Exploitation strategic plan, innovation plan and business model - initial

Deliverable 8.2

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TABLE OF CONTENTS

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

BGS	British Geological Survey
CLC	Cobre Las Cruces
CRM	Critical Raw Materials
EIP	European Innovation Partnership on Raw Materials
ETP SMR	European Technology Platform on Sustainable Mineral Resources
Euromines	European Association of Mining Industries, Metal Ores & Industrial Minerals
IPR	Intellectual Property Rights
M2M	Mine to Metal
NGO	Non-Governmental Organisation
RMSG	Raw Materials Supply Group
RSS	Rich Site Summary (summary of website content)
SIP	Strategic Implementation Plan (of the EIP)
UNEP	United Nations Environment Programme
USGS	United States Geological Survey

1. PURPOSE

The purpose of this report is to discuss the initial phase of the exploitation strategic plan of INTMET (D8.2); this includes Task 8.3 (business model), Task 8.4 (innovation management/plan) and refers to Task 8.5 (exploitation, application strategy). It also contributes to Tasks 8.2 and 8.1. The final version of the exploitation plan will be drafted towards the end of the project (once the details of the final INTMET product(s) are available).

D8.2 starts with the description of the business model (chapter 2). Chapter 2 is the basis for discussion of the innovation management/plan (chapter 3) and preliminary discussion of the exploitation/application strategy of INTMET (chapter 4). In chapter 5, conclusions are presented.

The main purpose of this document is to set the scene for all project participants with respect to the envisaged business case, the innovation management (IPR protection) and identification of exploitable results. The document is the start of a process resulting in a concrete and agreed final plan at the end of the project.

2. BUSINESS MODEL

The business model is based on the following sections (i.e. general features of any business model/plan): basic idea, product and services, marketing, cooperation and financing.

2.1 BASIC IDEA

The INTMET approach represents a unique technological breakthrough to overcome the limitations related to difficult low grade and complex polymetallic ores to achieve high efficient recovery of valuable metals (Cu, Zn, Pb, Ag, Au) and CRM (Co, In, Sb). The main objective of INTMET is applying on-site mine-to-metal hydro and bio-hydro processing of the produced concentrates enhancing substantially raw materials efficiency thanks to an increased Cu+Zn+Pb recovery over 60% vs. the existing selective flotation method (considered difficult and inefficient) to produce saleable concentrates of each metal. Moreover, the INTMET process will add secondary materials like mine tailings and metallurgical wastes to the process for valorisation and metal recovery.

The innovative approach of INTMET spreads the principle **Mine to Metal**. The Mine to Metal (M2M) principle is a modern way to treat mineral resources. Minerals are being processed on site without the need to transport large amounts of concentrates to other plants.
INTMET products will bring innovative technologies for members of the consortium and also high quality products for customers in the industrial sector. Products are intended to be used for the highly developed metallurgical industry in the European Union. The intended new flotation concepts have a huge potential for application when combined with appropriated hydro and/or biohydro metallurgical processes to be developed within INTMET project. This needs to be addressed in a market analysis (see chapter 2.3).

2.2 PRODUCT AND SERVICES

The innovation potential and added value of INTMET product(s) need to be demonstrated. In a nutshell, this is an "INTEGRATED INNOVATIVE METALLURGICAL SYSTEM TO BENEFIT EFFICIENTLY POLYMETALLIC, COMPLEX AND LOW GRADE ORES AND CONCENTRATES".

The details of the final INTMET product(s) will be available towards end of the project. For the (business) application of these products we (clearly) need to describe the added value i.e. innovative potential (in the exploitation plan) compared to the conventional concepts when approaching "INTMET customers" *during and after* the project. The innovation potential of INTMET shall also be a matter of (permanent) discussion with stakeholders (Task 8.2) and constantly be promoted (Task 8.1). This will increase the possibilities of application and contribute to the establishment of future potential customers/clients during/after the project. We need to draft a plan *how* to interact with stakeholders with the aim to maximise the innovation potential best as possible.

How to ensure a real business solution?

The technical, environmental and economic feasibility of the entire approaches will be evaluated to ensure a *real business solution* of the integrated INTMET process. Innovative hydrometallurgical processes (atmospheric, pressure and bioleaching), and novel more effective metals extraction techniques (e.g. Cu/Zn-SX-EW, chloride media, MSA, etc.) will be developed and tested at relevant environments aiming at maximising metal recovery yield and minimising energy consumption and their environmental footprint. Additionally, secondary materials like tailings and metallurgical wastes will be tested as well for metals recovery and sulphur valorisation.

INTMET will be economically viable thanks to diversification of products (Cu, Zn, Pb), high-profitable solutions (producing commodities not concentrates), with lower operation and environmental costs (on-site hydro-processing will avoid transport to smelters) and allowing mine-life extension developing a new business-model concept based on high efficient recovery of complex ores that will ensure EU mining industry competitiveness and employment.

The described INTMET process is the main target of the project and thus the centre of activities. Therefore, the business case will be centred around this process as the main result of the project. However, a couple of more individual results are expected from INTMET work. Those will be assessed individually and dealt with in the innovation and/or exploitation strategy.

2.3 MARKETING

As mentioned in Section 2.1 above, the current methods of physical concentration are not effective in realising the total contained value of polymetallic ores. For example it is never possible to obtain complete separation of copper and zinc into separate concentrates, and the extent of separation can only be improved at the cost of greater losses to tailings. The copper content remaining in a zinc concentrate being sold to a zinc smelter would attract a penalty, and the same applies to zinc content in a copper concentrate. Hence ironically valuable metal becomes a liability. The hydrometallurgical processes envisaged under INTMET have the potential of realising much closer to 100 percent of the full contained metal value than the current methods, even while treating a single bulk concentrate bearing all metals in a single feed stream.

This means that the outputs of the INTMET project are inherently valuable and would be desirable to the mining industry in solving problems that have long been known to exist. However a task remains of communicating this to the industry, and to tailor solutions to each unique case.

During the course of the project, all INTMET partners need to identify any kind of business opportunities (Task 8.3) and evaluate these in terms of economic conditions and viability. Marketing requires a comprehensive (market) analysis of (as determined in the application) valuable metals (Cu, Zn, Pb, Ag, Au) and CRM (Co, In, Sb) in

Europe and beyond. This will be done using the input of stakeholders in the frame of activities in Task 8.2. The information obtained will serve as basis for drafting the (final) exploitation and application strategy (Task 8.5).

In order to be able to determine the entire market potential of the INTMET process, we have to identify all potential users of the new developed technology (at global scale). For this, we need to carry out the following individual measures:

- Internet and literature surveys (some examples are given in this report)
- Questionnaires sent out to competitors and companies identified by the project partners
- Market survey on commodity basis – looking for companies producing similar products
- Interviews of staff in professional associations like Eurometaux, Euromines, IMA-Europe, etc.
- Other means identified in the course of the project (considering stakeholder interaction/Task 8.2)

Apart from that we need to screen the geological potential in Europe[1], using existing information for example from the Promine project (http://promine.gtk.fi/) as illustrated in Figure 1.

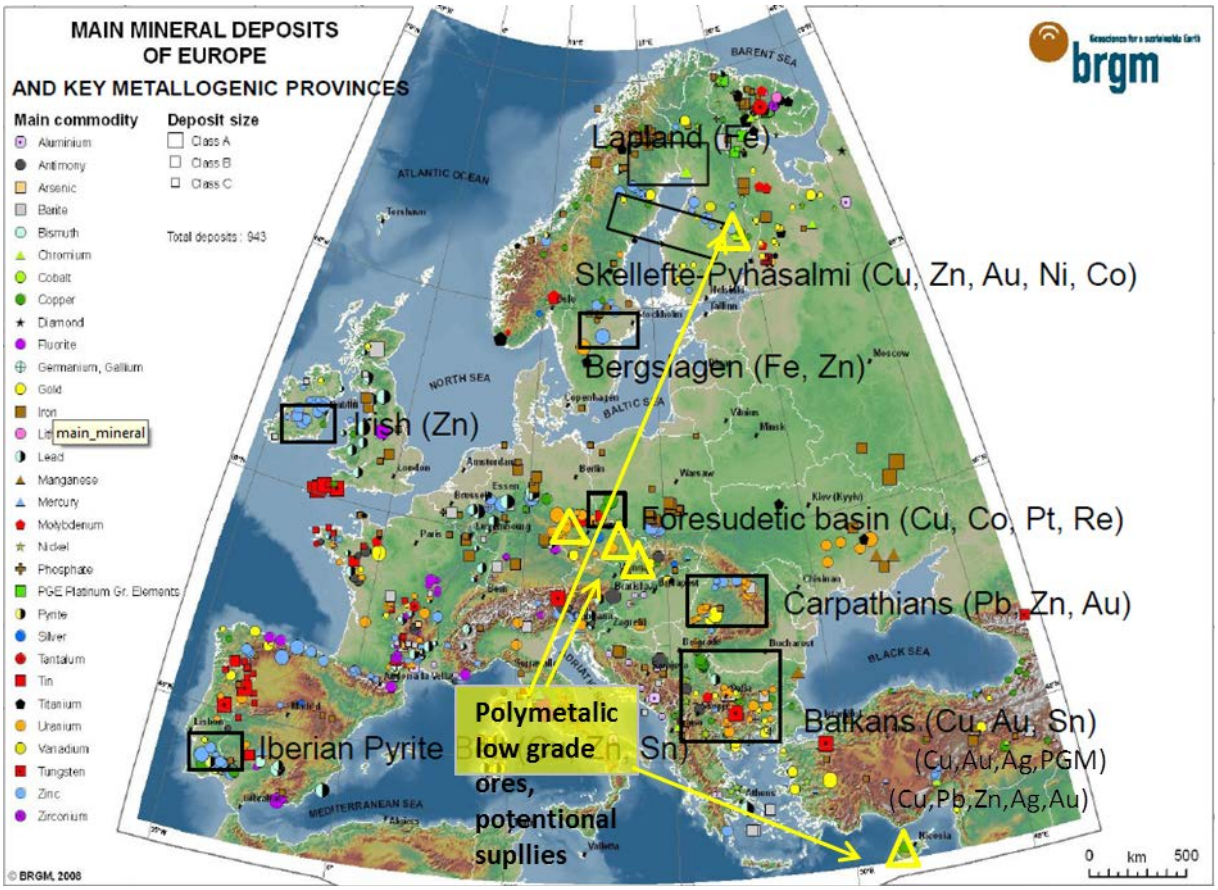
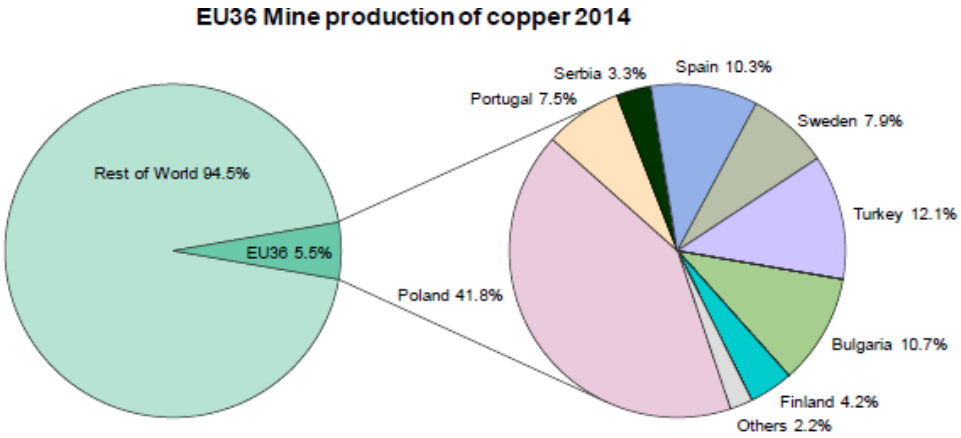


FIGURE 1: MAIN DEPOSITS OF EUROPE (SOURCE: PROMINE; HTTP://PROMINE.GTK.FI/MAIN_MINERAL_DEPOSITS_OF_EUROPA.PDF)

[1] The Iberian Pyrite Belt region in the south of Spain and Portugal is as an area rich in volcanogenic massive sulfide deposits which contains polymetallic ores and potential target of INTMET.

Figure 2 shows the example of the copper case for a market survey on commodity basis and value chain assessment, which is also required (mining, processing, refining). Related information may be collected from sources like BGS, USGS, world mining data[2], etc.



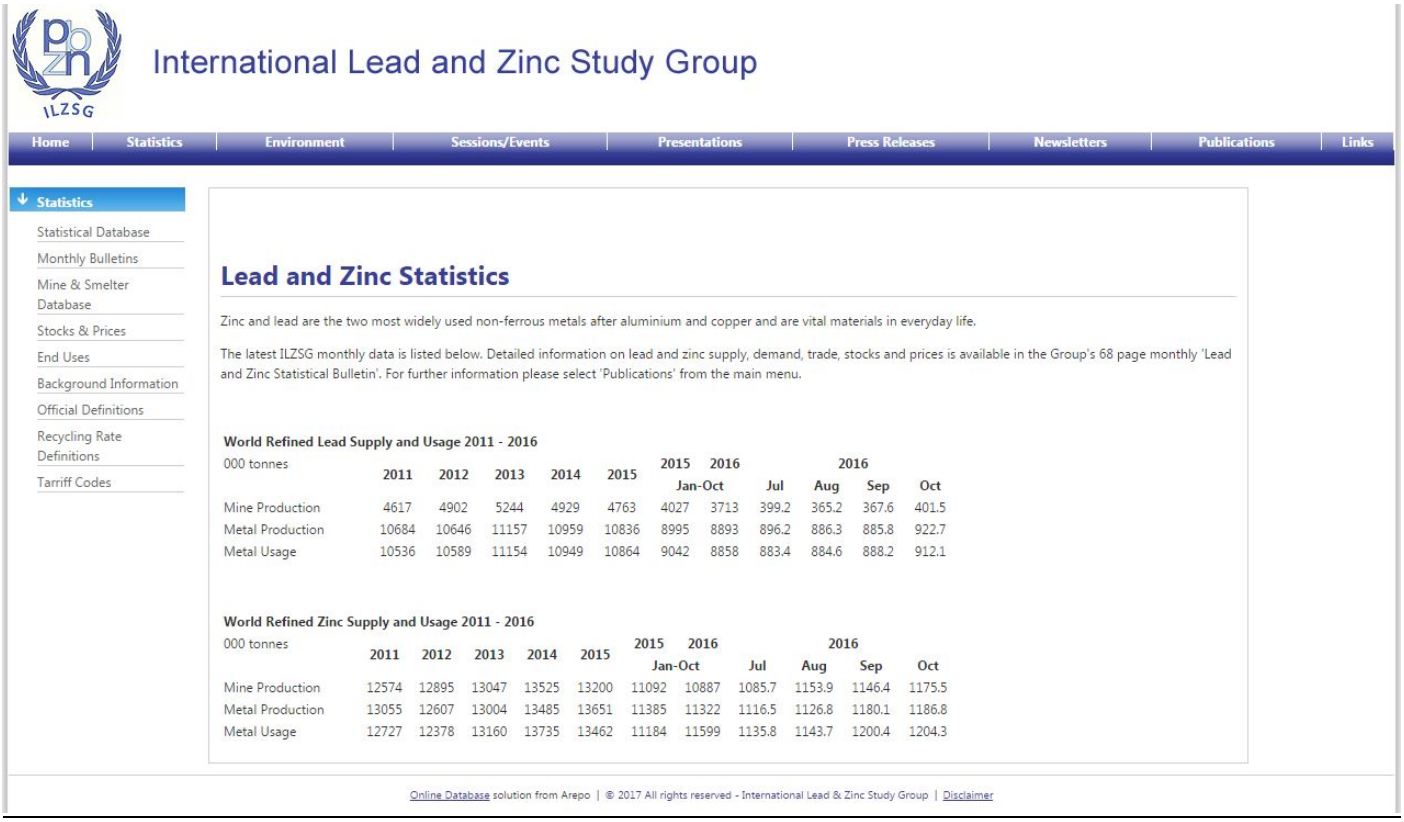
Mine production of copper tonnes (metal content)

Country	2010	2011	2012	2013	2014
Albania	2 672	4 379	5 691	5 087	3 503
Bulgaria (a)	112 904	114 603	118 255	115 149	108 300
Cyprus	2 595	3 660	4 328	3 631	3 088
Finland	14 700	14 000	25 446	38 763	42 790
Macedonia	7 912	7 555	9 506	9 802	8 187
Poland	425 725	426 665	427 064	428 879	421 700
Portugal	74 426	79 686	74 043	77 236	75 433
Romania	5 127	6 355	5 902	6 700	7 200
Serbia	22 800	26 100	32 200	36 200	33 739
Slovakia	22	28	31	40	46
Spain	54 335	68 511	97 452	104 600	103 900
Sweden	76 514	82 967	82 422	82 904	79 681
Turkey	79 900	92 500	104 300	120 500	122 000
EU36 total	880 000	927 000	987 000	1 029 000	1 010 000

FIGURE 2: COPPER PRODUCTION IN EUROPE (SOURCE: HTTPS://WWW.BGS.AC.UK/MINERALSUK/STATISTICS/EUROPEANSTATISTICS.HTML)

It is necessary to take into account the market outlook, taking into account existing information from metals associations and study organizations.

[2] If useful, we may consider also using private sources such as Roskill which produces good marketing reports, e.g. future demand of a metal https://roskill.com/.



International Lead and Zinc Study Group

Home | Statistics | Environment | Sessions/Events | Presentations | Press Releases | Newsletters | Publications | Links

Statistics

- Statistical Database
- Monthly Bulletins
- Mine & Smelter Database
- Stocks & Prices
- End Uses
- Background Information
- Official Definitions
- Recycling Rate Definitions
- Tarriff Codes

Lead and Zinc Statistics

Zinc and lead are the two most widely used non-ferrous metals after aluminium and copper and are vital materials in everyday life.

The latest ILZSG monthly data is listed below. Detailed information on lead and zinc supply, demand, trade, stocks and prices is available in the Group's 68 page monthly 'Lead and Zinc Statistical Bulletin'. For further information please select 'Publications' from the main menu.

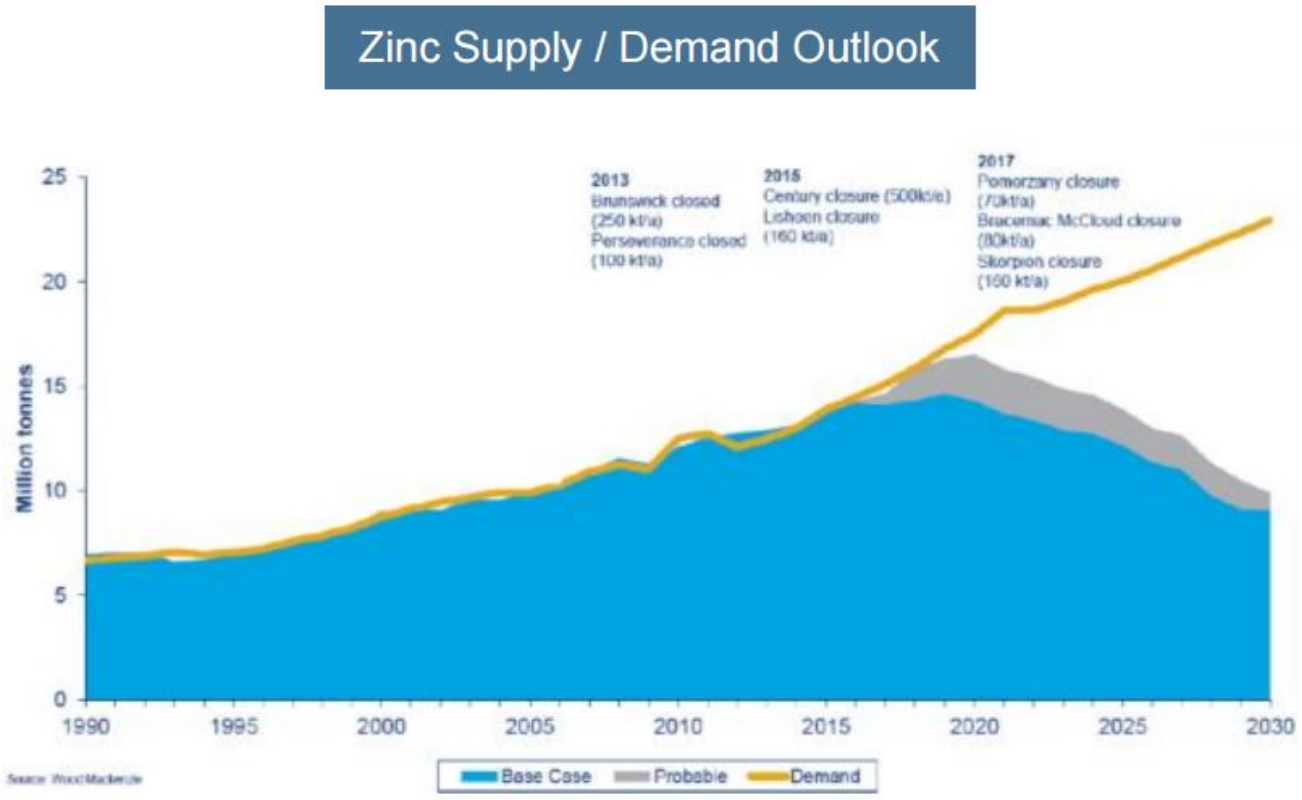
World Refined Lead Supply and Usage 2011 - 2016

000 tonnes	2011	2012	2013	2014	2015	2015 Jan-Oct	2016 Jan-Oct	2016 Jul	2016 Aug	2016 Sep	2016 Oct
Mine Production	4617	4902	5244	4929	4763	4027	3713	399.2	365.2	367.6	401.5
Metal Production	10684	10646	11157	10959	10836	8995	8893	896.2	886.3	885.8	922.7
Metal Usage	10536	10589	11154	10949	10864	9042	8858	883.4	884.6	888.2	912.1

World Refined Zinc Supply and Usage 2011 - 2016

000 tonnes	2011	2012	2013	2014	2015	2015 Jan-Oct	2016 Jan-Oct	2016 Jul	2016 Aug	2016 Sep	2016 Oct
Mine Production	12574	12895	13047	13525	13200	11092	10887	1085.7	1153.9	1146.4	1175.5
Metal Production	13055	12607	13004	13485	13651	11385	11322	1116.5	1126.8	1180.1	1186.8
Metal Usage	12727	12378	13160	13735	13462	11184	11599	1135.8	1143.7	1200.4	1204.3

FIGURE 3: LEAD & ZINC STATISTICS



Mine Closures and Production Losses

Mine	Year of Closure	Production Removed (kt/a)
Brunswick	2013	250
Perseverance	2013	100
Century	2015	500
Lisheen	2015	160
Pormorzany	2017	70
Bracemac McCloud	2017	80
Skorpion	2017	160
Total		1,320

FIGURE 4: ZINC OUTLOOK

FIGURE 5: ZINC PRICE STATISTICS

We need to identify organisations affected by INTMET results:

INTMET's results will be used by the heterogeneous INTMET partner consortium in various ways affecting the diverse competitive environments of the partners in different ways. In this sense, a competitor for a metals producer in INTMET can be a future customer for a technology provider in INTMET. However, a potential commercial launch of the INTMET process will impact on partners' environments. Most of the mining companies nowadays are using selective flotation process to produce a commercial product (metal concentrate) as a raw material for metal refineries. Consequently refineries will be affected if new projects using a new flotation concept integrated with the metal production facility are developed. Those companies might be Glencore, Freeport-McMoRan Inc., Norils and others large producers, for which the market for raw material and final product will be affected by new projects using INTMET technology.

Other competitors are companies that would be affected by the improvement of flotation and extraction methods. The following links show some of them.

- Engineering companies with expertise in selective flotation and conventional metal refineries.
- Specific Chemicals Producers for Selective Flotation and Refineries.
- Research laboratories specialised in selective flotation and conventional metal refining.
- New projects that are currently in developing stage using selective flotation and conventional metal refining as Red Mountain Project (White Rock Minerals ltd.) in central Alaska, Taylor Deposit (Arizona Mining), Abbeytown Zn, Pb, Ag & Cu Project (Erris Resources, Ireland), Hayes Creek Ag-Au-Zn Project (Australia), Ayawilca Peru (Tinka Resources), etc.

The examples only show a couple of competitors. In the course of the marketing campaign a more comprehensive analysis of the market situation has to be carried out.

2.4 COOPERATION

2.4.1 COOPERATION WITH OTHER PROJECTS

Cooperation with other running H2020-projects and already finalised related FP7-projects as well as the further use of technology in future projects is important. This cooperation is necessary in order to retrieve information and technology needed for the further course of INTMET in order to generate a kind of cross-fertilisation.

Examples of project are:
Finalised: Minerals4EU (http://minerals4eu.brgm-rec.fr/minerals4EU), I²Mine (http://www.i2mine.eu)
In progress: MINATURA, BIOMORE

2.4.2 MAPPING OF POTENTIAL OF INTMET PARTNERS

Europe still has active mines and several facilities which are processing ores and reprocessing secondary material[3]. INTMET results will have positive effects on ability to process low grade ores and/or with imported concentrated[4].

2.4.2.1 SPAIN

The new facility for processing low-grade and complex ores will extend the life of CLC mine. CLC is an important employer in the region and thanks to INTMET cooperation it will be possible to hire graduates and train experts in mineral extraction. First Quantum Minerals Ltd. (the owner of CLC) has announced that the life of the Las Cruces mine will extend until the year 2020. With a new extraction facility for low grade ores the mine life will even extend until 2032 (though this will depend on demand). The Las Cruces mine site lies in the Sevilla province in the South of Spain. According to the European Job Mobility portal, the unemployment rate in the Sevilla province reached 31,3 % in 2015. This only underlines the importance of the mining industry in the region as a local job creator of an industry that can grow on domestic mineral supplies.

AGQ MINING & BIOENERGY

AGQ Mining & Bioenergy consists in technological centres which provide research, service and support to the global process of the benefit of minerals: mining exploration, hydrometallurgy and mineral processing, quality metal products and mining environmental impacts. The company has broad experience in developing mining effluents treatments in mining field and innovative approaches in metal valorisation, and innovative approaches in ecology. Currently, AGQ is involved in several, national and international, R&D projects regarding to the implementation of new technologies in different mining processes. Also, the presence of AGQ in other countries

[3] http://copperalliance.eu/industry/structure/copper-exploration-production-and-fabrication-map-in-europe
[4] http://www.euromines.org/mining-europe/production-mineral#Copper

(most of them located in South-America) is a potential key aspect to be considered, and the INTMET project can became an important impact for the AGQ business activity.

TECNICAS REUNIDAS (TR)

TR is a general contractor and technology provider with a global workforce of more than 9.000 employees engaged in design and construction of industrial plants as well as in process development. Focusing on the NFM sector and hydrometallurgy technologies, since 1971 TR has maintained a leadership position in engineering and R&D projects in hydrometallurgy with early contacts in the Spanish Pyrite Belt. Its extensive knowledge of the ores, mines, processes, companies and people has provided value to companies and projects such as Rio Tinto, Xtrata, Glencore, Horsehead, Nyrstar, among many others. INTMET results will be used for improving TR's technology portfolio constructions. This constructions knowledge will create export potential for innovative technologies in mining and smelting industry, which is a goal of the European Union.

2.4.2.2 FINLAND

The Finnish partner Outotec is a company providing technologies and services for the metal and mineral processing industries. It is specialized in developing solutions of copper, zinc, lead, gold, silver and platinum group metal refining at all stages in the value chain from ore to metal. The company has a leading position in the market and on the technology ground of mineral processing all around the world. Outotec's technologies can help reduce the environmental impact of a large number of operations in the metallic-mineral industry. INTMET will bring new elements into Outotec's portfolio and improve the effectiveness of polymetallic ore-product process and sustainability in the supply of metallic materials in the European market.

2.4.2.3 PORTUGAL

SOMINCOR is a Portugal based mining company operating the Neves Corvo underground mine. SOMINCOR is important regional employer with nearly 2200 employees. It has built a wide spread network of roads and railways, which brings prosperity and employment to associated sectors. INTMET technologies have a potential to boost up company and region because so far the company is only producing concentrates[5]. INTMET technology will enable it to produce cathodes with high added value.

2.4.2.4 SWEDEN

Sweden has a highly advanced mining industry with positive approach to new research projects and progressive mineral policy [6].

[5] http://somincor.com.pt/en/ms/ms/how-many-are-we-7780-183-castro-verde/ms-90064631-p-4/
[6] http://www.sgu.se/en/mining-inspectorate/mines/mines-in-sweden/

2.4.2.5 POLAND

Poland is the European most important copper producer. Its production is twice as high as that of Bulgaria, Spain and Portugal together.[7] Two consortium members are from Poland.

The Institute of Non-Ferrous Metals

The Institute of Non-Ferrous Metals based in Gliwice, Poland, is a leading scientific centre of the Polish non-ferrous industry.

KGHM POLSKA MIEDZ

The KGHM Polska Miedz (Polish Copper) company is one of the global leading players in the production of copper and the largest producer of silver in the world (2012). It has several research projects in development. KGHM operates mining sites around the world as well smelting and refinery sites. Products include copper cathodes, raw materials, molybdenum, etc. The INTMET research has a potential to extend mine life and increase benefits for polish economy, employees and new technologies brings new opportunities for local employment market8.

2.4.2.6 SERBIA

Mining and Metallurgy Institute Bor, MMI Bor, (BOR INST)

Bor is a town located in eastern Serbia and owns one of the largest copper mines in Europe. MMI Bor is a research institute active in domestic and foreign markets in the field of geology, mining, mineral processing, metallurgy, chemical technologies, chemical control, hydrometallurgy, environmental protection, information technologies, industrial informatics, mechanical engineering, electronics, non-ferrous metals and alloys, energy efficiency, environmental protection, ecology and publishing.

MMI Bor possesses base data for many non-used primary and secondary mineral deposits in Serbia. These data can be of great interest for possible further mineral explorations, introducing new technologies and new deposits exploration. The Institute publishes two journals, one of international importance, “Mining and Metallurgy Engineering Bor”, and one of national importance, “Copper”.

2.4.2.7 SOUTH AFRICA

MINTEK

Mintek is South Africa’s national mineral research organisation and it is one of the world’s leading technology organisations specialising in mineral processing, extractive metallurgy and related areas. Working closely with industry and other R&D institutions, Mintek provides service testwork, process development and optimisation,

[7] http://www.euromines.org/mining-europe/production-mineral#Copper
[8] http://www.intmet.eu/kghm-polska-miedz-sa-poland/

consulting and innovative products to clients worldwide. Founded in 1934, MINTEK has become a leading provider of minerals processing and metallurgical engineering products and services to industries.
MINTEK will provide information on local markets and outside market from their experience.

2.4.3 IDENTIFICATION OF STRATEGICAL PARTNERS OUTSIDE THE CONSORTIUM

The main purpose of commercialisation of project results is to sell them to the market. Europe still has active mines and several facilities which are processing ores and reprocessing secondary material[9]. Therefore, we need to map these mines and processing facilities outside the INTMET consortium as important targets for marketing activities. At the current project stage, the following can only show some preliminary examples. More effort will be put into this in the further course of the project.

For example, in Greece we have the Helenic Copper Mine (http://www.hcm.com.cy/site/about-hcm), which appears interesting in the context of INTMET.

Bulgaria is the second largest copper producer in Europe but needs to import considerable amounts of ores and concentrates. New technologies would be highly effective for improving Bulgarian economy. Bulgaria has one of the lowest minimal wage in European Union. Therefore, it is essential to install innovative solutions which will stimulate the regional economy.

In Serbia, the old copper mines “RTB Bor Group” recently are under reconstruction by the government. In the future strategic partners for privatization will be in demand. Rakita Exploration d.o.o. that purchased the larger share from FreePort McMoRan Inc. is the owner of recently discovered big copper deposits. Furthermore, deposits producing selective Zn and Pb concentrates could be of interest (Rudnik and Trepca at Kosovo and Metohija district). Rich polymetallic ore deposits (Cu,Zn,Pb,Ag,Au), which are not in exploitation due to their complexity, belong to SMEs, such as Bobija AD, Balkan Exploration and Mining, Copper Minerals d.o.o. Coka Marin etc.

Beyond Europe
Opportunity to share experiences with copper mining will be discussed, e.g. Chile, Canada, Republic of South Africa (RSA: http://www.mintek.co.za/corporate-profile/corporate-information/)

2.5 FINANCING

In the current stage of the project, it is too early to intensively discuss about financial issues of commercialisation. Before stepping into this, the technical details of the intended INTMET result(s) need to be present as well as at

[9] http://copperalliance.eu/industry/structure/copper-exploration-production-and-fabrication-map-in-europe

least some information about the economic viability. After that, financing a potential pilot installation of costly marketing campaign can be discussed.

3. INNOVATION PLAN

The innovation plan is basically part of the initial exploitation plan (see chapter 4).

It is important to differ between the existing flotation concepts and new generated knowledge of INTMET (to indicate/measure the innovation potential of INTMET (taking into account possible co-ownership). In the course of developing the exploitation strategy, this requires a couple of actions as to IPR management:

- The definition of pre-existing knowledge of the project partners (Background);
  Knowledge of project partners that is used for the development activities of INTMET is already listed in the project Consortium Agreement.
- If needed, a mapping of existing patents and potentially overlapping IPR;
- An assessment of the new knowledge generated during the project (formerly called 'foreground', nowadays called 'results').
- A proposition of optimal IPR protection options (e.g. patent, copyright, trademark, confidentiality), in line with the selected business model options and taking into account possible co-ownership;
  The proposed IPR measure should be chosen in a way that it does not negatively affect any foreseen business activity.
- A proper implementation of the IPR protection measures during the project

The findings and recommendations will be included in the exploitation plan.

4. INITIAL - EXPLOITATION STRATEGIC PLAN

4.1 INITIAL VERSUS FINAL PLAN

The current initial exploitation plan should help the project partners in planning activities concerning IPR, planning of the potential business case and usage of results in general. The initial plan explains the potential measures that are possible in this respect and also explains where to pay special attention to. In the initial plan, actually no concrete measures for IPR or other exploitation measures are listed, simply because the results are not present yet.

EXPLOITATION OF PROJECT RESULTS

Following chart explains the exploitable results with the tentative exploitation plan for the results, for each partner:

LIST OF EXPLOITABLE RESULTS	Nº	LIST OF EXPLOITABLE RESULTS	TYPE OF RESULTS	PROPERTY OF THE RESULTS	BUSINESS STRATEGY OR EXPLOITATION MODEL FOR THE RESULT	TIMETABLE (COMMERCIAL) USE	TARGET SECTOR, POTENTIAL USERS
SOFTWARE	1	Communication platform	**Software**	MINPOL	On-line product with annual subscription.	2019 onwards	Mining sector, consultancy, government, metal industry, etc
	2	Web tool for life cycle assessment	**Software**	Consortium	Payable downloadable catalogue	2019 onwards	Mining sector, consultancy, etc
TECHNOLOGY	3	Atmospheric leaching Ag catalysed technology (WP3 result)	**Technology**	CLC	Process patent and Licensing contracts Replacement of smelters by hydrometallurgical processing of sulphide concentrates	2019 onwards	Mines with sulphide deposits and concentration or hydrometallurgical technologies
	4	Pressure leaching technology (WP4 result)	**Technology**	OUTOTEC	Patenting and **cession of patents**	2019 onwards	High or medium temperature leaching (atmospheric or pressure) current hydrometallurgical industry. This industry currently produces 4000 t of copper global. New mines and modernisation of current exploitation for above 15000 Mt. of reserves in Europe.
	5	Bioleaching technology (WP5 result)	**Technology**	MINTEK MMI Bor (Bor INST)	Patenting and **Licensing contracts**	2019 onwards	
	6	Energy efficient anode (WP4 result)	**Technology**	OUTOTEC	Patenting and **cession of patents**	2019 onwards	
	7	MSA Technology (WP3 result)	**Technology**	CLC	Patenting and **Licensing contracts**	2019 onwards	
	8	Chloride media Technology (WP3 result)	**Technology**	TR	Patenting and **Licensing contracts**	2019 onwards	

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PILOT / PROTOTYPE	9	Atmospheric leaching Ag catalysed (WP3 result)	**Prototype**	CLC	Patenting of prototypes and **cession of patents**	2019 onwards	Once technology is probed and market scaling, demonstration activities previously to commercial.
	10	Pressure leaching (WP4 result)	**Prototype**	OUTOTEC	**Patenting** of prototypes	2019 onwards	
	11	Bioleaching (WP5 result)	**Prototype**	MINTEK MMI Bor (Bor INST).	**Patenting** of prototypes	2019 onwards	
	12	Energy efficient anode (WP4 result)	**Technology**	OUTOTEC	Patenting and **cession of patents**	2019 onwards	
	13	MSA (WP3 result)	**Prototype**	CLC	**Patenting** of prototypes	2019 onwards	
	14	Chloride media (WP4 result)	**Prototype**	TR	**Patenting** of prototypes	2019 onwards	
PROTOCOL	15	Protocol for industrial application of technologies	**Protocol**	CLC OUTOTEC MINTEK TR. MMI Bor (Bor INST)	Patenting and **Licensing contracts New plants**	2019 onwards	The protocol allows identify market target and define procedure to integration.
	16	Protocol for industrial application of technologies	**Protocol**	CLC OUTOTEC MINTEK TR. MMI Bor (Bor INST)	Process patenting and **Licensing contracts** Technology is compatible with current leaching facilities	2019 onwards	Allows modernisation of mines to benefit target ores
	17	Procedure to integrate the different technologies at an industrial Plant	**Protocol**	CLC OUTOTEC MINTEK TR MMI Bor (Bor INST).	**Patents license** and **Licensing contracts**	2019 onwards	Hydrometallurgical processing plants for mines with target ores
	18	Safety protocol	**Protocol**	CLC OUTOTEC MINTEK TR. MMI Bor (Bor INST)	New methodology in safety assessment. Consultancy and support for executing the protocol For new mines	2019 onwards	Mine companies and metallurgical industries that implant new facilities
PRODUCT	19	Primary metals (Cu, Zn, Pb) obtained from IMNET solutions (WP3,4,5 result)	**Product**	MINES	Implantation of industrial scale process and operation to obtain commodities and value products. In this case, the business strategy continue online with current but extend mine life and add new products.	2020 onwards	As commodities, directly to market. Cu market consumed 21,019.7 t in 2013 globally
	20	Additional valuable products (Au, Ag, Sb, Co, In) obtained from recovery process (WP3,4,5 result)	**Product**	MINES			Au represent for example a annual market of 25.000 t, Sb, Co, In are consider CRM and Europe is deficitary.

LIST OF EXPLOITABLE RESULTS	Nº	LIST OF EXPLOITABLE RESULTS	TYPE OF RESULTS	PROPERTY OF THE RESULTS	BUSINESS STRATEGY OR EXPLOITATION MODEL FOR THE RESULT	TIMETABLE (COMMERCIAL) USE	TARGET SECTOR, POTENTIAL USERS
	21	Valorisation of pyrite Other by products (sulphur, fertilizer salts, construction materials) (WP6 result)	**Product**	MINES	Implantation of industrial scale process and operation to obtain commodities and value products. It's a new market different from metals and will require new commercial networks.	2020 onwards	Fertilizer producers chemical companies, construction material providers
SERVICES	22	Valuable productions from tailings and other wastes	**Business Line**	MINES	New business line to produce valuable products from metallurgical wastes including metals and byproducts	2021 onwards	Other mines with tailing and metallurgical waste applicable to INTMET
	23	Processing of low-grade/low quality commercial concentrates with low value to smelters due to impurities	**Business Line**	MINES	New business line to refining and recover metals from commercial concentrates	2021 onwards	Mines producers of low quality concentrates
KNOWLEDGE	24	Database of various waste streams (WP1 result)	**Database**	Consortium	Demonstration of the way of working with the waste stream, publication of the data. Consultancy to other waste streams. Service, further R&D.	2019 onwards	Mining companies, metallurgical industry, recycling sector
	25	Database of different metallic ores (WP1 result)	**Database**	Consortium	Potential technology users identified. **Licensing contracts**	2019 Onwards	Mining companies, metallurgical industry,
	26	Communication platform with the database / awareness related environmental and social initiatives (WP6 result)	**Software, web platform**	Consortium	On-line product with annual subscription.	2019 Onwards	Mining sector, consultancy, government, metal industry, etc
	27	Validation of different technologies in pilot	**Validation**	CLC OUTOTEC MINTEK TR MMI Bor (Bor INST)	It's a previous phase to implantation of technology and an important commercialisation tool, once developed industrial scaling	2018	Publicize of the scientific papers in journals worldwide and scientific papers on the International, regional and local level.

On the other hand, the final exploitation plan will list all exploitable results together with the agreed protection measures (if any) and the exploitation routes.

4.2 FINAL EXPLOITATION STRATEGIC PLAN

4.2.1 INTRODUCTION

The final exploitation plan is a compulsory document for EU funded research projects. It summarises the consortium's strategy and concrete actions to protect, disseminate and exploit the results generated by a project. The initial plan helps participants establish a basis for the dissemination and use of results, prepare to implement their strategy and conclude any necessary agreements.
However, the final exploitation plan shall be updated and complete. It is presented at the end of the project and describes participants' detailed plans for the management of results. The plan thus enables the Commission to evaluate the success of a project.

4.2.2 RESULTS TO BE DISSEMINATED

Parts of results obtained as outcome of a project may not be suitable for commercial exploitation, but may still be valuable as knowledge that can contribute to future scientific developments. In other cases, the results have already been protected and eventually put on the market, but it is still worthwhile to disseminate them to the public to provide an opportunity for future innovation. The exploitation of results also matches the public character of research carried out with the financial support of the European Community. Participants are required to highlight the Community financial contribution to the project in all dissemination activities (as well as in protection activities, such as patent applications).

Nevertheless, the exploitation of results may hamper its protection, its commercial exploitation or even the legitimate interests of some participants. Therefore, it is crucial to meticulously follow the procedures provided for in Annex II and always ensure that dissemination activities are carried out with the agreement of all participants and the approval of the Commission, where relevant. Confidential data or key information related to the use of results shall not be disclosed to the public.

4.2.3 EXPLOITABLE RESULTS

Participants shall first provide a list of all intellectual property rights that have been applied for or registered. Once again, such entries shall be verifiable; for instance, if a European patent has been applied for, the plan shall indicate the patent filing reference number.

Participants shall also provide a list of all the results that may have commercial or industrial applications. Such results may include software, inventions, prototypes, compiled information and data, etc. The plan shall indicate the owner of each particular element of the result, whether it is a single participant or several of them (in a

situation of joint ownership). It shall briefly explain how the results has been or is going to be used, in either further research or commercial exploitation activities, including elements such as the following:

- Purpose, main features and benefits of each technology or product, derived from the research results: innovative aspects in comparison with technologies and products already available, needs for further R&D activity (and implied risks), collaboration needs for exploitation (technology transfer activities);

- Customer detection: identification of the potential customers and the factors that affect their purchasing decisions;

- Features of the target market: size, growth rate, share that the technology/product could reach, driving factors likely to change the market, legal, technical and commercial barriers, other technologies likely to emerge in the near future;

- Positioning: how the participant (or other entity) entitled to the technology exploitation is positioned (or should be positioned) in the market, competing businesses/applications/technologies.

The members of a consortium shall of course discuss these issues in advance and agree on the best strategy for the exploitation of results among the various existing options: direct or indirect exploitation, involving the whole consortium or only some of its members, exploitation through a separate legal entity such as a spin-off, etc.

4.2.4 EXAMPLES OF EXPLOITABLE RESULTS

It is sometimes not easy for project participants to identify the results worth exploiting. The following should give an indication of what exploitable results are and where to find them. So, what are sources of results?

- Contractual deliverables
- Tools, components, equipment developed in the project
- Non-contractual documents produced in the project
- Technical or commercial data produced in the project
- Expertise based on combined knowledge

Exploitable results then could be (non-exhaustive list):

- Reports (contractual, policy statements, handbooks, etc.)
- Prototypes (technical prototypes, commercial prototypes)
- Data (statistics, benchmarks, trends, calibrations, etc.)
- Software (spreadsheets, algorithms, code, databases, systems, etc.)
- IPR (patents, copyright, trademark, registered designs, etc.)
- Technology know-how

- Educational (lecture material, courses, course notes, CDs, etc.)
- Media (website, video, audio, CDs, etc.)
- Publications (scientific journals, newsletters, proceedings, etc.)
- and many more

It will be up to all project participants to collaborate in the process of identifying exploitable results and initiate appropriate measure for protection and/or commercialisation and use.

4.3 WORK PROGRAM OF INITIAL EXPLOITATION PLAN

The initial exploitation plan includes the following work program.

WORKPLAN/PROGRAM						
	Sections	**Task allocation**	**month**	**role allo-cation**	**products**	**notes**
1	**Crosscheck of relevant (other) H2020-and FP7 projects** e.g. MINATURA2020, INTRAW, I²Mine, BIOMOre Synergetic effects		M12	MinPol(partners	Short statement (1 page), part of the newsletter, website and links to relevant projects	e.g. getting information of deposits (MINATURA; http://minatura2020.eu/); countries using advanced technologies (INTRAW; http://intraw.eu/) BIOMORE (http://biomore.info/home/)
2	• **INTMET products** - draft a plan/roadmap how to maximise the innovation potential of INTMET (interaction with t8.2 and t8.1) **Market analysis** • Internet and literature surveys • Questionnaires send out to competitors of and companies identified by project partners • Market survey on commodity basis – e.g. looking for companies	8.3	M12-16	MinPol(partners	Results of literature research (1 page) Compilation of a questionnaire List of companies producing similar products	

WORKPLAN/PROGRAM						
	Sections	**Task allocation**	**month**	**role allo-cation**	**products**	**notes**
	producing similar products • Interviews with Eurometaux, Euromines, IMA-Europe, etc. Mapping of relevant companies inside/outside of consortium (aspect of cooperation/added value)				semistructured interview guide	
	mapping of existing patents and potentially overlapping IPR	8.4	M25	MinPol(partners	Article for the newsletter	
3	assessment of the new knowledge generated	8.4	M27	MinPol(partners		
4	Final exploitation plan	8.5	M30	MinPol(partners		

FIGURE 6: TABLE OF WORK ITEMS IN THE COURSE FROM THE INITIAL TO THE FINAL EXPLOITATION STRATEGIC PLAN

Once the details of the final INTMET results are available, the drafting process of the (definitive) exploitation and application strategy will begin. This could be around project month 30.

5. CONCLUSIONS

The document shows how the potential business case for the (main) project result may look like and which measures have to be taken in order to complete until the end of the INTMET project. The business plan may be refined and changed depending of the progress of the project.

Especially with regard to the envisaged business case innovation management and IPR protection measures are of utmost importance. All project participants must take care of this.

This initial plan for the exploitation of results provides the basis for dissemination activities throughout the entire lifetime of the project. It can be used to develop and maintain dissemination activities. At drafting stage of this document, the dissemination will be done through the project website, press releases and scientific papers/presentations. Exploitation will start once exploitable results will be available. Suitable measures will be taken then.