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Presentation · June 2014

DOI: 10.13140/RG.2.1.3855.5920

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Future, needs and opportunities



GMMSA LARCO

Mineral Resources. Present, future, opportunities

Laterite – Nickel Industry

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G.M.M.S.A. LARCO

- G.M.M.S.A. LARCO is a mining and metallurgical company, which prospects and exploits Ferronickel in order to produce Ferronickel alloy (FeNi)
- 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
- 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

History of G.M.M.S.A. LARCO

- G.M.M.S.A. LARCO was founded in 1963 in order to utilize the Ferronickel ore of Lokrida district.
- In 1966 the smelter in Larymna begun its operations using as raw material the ore from nearby Agios Ioannis deposit
- In 1969 Euboea Mines were put into production
- In 1977 Servia Lignite Mines were put into production
- In 1996 Kastoria Mines were put into production utilizing ore from Ieropigi, Kastoria

Production of G.M.M.S.A. LARCO

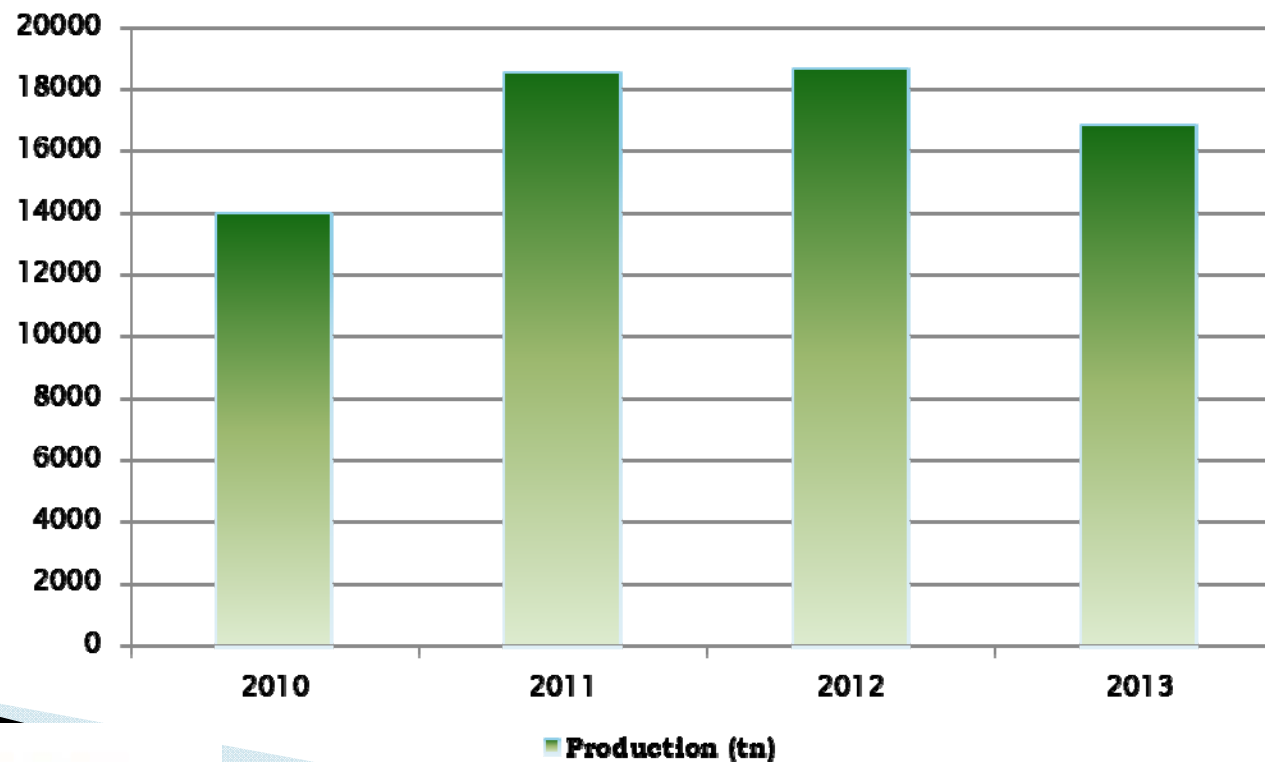
- ▶ GMMASA LARCO is the only Ferronickel producer utilizing Greek nickel deposits. The annual production in the three nickel mines (Euboea, Agios Ioannis, Kastoria) exceeds two million tones

Ore Production (tn)				
2010	2011	2012	2013	Total Production
2,200,000	2,600,000	2,300,000	2,200,000	85,000,000

Production of G.M.M.S.A. LARCO

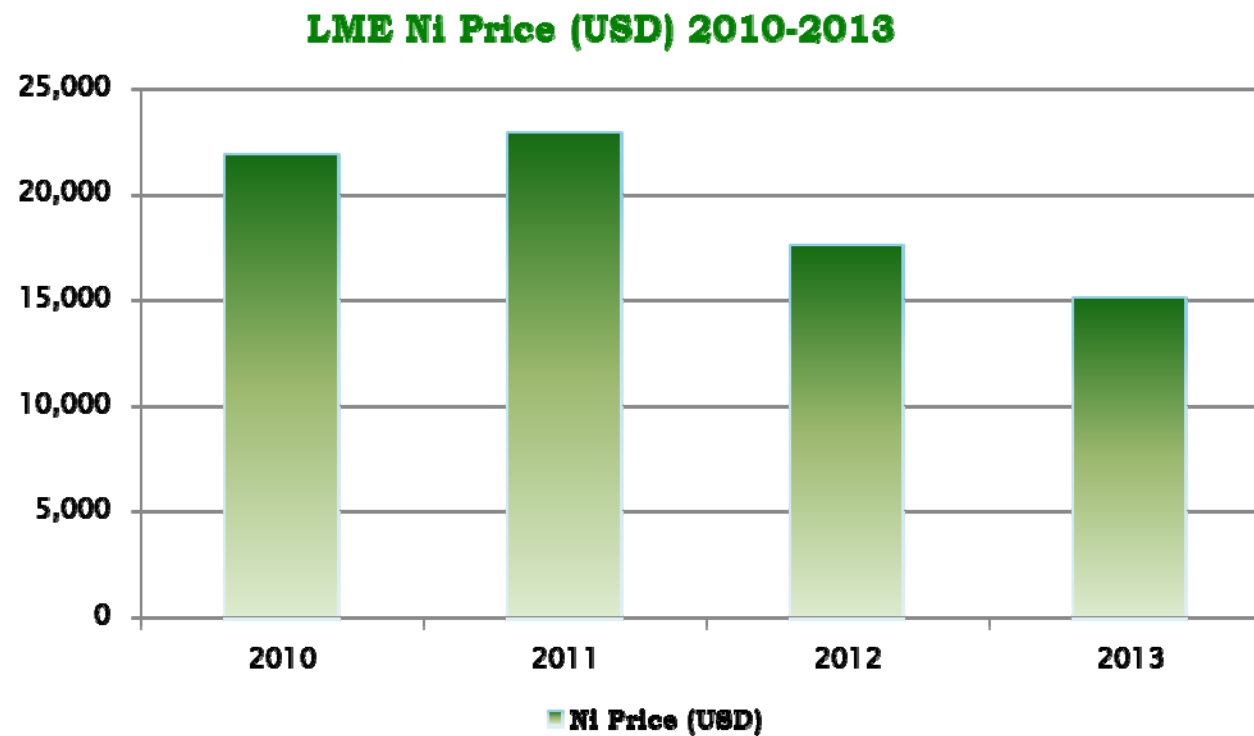
Nickel production is around 19.000 tones annually and is depended upon the demand and the sale price of the final product, which is exported exclusively to European steel producers

Annual Ni Production 2010-2013



Nickel Price

Nickel price (LME) is during the last four years is depicted in the following diagram:

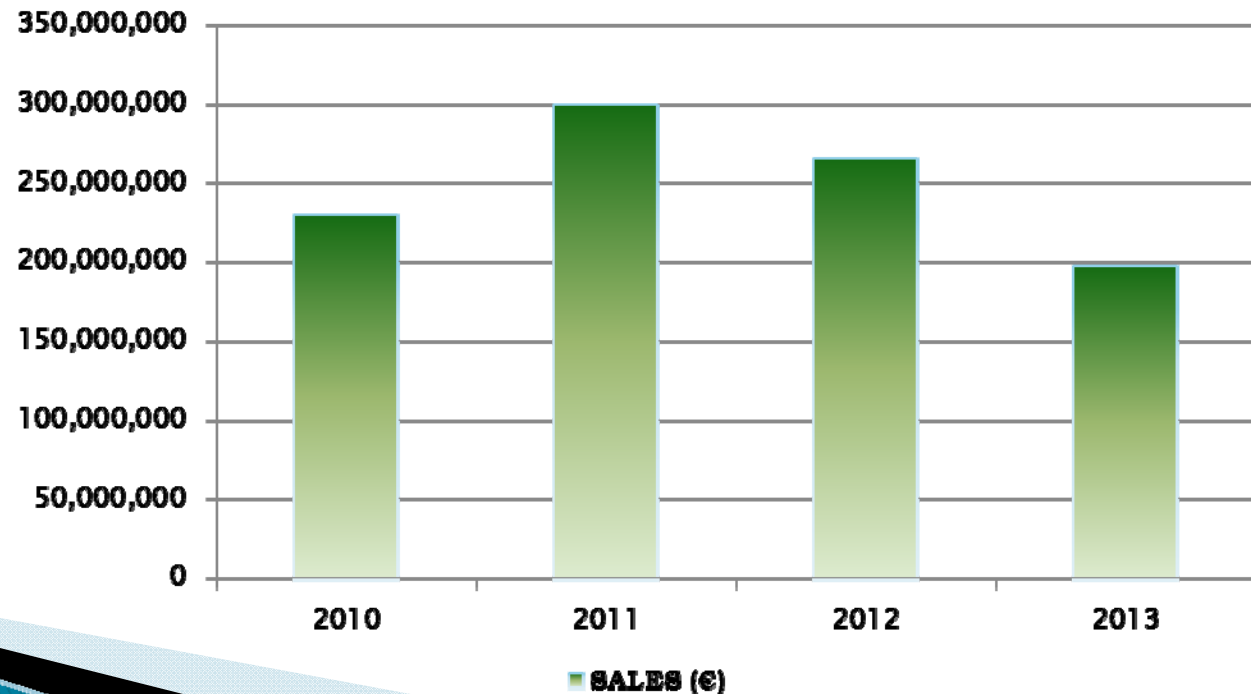


Nickel price today is around 19,000 USD / Tn and has positive prospective

Economic Facts

- ▶ LARCO produces 40% of nickel that is produced in the EU 27 from Primary Raw Materials
- ▶ Its production consist 1% of global nickel production
- ▶ Covers 5% European demand in nickel
- ▶ In Greek economy contributes 0,10-0,15% of Gross Domestic Product
- ▶ Its sales consist 1% of total Greek exports

ANNUAL SALES (EURO) 2010-2013



LARCO FeNi Specifications

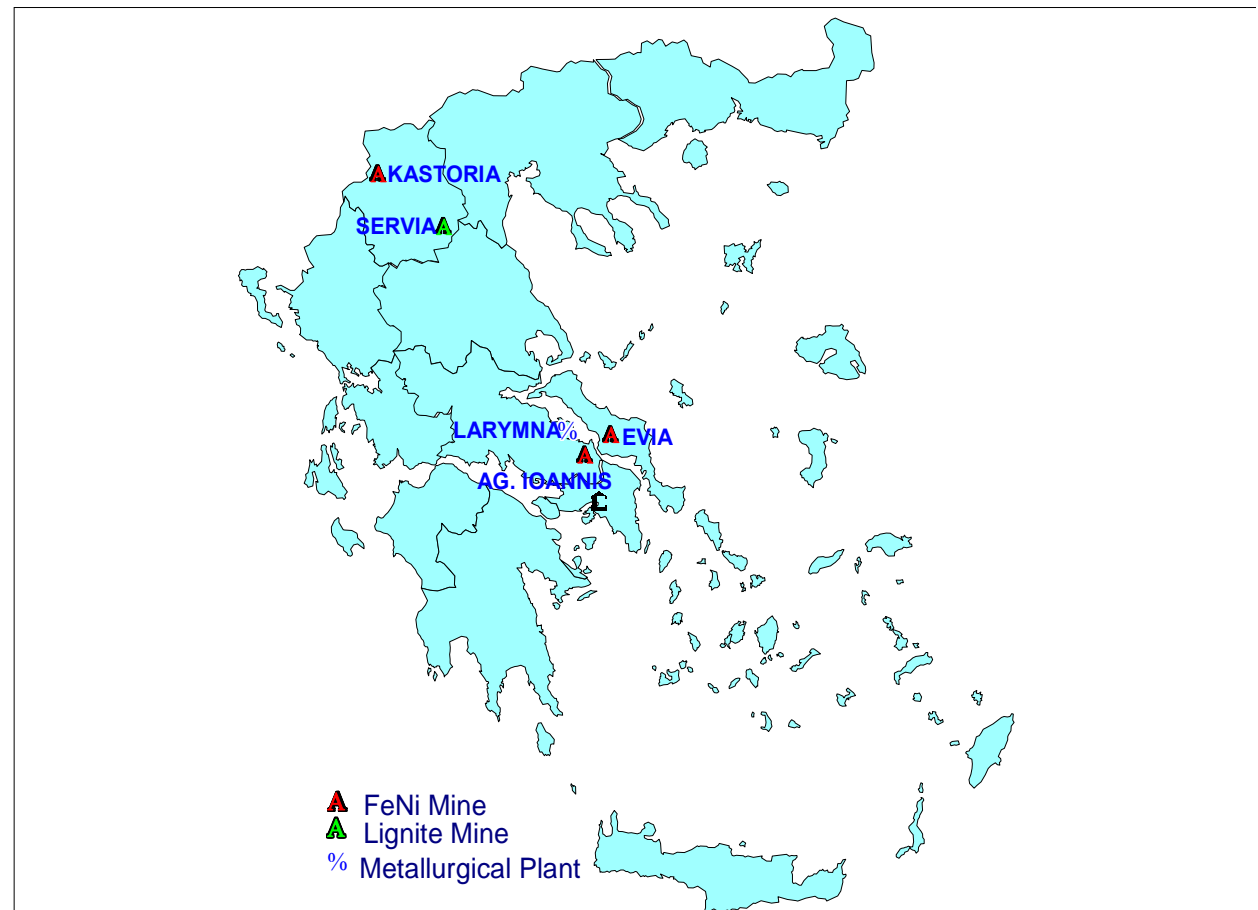
Ni	17 – 25%
Co	0.75 – 1.00 %
As	0.15 % Max
P	0.02 % Max
S	0.15 % Max
Cu	0.10 % Max
C,Mn,Si,Cr	Traces

- ▶ The competitive advantage of LARCO ferronickel is its highly prized virtually carbon-free content. The presence of cobalt in our nickel also makes the end product, stainless steel, stronger and less prone to metal fatigue and fractures.
- ▶ Nickel-containing materials play a major role in our everyday lives – food preparation equipment, mobile phones, medical equipment, transport, buildings, power generation

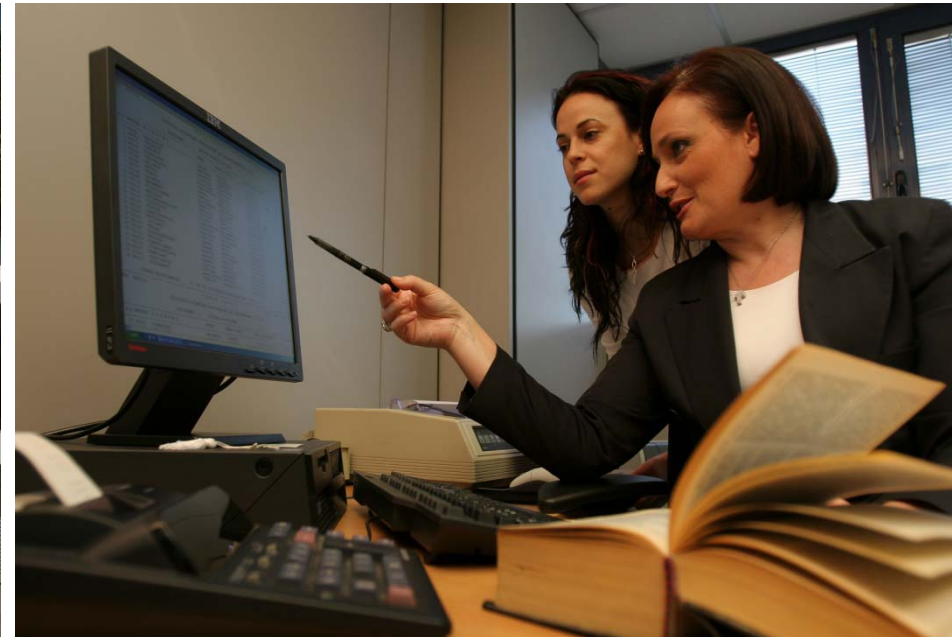
Activity of G.M.M.S.A. LARCO in Greek Territory

G.M.M.S.A. LARCO activates in six prefectures

- ▶ Athens Headquarters
- ▶ Euboea Mines
- ▶ Agios Ioannis Mines
- ▶ Kastoria Mines
- ▶ Servia Lignite Mines
- ▶ Smelter in Larymna



Athens Headquarters



- ▶ Administrative services of G.M.M.S.A. LARCO
- ▶ 67 employees

Euboea Mines

NTUA – NOA 2014



- ▶ Annual production: 1.2 to 1.5 million tones of ore
- ▶ 235 employees

Agios Ioannis Mines



- ▶ Annual production: 500,000 – 600,000 tones of ore
- ▶ 160 employees

Kastoria Mines

NTUA – NOA 2014



- ▶ Annual production: 350,000 – 450,000 tones of ore
- ▶ 130 employees

Servia Lignite Mines



- ▶ Annual production: 600,000 tones of Lignite
- ▶ 140 employees

Larymna Smelter



- ▶ Annual production: 19.000 tones of Ferro Nickel Alloy
- ▶ 850 employees

Human Resources

- ▶ GMMSA LARCO employs 1582 individuals including contractors
- ▶ 168 of them is scientific personnel
- ▶ Ensures considerable working positions in the six prefectures it operates

Human resources							
	Athens Headquarters	Larymn aSmelter	Agios Ioannis Mines	Euboea Mines	Kastori a Mines	Servia Mines	Total
Total Number of employees	67	850	160	235	130	140	1582
Scientific Personnel	43	72	15	28	6	4	168

Environmental Responsibility

- ▶ It is inevitable fact that mining activity affects the environment but it is certain that a major part of these changes is reversible
- ▶ LARCO embraces the principles of sustainable development
- ▶ The challenge of a modern mining company is the utilization of mineral resources in a way that all the affected parties receive the maximum benefit with minimum environmental consequences.
- ▶ LARCO is very sensitive concerning environmental impact at the sites of activity
- ▶ Application of Environmental Management System

Environmental Management System includes:

- ▶ Identifying and evaluating environmental impact
- ▶ Composing and approving by the Public Authorities required studies before the beginning of any operation
- ▶ Constant monitoring and evaluation of air quality, soil and water table
- ▶ Taking actions to minimize environmental impact of activities
- ▶ Restoration of the environment at the mining sites by tree planting

Investments in progress

Land deposit of rust produced during the metallurgical process at Liavda, Larymna

- ▶ Budget: 12,000,000 €
- ▶ Will cover the needs in depositing for the next 20 years
- ▶ This particular project is being made in a way that ensures the maximum protection of the environment

Investments in progress

Utilization of low grain size material that was piled during last 30 years of production at Larymna Smelter

- ▶ Budget: 4,000,000 €
- ▶ Pelletisation and re-feeding for the metallurgical process
- ▶ Recovery of 19,000tn of Ni, equivalent with the production of one year

LARCO's Relation with Education and Research

LARCO embraces the connection with Education and Research

Special attention to environmental technologies in order to improve working conditions, to achieve increase of productivity and to improve energy efficiency.

- ▶ Cooperating with NTUA, the **ManFeNi** proposal was approved to develop a mathematical model to maximize the energy efficiency of rotating and electric furnaces of Larco Smelter

- ▶ The design of a prototype unit of rust washing of electric furnaces

- ▶ The evaluation of Natural Gas usage to replace mazut in rotating furnaces

European Innovation Partnership (EIP)

- ▶ The **European Innovation Partnership on Raw Materials** will contribute to the mid- and long-term **security of a sustainable supply of the raw materials** that are required to meet the fundamental needs of a modern, resource efficient European society
- ▶ The EIP on Raw Materials is an essential contribution to the competitiveness of European industry. It will make Europe the world leader in capabilities related to **exploration, extraction, processing, recycling and substitution** by **2020**.
- ▶ G.M.M.S.A. LARCO is a dedicated partner of the EIP program, participating in several Commitments

European Innovation Partnership (EIP)

Metal Recovery from Low Grade Ores and Wastes (**MetGrow**)

Cooperating with Technical University Crete, School of Mineral Resources Engineering (TUC)

Objectives:

- ▶ To improve recovery of low grade ores and industrial residues
- ▶ To increase efficiency in downstream processing

LARCO's role Within The Commitment:

End user for the innovative hydrometallurgical processes on low grade Ni ores

European Innovation Partnership (EIP)

Development of Innovative Technologies for processing low grade, fine feeds for the primary ferronickel production industry (**FerroNi**)

Cooperating with National Technical University of Athens (NTUA)

Objective:

►The development of a novel and cost effective pyrometallurgical technology that will increase resource efficiency and productivity of the Fe-Ni production process

LARCO will be the coordinator of this consortium and will undertake the roles of material provider, know-how and above all technology demonstrator, as LARCO will up scale the technologies developed in industrial scale pilot plants

Prospective of G.M.M.S.A. LARCO

- ▶ The Measured Mineral Resources are 220.000.000 tons, of which half amount can be treated by pyrometallurgy, while the rest can be treated in the future by hydrometallurgy.
- ▶ The overall Greek area shows significant geological conditions for the existence of more nickel deposits.
- ▶ Our company owns a large number of mining survey permits
- ▶ Survey is at the last stage of data evaluation for certain areas with positive results derived from geological prospecting during the last years.
- ▶ There are defensible indications for deposits locations of significant quantities and qualities, which could be included in the number of the deposits under exploitation and will lead to the strengthening of the mining activities.

Conclusion

- The future course of the mining activity of LARCO seems particularly optimistic and must be considered as a very important factor for the development perspective of the country.

Thank you for your attention!