



ΠΕΡΙΦΕΡΕΙΑ
ΣΤΕΡΕΑΣ
ΕΛΛΑΔΑΣ



Case study 5: Regional specialization strategy in critical Raw Materials in Greece



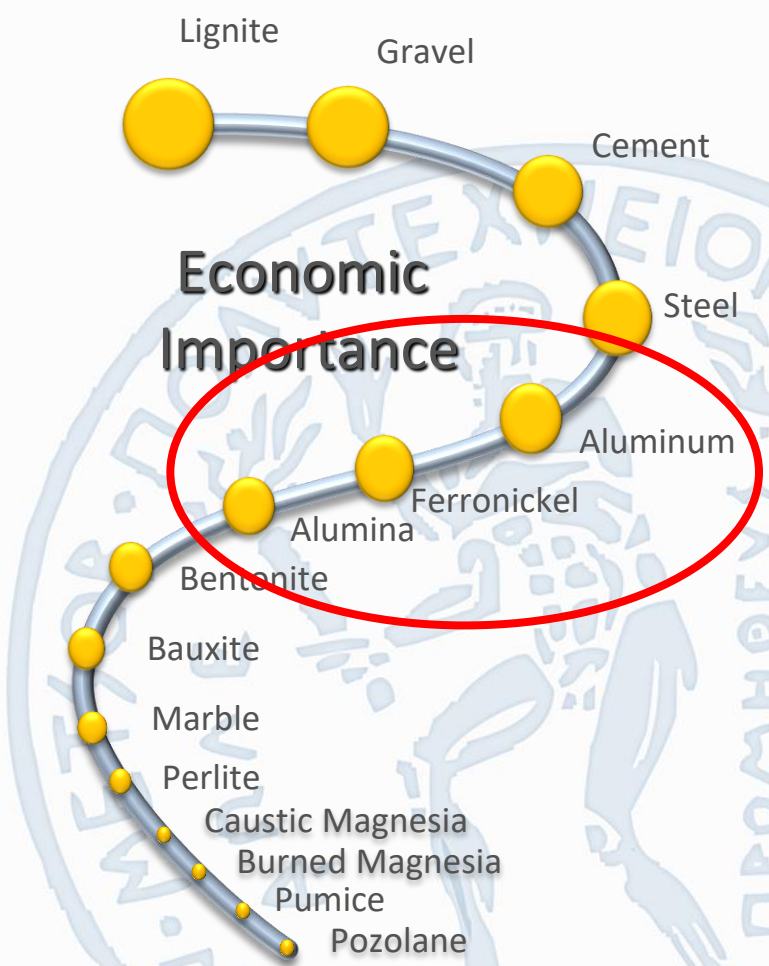
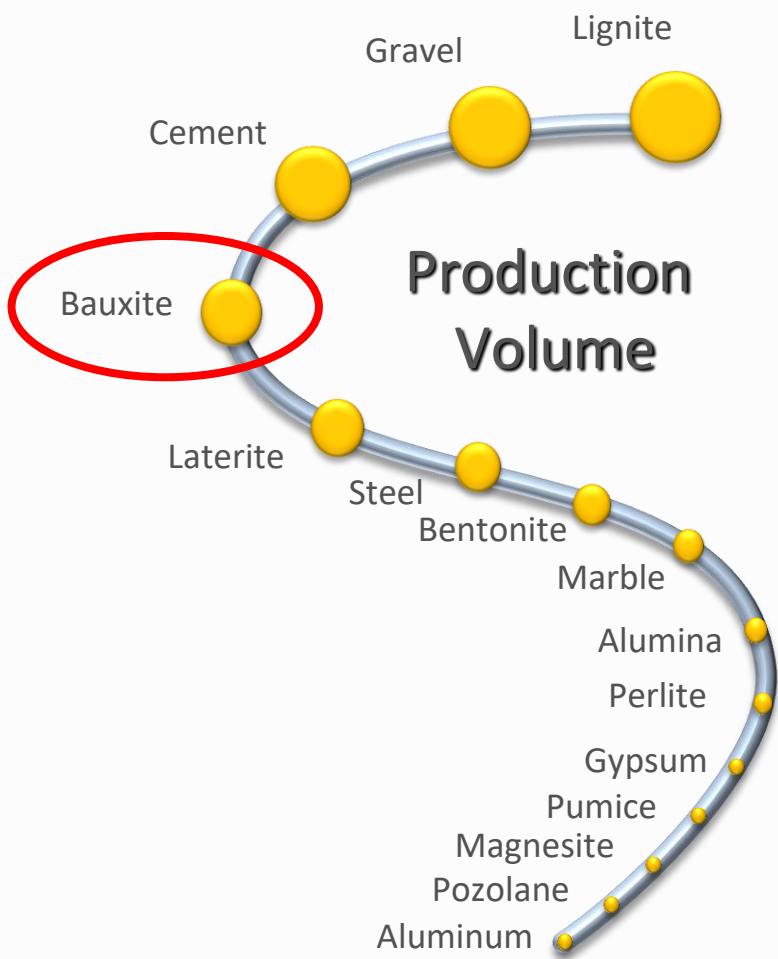
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National Technical University of Athens [NTUA]

Mining – Non-Metallic Minerals and
Basic Metallurgy in the Greek Economy

- Greek extractive industry together with the corresponding manufacturing sector has **a constant contribution of 3.0 – 5.0 %** to the GDP of Greece.
- The extractive sector is highly extroverted with the **exports** of primary and processed materials accounting for **over 65%** of its sales.
- Some **Greek companies** of the mining sector are **highly ranked** in European and International level.

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Greek Raw Materials: Relative Importance to Greek economy

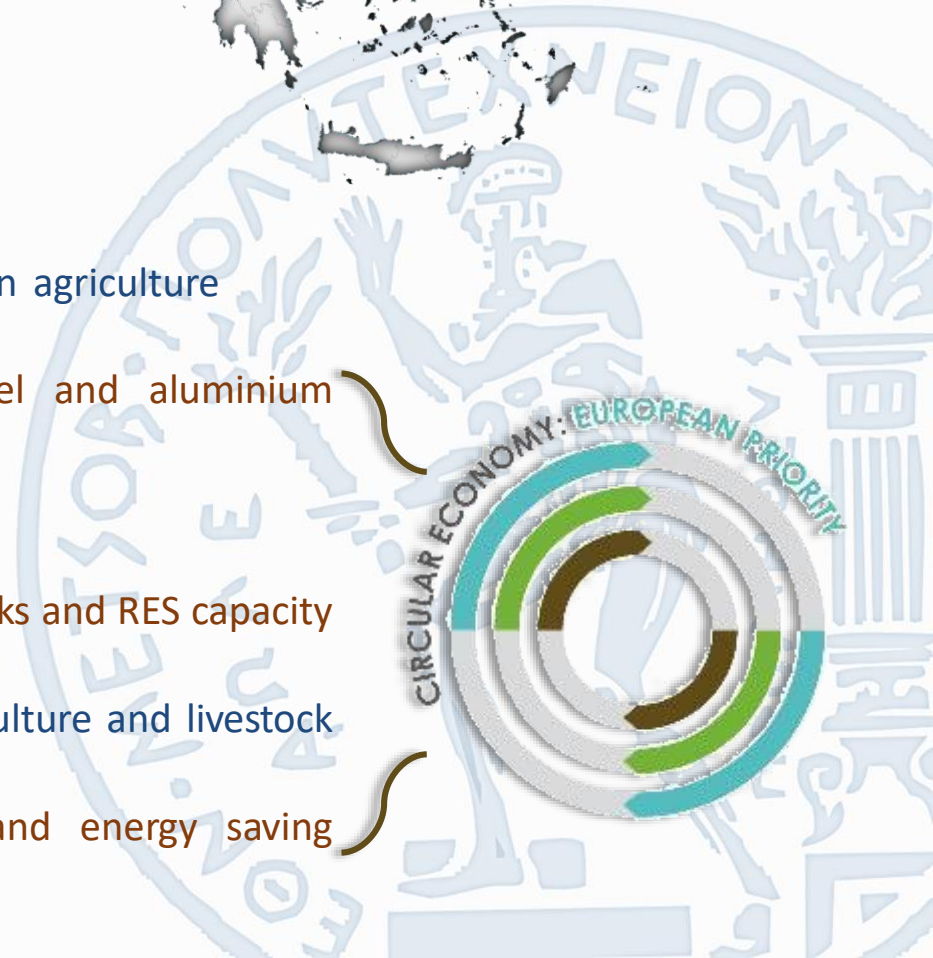


Region of Central Greece

- Area of 15.549 km²
- 2nd largest in Greece in total area
- Permanent population: 547.390 inhabitants, (5.07% of the country)

Strengths

- Great geographic position (proximity to Athens)
- Rich agricultural land and production expertise in agriculture and livestock production
- Strong industrial sector - first place in nickel and aluminium production
- Great concentration in fisheries and aquaculture
- Important cultural resources (Delfi, Thermopyles)
- Sound infrastructure of national transport networks and RES capacity (solar, wind, hydro)
- Potential in development of synergies with agriculture and livestock production
- Development of environmental technologies and energy saving technologies



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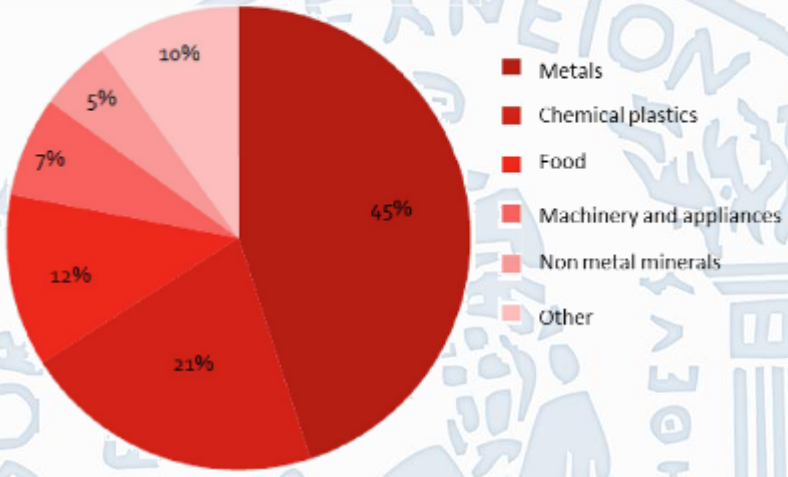


Region of Central Greece

Gross Value Added by Industry 2013

Industry/ Sector	Gross Value Added (amount in million euro)	% in total GVA of the Region
Agriculture, Forestry and Fishing	561	7.6
Mining, energy, water supply and waste management	584	7.9
Manufacturing	1856	25.2
Construction	213	2.9
Trade, transportation and storage, accommodation and food service activities	1449	19.6
Information and Communication	75	1.0
Financial and Insurance activities	158	2.2
Real Estate activities	986	13.4
Scientific, administrative and support service activities	128	1.7
Public administration, education, health and social work activities	1130	15.3
Arts, recreation and other service activities	234	3.2
Total	7375	100

Key exporting goods



The region has an active interest on EU Critical Raw Materials priorities (REMIX research project, MIREU commitment, SC5 call for regions etc.) and is interesting in being part of mirroring activities and part of several regional networks.

Bauxite – Alumina - Aluminum

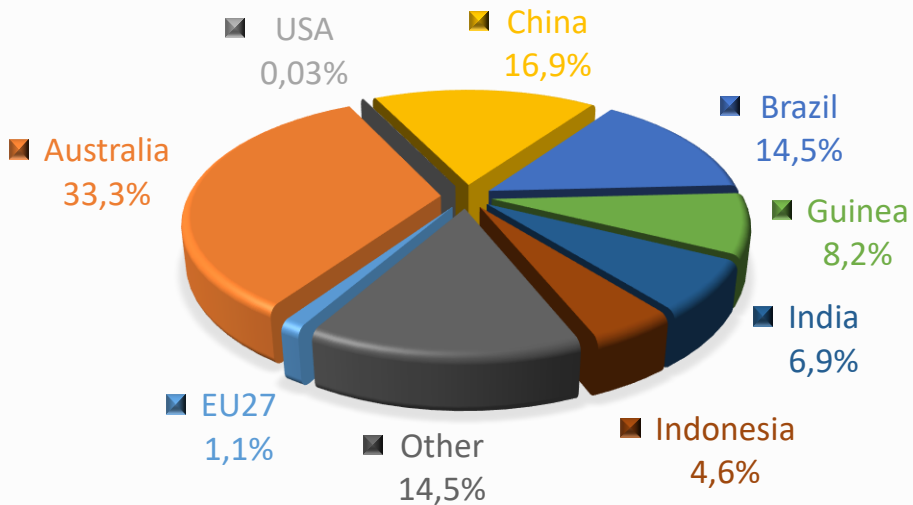
World's top 10 bauxite deposits (By country)



Source: USGS

Greece is included in the **world's top 10 countries** with the biggest bauxite reserves, **estimated to 600 Mt**

Bauxite – Alumina - Aluminum

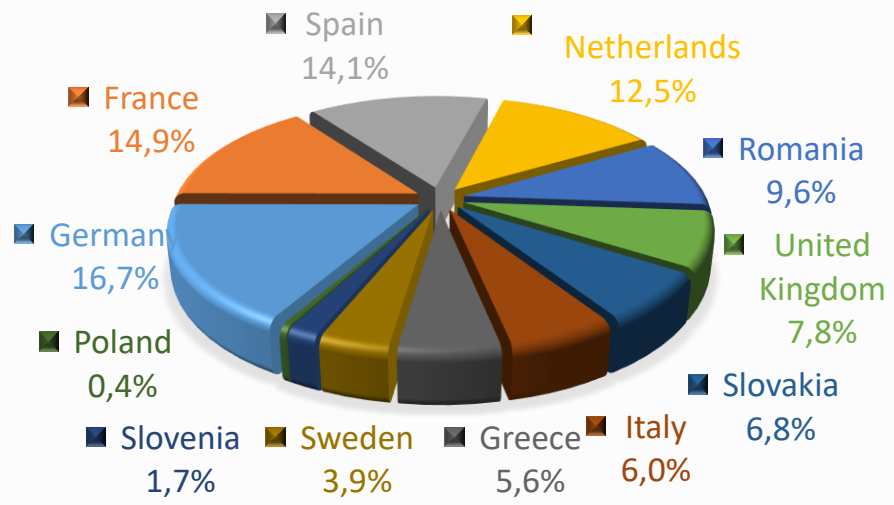


EU27 produced 1.15% of world bauxite

Greece is ranked (2010)

1st in EU27 with 85%

11th in the world with 1%



EU27 produced 5.8% of world primary Aluminum

Greece is ranked (2010)

9th in EU27 with 5.6%

32nd in the world with 0.3%

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THE LARGEST VERTICALLY INTEGRATED ALUMINIUM & ALUMINA PRODUCER IN E.U.



Bauxite Mines

- Second largest bauxite producer in Europe with ~700 ktpa of production capacity.
- Long life of mine underpinned by 11mt of resources.
- Long-term off-take agreement with third parties in Greece and abroad.



Aluminium Smelter

- ~182 ktpa of production capacity
- Established customer base
- Long-term off-take agreements provide security of sales



Alumina Refinery

- Amongst largest standalone smelters globally
- Producer of 17% of total European Alumina output ~820 ktpa
- Sufficient capacity to cover internal needs for the smelter and to export ~500 ktpa
- Long-term off-take agreement with global and regional players



334 MW CHP

- On-site power and steam production offering purchasing flexibility – Secured Electricity Supply
- Internal Steam production using Natural Gas



Port Facilities

- On-site port facilities for incoming raw materials and outgoing finished products, minimising logistical costs.

Primary Aluminium Annual Capacity

182 ktn

Refined Alumina Annual Capacity

820 ktn

Region of Central Greece

Bauxite – Alumina - Aluminum



Fostering environmental conscience and responsible behaviour among employees and supply chain actors



Control and reduction of solid, liquid and gaseous waste & improvements in the management of bauxite residues

Readiness and swift response to emergencies and correction of all deviations through the implementation of corrective action plans

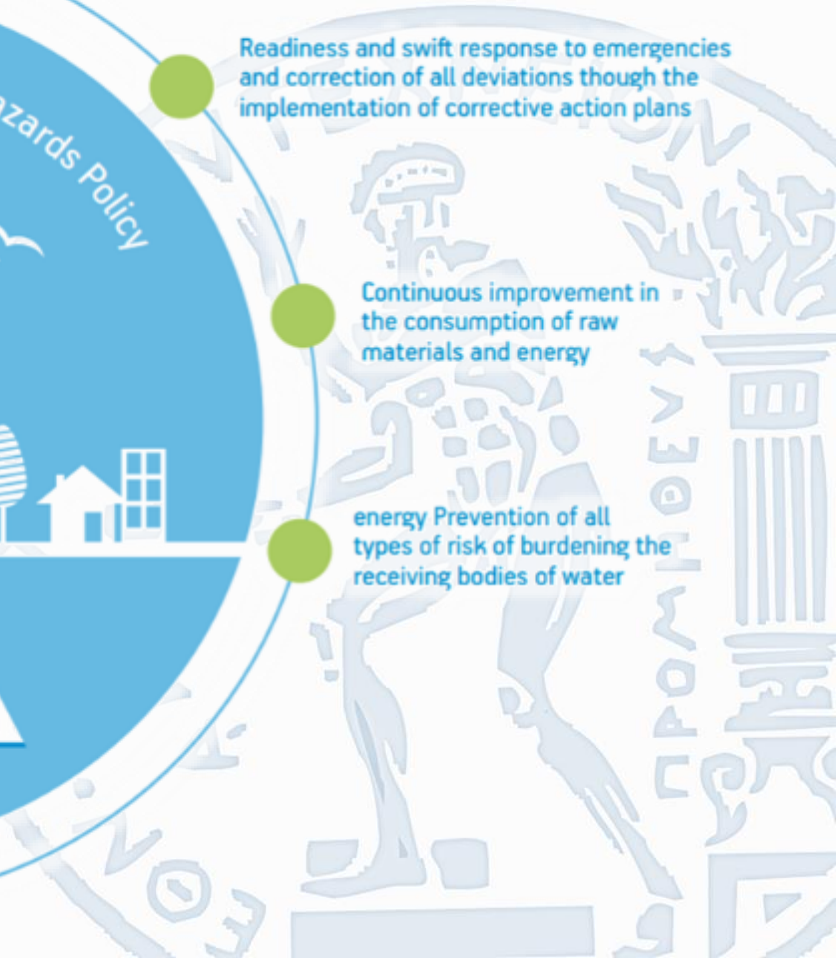


Evaluation and continuous control of impacts

Continuous improvement in the consumption of raw materials and energy

Adherence to the requirements of the law and to voluntary commitments

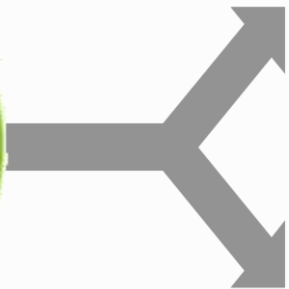
Prevention of all types of risk of burdening the receiving bodies of water



Bauxite – Alumina - Aluminum



nZeroWaste
Challenge



Mining and Metallurgical
wastes

Wastes of industrial
minerals exploitation



Bauxite residue production

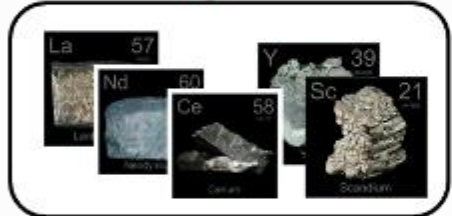
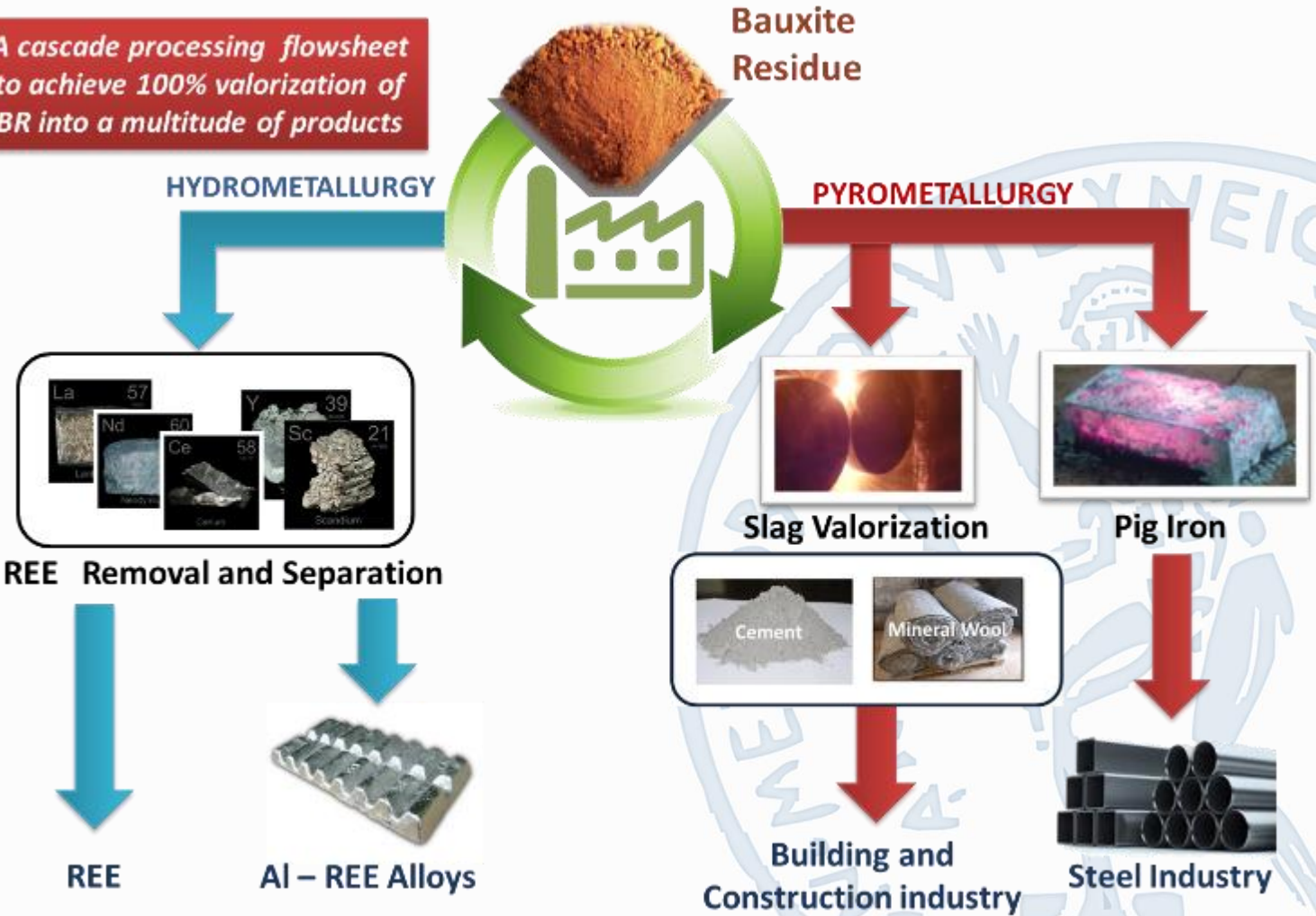


- ❖ Is the major solid waste generated, during the alumina refining with the Bayer process, produced as a slurry.
- ❖ More than **120 million tons of BR** are produced worldwide each year.
- ❖ **In AoG Greece the annual production is 700,000 tons.**
- ❖ The solid filter cake is stockpiled in landfill; only a small part of it (1-3%) is utilized in the cement industry

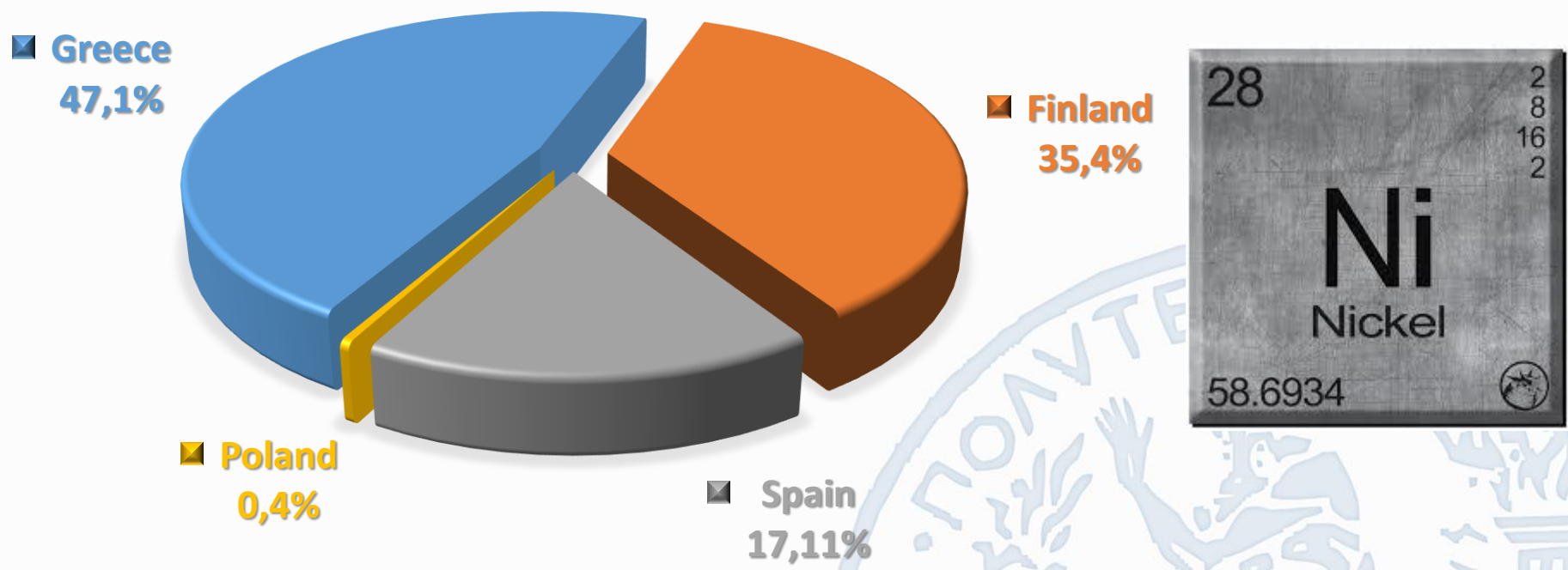


Bauxite – Alumina - Aluminum

A cascade processing flowsheet to achieve 100% valorization of BR into a multitude of products



Case study 5: Regional specialization strategy in critical Raw Materials in Greece



EU27 produced 2.22% of world mine nickel (2010)

Greece is ranked (2010)

1st in EU27 with 47.1%

12th in the world with 1%

Reserves in Nickel content: 490 ktons



- G.M.M.S.A. LARCO is today the only Ferronickel producer in European Union from local deposits, **covering 5 % of European market annual demand in nickel**
- The **annual production** in the three nickel mines (Euboea, Agios Ioannis, Kastoria) **exceeds two million tones**
- Larymna smelter: an **annual production of 19.000 tones of Ferro Nickel Alloy**
- Among the company's customers are the greatest stainless steel producers of western Europe
- GMMASA LARCO is a 100% exporting company and is considered among the most reliable producers in the global nickel market



Developing a life cycle assessment of mining projects for waste minimization and long term control of rehabilitated sites

Coordinator: Imperial College of Science, Technology and Medicine

a holistic approach to minimising the total impacts of mining, from exploration and development of a mineral deposit; to mining, processing of the ore, production of the concentrate; waste disposal, remediation; environmental monitoring, decommissioning and long term control and monitoring of the impacts of the mining related activities.

Applying space age technology to environmental aspects of surface mining

Coordinator: Integrated Information Systems (IIS) S.A./MuViReX

development of an electronic database for a specific test mining site. This database will be incorporated in a GIS system and will include multirate satellite data and other physical, environmental, geomorphologic, geologic and socio-economic factors.

RIS3 Regional Assessment: Central Greece

A report to the European Commission, Directorate General for Regional Policy, Unit I3 - Greece & Cyprus

Key points:

“**Environmental and energy saving technologies** would have an impact on a wide range of industries”

“The most significant challenge for Sterea Ellada is the **establishment and strengthening of mechanisms for collaboration with R&I stakeholders**”

“It is **recommended** to **replicate a competitive technology industrial cluster** approach to facilitate the rapid spread of good practice”

“A particular focus should be given to strengthening the cooperation of existing/emerging sectors/clusters to make **connections to local, national and global value chains**”

Case study 5: Regional specialization strategy in critical Raw Materials in Greece

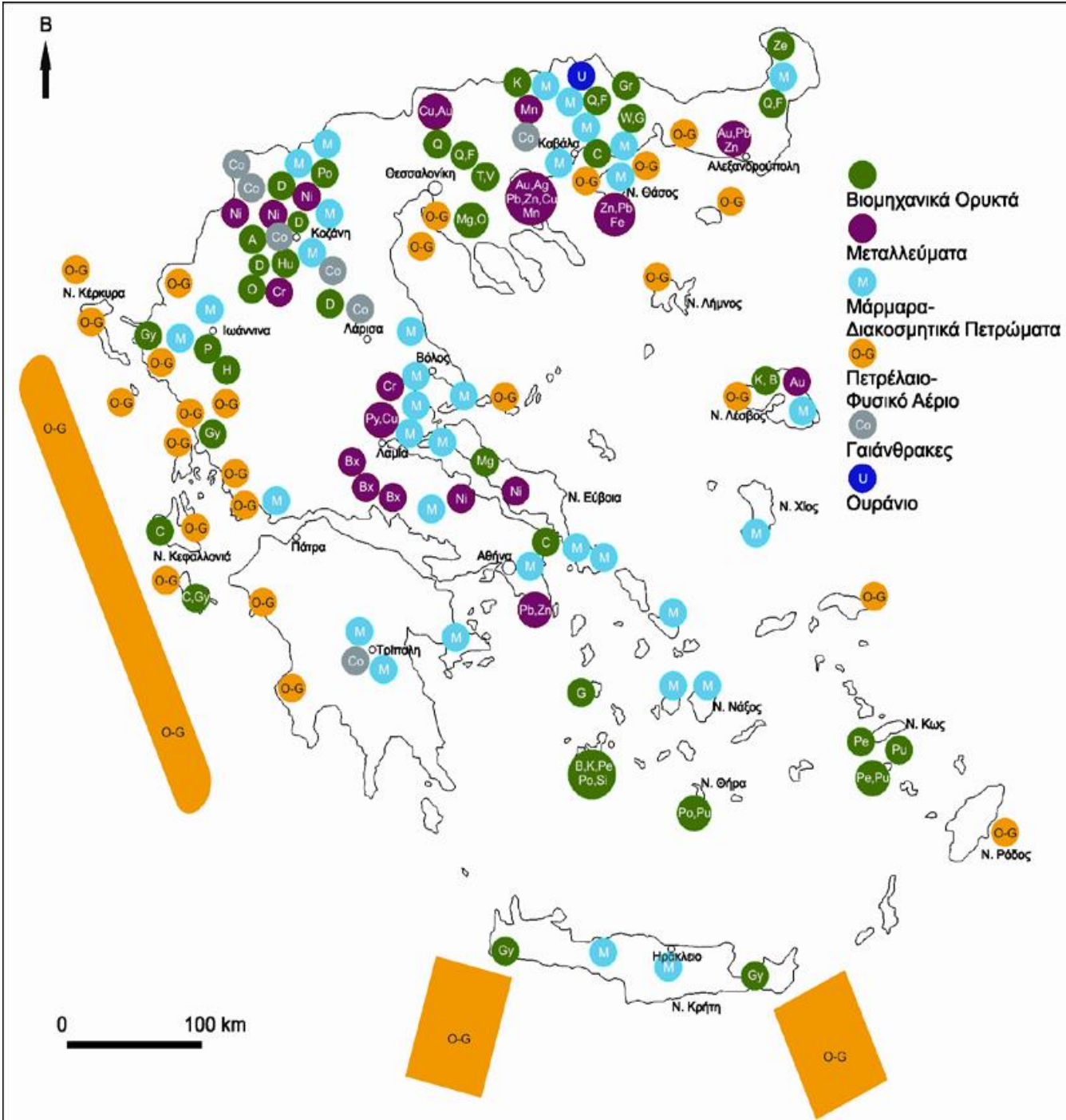
Region of Central Greece
NTUA delegate

- ✓ NTUA is the only higher education and research body for Mining in Greece performs as a hub over the whole RM value chain connecting academia-research-industry of Greek mining sector.
- ✓ It has a continuous collaboration with the Ministry of Environment, Energy and Climate Change and of the Regions involved in the Raw Materials sector. The relevant one for this project is Region of Sterea Ellada.
- ✓ Active in various projects and networks towards the enhancement of the National and Regional development of the RM Sector.



This block contains several logos and text boxes related to the project's institutional context. It includes the European Commission logo, the European Union flag, and the logos of the United States and Japan. The text boxes describe the following initiatives:

- European Innovation Partnership (EIP) on raw materials
- Raw Materials : Study on Innovative Technologies and Possible Pilot Plants
- European Rare Earths Competency Network
- Third Trilateral EU-US-Japan Conference on Critical Materials
- Mine Waste Directive (MWD), 2006/21



National Policy for the Exploitation of Mineral Resources



Main Policy axes, Required Policies – Actions and Actions Specification

MAIN POLICY AXES	REQUIRED POLICIES & ACTIONS	ACTIONS SPECIFICATION
<p>1. The national policy about the Mineral Resources as a basic component of the national and regional development policy of the Country.</p>	<ul style="list-style-type: none"> - Integrating the guidelines of the national policy for the exploitation of mineral resources horizontally into all individual policies and plans in order to ensure the optimal exploitation of the deposits and the common interest. - Establishment of a Forum for the Implementation of the National Policy for the Exploitation of Mineral Resources. 	<ul style="list-style-type: none"> • Ensuring the exploitation of the MRM deposits potential through the proper interventions in the legal framework. • Providing MRM research oriented incentives to the enterprises. • Enhancing the existing state research institutes on MRM-related issues. • Re-evaluating the state owned mining areas through complementary exploration where needed, and then auctioning them to ensure their optimal exploitation for the benefit of the common interest.
<p>2. Adequate land-use planning that shall ensure the possibility of access to the MRM deposits and contribute to the resolution of issues related to the competition of different land uses.</p>	<ul style="list-style-type: none"> - Integrating the national policy of MRM into the land-use planning policy of the country in order to strike a balance between: <ul style="list-style-type: none"> • A sustainable supply of the necessary mineral raw materials • Economic development • Social environment • Natural environment • Competitive land uses. - The adequate land-use planning in order to ensure the possibility of exploiting the MRM deposits in the long term while providing accessibility to them. The specificity of the mining industry, which, unlike other activities, is inextricably linked to the locations where nature has created the mining deposits and the fulfillment of the spatial requirements for carrying out the mining activities and the transportation of products (e.g. access to sea transportation), must be taken seriously into account at the land-use planning. - To provide for processes of land-use changes, when necessary, with a view to harnessing new deposits of mineral raw materials that had not been identified and, therefore, had not been taken into consideration during the previous phases of land-use planning. 	<ul style="list-style-type: none"> • Mapping and registering the regions with exploitation of deposits of mineral raw materials in the land-use planning and adoption of measures (recognition of requirements to be met) to ensure the long-term continuation of their exploitation. • The land-use planning must also take into account any deposits that have identified but are not yet exploited in order to prevent, to the greatest extent possible, their potential "sterilization" due to the establishment of competitive land uses or the construction of infrastructure works. • Development of an updated GIS database of digital spatial data which, alongside its other uses, will include geological and mineralogical data, established zones for extractive activities, aggregate quarrying areas, possible Organized Development Areas for Productive Activities of mining and quarry activities, other existing areas with extractive activities. • Review of Regional Land-Use Planning Frameworks taking into account the priorities of the national policy on MRM. • Updating the management studies about the protected areas in the light of the new developments in the relevant legislation and the guidelines of the EU on the possibility of establishing mining activities in NATURA 2000 areas. In addition, a more clear delineation of these areas is required.



NTUA and Region of Sterea Ellada can contribute with expertise and experience across the **whole value chain of the RM sector in the Region of Sterea Ellada**, including:

- ✓ circular economy,
- ✓ metallurgical innovative region
- ✓ valorization processes for mining and industrial wastes
- ✓ policy making
- ✓ novel processes on raw materials production,
- ✓ critical raw materials expertise,
- ✓ mine closure and remediation
- ✓ networking



EIT Raw Materials: 1st Greek Raw Materials Community Dialogue



AGENDA (tentative, changes may occur)

Day 1: Wednesday 23 November

12:00–14:00 Registration and light lunch

14:00–14:20 Welcome

Ioannis Paspaliaris
Deputy Rector (NTUA)
Dimitrios Kaliampakos
Dean of Mining and Metallurgical
Engineering School (NTUA)

EU and RM, Strategy and Actions

14:20–14:40 8 years post Raw Materials Initiative. Results and prospects of EC strategies for the RM sector

Name TBA
DG GROWTH, Raw Materials Unit

14:40–15:00 EIT RawMaterials. Linking academia-research-industry for innovation

Karen Hanghoj (TBC) & Krzysztof Kubacki
CEO and ECLC General Manager

Greece and RM, Status, policies, challenges and opportunities

15:00–15:20 National Mineral Policy

Michalis Verriopoulos
Secretary General of Energy and Mineral
Raw Material (Ministry of Environment &
Energy)

15:20–15:40 Greece and RM. Current status, issues, prospects

Thanasis Kefalas
President (Greek Mining Enterprises
Association)

15:40–16:10 Coffee break and networking

16:10–16:30 Land use planning and Greek policies relevant to RM sector

Lena Karka
Senior Land Planning Expert

16:30–16:50 Regions role in the Raw Material Sector. Smart Specialisation Strategies (RIS3) and support actions. The case of Sterea Ellada.

Name TBA
Region representative

16:50–17:10 GMEA. 90 years of experience in the mining industry. Challenges and actions

Christos Kavalopoulos
General Director (Greek Mining
Enterprises Association)

17:10–17:30 Education and industry. A common vehicle to improve competitiveness and business creation

Name TBA
Hellenic Federation of Enterprises

17:30–17:40 Wrap-up of 1st day

Ioannis Paspaliaris
Deputy Rector (NTUA)

19:00–22:00 Dinner and drinks with view to Acropolis

AGENDA (tentative, changes may occur)

Day 2: Thursday 24 November

09:00–09:10 Introduction to Day 2

Ioannis Paspaliaris
Deputy Rector (NTUA)

Funding, Legal Framework and Business Opportunities.

09:10–09:30 Tools and Funding schemes for the RM sector

Name TBA
Greek National Contact Point

09:30–09:50 EIT RawMaterials surpluses Operations – networking - projects

Karen Hanghoj (TBC)
CEO

09:50–10:10 EIT RawMaterials business development Support for SMEs and start up

Markus Klein
ECLC Business Manager

10:10–10:30 Innovation and start up support

Name TBA
Eurobank representative

10:30–11:00 Coffee break and networking

11:00–11:20 Challenges for the development of RM sector SME's in Greece

Tasos Kladis
Co-Founder & Co-Owner [AdMiRIS]

11:20–11:40 EIT Raw Materials: Support Centre for the Greek Raw Materials Community (GRAMASC)

Maria Taxiarchou & Antonis Politis
Assistant Prof. & NTUA Manager for EIT
RawMaterials (Laboratory of Metallurgy
– NTUA)

Greek RM Value Chain, Importance and contribution

11:40–12:00 LARCO Extracting value from the waste

Anthimos Xenidis
CEO

12:00–12:20 VIOHALCO Recycling with emphasis on innovation

Name TBA
VIOHALCO

12:30–13:30 Lunch with view to Acropolis

13:30–13:50 HELLAS GOLD Social Licence to Operate issues, price fluctuation, wastewater management

Emmy Gazea
Environmental Manager

13:50–14:10 GRECIAN MAGNESITE Critical Raw Material. Magnesite importance

Theofilos Zampetakis
Research Manager

14:10–14:30 IMERYS Industrial minerals. Excellence in specialty materials

Thanasis Karalis
Research and Applications Manager

14:30–15:00 Coffee/beverages and networking

15:00–15:20 SUNLIGHT Recycling SME success story

Spiros Kopolas
General Manager

15:20–15:40 STONE Group Technology excellence matching quality excellence

Ilias Rigopoulos
CEO

15:40–16:00 TITAN Group Innovation and sustainability

Yannis Paliaras
Executive Director

16:00–16:30 Wrap-up of event and future actions

Ioannis Paspaliaris
Deputy Rector (NTUA)