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Abbreviations

BRIC countries - grouping acronym that refers to Brazil, Russia, India and China
CRM - Critical Raw Material
EIA - Environmental Impact Assessment
EIP-RM - European Innovation Partnership on Raw Materials
EIT - European Institute for Innovation and Technology
ERA - European Research Area
ERC - European Research Council
ETP SMR - European Technology Platform for Sustainable Mineral Resources
HHI - Herfindahl-Hirschmann Index
KIC - Knowledge and Innovation Community
KIC-RM - Knowledge and Innovation Community on Raw Materials
MMO - Marine Management Organisation
NGO - Non-Governmental Organisation
RMI - Raw Materials Initiative
SIP - Strategic Implementation Plan
SLO - Social License to Operate

1 Executive Summary

¡VAMOS! aspires to enable the provision of a stable and competitive supply of raw materials for Europe by increasing the production of raw materials within the EU with the help of a breakthrough underwater mining system. This requires a thorough understanding of the mineral policy and regulatory framework on EU level and also on national levels in the countries where pilot actions are foreseen. Deliverable 1.1 investigates the link between the innovative mining solution being brought forward by ¡VAMOS! and the corresponding policy/regulatory framework by:

- Creating a list of instruments and mechanisms that are currently in place to support the accessibility of raw materials for the industries and the society;
- Discussing the economical/ political background in Europe with respect to demand forecast;
- Screening the regulatory aspects related to the specific industrial activities;
- Assessing the legal aspects of the utilization of in-land submerged metallic deposits;

Europe's need for security of supply is the main driving force behind recent developments in the mineral policy arena. Based on the 'World Mining Data' published by the Austrian Federal Ministry of Science, Research and Economy it is clear that Europe is highly dependent on the world market: whereas China, the USA and Russia are responsible for approximately 46% of world trade of mineral raw materials (iron, ferro-alloy, non-ferrous metals, precious metals, industrial minerals and mineral fuels) the European Union produces only 5,2 %. It can be assumed that the demand for raw materials (ore and industrial minerals) will grow strongly in the coming years. Looking globally the future demand is expected to increase from 2010 to 2050 by the factor of four to five.

The European Union is aware of these facts and has launched a 'European Raw Materials Initiative', aiming to foster a sustainable supply with raw materials from European sources whilst also increasing resource efficiency and promoting recycling technologies. New mining methods focused on reopening abandoned mine sites are also being considered as essential to increase Europe´s self-sufficiency of raw materials. By developing a prototype remotely controlled underwater mining machine ¡VAMOS! aims to increase Europe´s self-sufficiency and reduce dependence from the global raw materials market. Via public demonstrations in different European countries ¡VAMOS! can also contribute to the social acceptance of the new extraction techniques.

This deliverable has carried out an assessment of regulatory requirements on European and national level with the objective of supporting the deployment of the technological solutions that are being developed by the ¡VAMOS! consortium. On European level relevant initiatives, directives and communications from the Commission were screened. Instruments like the European Innovation Partnership (EIP) on Raw Materials or the launch of the European Institute of Innovation and Technology (EIT) show that the importance of minerals and the need to develop new mining solutions is recognized by member states and the European Commission. In order to collect relevant background information in the countries where demonstration is foreseen, a survey document was created and local partners were engaged for Portugal, Bosnia and the UK.

The review of European regulations and policies indicate that the time is right for the deployment of the ¡VAMOS! technology, as there appears to be a strong political support for this on EU level. If this support is maintained in the future ¡VAMOS! can play an important role in reaching Europe's objectives of reducing raw materials import dependency. Although the legal framework on European and national level has been reviewed in this study, continuous communication between the project stakeholders will still be necessary in order to monitor changes in national/international legislation. Project partners in all countries where pilot testing is foreseen will need to maintain a close relationship with the regulatory authorities. In order to

facilitate the pilots it will be necessary to provide further information to the authorities and local stakeholders, including technical details and drawings of the mining vehicle itself and any supporting infrastructure as these are becoming available.

2 Introduction

2.1 The ¡VAMOS! Project

Estimates indicate that the value of unexploited European mineral resources at a depth of 500-1,000 meters is ca €100 billion, however, a number of physical, economic, social, environmental and human constraints have as yet limited their exploitation. ¡VAMOS! will provide a new Safe, Clean and Low Visibility Mining Technique and will prove its Economic Viability for extracting currently unreachable mineral deposits, thus encouraging investment and helping to put the EU back on a level playing field in terms of access to strategically important minerals. Deriving from successful deep-sea mining techniques, the ¡VAMOS! mining solution aspires to lead to: Re-opening abandoned mines; Extensions of open cut mines which are limited by stripping ratio, hydrological or geotechnical problems; and opening of new mines in the EU. ¡VAMOS! will design and manufacture innovative automated excavation equipment and environmental impact monitoring tools that will be used to perform field tests in four mine sites across Europe with a range of rock hardness and pit morphology. ¡VAMOS! will:

1. Develop a prototype underwater, remotely controlled, mining machine with associated launch and recovery equipment
2. Enhance currently available underwater sensing, spatial awareness, navigational and positioning technology
3. Provide an integrated solution for efficient Real-time Monitoring of Environmental Impact
4. Conduct field trials with the prototype equipment in abandoned and inactive mine sites with a range of rock types and at a range of submerged depths
5. Evaluate the productivity and cost of operation to enable mine-ability and economic reassessment of the EU's mineral resources.
6. Maximize impact and enable the Market Up-Take of the proposed solutions by defining and overcoming the practicalities of the concept, proving the operational feasibility and the economic viability.
7. Contribute to the social acceptance of the new extraction technique via public demonstrations in EU regions.

2.2 Deliverable D1.1

2.2.1 Objectives

¡VAMOS! aspires to enable the provision of a stable and competitive supply of raw materials from EU sources (i.e. ultimately to increase domestic EU production of raw materials) while promoting good governance and facilitating public acceptance. This requires the development of a coherent mineral policy and stable regulatory framework, which is currently addressed at the highest levels within the EC working groups and projects (e.g. MINATURA, Minerals4EU, Minventory, etc.). The aim of Deliverable 1.1 is to investigate the link between the innovative mining solutions being brought forward by ¡VAMOS! and the policy/regulatory framework.

The key activities were:

a. Listing of instruments and mechanisms for guaranteeing the accessibility to raw materials for the industries and the society;

b. Evaluation of the economical/policy background in Europe (domestic production vs. imports) with respect to demand forecast (need of mineral raw materials in Europe; focus on critical minerals);
c. Screening of regulatory aspects related to mining;
d. Assessing the legal aspects of in-land submerged mining for metallic deposits (at local level) and policy aspects at European level.

2.2.2 Approach

In order to deliver a high-quality report, the Task leader and WP leader agreed[1] on a concept paper and an action plan, which were sent to the Project Coordinator and the Technical Coordinator for comments and approval. A summary of the action plan is annexed to this report (Annex 5.1). The first challenge faced was to sub-divide the Task in sub-tasks, defining a reasonable time schedule and assigning responsibilities. Task 1.1 was subdivided in the following four sub-tasks, being each of these assigned to specific participants, with a correspondent time frame and internal milestone/deliverable dates:

- List of documents (EFG, CF) – internal milestone /month 1;
- Policy background (GeoZS, MUL) – internal milestone month 2;
- Screen regulatory aspects (all, but GeoZS) – internal milestones month 3 and month 4;
- Assess legal aspects (all, but GeoZS) – internal milestones month 3 and month 5.

During the implementation of this task it became necessary to find participants willing to assess the local regulatory and legal aspects. Therefore, participants from other work packages were also involved (FZG), with permission of the project coordinator. Because the assessment of regulatory and legal aspects is a very time consuming task, and taking in consideration the need of comparing regulatory data, a survey document was developed to facilitate the collection of data by the partners participating in this task. The survey template is annexed to this report (Annex 5.3).

[1] Refer to minutes ¡VAMOS!_MoM_Skype01.docx

3 Economical and Policy Context

Compared to China, the US and Russia, the European Union depends much more on the global market when it comes to supply of mineral resources. Whereas in 2013 China, the USA and Russia produced approximately 46% of the world trade of mineral raw materials (Iron and Ferro-Alloy, Non-Ferrous Metals, Precious metals, Industrial Minerals and Mineral Fuels), the EU produced only 5,2% (World Mining Data 2013). This fact not only poses strategic risks to the EU's supply, but also to the future industrial development of the EU, which, in any case, is in a critical phase of economically essential re-industrialization.

The European Union is aware of these facts and launched the 'European Raw Materials Initiative' in 2008, to foster a sustainable supply of raw materials. Other European instruments like the European Innovation Partnership (EIP) on Raw Materials or the launch of a European Institute of Innovation and Technology dedicated to Raw Materials (EIT Raw Materials) show the common understanding of all member states on the importance of the minerals supply for the EU industry.

3.1 Background

3.1.1 Economical and policy background – review and synthesis

3.1.1.1 Introduction

The extraction of (by definition) non-renewable mineral raw materials from the earth's crust has always been of outstanding importance in human history. A stable supply with energy and non-energy mineral resources is essential for a modern (national and political) economy. Despite a giant step forward in the field of recycling, nature (being the part of the earth's crust that is available for mineral extraction) will still remain the basis for supply with energy and non-energy raw materials [Moser et Maier, 2015].

Although the mining industry is a key success factor for Europe, the raw materials sector is not dominant in the European economy. According to the world mining data, the total amount of mineral resources mined per year can only be estimated. This is because the group of construction materials (like sand, gravel, clay, etc.) – although they are essential for infrastructure and living – is not recorded properly in the statistics. This is seemingly due to the fact that the demand of these construction materials is satisfied on a local basis. The estimated global production is in the range of 24 billion tons.

In contrast to this, there is sufficient data available for global mining on iron ferro-alloys, non-ferrous metals, industrial minerals, precious metals and mineral fuels.

Table 1 to Table 5 provide an overview of the World Mining Data 2013, including information on the share of the three big producer countries and the EU as well as the concentration of the market (using the Herfindahl-Hirschmann Index). HHI is an index for measuring the concentration ratio. Only few companies providing large amounts of defined goods in a certain market result in a high HHI. Market concentration – and therefore dependency – is considered to be high when HHI goes beyond the calculated number of 1,800.

Table 1 – World Mining Data: Iron and Ferro-Alloys

Mineral	Production	Concentration of the Market	Share 3 Producer -countries	The 3 big Producer-countries	Share of EU
	[t/a]	[HHI]	[%]		[%]
Iron	1.521.714.519	1877	70,59	China, Australia, Brazil	1,2%
Chromium	13.293.671	2591	74,31	South Africa, Kazakhstan, Turkey	3,3%
Cobalt	109.799	3067	67,13	Congo D.R., China, Canada	1,9%
Manganese	20.026.789	1530	62,6	South Africa, China, Australia	0,2%
Molybdenum	260.773	2358	76,85	China, United States, Chile	0,0%
Nickel	2.548.742	1515	54,3	Indonesia, Philippines, Australia	1,9%
Niobium	79.745	8573	99,19	Brazil, Canada, Russia	0,0%
Tantalum	1.229	2819	81,04	Rwanda, Congo D.R., Brazil	0,0%
Titanium	6.977.697	1036	45,37	Australia, South Africa, China	0,0%
Tungsten	86.251	6889	89,87	China, Russia, Canada	2,4%
Vanadium	78.400	3792	97,45	China, South Africa, Russia	0,0%

Table 2 – World Mining Data: Non-Ferrous Metals

Mineral	Production	Concentration of the Market	Share 3 Producer -countries	The 3 big Producer-countries	Share of EU
	[t/a]	[HHI]	[%]		[%]
Aluminium	47.820.060	2306	59,19	China, Russia, Canada	4,2%
Antimony	159.054	5850	84,73	China, Tajikistan, Russia	0,0%
Arsenic	50.733	3204	86,67	China, Chile, Morocco	2,0%
Bauxite	288.146.160	1645	62,87	Australia, Indonesia, China	0,7%
Bismuth	7.973	6792	97,94	China, Mexico, Japan	0,0%
Cadmium	21.788	1598	58,4	China, South Korea, Japan	6,3%
Copper	18.070.695	1336	48,43	Chile, China, Peru	4,7%
Gallium	79	4386	87,34	China, Ukraine, Japan	5,1%
Germanium	117	6026	94,87	China, Finland, Russia	14,5%
Lead	5.610.075	3122	72,21	China, Australia, United States	3,8%
Lithium	64.423	2742	83,4	Chile, Australia, China	0,4%
Mercury	2.202	5563	91,33	China, Mexico, Tajikistan	0,0%
Rare Earth Concentrates	102.872	8347	97,93	China, United States, Russia	0,0%
Rhenium	42	2434	71,9	Chile, United States, Uzbekistan	12,5%
Selenium	2.254	1367	49,69	Germany, Japan, Belgium	51,1%
Tellurium	165	2450	80,61	United States, Japan, Russia	14,5%
Tin	341.429	2801	78,4	China, Indonesia, Peru	0,0%
Zinc	13.520.225	1783	58,98	China, Australia, Peru	5,5%

Table 3 – World Mining Data: Precious Metals

Mineral	Production	Concentration of the Market	Share 3 Producer -countries	The 3 big Producer-countries	Share of EU
	[kg/a]	[HHI]	[%]		[%]
Gold	2.847.293	593	32,53	China, Australia, United States	1,0%
Palladium	199.017	3272	87,44	Russia, South Africa, Canada	0,4%
Platinum	182.125	5325	86,11	South Africa, Zimbabwe, Russia	0,5%
Rhodium	21.740	6444	96,55	South Africa, Russia, Zimbabwe	0,0%
Silver	26.019.482	1091	50,62	Mexico, Peru, China	6,5%

Table 4 – World Mining Data: Industrial Minerals

Mineral	Production	Concentration of the Market	Share 3 Producer -countries	The 3 big Producer-countries	Share of EU
	[t/a]	[HHI]	[%]		[%]
Asbestos	1.765.829	2461	77	Russia, China, Brazil	0,0%
Baryte	9.489.061	2193	63,83	China, India, Morocco	1,0%
Bentonite	16.506.230	1368	56,58	United States, China, India	15,0%
Boron	4.461.780	2456	75,85	Turkey, United States, Chile	0,0%
Diamonds (Gem)*	76.092.596	1764	64,68	Russia, Botswana, Canada	0,0%
Diamonds (Ind)*	56.137.617	1881	65,34	Russia, Congo D.R., Zimbabwe	0,0%
Diatomite	2.207.111	1911	67,15	United States, China, Argentina	14,3%
Feldspar	33.644.137	2076	63,45	Turkey, Germany, Italy	29,3%
Fluorspar	7.012.166	4110	83,4	China, Mexico, Mongolia	5,4%
Graphite	1.124.207	4710	87,88	China, India, Brazil	0,0%
Gypsum and Anhydrite	169.110.206	942	44,6	China, Iran, United States	13,7%
Kaolin	36.437.403	866	41,31	United States, India, Germany	29,2%
Magnesite	25.700.332	4542	81,16	China, Turkey, Russia	10,7%
Perlite	2.875.296	2633	82,95	Turkey, Greece, United States	32,6%
Phosphates	76.929.419	2232	67,48	China, United States, Morocco	0,4%
Potash	34.716.250	1621	59,21	Canada, Russia, China	12,4%
Salt	280.396.457	948	45,62	China, United States, India	19,7%
Sulfur	67.166.466	771	39,47	China, United States, Russia	7,9%
Talc	8.086.114	1252	50,96	China, India, Mexico	13,4%
Vermiculite	430.225	1887	68,72	South Africa, United States, Brazil	0,0%
Zircon	1.384.456	2684	73,31	Australia, South Africa, China	0,0%

(*Diamonds in carats/a)

Table 5 – World Mining Data: Mineral Fuels

Mineral	Production	Concentration of the Market	Share 3 Producer -countries	The 3 big Producer-countries	Share of EU
	[t/a]	[HHI]	[%]		[%]
Steam Coal	5.772.657.962	2888	71,98	China, United States, India	1,5%
Coking Coal	1.018.213.600	3086	75,04	China, Australia, United States	2,1%
Lignite	859.146.042	906	37,89	Germany, Australia, United States	48,1%
Petroleum	4.068.775.343	563	32,79	Saudi Arabia, United States, Russia	1,7%
Natural Gas**	3.523.572	853	42,36	United States, Russia, Canada	4,7%
Oilsands*	126.501.200	6392	100	Canada, Venezuela	0,0%
Oilshales	21.304.753	9276	99,99	Estonia, Germany, Israel	98,4%
Uranium	68.132	2010	63,74	Kazakhstan, Canada, Australia	0,6%

(*as part of petroleum; **in Mio m^3)

Latest data on worldwide production of raw materials clearly show that European mining industry is stable on a very low level, whereas the rest of the world and especially BRIC countries are increasing their production capacities (Figure 1). At the same time worldwide raw material demand is still in an ascending trend.

The global concentration of 63 raw materials that are observed results in the following situation:

- China is leading producer for 28 mineral raw materials;
- The is no production on 19 mineral raw materials in the European Union;
- 52 mineral raw materials: more than 50 % of world production from only 3 countries;
- 27 mineral raw materials: more than 75 % of world production from only 3 countries;
- 38 mineral raw materials: high market concentration (HHI (Herfindahl-Hirschmann Index) greater than 1,800);

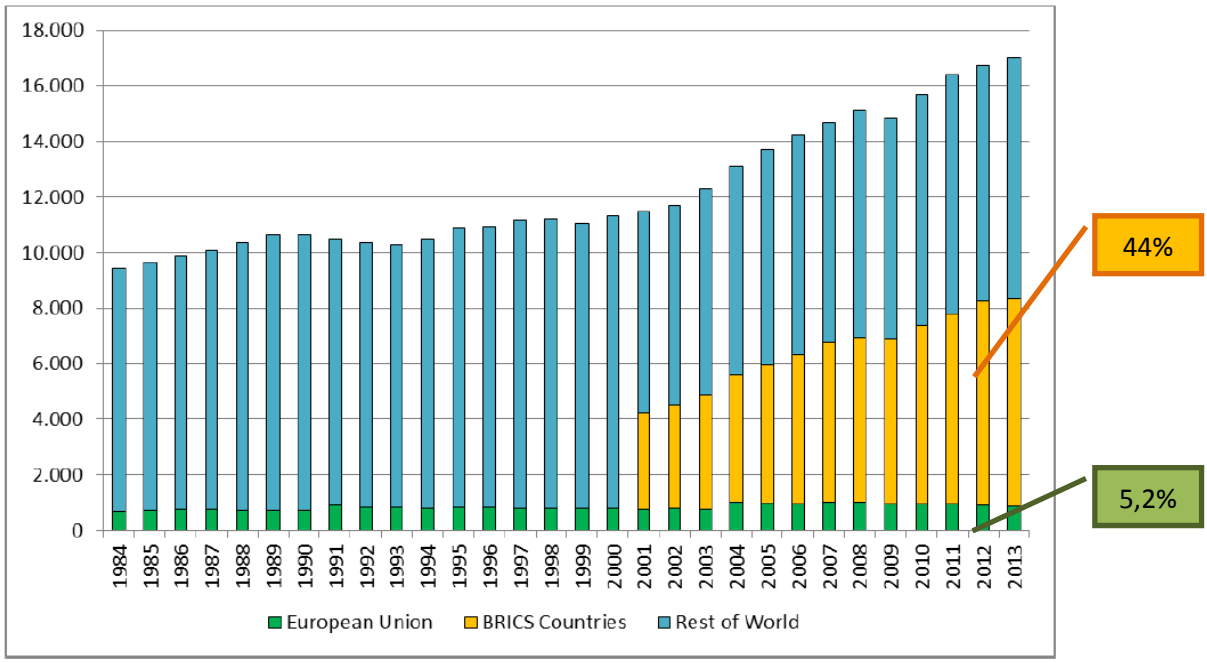


Figure 1 - World Mining Production; without construction materials [Reichl et al, 2015].

2010 Assessment only	Common to both Assessments	2013 Assessment only
Tantalum	Antimony Beryllium Cobalt Fluorspar Gallium Germanium Indium Magnesium Natural Graphite Niobium PGMs Rare Earths (Heavy) Rare Earths (Light) Tungsten	Borates Chromium Coking coal* Magnesite Phosphate Rock* Silicon Metal*

2010 Critical Raw Materials **2013 Critical Raw Materials**

Figure 2 – Comparison of EU critical raw materials from 2010 and 2013 [EU, 2014].

Critical raw materials for the EU's economy (Figure 2) have been identified by applying two criteria: the economic importance and the supply risk. A raw material is defined as critical when the effect on the economy and the risks of supply shortage are comparatively higher. Two sorts of risks are assessed: First, the supply risk including the political-economic stability of the producer countries (Figure 3) and second, the environmental country risk considering the impact of possible measures to protect the environment.

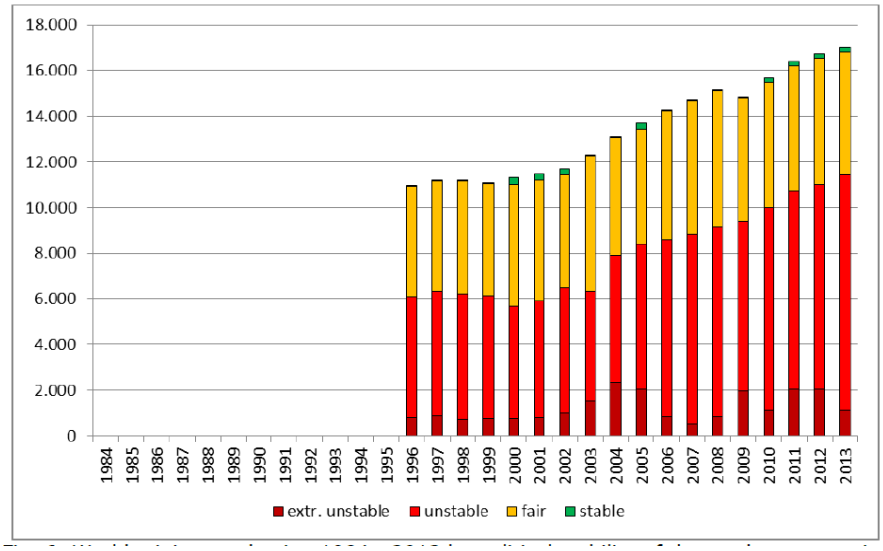


Figure 3 - Political stability of producing countries [Reichl et al., 2015].

The European Union extensively depends on import of energy (500 billion EUR) and non-energy (200 billion EUR) minerals. Taking a closer look at the non-energy mineral resources industrial policy, some questions arise:

- What are the risks, originated from the concentration of the world production?
- What is the impact; what is the likelihood of supply issues?
- What measures can be taken to cope with that situation?

Europe is facing considerable challenges related to the raw materials policy. The European Union addressed the raw materials issue first in 2005, in search of a mineral resources strategy. Three years later the first version of the "European Raw Materials Initiative" was published. The EU's actual growth strategy (for 2010-2020) aims at making the EU "a smart, sustainable and inclusive economy". One of its three priorities is to develop an economy based on innovation and knowledge. Several flagship initiatives where launched to contribute to the priorities [Weber et Stiftner, 2013].

The EU has set steps for a strategy development via representative activities of the Raw Materials Supply Group, the European Commission and the European Innovation Partnership on Raw Materials (EIP-RM) with the Strategic Implementation Plan (SIP). Further steps are planned. The three base lines of the European raw materials strategy are:

- Securing equal national competition laws for the access to raw materials in third party countries;
- Fostering a sustainable supply with raw materials from European sources;
- Increasing the resource efficiency and boosting the recycling technologies.

The report on critical raw materials (latest update 2014) can be seen as basic step and a setting of priorities. An important move was the establishment of the European Institute for Innovation and Technology (EIT) on

Raw Materials. The EIT is a body of the EU which aims to strengthen Europe's innovation power and to increase the European competitiveness with the overall target of boosting economic growth and creating new employment. Further, the EU research programme HORIZON 2020 finances the EIT with more then 2,7 billion Euros, making it a powerful instrument and more than a mere funding framework.

Science and research and their successful implementation are a key success factor for EU's competitiveness and therefore an important basis for our welfare. At European level, there is the certainty that the economic implementation of scientific findings and innovations in the industry can be improved. To meet this objective, the European Commission has recently placed emphasis to fund projects dealing with raw materials supply challenges. With its multidisciplinary partnership ¡VAMOS! connects science and research with the industry. A list of raw materials related research and cooperation projects can be found in Annex 5.4 of this report.

3.1.1.2 Forecast

Based on actual trends, the future demand of raw materials can be estimated. This forecast is based on:

- The prognoses of world population;
- The expected economic development;
- The consumption of mineral raw materials (for different states of economic development).

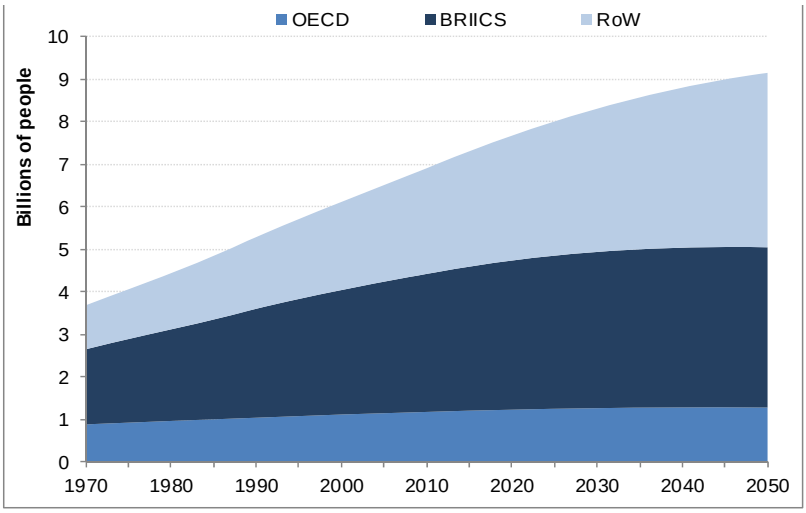
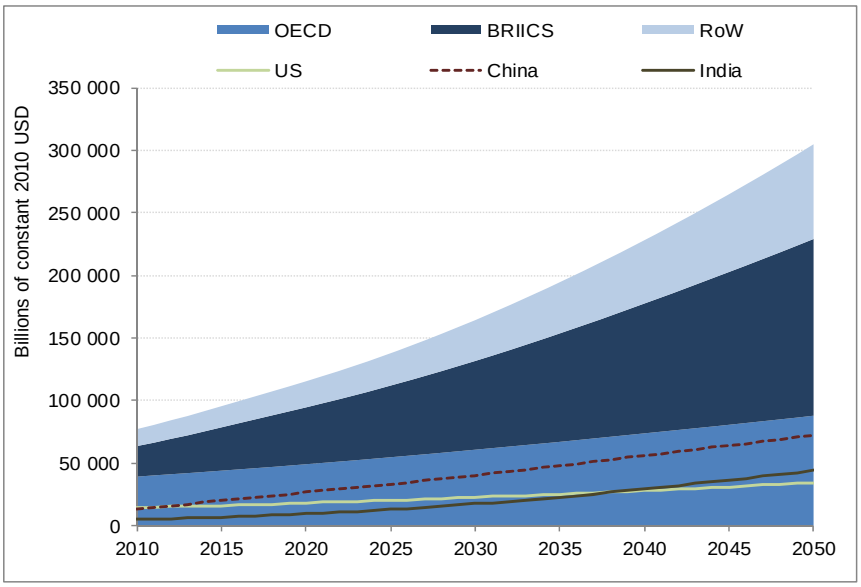


Figure 4 - World population by major regions, 1970-2050 [OECD, 2012-1]

Figure 4 shows the world population prospects until 2050. Although the growth rate for Europe won't be as high as for the rest of the world, there is still an ascending trend. The next graph (Figure 5) shows the expected economic development (from 2010 to 2015) - the projections for real gross domestic product.



Note: values using constant 2010 purchasing power parity (PPP) exchange rates.
Source: OECD Environmental Outlook Baseline; output from ENV-Linkages.

Figure 5 - Projections for real gross domestic product: Baseline, 2010-2015 [OECD 2012-2].

To assess the future consumption of raw materials, the historic data also needs to be analyzed. There is a relation between the demand of raw materials and the state of economic development.

In the first stages of economic development there is a direct link between the raw materials consumption per capita and the economic performance per capita. In later stages of economic development, the raw material consumption per capita decreases until the two factors are decoupled for mature economic systems.

When putting together the regional prognoses of population, the economic performance and the consumption of raw materials, the future demand of mineral resources can be assessed. Based on that data, it can be assumed that the demand on raw materials will grow strongly in the coming years. Looking globally to the sector of raw materials (ores and industrial minerals), the future demand will increase from 2010 to 2050 by the factor of four to five. Besides these developments, there are further trends that have an effect on the globalisation on raw materials:

- Increasing separation of the location of mining and the location of processing;
- Increasing importance of raw materials trade and demand;
- The supply with raw materials will become strategic focus.

Although there are enough deposits available for the predictable future to cover the predicted future demand, they will change in terms of quantity, quality and geotechnical attractiveness. The average ore grade in the deposits that are being mined has decreased in the past and with this trend continuing, mineable raw materials will be located ¡VAMOS! at greater depths, affecting the difficulty and the costs to extract them. In order to recover the resources in a safe and economic way, new technologies have to be developed [UNEP, 2011]. Consequently, the trends for exploitation technologies are the following:

- Machines become bigger;
- More automatized;
- Remote controlled;
- Use of robotics;
- From discontinuous to continuous processes.

¡VAMOS! is not only in line with the general trends, but it is also a potential game-changer that can enhance the social acceptance of mining thanks to the following factors that are innovative in the mining industry:

- Mining can be done in a submerged open pit without influencing the water table;
- Blasting noise, fumes and ground vibration or dust nuisance are no longer a constant factor accompanying mining activities;
- Workers are no longer exposed to the danger from rock blasts, roof collapses and other dangerous events.

3.1.1.3 Conclusions

The growing demand of raw materials will make the security of supply a question of highest strategic importance. Also, the increasing market concentration for many mineral raw materials and the politically unstable situation for two thirds of the total production have to be taken into account. In particular Europe, as a raw materials importing region, would be affected seriously by these developments.

On a long term view the stable supply of raw materials can only be ensured via domestic production, higher raw materials efficiency and recycling. New mining methods focused on reopening inactive and submerged mine sites as shown within ¡VAMOS! have to be considered as an essential step forward to increase Europe´s self-sufficiency and reduce the dependence on imports from the global market.

The security of supply depends on innovation and development of new technologies (for mining and raw materials consumption). New opportunities in mining are likely to arise, including:

- Mining of deposits which were abandoned in the past;
- Re-processing of old mining and ore processing wastes with new metallurgical technologies;
- Extraction of sea-bed deposits;
- Lower-grade deposits becoming economically important.

3.1.1.4 Synthesis

In order to cover the increasing demand, the European raw materials strategy is to foster a sustainable supply from European resources. As the extraction of materials will remain essential and deposits are becoming more difficult to mine, new technologies are needed for the extraction of primary minerals. Recycling technologies will not be able to cover all the needs within the foreseeable future.

Europe is rich in minerals. However, due to price developments for raw materials on the world market in the past, high environmental standards and severe competition for land and water use, the majority of metal mines within the EU were closed in the 20th century. Despite the presence of significant amounts of raw materials within the EU, many deposits are not accessible today from an economic, social acceptance or environmental perspective. In this context a breakthrough in the mining technology is needed. Concentrating on European resources, ¡VAMOS! is developing a technology solution that makes submerged high-grade deposits mineable in a safe and economic way. The project itself contributes to one of the three priorities of the EU’s growth strategy, which is to develop an economy based on innovation and knowledge.

3.2 Instruments

A secure supply of raw materials is a priority for the EU that extends beyond country borders and national policies. ¡VAMOS! is being implemented against the backdrop of the overall policy objectives of "Europe 2020", which is the EU's new growth strategy for the coming decade. Within Europe 2020 the "Resource-efficient Europe Flagship" is of particular relevance as it supports the shift towards a resource efficient and low-carbon economy emphasising that a new strategy on raw materials will need to be presented "to create the right framework conditions for sustainable **supply and management of domestic primary raw materials**" (European Commission, 2010).

The following instruments and mechanisms for ensuring the accessibility of the raw materials at a European level have been reviewed for their relevance to ¡VAMOS!. These instruments can directly support the implementation of ¡VAMOS! and the follow-up introduction of the developed technology on a European scale. Instruments with direct and medium relevance should be screened regularly as new opportunities for the European raw materials market are evident.

The instruments are sorted thematically according to their overall relevance to ¡VAMOS!. (first level) and chronologically (second level).

Key

Colour	Project type
blue	direct relevance
orange	medium relevance
grey	indirect relevance

EU policy instrument	short summary	links
H2020	**Horizon 2020** is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness. The programme has nearly €80 billion of funds available over 7 years (2014 to 2020). It promises more breakthroughs, discoveries and world-firsts by taking great ideas to the market.	ec.europa.eu/programmes/horizon2020/
EIP on Raw Materials	The **European Innovation Partnership (EIP) on Raw Materials** is a stakeholder platform that brings together representatives from industry, public services, academia and NGOs. Its mission is to provide high-level guidance to the European Commission, Members States and private actors on innovative approaches to the challenges related to raw materials. It will play an important role in meeting the objectives of the European Commission flagship initiatives 'Innovation Union' and 'Resource Efficient Europe'. EIP's three pillars are: Fair and sustainable supply of raw materials from global markets; Fostering sustainable supply within the EU; and Boosting resource efficiency and promoting recycling. The EIP targets non-energy, non-agricultural raw materials.	ec.europa.eu/eip/raw-materials/en/content/european-innovation-partnership-eip-raw-materials
Strategic Implementation Plan (SIP) for EIP on Raw materials	The **Strategic Implementation Plan (SIP)** is the EIP's action plan. It incorporates inputs from EU governments, industry, academia and NGOs, consulted at meetings of the EIP's Operational Groups. The Strategic Implementation Plan sets out the objectives, targets and actions to be reached or implemented by 2020. It consists of two parts: (I) EIP objectives, targets & methodology, overall strategy and (II) Priority Areas, Action Areas & Actions targeting sector-specific stakeholders &	ec.europa.eu/eip/raw-materials/en/content/strategic-implementation-plan-sip-0

	practitioners.	
European Institute of Innovation and Technology (EIT) Raw Materials	**EIT Raw Materials** was designated as an EIT Knowledge and Innovation Community (KIC) by the EIT Governing Board in December 2014. Its mission is to boost the competitiveness, growth and attractiveness of the European raw materials sector via radical innovation and entrepreneurship materials across the whole raw materials value chain. The main goals of the EIP are (I) to secure the raw materials supply to the European economy, (II) to put Europe at the forefront in raw materials sectors and (III) to mitigate related negative environmental, social and health impacts.	ec.europa.eu/eip/raw-materials/en/content/european-innovation-partnership-eip-raw-materials
The raw materials initiative COM(2008) 699	In 2008 the Commission launched the "**Raw Materials Initiative**" (RMI) which established an integrated strategy to respond to the different challenges related to access to non-energy and non-agricultural raw materials. The RMI is based on three pillars: (I) ensuring a level playing field in access to resources in third countries, (II) fostering sustainable supply of raw materials from European sources and (III) boosting resource efficiency and promoting recycling.	eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0699:FIN:en:PDF
Knowledge and Innovation Community on Raw Materials (KIC)	**KIC RawMaterials** is part of the EIT (European Institute of Innovation & Technology) program. The EIT achieves its mission by fully integrating all three sides of the 'knowledge triangle', i.e. higher education, research and business. By bringing together leading players from all these dimensions to cooperate within the KICs, the EIT is able to promote innovation in raw materials sector in Europe.	eitrawmaterials.eu/
European Commission's Investment Plan for Europe (Juncker Plan/initiative)	The Investment Plan focuses on removing obstacles to investment, providing visibility and technical assistance to investment projects and making smarter use of new and existing financial resources. To achieve these goals, the plan is active is three areas: 1), mobilising investments of at least €315 billion in three years. 2), supporting investment in the real economy. 3), creating an investment friendly environment. It aims at unlocking public and private investments in the "real economy" of at least € 315 billion over a three years fiscal period (Jan. 2015 – Dec. 2017).	https://ec.europa.eu/eip/raw-materials/en/content/workshop-raw-materials-juncker-plan
European Research Area ERA	**European Research Area (ERA**) is a unified research area open to the world based on the Internal market, in which researchers, scientific knowledge and technology circulate freely. ERA should lead to a significant improvement in Europe's research performance to promote growth and job creation. Through ERA, the Union and its Member States will strengthen their scientific and technological bases, their competitiveness and their capacity to collectively address grand challenges.	ec.europa.eu/research/era/index_en.htm
ERA-MIN	ERA-MIN was an ERA-NET program on the Industrial Handling of Raw Materials for European industries, supported by the European Commission's 7th Framework Programme. It set up networks and mechanisms to foster research in the field of industrial production and supply of raw materials, in line with the "EU Raw Materials Initiative". ERA-MIN focused on the issues related to the three segments of the non-energy mineral resources: construction minerals, industrial minerals and metallic minerals. ERA-MIN aimed at overcoming the current state of fragmentation of research in the field of raw material supply and production by developing convergence and synergies at EU level between national research programs, industry, and with research programs led by	http://www.era-min-eu.org/

	the European Commission. A call to fund a new ERA-MIN has just been launched by the H2020 program	
Decision No 1386/2013/EU: General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' (7th EAP, 2012-2020)	It identifies three key objectives: 1), to protect, conserve and enhance the Union's natural capital 2) to turn the Union into a resource-efficient, green, and competitive low-carbon economy 3). to safeguard the Union's citizens from environment-related pressures and risks to health and wellbeing Four so called "enablers" will help Europe deliver on these goals: 1).better implementation of legislation 2).better information by improving the knowledge base 3).more and wiser investment for environment and climate policy 4).full integration of environmental requirements and considerations into other policies Two additional horizontal priority objectives complete the programme: 1). to make the Union's cities more sustainable. 2). to help the Union address international environmental and climate challenges more effectively.	http://ec.europa.eu/environment/newprg/
European Research Council (ERC)	European Research Council (ERC) grants support individual researchers of any nationality and age who wish to pursue their frontier research. The ERC encourages in particular proposals that cross disciplinary boundaries, pioneering ideas that address new and emerging fields and applications that introduce unconventional, innovative approaches.	http://erc.europa.eu/
Infrastructure for Spatial Information in the European Community (INSPIRE) (Directive 2007/2/EC)	The INSPIRE directive came into force on 15 May 2007 and will be implemented in various stages, with full implementation required by 2019. The INSPIRE directive aims to create a European Union (EU) spatial data infrastructure. This will enable the sharing of environmental spatial information among public sector organisations and better facilitate public access to spatial information across Europe. The Directive addresses 34 spatial data themes needed for environmental applications, with key components specified through technical implementing rules. A European Spatial Data Infrastructure will assist in policy-making across boundaries. Therefore the spatial information considered under the directive is extensive and includes a great variety of topical and technical themes.	http://inspire.ec.europa.eu/index.cfm
Decision No 1600/2002/EC Sixth Community Environment Action Programme (6th EAP) (2002-2010)	The Sixth Environment Action Programme of the European Community entitled "Environment 2010: Our Future, Our Choice" covers the period from 22 July 2002 to 21 July 2012. The Communication proposes five main avenues for strategic action: 1). improving the implementation of existing legislation; 2). integrating environmental concerns into other policies; 3). working in partnership with business; 4). empowering citizens and changing their behaviour; 5). taking account of the environment in land-use planning and management.	http://europa.eu/legislation_summaries/agriculture/environment/l28027_en.htm

3.3 SWOT- Analysis

By developing a reliable and economically viable prototype of a submerged, remotely operated mining machine ¡VAMOS! has the potential to play an important role in reaching Europe's objectives of reducing dependency from external suppliers of raw materials. The economical and policy background was reviewed to create an overview on the strengths, weaknesses, opportunities and threats coming up on the ¡VAMOS! project.

STRENGTHS	WEAKNESSES
• ¡VAMOS! is aligned with Europe's raw materials strategy • New approach to mine submerged deposits and increasing resource efficiency • Breakthrough in mining technology • Multidisciplinary partnership involving science, research and industry • ¡VAMOS! aims at low visibility, low impact mining • Focus on human safety (monitoring machinery instead of heavy physical work in mining sites)	• Economic feasibility of ¡VAMOS! technology is essential for success • Trust and public acceptance can only be established once results are available from the future demonstrations
OPPORTUNITIES	**THREATS**
• Europe is highly dependent on global raw materials market and aims to strengthen self-supply ('economically essential re-industrialization') • Flagship Initiative under Europe 2020 Strategy –'A resource-efficient Europe' [COM(2911)21] • Foundation of a European Institute for Innovation and Technology on Raw Materials • Raw materials topics as essential part of H2020 funding programs • Trends for technology in mining: higher automation, remote controlled • Big number of abandoned and/or submerged mines in Europe • Demand of raw materials will grow strongly in the coming years • Higher raw materials efficiency needed • Reduction of environmental impacts required	• Raw materials sector is not dominant in the European economy • European mining sector massively lost importance within the last 50 years • Average ore grades in the deposits that are being mined is decreasing

4 Regulatory Requirements

The assessment of regulatory requirements has been carried out at European and national levels. The objective was to map relevant regulations, anticipate challenges and create an overview of regulations that are of relevance.

In order to collect information at local level a survey template was created to collect relevant background information in the countries where demonstration is foreseen (Portugal, Bosnia and the UK).

4.1 EU instruments

To ensure legal compliance of ¡VAMOS!, European regulations such as Council Directives, Communications and Decrees have been screened. None of these regulations explicitly regulate or discuss inland submerged mining for metallic deposits. The ones that are of the highest relevance are quoted below.

Mining activities and waste from mining industries:

Directive 2006/21/EC on the Management of Waste from the Extractive Industry, amending Directive 2004/35/EC

Commission COM(2000) 664 on the Safe operation of mining activities

Machinery, CE-label:

Directive 2006/42/EC on machinery, amending Directive 95/16/EC

Environmental Impact Assessment/ water:

Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, amending Directive 2011/92/EU

Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration

Directive 2000/60/EC establishing a framework for Community action in the field of water policy

Health& Safety:

Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work

Directive 89/654/EEC on minimum safety and health requirements for the workplace

Directive 2001/45/EC on minimum safety and health requirements for the use of work equipment by workers at work, amending Directive 89/655/EEC

Directive 89/656/EEC on minimum health and safety requirements for the use by workers of personal protective equipment at the workplace

Directive 90/269/EEC on minimum health and safety requirements for the manual handling of loads where there is a risk particularly of back injury to workers

Directive 90/270 on minimum safety and health requirements for work with display screen equipment

COM(2004)0062 final - Communication on the practical implementation of the provisions of the Health and Safety at Work Directives 89/391, 89/654, 89/655, 89/656, 90/269 and 90/270

Directive 1999/38/EC on the protection of workers from the risks related to exposure to carcinogens at work and extending it to mutagens, amending Directive 90/394/EEC and Directive 97/42/EC

Directive 90/679/CEE on protection of workers from risks related to exposure to biological agents at work

Directive 91/383/EEC on improvements in the safety and health at work of workers with a fixed-duration employment relationship or a temporary employment relationship

Directive 92/104/EEC on minimum requirements for improving the safety and health protection of workers in surface and underground mineral-extracting industries

Directive 92/85/CEE on improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding

Directive 94/33/EC on the Protection of Young People at Work

Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

Directive 2000/54/EC on the protection of workers from risks related to exposure to biological agents at work

Directive 2013/35/EU on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields)

Further to the above list of relevant directives, another ¡VAMOS! Deliverable 'D1.3 - Zero-state environmental and geo-hazard evaluation criteria' has already provided recommendations for standard zero-state environment and safety risks evaluation criteria and standards in order to properly address safety risks and environmental issues, and to determine the actual state of the environment before any submerged mining operations begin.

The screening of European regulations did not reveal any factors that could jeopardize the implementation of the ¡VAMOS! pilots or the subsequent deployment of the ¡VAMOS! technology.

4.2 Local regulations

On national levels ¡VAMOS! partners were mobilised to provide legislative input from countries, where demonstrations are foreseen. In addition to the EU directives and regulations listed, the local regulations mentioned below will also have to be considered during the demonstration and/or full scale deployment of the ¡VAMOS! technology.

To facilitate the collection of information on legislation at national level by the project partners a questionnaire on national regulations concerning water, mining, environmental impact assessment and health & safety was created. The survey covered Portugal, Bosnia and Herzegovina and the UK. Based on the feedback obtained this summary was created, bearing in mind that at this early stage some legal questions could not have been properly investigated.

4.2.1 Portugal

Field tests are being considered for two different mine sites in Portugal.

The Sao Domingos open pit mine is located in the administrative region of Alentejo, approximately 20 km from the city of Mértola. Modern mining activity occurred between 1857 and 1966 within open pit works to a depth of 120 m and by underground works to a depth of 420 m, exploiting copper and zinc. The mine exploited a massive sulphide ore body estimated to have ~ 25 Mt of massive sulphides, the reported ore grades are: 1.25% Cu, 2-3% Zn, 45-48% S. The orebody is sub-vertical and oriented W-E and is estimated to extend 300 m below the open pit. The existing and flooded open pit is 450 m long and 300 m wide at the water level.

Trials are also planned within the Bejanca project as well, facing different problems in technical terms e.g. rock hardness and different type of mineralization. The Bejanca concession is located 12 km northwest of the city of Viseu (northern central Portugal) and covers an area of 89 km². The mines at Bejanca operated from the early 1900´s until 1985, when low tungsten prices resulted in their closure. The tungsten and tin mineralization occurs in stockworks in greisens and also in hydrothermal quartz veins in granites. It is estimated that ore extends up to 400-500 meters deep.

Mineral Resources are part of the Strategy of Geological Resources approved by the Council of Ministers within resolution no. 78/2012. Portuguese Mining Law No. 90 of 1990 regulates the general legal regime for the exploration and exploitation of geological resources. The Ore deposits law (Act. No 88/90) and Quarry Law (Act No. 89/90, modified in 2001) are focused on mineral deposits. Decree-Law no. 10/2010 by the Ministry of Environment and Land Use Planning establishes the regulations for mining waste management.

Basic rules such as the environmental policy general principles are issued by the Assembly of the Republic (law no. 19/2014), detailed regulations on environmental licensing procedures and licensing or the EIA can be found within Administrative Rule no. 330/2001 establishing technical rules for the EIA procedures. Regulatory framework for EIA which establishes rules for public and private projects likely to cause deleterious effects on the environment is provided by Decree-Law no. 151-B/2013 whereas Decree-Law no. 75/2015 describes the licensing procedure itself.

Based on common European directives Portuguese law covers regulations on Health and Safety at work, e.g. within the law 3/2014 amending law 102/2009 for the promotion of Health & Safety at work. The minimum health and safety prescriptions for work at mining industries (Administrative Rule no. 198/96 by the Ministry of Economy and Decree-Law no. 324/95 - Ministry of Employment and Social Security) have to be met as well as Decree-Law no. 50/2005 providing prescriptions for the health and safety at using work equipment and Decree-Law no. 273/2003 regulating the conditions of health and safety for work at temporary or mobile shipyards.

Although basic European and Portuguese legislation is known, regulations explicitly covering in-land submerged mining for metals could not be found. At the moment the status of required permissions, e.g. from mine site owner is not clear.

In order to facilitate the trials it will be necessary to provide further information to the authorities and local stakeholders, including technical details and drawings of the mining vehicle itself as these are becoming available. Strengthening the contacts between local authorities and ¡VAMOS! project partners is seen to be the key to success.

The regulatory framework for Portugal was evaluated with the help of ‘Empresa de Desenvolvimento Mineiro’ (EDM).

4.2.2 Bosnia and Herzegovina

In Bosnia and Herzegovina field trials are planned in the Smreka open pit in Vares.

Current estimates are that the mine itself contains 135 million of tons of resources of iron ore. The open pit was closed in 1992 during warfare and is currently flooded with approximately 5 million m³ of water in the pit itself, with additional flooding of underground mines. The depth of the lake is approximately 200m. The Bosnian government is considering the possibility to re-open the mine.

Concerning active permits it has to be stated that the permission for exploiting mineral resources in the Vareš mine expired in 1991. The legal owner of the mine is Rudnik željezne rude Vareš doo., and they are not in the possession of active mining permits at the moment. According to Bosnian Mining Law in addition to an official exploration/ operation permit, permission from the mine site owner is also mandatory and has been applied for.

The director of the mine in Vareš is appointed as competent (qualified) person within Mining Law. The Mining Law also covers the construction and operation of any processing plant. Permissions related to the operation of the mining vehicle are fully covered by the Mining Law of Bosnia and Herzegovina, there are also additional laws on machinery to be addressed. For obtaining CE label European laws/ directives have to be complied with as there is no local regulation. Parts of Mining Law and the Law of Waste Management cover the handling and storage of waste from mining as well as tailings but they do not specifically cover submerged extraction. Specific regulations for in-land submerged mining for metallic minerals in BiH are not known.

Bosnian law also covers regulations concerning occupational Health & Safety mainly based on common European directives. As Health & Safety is related to mining activities within this project, Mining Inspectors are responsible for executing the law.

Within the Law on Environment there are provisions for EIA as the mandatory frame of environmental permits. National regulations also provide legal aspects for in-land fishery. Field tests are not planned within the current boundaries of environmentally protected areas.

Obtaining a social license to operate is mandatory for mining operations. If full mining permission is needed the Municipality of Vareš, the mining company (Rudnik želj ezne rude Vareš doo.) and the Federal ministry of energy, mine and industry will have to be addressed.

The use of processing water is regulated by law but it does not cover changes in ground water and transport of materials in water. As no changes of the water table will occur within the trials in Bosnia and Herzegovina, this law is only partially applicable. Additionally to the above mentioned regulations the Law on in-land and offshore shipping has to be complied with.

Except for the Law on Environmental Protection which is available in English, all national regulations are only available in the local language.

The approval from the mine site owner to carry out trials, as well as the social license to operate by the Municipality of Vareš are still pending at the date of submission of Deliverable 1.1. It will be necessary to provide further information to the authorities and local stakeholders as these are becoming available.

The regulatory framework for Bosnia and Herzegovina was evaluated with the help of ‘Federalni zavod za geologiju’ (FZG) and ‘Fondacija za obnovu razvoj regije Vares’ (FORRV).

4.2.3 United Kingdom

After the contained trial sites in Portugal and Bosnia the system will be tested in an offshore location with improved knowledge of likely impact serving as a stepping stone for subsea expansion in EU territorial waters.

The system will be tested at Porthtowan Bay in the UK aiming to exploit tin tailings which were washed down to the seabed off Cornwall from the old mines in the area. Marine Minerals Limited (MML) as local project partner believes that about 30% of the tin mined on land is now sitting in the seabed averaging one kilometer from the low water mark off the coast at St Ives Bay, Porthtowan and Perran. The company estimates that it could produce about +1,000 tonnes of tin a year from this source.

The planned offshore work areas are owned by ‘The Crown Estates’, an independent organisation which is accountable to Parliament. The offshore mining related work carried out by MML also requires a permit from the Marine Management Organisation (MMO). The MMO has given MML permission for limited impact works such as drilling and bulk sampling in the past, receiving a permission of work related to the ¡VAMOS! program should not cause significant problems.

The Deep Sea Mining Act 2014 cannot be applied in this case as the test area is in territorial waters. Mines Regulations 2014 cannot be applied as they don’t cover offshore activities. The consortium should be aware of The Merchant Shipping (Safety of Navigation) Regulations 2001 (SI 2002/1473) and the SOLAS Regulation V/34 (‘Safe Navigation and avoidance of dangerous situations’).

Additionaly the Supply of Machinery (Safety) Regulations 2008 No. 1597, the Electrical Equipment (safety) Regulations 1994 and the Pressure Equipment Regulations 1999 have to be met to run mining vehicles and a CE label needs to be obtained. The Pipeline Safety Regulations 1996 will also need to be met.

As no water is used in the course of mining the Water Resources Act 1963 and 1991 is not applicable. The regulating authority, the Environment Agency has confirmed that the work in St Ives doesn´t fall under any regulation relating to water as no chemicals or pollutants are being added to the circulating water.

According to the Environmental Impact Assessment 1985, the Environmental Protection Act 1990 and the Town and Country Planning (Assessment of Environmental Effects) Regulations 2011 an EIA is mandatory for exploitation. Confirmation from the relative authority of whether or not an EIA is needed for the planned research activities is currently outstanding.

The Salmon and Freshwater Fisheries Act 1975 provides legal aspects for in-land fishery only and is therefore not relevant for project ¡VAMOS!. Parts of the St Ives Bay area are classified as Bivalve Mollusc harvesting areas and are therefore protected. The project area at St Ives is not within these protected areas but it is adjacent – this issue needs to be checked with lease or permit holders within the ¡VAMOS! consortium.

For ensuring occupational health and safety both the Health & Safety at Work Act 1974 and Health & Safety at Work Regulations 1999 have to be observed. The Health & Safety Executive is responsible for the execution of these laws.

A social license to operate is not mandatory in UK.

For the licensing of work in the Porthtowan offshore area the MMO will take the opinion of the statutory stakeholders which includes: English Nature, English Heritage, CEFAS, Environmental Agency, Department of Energy and Climate Changes, Cornwall County Council and Natural England. They may also take the opinion of other non-statutory stakeholders such as the Royal Society for the Protection of Birds (RSPB), Cornwall Wild Life Trust and/or Cornwall Seal Group.

When planning an active mine in the future, an exploitation permit meeting the Offshore Marine Conservation (Natural Habitats) Regulations 2007 can be applied for when an EIA is done. The overall permitting of MML´s mining proposals is a major operation relating to the assessment of environmental impact and is more complex than the ¡VAMOS! experiments. For the testing activities competent offshore operator's qualifications or dredging expertise is strongly recommended.

MML is aiming for an operating license since May 2015 that is still pending and in permanent contact with the MMO. An environmental scoping study has been submitted to the Marine Management Organization (MMO).

The regulatory framework for the United Kingdom was evaluated with the help of 'Marine Minerals Limited' (MML) and 'Soil Machine Dynamics Limited' (SMD).

4.3 SWOT - Analysis

For creating this SWOT-analysis only the above described regulatory background on European and national level of countries where demonstrations are foreseen was considered.

STRENGTHS	WEAKNESSES
• Project partners have knowledge in regulatory issues • Project partners are in contact with regulating authorities • MML is in permanent contact with MMO, environmental scoping study is already submitted	• In the UK the project area is adjacent to a protected area in St Ives Bay; • Law in Bosnia and Portugal is only available in national language • Potential misinterpretation of legal aspects
OPPORTUNITIES	THREATS
• UK: work in St Ives doesn´t fall under any regulations relating to water • MMO signals that permission of work (needed for demonstration in UK) will not cause significant problems • No additional local regulation for obtaining a CE-label in Bosnia needed • Health & Safety issues in Bosnia are	• Confirmation from relative authorities in UK if EIA is needed is still missing • Operating license for MML is still pending • Lots of statutory stakeholders are involved in the UK • If additional permissions to those already known should be mandatory ¡VAMOS! will not be working in St Ives Bay • EIA is mandatory in Bosnia and Herzegovina

based on common European law • In Portugal and Bosnia tests are outside environmentally protected areas	• Social License to Operate is pending for test site in Bosnia • Allowance from mine site in Bosnia is mandatory, permission is still pending • In-land submerged mining is not regulated by law • Changes in European or national legislation

4.4 Conclusions and recommendations

Raw materials policies, regulations and priorities are in a constant change of flux in Europe and worldwide. From the perspective of ¡VAMOS! (which develops a new technology solution) this means that there is a need for continuous monitoring the evolution of the legislative framework. The most efficient approach to this would be the establishment of direct links with past and ongoing EU projects that have an exclusive focus on mineral policies. Of particular interest are:

- „MINATURA 2020", which develops a concept and methodology (i.e. a harmonised European regulatory, guidance and policy framework) for the definition and subsequent protection of "mineral deposits of public importance" in order to ensure their "best use" in the future (http://minatura2020.eu/).
- „Minerals4EU", which develops an EU Mineral intelligence network structure delivering a web portal, and the European Minerals Yearbook (http://www.minerals4eu.eu/).
- „Minventory", which is implementing a pan-European statistical database on raw materials deposits (http://www.minventory.eu/).

Several other European projects have a partial focus on raw materials policies and regulations. A list of projects of relevance is provided in Annex 5.4. It is recommended that the Project Coordinator establishes direct contact with the representatives of the most relevant projects so that developments in the raw materials policy arena can be followed up closely.

The present study reviewed the European and national policy and legislative frameworks and it did not identify any immediate bottlenecks that could jeopardize the implementation of the ¡VAMOS! pilot work. In addition the study did not reveal any clear threat to the actual deployment of the technology in Europe in the future. There appears to be sufficient precedents and pieces of legislation in place from related areas (dredging, aggregates, surface and subsurface mining, etc) that could facilitate the permitting process on a case by case basis. Nevertheless, in case that the ¡VAMOS! technology is to be deployed on a larger scale in Europe, it is recommended that dedicated EU level recommendations and guidelines are developed on inland submerged mining for metallic minerals, as this could speed up the permitting process.

Project partners from the countries where pilot tests will be carried out should be requested to maintain continuous communications with the regulatory authorities in order to facilitate the implementation of the pilots. It will also be necessary to provide further information to the authorities as these are becoming available, such as technical details and drawings of the prototype mining system and the supporting infrastructure, as well as details on the scale and specific requirements of the pilots. Such continuous communication will facilitate a better interpretation of the national legislations, and will also facilitate the timely arrangement of permits on a case by case basis.

5 Annex

5.1 Action Plan

Action plan as implemented by October 2015 (below).

			Months*									Start-End
	Tasks and Sub-Tasks		1	2	3	4	5	6	7	8	9	
T1.1	**Policy and regulatory background**	**MUL**										1-9
S1.1.a	List of instruments	EFG, CF					M1					4-5
								✓				
S1.1.b	Policy background	GeoZS, MUL					M2					4-5
							✓					
S1.1.c	Screen regulatory aspects	CF, EDM, EFG, MUL				M3			M4			4-8
						✓				✓		
S1.1.d	Assess legal aspects					M3			M5			4-8
						✓				✓		
D1.1	Create deliverable D1.1	MUL									M6	5-9

*Month 1 = Feb 2015

Sub-Task description:

S1.1.a	List of instruments	EFG, CF
	A short summary on EU initiatives, working groups and projects; contact person	
M1	**List of instruments incl. explanation (June)**	**finished**
S1.1.b	Policy background	GeoZS, MUL
	Review relevant projects	
M2	**Inventory of projects incl. short summary (June)**	**finished**
S1.1.c	Screen regulatory aspects	all, but GeoZS
	Create guidance document	MUL
M3	**Guidance document (May)**	**finished**
	Screen laws and regulations on EU level	EDM, EFG, CF
	Screen laws and regulations on local level: Bosnia, UK, Portugal	(EFG, EDM, FZG)
M4	**List of relevant laws and regulations (August)**	**finished**
S1.1.d	Assess legal aspects	all, but GeoZS
	Create guidance document	MUL
M3	**Guidance document (May)**	**finished**
	Screen laws and regulations on EU level	EDM, EFG, CF
	Screen laws and regulations on local level Bosnia, UK, Portugal	(EFG, EDM, FZG)
M5	**List of relevant mining laws and regulations (August)**	**finished**
D1.1	Sum up findings	MUL
	Screen collected information	
	Create document with requirements and recommendations	
M5	**Deliverable D1.1 (October)**	**finished**

5.2 Guidance document (legal and regulatory background)

Excerpt from ‘Guidance Document - S1.1.cd’ as delivered to local partners: (The original document can be found on the ¡VAMOS! platform share point.)

Introduction

This guidance document should be used when assessing the legal and regulatory background for the ¡VAMOS! project. It sets clear limits for the search perimeter to ensure only relevant data is collected and therefore limits the expenditure of time.

The questions of the survey have to be answered, but they don’t exclude further answers on relevant topics for the ¡VAMOS! project. The formal requirements are also valid for those extra answers.

The search is limited to metallic deposits. The expected output is a filled survey (list) with

the relevant information.

Definitions

According to the basic concept of ¡VAMOS!, there could be several industrial activities affected, like:

- Mining (remotely operated mining vehicle)
- Shipping (launch and recovery vessel)
- Haulage (slurry transport system)
- Pre-Processing (plant, tailings/waste storage, water cycle)
- Support (control centre, workshop, safety, ...)

Directives and laws covering these activities shall concern:

- Machinery
- Water framework
- Health and safety
- Environmental Impact Assessment
- Mining

The survey document shown below is part of the survey document and therefore only annexed once.

5.3 Survey document (legal and regulatory background)

Survey Document ‘Survey Document-S1.1.cd’ as delivered to local partners: (The original document can be found on the ¡VAMOS! platform share point.)

This survey is done for	This survey was filled by	from
☐☐☐EU level		EDM
Bosnia and Herzegowina		CL
☐☐☐Portugal		EFG
☐☐☐UK		FZG

Please refer to the guidance document for instructions on the survey.

(Questions can be overwritten by answers.)

Mining Vehicle
Directive/law on machinery
Is there a directive/law on machinery?
Law/regulation for CE label
Which law/regulation is to address for obtaining a CE label?
Evaluation checklist
Does the law on machinery include an evaluation checklist or guideline for putting a machine on the market?
Water
Directive/law
Is there a directive/law for water?
Change ground water level
Does it cover the permitting process to change the ground water level?
Water usage for mining
Is there a special regulation/paragraph for water usage in the course of mining?
Water usage for plant
Is there a special regulation/paragraph for using water as processing water for the plant?
Transport
Does it cover transport of materials in water (boats, pipes)?
Safety
Directive/law
Is there a directive/law on occupational health and safety?
Evaluation checklist
Does the law include an evaluation checklist or guideline for machines/systems when they ar eput on the
Official body
Is there an official body responsible for executing this law?
Environmental Impact Assessment
Directive/law
Is there a directive/law for an environmental impact assessment?
Is an EIA (environmental impact assessment) mandatory?
Are there special KPIs (i.e. ha or ha per year) as threshold for a mandatory EIA?
Directive/law

Is there a directive/law for in-land fishery?
Protected areas
Is there a list of protected areas available? (i.e. Natura2000, reservoirs, national parks, protected waterland,
Is the site for the field tests in one of these protected areas?
Mining
Directive/law
Is there a mining/minerals law existing?
Raw material groups
Are there raw material groups or categories defined?
In which group are metallic deposits?
Metallic deposits
What permits are necessary (exploration, operation)?
What competent persons are necessary or recommended?
What documents have to be provided when aiming for a permit?
Reserves and resources
Are ther official reserves and resources reporting codes or standards mentioned in the mining law?
Submerged mining
Are there any special regulations for submerged mining covered by the mining law?
Marine mining (only UK)
Is marine mining covered by the mining law (only UK)?
Open pit/underground
Is there a different permitting approach for open pit and underground mines?
Further directives/laws
What other laws and authorities have to be consulted for getting a mining permit according to the mining law? (i.e. forestry, water, environment, safety, ...)
Plant
Is the construction and operation of a processing plant covered by the mining law?
Provisions
Does the mining law demand any provisions for restoration of environmental damage (caused by mining)?
Does the mining law demand any provisions for recultivation/renaturation once the deposit is exhausted?
Permits
Are there any active permits for the test sites? (If yes, who has them?)
Have there been any mining permits for the test sites recently?
Transport
Does the mining law cover transport of material?
Other
Coast mining (only UK)
Is seabed mining covered in the mining law?
Is the test site St. Ives considered as seabed mining?
Would the mining code of the International Seabed Authority be applicable for mining at St. Ives?
Waste
Does it cover waste from mining or is that part of the mining law?
Does it cover tailings from the plant or is that part of the mining law?
Are there special regulations for the storage of waste and tailings? (If yes, does it cover submerged storage?)
Public awareness
Is a social licence to operate common practice for mining operations?
Which stakeholders have to be involved in the mining permitting process?
Financing

Is it possible for a foreign company to get a licence to operate (mining permit)?
Is it possible for foreign investors to participate in a mining project?
Shipping
Is there a directive/law on shipping (in-land)?

5.4 List of projects relevant for ¡VAMOS!

The projects are sorted thematically (first level) and chronologically (second level).

Key:

Colour	Project type
blue	European Commission internal projects, including EUROSTAT & JRC
orange	minerals policy, planning and minerals data projects
grey	waste related projects
green	geo-spatial data and Earth Observation projects
brown	innovative mining projects
turquoise	sea & fresh water related projects
purple	robotics & other equipment development projects

PROJECT ACRONYM	WEB PAGE	DESCRIPTION	DURATION	relevant to ¡VAMOS!
Waste Data Centre (Eurostat)	ec.europa.eu/eurostat/web/waste	The Centre provides robust data, indicators and other relevant information to support the assessment of policy effectiveness, be the central entry point for reporting of data under European Union legislation on waste, be the reference point for answering specific policy questions related to (statistical) information on waste and the associated environmental impacts; and Co-operate with DG Environment, the JRC and the EEA to develop and coordinate the necessary methodologies to produce statistical data, information and indicators on the environmental impacts of waste generation and waste management, within a life cycle perspective.	cont.	mining waste
COMEXT (Eurostat)	epp.eurostat.ec.europa.eu/newxtweb/	The ComExt intra- and extra-European trade database provides statistics on merchandise trade among European Union member states, and between member states and global partners. ComExt, prepared by Eurostat, is based on data provided by the statistical agencies of the EU member states.	cont.	raw materials trade
PRODCOM (Eurostat)	ec.europa.eu/eurostat/web/prodcom	Prodcom provides statistics on the production of manufactured goods. The term comes from the French "PRODuction COMmunautaire" (Community Production) for mining, quarrying and manufacturing: sections B and C of the Statistical Classification of Economy Activity in the European Union (NACE 2).	cont.	minerals statistics
SETIS	setis.ec.europa.eu	The European Strategic Energy Technology (SET)-Plan aims to transform energy production and use in the EU with the goal of achieving EU worldwide leadership in the production of energy technological solutions capable of delivering EU 2020 and 2050 targets. The move towards a low-carbon Europe	2007-	minerals statistics

		requires innovative research, effective strategic planning and an emphasis on timely and appropriate action.		
SBS	ec.europa.eu/eurostat/web/structural-business-statistics	Structural business statistics (SBS) and global business activities cover industry, construction, trade and services. Presented according to the NACE activity classification, they describe the structure, conduct and performance of businesses across the European Union (EU) – data are available for the EU28/EU27 and for the Member States.		minerals statistics
EIT Raw Materials	eit.europa.eu/eit-community/eit-raw-materials	EIT Raw Materials has the ambitious vision of turning the challenge of raw materials dependence into a strategic strength for Europe. Its mission is to boost the competitiveness, growth and attractiveness of the European raw materials sector via radical innovation and entrepreneurship. This KIC will integrate multiple disciplines, diversity and complementarity along the three sides of the knowledge triangle (business, education and research) and across the whole raw materials value chain.	2014-2022	raw materials, research
LCDN (JRC)	eplca.jrc.ec.europa.eu/?page_id=134	The Life Cycle Data Network, managed by the Joint Research Centre, is aimed at providing a globally usable infrastructure for the publication of quality assured LCA data from different organizations. It is a web-based infrastructure to ensure LCA data with easy access via searches, filtering, and sorting. All datasets registered and published through the Life Cycle Data Network are compliant with quality requirements aimed at guarantee datasets quality and coherence in terms of Methodology, Documentation, and Nomenclature.	2014-	life cycle analysis
AEGOS	www.aegos-project.org/	The African-European Georesources Observation System project aimed at setting-up the preparatory phase for the building of an information system containing and making accessible data and knowledge on African geological resources including mineral resources, raw material, groundwater and energy (georesources).	2008-2011	African mineral deposits
SARMa	www.sarmaproject.eu	Aggregates (crushed stone, sand and gravel) are crucial for infrastructure and construction. SEE countries are rich in aggregates, but supply is not coordinated within or across the area. The main objective of the project was to develop a common approach to sustainable aggregate resource management (SARM) and sustainable supply mix (SSM) planning, at three scales: regional, national and transnational.	2009-2011	planning, restoration, sand and gravel pits
Promine	promine.gtk.fi	The non-energy extractive industry (NEEI) is a significant contributor to the economy of the EU providing metalliferous and non-metalliferous mineral resources to the society as well as direct and indirect employment. The philosophy behind ProMine is to stimulate the extractive industry to deliver new products to manufacturing industry.	2009-2013	EU deposit database
EURO-GEOSOURCE	www.eurogeosource.eu	Project built the EU Information and Policy Support System for Sustainable Supply of Europe with Energy and Mineral Resources.	2010-2013	information system, policy

Polinares	www.polinares.eu	POLINARES examined the global challenges faced with respect to access to oil, gas and mineral resources over the next 30 years and proposes solutions for the various policy actors, including the EU.	2010-2012	global demand, conflicts
ERA-MIN	www.era-min-eu.org	ERA-MIN is an ERA-NET program on the Industrial Handling of Raw Materials for European industries and is supported by the European Commission's 7th Framework Programme. It is aimed at setting up networks and mechanisms to foster research in the field of industrial production and supply of raw materials, in line with the "EU Raw Materials Initiative".	2011-2015	minerals network, research networks, funding
SNAP-SEE	www.snapsee.eu	Sustainable Aggregates Planning in South East Europe aimed to facilitate improved aggregates planning by developing a Toolbox as a support to national/regional, primary and secondary aggregates planning in SEE countries. One of the key aspects is to enhance involvement of stakeholders into aggregates planning at the national and/or regional level.	2012-2014	policy, planning, management
CRM_InnoNet	www.criticalrawmaterials.eu/	Critical Raw Materials Innovation Network project drives innovation and influence policy in the field of substitution of critical raw materials for the benefit of EU industry.	2012-2015	critical raw materials, substitution
Minventory	www.minventory.eu minventory.brgm-rec.fr	Study on Structured statistical information on quality and quantity of EU raw materials deposit, creating directory, and web-site and perform data harmonisation.	2013-2014	statistical database, legislation
Minerals4EU	www.minerals4eu.eu	Mineral Intelligence Network for Europe is designed to meet the recommendations of the EIP Raw Materials Initiative and to develop an EU Mineral intelligence network structure delivering data, information and knowledge on mineral resources around Europe.	2013-2015	minerals yearbook, minerals intelligence network
EURARE	www.eurare.eu	The main goal of the EURARE project is to set the basis for the development of a European Rare Earth Element (REE) industry. It will safeguard the uninterrupted supply of REE raw materials and products crucial for sectors of the EU economy (including automotive, electronics, machinery and chemicals) in a sustainable, economically viable and environmentally friendly way.	2013-2018	REE resources, mapping, novel extraction methods
COBALT	www.cobalt-fp7.eu	COBALT project brings together industry, civil society, research bodies, and public authorities to stimulate a joint debate on sustainable raw material use. It will explore how the needs of EU industry and civil society can be simultaneously met through innovation along the value chain from extraction to final consumption.	2013-2015	cooperation between industry, education and civil society
ERECON	ec.europa.eu/growth/sectors/raw-materials/specific-interest/erecon/index_en.htm	The European Rare Earths Competency Network comprises rare earth experts that were recruited for three distinct Working Groups: i) Opportunities and road blocks for primary supply of rare earths in Europe; ii) Closing the loop: European rare earths resource efficiency and recycling and iii) European end-user industries and rare earths supply trends and challenges	2013-2014	supply of REE

INTRAW	intraw.eu	The INTRAW project will map and develop new cooperation opportunities related to raw materials between the EU and other technologically advanced countries, such as Australia, Canada, Japan, South Africa and the United States, addressing RTD, data reporting, policies, education management, exploration and licencing systems. The outcome will be the EU International Observatory of Raw Materials.	2015-2018	export, information, policies, world
Minatura	minatura.eu	The overall objective of MINATURA 2020 is to develop a concept and methodology (i.e. a harmonised European regulatory, guidance and policy framework) for the definition and subsequent protection of “mineral deposits of public importance” in order to ensure their “best use” in the future.	2015-2018	minerals, safeguarding, policy, planning
I2MINE	www.i2mine.eu	Innovative Technologies and Concepts for the Intelligent Deep Mine of the Future project is designed to realise the concept of an invisible, zero-impact mine, concentrating on the development of technologies suitable for deep mining activities. The project encompasses the development of new techniques for geological engineering methods and rock mechanics that will be demanded by deeper mines and the new technology.	2011-2015	future mining, deep mines, robotics and automation
EXTRACT-IT	www.extract-it.eu	Identifying potentially disruptive trends in ICT that could support future underground mining at extreme depths where the conditions (humidity, dust, heat, etc.) and the confined spaces represent some rather complex challenges. These research topics will go beyond today's applied research efforts in this domain, and will venture into the unchartered waters of basic, exploratory sciences.	2012-2013	future mining, technologies & concepts
MIN-NOVATION	www.min-novation.eu	Mining and mineral Processing Waste Management Innovation Network aims to create a transnational network with regional networks as building blocks of effective multi-lateral cooperation. The activities carried out on the regional and transnational level will secure better access to knowledge, state-of-the-art technologies and good practice to SMEs active in the mineral waste management & prevention sector. The project will address all the waste management challenges and opportunities, which face the BSR mining industry, which should be understood as extending to all forms of extraction of natural non-renewable resources.	2011-2013	
REECover	www.reecover.eu	Recovery of Rare Earth Elements from magnetic waste in the WEEE recycling industry and tailings from the iron ore industry.	2013-2016	tailings processing, abandoned deposits, REE
BIOMETAL DEMO	www.biometaldemo.eu	Biometal Demonstration Plant for the Biological Rehabilitation of Metal Bearing-Wastewaters project will address the problem of polluted water with heavy metals. Project will demonstrate the feasibility of the application of biotechnologies (bioprecipitation and biosorption) in a three demonstration projects, including mine and an	2013-2017	water contamination, remediation, metals

		electroplating company.		
PROSUM	www.weee-forum.org/prosum-0	The ProSUM project will gather data on WEEE, ELVs, batteries and mining waste known to have relatively high concentrations of CRMs. Methodologies will be developed to gather harmonised and standardised data, compliant with existing primary raw materials databases, to provide a general architecture for an inventory for secondary raw materials in the urban mine and mining wastes. Access to the data inventory will be through the EU Urban Mine Knowledge Data Platform (EU-UMKDP) and a user friendly web portal.	2014-2017	waste, recycling, metals
IAMTEC	cordis.europa.eu/project/rcn/80282_en.html	Target was to improve the efficiency of Roadway Drivages, one of the key factors in the productivity of modern high-performance Coal Mines, through use of the latest advances in Information, Communication, Automation and Maintenance Technologies.	2004-2007	coal, mining equipment
SHOAL	www.robosho al.com	SHOAL aimed to develop number of autonomously controlled robotic fish with chemical sensors attached that will work together in order to monitor and search for pollution in ports and other aquatic areas in real-time. Further to this the fish will also be given intelligence so that if they do find significant amounts of pollution and they deduce it's coming from a source they will all work together to find the source of the pollution so that the port can stop the problem early before more pollution occurs.	2009-2012	marine pollution, intelligent robots
EMIMSAR	http://bookshop.europa.eu/en/enhanced-miner-information-interaction-to-improve-maintenance-and-safety-with-augmented-reality-technologies-and-new-sensors-emimsar--pbKINA26172/	Develop, implement and demonstrate “Augmented Reality” devices and applications, enhanced marker systems and real-time location systems that will improve the interaction of mine personnel with computer-stored information.	2009-2012	augmented reality in mines
SUPPORT	www.support project.info	SUPPORT aimed to support port security stakeholders to establish the necessary and sufficient security level to satisfy evolving international regulations and standards while efficiently supporting the complexity of the real port environment. The SUPPORT project utilised the robot in port environments to look for underwater threats and intrusions to the port.	2010-2014	marine environment , robots
STABALID	stabalid.eu-vri.eu	The main objective of StAtionary Batteries LI-ion safe Deployment project is to support the deployment of safe Li-ion stationary batteries with a cell size larger than 10 Ah and systems larger than 1 MWh.	2012-2015	batteries, power
SNIFFER	www.sniffer-	A bio-mimicry enabled artificial sniffer project	2012-	sensor

	project.eu	envisions the design and development of a network of distributed detection devices, capable of rapid, on-site detection of multiple kinds of agents and CBR agents with high sensitivity.	2015	developmen t
ICARUS	www.fp7-icarus.eu	The introduction of unmanned Search and Rescue devices can offer a valuable tool to save human lives and to speed up the SAR process. ICARUS concentrates on the development of unmanned robotic SAR technologies for detecting, locating and rescuing humans.	2012-2016	robots, autonomy, sensors
CARLoS	carlosproject.eu	The CARLoS project aims to apply recent advances in cooperative mobile robotics, to a representative industrial scenario in shipyards. The problems at hand in CARLoS project are the fit-out operations inside blocks of ship superstructures. Currently, these tasks require arduous manual works. There is no available solution to automate the targeted works in a complex environment such as shipbuilding. CARLoS robot will be built using off-the-shelf technology under a modular approach. The final prototype will be demonstrated as a robot co-worker for fit-out operations inside blocks of ship superstructures.	2013-2015	robotics
STAMINA	stamina-robot.eu	Sustainable and Reliable Robotics for Part Handling in Manufacturing Automation Project develops of a fleet of autonomous and mobile industrial robots with different sensory, planning and physical capabilities for jointly solving multiple logistics and handling tasks.	2013-2017	robots, autonomy, sensors
TURTLE	www.inesctec.pt/crob-en/projects/recent-projects/projetos-recentes.html	TURTLE develops materials in order to create equipment for deep sea operations, and to increase the tele-presence of humans in a water environment, through remote equipment.	2014-2015	security, deep sea, robotic exploration
SUNNY	www.sunnyproject.eu	The SUNNY project aims to develop system solutions capable of improving the effectiveness of the EU border monitoring compared to the legacy systems whilst keeping affordability and interoperability as key enabling factors. The SUNNY project aims to contribute to the objectives of EUROSUR by improving sensor and data transmission capacities and real time data processing capabilities.	2014-2017	remote sensing, sensors, UAV, data transition
EMODNET	www.emodnet.eu	The overall objective of the European Marine Observation and Data Network (EMODNET) is to create pilot studies that assemble fragmented and inaccessible marine data into interoperable, contiguous and publicly available datasets for whole maritime basins. The EMODNET-Geology project is one of six preparatory action projects that, in addition to marine geology, bring together information on marine chemistry, marine biology, hydrography, sea-bed habitats and physical properties.	2009-2020	marine data infrastructur e
ASTIS	astis.ung.si	Development of guidelines for the Italian-Slovenian important problem in the management of transboundary waters in the basin of the river Soča	2011-2014	water managemen t, drinking

		on integrated management of transboundary aquifers, in particular the qualitative and quantitative development of groundwater and the protection and use of transboundary aquifers.		water conservation
HYDROKARST	www.hydrokarst-project.eu	The project has as its primary objective the protection and coordinated management of the aquifer Reka-Timava by monitoring the quantity and quality of underground water and the territory of the Classical Karst.	2012-2015	water conservation, karst
MIDAS	www.eu-midas.net	**M**anaging **I**mpacts of **D**eep-se**A** re**S**ource exploitation project will investigate the environmental impacts of extracting mineral and energy resources from the deep-sea environment. MIDAS will carry out research into the nature and scales of the potential impacts of mining, including the exploitation of materials such as polymetallic sulphides, manganese nodules, cobalt-rich ferromanganese crusts, methane hydrates and the potential mining of rare earth elements.	2013-2016	environment, deep sea mining
Terrafirma	www.terrafirma.eu.com	Project aimed to provide a Pan-European ground motion information service for the identification, assessment, understanding and monitoring of ground motions in Tectonics, Flood and Hydrogeology (including abandoned and inactive mines).	2003-2012	ground subsidence, radar interferometry
One Geology Europe	www.onegeology-europe.org	The purpose of One Geology-Europe was to enable the sharing and accessibility of European geological data. The national geological institutes have a wealth of data assets which is often accessible only to specialists. In addition, these data have not been easy to understand so far, their use and inter-operability are difficult. These functions will be possible with One Geology-Europe.	2008-2010	geological data, information infrastructure
OBSERVE	www.observe-fp7.eu	Observe mission was to collect and process all the necessary information for delivering an integrated analysis on the current status of Earth Observation activities and networks in the Balkans regarding environmental monitoring, the potential benefit from the full exploitation of an integrated capacity development strategy and the prospect of creating a relevant permanent Earth Observation Community in the broader region.	2010-2012	Balkan, Earth Observation
ImpactMin	www.impactmin.eu	The objective of ImpactMin project was to collect and process data from designated demonstration sites that represents various environmental and social issues related to mining operations. The analysed data and information then served to conclude how Corporate Social Responsibility and thus the socio-economic aspects of mining are implemented in reality. Beside this, what innovative monitoring techniques and standard procedures can be tailored to measure the environmental impacts of mining activities, thus how quality data and information can be assured.	2010-2012	Earth Observation, environmental impacts
EO-MINERS	www.eo-miners.eu	Earth Observation for Monitoring and Observing Environmental and Societal Impacts of Mineral Resources Exploration and Exploitation, use current knowledge and data, along with existing and new	2010-2013	earth observation, minerals, environment

		technological and scientific earth observation-based methods and tools, to monitor mineral resources exploration and mining and provide information to manage its impacts on the environment and society.		al impacts
BalkanGeoNet	www.balkangeo.net	The project aimed to identify the existing EO-data providers and users in the wider Balkan region, to determine their status, potentials and needs, and to coordinate the EO players by establishing a proper interface and networking between them. A broad analysis of gaps and complementarities of the EO activities in the region were performed, with an emphasis on the user needs in the specific context of the Balkan region.	2010-2013	Balkan, Earth Observation
EarthServer	www.earthserver.eu	Several Applications are being established in EarthServer, each of which poses distinct challenges on Earth Data Analytics: Cryospheric, Airborne, Atmospheric, Geology, Oceanography, and Planetary Science. Altogether, they cover all Earth Science domains; the Planetary Science use case has been added to challenge concepts and standards in non-standard environments.	2011-2014	earth science data serving, OGC
PANGEO	www.pangeoproject.eu	Pangeo project provided access to geological information about geo-hazard information (landslides, ground instability) for many of the largest cities in the EU.	2011-2014	land stability, geohazard
EGDI-SCOPE	www.egdi-scope.eu/	The European Geological Data Infrastructure covers pan-European, interoperable, thematic geological data and information related to e.g. geohazard, mineral resources and groundwater and soil quality. This includes three levels and services. The basic level covers 'raw data', e.g. from boreholes, earth observation and monitoring programs. A next level could be described as 'interpreted geological information', such as (digital) geological maps and models. The following level could be described as 'information products' that can be derived from the other levels, for example by applying specific queries and calculations, and combining with information from other domains.	2012-2014	geological data & services, data infrastructure
EO-POWER	www.eopower.eu	The purpose of the EOPOWER project is to create conditions for sustainable economic development through the increased use of Earth observation products and services for environmental applications. This purpose serves the higher goal of effective use of Earth observation for decision making and management of economic and sustainable development processes.	2013-2015	earth observation
IASON	www.iason-fp7.eu	IASON Project has the ultimate goal to establish a permanent and sustainable Network of scientific and non-scientific institutions, stakeholders and private sector enterprises belonging in the EU and third countries located in two significant areas: The Mediterranean and the Black Sea regions. The main focal points of the project will be the usage and application of Earth Observation (EO) in the topics of climate change, resource efficiency and raw materials management.	2013-2015	earth observation, raw materials, climate change
HERCULES	www.hercules	The project builds on the development and	2013-	landscapes

	-landscapes.eu	application of innovative technologies and tools for assessing cultural landscapes. The strong involvement of small and medium-sized enterprises and non-governmental organisations provides a prototype for the empowerment of these institutions in landscape planning and management. The project cooperates closely with public and private authorities, agencies, and associations of citizens at local, national, and EU levels.	2016	conservation, spatial planning
EO4OG	http://zoz.cbk.waw.pl/index.php/en/projects/project-eo4og-en	This project is driven by the needs of the oil & gas industry with regards to meeting the challenges of onshore exploration and production, health and safety, and compliance with national and international regulations and to define expectations and information requirements for geospatial data and services. The goal is to understand industry needs and to identify new technologies that support industry across all phases of the oil & gas lifecycle.	2014-2015	oil and gas, geospatial data

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