Sustainable Development Indicators for the Greek Industrial Minerals' Sector

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1. INTRODUCTION

Since the concept of Sustainable Development (SD) became established, Sustainable Development Indicators (SDIs) have been seen as a prominent tool for the evaluation of different sectors of the mining and minerals industry. To this end, numerous, mostly voluntary, activities emerged proposing a set of SDIs for the establishment of a SD framework and for the measurement and assessment of the mining sector.

why Greece

- Due to its active participation in the global mining activities and
- as a member of the European Union, Greece's mining and mineral industry is engaged to take part in the debate of SD and should be capable of responding to the challenges first raised at the Earth Summit Conference in Rio de Janeiro in 1992.

what had happened until now

- The Greek Mining Enterprises Association (GMEA) adopted in 2006 the 'Code of principles for SD' and agreed to work actively towards continuous improvement in economic, environmental and social performance.
- GMEA presented ten sets of SDIs and asked members of the association to adopt them for the measurement and the assessment of the sector performance as a whole.

2. THE CONCEPT OF SD IN THE MINING AND MINERALS INDUSTRY

"Meeting the needs of the present generationwithout compromising the ability of future generations to meet their needs Brundtland (1987) "

- In the mining industry sustainability has been frequently considered as a controversial issue because it involves the extraction of non-renewable resources
- According to Mikesell, 1994 the concept of sustainability for the sector can be communicated as the maintenance by each generation of the capital value of the natural resources it inherits

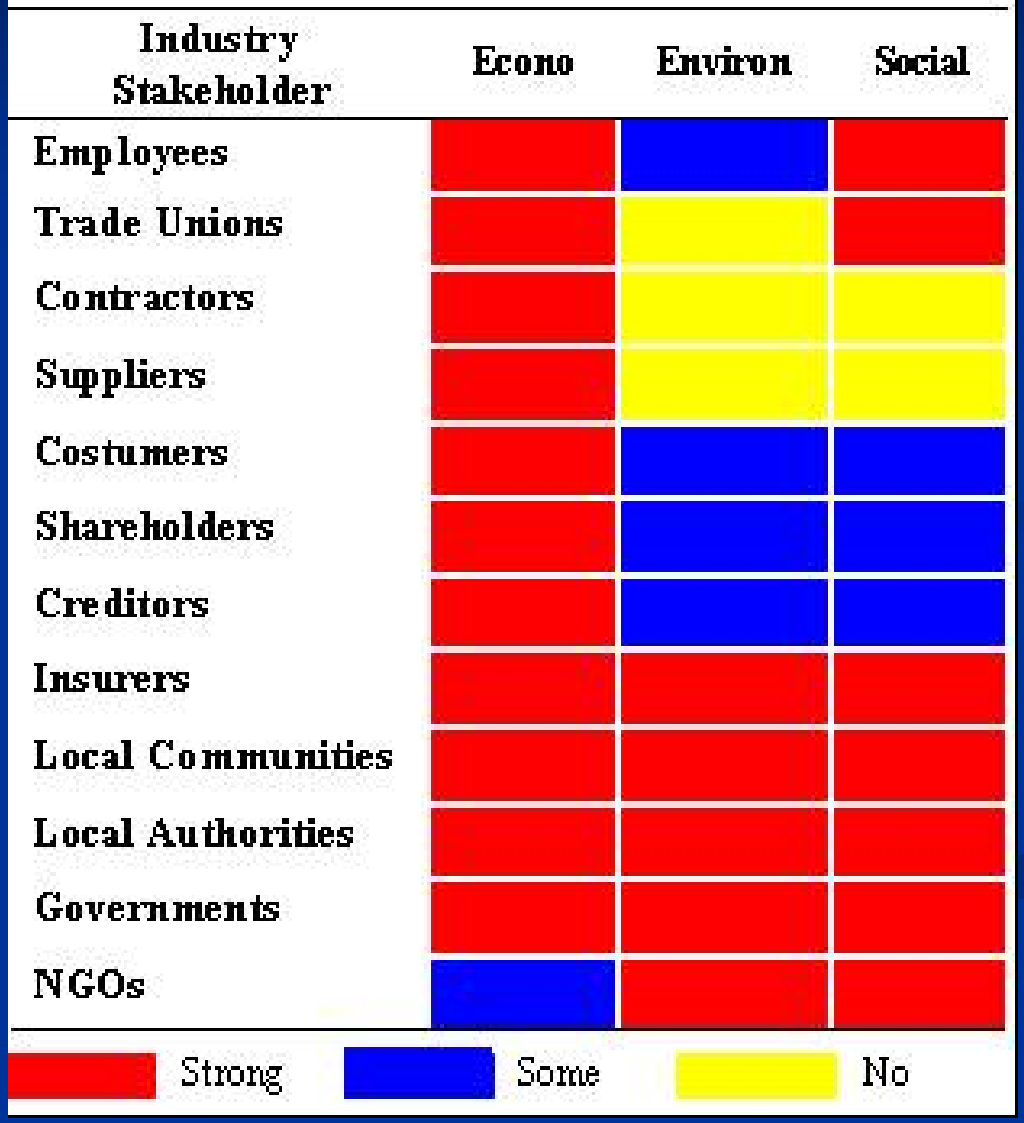
history

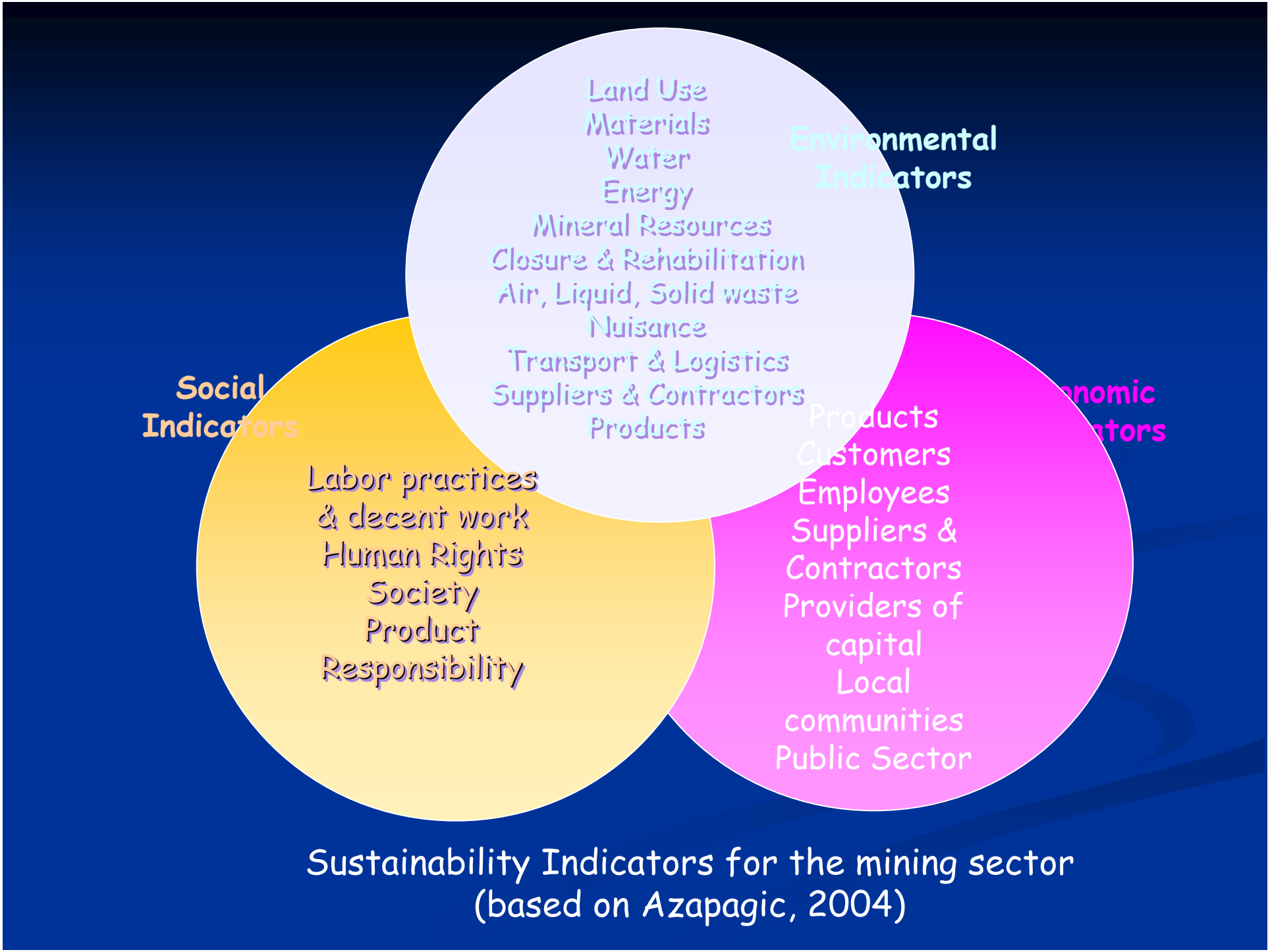
- 1998, a new initiative, the Global Mining Initiative (GMI), was launched
- May 1999, the International Institute for Environment and Development (IIED) undertook a scoping study
- 2002, the final report completed, known as the MMSD Report
- 2004, a working group (Raw Materials Supply Group) was set up to develop SDIs for the sector

the identification of key economic, environmental and social issues as well as the level of concern for stakeholders are considered of major importance.

Major Stakeholders and their interest in sustainability issues for the sector

(based on Azapagic, 2004)

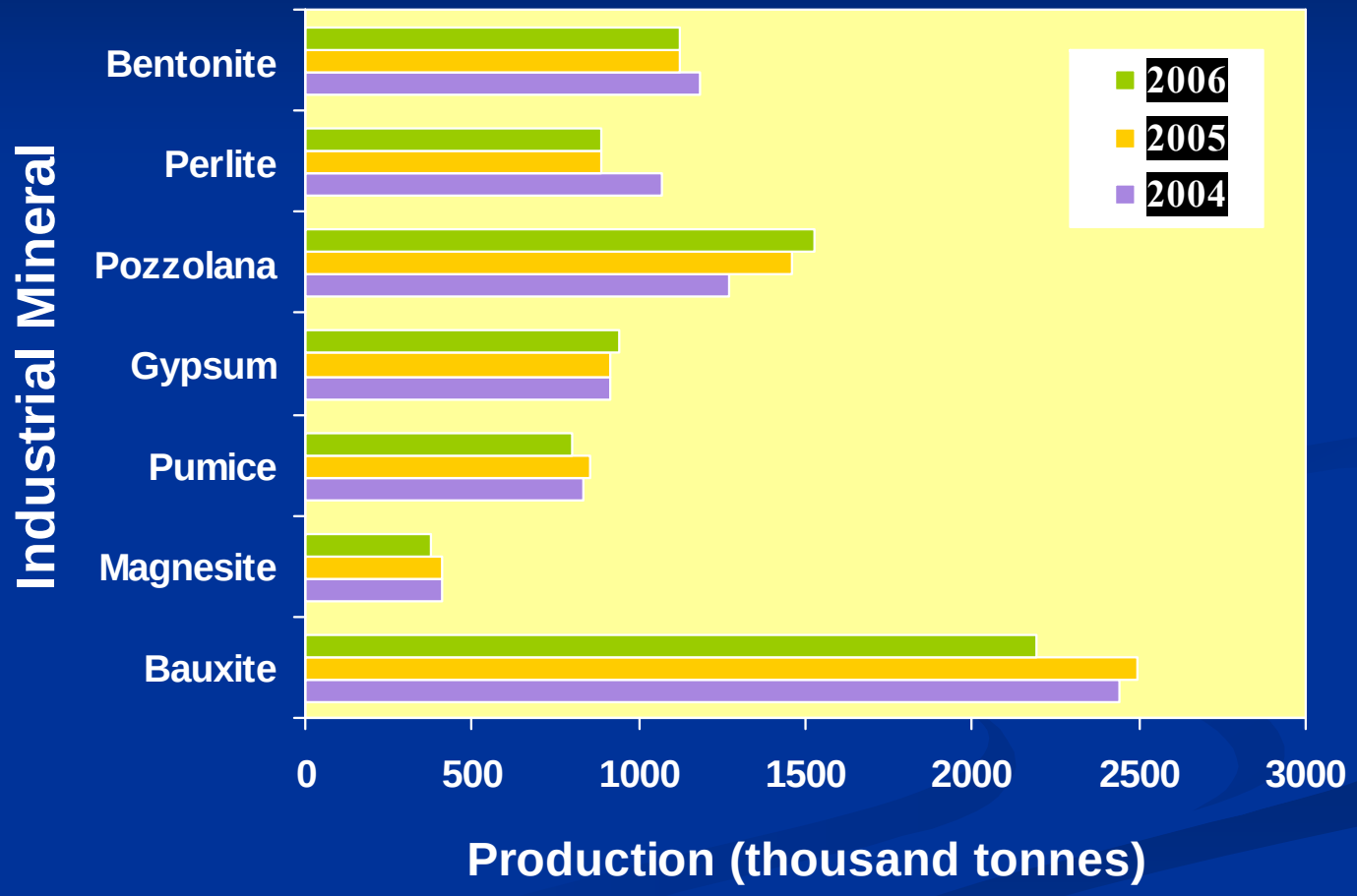




Sustainability Indicators for the mining sector
(based on Azapagic, 2004)

3. GREEK INDUSTRIAL MINERALS' SECTOR TOWARDS SD

- The mining and metallurgical sector in Greece covers a wide range of mineral commodities



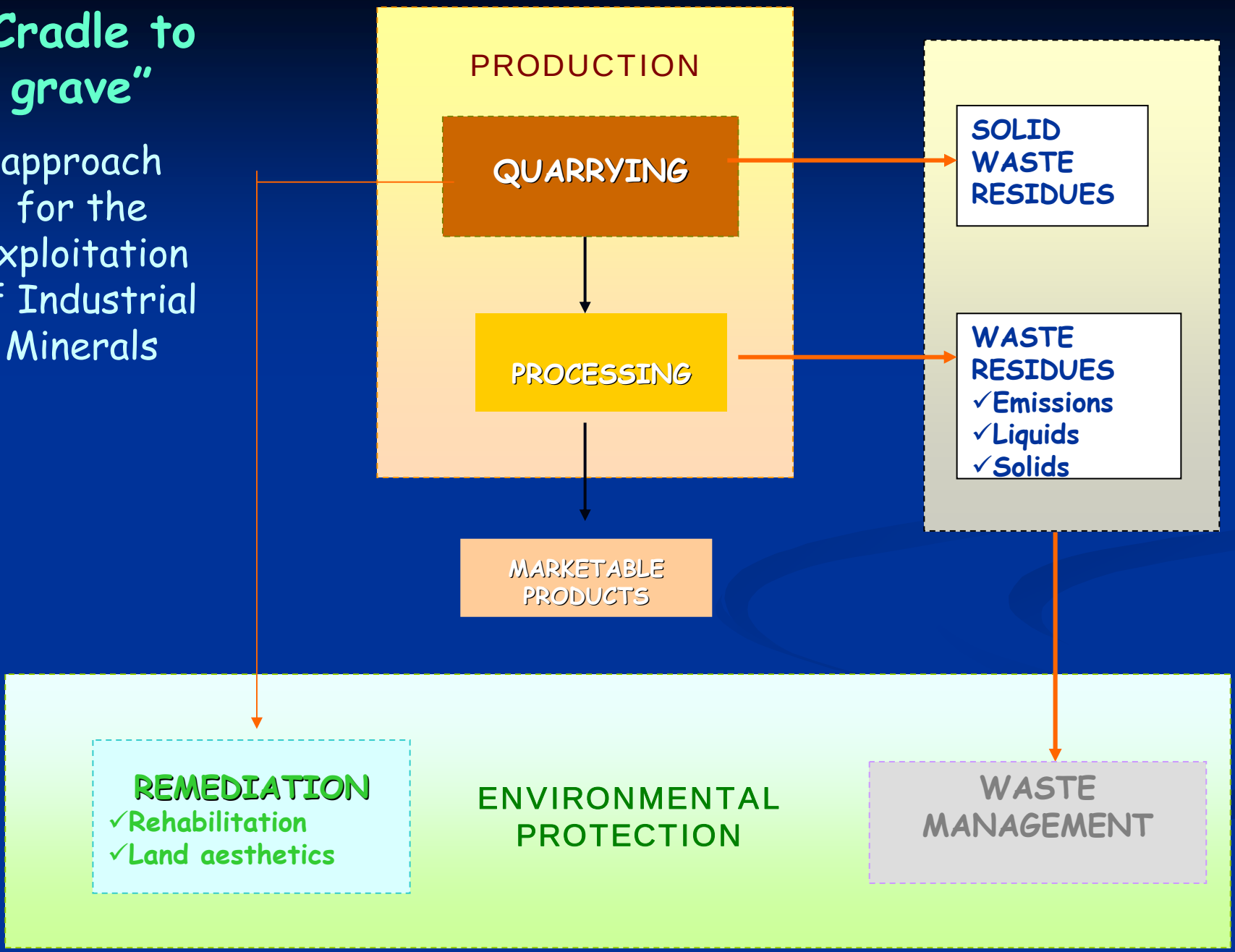
Source 2006 annual review GMEA

Key players in the Greek Industrial Minerals Sector

Mining Company	Major Commodities
S&B Industrial Minerals S.A.	Bentonite, Perlite, Bauxite, Vollastonite
Grecian Magnesite S.A.	Magnesite, Caustic Magnesia, Dead burned Magnesia
Dionyssos Marbles Ltd.	Marble, Ornamental Stones, Various fillers
Lava Mining and Quarrying Co S.A	Pumice, Pozzolane, Gypsum, Quartz
Mevior S.A.	Feldspar
Elvior S.A.	Quartz
Ionian Kalk S.A.	Calcium carbonate /filler grade, Talk, Dolomite
Microfill – K.Zafranas S.A.	Various fillers
Possehl S.A.	Filler products, Refractories
Geohellas S.A.	Attapulgite
Interbeton Construction Materials S.A.	Kaolin, Pozzolane

"Cradle to grave"

approach for the exploitation of Industrial Minerals



SDIs for the Greek Industrial Minerals' Sector

- Greek Mining Enterprises Association announced in 2006 its commitment to embrace and apply the 'Code of Principles for Sustainable Development' and agreed to work actively towards continuous improvement in economic, environmental and social performance. Furthermore, it proposed a set of SDIs for the measurement and the assessment of the performance of the sector as a whole
- an effort is made in this paper to develop SDIs tailored for the Greek Industrial Minerals Sector due to its importance for the national economy. The development of SDIs is based on a holistic approach 'from cradle to grave'

Appropriate SDIs for the Greek Industrial Minerals Industry

Indicators measuring:	Units	SDIs proposed by: GMEA	Authors
1. Employment		▲	
a. Average number of people directly employed	Full time Equivalent	●	
b. Average number of people indirectly employed (including contractors)	Full time Equivalent	●	
c. Total number of hours worked (including a and b)	Hours Number	●	
d. Creation of new workplaces			●

2. Development of Skills

a. Total number of training hours	Hours
b. Training in innovative production & waste management techniques per year	Hours per employee or %

3. Health and Safety of employees		▲
a. Number of working hours lost per year due to accidents	Number	●
b. Number of hours of training in Health & Safety	Number	●
c. Number of fatalities	Number	●
d. Frequency indicator for employees under supervision	Number	●
e. Seriousness indicator for employees under supervision	Number	●
f. Number of employees that are periodically under medical supervision	Number	●
g. Number of accidents (fatalities) per e.g 100 workers or 1000 t of final product per year	%	●
h. Lost working hours per t of final product per year	Hours/ton	●

4. Total turnover & production

a. Total turnover	Million €
b. Production of marketable product	tonnes
c. Daily production per employee	tonnes/employee
d. Increase of annual income in nearby areas	%

5. Exploration costs

a. Total exploration costs	Million €
b. R&D cost as % of turnover per year	%

6. Communication with the local community

a. Number of public events - "open days"	Number
b. Number of pupils/students visited the plant	Number
c. Number of trained students	Number
d. Resources available to the local community (infrastructure, unions, support, awards etc)	000 €
e. Resources available to the wider community (same as d)	000 €
f. Public acceptance	%

7. Energy Demand		▲		
a. Total energy consumption or per tonne of final product	MJ or MJ/t	●		
b. Reduction in energy consumption over a given period (e.g 3 years)	%			●
c. Increase in the use of green energy over a given period (e.g 3 years)	%			●
8. Water Demand		▲		
a. Total net water consumption (or water consumption per t of final product)	000 m3 (m3/t)	●		
b. Water consumption during production	000 m3		●	
c. Water consumption during environmental rehabilitation	000 m3 /he			●

9. Waste Management

a. Wastes from mining activities the current year	tonnes	●		▲
b. Wastes from mining activities used for backfilling	tonnes	●		
c. Volume of (hazardous) wastes produced	m3			●
d. Volume of (hazardous) wastes produced per t of product	m3/t			●
e. Volume of wastes recycled or/and used as added value material per t of product	m3/t			●
f. Volume of greenhouse gases produced	m3			●
g. Volume of greenhouse gases produced per t of product	m3/t			●
h. Recycled water used per total water consumption	%			●

10. Land Demand – Environmental Rehabilitation

a. Total land in use for deposit exploitation at the end of the calendar year (rehabilitated surface is excluded)	hectares	●
b. Total new land for deposit exploitation the current year	hectares	●
c. Total land surface returned to beneficial use or rehabilitated by planting trees	hectares	●
d. Total land surface recreated (e.g. golf courses, open theatres etc)	hectares	●
e. Number of planted trees per unit (e.g hectare)	Number	●
f. Cost for rehabilitation of mines and protection of the environment	000 €	●

11. Use of dangerous substances		▲	
a. Quantity of classified dangerous substances used in the production process (lubricants are excluded) according to the Directive 67/548/EEC	tonnes	●	
b. Increase in the use of environmental friendly reagents over a given period	%		●

4. CONCLUSIONS

- Greece's mining and mineral industry is engaged to take part in the debate of sustainable development. The Industrial Minerals sub-sector plays a significant role
- In order to measure and assess sustainability for the sector, SDIs have been seen as the predominant tool.
- For the case of Greece, in 2006 GMEA proposed a set of ten groups of SDIs for the assessment of mining operations.
- Additional SDIs were introduced and a new grouping was proposed aiming at enhancing the existing SDIs system and improving environmental, social and economic performance looking to increase competitiveness and credibly of the sector in the global market.

Thank you for your attention