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Review

A KNOWLEDGE BASE AS A MONITORING SYSTEM OF ENVIRONMENTAL STATE IN MINING OPERATIONS AREAS OF THE CROSS-BORDER REGION OF ROMANIA AND SERBIA

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ABSTRACT

In our opinion, more open knowledge systems are necessary to inform researchers and population about environmental challenges and to produce societal responses to environmental problems. We have developed a knowledge base to be used as a monitoring system of environmental state in the regions of copper mining operations from the cross-border area of Romania and Serbia. The knowledge base and its content are publicly available. The knowledge base hosts four sections: one section where the specific terms are defined (in English), one section containing information about the state of water, air and soil in the investigated area (in English), the third section enclosing remediation procedures (in English) and the fourth section comprising educational and awareness-building materials that are used in training sessions of youth on the subject of the environmental issues (in both Romanian and Serbian). The knowledge base can be accessed at the following link http://www.elearning-chemistry.ro/rosnet2/knowledge-base/ and a tutorial explaining how to use it is also available.

Keywords: knowledge base; mining pollution; environmental state; environmental issues; cross-border area of Romania and Serbia

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INTRODUCTION

Information technology is allowing the storage, management and use of data in ways unimagined before. Information systems can be used by research institutes, universities and NGOs to inform the public about broad environmental issues and / or local environmental situations. Consequently, information technology allows timely access to a wide range of relevant information and become a dominant tool for promoting sustainable development, the timely availability of information playing an important role in environmental decision making. Furthermore, industrial environmental data has demonstrated to be particularly useful for strategic planning by regulatory agencies (Richards and Kabjian 2001).

Nowadays everyone expects and demands easy access to accurate information. Moreover, methods helping to minimise wastes and control pollution are becoming important issues for industry, authorities, and individuals.

In the Western Romania (region of Moldova Nouă) and Eastern Serbia (Bor District) copper mining and mineral processing has played a vital role in the history and economy. The mining operations are stopped in Western Romania, but they are still active in Eastern Serbia. It is commonly accepted that mining operations conduct to environmental damages, both in the case of active mines and when the mining activities are stopped. Mining activities from cross-border area of Romania and Serbia produce serious injuries by preventing vegetation development, reducing the value and agricultural production and affecting the state of human health (Ciopec et al. 2015; Dumitru et al. 2019; Keresztesi et al. 2020; Marković et al. 2014; Obradović et al. 2012; Stevanović et al. 2011; Stevanović et al. 2013).

Another challenge regards education for the environment, being widely recognized that there is a lack of education and awareness of youth regarding the environmental issues in many countries (Ilovan et al. 2018; Bocam and Sinan 2019). Environmental education provided by higher education institutions has proven to have an important impact on training and preparing the youth for sustainable development (Pana et al. 2018; Díaz et al. 2019; Bocam and Sinan 2019).

The aim of this short communication is to present a publicly available knowledge base that is considered as a monitoring system of the environmental state in the regions of mining operations from the cross-border area of Romania and Serbia and that also promotes the education in the field of environmental protection and horizontal principles.

METHOD

We build a publicly available knowledge base (http://www.elearning-chemistry.ro/rosnet2/knowledge-base/). This knowledge base KB is considered as a monitoring system of environmental state in the cross-border area of Romania and Serbia. By the means of the KB, explanations of terms and concepts regarding mining activities and environmental protection, data concerning the pollution caused by mining operations and resulting from monitoring campaigns in the cross-border area and / or retrieved from specific literature, and training materials become available to researchers, policymakers, NGOs remediation procedures, governmental agencies, public authorities and to the general public.

RESULTS

The knowledge base (KB) is publicly accessible on the web. KB reveals the dynamics of the environmental parameters in the considered areas and the remediation procedures by summarizing all the scientific reports that are produced during the project implementation and after its end. It has four sections, as it is revealed in Figure 1. Each section contains several subcategories, and their number can be changed as appropriate.

First section, Terms Definitions, contains definitions of the terms specific for mining operations, environmental monitoring, protection, pollution and remediation (Figure 2) and the used language is English. The second section (also in English), Pollution state, describes chemical and biological methods dedicated to assess the pollution state (air, water, soil and cities pollution) in mining operations areas and one subsection, Evaluation of air, water and soil quality in considered areas, illustrating the state of the environment in the investigated areas. The data contained in this subsection are obtained by both in situ and laboratory measurements performed by the project teams and aiming to establish the pollution state of water and soil in the mining operations areas (Figure 3).

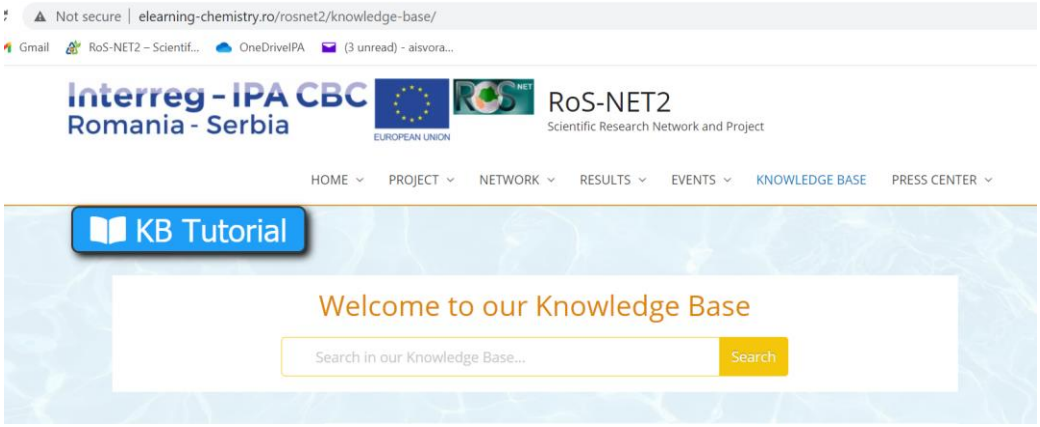

Figure 1. Illustration of the web page access of the knowledge base (http://www.elearning-chemistry.ro/rosnet2/knowledge-base/)

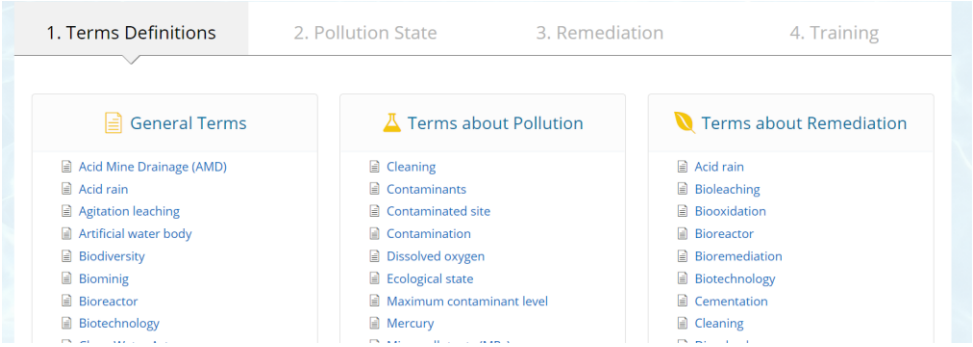

Figure 2. Illustration of the organization of the section ”Terms Definitions”.

The third section, Remediation, encompasses descriptions of physical, chemical, biological, enzymatic and miscellaneous methods found in specific literature that can be used for remediation of polluted areas due to mining activities. There also is a subsection, Remediation solution proposed by project teams, promoting those remediation methods that have been tested during the project implementation (Figure 4). All information in this section is presented in English. The fourth section contains training materials for the youth (pupils and students) and general public education and awareness rising in the field of environmental protection and horizontal principles (Figure 5). These materials are presented in both Romanian and Serbian.

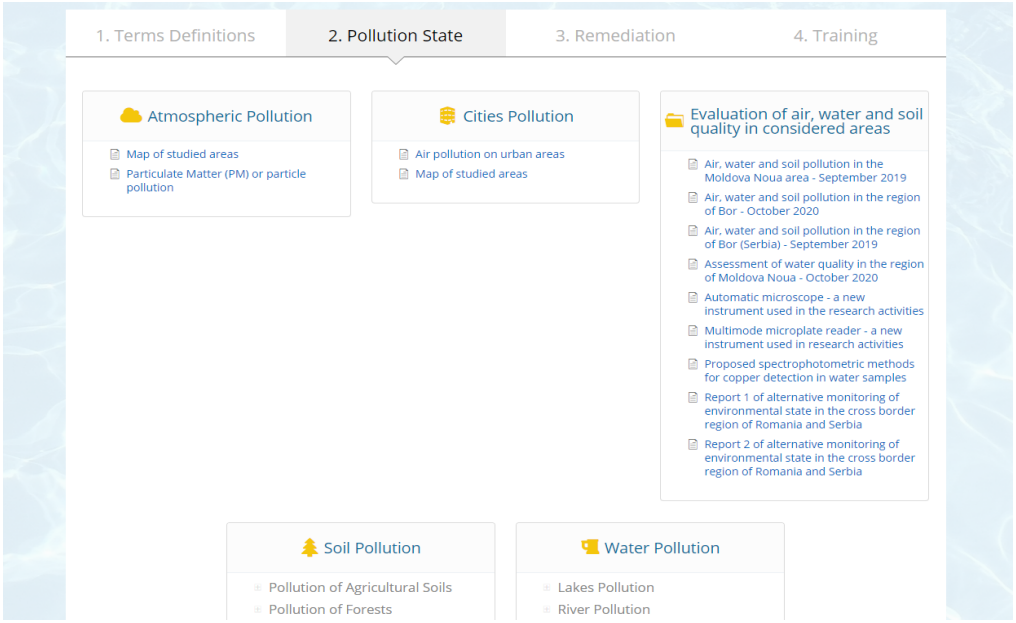

Figure 3. Illustration of the organization of the section ”Pollution state”.

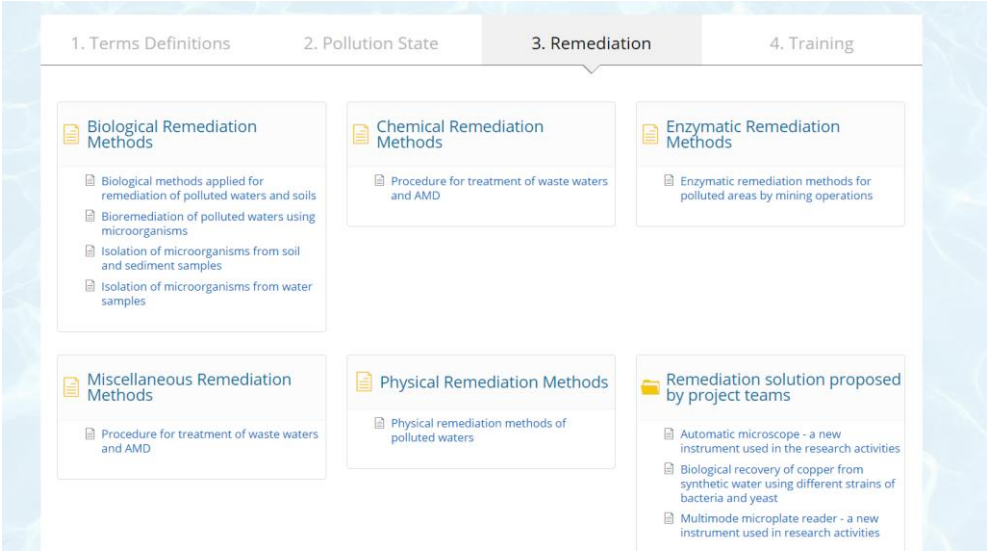

Figure 4. Illustration of the organization of the section ”Remediation”.

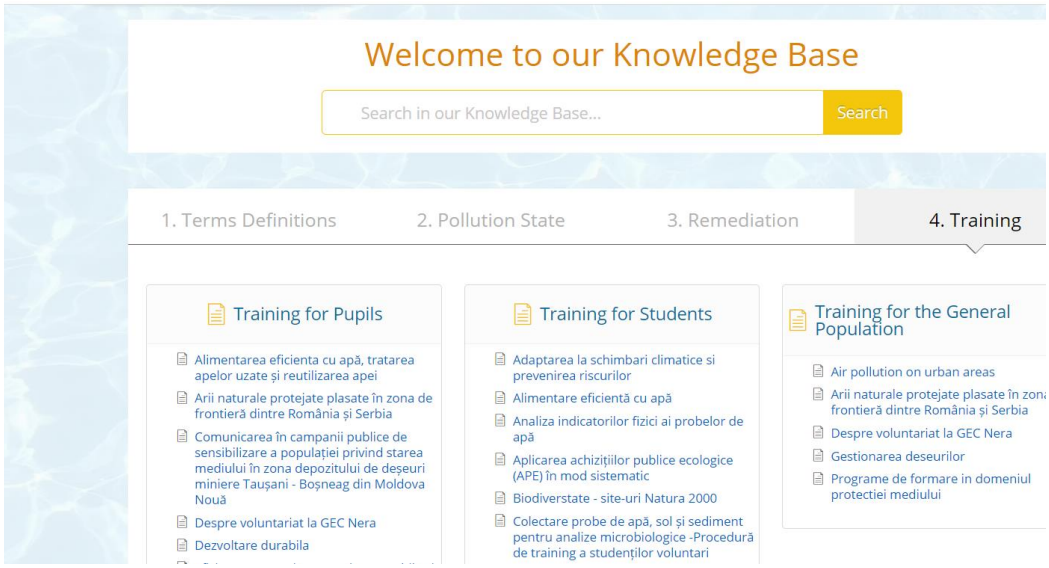

Figure 5. Illustration of the organization of the section ”Training”.

Once a subcategory is accessed (by clicking on it), its page will open and the description will be lightened, as it is revealed in Figure 6 for the term “Biodiversity”.

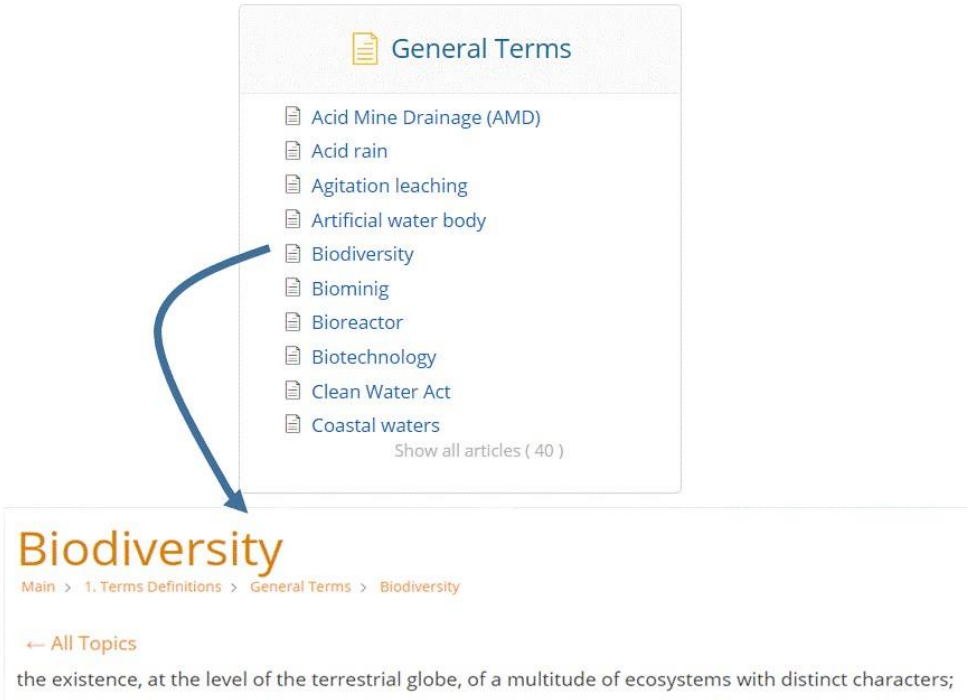

Figure 6. Illustration how the information is obtained when searching the term “Biodiversity”.

A tutorial explaining how to use the knowledge base is also available on the web page.

DISCUSSION

The publicly available KB offers both short and long time benefits. The short time benefits are expressed by the fact that people from higher education and research, NGOs, local, regional and national public authorities and institutions with activity in the field of environmental protection have unlimited access to the knowledge base. There will be a continuous update of the knowledge base after the project ending assuring its lasting effect beyond project duration. We expect, as a long time benefit, that data published in the KB and their public availability, beside the other outcomes of the project implementation, to conduct to measures adopted by the authorities concerning the environmental protection and sustainable use of natural resources in the mining operating zones.

CONCLUSION

We have built and are continuously managing a knowledge base that is used as a monitoring system of environmental state in the regions of mining operations from the cross-border area of Romania and Serbia. A tutorial explaining how to use the knowledge base is also available. The knowledge base offers the advantage of presenting the dynamics of the environmental monitoring indicators. To the best of our knowledge, such an instrument is unique in the two countries and goes beyond existing practice in the field of environmental protection and management. The knowledge base can be freely accessed at http://www.elearning-chemistry.ro/rosnet2/knowledge-base/.

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