scope of degradation of natural and man-made environment as the implication of physical interventions, socio-economic impacts, etc. Therefore, planning in large mining basins requires certain adjustments of current institutional organisation, normative regulations, standards, methods, approach, dynamics and other planning aspects. Special concern relates to strategic documents which contain guidelines on environmental protection and social stability through mining development projects. Implementation of planning concepts for the mining areas should thus be appropriately harmonised with pertinent strategic documents which are the part and parcel of international standards and practices.

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MINERAL SECTOR OUTLOOK – THE WORLD AND EUROPEAN COUNTRIES PERSPECTIVE

Mineral resources' exploitation (mineral industry) is placed at one of the key positions among the strategic economic activities. Across the World, on the annual basis, there are approximately 23 billion t of mineral resources that are exploited, out of which 18 billion t are of solid nature and 5 billion t are oil and gas (Vujić *et al.*, 2009:5). The structure of a solid mineral resources' use reflects that the non-metallic ones account for the largest part (12.0 billion t per annum), followed by the coal exploitation (3.5 billion t per annum) and metallic mineral resources exploitation (2.5 billion t per annum). There are over 50,000 mines around the world in which approximately 200 types of mineral resources are in use (ibid.).

Distribution and availability of mineral resources is quite uneven. The majority of mineral deposits (around 80%) is located in few countries only. For example, the United States, Canada and Australia are among the countries with major mineral production due to good or excellent geological predisposition[2]. Analogy can be noticed with the mineral resources applied for energy production having that over 2/3 of the world known fossil energy resources are located in 3 countries only (USA, Russia and China) (Spasić, Vujošević, 2009:152). For example, the coal reserves are widely dispersed, but the major deposits of the northern hemisphere are mainly situated between latitudes of 35 and 50 degrees. It has been estimated that 95.8% of the total coal reserves are located in 15 countries only (Maksimović *et al*., 2010). The reserves of coal in Europe are estimated on 71 billion t of hard coal whereas the reserves of lignite and brown coal are estimated on 75 billion t (EURACOAL, 2009). As for the matter of coal production at the European coal market (EU-27 countries), in 2008 out of 422.3 million t of lignite which was produced in EU-27 countries, Germany had by far the largest share (175.3 million t), followed by Greece, Poland, Czech Republic, Romania, Bulgaria, Hungary, Slovak Republic and Slovenia (Zeković, 2010:3). Poland is the greatest producer of hard coal among the EU-27 countries (83.4 million t out of 148.3 million t produced in 2008 in the EU), and it is followed by Germany, UK, Czech Republic, Spain, Bulgaria and Romania (EURACOAL, 2009).

With current level of exploitation, world production of hard coal is foreseeable for the next 160 years and of lignite for the next 460 years. Although production of coal increases, it is estimated that in the next 30 years only 25% of the presently known reserves of coal will be exhausted, which is respectively much lower in comparison to the exhaustion of current reserves of oil (84%) or gas (64%) (Maksimović *et al*., 2010:234).

Potentials and use of mineral resources in Serbia

Although there is a relatively spread public belief on the abundance of mineral resources in Serbia, which is based on the Middle age mining legacy, the present facts highly challenge this notion. Serbia has certain resources of strategic colour metals and coals for energy production (lignite), which could be to some extent comparatively better ranked at the European level (Radević, 1997:167). Economic and technology status of the mineral resources production in Serbia has been stagnating for a number of decades. On the other hand, an increasing need for mineral resources' consumption and the drop in their average content in ores have influenced a change in their way of exploitation. Surface exploitation is the dominant way of extracting solid mineral resources in all countries. In comparison to the world's 65-70% of solid mineral resources production based on surface exploitation, this share is even more emphasised in Serbia (95%) (Vujić *et al.*, 2009:5).

Surface exploitation in Serbia features lignite production, as well as the production of non-metallic mineral resources, production of copper, silver and gold, whereas the ores of lead, zinc, antimony and other higher caloric coals (brown and hard coal) are produced by underground exploitation. It is estimated that in Serbia some 100 km^2 of land surfaces have been engaged so far for the mining purposes, and that future may bring to several times multiplication of the needed territorial encompass for this activity if it is to be uninterruptedly performed (Spasić, Jokić, 1998:4).

Lignite, as one of the key mineral and thermal energy resources of Serbia takes in 96.8% of the country's total geological reserves of coal. Without considering the coal reserves of Kosovo and Metohija, the total balance reserves of coal in the rest of Serbia are estimated on 1.0 billion t of equivalent coal, or 0.34% of the world balance reserves (Maksimović *et al*., 2010:230). Out of these reserves, which are expressed in equivalent coal, Kolubara lignite basin comprises 15.4%, Kostolac 8.7%, Sjenica 1.3% and Kovin basin 2.5% (ibid.:231). Kosovo-Metohija basin with more than 67% of the total geological reserves of lignite in the Republic of Serbia represents the major energy potential but is not in use by Serbia which does not have access to these reserves after the year 1999 and the UN Resolution 1244. A long-term concept of energy development in Serbia until the year 2020 presumes an increase of lignite production from the current 37 million t per year to 50 million t per year, where the major pressure on production increase will be put on Kolubara lignite basin (Spasić, Vujošević, 2009:153).

The largest proportion of lignite produced in Serbia (93%) is used by thermal power plants for the electric energy production and 7% is used by other consumers (Maksimović *et al*., 2010:236). Lignite is therefore a foundation of the energy sector in Serbia and its present reserves allow long-term production of energy in thermal power plants. According to the Strategy of energy development in Serbia until 2015 (*Strategija razvoja energetike Srbije do 2015. godine*), the priority in energy sector development is based on modernisation and restructuring of production and processing of coal with aim to increase competitiveness as well as to fully acknowledge the ecological principles, i.e. to apply ecologically clean effective technologies.

SPATIAL PLANNING OF THE MINING AREAS IN SERBIA

As it was previously discussed, the energy potential of strategic significance for Serbia is represented by its large lignite basins. With that in view, lignite exploitation requires coordination at several planning levels (national, regional and local). Intensive development of surface exploitation, as well as of facilities for lignite transformation, dynamic spatial changes, and large scope of degradation of natural and man-made environment, created a framework of specific conditions and challenges for spatial planning in the large lignite basins. Surface exploitation brings to certain ecological problems, but it is contestable whether this type of solid mineral resources' extraction is much more condemned for the 'negative' effects than it truly imposes them. The main reason for a negative public opinion is caused by embedded visual impression of surface mines (disintegration of solid rocks, occupation of productive land, degradation of forests, etc.). At the same time it is commonly neglected the fact that this is a 'temporary condition' in the area where the mining works take place, and that with adequate planning and proper ways of technical and biological recultivation, degraded space can be effectively restored,

[2] The United States is a net importer of minerals while Canada and Australia export more than they consume.

with a number of successful international examples in support of this assertion.

Nowadays, planned coordination of a long-term development, including a subsequent regeneration of the degraded space in the large mining basins, is no longer a possibility but a necessity. Planning and regeneration in the mining basins require adjustments to the institutional setup, legal framework and relevant strategic documents. At the same time, spatial planning in the large mining basins is determined by: structural spatial changes, integral as well as the regional planning approach, information base, reconciliation of development conflicts, recultivation, long-term forecasts, etc. (Spasić *et al*., 2007, Spasić *et al*., 2009a).

Due to the nature of spatial changes which are caused by surface mining, planning in the mining areas is faced with a number of specific development, environmental, social and spatial conflicts and limitations. Planning experience from the mining areas around the world may serve as a pointer but could not be directly translated to the Serbian practice. Therefore, an extensive research, both general (fundamental) and specific (applied), is needed in support of planning activity in the mining areas. Fundamental research relates to the state-of-the-art technologies and analyses of long-term environmental implications. Applied research in this field considers structural spatial changes, socio-economic implications, possibilities for revitalisation of damaged areas, and the environmental as well as the quality of life improvements in the mining activity's immediate zone of influence. The experience confirms that research and planning process for the mining areas should be a continuous one, encompassing forecasts and development solutions for the various time horizons: long-term (20-50 years), medium-term (5-10 years), short-term (1-5 years), and operative (2-12 months) (Spasić *et al*., 2007:79).

Within the scope of integral and regional approaches, the strategic planning in large mining basins is founded on long-term forecasts (and research). Newly opened pits are typically planned for the period of 25-30 years, where the process of preparation, including a design, takes around 10 years. The accompanying so-called negative externalities, e.g. land acquisition, resettlement of population, change in the water regimes, environmental degradation, etc. are exhibited on a long-term basis (ibid.:74).

Apart from time dynamics, large mining basins are also qualified by the spatial dynamics, which is determined by continuous demand for the new exploitation areas. The requirements to expand a territorial encompass for the mining activity as well as the need to involve comprehensive development imply that the strategic planning framework in the mining basins is implemented through plans of smaller territorial entities, as well as through medium-term and short-term plans and programs that are in accordance with the general planning framework, i.e. with higher order spatial plans.

Specific targets of comprehensive planning in the mining areas involve: dissemination of scientific research results and their inclusion in development concepts; optimisation and guidance to the resettlement process; optimisation of transport facilities; utilisation of water resources and agricultural land; ecological and physical conditions for revitalisation of degraded soil; protection and preservation of natural and cultural heritage, etc.

Implementation of planning concepts, goals and solutions for the mining areas includes a range of measures and coordinated activities, e.g. improvements and adjustments to normative regulations; sustainable development; monitoring and provision of a continuous planning process; and permanent institutional support from the national, regional and local levels.

MINING REGULATORY FRAMEWORK AND PERTINENT STRATEGIC DOCUMENTS

Current international law adopts a non-interventionist approach to the mining sector, which presumes that nation-States have sovereignty over their own natural resources. State ownership over mineral resources is reflected in national legal framework. However, nation-States could disclaim a part of their sovereign rights 'through long-term practice of legal customs, through the development of general principles of a legal nature, through treaties and other binding legal agreements, and through judicial decisions' (Buergenthal & Maier, 1990:19, Guruswamy & Hendricks, 1997:15), all of which constitute a part of the international law.

Mining legislation incorporates a number of different laws which relate to regulations for environment, land, water, etc. In majority of countries, the Mining Law[3] is a key regulatory instrument for exploitation of mineral resources, and it defines both rights and obligations of stakeholders in this field (Petrić *et al.*, 2009).

Transition of the mining industry from public to the private sector re-opens an issue of legal framework adjustments in this sphere which would respond to the new economic conditions. As Otto (1996) observes, in the period 1985-1996, over 90 nations either completely changed their mineral sector laws or they have significantly altered them by amendments. This number is now probably much bigger since in the last 15 years a number of former communist countries also changed their old mining regulations. On the other hand, Serbia has not till now updated its mining law with adjustments to the market economy. Its legal framework in this field is based on the Mining Law from 1995 which was amended several times until 2009, and on the Law on geological research (1995). Planning in the large mining basins in Serbia is also treated according to the Law on planning and construction (2009), and Regulation on contents, method and procedure of developing a planning document (2010), in reference to development of 'spatial plans of the special purpose areas'. Mining sector is also partly covered by other laws referring to the energy sector development, water management, agriculture, environment, expropriation, etc. Still, many related issues which concern population resettlement, social issues, property regulation, recultivation of the damaged soil, liability, etc. have not been covered by the current legislation (Spasić *et al.*, 2009b:176).

Other strategic documents which are relevant to the mining sector in Serbia are the *National Strategy of Sustainable Development* (Nacionalna strategija održivog razvoja, 2008) with chapter on mineral resources - primarily the part on coal and fossil fuels, and the *Strategy on sustainable use of natural resources of Serbia* with partial strategy dedicated to mineral resources, latter still not being completed (Tošović, 2010:418). Goals in the sector of fossil fuels which feature the *National Strategy of Sustainable Development* are: optimum long-term energy efficiency through exploitation of non-renewable natural resources with least environmental degradation and impact on human health; exploration of new mines and sustainable use of non-renewable natural resources; application of modern methods for exploration of oil and gas – application of BAT (Best Available Techniques) for disposal of waste material; substitution of fossil fuels by the renewable energy sources with special economic incentives, etc. (Nacionalna strategija održivog razvoja, 2008:93).

Strategic documents on environmental issues related to the mining sector

Intensive exploitation of mineral resources causes the significant spatial transformation

[3] A comprehensive international law on mining has not been set up.

processes, as well as ecosystem changes and environmental degradation. Some recent global surveys show that environmental concerns (40%) continue to raise the most evident sustainable development alarm for the mining industry, being followed by social concerns (28%) (Opinion poll, 2010). Mining is certainly among the activities which has an intensive effect on the environment, both from the aspect of the mineral resources' exhaustion and from the aspect of environmental degradation and extensive pollution. On top of that, the public and most of all the environmentalists' perception of the mining industry is typically featured by the negative image created by immediate visual impacts of a large scale open-pit extraction.

Knowing that the location of mining facilities is conditioned by the imperatives of geology and that mines are linked to specific sites, the environmental effects of this activity tend to be governed by site-specific factors (Wälde, 1992). With intention to integrate regulations of the Mining Law and Law on Environmental Protection, a large number of countries prescribe special guidelines on environmental protection for mining. Those guidelines are typically a part of the Law on Environmental Protection referring to the following aspects: Environmental Impact Assessment; Socio-Economic Impact Assessment; environmental management plan; environmental monitoring programme; environmental audits and reports; recultivation programme; mine closure; compensation; costs and financial aspects. Some other issues, e.g. water usage, waste disposal, air pollution and control of hazard substances are typically regulated by other specific laws.

Responsibilities of the mining sector towards environment are governed by actions in the international forum and these actions are channelled via certain conventions and strategies, e.g. Stockholm Declaration on the Human Environment (1972); Rio Declaration on Environment and Development (1992); Kyoto Protocol (1997); Johannesburg Declaration from the World Summit on Sustainable Development (2002), just to name a few.

Principles of direct relevance for the mining activity, which are stated in these documents, underline the following obligations: non-renewable resources should be used and protected in a way to provide the benefit of present as well as of future generations; identification and prevention of environmental risks require application of adequate technology and research; for mitigation of effects that climate changes put on sustainable economic development it is most necessary to apply the concept of 'precautionary approach'; the emphasis should be made on co-operation through various types of arrangements and trans-boundary movements to prevent, control, reduce and eliminate adverse environmental effects. Still, such treaty obligations apply to the signatory countries only, forming the boundaries on their general applicability.

Serbia has ratified 64 international conventions in the sphere of environmental protection (ratifications which are taken over as responsibilities of a successive country), whereas ratification of other international conventions in this sphere is in the course (Petrić *et al.*, 2009).

In relation to the mining-energy sector, the country's priority in the forthcoming period is the implementation of the SEE Energy Community Treaty which was signed in 2005 in Athens between the European Community on the one side and the countries of south-eastern Europe including Serbia, on the other side. The Contract was enacted in Serbia in 2006 by the Law on ratification of Energy Community Treaty SEE (2006). As Gavrić et al. (2009) notice, the Energy Community Treaty foresees a gradual but comprehensive application of *Acquis Communataire Environment* by the year 2017, which is related to the energy and mining sector of activities. These obligations include: implementation of the Directive 2001/80/EC of the European Parliament dated 23rd October 2003 on the limitation of emissions of certain pollutants into the air from large combustion plants and Council Directive 79/409/EEC of 2nd April 1979; implementation of Council Directive 85/337/EEC of 27th June 1985 on the assessment of the effects of certain public and private projects on the environment, with modifications and amendments from the Council Directive 97/11/EC of 3rd March 1997 and the Directive 2003/35/EC of the European Parliament of 26th May 2003; and implementation of Council Directive 79/409/ EEC of 2nd April 1979 on the conservation of wild birds (Article 4 (2)).

For Serbia as a non-annex country, the policy of the EU which defines responsibility to reduce CO_2 emissions by 20% until 2020 does not impose any direct responsibilities, but it entitles Serbia to fully participate as a signatory of the Energy Community Treaty (ibid.:29). With present global concern on the climate changes and with the insight on the mining-energy industry being one of the most carbon-intensive sectors influencing these changes, Serbia is directed to implementation of the UN Framework Convention on Climate Changes, ratified by the State Union Serbia and Montenegro in 2001. Implementation of this convention should at least cover the preparation of the inventory of greenhouse gases and reporting on emissions. As an important step towards adjustments with 'green' regulation, and as the opening possibility for application of clean development mechanisms (CDM projects), Serbia ratified the Kyoto Protocol in 2007. However, it should be stressed that in terms of taking in responsibilities of quantified reduction of GHG emission in relatively short term, Serbia as a non-annex country may face difficulties if it doesn't obtain a significant technical and technological support.

Strategic documents on socioeconomic issues related to the mining sector

Involuntary resettlement is among the most delicate issues accompanying large-scale development projects including those relating to lignite and energy production (Petrić, 2005). Displacement of people from their traditional residential place implies not only the change of their actual physical environment, but also the change of their social and cultural settings. In this case, the social relationships, people's needs, values, customs, and attitudes are typically faced with major changes due to the new physical and social circumstances which demand certain adaptations. Although planning for resettlement which is induced by large-scale mining projects in Serbia has not been of a very long tradition (it goes back to the beginning of 1980s), the local experience confirms that the process of people's adjustments to the resettlement will be more successful if they are properly and timely informed on: development goals; dynamics of the exploitation area's expansion; dynamics of planned resettlement for a certain time ahead; resettlement conditions; options for compensation of the property loss; etc. (Spasić, 1998).

Ideally, the resettlement process should result in rehabilitation of the previous socioeconomic status of the affected people/community. Yet this goal is often out of reach, not to mention that it is much less likely to achieve the improved position of a community after its resettlement in comparison to the position it had before the process started. Basically, the paradox is that development process embedded in the mining activity goes hand in hand with the risk of impoverishment of population that has to resettle because of the mining activity's expansion.

Even though development induced displacement is not a new thing, it was long the case that policies or guidelines on involuntary resettlement have been missing. For example,

the state would typically deal with the legal process of expropriation with outlined compensation mechanisms but without further consideration of resettlement in the ways that would prevent impoverishment.

Starting from the early 1970s, in response to consequences of social impacts of various development projects including the ones related to the mining sector, much interest has been raised over development of the Social Impact Assessment (SIA). There are many definitions of SIA but in general SIA is a methodology or instrument which is performed for assessing the social impacts of planned interventions or events, and for development of strategies for the ongoing monitoring and management of those impacts (Vanclay, 2003:6). The key objective of undertaking SIA is to provide that local communities are not being threatened and that they can achieve sustainable benefits from development activities such as mining projects. Instead of being merely concerned with the identification and/or amelioration of unintended/adverse social consequences, the objective of SIA is to take the proactive stance for ensuring better development outcomes, especially in terms of minimising the costs of development activity borne by people. SIA is not yet a part of particular legislation at the EU level although in the last couple of years the Impact Assessments in general are getting in focus of attention (Jokić, Petovar, 2010). In Australia, for example, SIA for mine development purposes has already become a standard practice being integrated in the country's legislation system. Experience shows that SIA should be used to promote sustainability both for the mining company and the affected people, and it should be a process of navigation rather than prediction. One can distinguish two different approaches in performing SIA - 'technical' and 'participative' one. As Lahiri-Dutt *et al.* (2008:13) point out 'the technical approach to SIA treats social impacts in the same way as environmental impacts, without particular attention to public participation, whereas the participative SIA acknowledges that local people know more about their own lives and things that would matter to them in the future than outside experts or mining company staff'. Participative SIA involves community representatives in the ongoing monitoring and evaluation of activities featuring the whole mining project – from its initiation till the mine closure. Hence, community is actively participating in the dialogue with development proponents throughout whole mining project's lifecycle giving community a chance to have a say in management and mitigation of impacts.

Although in Serbia the resettlement plans are included in the planning process for the mining/energy development, the participative SIA is still lacking. This is not surprising having that the sole interest of development proponents is oriented towards the easiest, simplest and cheapest way to resettle local population (land occupiers, affected people) in order to provide undisturbed mining activity. Instead, more attention needs to be paid to social stability of mining development projects, including prediction of likely impacts and community's response to them, and early assessment of benefits that local population could achieve out of these projects (Jokić, Petovar, 2010).

CONCLUSIONS – THE WAY FORWARD IN IMPLEMENTING NECESSARY ADJUSTMENTS

Knowing that Serbia highly depends on lignite as the key (strategic) resource for energy production, it is not likely that the country would opt for future decrease in its exploitation. Coal production and prospective activation of new open pits, as well as development of mining-energy systems in the mining basins in general require steering through coordinated planning actions. Spatial planning of the mining areas in Serbia develops under the circumstances of legislation reforms, endorsement and preparation of strategic/development documents as a way of necessary adjustments to the EU standards particularly in the sphere of environmental protection. The goal is to achieve sustainable development of the energy sector within new institutional, organisation and economic settings (Spasić *et al.*, 2009c).

Implementation of standards for environmental and social protection through plans for the mining sector development in Serbia is exposed to two types of challenges. First one is the focus on competitiveness growth and wish to sustain economic development versus environmental and social equation, and the second one is adaptation to externally suggested standards to local conditions, institutional and legal framework. Easy solution to this inherent tension could not be seen except if some kind of 'double' standards is applied on the global scene. Developed World would thus be subjected to strict standards given in the pertinent strategic documents on environmental and social protection within mining activity, whereas developing countries such as Serbia would have less restrictive global minimum standards which will gradually evolve depending on the obtained technical and technological support.

Regardless they have been prescriptive or legally binding, the following fundamental principles consisted in various strategic documents should serve as guidelines for adjustment of planning process in the mining areas:

- Identification of environmental management priorities, early and comprehensive environmental impact assessment, pollution control and other steps for prevention and mitigation of negative effects;
- Awareness on the SIA importance which should be conducted right from the start of the mining project;
- Identification of environmental responsibilities both in the mining sector and at the highest national levels of management and decision-making;
- Provision of real participation and dialogue with communities affected by the mining activity, as well as with other stakeholders involved in social and environmental aspects of the mining activity;
- Application of modern technologies for environmental protection in all phases of mining activity and the emphasis on appropriate technology transfer which would mitigate negative environmental impacts that mining may impose; and
- Development of infrastructure, information system and capacity building for environmental management through mining activity.

References

Buergenthal, T. & Maier, H.G. (1990) *Public international law in a nutshell*. Second edition. St. Paul, MN: West Publishing co.

European Association for Coal and Lignite (EURACOAL) *Coal industry around Europe 2009*. URL: http://www.euracoal.org.

Gavrić, M., Vlajčić, A., Čeperković, B. (2009) *The green book of the Electric Power Industry of Serbia*. Belgrade: Publikum.

Guruswamy, L. & Hendricks, B. (1997) *International environmental law in a nutshell*. Eagan, Minn.: West Group.

Jokić, V., Petovar, K. (2010) Procena uticaja na socijalni razvoj u projektima otvaranja i širenja površinskih kopova, in: Nenad Spasić, Jasna Petrić (eds.) *Prostorni, socijalni i ekološki aspekti održivog razvoja u velikim ugljenim basenima*, Tematski zbornik, izdanje br. 61, Beograd: Institut za arhitekturu i urbanizam Srbije, p. 69-84.

Lahiri-Dutt, K., Nair, A., Dowling, S. (2008) *Social Impact Assessment: A Manual for Mining Projects*, Australian National University,

Resource Management in Asia Pacific Program.

Maksimović, S., Kričković, A., Babović, M. (2010) Ugalj, strateški energent Republike Srbije, in: Slobodan Vujić (ed.) *Mineralno-sirovinski kompleks Srbije danas: izazovi i raskršća/ Mineral-resources complex of Serbia today: Challenges and crossroads*. Beograd: Akademija inženjerskih nauka Srbije; Rudarsko-geološki fakultet Univerziteta u Beogradu; Privredna komora Srbije, p. 223-266.

Nacionalna strategija održivog razvoja printed in „Službeni glasnik RS/Official Gazette of the Republic of Serbia" No. 57/2008.

"Opinion poll: environmental concerns biggest issue facing mining industry" (2010) URL:http://www.icmm.com/page/53279/opinion-poll-environmental-concerns-biggest-issue-facing - mining - industry [accessed on 8th December 2010].

Otto, J. (1996) Foreword: The Changing Regulatory Framework for Mining Ventures. *Journal of Energy and Natural Resources Law*, 14 (3), p. 251-261.

Petrić, J. (2005) Residents' view on resettlement issue of Vreoci – Sustainability or phrases. *SPATIUM International Review*, No. 12, p. 12-17.

Petrić, J., Josimović, B., Đurđević, J. (2009) Razvoj međunarodne legislative na putu ka održivom razvoju u rudarstvu – obaveze i smernice za Srbiju, in: Mila Pucar, Nenad Spasić (eds.) *Neki aspekti održivog prostornog razvoja Srbije*. Beograd: Institut za arhitekturu i urbanizam Srbije, p.185-204.

Pravilnik o sadržini, načinu i postupku izrade planskih dokumenata/Regulation on contents, method and procedure of developing a planning document (2010), Official Gazette of the Republic of Serbia, No. 31/10, No. 69/10.

Radević, V. (1997) Eksploatacija ležišta mineralnih sirovina i konflikti sa okruženjem, in: Nenad Spasić (ed.) *Korišćenje resursa, održivi razvoj i uređenje prostora 2*, Posebna izdanja 35, Beograd: Institut za arhitekturu i urbanizam Srbije, p. 167-185.

Spasić, N. (1988) *Planiranje razvoja, obnavljanje i uređivanje prostora u velikim lignitskim basenima*, Posebna izdanja 19, Beograd: Institut za arhitekturu i urbanizam Srbije.

Spasić, N., Jokić, V. (1998) Prostorni aspekti obimnog korišćenja mineralnih sirovina, posebno lignita – konflikti i ograničenja, in: Nenad Spasić (ed.) *Korišćenje resursa, održivi razvoj i uređenje prostora 3*, Posebna izdanja 36, Beograd: Institut za arhitekturu i urbanizam Srbije, p. 3-21.

Spasić, N., Vujošević, M., Dželebdžić, O. (2007) *Sustainability in the use of natural resources and spatial development*. Belgrade: Institute of Architecture and Urban & Spatial Planning of Serbia.

Spasić, N., Vujošević, M. (2009) Pristup planiranju razvoja i uređenja prostora u velikim lignitskim basenima, in: Mila Pucar, Nenad Spasić (eds.) *Neki aspekti održivog prostornog razvoja Srbije*. Beograd: Institut za arhitekturu i urbanizam Srbije, p. 151-162.

Spasić, N., Petovar, K., Jokić, V. (2009a) Potentials and limitations of spatial and demographic development in Kosovo-Metohija lignite basin. *SPATIUM International Review*, No. 19, p. 30-50.

Spasić, N., Maričić, T., Džunić, G. (2009b) Institucionalni i normativni aspekti prostornog razvoja u velikim rudarskim basenima, in: Mila Pucar, Nenad Spasić (eds.) *Neki aspekti održivog prostornog razvoja Srbije*. Beograd: Institut za arhitekturu i urbanizam Srbije, p.163-184.

Spasić, N., Džunić, G., Đurđević, J. (2009c) Konflikti i ograničenja u prostornom razvoju rudarskih basena. *Arhitektura i urbanizam*, 27, p. 20-34.

Strategija razvoja energetike Srbije do 2015. godine printed in „Službeni glasnik RS/Official Gazette of the Republic of Serbia" No. 44/2005.

Tošović, R. (2010) Menadžment u savremenim uslovima mineralne ekonomije Srbije, in: Slobodan Vujić (ed.) *Mineralno-sirovinski kompleks Srbije danas: izazovi i raskršća/ Mineral-resources complex of Serbia today: Challenges and crossroads*. Beograd: Akademija inženjerskih nauka Srbije; Rudarsko-geološki fakultet Univerziteta u Beogradu; Privredna komora Srbije, p. 411-452.

Vanclay, F. (2003) International Principles For Social Impact Assessment. *Impact Assessment and Project Appraisal*, volume 21, number 1, March 2003, p. 5-11.

Vujić, S., Cvejić, J., Miljanović, I, Dražić, D. (2009) *Projektovanje rekultivacije i uređenja predela površinskih kopova*. Beograd:Rudarsko-geološki fakultet Univerziteta u Beogradu; Akademija inženjerskih nauka Srbije, Odeljenje rudarskih i geoloških nauka.

Wälde, T. (1992) Environmental Policies towards Mining in Developing Countries, *Journal of Energy & Natural Resources Law*, p. 1-48.

Zakon o geološkim istraživanjima/Law o geological research (1995), Official Gazette of the Republic of Serbia, No. 44/95.

Zakon o planiranju i izgradnji/Law on planning and construction (2009), Official Gazette of the Republic of Serbia, No.72/09, No.81/09, No.64/10 US

Zakon o ratifikaciji Ugovora o energetskoj zajednici JIE/Law on ratification of Energy Community Treaty SEE (2006), Official Gazette of RS, No. 62/06.

Zakon o rudarstvu/Mining Law (1995), Official Gazette of the Republic of Serbia, No. 44/95, 104/09.

Zeković, S. (2010) Opšta kretanja i perspektive razvoja sektora uglja u Evropi, in: Nenad Spasić, Jasna Petrić (eds.) *Prostorni, socijalni i ekološki aspekti održivog razvoja u velikim ugljenim basenima*, Tematski zbornik, izdanje br. 61, Beograd: Institut za arhitekturu i urbanizam Srbije, p. 1-28.

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