ICAMCYL

Centro internacional de materiales avanzados y materias primas

International center for advanced materials and raw materials

Dr. Santiago Cuesta-López

Director General

FUNDACION ICAMCyL: Centro internacional en materiales avanzados y materias primas de Castilla y León

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ICAMCYL & IBERIAN SUSTAINABLE MINING CLUSTER

ICAMCyL (Internacional Center for Advanced Materials and Raw Materials of Castilla y León)

Non-profit research foundation created by the main industries of Castilla y León region (Spain) in the sectors of automotive, manufacturing, advanced materials, engineering, mining and processing of raw materials.

It constitutes a singular Competence Center with the objective of aligning and working towards regional Smart Specialisation Strategies (RIS3) and international policies

BUILDING A FUTURE IN RAW MATERIALS

XXI CENTURY SUSTAINABLE MINING

SCIENTIFIC INTERESTS

ADVANCED MINING TECHNOLOGIES

- Exploration
- Classification
- Processing

CIRCULAR ECONOMY

- Waste
- Recycling
- Valorisation

SUSTAINABILITY

- New production methods
- Eco-innovation
- Resource efficiency

NANOMATERIALS

- Carbon-based
- MOFs
- Composites
- Alloys

FABRICATION

- Additive manufacturing
- Pilot lines
- Industry

ENERGY & CLIMATE CHANGE

- Batteries / fuel-cells
- CO_2 capture
- Smart cities

EXPERTISE AND CAPACITIES

ENGINEERING & DESIGN
RAW MATERIALS RECOVERY
CRMs
MARKET
SUSTAINABLE PRODUCTION
ENVIRONMENTAL PROTECTION
DIGITAL MINE
RECYCLING
MODELLING & SIMULATION
FRAMEWORK POLICIES
WASTE VALORISATION
STAKEHOLDER ENGAGEMENT
VALUE-CHAIN DESIGN
INDUSTRY
CLUSTERING ACTIVITIES
END USERS INVOLVEMENT
RESOURCE MANAGEMENT
ECOSYSTEMS
LCA

EUROPEAN PROJECTS

MIREU
RawMaterials
tarantula
INNOCAT
NEXTOWER
Interreg Europe
cost
SMARTY Interreg Europe
CRM
MINEA
STRONGER
Join the SMART SPECIALISATION PLATFORM

ISMC (Iberian Sustainable Mining Cluster)

MISSION & VISION

The Iberian Sustainable Mining Cluster (ISMC) has been created to halt the current decline of the mining sector in Spain, with special attention to the region of Castilla y León and the mining areas of the Province of León, in Northwest Spain. This decline affects the whole value chain as well as social acceptance of mining operations.

ISMC currently includes around 50 companies, research and institutional entities joining efforts to consolidate the strengths of the mining sector and its associated services, promoting sustained economic growth for its members, with special attention to SMEs.

OBJECTIVES

- ❑ Boost the mining sector and related services
- ❑ Promote growth and competitiveness
- ❑ Foster cooperation across industries
- ❑ Attract business and commercial opportunities
- ❑ Promote technological innovation and sustainability

EXPERTISE OFFER

- ❑ ISMC covers the whole mining value chain
- ❑ Wide coverage of raw materials & CRMs
- ❑ Pilots and new lines of research
- ❑ Stakeholders participation
- ❑ Clustering and matchmaking activities

ECONOMY · ENVIRONMENT · SOCIETY

ISMC & THE MINING VALUE CHAIN

ISMC has members across the whole mining value chain, from mineral extraction, exploration and production to business development, recycling and other services.

RAW MATERIALS & THE CIRCULAR ECONOMY

ISMC members cover a wide range of raw materials, including some essential critical raw materials (CRMs) used in high added-value, innovative products.1

EU LIST OF CRITICAL RAW MATERIALS (2017)

Antimony	Gallium	Magnesium	Scandium
Baryte	Germanium	Natural graphite	Silicon metal
Beryllium	Hafnium	Natural rubber	Tantalum
Bismuth	Helium	Niobium	Tungsten
Borate	HREEs	PGMs	Vanadium
Cobalt	Indium	Phosphate rock	
Fluorspar	LREEs	Phosphorus	

The development of a sustainable, low environmental impact mining will only occur through the improvement and integration of new methods, techniques and processes that allow the use and valorisation of raw materials and their by-products, always according to the principles of sustainability and circular economy.

Research & exploration → Deposit appraisal → Design of mining complex → Mining operations → Site restoration

IBERIAN SUSTAINABLE MINING CLUSTER

BUILDING THE FUTURE OF THE MINING TERRITORIES AND ASSEMBLING THE SPANISH MINING INDUSTRY

IBERIAN SUSTAINABLE MINING CLUSTER

ICAMCYL

Iberian Sustainable Mining Cluster (ISMC)

http://www.ismc-iberiamine.com/es/inicio/

Raw Materials and Circular Economy

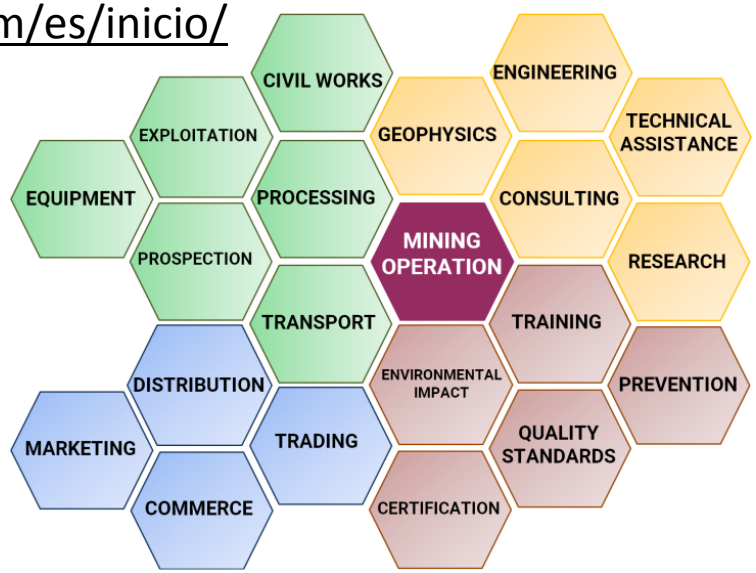
2017 CRMs

Antimony	Gallium	Magnesium	Scandium
Baryte	Germanium	Natural Graphite	Silicon metal
Beryllium	Hafnium	Natural Rubber	Tantalum
Bismuth	Helium	Niobium	Tungsten
Borate	HREEs	PGMs	Vanadium
Cobalt	Indium	Phospate rock	
Fluorspar	LREEs	Phosphorus	

IBERIAN SUSTAINABLE MINING CLUSTER

ISMC brings together +50 leading companies in the extraction of mining resources and raw materials, engineering, training, transportation, associated services and commercialisation. In addition, it covers a wide range of raw materials and critical raw materials.

CORE CAPACITIES



MEMBERS

Strategic Minerals Spain · fsb fundación santabárbara · EPC GROUPE · emico · LEONORE DEVELOPMENT · comet Global Innovation Consulting · GESMINLE · CIISE · BEFESA · CONFEDEM · teLICE · AMPHOS 21 · SALAMANCA INGENIEROS · TERRA DAT down to earth geophysics · Calizas Suabar · ICAMCYL · Bench & Ground · tComet · CUPA PIZARRAS · BERKELEY minera · TARMA · minera de ORGIVA · ipc IPControl · INTAUXMA · TRESCA · piedranatural · MINING SENSE · AGQ · AiteminLE · SEGYCAL · PEAL · SIEMCALSA · inprocobras

ISMC covers strategically the full value chain of sustainable mining

IBERIAN SUSTAINABLE MINING CLUSTER

85% SMEs
> 65
partners

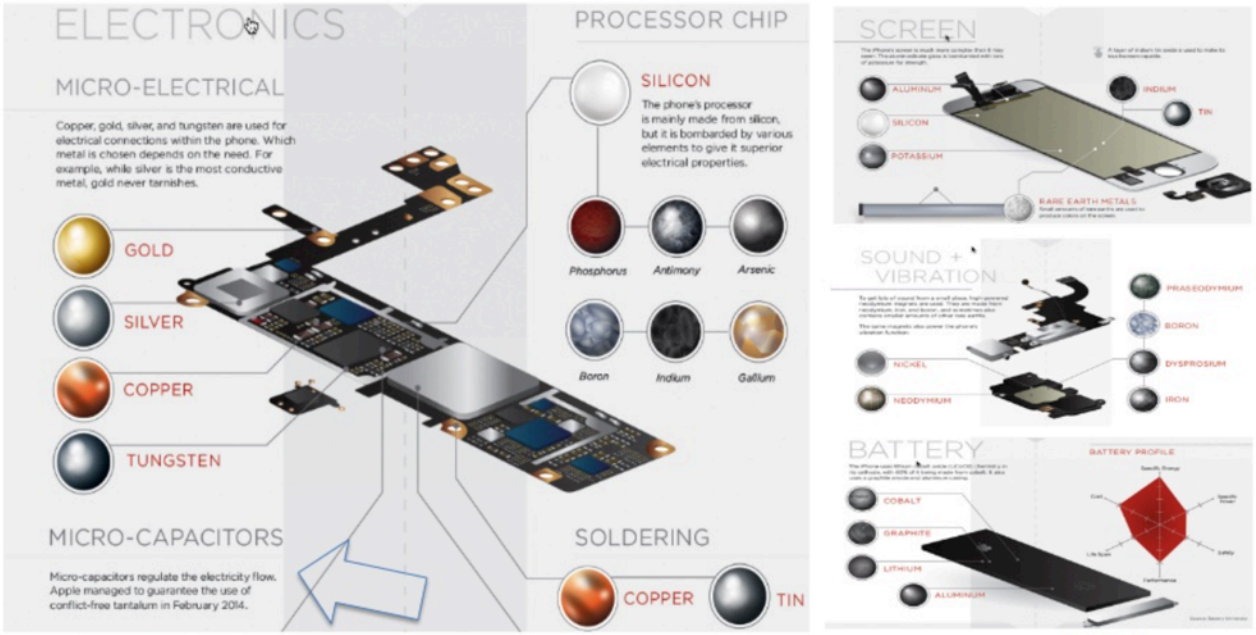
> 1300 jobs

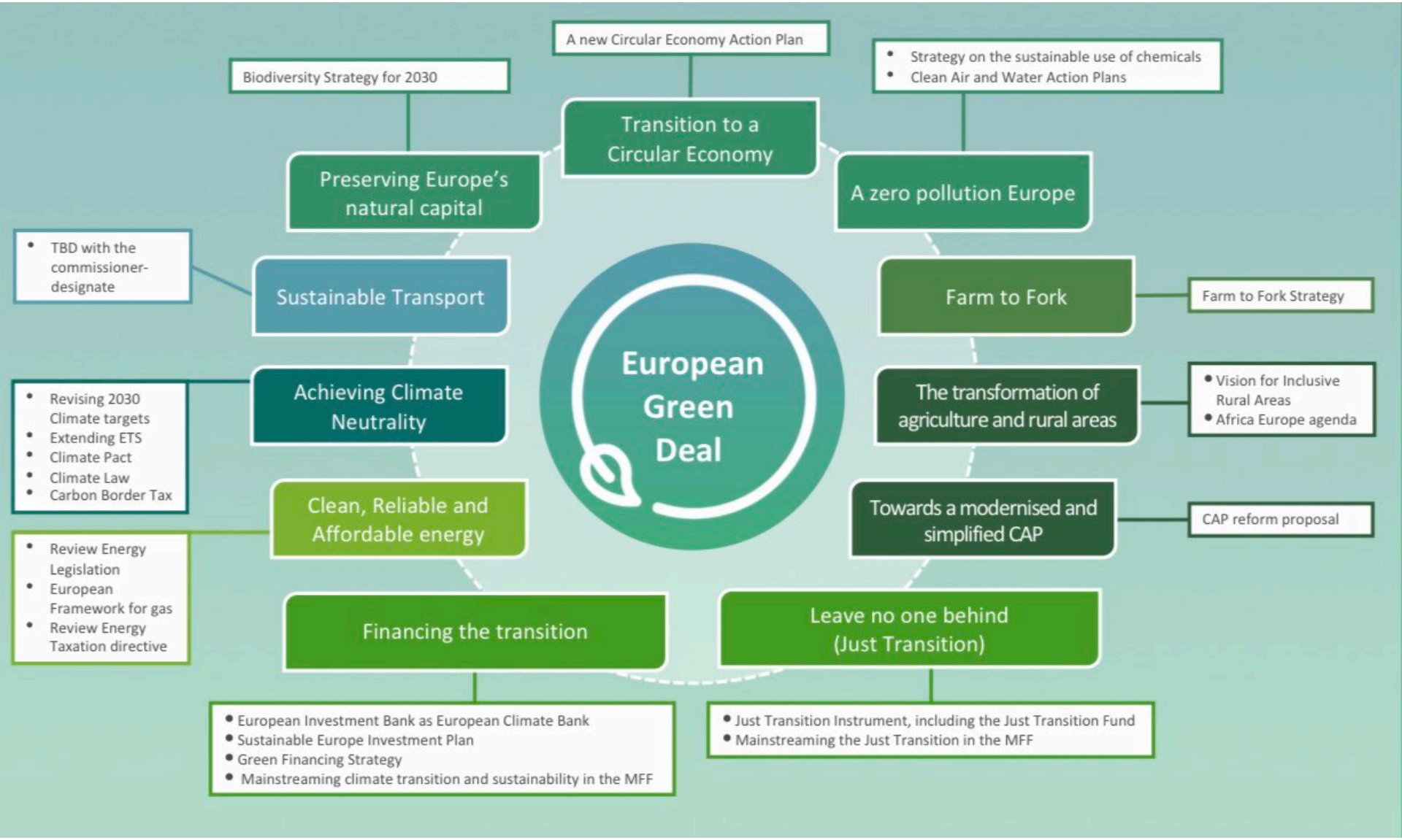
Turn over
≈ 480 M euros
That will double in
2020 to 1.000M

ICAMCYL
Centro Internacional de materiales avanzados y materias primas

Raw Materials are essential

"Of the 83 elements in the periodic table, a total of 62 different types of metals go into the average mobile handset."




European Green Deal
Transition to a Circular Economy
A new Circular Economy Action Plan
Biodiversity Strategy for 2030
Strategy on the sustainable use of chemicals
Clean Air and Water Action Plans
Preserving Europe's natural capital
A zero pollution Europe
Sustainable Transport
TBD with the commissioner-designate
Farm to Fork
Farm to Fork Strategy
Achieving Climate Neutrality
Revising 2030 Climate targets
Extending ETS
Climate Pact
Climate Law
Carbon Border Tax
The transformation of agriculture and rural areas
Vision for Inclusive Rural Areas
Africa Europe agenda
Clean, Reliable and Affordable energy
Review Energy Legislation
European Framework for gas
Review Energy Taxation directive
Towards a modernised and simplified CAP
CAP reform proposal
Financing the transition
European Investment Bank as European Climate Bank
Sustainable Europe Investment Plan
Green Financing Strategy
Mainstreaming climate transition and sustainability in the MFF
Leave no one behind (Just Transition)
Just Transition Instrument, including the Just Transition Fund
Mainstreaming the Just Transition in the MFF

ON EUROPE'S ENERGY TRANSITION

1. Energy has historically been a key driver of European **COOPERATION**. But current EU proposals are not enough. To comply with the Paris Climate Agreement, we **MUST GIVE UP** fossil fuels altogether by 2050.

2. A **100%** renewable energy system in Europe is now technically possible using existing **STORAGE** and **DEMAND RESPONSE** technologies.

3. Stronger **INTERCONNECTIONS** of markets and infrastructure across Europe will make the energy transition cheaper for all Europeans.

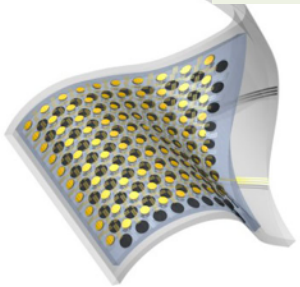
4. The biggest potential lies in **INCREASING EFFICIENCY**. Europe-wide we could reduce our energy demand by half by 2050.

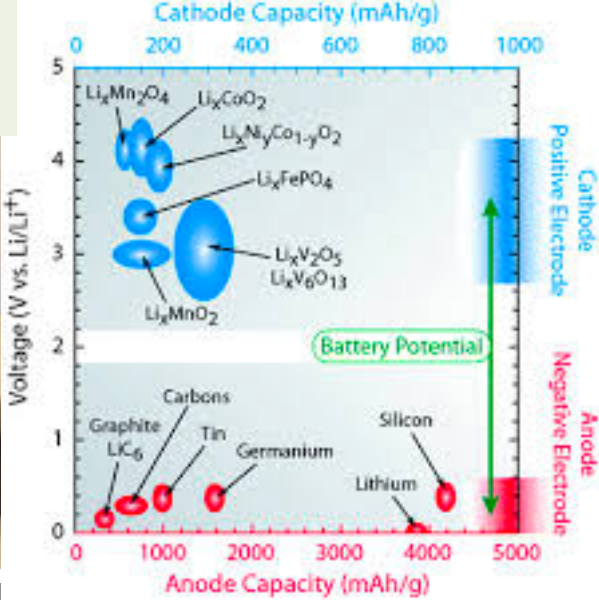
5. A switch to 100% renewables in Europe will trigger **SYSTEM CHANGE** – away from centralized, monopolistic utilities to decentralized, community power projects and innovative business models.

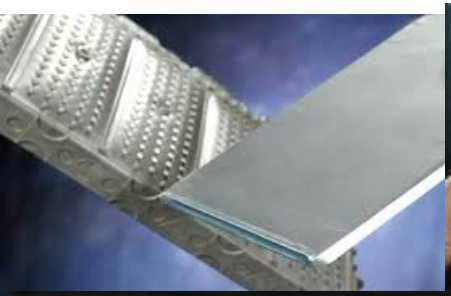
6. Framed by smart strategies and legislation, this system change can be driven by **CITIZENS, CITIES AND ENERGY COOPERATIVES**, leaving much more wealth in communities.

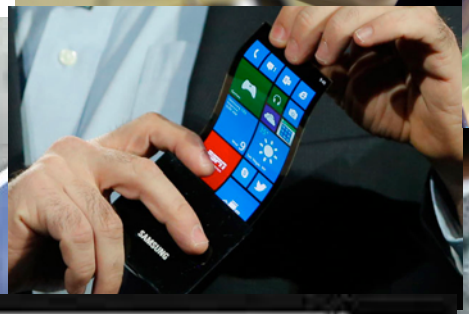
IBERIAN SUSTAINABLE MINING CLUSTER

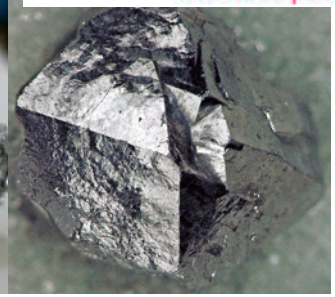
SUSTAINABLE FUTURE IS HERE AND IT NEEDS RAW MATERIALS











Raw Materials Value chain is crucial for present and future EU economy, employment and well-being

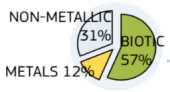
Raw materials extractive and processing industries provided more than EUR 206 billion of value added and **3.4 million jobs**

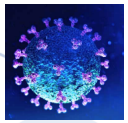
Downstream industries generated around EUR 1 422 billion and **25 million jobs.**

Repair and materials recovery provided EUR 103 billion and **2.2 million jobs.**

Sustainable raw materials production is the basis of the EU economic security and autonomous, all technology development and needed to achieve EU targets in Green Deal

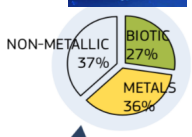
EXTRACTION
Value added: **€37.4 billion***
Jobs: **647 thousand jobs***



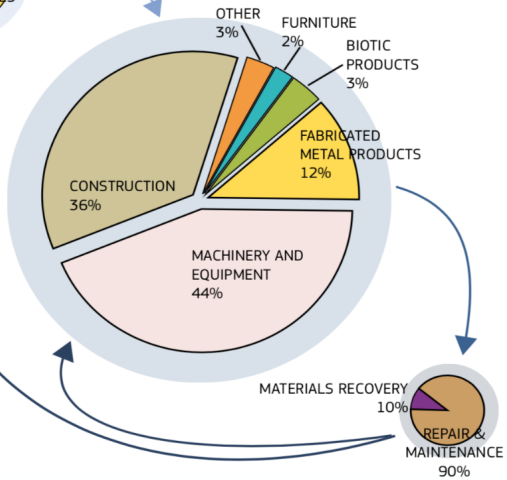


COVID-19/Mining industry risks to loose $100-$200 billion in EBITDA. Production of metals like Nickel have lost more than 30 per cent of production. 25% of the employment is in risk. From Apr.16 about 247 mining projects closed world-wide

PROCESSING
Value added: **€168.4 billion**
Jobs: **2.7 million jobs**



DOWNSTREAM MANUFACTURING
Value added: **€ 1422 billion**
Jobs: **24.6 million jobs**

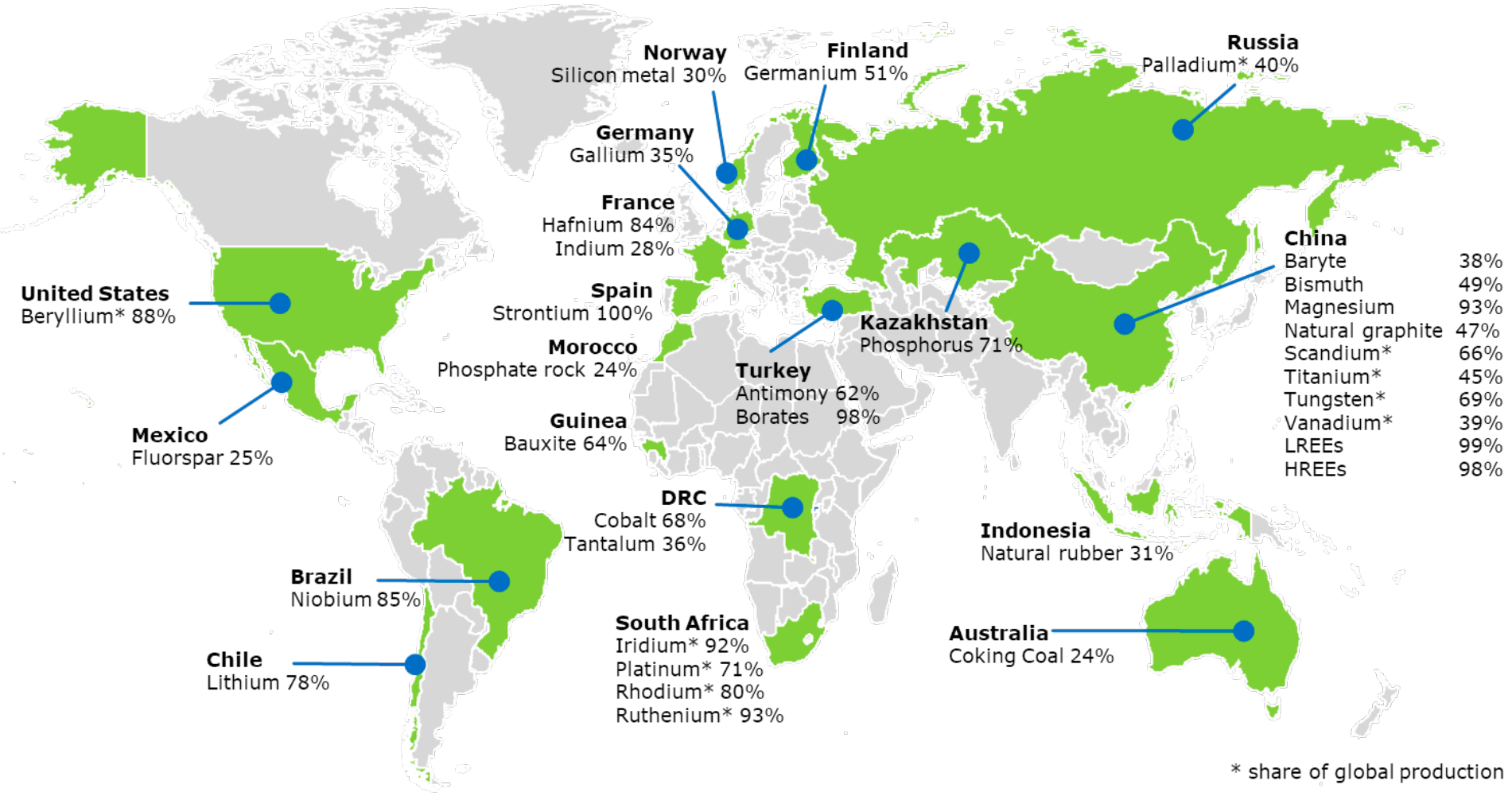


REPAIR & MATERIALS RECOVERY
Value added: **€103 billion**
Jobs: **2.2 million jobs**

EU-28 as trade bloc is the 1st top 10 global **exporters of mining equipment, close to 20 billion USD**. Total R&D investment for the sector represents > EUR 2.7 billion EUR. EU generates an average of 1200 patent applications/year

EU raw materials industries are **leaders in sustainability and corporate social responsibility.** About 24 % of the Global Reporting Initiative reports are from companies with headquarters in the EU.

Only EU sustainable mobility and associated Li batteries value chain will need for 2025 > 400.000 t for cathode materials ; > 250.000 t for anode materials; > 235.000 t in electrolytes Including Ni, Co, Al, Mn, Graphite, and Li.


Norway
Silicon metal 30%
Finland
Germanium 51%
Russia
Palladium* 40%
Germany
Gallium 35%
France
Hafnium 84%
Indium 28%
China
Baryte 38%
Bismuth 49%
Magnesium 93%
Natural graphite 47%
Scandium* 66%
Titanium* 45%
Tungsten* 69%
Vanadium* 39%
LREEs 99%
HREEs 98%
United States
Beryllium* 88%
Spain
Strontium 100%
Kazakhstan
Phosphorus 71%
Morocco
Phosphate rock 24%
Turkey
Antimony 62%
Borates 98%
Mexico
Fluorspar 25%
Guinea
Bauxite 64%
DRC
Cobalt 68%
Tantalum 36%
Indonesia
Natural rubber 31%
Brazil
Niobium 85%
South Africa
Iridium* 92%
Platinum* 71%
Rhodium* 80%
Ruthenium* 93%
Australia
Coking Coal 24%
Chile
Lithium 78%
* share of global production

FIGHT FOR RARE EARTH

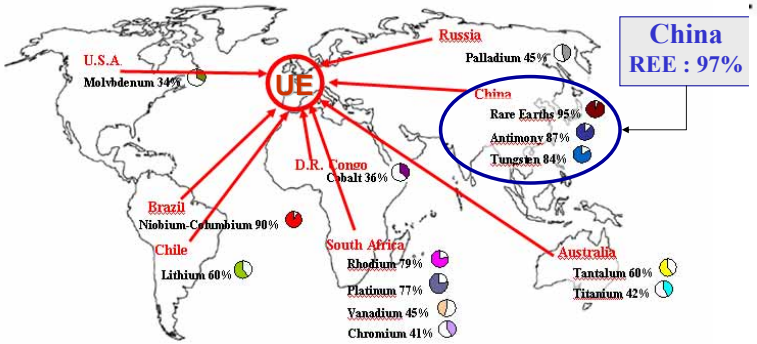
From iron ore to timber, China relies on foreign supplies to fuel its growth. But when it comes to rare earth metals—essential for clean energy and electronics—China dominates. The rest of the world is worried.

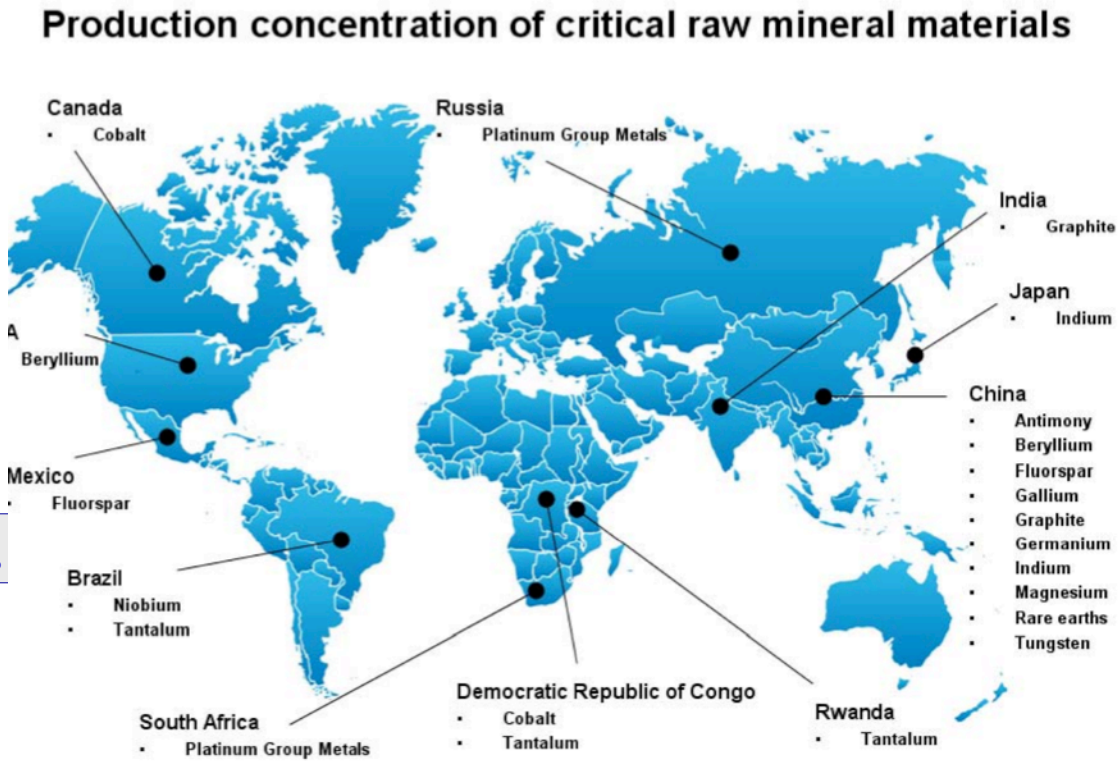
REUTERS

CRMs are a clear world-wide problem … Rare Earths "*the 21th gold fever*"?

Rare Metals

A strong UE importation dependancy &
Some countries with a monopolistic production





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Environment/Social: Extraction has social and environmental consequences, making these materials not so green!

Cobalt mining in the DRC

Graphite mining in China

Lithium extraction in Chile

REE mining in China

European Commission

Study on the EU's list of Critical Raw Materials (2020)

Final Report

European Commission

Critical Raw Materials for Strategic Technologies and Sectors in the EU

A Foresight Study

EUROPEAN
COMMISSION

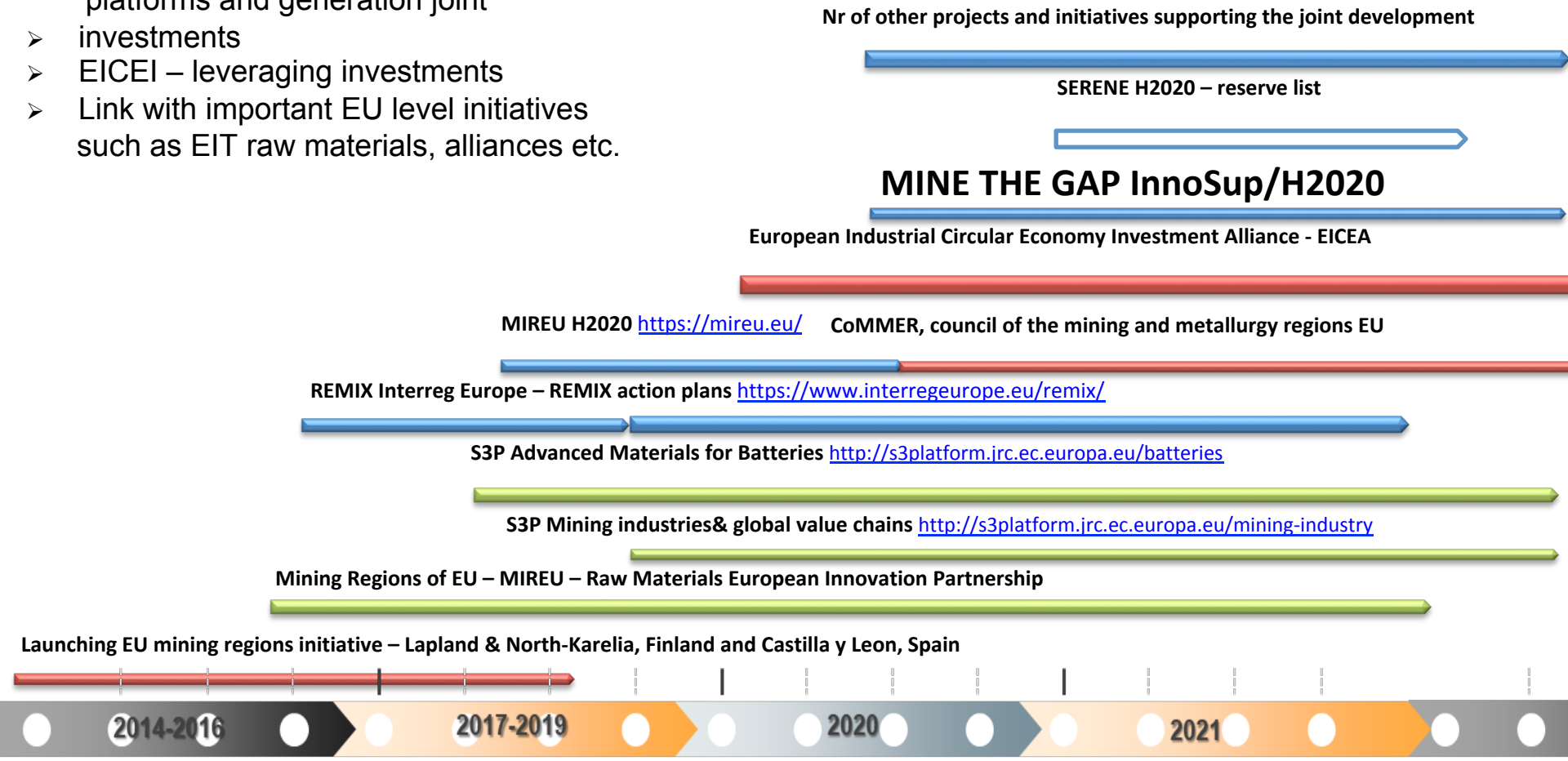
Brussels, 3.9.2020
COM(2020) 474 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability

How to develop strategic interregional approach?

- ESIF to develop the operational environment and build the capacity
- Horizon 2020 to increase RDI capacity in clusters
- Interreg to learn from each others
- S3P, EIP and COMMER creating the collaboration platforms and generation joint
- investments
- EICEI – leveraging investments
- Link with important EU level initiatives such as EIT raw materials, alliances etc.



REMIX – MIREU – S3P Mining industry as key future EU Actions in raw materials

Smart and Green Mining Regions of EU

REMIX
Interreg Europe

01/2017 – 06/2021

www.interregeurope.eu/remix/

Connect EU regions through their raw materials and minerals production, metallurgy and common S3 objectives

9 Partners | 1 Advisory Partner | 9 Countries | 8 Policy Instruments

Mining and Metallurgy Regions of EU

MIREU
MINING AND METALLURGY REGIONS OF EU

12/2017 – 11/2020

www.mireu.eu

Establish a network of mining and metallurgy regions across Europe

30 Partners | 17 Regions | 15 Countries

Join the SMART SPECIALISATION PLATFORM

Joint Research Centre

European Commission

"Advanced Materials for Batteries"

http://s3platform.jrc.ec.europa.eu/batteries

KEMIJSKI INŠTITUT

Junta de Castilla y León

ICAMCYL Pilot leader "Sustainable Raw Materials Extraction & Processing" (Pilot 2)

"Mining Industry"

http://s3platform.jrc.ec.europa.eu/mining-industry

BUSINESS JOENSUU | JOE

REGIONAL COUNCIL OF LAPLAND

Towards a common strategy for securing reliable access to and supply of (critical) raw materials in the European Union area

Participation in other S3P-Industry Platforms

"Advanced Materials for Batteries"

http://s3platform.jrc.ec.europa.eu/batteries

Part of the Strategic Action Plan on Batteries

26 regions involved

ICAMCYL Pilot 2 leader: "Sustainable Raw Materials Extraction & Processing"

6 pilots

Outcome: PP investment projects industry-driven

"Mining Industry"

http://s3platform.jrc.ec.europa.eu/mining-industry

Approved Feb 2019 - KOM March 2019

Matching & Scoping note next

Key themes:

- Critical raw material production
- Empowerment of SMEs in Global Value Chains
- New technologies and sustainable mining
- Social acceptance of mining through stakeholder involvement
- Education and training in mining and related industries

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Mining in the XXI Century - Digitalisation

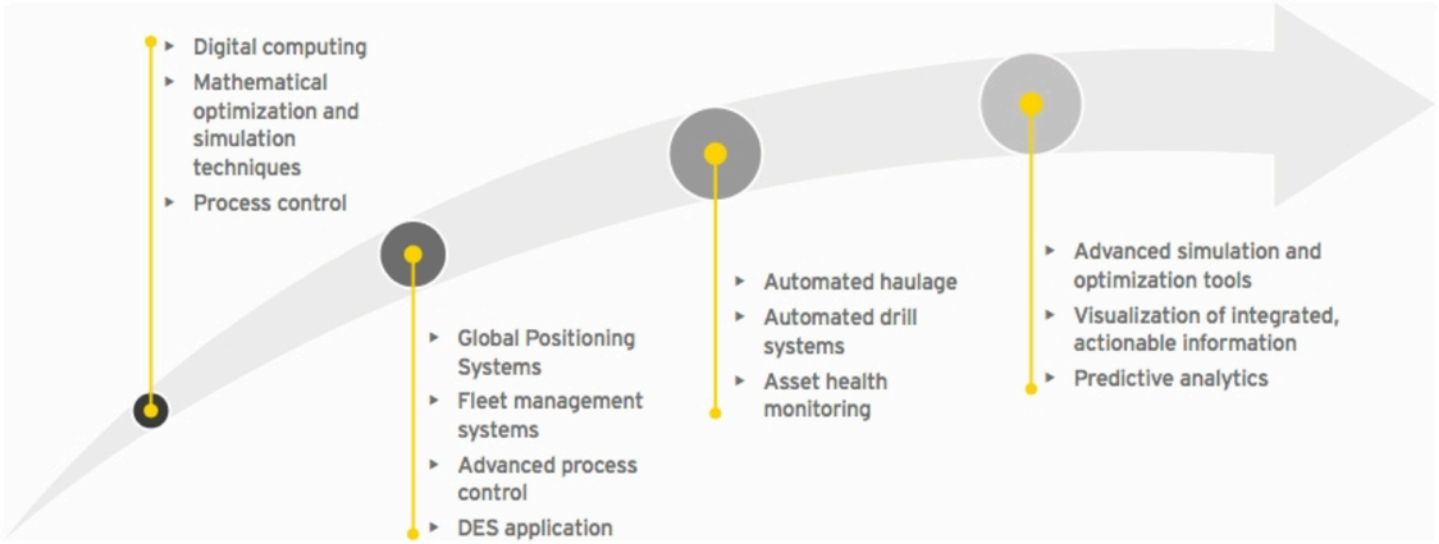
EY advises mining groups on best route to digitalisation

15 June 2017 | Consultancy.uk

Focusing on meshing digital innovation with productivity outcomes, a new report from professional services specialists EY have drawn on a number of ways to improve the outcome of automation in mining.

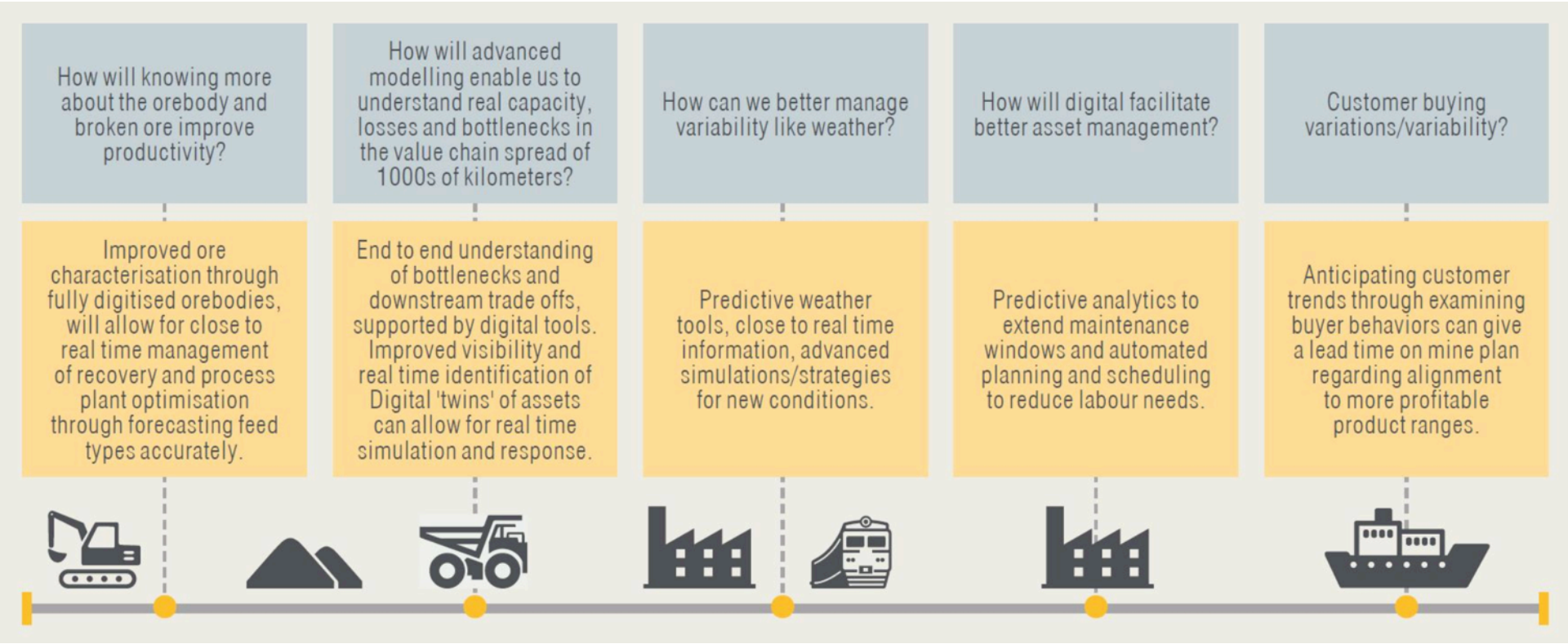
Over the course of its long industrial history, mining has elevated numerous technologies in its wider value chain. However, while a new digital boom has seen technological advancement in many sectors, EY's new paper claims the latest wave of digitalisation and automation, according to a new study, has yet to be capitalised upon by the wider mining industry.

Waves of digital transformation since 1950



Paul Mitchell
Global Mining & Metals Advisory Leader

Mining in the XXI Century - Digitalisation



Mining in the XXI Century - Digitalisation

Boliden trials first automated electric drill at Aitik copper mine

Posted by Daniel Gleeson on 29th May 2019

Boliden says it has completed a world first with the trial of an autonomous electric Epiroc 351 Pit Viper drill at its Aitik copper mine in Sweden.

First fully autonomous Epiroc SmartROC D65 perfected at Newmont Goldcorp Hollinger

Posted by Paul Moore on 27th June 2019

Epiroc, one of the leaders in mining and mining equipment automation development, says it is constantly pushing the boundaries in the rock excavation industry. Proof of this is that the world's first fully autonomous SmartROC D65 surface drill rig, is now in production.

"In the midst of the 4th industrial revolution, Epiroc presents an important milestone for surface drilling in open-pit mining and quarrying. With a push of a button it is now possible to complete entire drill patterns autonomously."

CHN's Zhungeer Energy invests in autonomous trucks & more domestic parts & equipment supply

Volvo will offer mining a total autonomous solution but starting simple & building on successes

MINE.THE.GAP Ecosystem: – a solid network to support SMEs in the EU raw materials industry

Smart and Green Mining Regions of EU

REMIX Interreg Europe

01/2017 – 06/2021

www.interregeurope.eu/remix/

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9 Partners | 1 Advisory Partner | 9 Countries | 8 Policy Instruments

S3 Platform Mining Industry and Global value chains

http://s3platform.jrc.ec.europa.eu/mining-industry

Mining and Metallurgy Regions of EU

MIREU MINING AND METALLURGY REGIONS OF EU

12/2017 – 11/2020

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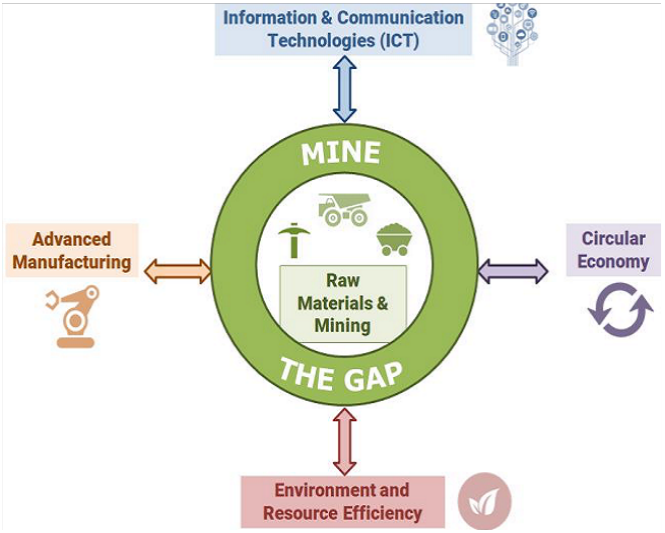
30 Partners | 17 Regions | 15 Countries

INNOSUP-01-2019

Horizon 2020 European Union Funding for Research & Innovation

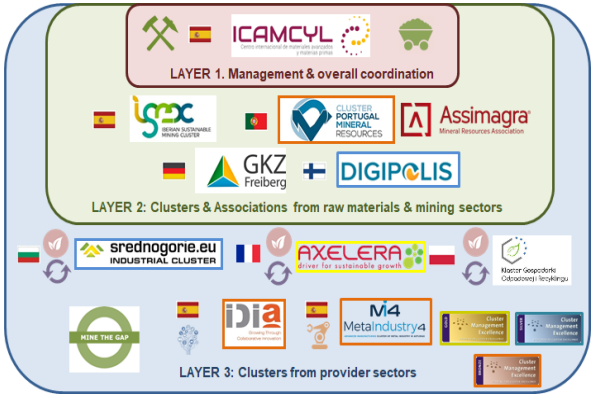


EU Council of Mining regions

SMARTY Interreg Europe

Interreg Europe

14 Partners | 10 regions | 7Countries | 8 Policy Instruments



INNOSUP-01-2019 – MINE.THE.GAP

MINE.THE.GAP

OBJECTIVES

- Ensuring the sustainable supply of raw materials to the European economy
- Reducing import dependency & diversify raw material sourcing
- Improving resource efficiency (including recycling)
- Putting Europe at the forefront in raw materials sectors
- Mitigating the related negative environmental, social and health impacts

TARGETS

- New innovative pilot actions for production of raw materials
- Enhanced efficiency in material use
- Enhanced efficiency in waste prevention, re-use and recycling
- Raw materials efficient product design

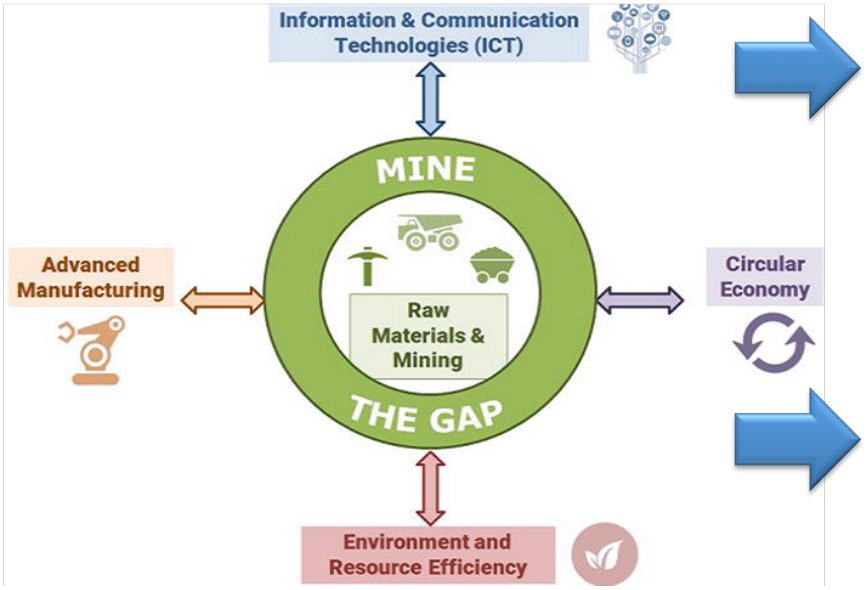
PRIORITY AREAS

- I.A. Research and innovation coordination
- I.B. Technologies for primary and secondary RM production
- II.B. Improving Europe's waste management framework conditions and excellence
- II.C. Knowledge, skills and raw materials flows
- III. International cooperation

MINE.THE.GAP Ecosystem CLEAR PRIORITIES AND FOCUS IN SMEs: Funding & Business

INNOSUP-01-2019

Horizon 2020 European Union Funding for Research & Innovation



1. **Upgrading SME competitiveness in mining to industrial services**
   - role of clusters, digitalisation, access to finance, piloting, and technologies
2. **Sustainability of mining**
   - circular economy, industrial symbiosis, recovery-reuse, reduce pollutants, and social licensing
3. **Inter - Regional Business Hubs**
   - Potential for public funding/financing of SMEs
4. **Social and industrial related value chains**
   - highly synergetic raw materials value chains
5. **Value chain elements**
   - digitalisation of the industry (related to the development of the testing centre or the automation of mining

By means of the MINE.THE.GAP ECOSYSTEM
Help and support > 500 SMEs - Secure > 100.000 jobs - Support > 25 EU regions

Case study 1: Linking ICT and mining – A reinforced value chain

A junior mining company in Spain incorporates cutting-edge remote sensing and satellite technology from a German SME, replacing traditional, ground-based exploration methods on the field in a new Tungsten mine.

01

The problem

The mine is in an area of difficult access, where ground-based exploration is challenging. This exploration phase is taking longer than expected, hindering access to finance and jeopardising the whole project.

02

The technology

Satellite imagery and remote sensoring previously used in agriculture can highlight ore bodies, their mineralisation or alteration, variability through the mine site and associated structural features.

03

MINE.THE.GAP

The project

A Spanish mining company and a German ICT company receive funding through MINE.THE.GAP, resulting in a cross-regional, cross-sectoral project for adapting satellite technology to the mining industry needs.

THE IMPACT

The mining company

- Accelerate exploration phase
- Improve access to finance
- Reduce operational costs
- Can use the technolgy in subsequent phases

The ICT company

- Access a new market
- Gain new knowledge
- Offer a new service
- Strenghten international presence

THE BIG PICTURE

SHORTER, REINFORCED VALUE CHAIN

ECONOMY THRIVES AT LOCAL MINE SITE

INTERREGIONAL LINKS STRENGTHEN

SOCIAL ACCEPTANCE IMPROVES

Case study 2: Linking advanced minerals processing and circular economy – A new value chain

A WEEE management company in Poland incorporates advanced, tailored-made hydrometallurgical processes from a Finnish company for recovery and reuse of high added value rare earth elements (REE) and other critical raw materials (CRM).

01

The missed opportunity

Metal scrap is recovered from electronic waste and sold to metallurgical companies as a mixed alloy for lower value applications. However, it contains significant amounts of highly valuable elements (REE & other CRM).

02

The advanced technology

Recently developed hydrometallurgical technologies allow tailored-made solutions for the recovery of REE and other CRM in a cost-effective, environmentally-friendly and sustainable process.

03

MINE.THE.GAP

The project

MINE.THE.GAP Open Calls provide a hub where a Finnish company specialised in advanced processing technologies joins a Polish WEEE company for the recovery of products of higher added value.

THE IMPACT

The recycling company

- Add new value to its products
- Contribute to the circular economy
- Extend its customer base
- Improve its knowledge on materials recovery

The AM company

- Access a new market
- Gain new knowledge
- Offer a new service
- Strenghten international presence

THE BIG PICTURE

- A NEW VALUE CHAIN IS CREATED
- THE CIRCULAR ECONOMY IS REINFORCED
- INTERREGIONAL LINKS STRENGTHEN
- DEPENDENCE ON IMPORTS LESSENS

MINE.THE.GAP Open Calls (Incomming 2020 – 2021)

MINE-PoC

MINE-PoC: Design and implementation of a prototype/proof-of-concept to demonstrate the viability of the proposed solution.

TRL: 6-7

Project lifetime: 9 months

MINE-Demo

MINE-Demo: Developing and testing of a fully functional demo/pilot in a production environment with all the major features of the product/ service/solution.

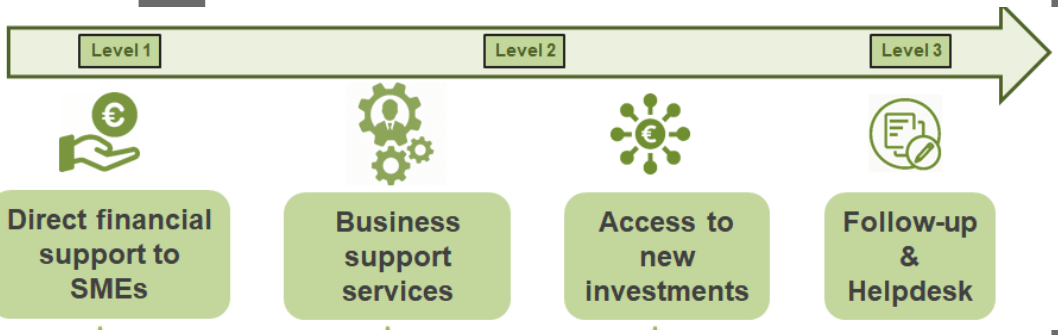
TRL: 7-8

Project lifetime: 12 months

Total no. SMEs in the 'adopters' sectors: 29

Total no. SMEs in the 'provider' sectors: 58

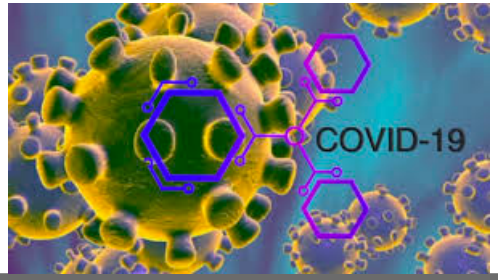
Maximum no. expected SMEs benefited: 87



OPEN CALLS

URGENT COVID-19 CALL?:

Making the raw materials industry resilient to pandemia



ICAMCYL
Centro internacional de materiales avanzados y materias primas
International center for advanced materials and raw materials

IBERIAN SUSTAINABLE MINING CLUSTER

Thank you for your attention

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