University of Belgrade
Technical Faculty in Bor and
Mining and Metallurgy Institue Bor

51st International October Conference on Mining and Metallurgy

PROCEEDINGS

Editors:

Prof. dr Srba Mladenović
Prof. dr Čedomir Maluckov

Bor Lake, Serbia,
October 16-19, 2019

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Technical Editor:
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Publisher: *University of Belgrade, Technical Faculty in Bor*
For the publisher: Dean prof. dr Nada Štrbac
Circulation: 100

Printed by "Tercia", Bor, 2019.

ISBN 978-86-6305-101-0

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

622(082)(0.034.2)
669(082)(0.034.2)

INTERNATIONAL October Conference on Mining and Metallurgy (51 ; 2019 ; Borsko jezero)

Proceedings [Elektronski izvor] / 51st International October Conference on Mining and Metallurgy - IOC 2019, Bor Lake, Serbia, October 16-19, 2019 ; [organized by] University of Belgrade, Technical Faculty in Bor and Mining and Metallurgy Institute Bor ; editors Srba Mladenović, Čedomir Maluckov. - Bor : University of Belgrade, Technical Faculty, 2019 (Bor : Tercia). - 1 USB fleš memorija ; 1 x 1 x 5 cm

Sistemski zahtevi: Nisu navedeni. - Tiraž 100. - Preface / Srba Mladenović. - Napomene i bibliografske reference uz radove. - Bibliografija uz svaki rad. - Registar.

ISBN 978-86-6305-101-0

а) Рударство -- Зборници б) Металургија – Зборници

COBISS.SR-ID 280007180

Bor Lake, Serbia, October 16-19, 2019

Conference is financially supported by
The Ministry of Education, Science and
Technological Development of the
Rapublic of Serbia

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PREFACE

On behalf of the Organizing Committee, it is a great honor and pleasure to wish all the participants a warm welcome to the 51st International October Conference on Mining and Metallurgy (IOC 2019) held at Bor Lake, Serbia, 16 – 19 October 2019.

The IOC 2019 has been organized by the University of Belgrade, Technical Faculty in Bor, in cooperation with Mining and Metallurgy Institute Bor. It is devoted to presenting recent research results and advances in the fields of geology, mining, metallurgy, materials science, technology, environmental protection, and related engineering topics. The primary goal of IOC is to bring together academics, researchers, and industry engineers to exchange their experiences, expertise and ideas, and also to consider possibilities for collaborative research.

These proceedings include 81 papers from authors coming from universities, research institutes and industries in 15 countries: Bosnia and Herzegovina, Croatia, Japan, Kazakhstan, México, Montenegro, Poland, Romania, Russia, Slovenia, Turkey, Ukraine, Switzerland, Brasil and Serbia.

Financial assistance provided by the Ministry of Education, Science and Technological Development of the Republic of Serbia is gratefully acknowledged. The support of the sponsors and their willingness and ability to cooperate has been of great importance for the success of IOC 2019. The Organizing Committee would like to extend their appreciation and gratitude to all the donors and friends of the Conference for their donations and support.

We would like to thank all the authors who have contributed to these proceedings, and also to the members of the scientific and organizing committees, reviewers, speakers, chairpersons and all the Conference participants for their support to IOC 2019. Sincere thanks to all the people who have contributed to the successful organization of IOC 2019.

We look forward to welcoming you to the 52nd International October Conference on Mining and Metallurgy (IOC 2020), which will be held in October 2020.

On behalf of the 51st IOC Organizing Committee,
Prof. dr Srba Mladenović

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ROADMAP FOR SOUND MULTISECTORIAL MANAGEMENT OF CONTAMINATED SITES IN SERBIA IN ACCORDANCE WITH THE OSTRAVA DECLARATION

Branislava Matić[1], Dragana Vidojevic[1], Dragana Jovanović[1], Snežana Živković[1], Dragan Miljuš[1]

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Abstract

Mining and mineral processing is still a vital source of income in Serbia, due to abundance in copper, lead, zinc, antimony. Copper mining and metal-processing are located in the east: Bor, Veliki Krivelj, Cerovo, Majdanpek. Antimony and lead mining and processing sites are at the western border: Zajača, Krupanj, Stolice. Coal mining and coal-firing power plants are surrounding Belgrade: Obrenovac (2 power plants), Grabovac (plant ash landfill), Kolubara and Kostolac.

The aim of this work is to present key elements of the document "Roadmap for sound management of contaminated sites", a deliverable of the multi-stakeholder project "Strengthening Serbian national capacities and inter-sectorial synergies for safe management of contaminated sites related hazardous substances to prevent negative impact on human health and environment"(No.QSPTF13/13/GOV/19), supported by the UNEP, SAICM and WHO. Project pilot study was focused on Bor.

The need for the national approach to delivering a Roadmap was pointed out in the Ostrava Declaration of the Sixth Ministerial Conference on Environment and Health (Ostrava, 2017), signed by the dignitaries of the WHO Member States (Republic of Serbia as well), and important international bodies, as a guidance document for the overall European Environment and Health Process (EHP). Roadmap is a result of multi-stakeholder project teamwork. It consists of 4 specific parts: Expanding the knowledge base; Monitoring and reporting; Leadership and cooperation; Strengthening institutional capacities. It took 6 months in 2018 to finalize the Action plan, a key component of the Roadmap.

***Keywords**: contaminated sites, roadmap, Ostrava Declaration, action plan*

1. INTRODUCTION

Mining and mineral processing has played a vital role in the history and economy of the Western Balkans. Being abundant in mineral resources, such as copper, chromite, lead, zinc, and antimony, the region counts as one of the largest deposits in Europe. As expected, environmental health hot spots in Serbia are, principally, through history, associated with mining, processing and smelting of above mentioned ores [1-4].

In the late 1980's, European countries initiated the first ever process to eliminate the most significant environmental threats to human health. Progress towards this goal is driven by a series of ministerial conferences, held every 5 years, and coordinated by the WHO/Europe. Defining Priority Goals for further actions of the WHO (World Health Organization) Member States (MSs) and its partners was a goal of each of the six ministerial conferences, until now, during which period they have changed and evolved, due to on-going changes of global UN policies in the field of environment and health [5]. Concerning policies towards the issue of managing contaminated sites, the perspective of Primary goals has changed in between the Fifth and Sixth ministerial conference [6, 7]. Defining new EH indicators according to twelve major SDGs (Sustainable Development Goals) was a key activity of MSs during the intermediary period till the Sixth Ministerial Conference in 2017, and its Declaration [7], with a major change in setting of the new list of Priority Goals for further action: improving indoor and outdoor air quality for all; ensuring universal, equitable and sustainable access to safe drinking water,

sanitation and hygiene for all and in all settings; minimizing the adverse effects of chemicals on human health and environment; preventing and eliminating the adverse environmental and health effects, costs and inequalities related to waste management and contaminated sites [7]. Actually, the Roadmap for sound management of contaminated sites, deriving from the last goal listed above, is part of the National Portfolio of Actions, a dominant activity of all MSs having signed the Ostrava Declaration, as defined in its Annex 1 [8].

2. EXPERIMENTAL

Key aim of the work on the Roadmap and its Action Plan was to clearly demonstrate the rationale, the focused target, and methodology on which necessary future activities should be based, to achieve the main goal of improving the synergies in multi-sectorial approach to safe management of CSs in Serbia, both on local and national levels. A more specific objective of the Roadmap was to integrate all relevant social capacities in order to establish a unique, adequate and operational system for monitoring the effects of industrial production at the CS on the surrounding environment and level of exposure and complexity of health effects of the population living in its vicinity. Focus of work on the Roadmap was exclusively on those CSs of more prominent public health concern, according to the definition given by the WHO [9, 10]. Chosen pilot CS was the town of Bor.

Multi-stakeholder approach was established in engaging experts from the Institute of Public Health of Serbia, Ministry of Health, Ministry of Environment Protection, Serbian Environment Protection Agency, and Mining and Metallurgy Institute from Bor. The whole process was followed by the WHO experts. In order to get an insight into the epidemiological approach to quantifying health effects of long-term environmental pollution, SENTIERI epidemiological methodology has been tested. Results of the Bor study have facilitated delivering an Action Plan that contains such activities in the future, implemented on all significant CSs [11].

2. RESULTS AND DISCUSSION

Prior to final design of the Roadmap, the crucial project activity was to perform a detailed status analysis of all recorded flaws in the overall process of the multi-stakeholder management of the CSs, which served as a foundation for a rational and realistic Action Plan for further actions in that field. The Roadmap's structure, as defined by the Ostrava Declaration Annex 1, has four specific sections (Figure 1).

Section 1. Expanding the knowledge base. Building and disseminating the evidence and knowledge relating to: the impacts on health of CSs, the effectiveness (in health terms) of policies, and interventions to address contamination and its sources that have been undertaken by different sectors. This includes identifying knowledge gaps and the promotion of innovation and research needed to address the impacts of CSs on health.

Section 2. Monitoring and reporting. Enhancing systems, structures and processes needed to support monitoring and reporting on health associated with environmental pollution in CSs and its sources of contamination.

Section 3. Leadership and coordination. Leveraging health sector leadership and coordinated action at the country, region and local levels in order to enable an appropriate and adequate response to the dimension of environmental health issues related to CSs.

Section 4. Strengthening institutional, technical and financial capacities. Building the capacity to analyze and influence policy and decision-making processes in support of joint action on environmental pollution and health in CSs, to support the development of strategies and action plans to reduce overall pollution and health risks, at national level or in local areas, as well as to support the implementation of international recommendations, like those provided by

WHO. The aim of the activities in this area is to strengthen the capacities, above all, the institutional ones, in order to create a center of knowledge and coordination for program-based monitoring of the impact of CSs on the environment and health of the population. Also, strengthening the technical and human resource capacities of IPHs labs creates conditions for systemic approach to HBM (HBM), vital for the process of assessing the exposure of the population to hazardous substances.

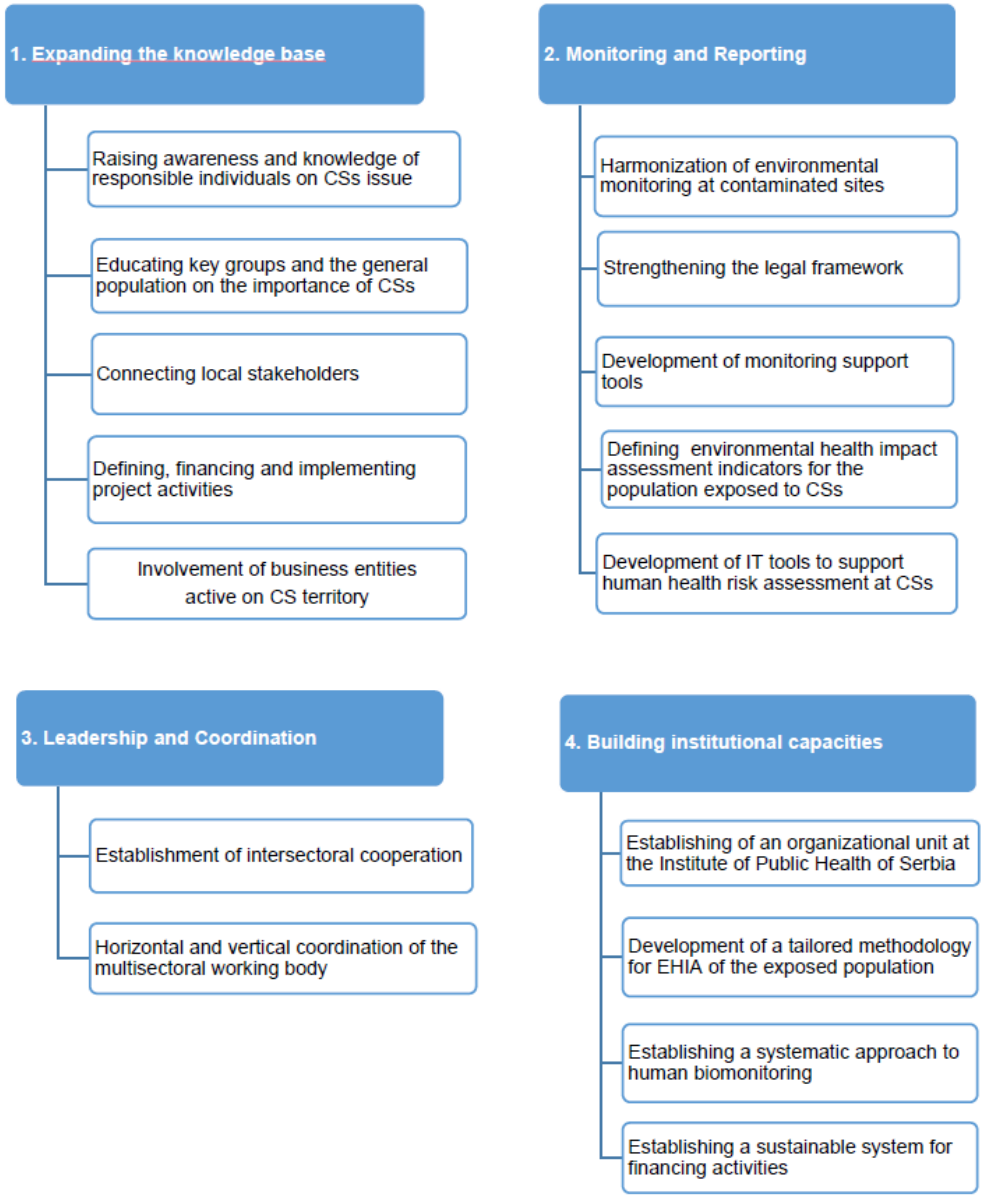

Figure 1. Elements and Structure of the Roadmap

Actually, while working on the document, the project team has noted both its advantages and disadvantages. While being a good starting point for better management of CSs through multisectoral approach, the truth is only two ministries were involved in the „multisectoral“ cooperation (MoH, MEP). This means that any further step should involve other relevant stakeholders, such as Ministry for Mining and energy production, Ministry of State Administration and Local Self-Government, Ministry of Economy, Chamber of Commerce of Serbia, NGO sector. Document gives a realistic picture of needed capacity building in all of the 4 fields, focusing on the need to harmonize HBM measures with its EU practice. As for the population groups exposed to hazardous substances, due to absence of the Ministry of labour

from the project, it does not include occupational exposure assessment for workers at the CSs. While it defines the means of awareness raising and education of the population exposed to harmfull effects of CSs, it says nothing on the issue of Communicating Risks. Actual willingnes is noted to proceed in improving and adapting new epidemiological methods in order to implement ecological epidemiological studies linked to CSs. Regretingly, defined environmental data are still not available in the scope that fits the needs for correlating with health data, for reliable epidemiological studies.

CONCLUSION

Republic of Serbia is a signatory of Parma Declaration in 2010, at the 5th Ministerial Conference for Environment and Health, and has adopted Children's Environment and Health Action Plan as its national legal act. Both of the papers focus on environmental health challenges for children's health and HBM as a tool for its monitoring [6, 12]. Until now, no further steps were made in implementing these international binding obligations [6, 7, 12]. Republic of Serbia, with its health sector in a leading role, needs to organize and adopt HBM as a key public health measure, especially for the vulnerable population groups living close to recognized ICSs [13]. Reason for such an urgent need in implementing this kind of preventive measures is in the nature of most highly toxic substances to which these vulnerable groups are being exposed *in continuum*, being easily absorbed by pregnant mothers, and transferred via placenta to the offspring, making severe organic damage to the unborn child [14].

ACKNOWLEDGEMENTS

This work is supported by WHO, UNEP, SAICM as a part of Project "Strengthening Serbian national capacities and inter-sectorial synergies for safe management of contaminated sites related hazardous substances to prevent negative impact on human health and environment"(No.QSPTF13/13/GOV/19).

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