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*Review paper*

## LEGAL FRAMEWORK FOR RECULTIVATION OF DEGRADED AREAS CAUSED BY MINING EXPLOITATION

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**Abstract:** During the exploitation of coal, both surface and underground exploitation systems damage larger or smaller areas of land. Experiences show that land damage is significantly greater with the surface exploitation system, where the content of the space is degraded not only in the contour of the mine and the surrounding area, but changes are made in the natural flows and conditions as well.

The article presents the results of a study of the regulatory framework the issues of reclamation in some world countries also in Serbia. Practical experience of reclamation has shown that utilisation and devastation by mining activities present not only danger to affected areas but also an opportunity to correct negative developments and to plan in accordance with the expectations of the population and respected to laws.

**Keywords:** recultivation, reclamation, coal mining, legal regulation

### 1 INTRODUCTION

Recultivation can produce more value for the environment and create a better situation for post-mining land. Recultivation obligation policy is a great way to introduce a restorative approach to the environment, but main problem is the inconsistency of the mining companies for their reclamation obligation. It is very important conceptualizing the strengthening of the recultivation obligation policy in the Mining Act based on the understanding of preventing environmental damage and also for humans.

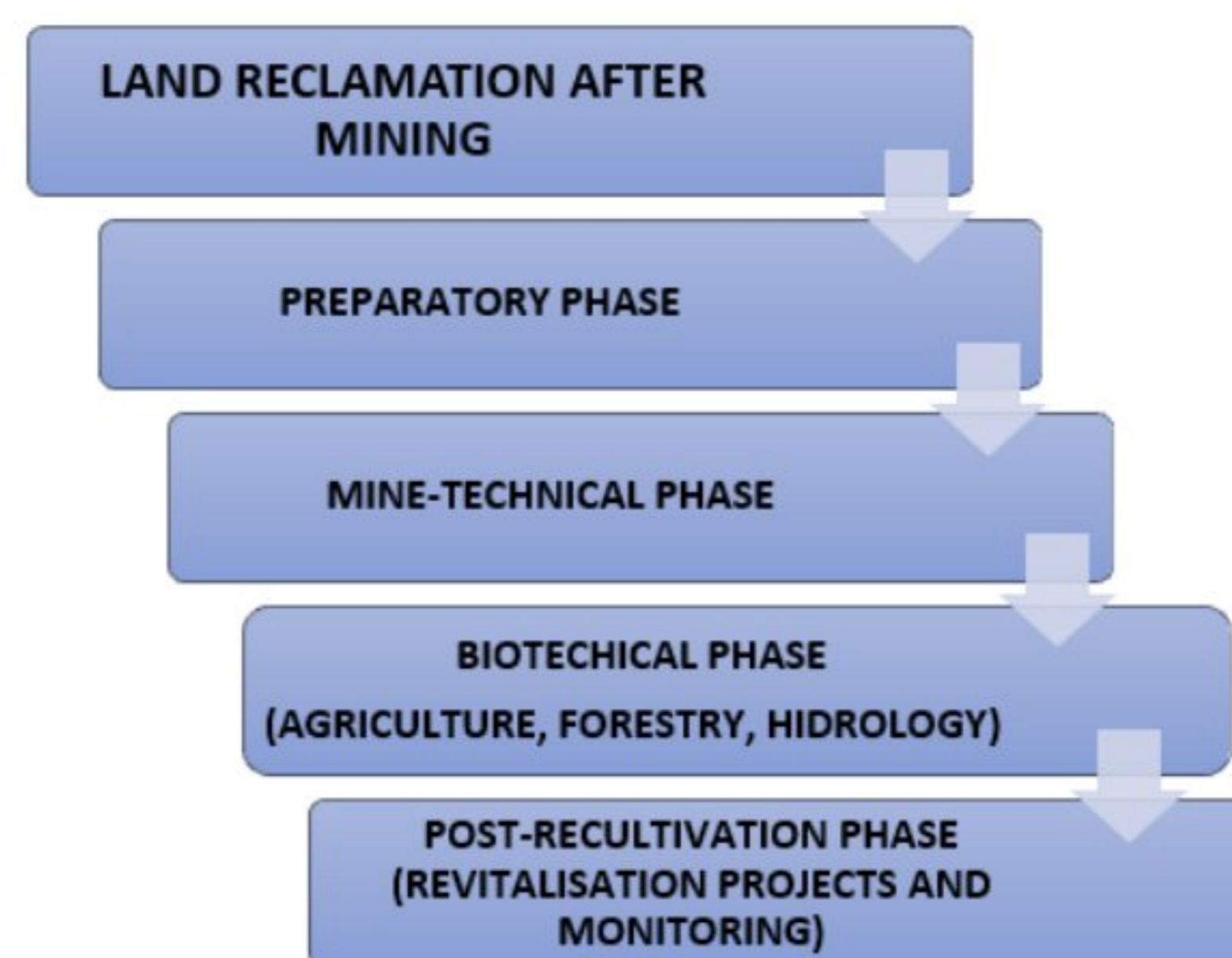
Mineral and coal mining often increases soil density, erosion, sedimentation, landslides, disruption of flora and fauna, and disruption of public health, which leads to microclimate change (Goudie and Viles, 2013). The post-mining impacts have resulted in land morphology, topography, and landscape changes. Landscapes on the post-mining areas are usually irregular, causing steep holes and tumps), after which, the land becomes

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unproductive. Mining activities have a high risk of environmental damage and create environmental justice issues, which have become a global concern (Preston, 2018). Reclamation forces mining companies to restore the caused environmental losses. Land reclamation aims to repair the damage to post-mining ecosystems by improving soil fertility and planting lands at the surface (Listiani et al., 2023). Land recultivation seeks to make the land more productive and create a far better situation for environment after coal mining. Moreover, a good recultivation policy is a great way to introduce a restorative approach to the environment plus the sustainable management of reclaimed land. Mining companies should conduct reclamation of unused post-mining land inside and outside ex-mining zone. Land outside an ex-mining zone includes (1) landfill; (2) stockpiling of raw materials; (3) transportation roads; (4) plant/processing; (5) offices and housing. For the successful recultivation and post-mining activities, few steps must be followed (the approval of the recultivation plan and post-mining plan to the proposed changes).

After the completion of mining operations, enterprises must complete reclamation of the land within the specified period and government departments should organize timely acceptance after the completion of land reclamation. For agricultural land reclamation, especially after restoration of the original use of arable land, acceptance of the main content should include: reclaimed land area, surface cover thickness, ground slope and drainage function, the physical and chemical properties of the soil are in line with the standards of arable land, and the failure to meet the acceptance criteria, should not pass the acceptance (Guo et al., 2022). After the enterprise completes the land reclamation and the acceptance meets the standard, land should be established on a scientific basis, achieve a social balance between short-term and long-term interest and respect the interests of all parties.



**Figure 1** Phases of land reclamation

## 2 TERMS - RECULTIVATION, RECLAMATION, RESTORATION, REVITALISATION

Although the term reclamation appeared at the beginning of the 20th century, the first attempts to rehabilitate degraded land date back to the end of the 19th century, note in Germany. The term "damaged land" means all those surfaces that have been affected directly or indirectly by a specific activity. The term devastated area is also usually used, which denotes a lifeless area after use, without a fertile soil layer suitable for future cultivation. Damaged land is brought to a new purpose through technical and biological reclamation, where land reclamation is a set of works for the rehabilitation (restoration) of productivity and economic value of damaged land, as well as improving the conditions of the surrounding environment.

Various terms have been used to describe the repair of land disturbed by mining and other industrial use of land use, including recultivation, reclamation, rehabilitation, reconstruction, renaturation, restoration and revegetation. In table 1 are shown basic definition regarded to recultivation of degraded land.

**Table 1** Terms which are used to describe the remediation of degraded land

<b><i>Reclamation</i></b>	represents restoring or giving the usable values to degraded land by appropriate land modelling, improvement of grounds properties, water regulation, soils restoration and roads construction.
<b><i>Rehabilitation</i></b>	means the return to the natural state according to the original land development plan. The return to the natural state should be in accordance with the aesthetic qualities of the surrounding areas.
<b><i>Restoration</i></b>	understood as the return to the original state of the altered land, the state before degradation.
<b><i>Revitalization</i></b>	is the term that covers both stages: reclamation and land development, and it means the state restoration, giving the opportunity to perform the utility function of this area.

According to Jancura and Belachek (Jancura and Belachek, 2003), the newly created landscape should satisfy the following requirements:

- "to be environmentally friendly;
- to harmonize with the natural environment, complementing the missing elements, increasing the number and variety of ecological niches;
- to meet aesthetic requirements;
- to meet the present and future needs of the local population and the region".

Considering the concept of recultivation, the analysis of researchers' views on the concept of "recultivation" shows that it is increasingly being replaced by the terms "revitalization", "renaturation", "restoration" or even "environmental remediation". Such understanding provides the harmonious inclusion of the restored landscape into the environment, taking into account landscape architecture (Ignatyeva, 2020).

Failure to plan and to start rehabilitation early in the life of the operation may create an obstacle to building the knowledge and capacity necessary to deliver a sustainable outcome that meets agreed success criteria (Australian Government 2016).

### **3 LEGAL FRAMEWORK IN WORLD**

Mine reclamation is required by the governments of most countries. Before the mining process begins, companies develop mining plans that outline the process of land disturbance to obtain the mineral resource. The mining plan also outlines a reclamation procedure to restore the land to a productive post-mining land use (Skousen and Zipper, 2014). This paper will give a brief overview of the legal regulations of some world countries China, USA, Australia, Germany, Poland.

#### **CHINA**

The State Council issued and implemented Land Reclamation Regulation (No.592 Order of the State Council of the People's Republic of China) On March 5, 2011. This LRR includes six chapters and 44 articles. That marks that China's land reclamation career entered into a new stage with cooperation of institution, standardization and legalization.

Compared with the "Stipulation on Land Reclamation" (SLR), which was issued in 1988, the main differences can be summarized by the following several aspects:

1. The definition of the reclamation object is more comprehensive. In addition to the damaged land by production and construction activities, damaged land by natural disasters is taken into consideration;
2. It has clarified the main responsibility of the land reclamation;
3. It has perfected the land reclamation obligations constraint mechanism;
4. the land reclamation incentive mechanism has been strengthened;
5. the department's responsibility is clarified further.

On December 11, 2012. based on LRR, Implementation Measures on Land Reclamation Regulation (IMLRR) was also published and represents a detailed regulation on LRR. Regulation on Compiling Land Reclamation Plan (RCLRP) was issued in 2011, contains 7 parts (general rules, opencast coalmine, underground coal mine, metal mine, petroleum and natural gas (including coal-bed gas), construction projects, and uranium mine).

Further, Completion Standards on Land Reclamation Quality (CSLRQ) was issued in 2013 and are concentrated on the land reclamation quality.

#### USA

The first legislative act relating to the recultivation of disturbed land was adopted in 1939 (USA) when authors identified three stages in the evolution of legal support for recultivation. The first stage called the initial stage of the development of recultivation legislation (1939 to 1954). Second stage was the main period, when the basis for recultivation legislation was created from 1955 to 1975. The third stage was devoted to the development of organizational and economic infrastructure.

#### AUSTRALIA

In Australia, for example, individual states and territories are responsible for mining, rehabilitation, and mine closure, including the adoption of individual laws, regulations, and guidelines. Industry and government agencies have established policies, principles, and guidelines for mine closure (Morrison-Saunders et al. 2016). Legislation on mine closure are either enacted as part of the mining sector or through specific environmental laws that apply to the mining companies. For instance, Environment Protection and Biodiversity Conservation Act (EPBC 1999) provides a uniform national framework for the environmental impact assessment of new projects. The largest share of control of the mining industry, including mine closure and recultivation, belongs to the Ministry of Minerals and Energy.

#### GERMANY

In Germany, according to the Federal Mining Act (BBergG) from 1980, mining activities do not end with the extraction of mineral resources. Rehabilitation represents an integral part of mining activity and mines operators are required under law to rehabilitate excavated sites. The surface affected mining must be rehabilitated as soon as the extraction work permits. Recultivation needs not necessarily mean restoring the land to its original state.

Practical experience of reclamation and restoration has shown that utilisation and devastation by mining activities present not only a burden or danger to affected areas but also an opportunity to correct negative developments and to plan in accordance with the expectations of the population and more freely than one could in a grown landscape (National Report).

#### POLAND

In Poland, recultivation is covered by 3 laws: Environmental Law, Geological and Mining Law and Act on the protection of agricultural and forest land. Undertaking the exploitation of mineral deposits is obliged to take the necessary measures to protect the resources of the deposit, the surface of the earth ..., successively carry out reclamation

of post-mining areas and restoration of other natural elements to the proper state (Environmental Law , art. 126).

#### **4 LEGAL FRAMEWORK IN SERBIA**

The policy of the state and local authorities regarding the protection of land from pollution and damage, as well as the mandatory undertaking of reclamation works, is regulated by several legal and by-laws, each of which, from its point of view, regulates this problem (Ivković at all, 2013).

In the field of mining, the basis is the Law on Mining and geological research, which orders that mining companies that have acquired exploitation rights are obliged to bring the land to a specific purpose during and after exploitation and carry out land reclamation activities in accordance with the reclamation project (Law on Mining and geological research, 101/2015,95/2018, 40/2021). The performance of mining exploitation is conditioned by the existence of prepared and approved investment-technical and project documentation, and the scope of recultivation and rehabilitation works is also determined by the valid regulations on the content of project documentation. The set of laws in the field of environmental protection also includes the protection of land from physical degradation and pollution by harmful materials. Only valid basic legal acts are listed here:

- Law on Environmental Protection,
- Law on Agricultural Land,
- Water law,
- Law on Forests,
- Law on Waste Management,
- Law on Environmental Impact Assessment,
- Law on Strategic Environmental Impact Assessment,
- Law on Integrated Prevention and Control of Environmental Pollution.

Legal and physical entity who use natural resources are obliged to keep up to date during the execution of works and performance of activities, as well as after their termination, plans and implements measures to prevent endangerment of the environment. Namely, whoever degrades the environment is obliged to carry out recultivation or rehabilitate the degraded environment in another way.

The assessment of the impact of the project on the environment is an integral part of the documentation without which the execution of the project cannot be started, and it is based on the preparation of the Study on the assessment of the impact on the environment (scope and content is determined by special regulations adopted on the basis of the above of the law).

## 5 COMPARATION LEGAL FRAMEWORKS IN SERBIA AND OTHER LEADING COUNTRIES

Recultivation of degraded areas caused by mining is under supervision of Ministry of Mining and Energy in Serbia, as well as regulatory function of state mining administration which are in the form of directorate, department or agency. The supervisory functions of state mining administration are defined in form of inspection and also belong to the relevant ministries. Advisory function is equally important as previous two described functions of state mining administration. In accordance with EU legislative, in Germany and Poland local entities has that role. Serbia is faced with lack of precisely defined aims of advisory service, but that does not mean that current units in state mining administration are not available for any kind of advice, in accordance with procedures. Table 2 shows relevant mining Ministries and their functions.

**Table 2** Relevant mining authorities and recultivation after degradation administration in countries

Country	The Competent Ministry	Regulatory function	Supervisory function	Advisory function
Serbia	Ministry of Mining and Energy	Sector for geology and mining	Mining Inspection	Not established
China	Ministry of Natural Resources (MNR)	Ministry of Environmental Protection	Inspection	Established
USA	Secretary for Economic Growth, Energy and Environment	The Bureau of Energy Resources (ENR)	Inspection	Established
Australia	Department of Mines, Industry and Safety	Regulated states and territories	Inspection	Established
Germany	Federal Ministry for Economic Affairs and Energy	Depending on the Federal State	District and State Mining Authorities	Local entities
Poland	Ministry of Environment	District governors	District and State Mining Authorities	Local entities

*Source: Original*



Based on the information exchange provided in Art. 21(3) of Extractive Waste Directive 2006/21/EC, the Best Available Techniques Reference Document for Management of Waste from Extractive Industries offers more than 700 pages of examples for good practice mining operations and best available techniques. Moreover, the Reference Document on BAT is not legally binding and the recommendation requires further specification, especially with regard to intact land reclamation after coal mining. Transposition of the Extractive Waste Directive 2006/21/EC into national laws, regulations and administrative provisions is mandatory for EU members. The implementation of EU Directive into national laws and administrative provisions is very different within Europe.

For example, in Germany there is one single legislative regime or framework - the national mining law, BBergG (1980) - bringing together all mining operations and the general environmental laws to speed up and simplify the complex planning process.

The law in Serbia defines that the Exploitation Holder is obliged to recultivate the land in accordance with the technical project of the technical and biological reclamation, which is an integral part of the main or supplementary mining project, and it is reported to the Ministry, i.e. the competent authority of the autonomous province and the ministry responsible for agriculture and water management, i.e. the ministry responsible for environmental protection. If liquidation or bankruptcy proceedings are opened against the holder of the exploitation, the costs of rehabilitation and recultivation of the land on which the exploitation was carried out will be covered as a matter of priority from the liquidation or bankruptcy estate.

Proposals for improved legal regulations in Serbia:

- To improve or specify certain norms, to formulate a proposal for amendments to the law, consolidate all measures for the implementation of reclamation into the law on mining as in German practice
- Policies and strategy development (emphasizes that coal mine closure requires clear policy direction, large budget outlays, and significant stakeholder consultations)
- Public participation is crucial for an effective system of environmental protection; however, the Environmental Impact Assessment Law does not provide details about what form public participation should take. It is necessary to issue Interim Measures for Public Participation in Environmental Impact
- Tightening of the penal policy for non-implementation of reclamation solutions within the prescribed legal time
- Harmonization according to the EU legal framework.

## 6 CONCLUSION

The changes in the environment effected by the coal mining are so complex that often no natural recovery of disturbed areas can occur. Land recultivation is a method of countering the negative after-effects of extracting coal and returning the land to its original purpose or conversion land. It is also a comprehensive interdisciplinary process that covers the problems of landscape redevelopment, the restoration of its productivity, environmental quality, economic and aesthetic values.

The area of land reclamation damaged by surface coal exploitation is widely covered by legal regulations and that it is the responsibility of several ministries, more precisely their authorities. In practice, this creates a number of problems, especially in the phase of creating and approving project and technical documentation, because it requires more time and higher costs. Consequently, the field of reclamation should be regulated uniformly by the Mining Law, which would avoid unnecessary administration and would not affect the quality of technical solutions and their implementation.

Identifying development of the legal framework governing the restoration of disturbed land areas, the revealed stage-by-stage evolution of the legislative base of recultivation indicates a 10-year quality gap between the Serbian legislative framework governing recultivation and the foreign ones.

Based on all of the above, it can be concluded after mining exploitation and reclamation, land should also be regulated by national laws, effectively strengthen the protection of tillable land, promote the economic cycle of land, and realize the environmental value of mining land.

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