Roadmap of actions for the exploitation of RM sector in the ESEE region (D6.4)

Version 1 .06|2021

EXECUTIVE SUMMARY

KAVA Reference: 17029 - RESEERVE. Mineral potential of the ESEE region

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DOCUMENT CHANGE LOG

Document Issue.	Date	Reasons for change
Version 1.0	30.06.2021	Initial version of the document

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1. INTRODUCTION

The present report is the Executive Summary of Deliverable 6.4, entitled "Roadmap of actions for the exploitation of RM sector in the ESEE region" prepared as a part of RESEERVE's Work Package 6 (WP6) "SWOT/GAP analysis and business opportunities in the ESEE region". The Executive Summary is submitted as a separate document for translation or/and publication purposes as provisioned by the Project Coordinator.

RESEERVE project is a RIS KAVA project, mapping the mineral sources of the six ESEE countries: Albania (ALB), Bosnia and Herzegovina (BiH), Croatia (HRV), Montenegro (MNE), North Macedonia (MKD) and Serbia (SRB), currently not included in the existing data platforms. The main project outcome is the creation of the *West Balkan Mineral Register for Primary and Secondary Mineral Resources*.

The main scope of WP6 was to examine the potential of turning the PRM (Primary Raw Material) and SRM (Secondary Raw Material) resources of the 6 ESEE countries participating in the Project (ALB, BiH, HRV, MNE, MKD and SRB) into marketable products and create a Road Map of actions for exploiting these resources. WP6 focuses on the identification of business opportunities arising at the different stages of a mining project, from the initial stage of exploration of a PRM to mine production, ore processing as well as reprocessing of SRMs for the recovery of contained metal values. Sustainable Development of PRM or SRM resources consists a multi-faceted challenge for companies, with a high range of activities needed, e.g. consultancy services, equipment manufacturing, R&D activities, software development, resulting in a high number of business opportunities in diverse fields.

Road maps are strategic plans defining goals or/and outcomes used to guide development in businesses and strategic initiatives. Hence, a Strategic Road Map was formulated within D6.4 in order to guide the exploitation of RM sector in the ESEE Region, based on a number of selected case studies, potential business opportunities, representing PRMs and SRMs of the 6 ESEE countries.

For the preparation of D6.4, data presented in the relevant RESEERVE Deliverables, the West Balkan Mineral Register and other material delivered within the RESEERVE Project were examined.

Deliverable 6.4 was structured in chapters, as follows:

1 INTRODUCTION
2 METHODOLOGY
3 DESCRIPTION OF ROADMAP RMs CASE STUDIES – PROPOSED ACTIONS
4 FRAMEWORK FOR BUSINESSES DEVELOPMENT
5 GAPS TO BE COVERED
6 ROAD MAP SUMMARY AND PROPOSALS
7 REFERENCES

The Deliverable 6.4 is also supported by the following Annexes:

ANNEX I. PRM, SRM AND CRM MAPS, based on the West Balkan Mineral Register, prepared within Deliverable 6.1.

ANNEX II. BUSINESS OPPORTUNITIES: Business Opportunities in the PRMS presented in Deliverable 6.1 of the RESEERVE Project and summarised in ANNEX II of D6.4.

ANNEX III. INPUT FROM TASK PARTNERS: The material provided by the Task Partners from all 6 ESEE countries during the preparation of D6.4, is included in ANNEX III of D6.4.

It is noted that within the framework of the RESEERVE Work Package 6, twenty two (22) in total analytical maps were prepared by the NTUA team and included in the ANNEX of this Executive Summary. These maps were created in ArcGIS 10.5.1 environment taking into account the Technical Guidelines for Mineral Resources of the INSPIRE Directive and include: six (6) maps, one per country examined for PRM resources; one (1) map presenting SRM sites for all 6 ESEE countries and one (1) map presenting CRM sites for all 6 ESEE countries, all maps based on the data of the *West Balkan Mineral Register*; two (2) maps presenting PRM and SRM case studies selected for the Road Map for all 6 ESEE countries; six (6) maps, one per country, presenting transport infrastructure, and six maps (6), one per country, presenting the protected areas in the country.

Additional sources for the preparation of this deliverable comprised the open data and reports of World Bank regarding the business performance of the 6 ESEE countries and the World Mining Data on mineral production. Metal Bulletin and other published data were used to assess the trends for the metal prices of the commodities of interest.

Finally, for the preparation of the present Deliverable and the final selection of the case studies to be examined, the NTUA team cooperated closely with the Project Coordinator, Geological Survey of Slovenia (GeoZS) and the Task Partners, TPs, from the 6 ESEE Countries, whose valuable contribution is gratefully acknowledged.

2. REVIEW AND MAIN CONCLUSIONS REGARDING THE RM SECTOR DEVELOPMENT IN THE 6 ESEE COUNTRIES

2.1 CASE STUDIES

As provisioned in the Project description, the aim of Task 6.4 was to produce a short-, mid- and long-term Road Map for the exploitation of the RM sector in the ESEE region, on country and ESEE region level. This included the selection of case studies among the business opportunities identified in Task 6.1 of the Project summarized in ANNEX II of this Deliverable). The list of the case studies was finalized after extensive discussions with the Project Coordinator, GeoZS, the Project TPs and Stake Holders.

For the selection of PRM case studies the main criteria applied were:

- The importance of the proposed PRM for the country's economy.
- The geological potential of the PRM to be high and/or untapped.
- The commodity produced after processing of the ore to be of high value.
- The existing potential for CRMs production from the PRM itself, or as by-product.
- The diversity of the proposed case studies including metallic and non-metallic PRMS.
- The conditions prevailing in the area where the PRM is located should be favourable, (i.e. no conflicts with local communities).

Based on the Business Opportunities in the PRMs in D6.1 of the RESEERVE Project and summarised in ANNEX II of the Deliverable 6.4, the case studies selected to be examined in the this Deliverable are given below.

For ALB further development of the Chromite sector was considered important for the country's economy, by modernising mines and plants and increasing the processing plants' capacity so as to export processed material instead of Run-of-Mine ore. The Fushe Bardhe Phosphates and Ti-magnetite (Sukaxhi) - a Green Field Project - were two cases proposed by the Albanian TP, stressing the need to conduct additional exploration for increasing estimated reserves. Both Phosphate rocks and Ti are included in the CRMs list of Europe 2020.

For BiH, the Jasenica-Lušci Palanka bauxite deposits were selected as case study, since BiH is important bauxite, (among other commodities), producer. Moreover, bauxite is included in the CRMs list of Europe 2020 and presents the potential to contain REEs. Industrial Minerals are important for BiH, thus the Dubnica zeolites were selected as the second case study for this country, given that this PRM is worth of further exploration.

HRV presents only small sized bauxites deposits that, as reported by the TP, contain REEs. Thus, for HRV the Mamutovac bauxite deposits were selected as case study for further evaluation and development. Moreover, hard rocks currently used for aggregates' production were also proposed by NTUA for further investigation for the production of added value materials (e.g. rock wool, abrasives and e.tc.). In this line, HRV would further examine the development of added value products from its non-metallic PRMs that could be used by the Construction Sector, consisting thus a business opportunity.

For MNE, the development of Brskovo and Zuta Prla Pb-Zn mines was proposed as a case study. Pb-Zn is a major metallic PRM of MNE corresponding to medium, large and very large sized ore deposits. The related sector includes five Greenfields areas currently at the feasibility stage. Therefore, Pb-Zn ores are important for the Country's economy and, based on the views of the Industrial Stake Holder, the whole sector requires re-assessment.

MKD, despite its relatively low current mineral production, is presently developing its metallic PRM ore deposits (mainly Cu, Pb-Zn, Fe-Ni) with many of them under feasibility, conducted by foreign investors. Thus, a number of business opportunities are open, especially in sectors supporting RMs extraction and processing, e.g. machinery suppliers, consulting companies, testing laboratories e.tc. Moreover, and as reported by the TP poorly explored deposits of metallic PRMs, such as the Fe-Ni ore in Ržanovo, could consist a business opportunity, and thus the above deposit was selected as a case study to be further examined.

Finally, SRB despite its relatively low current mineral production is presently developing its metallic PRM ore deposits (mainly Au, Cu, borates – Li, Mo), with many of them at the feasibility stage undertaken by foreign investors. Two PRM case studies were selected as potential major business opportunities: the Čukaru Peki - Lower zone Cu ore and the Mačkatica Mo ore deposit. Moreover, in addition to these deposits many business opportunities are open in SRB in the mid- long term, both in RMs exploitation as well as in the sectors supporting such activities.

Regarding SRMs, detailed quantitative and qualitative data corresponding to SRM sites are not presently included in the relevant RESEERVE Mineral Register. For this reason a list of Important Fields was prepared by GeoZS including only Processing Wastes, namely Flotation Tailings, Red Mud and Slag/Ash Wastes from Smelters and Ironworks and excluding Mining Wastes. This list constituted the basis for the selection of the Case Studies included in the Road Map for the development of SRMs in the 6 ESEE countries. Major criteria for the selection of case studies were the size of the facility and the tonnage (if available), as well as the value of the potential mineral commodities that could be recovered. In addition to the valuable minerals' potential, other parameters examined were the status of the facility, e.g. operating, abandoned, reclaimed, and the general views of the TPs regarding the potential for further exploitation of the specific SRM disposal area.

Specifically, SRM case studies selected for further examination included: the Pb-Zn Flotation Tailings of Probistip in MKD, the Cu Flotation Tailings of Bor in SRB and the Red Mud, mainly in BiH (Dobro Selo, Dulici) and MNE (Podgorica). The flotation tailings were selected due to the increased value of contained metals. Following the analysis of the key elements present in wastes, it was concluded that Cu prevails in sizeable waste facilities in SRB and MKD, while ALB also presents a number of Cu waste facilities. Finally Red mud was selected as a case study given the research interest reported internationally for the recovery of REEs from this aluminium processing waste. As already noted Mining Wastes were not included in the aforementioned SRMs case studies list, however based on their properties, e.g. if inert or alkaline, they could be beneficially used, for backfill mining voids, as construction material for restoration of old mining sites, aggregates in embankments, road, pavement, foundation and building construction.

It is underlined that the limited number of SRM case studies selected does not imply that these sites are considered as the only potential business opportunities in the region examined. These cases were used as main examples, whereas the actions proposed for their development may apply in similar cases

such as: Flotation tailings and metallurgical slags stemming from processing of Cr and Cu ores in ALB; Pb-Zn flotation tailings in MNE and SRB, and the Cu and Sb flotation tailings in MKD.

Following the examination of the aforementioned PRM and SRM selected case studies performed within Task 6.4 of the RESEERVE Project, a number of case specific actions are proposed for the further development of the relevant PRMs and SRMs. For PRMs these include:

- Additional exploration works using innovative methods/techniques (e.g. remote sensing) including drilling, geophysical research, geochemical analysis e.tc., when applicable), in order to increase the volume/tonnage resources and reserves and the respective level of confidence (e.g. inferred resources to become probable and proven) and estimate probable and proven reserves as per the commodity/ies of interest.
- Performing scoping, pre-feasibility or feasibility studies, depending on the research stage for the development of the PRM examined.
- Conducting (if needed) review studies on the best available methods/techniques for PRM's treatment and processing. Performing the necessary laboratory investigation for the production of processed or/and added value final products.

As for the further development of SRMs it is necessary to quantify the valuable metal contents based on the assessment of historical data (if available), additional sampling and geochemical analyses, as well as laboratory testing for the recovery of the contained valuable minerals. Additionally for Red mud a review study on the state-of-the art research conducted internationally for its treatment is proposed. Following the above, pre-feasibility studies will be required for the potential development of the examined SRMs.

The detailed examination of the Road Map PRM and SRM case studies is presented in Chapter 3 of the RESEERVE D6.4 Deliverable, entitled *DESCRIPTION OF ROADMAP RMs CASE STUDIES – PROPOSED ACTIONS.*

However, it is noted that above proposed actions constitute a part of the steps needed for the sustainable development of the RM sector in the 6 ESEE countries. A number of additional general factors including the states' mineral policies and strategies and the other prevailing legislation, the economic and business environment, the financing opportunities, and the existing personnel skills also consist decisive parameters for the achievement of these goals.

2.2 FRAMEWORK FOR BUSINESS DEVELOPMENT

To construct the General Strategy Road Map for the ESEE Region, Gap analysis results were used in the Deliverable 6.4 in order to identify the main, general areas where improvements are required for the further development of the RM Sector. This analysis was initially conducted as part of the Deliverable 6.3 "SWOT and Gap analysis for the ESEE region" of the RESEERVE Project, where the gaps noted were allocated in seven (7) key areas.

These key areas are: Key Area 1 'Geological Potential'; Key Area 2 'Economic Environment'; Key Area 3 'Legal & Regulatory Framework'; Key Area 4 'Innovation & Technological Framework'; Key Area 5 'Environmental Protection & Land Use Planning'; Key Area 6 'Government & Societal Potential' and Key Area 7 'Human Resources, Educational Potential'.

Moreover, and for the purposes of D.6.4, a number of main parameters were selected to be examined in more detail, in order to further assess the general framework prevailing for the exploitation of the Raw Material sector in the ESEE Region. These parameters, addressing general main fields of interest for potential RM exploitation, consist part/s of the aforementioned key areas and include:

- Economic Environment containing main income indicators, mineral production data and metal prices trends data (Key area 2 'Economic Environment');
- Transport Infrastructure (Key area 2 'Economic Environment');
- Business Environment (Key Area 2 'Economic Environment' and Key Area 3 'Legal & Regulatory Framework');
- M&Q and Waste Management Regulations - Permitting Flow Diagrams (Key area 3 'Legal & Regulatory Framework' and Key Area 6 'Government and Societal Potential');
- Nature Protected Areas (Key Area 5 'Environmental Protection & Land use planning');
- Human Resources and Capacity Building (Key Area 7 'Human resources, Educational potential' and Key Area 4 'Innovation & Technological Framework).

Analysis of above parameters is included in Chapter 4 of the RESEERVE D6.4 Deliverable entitled *FRAMEWORK FOR BUSINESSES DEVELOPMENT*.

2.3 GAPS TO BE COVERED

The major findings of D6.3 SWOT/GAP Analysis and the additional investigation performed in this Deliverable provides the basis for the design of the Road Map of actions for the exploitation of the RM sector in the ESEE region and are summarised below.

- For all the countries examined their major Strength is related to their Geological Potential and the presence of a number of metallic commodities in PRMs and SRMs, including Aluminum, (Al) Antimony, (Sb), Chromium, (Cr), Copper, (Cu), Lead (Pb), Zinc, (Zn), Precious metals, (Ag, Au), the presence of Mineral Fuels, Industrial Minerals and Building materials, as well as their geographic location and their long tradition in mining. However, in almost all of the countries the need to extend exploration activities in order to increase their Geological potential for certain PRMs was reported. The need to increase the level of confidence for inferred resources and unknown reserves for specific PRM deposits and estimate mineral resources and reserves per type (inferred – indicated - measured and probable – proved, respectively) was also reported.

- Special emphasis is needed for the comprehensive assessment of the CRM content in PRMs, bauxite deposits, as well as SRMs, mining waste and processing waste facilities (Ga, REEs), and their potential recovery. The rapid growth in clean energy technologies, renewables, and hi-tech information technology caused a substantial increase in the demand for a number of minerals and metals and for these Critical Raw Materials.

- Almost all of the 6 ESEE countries examined, reported databases covering their mineral resources, deposits, drill logs, mining permits etc., however in some cases they are not publically available. To that end an important goal and action to mitigate weaknesses and gaps recognized by the countries' stake holders was successfully achieved within the RESEERVE project, namely the compilation and formation of two Mineral Registers, for PRMs and SRMs, respectively. These Registers were formulated in compliance with the INSPIRE Technical Guidelines, eliminating thus the gaps already recognized by the 6 countries, as per common language and homogeneity of data presented.

- Updating of the West Balkan Mineral Register as per the INSPIRE guidelines, after additional exploration works and classification of resources and reserves according to international standards, is important in order to attract new investors, local and foreign for further exploitation of the RM sector. To achieve this, exploration results confirmed with international standards is a prerequisite. Technical experts of the countries recognized the need for these additional exploration activities; however the funds needed are often significant, and difficult to locate. In this framework PRM exploration funding from national or/and EU projects, cooperation of the state with the private sector, as well as attracting new inward investments provide some of the means to overcome this constraint.

- There is a number of parameters impacting the future exploitation of SRMs, common for all 6 ESEE countries. More specifically:

  - The majority of the SRM Important fields are not reclaimed, adversely impacting the quality of the surrounding and downstream environment. Environmental impacts recorded include the formation of Acid Mine Drainage, acidic effluent with elevated content of dissolved metals that subsequently impacts the quality of surface and ground waters and soils, Air pollution due to air born dispersion of dust and waste fine particles as well as Loss of Landscape.
  - Estimation of SRM resources as per their size and composition needs to be performed and reserves for the p commodities potentially contained in the examined wastes should be calculated in order to conduct the necessary scoping and feasibility studies to support their exploitation. To achieve this, additional research activities and geochemical analyses might be required.
  - Mining and Processing Waste management is a prerequisite for the future development of the Mining Sector in the region in order to achieve both Resource Efficiency objectives and compliance with Environmental Legislation. As reported by the stake holders the waste management legislation in the 6 ESEE Countries needs updating and integration in order to include the alternative use and exploitation of SRMs, Mining and Processing Wastes.

- Research and technology transfer is also deemed necessary, as reported by the countries' experts, especially in cases where added-value materials may be produced after treatment of the PRMs or by-products. Characteristic examples for non-metallic minerals are the production of filler grade calcite from high calcite raw materials presently used for other purposes, such as in cement industry. Moreover, certain rocks, such as hard rocks are suitable for added value uses in areas such as abrasives, rock wool e.tc. With this aim the re-evaluation of the potential uses under a new perspective, especially in cases where industrial mineral and rocks are abundant is proposed. For example, tailored-made products for the construction sector may efficiently cover local needs, substituting imports.

- Upgrade and increase the capacity of processing plants is another need recognized by the countries' experts. The use of innovative processing technologies in plants of higher capacity is directly related to the competiveness and sustainability of the RM sector given that the presently existing mines and processing facilities are often using old techniques and machinery.

- Successful implementation of the above proposals largely depends on the availability of skilled personnel in the whole RM value chain operations. Brain Drain impacts, Secondary Schools, and RM University curricula that remain traditional, Lack of soft skills and other competencies are some of the factors resulting in the shortage of skilled technical and professional personnel in most of the 6 ESEE countries examined. For that reason the updating of the RM Universities curricula and the organization of LLL programs for the RM professionals, present a major opportunity for the revitalization of the M&Q sector in the countries examined. Mining Companies in the ESEE region face challenges in

attracting qualified and diverse talent into their operations. Therefore, through the introduction of training and work-based learning opportunities in partnership with local education institutions, the capacity of RM workforce can be enhanced and diversified, new talent pools may be formed and existing staff may improve their skills.

- Despite the fact that the 6 ESEE countries examined have lately upgraded their national legal framework related to the RM sector and business environment regulatory areas, it was also recognized that Mineral Policy, Land Planning, Mineral Laws and Regulations for exploration and mining, need further reforms in order to integrate spatial planning legislation and provide a clear mineral policy and strategy regarding access to resources and safeguard of reserves. Resource efficiency and Sustainable management of Mineral resources, including the extension of mines life and safeguarding the access to depleting mineral resources are strategic objectives reported by the stake holders along with the need to define mineral deposits of public interest.

- It is important to report that all the 6 ESEE countries are planning to incorporate EU legislation in their national legal framework and they consider this option as an Opportunity. However, concerns were expressed regarding the restrictions that these EU regulations might impose on the M&Q activities, including the possible continuation of existing operations and/or the development of Green field extractive activities in nature protected areas.

- Given the evolving, more stringent environmental regulations, often in agreement with EU legislation, Mining Companies, Universities and Research Organizations need to cooperate in the development and application of innovative, techniques that would improve the resource efficiency and the environmental performance of the sector These techniques and methods could indicatively include i the quantitative recovery of contained valuable minerals from PRM, minimization of wastes and waste disposal facilities, SRMs reprocessing for the recovery of valuable resources, water recycling, effective chemicals handling, and improving energy efficiency.

- Last, but not least, problems in ensuring the Social Acceptance was reported as a Threat for the Sustainable Development of the RM Sector. Transparency during permitting procedures, comprehensive public consultation, as well as measures applied within the Corporate Social responsibility of Mining operators are some of the actions reported to improve the acceptance of the RM sector by the wider society. The need to properly inform authorities and communities at all administrative levels of the countries regarding RM activities and promote their efficient co-operation during permitting and operation of these activities, and the active participation of stake-holders in permitting processes and legislation preparation actions were also highlighted.

3. ROAD MAP - GENERAL STRATEGY & TIMELINE

Based on the overall review of the available data, regarding existing business opportunities, the selected case studies in the PRMs and SRMs, the prevailing Framework for the development of the RM sector and the results of the SWOT and GAP Analysis, a General Strategy Road Map of actions for the exploitation of the RM sector in ESEE Region was constructed.

Actions proposed in the Road Map for the improvements in the major general fields that impact the overall performance of the sector are presented in the following sections. The Timeline of proposed actions is given in section 3.6 of the present Executive Summary.

3.1 PROMOTING STAKE HOLDERS CONSENT

For the development of a new mining project and the continuation of the operation of an existing one compliance with the prevailing legal framework is required. However, it is also widely recognised that Social acceptance and stake holders' consent is a pre-requisite for the timely implementation of all the project stages, including permitting, construction, operation, closure and the post-closure stages. The participation of stake holders and their advance consent is pivotal for the development of the RM sector.

The RESEERVE Task Partners have identified the above issues when presenting their SWOT analyses in the National Thematic Networks organized within the RESEERVE Project. As noted by the TP from SRB, the wider public is not adequately informed about the importance of mineral resources for the development of society in general, and particularly for the local communities. It was also reported that the concept of sustainable development is often understood as the need to stop mines and quarries operations instead of applying new methods and management systems in the effort to develop more sustainable exploration and exploitation of mineral resources and to improve the overall performance of the RM Industry. MKD stressed the need that the State presents a greater interest in geology and mining and in the education of competent Raw Materials experts. MKD also underlined the importance for active participation of professional associations as stake holders during the preparation of legislation. The Task Partners from HRV reported that the perception on the significance of mineral resources is not the same at the different administrative levels of the Country (state, county, and municipality), while MNE underlined the inadequate cooperation often reported between public authorities regarding the use of mineral resources. The TP from FBiH expressed their concern regarding the difficulties possibly encountered in order to reform the Federation's legal framework in the close future.

Following the above, **Awareness-Raise Campaigns** are proposed as an action to inform the competent and local authorities, the wider public, the industrial, the professionals and other stake holders on the significance of the RM sector for the country's economy. This campaign is proposed to also highlight the need for improvements in the specific areas that impact the development of the sector, as well as the steps and actions required in order to eventually achieve the Social License to Operate, SLO. It is proposed that each country identifies the target stake holders groups and carries out the awareness-raise campaigns in the first 2 years (short term) of the roadmap timeline. Then, recall awareness-raise campaigns are proposed to be carried out in years 4 and 5 of the roadmap and in the midterm period (years 7-10).

The Timeline of proposed actions is given in section 3.6 of the present Executive Summary.

3.2 UPGRADING THE QUALITY OF GEOLOGICAL POTENTIAL DATA

As highlighted in the RESEERVE project, prior to the planned actions to develop a PRM or SRM resource and attract investors' interest, the data concerning resources type, inferred, indicated, measured, or/and reserves' type of a deposit, probable, proved, for all the commodities of interest have to be identified. Based on the SWOT analyses presented by the TPs during the National Thematic Workshops conducted in the period 2018-2020, all 6 ESEE countries examined have digital databases, including geological potential data. However, for reporting of Exploration Results, Mineral Resources and Ore Reserves by companies in order to attract new investments or financing, estimation of resources or reserves is proposed to be performed in accordance with international codes and standards, like JORC, PERC, CIM, e.tc. As already noted, Identification of mineral resources and characterization of reserves as per the INSPIRE Directive was an important project objective completed with the RESEERVE West Balkan Mineral Register. However, the PRM Register could be further developed to include data for the reserves of other commodities contained in the deposits, including REEs, or new exploration results. Thus, additional exploration work may be required for certain PRMs to increase the confidence level of existing geological data and estimate reserves per commodity.

Furthermore, the West Balkan SRM Mineral Register could be extended to include qualitative and quantitative information for the valuable metal contents and mineral forms of occurrence. With this aim conducting additional sampling and geochemical analyses of representative waste samples, as well as the necessary laboratory investigation, are needed in order to comprehensively assess the SRM potential.

It is proposed that in Year 1 of the General Road Map, each country identifies through a **Scoping Study** the main PRMs and SRMs of interest, including the selected case studies presented in the present Deliverable. **Exploration and Research Programs** for these resources to be carried out with the use of innovative methods / techniques in the first 5 years (short term) of the General Strategy Road Map Timeline, so as to conclude with supporting, well documented results regarding the corresponding potential and reserves.

The Timeline of proposed actions is given in section 3.6 of the Executive Summary.

3.3 PROMOTING LEGISLATION REFORMS AND CODIFICATION

All 6 ESEE countries report legislation reforms in the last years, including regulations to enhance their business environment, as was reported by World Bank in its *Doing Business* report published in 2011 specifically for the ESEE Region. However, there are areas that need further improvement concerning the Mineral state policies and M&Q regulations prevailing in the countries that will assist the development of the RM sector.

Based on the review conducted concerning legal constrains five (5) axes for interventions were defined to be included in the Road Map: State's Mineral Policy and Strategy; Licensing and Permitting Procedures for Exploration and Exploitation – Competencies; Royalties / fees and compensatory benefits; Harmonization of Spatial Plans, and Alignment with the EU environmental legislation. In addition to above reforms and updates, codification of the M&Q regulations and the simplification of

relevant legislative regulations, is necessary in order to enhance the performance of the RM sector. The general actions proposed are presented in the following paragraphs.

State's Mineral Policy and Strategy: Some of the ESEE countries have already adopted long – term mineral strategy (e.g. ALB), or the related legislation is under preparation (e.g. HRV). However, almost all of the 6 ESEE Countries reported that the legislation in place is not adequate in protecting the development of mineral resources of public importance. Updated national mineral strategy, including sustainable management of mineral resources in line with EU legislation, is needed. Such strategies and policies should include provisions both for PRMs and SRMs, since the prevailing regulations for the reprocessing of SRMs is not considered sufficient for most of the countries.

Exploration and exploitation Licensing and Permitting Procedures - Competencies: Irrespectively of any recent updates in the permitting procedure, almost all countries report that simplification and integration of these procedures is necessary and that the number of the authorities involved in the permitting procedures should be reduced. Also the co-operation of the authorities at national and local level, needs to be enhanced possibly through regulating the specific competencies and the responsibilities.

Royalties / fees and compensatory benefits: The need for re-assessing mining royalties and fees possibly in relation to the value of the commodity mined was reported. Also the need for compensatory benefits for local communities was noted.

Harmonization of Spatial Plans: Almost all countries reported the need for harmonization of spatial plans at national and local state levels so as to allow the development of RM. It is proposed to reform the existing plans by including provisions for mineral resources exploitation and develop a detailed Special Minerals Spatial Plan covering the whole country.

Harmonization with the EU environmental legislation: With the exception of HRV, which is EU member since 2011, all other countries underlined the need for the Harmonization of their Environmental legislation with EU and other International legislation, a step expected to improve the social acceptance RM sector and enhance its sustainability.

Following the above, a **Study** is initially proposed as an action for **Mapping the Major, Legal Constraints in the Mineral Resources' Legislation** (year 1,5 of the General Strategy Roadmap Timeline) focusing on the aforementioned issues. The formation of a group of mining, geological and spatial planning experts is recommended to support this study and submit proposals to the competent authorities for the restructuring and updating of M&Q regulations, including wastes' management, old mines rehabilitation and spatial planning issues. The proposals should take into account the relevant EU legislation.

Updating or adopting (if not in place) a clear, consistent **Long-term State Mineral Policy and Strategy** setting the general principles for the sustainable management of Mineral Resources, identifying the mineral resources of public importance and envisaging key actions for their protection, is an initial short term specific goal proposed (year 2-2,5 of the General Strategy Road Map Timeline).

Harmonization of Existing Spatial Plans after revision or/and adoption (if not in place) at national and regional level, so as to envision the development of mineral resources in order to protect such resources and facilitate access to them. Moreover, drafting a **Special Mineral Spatial Plan** can be conducted in year 3-3,5 of the General Strategy Road Map Timeline.

Reform and Codification of the Mine & Quarrying and relevant Regulations after updating the provisions for exploration and exploitation permitting procedures adopting the one shop stop concept. Mining royalties and fees as well as compensatory benefits for local communities should be included in this legislation. Provisions regarding mining and processing waste management, SRMs exploitation and rehabilitation of mined-out areas should also be included. The goal is proposed to be achieved in the first five (5) years of the General Strategy Road Map Timeline.

The Timeline of proposed actions is given in Section 3.6 of the Executive Summary.

3.4 ENHANCING RM SECTOR COMPETIVENESS - ATTRACTING FINANCING

Enhancing the competiveness of the RM sector is a multi-level and multi-discipline task covering many areas such as enhancing R&D activities, technology transfer to modernization of mines and plants, increasing of the processing plants' capacity for vertical integration of the RM sector. Attracting financial resources for boosting the exploration and other research activities and support investments in new areas, can be achieved through funded research programs, international organizations funding and by attracting local and foreign investors. The general actions proposed are presented in the following paragraphs.

A **Scoping Technical Study** (year 2 of the General Strategy Road Map Timeline) is proposed for the identification of the specific target areas / sites / RMs, both PRMs and SRMs, in each country, where technology transfer, application of innovative methods and techniques for exploration, mining or processing, reprocessing SRMs, developing downstream users of RMs e.tc., will result in the overall optimization of the resource efficiency and economic performance, of the RM sector. This study should also include the major actions for upgrading the RM sector's environmental performance regarding wastes management and rehabilitation of mined out areas. For the preparation of this Scoping Technical Study the Business Opportunities identified within the RESEERVE Project, and summarized in Annex II of the present Deliverable will be evaluated.

Based on the results of the aforementioned study, **Focused Funded Research Projects** are proposed to be carried out (short, mid-and long term, 0-20 years of the General Strategy Road Map Timeline) within funded EU Programs, in order to solve specific technical problems, e.g. processing of RMs and recovery of CRMs. In this framework, comprehensive review studies will be conducted on the best available methods/techniques for the processing and overall treatment of the mineral raw material that will be selected for further development.

Market Studies and **Feasibility Studies** covering the overall range of the products and activities of interest will be conducted in order to document the overall sustainability of the proposed changes and/or **Upgrades in Mines and Plants**.

Finally, attracting funds and/or investors to **Finance** either new Greenfield projects or the upgrading of already existing activities and plants is crucial for the overall development of the RM sector in the 6 ESEE Countries Improvements in the countries' **Business Environment**, in agreement with the World Bank assessments, must be ensured concerning mainly the indicators of Starting a business, Dealing with construction permits and Enforcing contracts. To promote the countries' potential in PRMs and SRMs and highlight the potential business opportunities, **Invest in …** (*Name of the Country*) **Guides** can be constructed to inform and attract the interested investors.

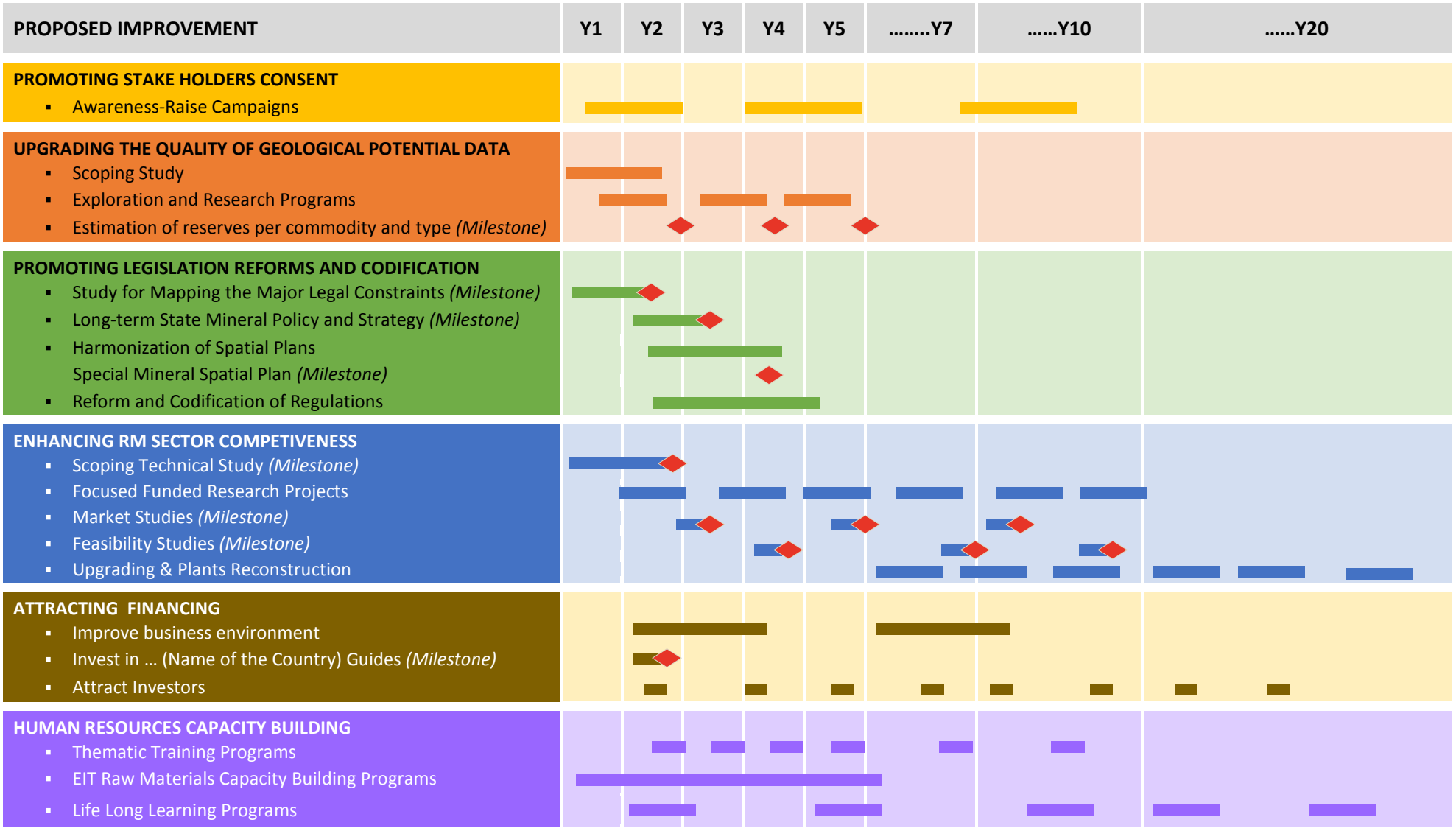
The Timeline of proposed actions is given in section 3.6 of the Executive Summary.

3.5 HUMAN RESOURCES CAPACITY BUILDING

The need to strengthen the skills of technical, scientific and managerial personnel involved in the overall range of RM activities, including research, exploration, mining, processing, recycling and environmental management, is a common conclusion among the 6 ESEE countries. Reduced availability of skilled professionals and technical staff due to Brain Drain or other reasons (e.g. limited interest in the Field of Geology and the RM sector in general) and limited expertise on new technologies on exploration, extraction and processing of minerals and wastes, are some of the issues reported by the countries. Gaps were noticed in the related educational programs as compared with the present and evolving needs of the RM sector as well as lack of cooperation between Academia, RTOs, and Industry in different areas. Capacity Building programs are needed for the training of scientists and technicians, given the challenges that will emerge in the future in the RM sector of the Region. Croatia is already an active partner in the European Institute of Innovation Technology Regional Innovation Scheme, (EIT RIS) projects. Croatian Universities and other partners from the Knowledge Triangle coordinate and participate in EIT Raw Materials programs, aiming to increase innovation, entrepreneurship along the Raw Materials sector. Moreover, almost all ESEE countries expressed their interest for participation in EIT Raw Materials projects and active cooperation with international institutes, and organizations.

In this framework, participation in **Thematic Training Programs** (short term goal) addressed to specific target groups from the Industry and other professionals of the RM sector as well, as capacity building programs in cooperation with Academia and RTOs is proposed. Also, cooperation with EU and other innovation providers within **EIT Raw Materials Capacity Building Programs** (short term goal) and other funded programs in order to transfer methods and best techniques and **Life Long Learning Programs** for the professionals of the sector (mid- long term goal) are also included in the Road Map whose Timeline is given in section 3.6 of the Executive Summary.

3.6 GENERAL STRATEGY ROAD MAP TIMELINE FOR THE 6 ESEE COUNTRIES



4. SUMMARY PROFILES OF THE 6 ESEE COUNTRIES

In the following sections the summary profiles for each of the 6 ESEE countries examined are presented.

These summary profiles include key information for each country regarding demographics, economic and business performance indicators, geological potential and mineral production data. The proposed actions for the selected case studies, both PRMs and SRMs and actions proposed in the Road Map for the improvement of the General fields/areas impacting the overall performance and sustainable development of the Raw Materials sector are highlighted in these profiles.

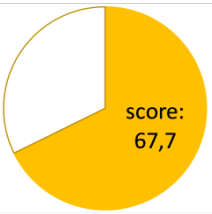
4.1 ALBANIA (ALB)

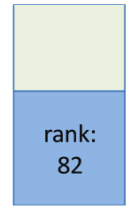
The summary profile of ALB is presented in next page, including the following individual templates:

- General information for the country: Surface area of the country and population data, main economic indicators (GDP, GNI), total mineral production in metr. t and MUSD and the DB20 score and ranking of the Country. The sources of these data are the World Bank reports and open data and the World Mining Data (WMD) reports.
- PRMs geological potential, based on the RESEERVE West Balkan Mineral Register entries, and a snapshot of the ALB's PRMs Map constructed within RESEERVE D6.1.
- Current production of commodities, 2019, based on the WMD 2021 Report. It is noted that regarding the Mineral-Fuels Group, this table includes only lignite production. However the total mineral production figure also given in the template is including the petroleum and natural gas production figures for 2019.
- PRMs business opportunities - proposed actions for the selected case studies (chromite sector, the Fushe Bardhe phosphates and the Sukaxhi Ti-magnetite), where the main Road Map actions for the development of these case studies are summarized, including timeline.
- General Fields for improvement – General Road Map short- mid- long term actions. This section of the template summarizes the key actions proposed for the general improvement of the Country's RM sector per field defined in Chapter 3 of the Executive Summary. The General Strategy Road Map Timeline is presented in Section 3.6 of this Chapter.

ALBANIA (ALB)

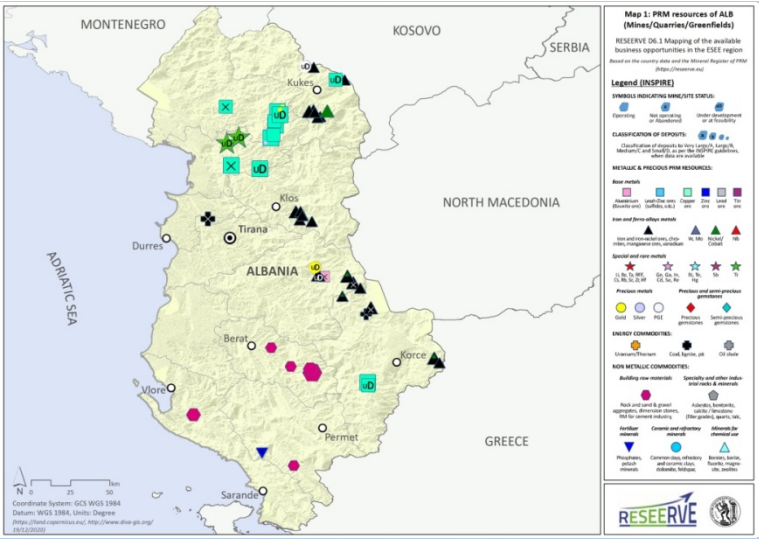
Surface area (2018): 28.750 sq. km
Population (2021): 2.872.933
GDP per capita (2019): $5.353
GNI per capita (2019): $5.220
Total mineral production 2019 (metr. t): 1.782.830
Total mineral production 2019 (MUSD): 5.157
DB20 (World Bank): score 67,7/100, rank 82/190





PRMs geological potential (RESEERVE West Balkan Mineral Register):

- Small to medium sized Cr deposits of 15Mt Proved and 2Mt Proved and Probable ore reserves;
- Small to medium sized Fe and Fe-Ni deposits of 162Mt Proved and 58Mt Proved and Probable ore reserves;
- Medium to large Cu ores, some containing Au, of 25Mt Proved ore reserves;
- Ti (rutile) – magnetite large deposits of 80Mt Proved and Probable ore reserves;
- 12Mt of phosphates (Proved ore reserves);
- Gypsum and talc.



Current production of commodities, 2019 (WMD 2021), by metr. t (except petroleum and natural gas). Industrial Minerals include gypsum and salt.	Chromium	Nickel	Copper	Industrial Minerals	Lignite
	488.700	2.960	5.900	128.000	95.380

PRMs business opportunities - proposed actions for the selected case studies:

- Development of the chromite's mining sector (short- midterm goals, 0-10 years): Modernize and upgrade mines, increase the processing plants' capacity and update their technology based on feasibility studies; Management of Cr extractive wastes; Conduct a scoping /pre-feasibility study for vertical integration of the Cr sector.
- Development of the Fushe Bardhe phosphates (short term goals, 0-5 years): Additional exploration and geochemical research to assess the geological potential; Conducting a review study on the best available methods/techniques for phosphates processing; Performing scoping and pre-feasibility studies based on the results of exploration works to examine the viability of phosphates extraction and processing.
- Development of Ti-magnetite (case study: Sukaxhi) (short term goals, 0-5 years): Additional exploration with the use of innovative techniques (i.e. remote sensing) to assess the geological potential; Conducting of a review study on the best available methods/techniques for Ti-magnetite processing; Performing a pre-feasibility study based on the results of exploration works examining the viability of Ti-magnetite extraction and processing.

General fields for improvement – General Road Map short- mid- long term actions

Promoting stake holders consent: Awareness campaigns addressed to the competent authorities and the other stake holders on the significance of RM to the Country's economy. Consultation on the actions needed to improve the framework for the development of the sector and the achievement of the Social License to Operate (SLO).

Upgrading the quality of geological potential data: Classification of resources, (inferred, indicated, measured), estimation of reserves per commodity and per type, (probable, proved), application of International codes and standards; Additional exploration work to increase resources and reserves and the level of confidence with application of innovative exploration techniques, combined with geochemical analyses (when needed) and lab research. Updating of the West Balkan Mineral Register.

Promoting legislation reforms and codification: Review of the State's Mineral Policy by a committee of representatives from the public sector and other stake holders - Simplification and Codification of inter linked regulations, including spatial planning and permitting; Compliance with EU environmental legislation, emphasis on protected areas (IUCN) covering 17,5% of the overall area of ALB; Upgrade regulatory areas such as Dealing with construction permits and Enforcing contracts.

Enhancing competiveness of RM sector – Attracting financing: Participation in R&D funded projects, emphasis on the improvement of RMs processing issues; Conduct market, scoping pre-feasibility and feasibility studies; Integrate chromium production concentrate instead of crude ore production; Attract investors to modernize chromite' mines and processing plants and further develop copper mines and plants, including reprocessing of copper flotation tailings.

Human Resources Capacity Building: Participation in thematic training programs, capacity building programs in cooperation with innovation providers and EU countries within EIT Raw Materials and other funded projects for technology and Best Available Techniques transfer, BATs; Life Long Learning, Train the Trainers programs.

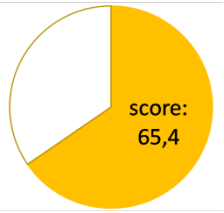
4.2 BOSNIA & HERZEGOVINA (BIH)

The summary profile of BiH is presented in next page, including the following individual templates:

- General information for the country: Surface area of the country and population data, main economic indicators (GDP, GNI), total mineral production in metr. t and MUSD and the DB20 score and ranking of the Country. The sources of these data are the World Bank reports and open data and the World Mining Data (WMD) reports.
- PRMs geological potential, based on the RESEERVE West Balkan Mineral Register entries, and a snapshot of the BiH's PRMs Map which was constructed within RESEERVE D6.1.
- Current production of commodities, 2019, based on the WMD 2021 Report.
- PRMs business opportunities - proposed actions for the selected case studies (Jasenica-Lušci Palanka bauxites and the zeolites of Dubnica), where the main Road Map actions for the development of these case studies are summarized, including timeline.
- SRMs business opportunities - proposed actions for the selected case studies (Red Mud of Dobro Selo and Dulici), where the main Road Map actions for the development of these case studies are summarized, including timeline.
- General Fields for improvement – General Road Map short- mid- long term actions. This section of the template summarizes the key actions proposed for the general improvement of the Country's RM sector per field defined in Chapter 3 of the Executive Summary. The General Strategy Road Map Timeline is presented in Section 3.6 of this Chapter.

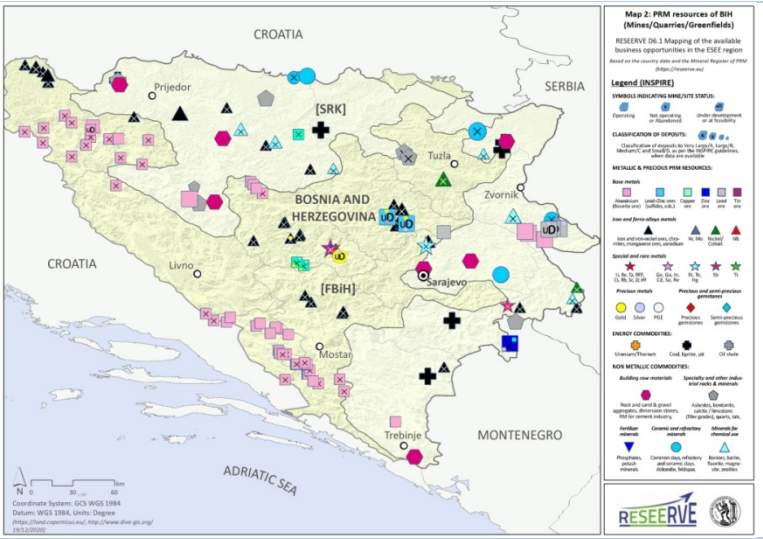
BOSNIA & HERZEGOVINA (BiH)

Surface area (2018): 51.210 sq. km
Population (2021):3.260.736
GDP per capita (2019): $6.109
GNI per capita (2019): $6.170
Total mineral production 2019 (metr. t): 16.657.815
Total mineral production 2019 (MUSD): 718
DB20 (World Bank): score 65,4/100, rank 90/190



PRMs geological potential (RESEERVE West Balkan Mineral Register):

- Large bauxite deposits in operating mines (unknown reserves), small bauxite deposits of 34Mt Probable ore reserves and many bauxite deposits of unknown size and reserves ;
- Medium to very large sized Fe-ore deposits of 130 Mt (either Proved or Probable reserves);
- Large to very large Pb-Zn deposits of 18Mt Proved and 7Mt Probable ore reserves;
- 3 Mt Proved Co ore reserves and some Sb;
- Zeolites (unknown reserves), bentonites, kaolin and gypsum;
- Lignite.



Current production of commodities, 2019 (WMD 2021), by metr. t . Ind. Minerals are bentonite, gypsum, kaolin, magnesite and salt.

Iron	Aluminum	Bauxite	Lead	Zinc	Industrial Minerals	Lignite
739.600	67.690	1.043.343	7.470	9.160	1.414.004	13.376.548

PRMs business opportunities - proposed actions for the selected case studies:

- Development of the Jasenica-Lušci Palanka bauxites (short term goal, 0-5 years): Additional exploration with the use of innovative techniques (i.e. remote sensing) to assess the geological potential; Performing scoping and pre-feasibility studies based on the results of exploration works to examine the viability of bauxites extraction and processing.
- Development of zeolites (case study: Dubnica) (short term goal, 0-5 years): Additional exploration with the use of innovative techniques to assess the geological potential and estimate reserves according to International standards; Conducting a pre-feasibility study based on the results of exploration works to examine the viability of zeolites exploitation.

SRMs business opportunities - proposed actions for the selected case studies: Red Mud of Dobro Selo and Dulici (midterm, 0-10 years, goals): Assessment of historical data; Review study for the internationally available state-of-the-art methods for red mud treatment and recovery of contained metal values Review study on the progress achieved in red mud processing globally; Additional research, geochemical analysis, lab test work and estimation of the REEs reserves contained of the REEs included in the Red mud; Conducting a scoping study for reprocessing and recovery extraction of the contained REEs.

General fields for improvement – General Road Map short- mid- long term actions

Promoting stake holders consent: Awareness campaigns addressed to the competent authorities and the other stake holders on the significance of RM to the Country's economy. Consultation on the actions needed to improve the framework for the development of the sector and the achievement of the Social License to Operate (SLO).

Upgrading the quality of geological potential data: Classification of resources, (inferred, indicated, measured), estimation of reserves per commodity and per type, (probable, proved), application of International codes and standards; Additional exploration work to increase resources and reserves and the level of confidence with application of innovative exploration techniques, combined with geochemical analyses (when needed) and lab research. Updating of the West Balkan Mineral Register.

Promoting legislation reforms and codification: Review of the State's Mineral Policy by a committee of representatives from the public sector and other stake holders from both entities, e.g. FBiH and RSK - Simplification and Codification of inter linked regulations, including spatial planning and permitting; Harmonization of regulations among the two entities, e.g. FBiH and RSK. Compliance with EU environmental legislation, emphasis on protected areas (IUCN) covering 3,94 % of the overall area of BIH; Upgrade regulatory areas such as Starting a business, Dealing with construction permits and Enforcing contracts.

Enhancing competiveness of RM sector – Attracting financing: Participation in R&D funded projects to support exploitation of bauxites and red mud processing and the lead-zinc exploitation; Conduct market, scoping and feasibility studies; Attract investors to invest in the exploration of industrial minerals such as zeolites and the exploitation of bauxites and lead-zinc ore deposits; Meeting the Extractive Industries Transparency Initiative (EITI) Standard.

Human Resources Capacity Building: Participation in thematic training programs, capacity building programs in cooperation with innovation providers and EU countries within EIT Raw Materials and other funded projects for Technology and Best Available Techniques, BATs transfer; Life Long Learning, Train the Trainers programs.

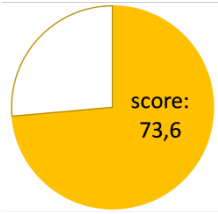
4.3 CROATIA (HRV)

The summary profile of HRV is presented in next page, including the following individual templates:

- General information for the country: Surface area of the country and population data, main economic indicators (GDP, GNI), total mineral production in metr. t and MUSD and the DB20 score and ranking of the Country. The sources of these data are the World Bank reports and open data and the World Mining Data (WMD) reports.
- PRMs geological potential, based on the RESEERVE West Balkan Mineral Register entries, and a snapshot of the HRV's PRMs Map which was constructed within RESEERVE D6.1.
- Current production of commodities, 2019, based on the WMD 2021 Report. It is noted that regarding the Mineral-Fuels Group, this table does not include petroleum and natural gas production. However the total mineral production figure also given in the template is including the petroleum and natural gas production figures for 2019.
- PRMs business opportunities - proposed actions for the selected case studies (the Mamutovac bauxite deposits and production of added value products from non metallic PRMs), where the main Road Map specific actions for the development of these case studies are summarized, including timeline.
- General Fields for improvement – General Road Map short- mid- long term actions. This section of the template summarizes the key actions proposed for the general improvement of the Country's RM sector per field defined in Chapter 3 of the Executive Summary. The General Strategy Road Map Timeline is presented in Section 3.6 of this Chapter.

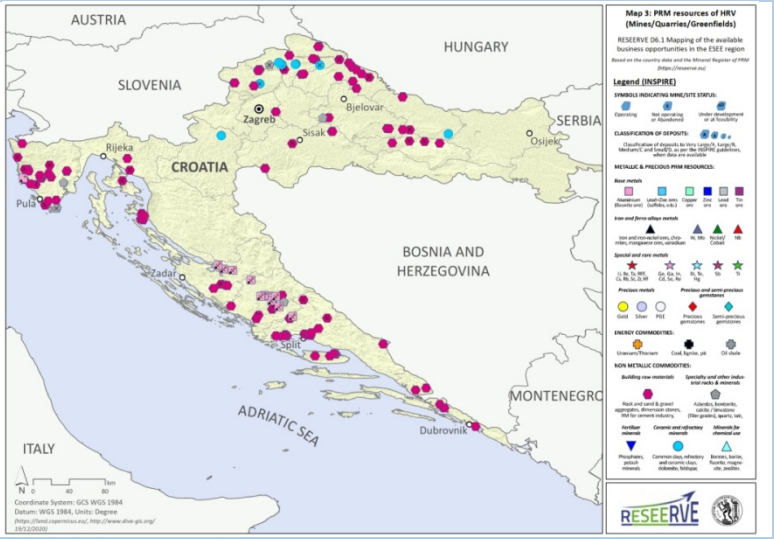
CROATIA (HRV)

Surface area (2018): 88.070 sq. km
Population (2021):4.081.651
GDP per capita (2019): $14.936
GNI per capita (2019): $14.980
Total mineral production 2019 (metr. t): 1.836.367
Total mineral production 2019 (MUSD): 440
DB20 (World Bank): score 73,6/100, rank 51/190



PRMs geological potential (RESEERVE West Balkan Mineral Register):

- Bauxite deposits of unknown size and reserves, containing Ti, V, Ga;
- Limestone and hard rock (andesite, dolerite, amphibolite) crushed rock aggregates, sand & gravel aggregates;
- Calcite and quartz sand deposits, of unknown size and reserves;
- Gypsum deposits of unknown reserves.



Current production of commodities, 2019 (WMD 2021), by metr. t (except petroleum and natural gas).	Bauxite	Industrial Minerals	
		Gypsum and Anhydrite	Salt
	14.342	199.255	93.870

PRMs business opportunities - proposed actions for the selected case studies:

- Development of the Mamutovac bauxite deposits (short term goal, 0-5 years): Additional exploration with the use of innovative techniques (i.e. remote sensing) to assess the geological potential; Estimation of the bauxite and REEs reserves according to International standards; Conducting scoping and pre-feasibility studies based on the results of exploration works to examine the viability of bauxites extraction and processing.
- Production of added value products from non metallic PRMs (short- midterm goal, 0-7 years): Conducting a comprehensive review study on the alternative uses of hard rocks and industrial minerals; Scoping study for the definition of the non metallic resources that present potential for production of added value products; Laboratory and pilot scale research for the production of added-value products such as ready-mixed mortars, abrasives, rock-wool e.tc from hard rocks.

General fields for improvement – General Road Map short- mid- long term actions

Promoting stake holders consent: Awareness campaigns addressed to the competent authorities and the other stake holders on the significance of RM to the Country's economy. Consultation on the actions needed to improve the framework for the development of the sector and the achievement of the Social License to Operate (SLO).

Upgrading the quality of geological potential data: Classification of resources, (inferred, indicated, measured), estimation of reserves per commodity and per type, (probable, proved), application of International codes and standards; Additional exploration work to increase resources and reserves and the level of confidence with application of innovative exploration techniques, combined with geochemical analyses (when needed) and lab research. Updating of the West Balkan Mineral Register.

Promoting legislation reforms and codification: Update – improvement of the procedures followed for granting exploration and exploitation permits; Review of the role of local administrative bodies during permitting; Upgrade the regulatory area of Dealing with construction permits and improve areas such as Ease of getting credit and Ease of resolving insolvency.

Enhancing competiveness of RM sector – Attracting financing: Upgrading and increase of the research facilities; Participation, as a leading partner in the EIT RIS projects, and other R&D funded projects to investigate the recovery of REEs from bauxites and the production of added value products from non-metallic PRMs; Conduct market, scoping and feasibility studies; Attract investors to invest in new ideas; Meeting the Extractive Industries Transparency Initiative (EITI) Standard.

Human Resources Capacity Building: Participation in thematic training programs, Coordination and Participation in Capacity building programs in cooperation with innovation providers funded by EIT Raw Materials or other sources for Technology and Best Available Techniques, BATs transfer; Life Long Learning, Train the Trainers programs.

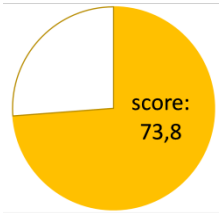
4.4 MONTENEGRO (MNE)

The summary profile of MNE is presented in next page, including the following individual templates:

- General information for the country: Surface area of the country and population data, main economic indicators (GDP, GNI), total mineral production in metr. t and MUSD and the DB20 score and ranking of the Country. The sources of these data are the World Bank reports and open data and the World Mining Data (WMD) reports.
- PRMs geological potential, based on the RESEERVE West Balkan Mineral Register entries, and a snapshot of the MNE's PRMs Map constructed within RESEERVE D6.1.
- Current production of commodities, 2019, based on the WMD 2021 Report.
- PRMs business opportunities - proposed actions for the selected case studies (the Brskovo and Zuta Prla Pb-Zn mines), where the main Road Map actions for the development of these case studies are summarized, including timeline.
- SRMs business opportunities - proposed actions for the selected case studies (Red Mud of Podgorica), where the main Road Map actions for the development of these case studies are summarized, including timeline.
- General Fields for improvement – General Road Map short- mid- long term actions. This section of the template summarizes the key actions proposed for the general improvement of the Country's RM sector per field defined in Chapter 3 of the Executive Summary. The General Strategy Road Map Timeline is presented in Section 3.6 of this Chapter.

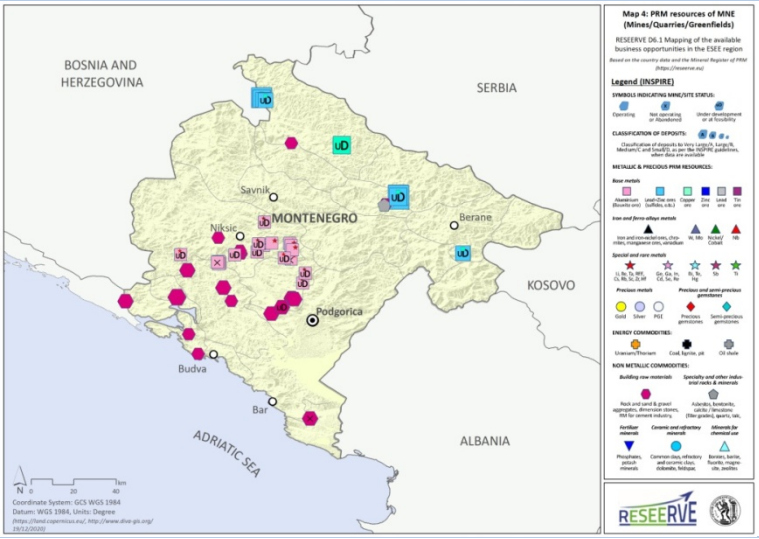
MONTENEGRO (MNE)

Surface area (2018): 13.810 sq. km
Population (2021):628.053
GDP per capita (2019): $8.909
GNI per capita (2019): $9.060
Total mineral production 2019 (metr. t): 2.429.477
Total mineral production 2019 (MUSD): 159
DB20 (World Bank): score 73,8/100, rank 50/190



PRMs geological potential (RESEERVE West Balkan Mineral Register):

- Medium to large and very large sized Pb-Zn deposits of 53,6 Mt Proved ore reserves in one operating mine and many mines at the feasibility stage;
- Small sized bauxite deposits of 24Mt Proved and 6,MT Probable ore reserves in operating and under development mines;
- 7,4Mt of Probable Cu ore reserves;
- Limestone crushed rock aggregates, sand & gravel aggregates;
- Lignite.



Current production of commodities, 2019 (WMD 2021), by metr. t.	Aluminum	Bauxite	Lead	Zinc	Lignite
	36.552	774.725	3.480	9.520	1.605.200

PRMs business opportunities - proposed actions for the selected case studies:

Development of the Brskovo and Zuta Prla Pb-Zn mines (short – mid and long term goals, 0-20 years): Additional exploration work, including geophysical research with the use of innovative techniques to assess the geological potential; Conducting feasibility studies based on the results of exploration and research works to examine the development of new Pb-Zn mines and processing plants; Design of reclamation plans for the environmental management of brown fields.

SRMs business opportunities - proposed actions for the selected case studies:

Red Mud of Podgorica (midterm, 0-10 years, goals): Assesment of historical data; Review study for the internationally available state-of-the-art methods for red mud treatment and recovery of contained metal values; Additional research, geochemical analysis, lab testwork and estimation of REEs reserves contained in the Red mud; Conducting a scoping study for reprocessing and recovery of the contained REEs.

General fields for improvement – General Road Map short- mid- long term actions

Promoting stake holders consent: Awareness campaigns addressed to the competent authorities and the other stake holders on the significance of RM to the Country's economy. Consultation on the actions needed to improve the framework for the development of the sector and the achievement of the Social License to Operate (SLO).

Upgrading the quality of geological potential data: Classification of resources, (inferred, indicated, measured), estimation of reserves per commodity and per type, (probable, proved), application of International codes and standards; Additional exploration work to increase resources and reserves and the level of confidence with application of innovative exploration techniques, combined with geochemical analyses (when needed) and lab research. Updating of the West Balkan Mineral Register.

Promoting legislation reforms and codification: Development of a comprehensive Mineral Policy identifying RMs of public importance by a committee of representatives from the public sector and other stake holders - Simplification of the procedures for granting concessions and Codification of inter linked prevailing state regulations, including spatial planning and permitting; Alignment with EU environmental legislation; emphasis on protected areas (IUCN) covering 13,4% of the overall area of MNE. Upgrade regulatory areas such as Registering property and Enforcing contracts.

Enhancing competiveness of RM sector – Attracting financing: Participation in R&D funded projects to support exploitation of the lead-zinc mineral potential of the country; Conduct market, scoping and feasibility studies; Attract investors for the exploration and exploitation of lead-zinc ore deposits and modernize mines and especially processing plants; Reclamation and Management of brown fields. Meeting the Extractive Industries Transparency Initiative (EITI) Standard.

Human Resources Capacity Building: Participation in thematic training programs, in Capacity building programs in cooperation with innovation providers funded by EIT Raw Materials or other sources for Technology and Best Available Techniques, BATs transfer; Life Long Learning, Train the Trainers programs.

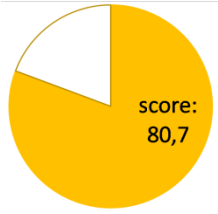
4.5 NORTH MACEDONIA (MKD)

The summary profile of MKD is presented in next page, including the following individual templates:

- General information for the country: Surface area of the country and population data, main economic indicators (GDP, GNI), total mineral production in metr. t and MUSD and the DB20 score and ranking of the Country. The sources of these data are the World Bank reports and open data and the World Mining Data (WMD) reports.
- PRMs geological potential, based on the RESEERVE West Balkan Mineral Register entries, and a snapshot of the MKD's PRMs Map constructed within RESEERVE D6.1.
- Current production of commodities, 2019, based on the WMD 2021 Report.
- PRMs business opportunities - proposed actions for the selected case studies (poorly explored Fe-Ni ore deposits of Rzanovo), where the main Road Map actions for the development of these case studies are summarized, including timeline.
- SRMs business opportunities - proposed actions for the selected case studies (Pb-Zn Flotation Tailings of Probistip), where the main Road Map actions for the development of these case studies are summarized, including timeline.
- General Fields for improvement – General Road Map short- mid- long term actions. This section of the template summarizes the key actions proposed for the general improvement of the Country's RM sector per field defined in Chapter 3 of the Executive Summary. The General Strategy Road Map Timeline is presented in Section 3.6 of this Chapter.

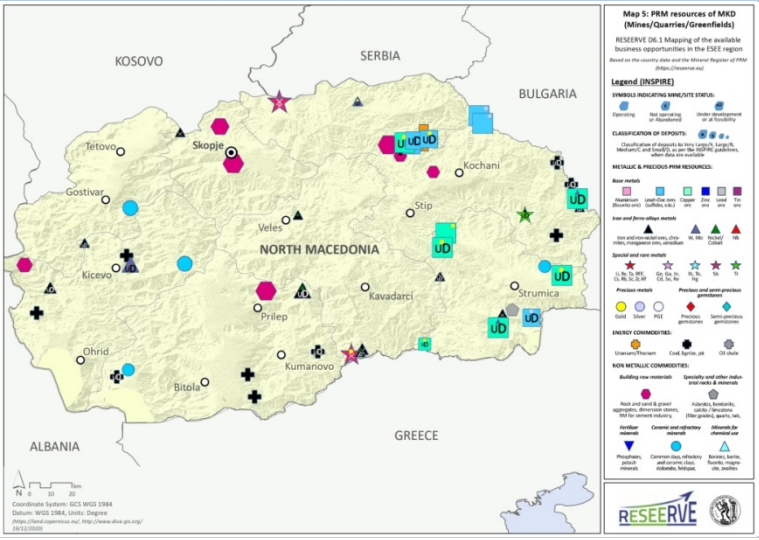
NORTH MACEDONIA (MKD)

Surface area (2018): 25.710 sq. km
Population (2021): 2.082.658
GDP per capita (2019): $6.022
GNI per capita (2019): $5.840
Total mineral production 2019 (metr. t): 5.445.245
Total mineral production 2019 (MUSD): 362
DB20 (World Bank): score 80,7/100, rank 17/190



PRMs geological potential (RESEERVE West Balkan Mineral Register):

- Very large Cu deposits of 734 Mt Proved and Proved & Probable ore reserves, most of them under development, some by foreign investors;
- Large and very large Pb-Zn deposits of 28Mt mostly Proved ore reserves in operating mines or at feasibility stage;
- A very large Fe-Ni deposit of 200Mt Probable ore reserves, at feasibility; Small sized Fe-ore deposits (18Mt all types of reserves), mainly under development;
- 0,6Mt Probable ore reserves of Mo containing Re, at feasibility; Unknown reserves of Mo ore containing Au, Ag, at feasibility;
- Sb ores containing As of 0,8Mt Probable and Probable & Proved ore reserves; Unknown reserves of Ti ore, at feasibility; Gypsum and feldspars; Lignite.



Current production of commodities, 2019 (WMD 2021). Ind. Minerals include bentonite, feldspars and gypsum.	Copper (metr. t.)	Lead (metr. t.)	Zinc (metr. t.)	Gold (Kg)	Silver (Kg)	Ind. Minerals (metr. t.)	Lignite (metr. t.)
	7.231	43.490	31.040	593	17.880	297.382	5.066.083

PRMs business opportunities - proposed actions for the selected case studies:

- Development of poorly explored Fe-Ni ore deposits (i.e. Rzanovo) (short term, 0-5 years): Additional exploration work using innovative techniques; Conducting feasibility studies based on the results of exploration and other research works.
- Development (short – mid and long term goals, 0-20 years) of other sectors supporting extraction and processing activities in areas with high and very high business opportunities potential such as future exploitation of Cu and Pb-Zn ores, e.g. machinery suppliers, consulting companies, constructors, R&D facilities, e.tc.

SRMs business opportunities - proposed actions for the selected case studies: Pb-Zn Flotation Tailings of Probistip (short term, 0-5 years, goals): Assesment of historical data; Additional research, geochemical analysis, lab testwork and estimation of reserves of the metallic commodities and precious metals found in the tailings; Conducting a scoping study for reprocessing and recovery of the contained commodities.

General fields for improvement – General Road Map short- mid- long term actions

Promoting stake holders consent: Awareness campaigns addressed to the competent authorities and the other stake holders on the significance of RM to the Country's economy. Consultation on the actions needed to improve the framework for the development of the sector and the achievement of the Social License to Operate (SLO).

Upgrading the quality of geological potential data: Classification of resources, (inferred, indicated, measured), estimation of reserves per commodity and per type, (probable, proved), application of International codes and standards; Additional exploration work to increase resources and reserves and the level of confidence with application of innovative exploration techniques, combined with geochemical analyses (when needed) and lab research. Updating of the West Balkan Mineral Register.

Promoting legislation reforms and codification: Review and Codification of existing mining and interlinked legislations by a committee of representatives from the public sector and other stake holders in order to minimize overlapping competencies; Compiliance with EU environmental legislation, emphasis placed on protected areas (IUCN) occupying 10,83% of the area of MKD; Further improvement of regulatory areas such as Registering property and Enforcing contracts.

Enhancing competiveness of RM sector – Attracting financing: Improve social acceptance for the RM Sector activities; Conduct market, scoping and feasibility studies; Enhance the development of domestic sectors supporting the RM activities; Management of wastes and reclamation of brown fields; Meeting the Extractive Industries Transparency Initiative (EITI) Standard.

Human Resources Capacity Building: Participation in thematic training programs, in Capacity building programs in cooperation with innovation providers funded by EIT Raw Materials or other sources for Technology and Best Available Techniques, BATs transfer; Life Long Learning, Train the Trainers programs.

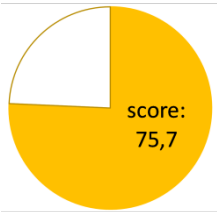
4.6 SERBIA (SRB)

The summary profile of SRB is presented in next page, including the following individual templates:

- General information for the country: Surface area of the country and population data, main economic indicators (GDP, GNI), total mineral production in metr. t and MUSD and the DB20 score and ranking of the Country. The sources of these data are the World Bank reports and open data and the World Mining Data (WMD) reports.
- PRMs geological potential, based on the RESEERVE West Balkan Mineral Register entries, and a snapshot of the SRB's PRMs Map constructed within RESEERVE D6.1.
- Current production of commodities, 2019, based on the WMD 2021 Report. It is noted that regarding the Mineral-Fuels Group, this table includes only lignite production, and not petroleum and natural gas production. However the total mineral production figure also given in the template is including the petroleum and natural gas production figures for 2019.
- PRMs business opportunities - proposed actions for the selected case studies (the Mačkatica Mo ore and the Čukaru Peki - Lower zone Cu ore), where the main Road Map actions for the development of these case studies are summarized, including timeline.
- SRMs business opportunities - proposed actions for the selected case studies (Bor Cu flotation tailings), where the main Road Map actions for the development of these case studies are summarized, including timeline.
- General Fields for improvement – General Road Map short- mid- long term actions. This information template summarizes the key actions proposed for the general improvement of the Country's RM sector per field defined in Chapter 3 of the Executive Summary. The General Strategy Road Map Timeline is presented in Section 3.6 of this Chapter.

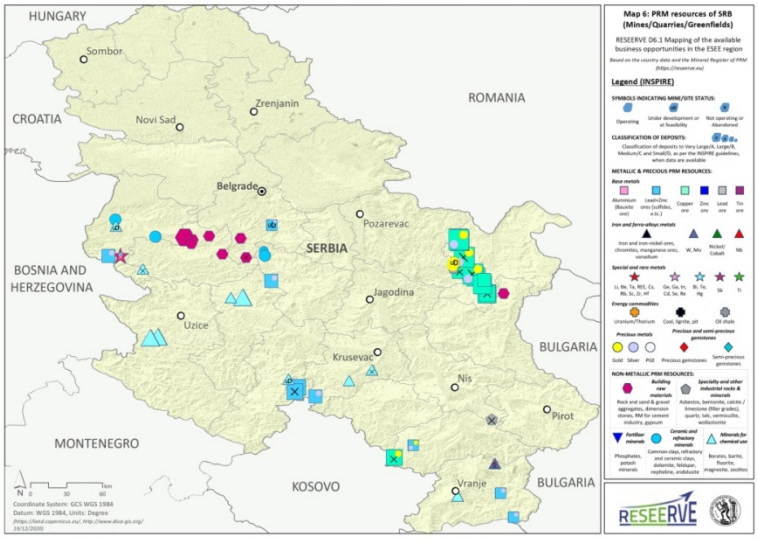
SERBIA (SRB)

Surface area (2018): 88.360 sq. km
Population (2021):8.697.550
GDP per capita (2019): $7.412
GNI per capita (2019): $7.030
Total mineral production 2019 (metr. t): 40.314.260
Total mineral production 2019 (MUSD): 1.726
DB20 (World Bank): score 75,7/100, rank 44/190



PRMs geological potential (RESEERVE West Balkan Mineral Register):

- Two Au ore deposits (total size: 43Mt) (unknown reserves), in development by foreign investor;
- Large and very large Cu deposits of 4.784Mt Proved and Probable or unknown ore reserves, some in operating mines run by a multinational group;
- Very large borates – Li ore deposit (135,7Mt all types of resources – unknown reserves) under development by foreign investor;
- Mo ore deposit (177Mt-unknown reserves) under development by foreign investor;
- 22 Mt Proved and Probable Pb-Zn ore reserves;
- Kaolin, magnesite and zeolites (unknown reserves) in operating mines; Quartz sand and gravel aggregates; Lignite.



Current production of commodities, 2019 (WMD 2021) (except petroleum and natural gas). Ind. Minerals include kaolin and salt.

Copper (metr. t.)	Lead (metr. t.)	Selenium (metr. t.)	Zinc (metr. t.)	Gold (Kg)	Palladium (Kg)	Platinum (Kg)	Silver (Kg)	Ind. Minerals (metr. t.)	Lignite (metr. t.)
43.550	13.930	20	10.560	1.452	10	10	14.502	133.464	38.880.520

PRMs business opportunities - proposed actions for the selected case studies:

- Development of the Mačkatica Mo ore and the Čukaru Peki - Lower zone Cu ore (midterm, 0-10 years): Identification of reserves per commodity; Investigate processing; Conducting market and feasibility studies.
- Development (short – mid and long term goals, 0-20 years) of other sectors supporting extraction and processing activities in areas with very high business opportunities potential such as future exploitation of Au, Cu, the borates-Li and the Mo ore deposits, like machinery suppliers, consulting agencies, constructive companies, testing facilities, e.tc.

SRMs business opportunities - proposed actions for the selected case studies: (short term, 0-5 years, goals): Reprocessing of Bor Cu flotation tailings: Assesment of historical data; Additional research, geochemical analysis, lab testwork and estimation of reserves per metallic commodity included in tailings; Conducting a scoping study for reprocessing and extraction of valuable commodities.

General fields for improvement – General Road Map short- mid- long term actions

Promoting stake holders consent: Awareness campaigns addressed to the competent authorities and the other stake holders on the significance of RM to the Country's economy. Consultation on the actions needed to improve the framework for the development of the sector and the achievement of the Social License to Operate (SLO).

Upgrading the quality of geological potential data: Classification of resources, (inferred, indicated, measured), estimation of reserves per commodity and per type, (probable, proved), application of International codes and standards; Additional exploration work to increase resources and reserves and the level of confidence with application of innovative exploration techniques, combined with geochemical analyses (when needed) and lab research. Updating of the West Balkan Mineral Register.

Promoting legislation reforms and codification: Further improvement of the Mining Legislation reformed recently with emphasis on the codification of interlinked regulations, including regulations' for the alternative exploitation of SRMs; Developing a comprehensive RMs policy and strategy; Compliance with EU environmental legislation, emphasis placed on protected areas (IUCN) occupying 7,93% of the area of SRB; Further improvement of the areas of Enforcing contracts, Ease of getting credit and Ease of resolving insolvency.

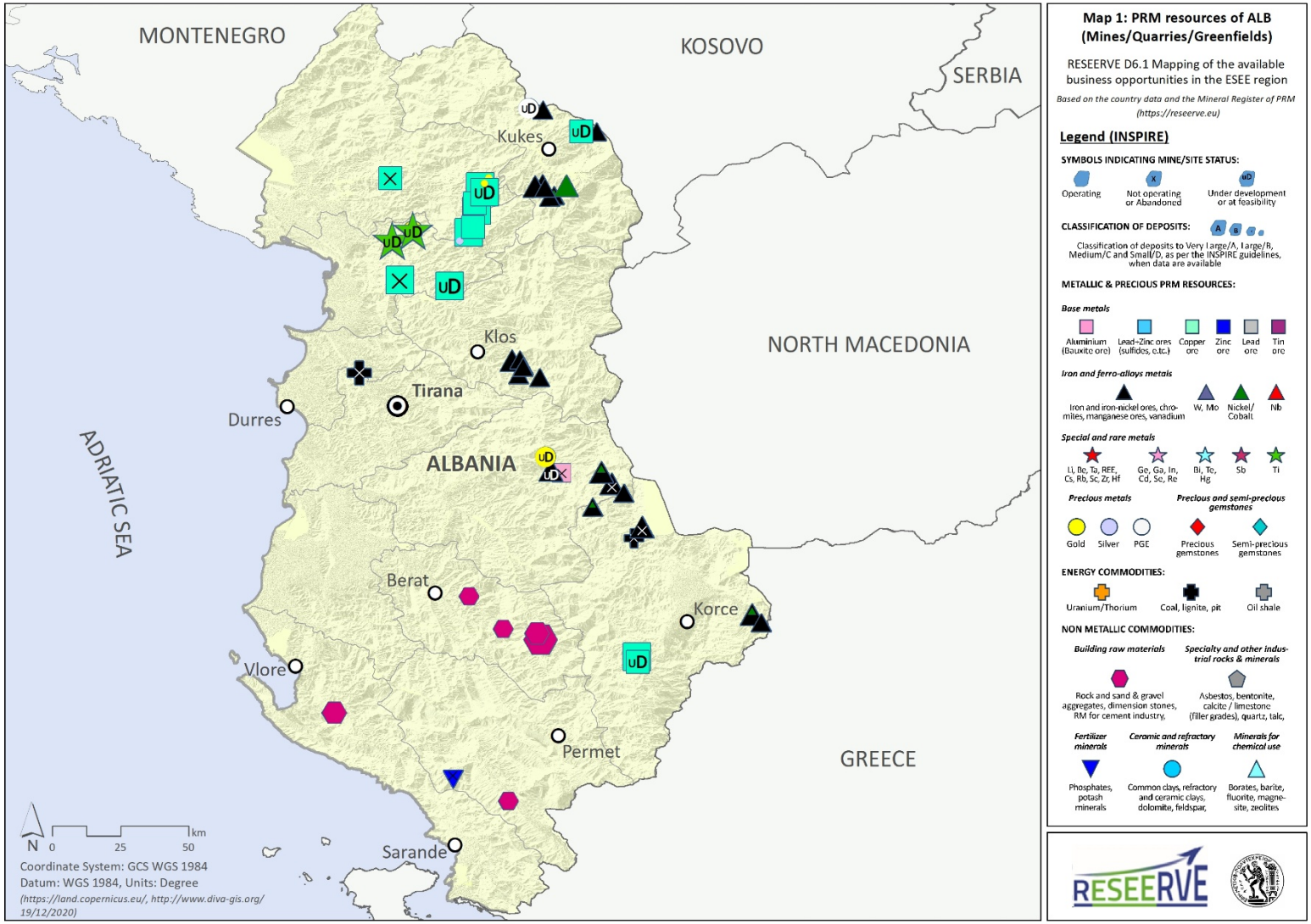
Enhancing competiveness of RM sector – Attracting financing: Improve social acceptance for the RM Sector activities; Conduct market, scoping and feasibility studies; Enhance the development of domestic sectors supporting the RM activities; Management of wastes and Reclamation of brown fields; Meeting the Extractive Industries Transparency Initiative (EITI) Standard.

Human Resources Capacity Building: Participation in thematic training programs, in Capacity building programs in cooperation with innovation providers funded by EIT Raw Materials or other sources for Technology and Best Available Techniques, BATs transfer; Life Long Learning, Train the Trainers programs.

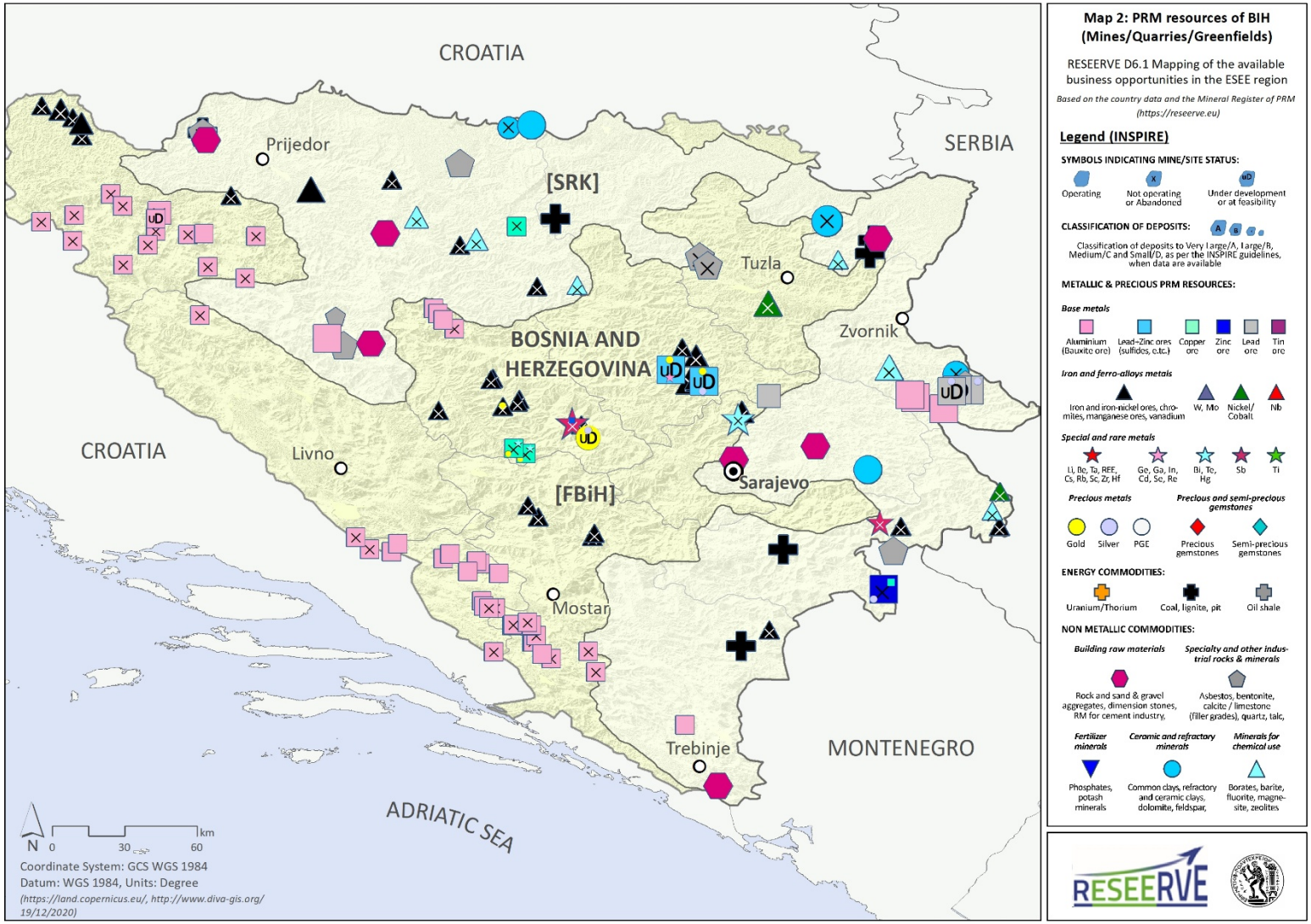
ANNEX: MAPS

Twenty two (22) maps were created in ArcGIS 10.5.1 for the 6 ESEE countries examined:

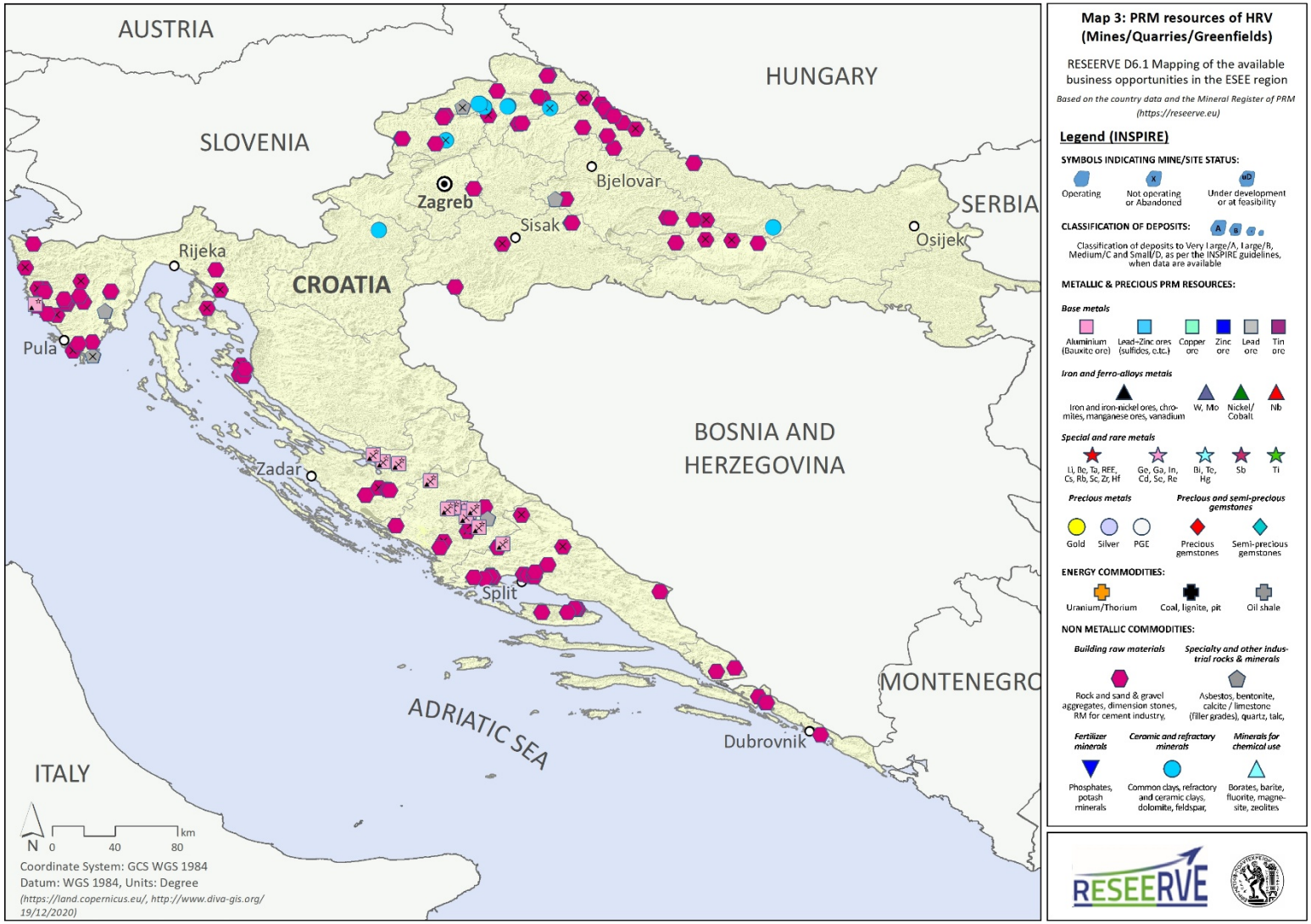
- *Eight (8) maps with PRM resources, SRM sites and CRM presence, using the INSPIRE Directive Technical Guidelines -Data Specification on Mineral Resources. These maps were included in the RESEERVE D6.1 Report;*
- *Two (2) maps, one for PRM and one for SRM sites presenting the case studies selected within D6.4;*
- *Six (6) maps, one for each country with transport infrastructure information, and*
- *Six (6) maps, one for each country presenting the protected areas, as defined by the countries.*



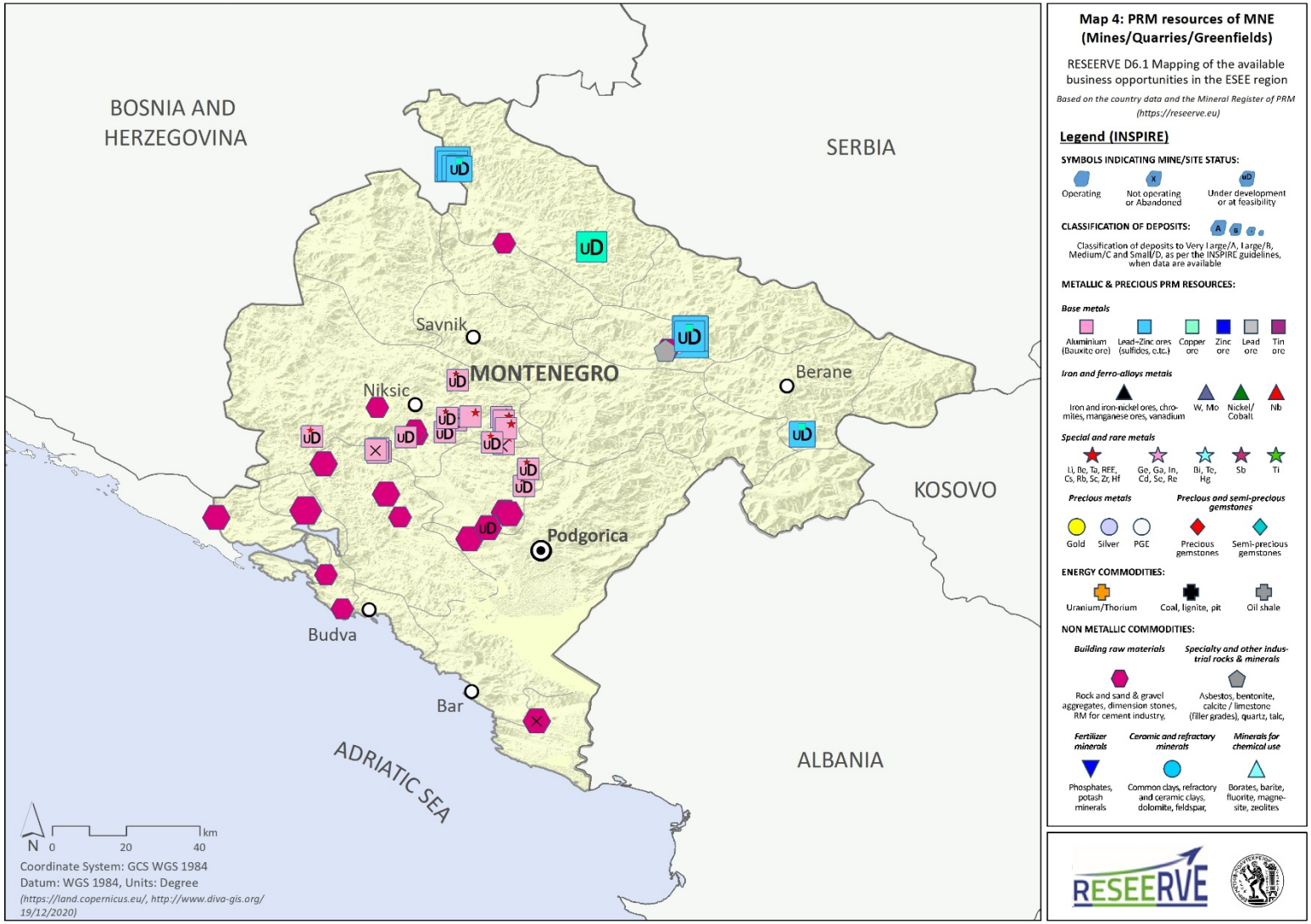
Map 1: PRM Resources of Albania – ALB (Mines/ Quarries/ Greenfields)



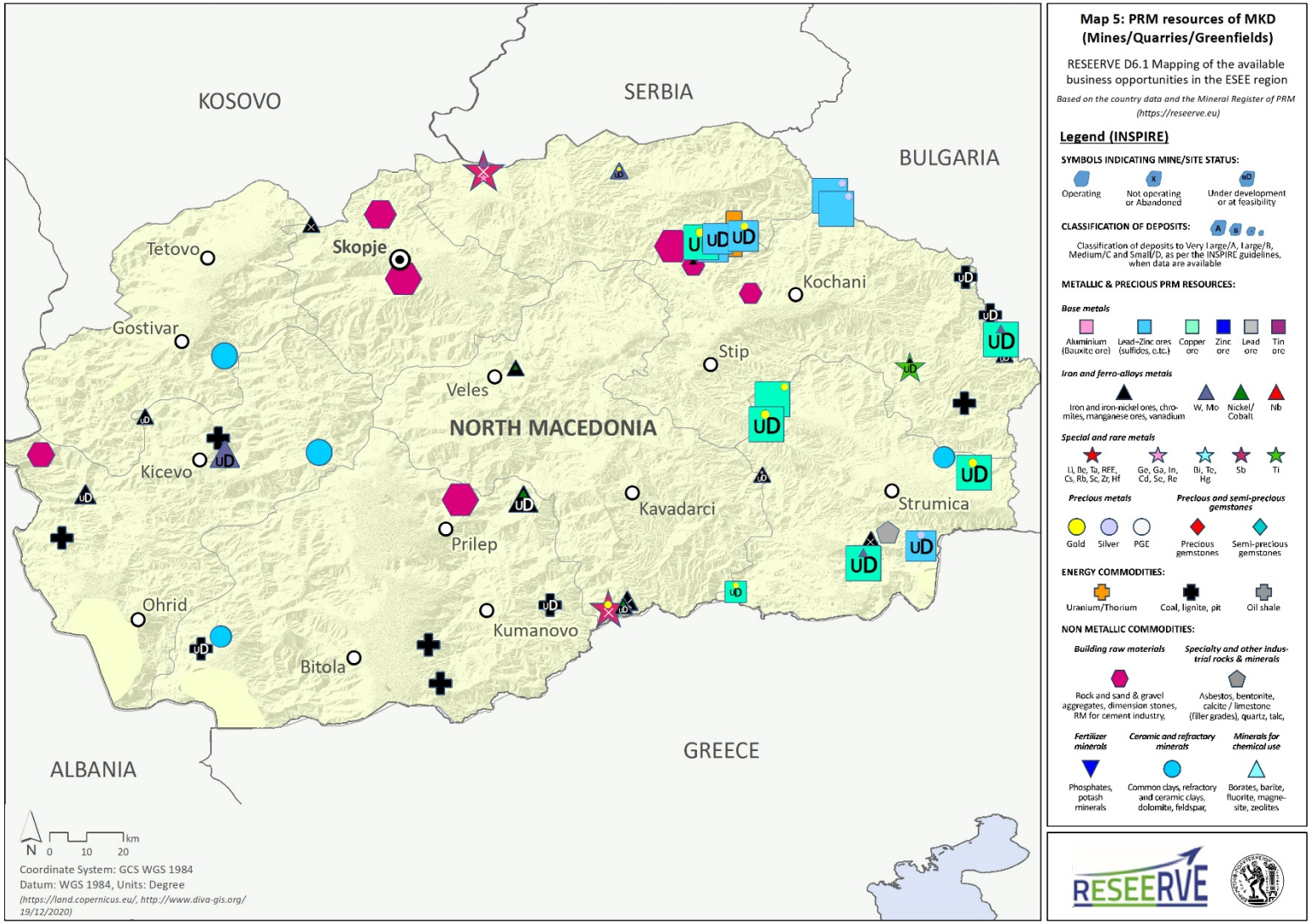
Map 2: PRM Resources of Bosnia and Herzegovina – BiH (Mines/ Quarries/ Greenfields)



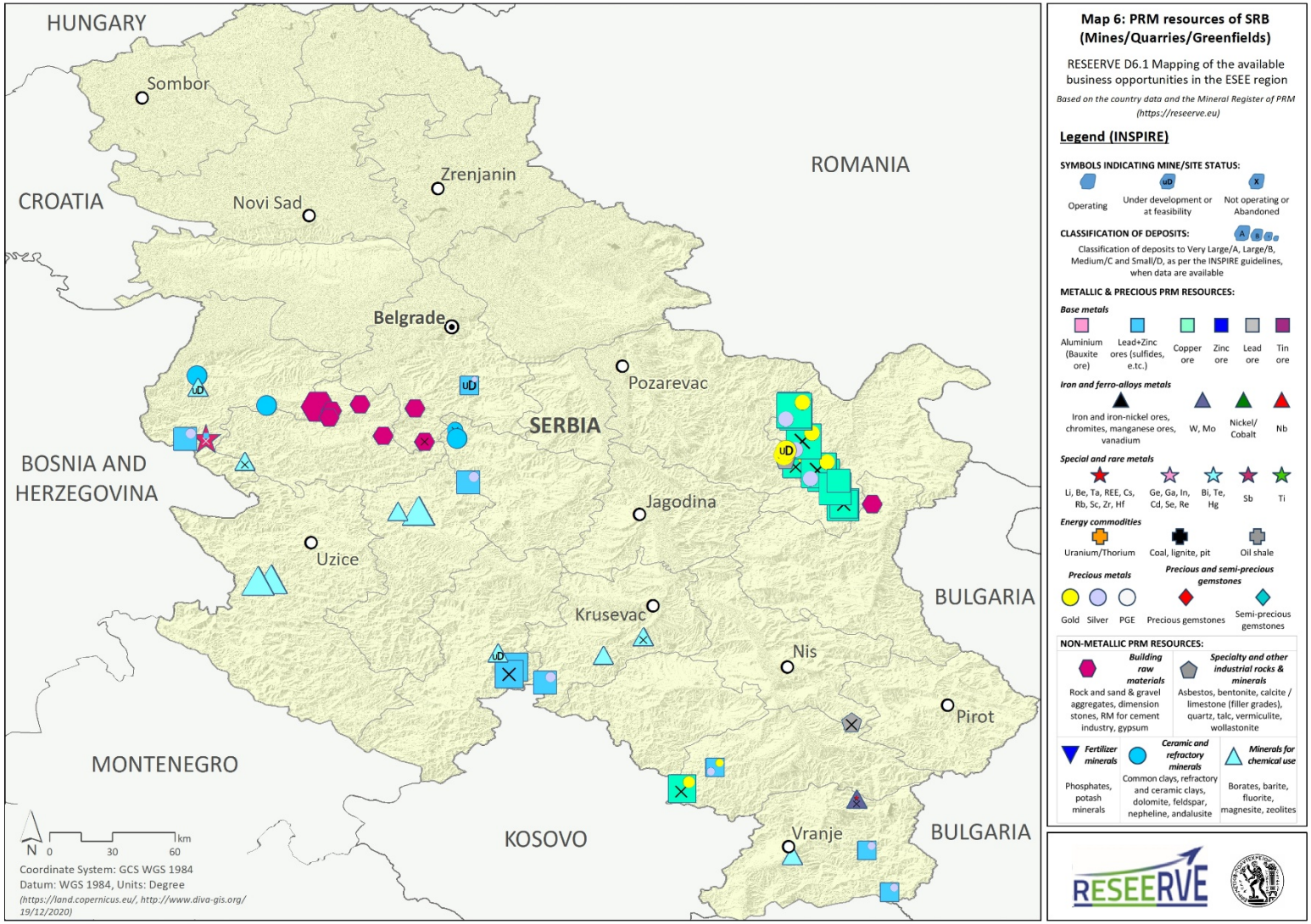
Map 3: PRM Resources of Croatia – HRV (Mines/ Quarries/ Greenfields)



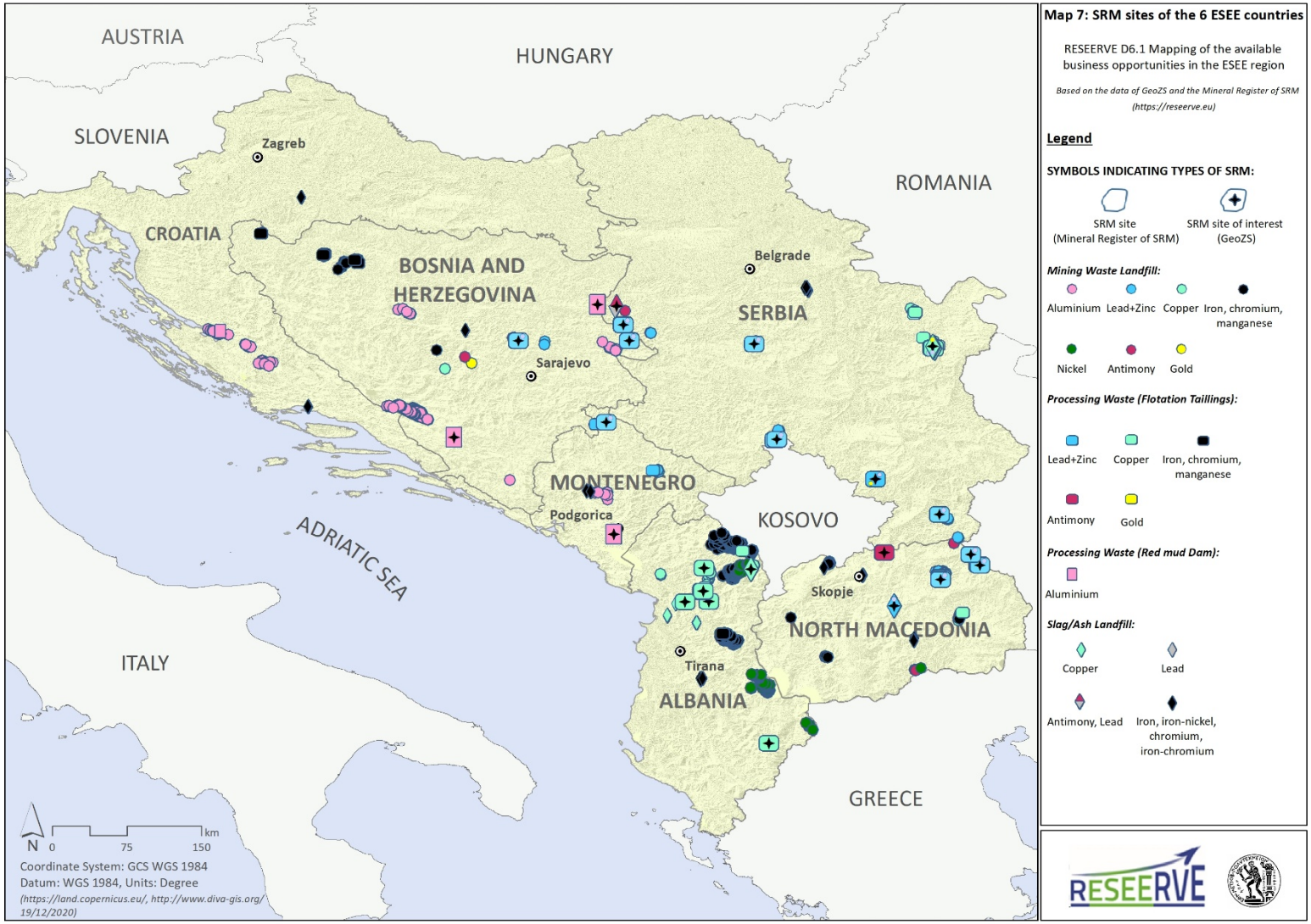
Map 4: PRM Resources of Montenegro – MNE (Mines/ Quarries/ Greenfields)



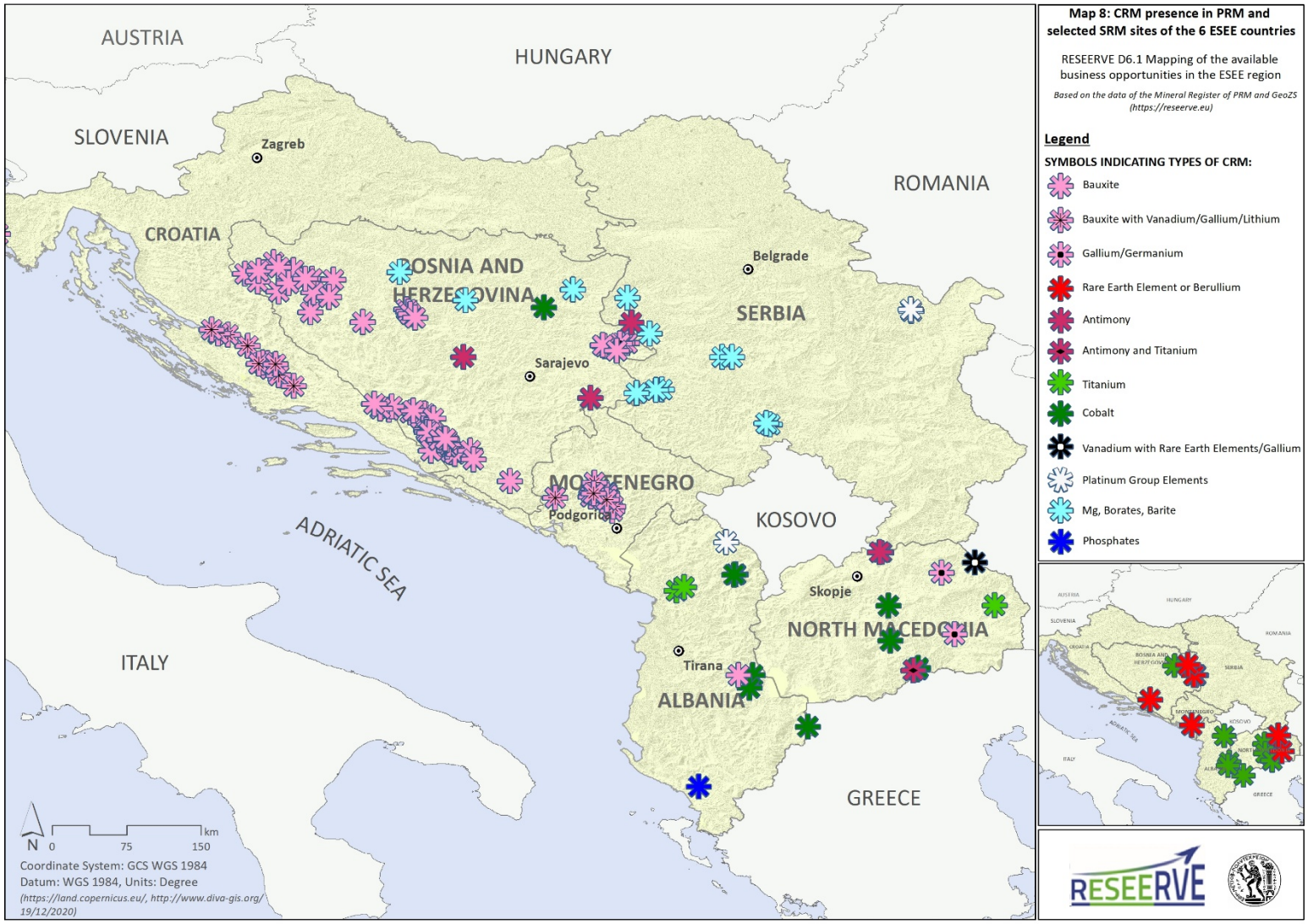
Map 5: PRM Resources of Republic of North Macedonia – MKD (Mines/ Quarries/ Greenfields)



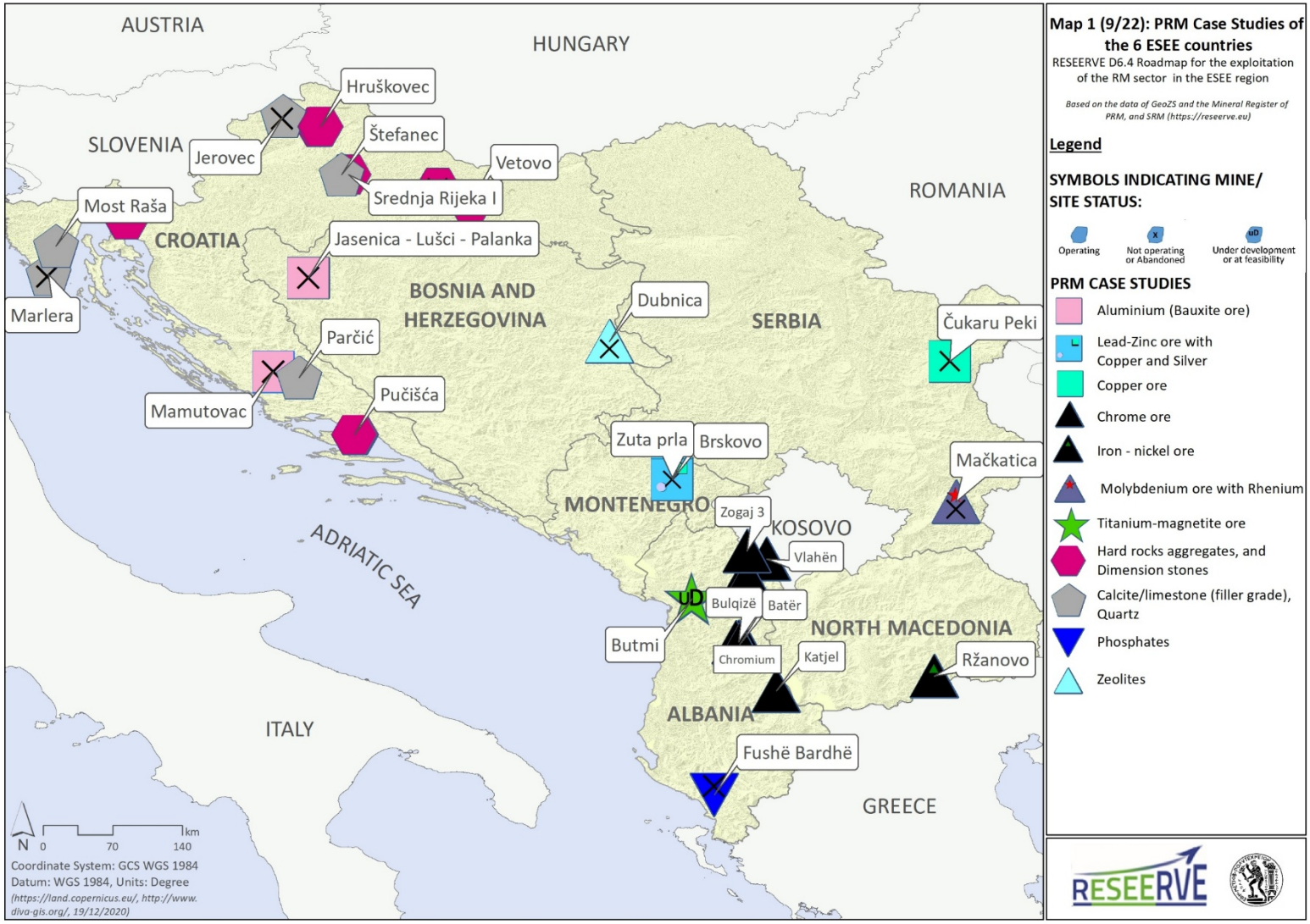
Map 6: PRM Resources of Serbia – SRB (Mines/ Quarries/ Greenfields)



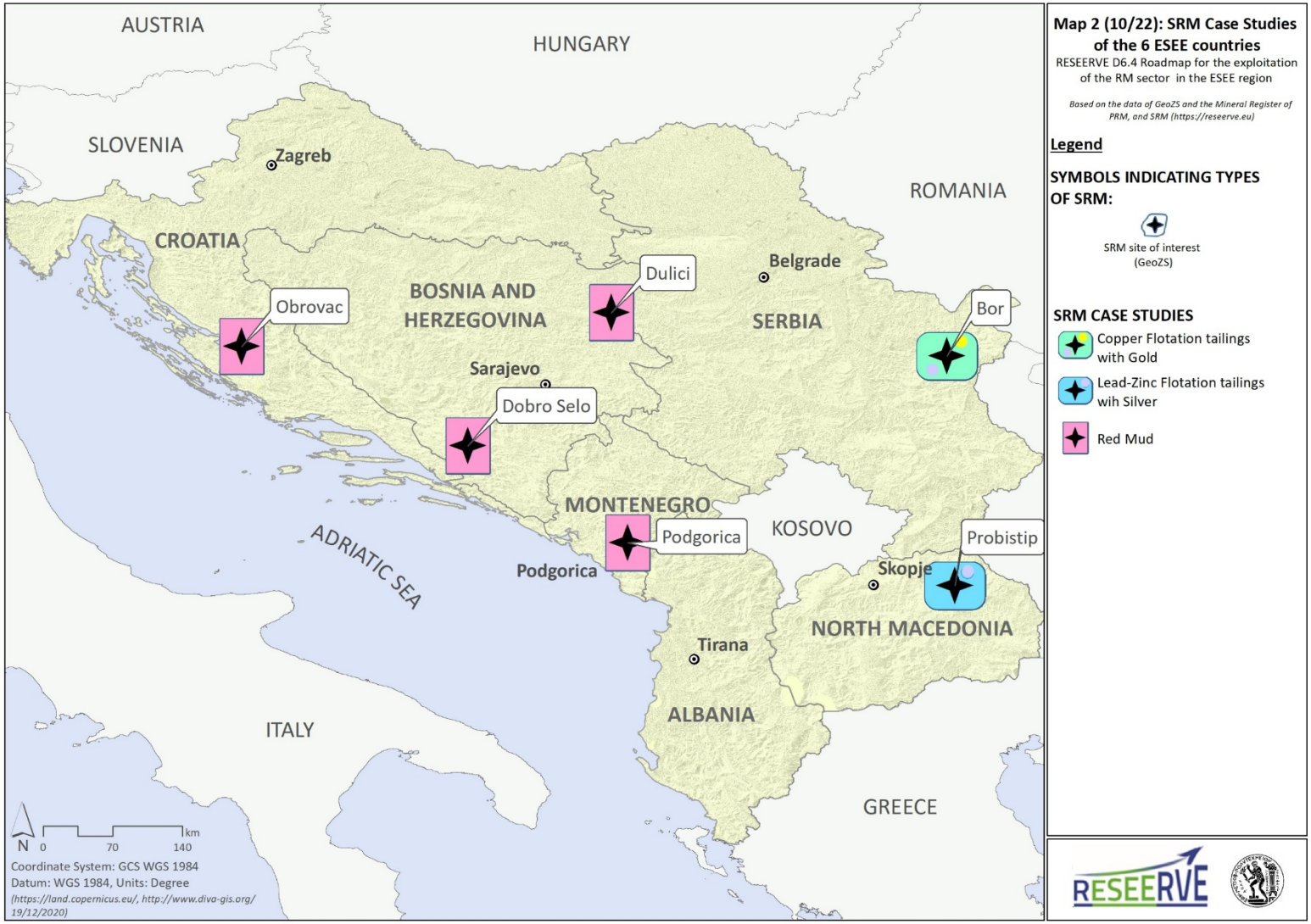
Map 7: SRM sites of the 6 ESEE Countries



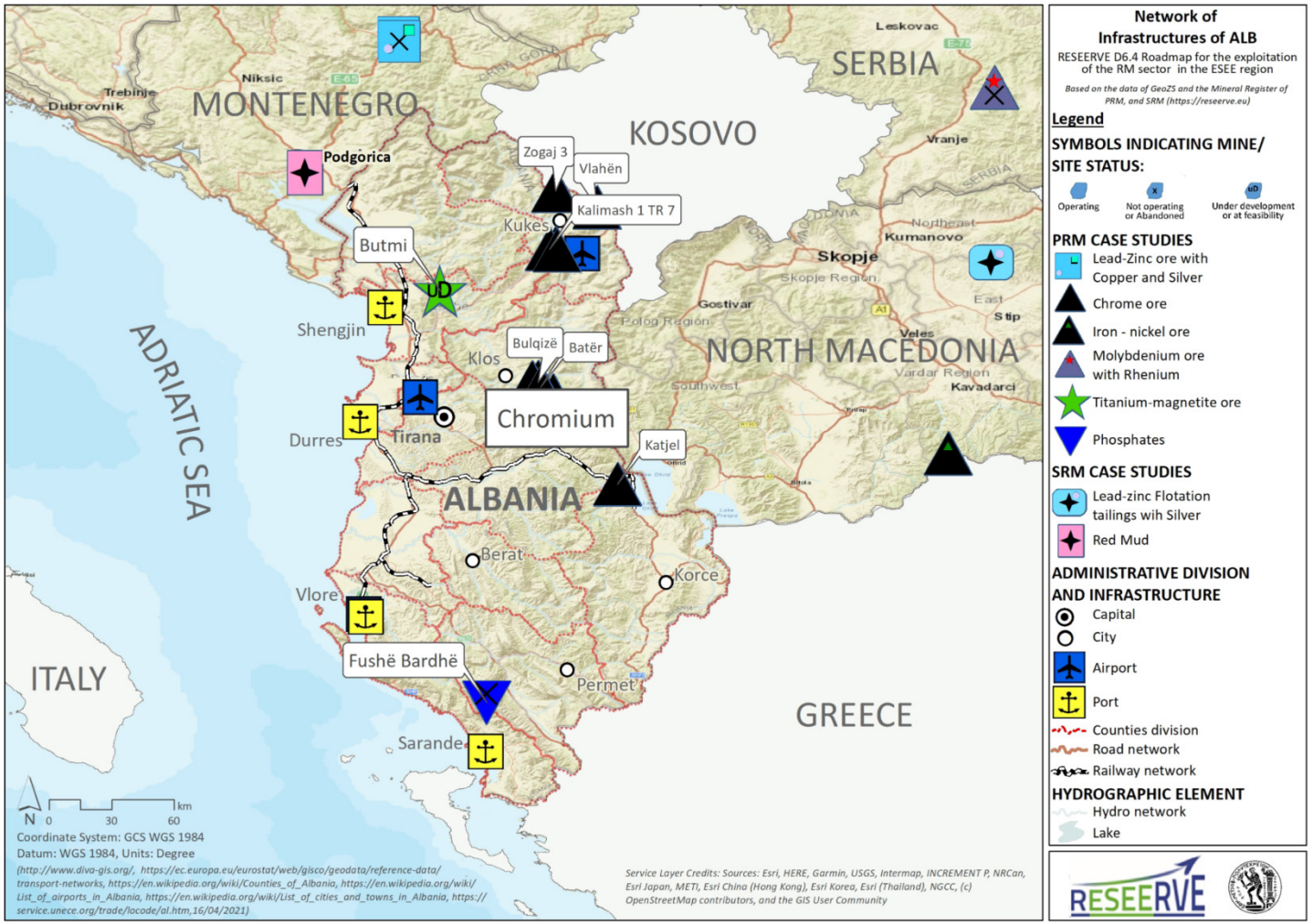
Map 8: CRM presence in PRM and selected SRM sites of the 6 ESEE Countries



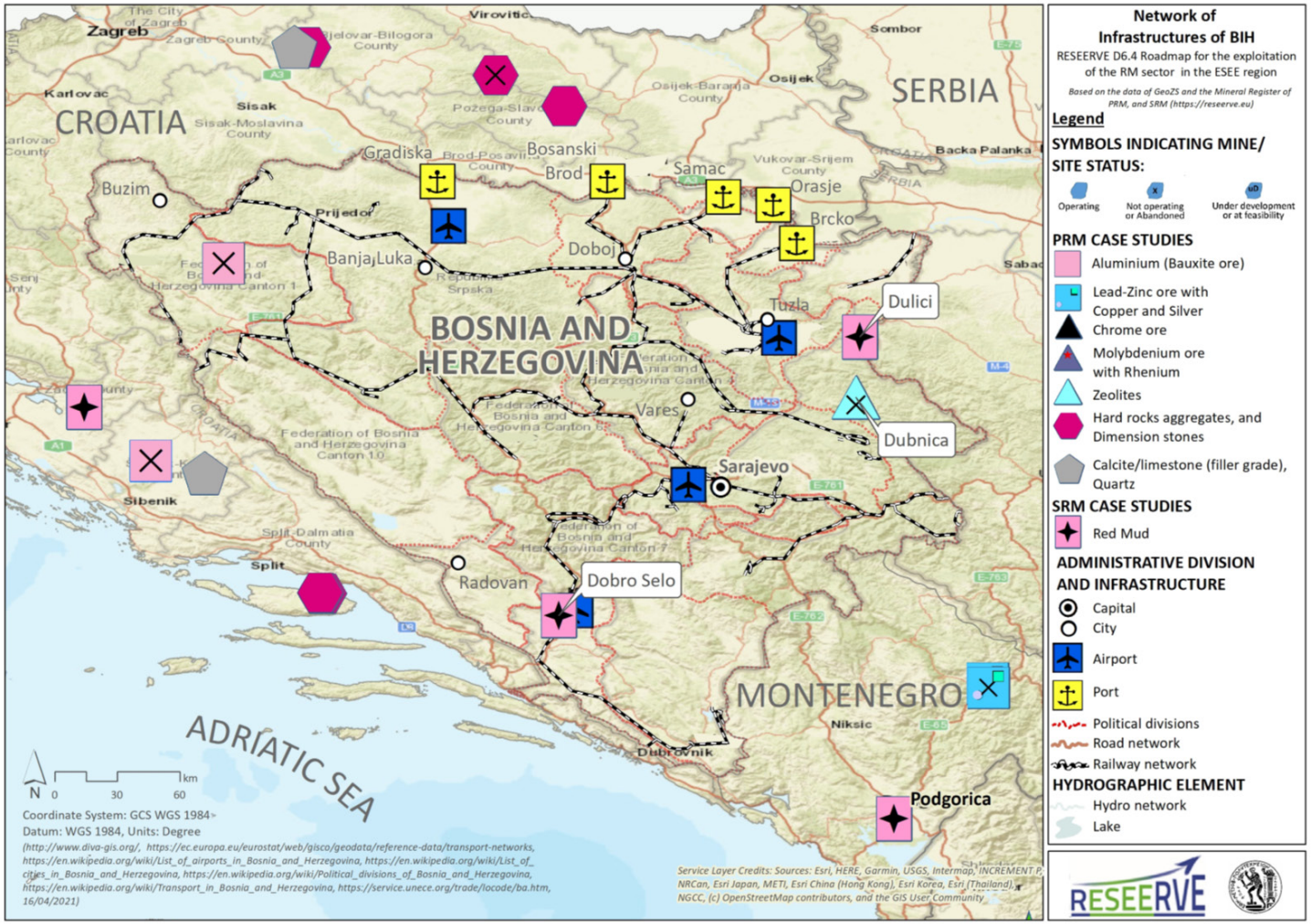
Map 9: PRM Road Map Case Studies of the 6 ESEE countries



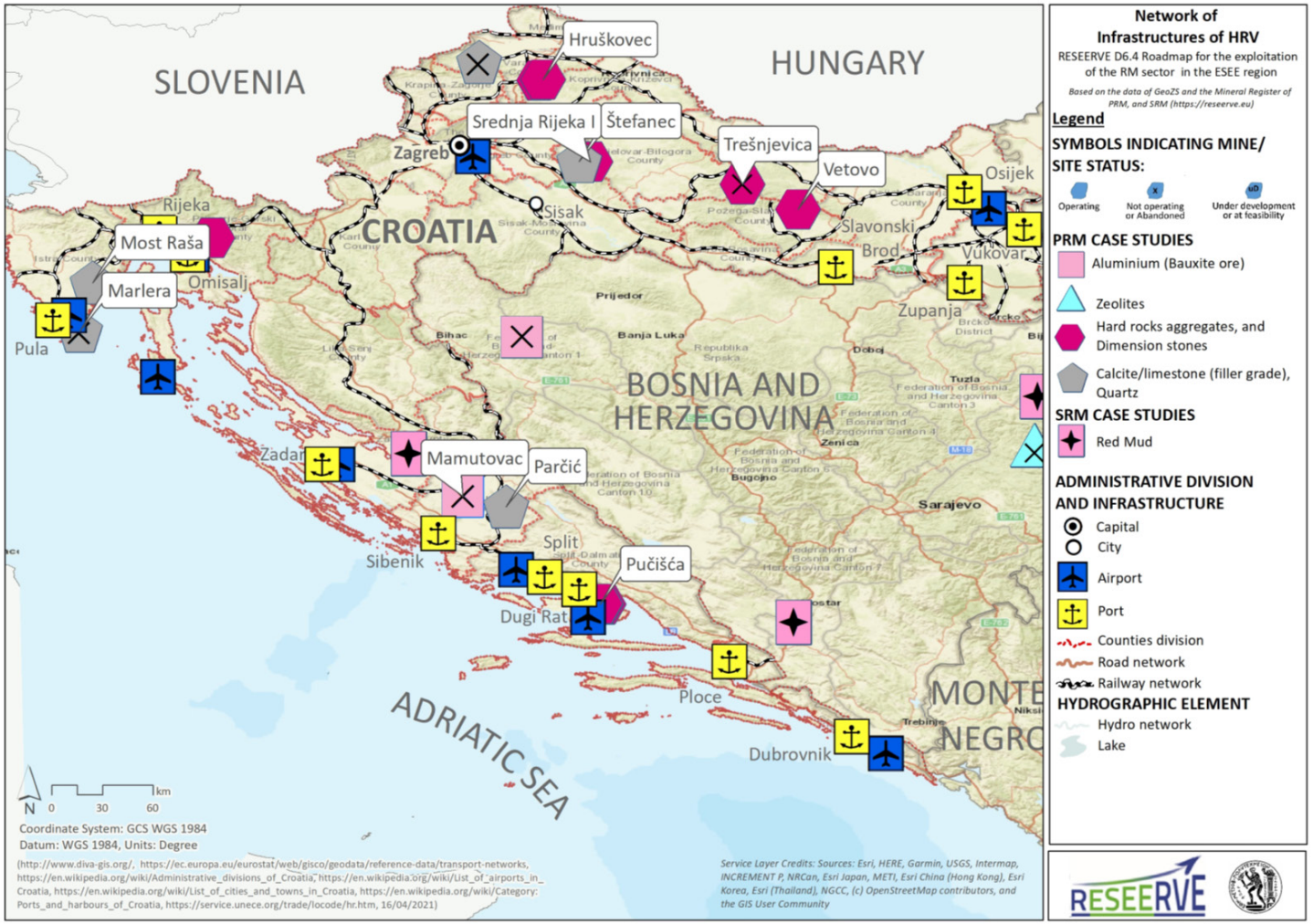
Map 10: SRM Road Map Case Studies of the 6 ESEE countries



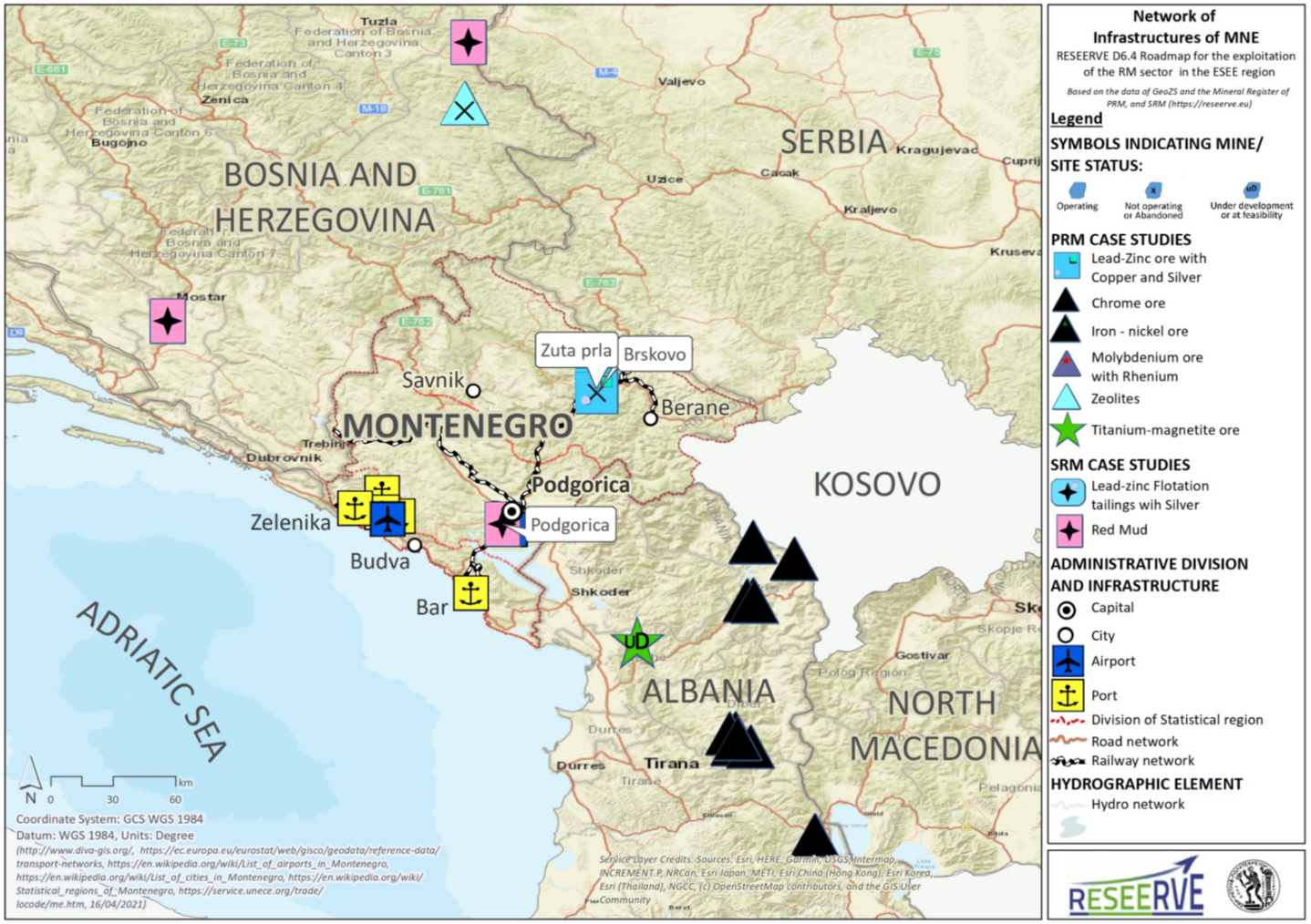
Map 11: Transport infrastructure of ALB



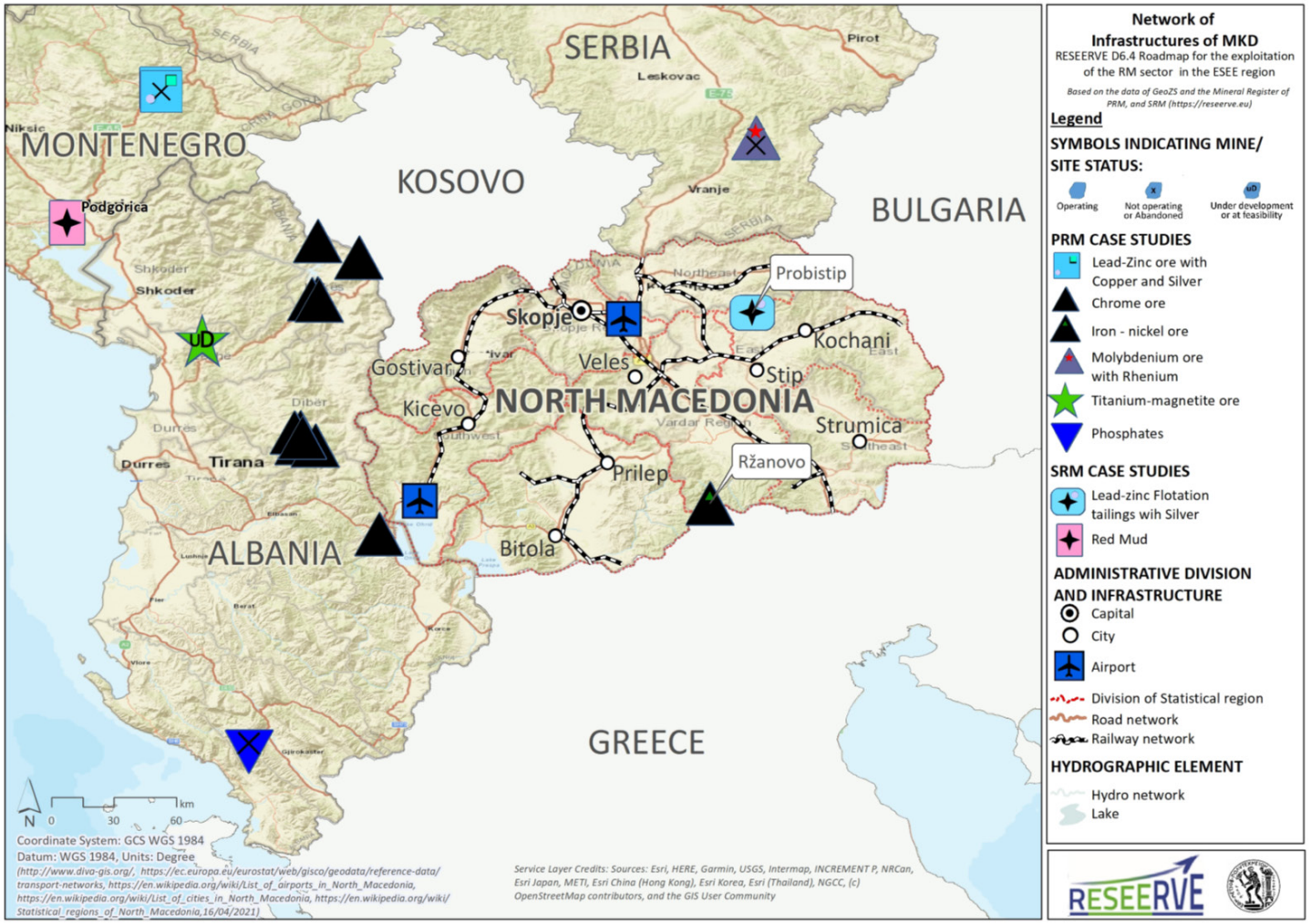
Map 12: Transport infrastructure of BiH



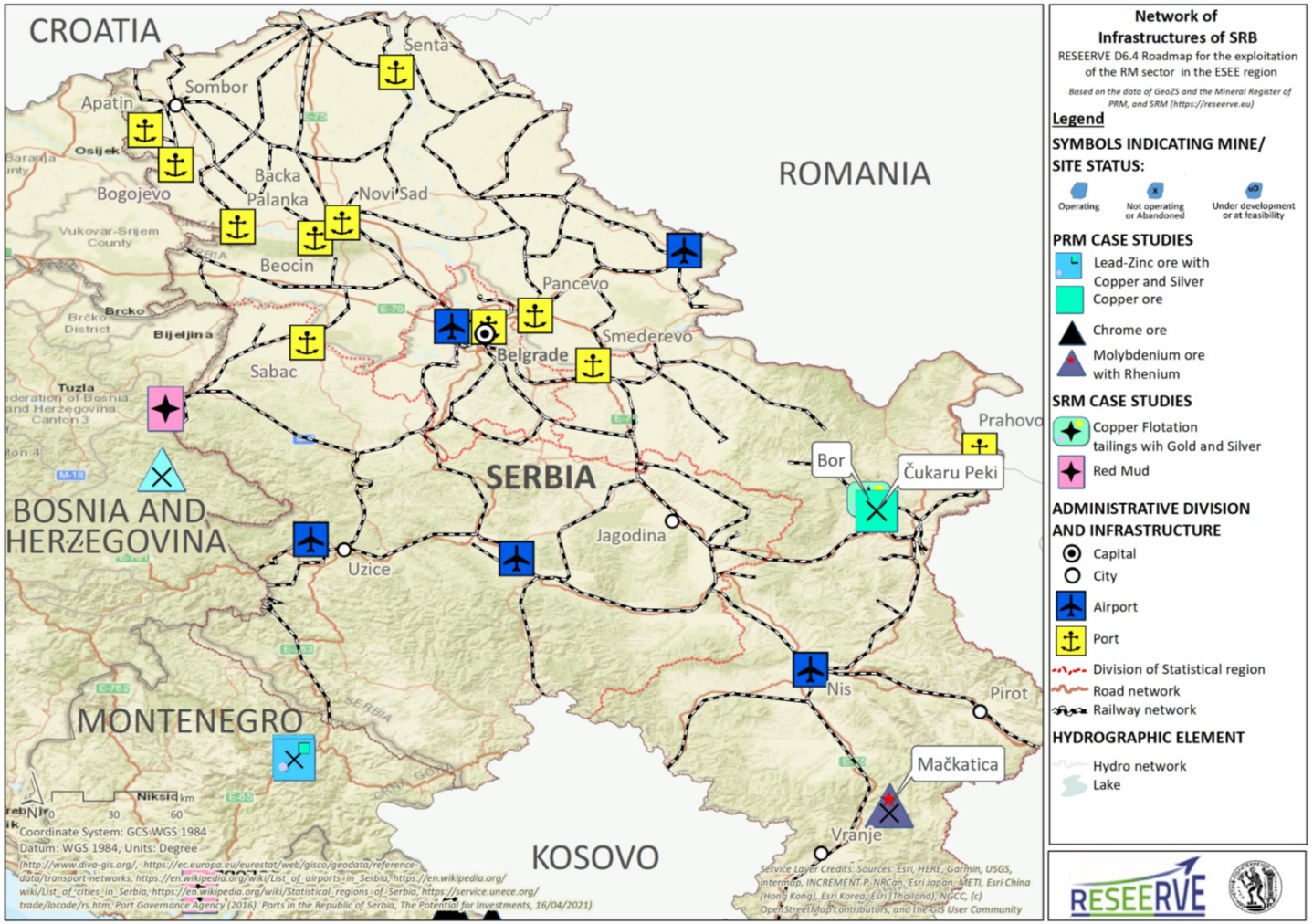
Map 13: Transport infrastructure of HRV



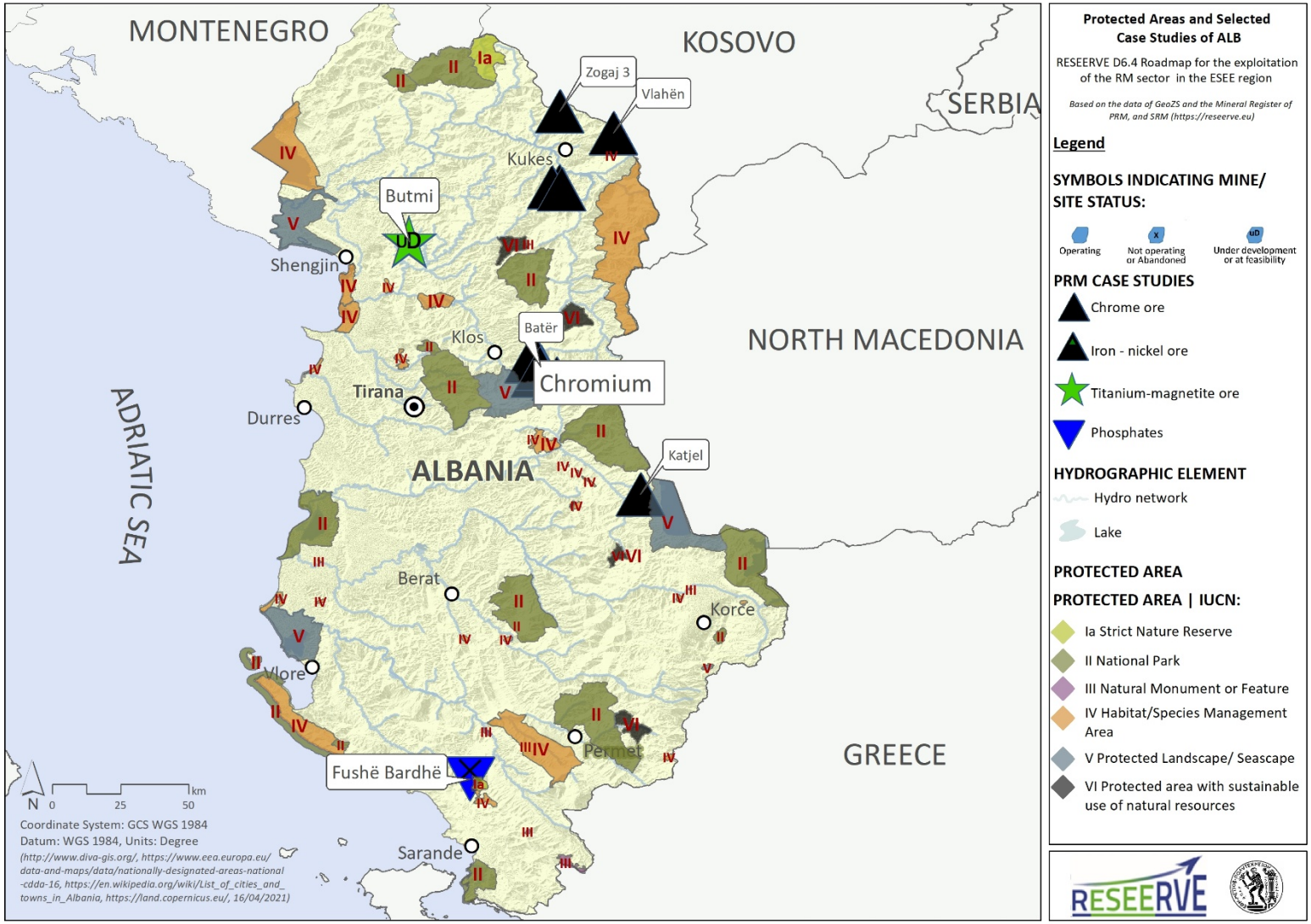
Map 14: Transport infrastructure of MNE



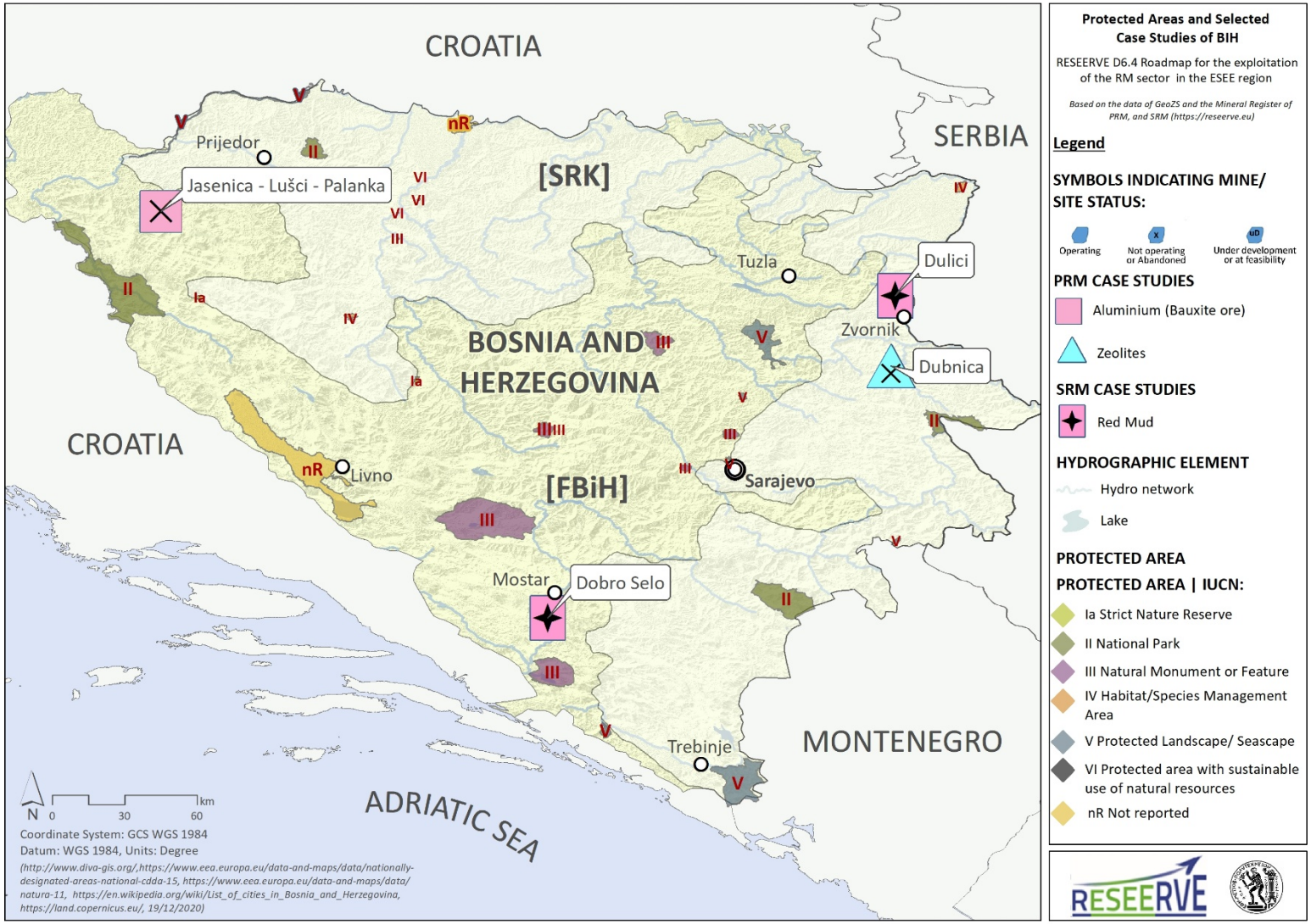
Map 15: Transport infrastructure of MKD



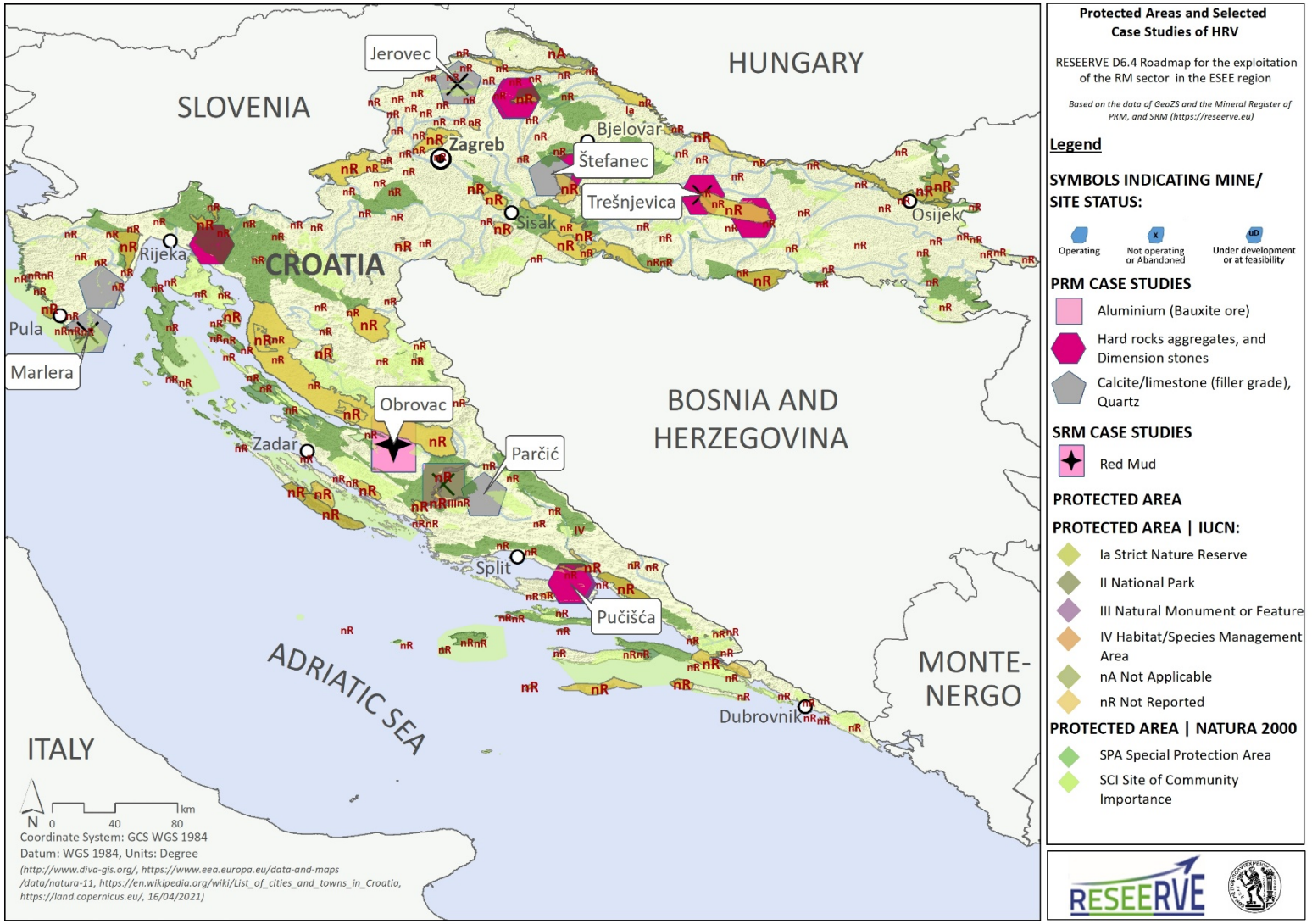
Map 16: Transport infrastructure of SRB



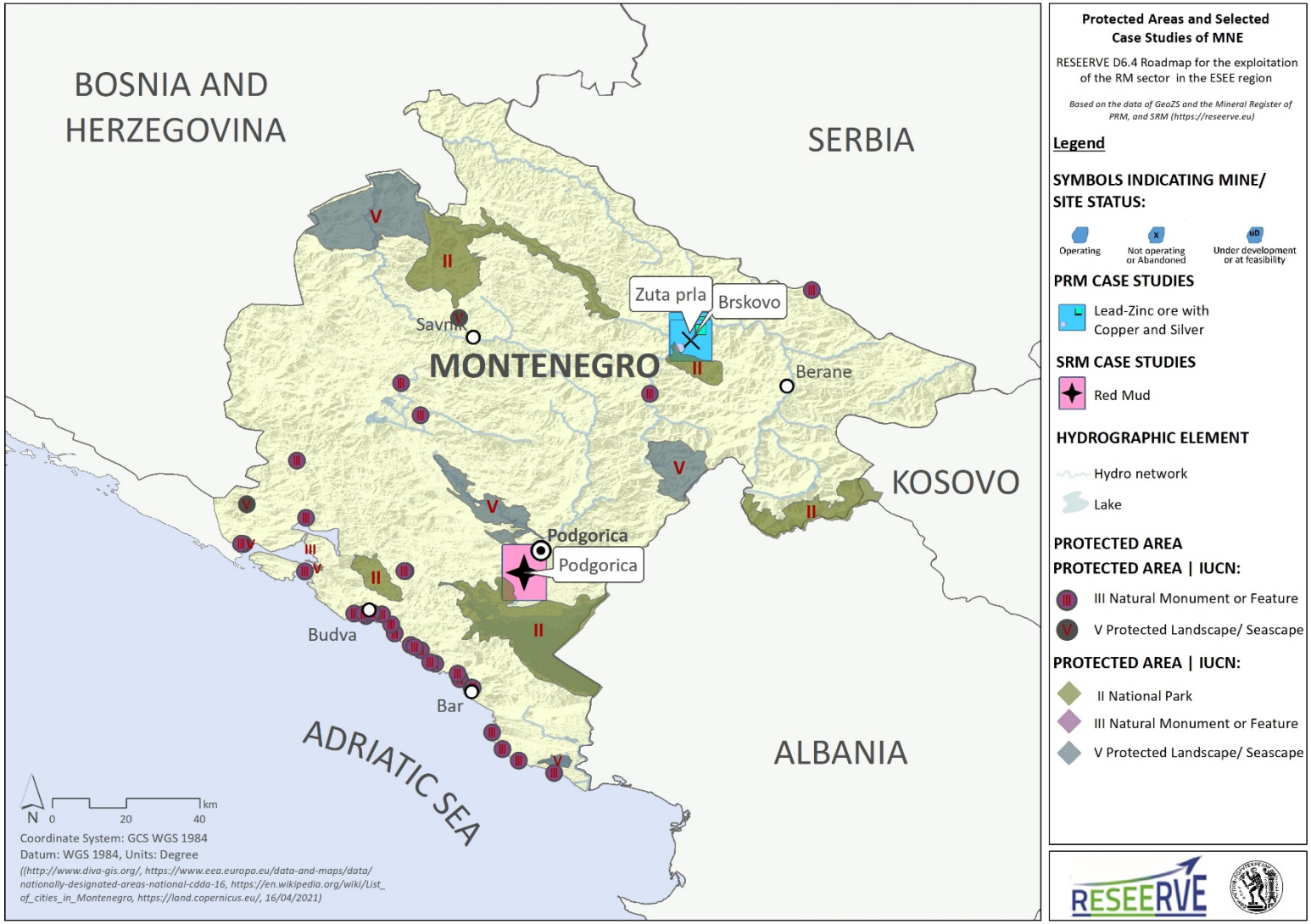
Map 17: ALB's protected areas



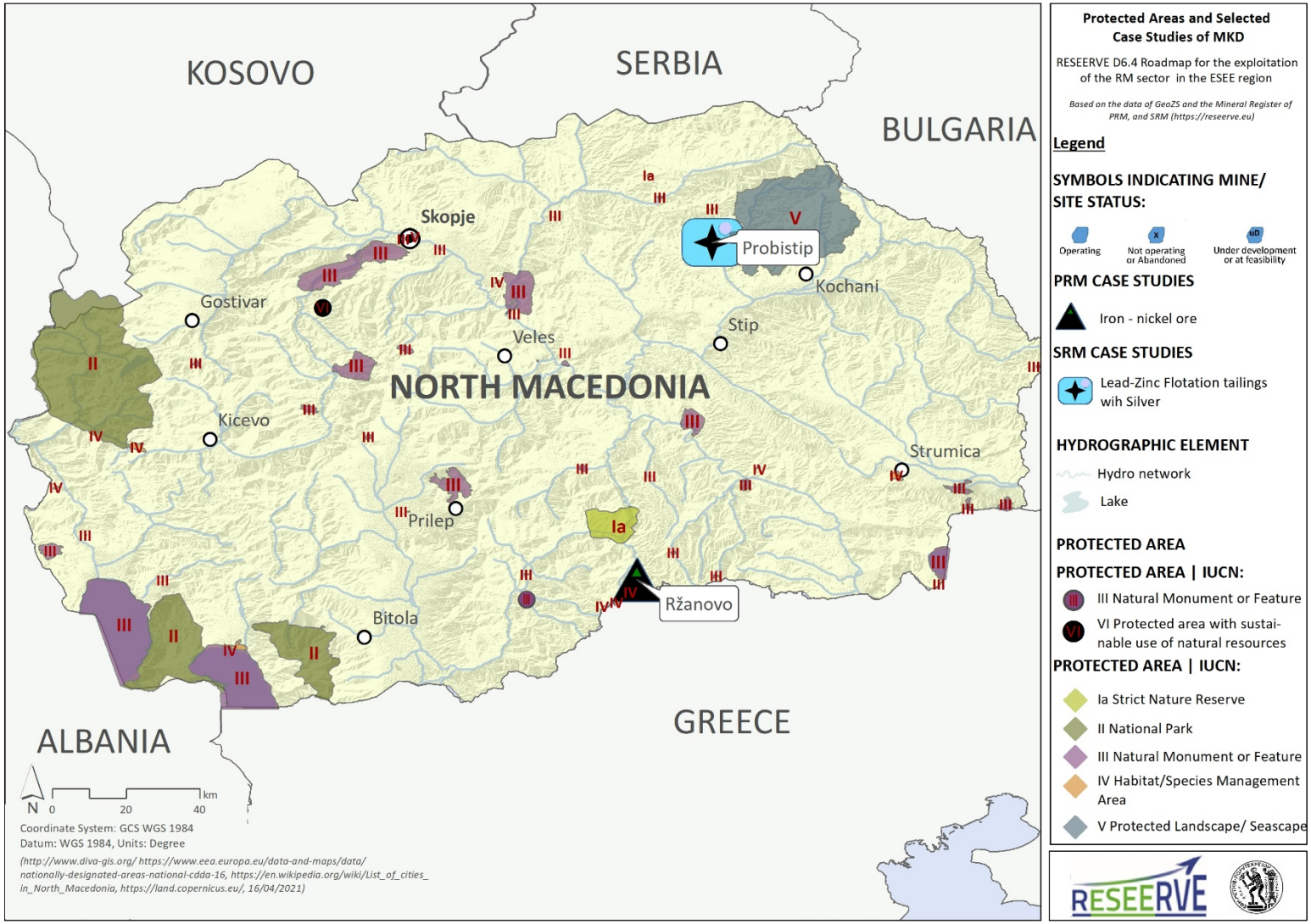
Map 18: BiH's protected areas



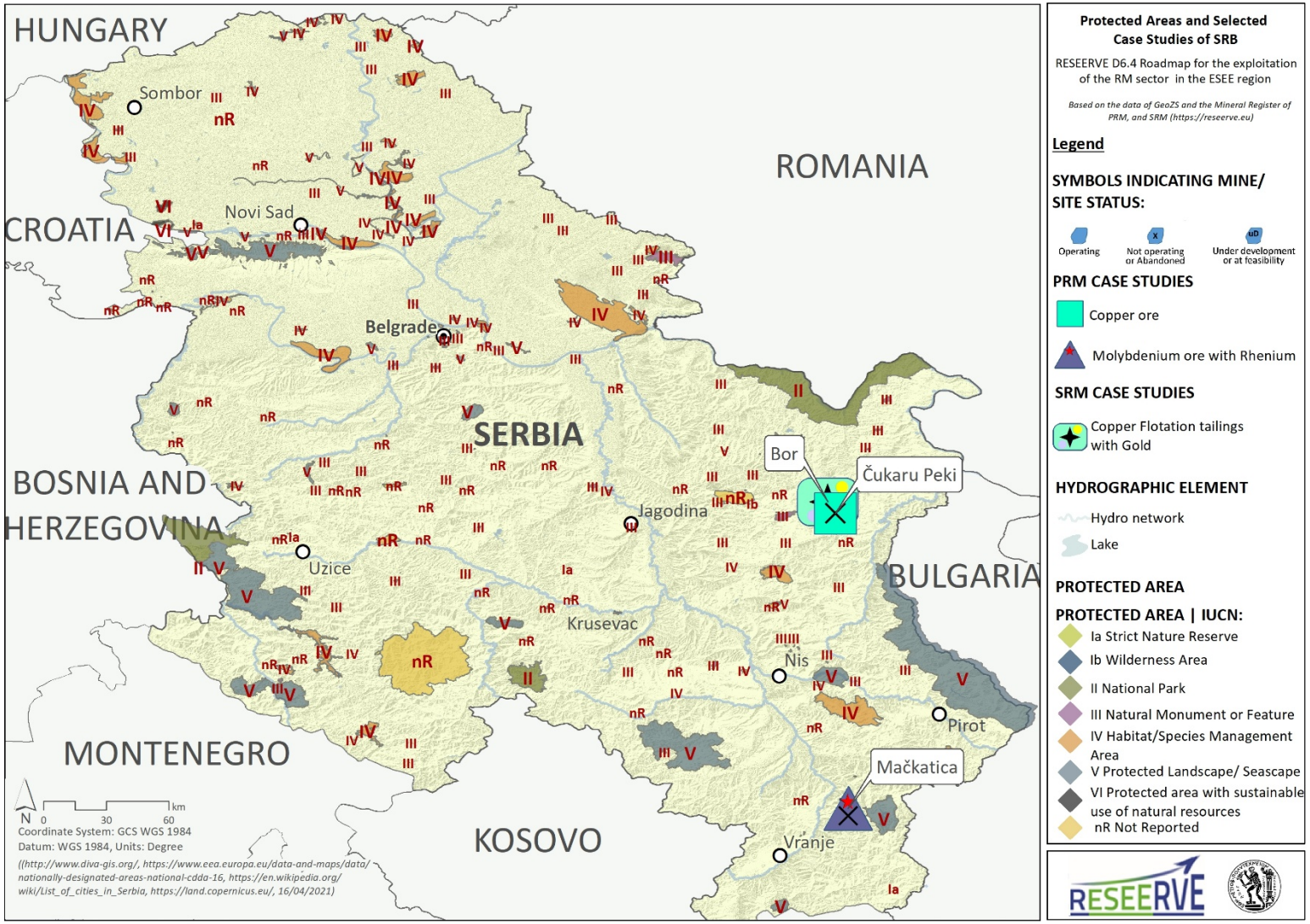
Map 19: HRV's protected areas



Map 20: MNE's protected areas



Map 21: MKD's protected areas



Map 22: SRB's protected areas