



The Association of Geological Surveys of the European Union
(EuroGeoSurveys)
in their position as
custodians to their national natural resources
and
guardians of their terrestrial environment
present their contribution

Minerals in Europe: the risks of outsourcing

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1. Introduction: Minerals as items of daily use

Most people are unaware of the important role which **mineral resources** and the finished products made from them play in daily life - most of these products are derived and thus not readily recognisable as materials of mineral origin. The **houses** we live in are built of **sand, gravel, cement, bricks, tiles and glass**, all of which are derived from naturally occurring Earth materials. **Cars, trains, ships and aircraft**, like **factory production lines, household appliances, electronic goods and computers** are made up from many different **metals**. The **roads** we drive on are built with material derived from the Earth. Many other products used in daily life, such as **food, cosmetics, medicines, chinaware, ceramic goods, toothpaste, paper, paint and fertilisers** also include minerals as essential ingredients. During an average 70 year lifetime everyone in Western Europe consumes about **460 tonnes of sand and gravel**, about **39 tonnes of steel, 100 tonnes of limestone**, and more than **360 tonnes of fuel** to heat houses, produce electricity or keep the car running (1). **Mining** is the only way to obtain these materials for home or industrial use.

Almost everyone has seen an open quarry from which natural stone or gravel is extracted. Some of the ores from which metals are produced can also be mined by open pit methods but most come from underground mines. To produce copper for **electrical purposes** the ore has to be brought to the surface, where it is processed, smelted and refined to produce the pure metal. Each step in such a production process needs **energy**, which is provided by **coal, oil, natural gas, hydropower or nuclear electricity**. These energy substances also are part of our mineral wealth and are produced by mining or subsurface drilling methods.

Minerals are a natural capital and bring benefits for the citizens of **Europe**. A healthy mineral industry contributes to the **economic growth** of European nations and provides permanent **employment** for many people - in the extractive industry as well as in manufacturing and other downstream activities.

2. The economic importance of mining in Europe:

Europeans consume one-third of world mineral resources and the mineral industry is vital to the European economy. The value of mineral production excluding energy raw materials in the EU exceeds several billion Euros annually. Most of this value is represented by natural aggregates (sand and gravel), crushed rock aggregates and other minerals used in the construction industry, but high-value minerals are also produced.

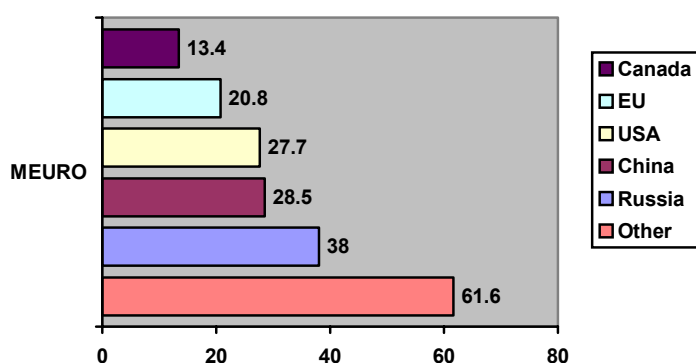
In spite of these facts, mining in Europe has not been considered a key issue by the EU institutions, although they have carried some studies in recent years.

In 1992 the Commission drafted the report "*Non-Energy mining industry: current situation and guidelines for a Community Approach*" (2). The text highlighted the recent evolution of the Industrial Minerals & Rocks (IM&R) mining sector in a global context. The EU has been particularly worried about the evolution of this mining sub-sector, aware of the important dependence of European industry on IM&R materials.

It is quite clear that in the 20th century a radical change took place in the global mining industry, not only due to the increase in the production and value of minerals, but also

because of the geographical displacement of production. Europe has maintained a leading role in transformation of metallic minerals and IM&R, but as time goes on it is more and more dependent on foreign sources, sometimes located in countries which have little or no political or cultural relation with Europe. This dependence on obtaining resources from countries that demand the rights to use their own resources to elaborate them in order to obtain a higher added value, results in a substantial political risk for the European economy.

WORLD MINING INDUSTRY PRODUCTION VALUE (METALLIC ORES & IM&R)



The 1992 Commission paper (2) gave a quick glance at the metallic ores and IM&R mining sectors in the world. The diagram below shows the distribution of the world production value estimated for those resources. And the total world mining production of non-energy materials was estimated as 190 000 MEURO. A more recent review made by the Instituto Tecnológico Geominero de España (3), based on information from the European Minerals Yearbook 1996-97 compiled by BRGM (4) shows trends in three main classes of mineral production in Europe: for **energy materials, metallic ores and industrial minerals** (Tables 1a, 1b, 1c).

TRENDS IN MINING PRODUCTION IN EUROPE

	1992	1993	1994	1995	1996p	Δ 96 / 92
1a: ENERGY MINERALS						
Coal (10 ³ t)	178 993	153 788	127 155	133 463	123 162	- 31,2 %
(%)	5,13	4,48	3,57	3,61	3,33	- 35,2
Lignite (10 ³ t)	315 747	294 448	278 170	264 435	258 651	- 18,1 %
(%)	30,62	30,01	29,28	28,07	27,03	- 11,7
Oil (Mt)	118,5	124,3	152,4	155,5	156,0	+ 31,6 %
(%)	3,72	3,91	4,72	4,76	4,64	+ 24,7
Natural Gas (Mtep)	149,6	160,4	162,0	169,5	191,8	+ 28,2 %
(%)	8,17	8,62	8,61	8,85	9,55	+ 16,8
Uranium (t U)	3 327	1 871	1 394	1 316	1 268	- 61,9 %
(%)	9,11	5,73	4,39	4,00	3,59	- 60,6

	1992	1993	1994	1995	1996p	Δ 96 / 92
1b: METALLIC ORES						
Aluminium (t bauxite)	2 286 643	2 446 798	2 348 089	2 058 000	2 000 000	- 12,5 %
(%)	2,08	2,17	2,17	1,88	1,80	- 13,5
Bismuth (t Bi)	20	0	0	0	0	- 100,0 %
(%)	0,55	0	0	0	0	- 100,0
Cadmium ⁽¹⁾ (t Cd)	6 028	5 877	5 357	6 023	5 820	- 3,4 %
(%)	28,84	30,61	28,80	30,19	29,39	+ 1,9

Zinc (t Zn)	706 980	618 052	579 425	577 931	509 500	- 27,9 %
(%)	9,86	9,19	8,36	8,28	7,05	- 28,5
Cobalt (t Co)	216	167	121	na	na	Na
(%)	0,75	0,72	0,60	Na	Na	na
Copper (t Cu)	267 808	260 050	229 045	250 065	229 306	- 14,3 %
(%)	2,80	2,70	2,35	2,48	2,09	- 25,3
Chromium (t mineral)	499 325	513 318	576 747	602 000	586 000	+ 17,3 %
(%)	4,53	5,47	6,00	4,81	5,45	+ 20,3
Tin (t Sn)	5 062	7 534	6 226	6 573	6 710	+ 32,5 %
(%)	2,81	4,13	3,36	3,47	3,26	+ 16,0
Iron (10 ³ t mineral)	29 756	26 378	26 224	26 910	26 045	- 12,5 %
(%)	3,20	2,82	2,65	2,65	2,59	- 19,0
Manganese (t Mn)	35 711	30 391	34 728	45 413	na	Na
(%)	0,44	0,37	0,46	0,60	Na	na
Mercury ⁽¹⁾ (t Hg)	110,9	761,7	482,3	1 593,6	950,2	+ 756,8 %
(%)	5,60	31,31	22,75	50,34	44,20	+ 688,2
Nickel (t Ni)	25 735	21 793	26 452	24 300	26 100	+ 1,4 %
(%)	2,80	2,35	2,95	2,36	2,47	- 11,8
Gold (kg Au)	17 455	16 217	18 012	16 533	17 163	- 1,7 %
(%)	0,77	0,72	0,80	0,75	0,75	- 2,7
Paladium (kg Pd)	107	121	96	100	na	Na
(%)	0,09	0,09	0,06	0,05	Na	na
Silver (t Ag)	565,2	539,5	548,4	498,4	510,0	- 9,7 %
(%)	3,94	4,04	3,97	3,34	3,33	- 15,5
Platinum (kg Pt)	54	51	37	50	na	Na
(%)	0,04	0,04	0,02	0,03	Na	na
Lead (t Pb)	230 680	222 859	226 154	213 647	189 300	- 17,9 %
(%)	7,44	7,95	8,25	7,86	6,70	- 9,9
Wolfram (kg WO ₃)	2 260	1 276	60	1 520	2 050	- 9,3 %
(%)	6,26	4,18	0,18	4,27	8,81	+ 8,79

(1) Metallurgical production

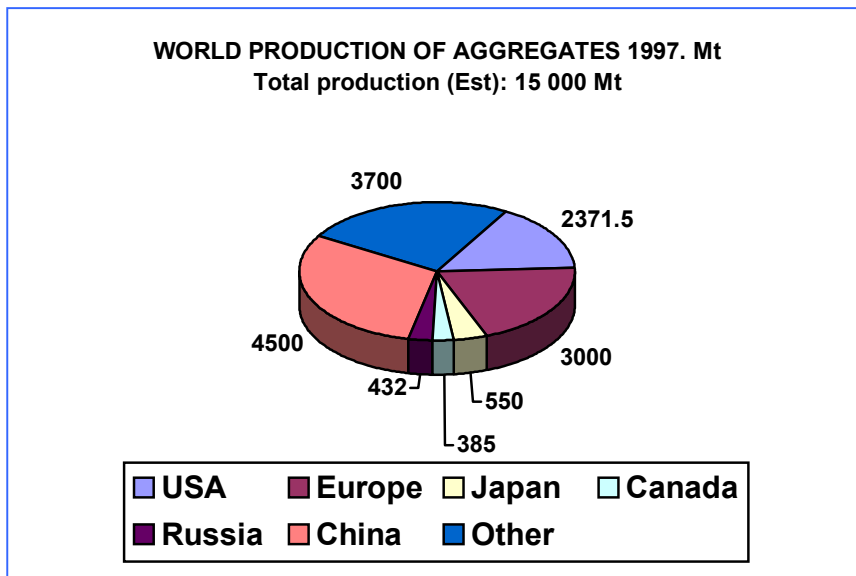
	1992	1993	1994	1995	1996	Δ 96 / 92
1c:INDUSTRIAL MINERALS						
Aluminium silicates (t)	52 000	46 000	46 000	46 000	81 050	+ 55,8 %
(%)	8,2	9,1	8,6	8,6	13,9	+ 69,5
Asbestos (t mineral)	28 592	56 948	55 502	75 000	78 000	+172,8 %
(%)	0,8	2,0	2,0	2,9	3,1	+ 277,4
Sulphur from pyrites (t S)	987 949	876 628	811 163	780 336	875 000	- 11,4 %
(%)	14,3	11,7	10,4	9,3	10,8	- 24,6
Barite (t mineral)	518 430	407 007	374 271	387 471	485 000	- 6,4 %
(%)	11,3	10,4	9,0	8,8	9,8	- 12,7
Bentonite (t)	1 495 056	1 647 077	1 750 346	1 895 155	1 855 545	+ 24,1 %
(%)	16,8	19,5	19,9	19,5	na	Na
Kaolín (t)	4 548 074	4 276 052	4 451 418	3 982 955	4 015 000	- 11,7 %
(%)	20,1	19,1	19,5	21,1	20,9	+ 4,0
Celestite (t mineral)	74 295	54 968	102 046	105 866	114 829	+ 54,5 %
(%)	25,6	17,7	24,3	23,4	24,8	- 3,2
Diatomite (t)	461 929	489 382	459 578	461 590	na	Na
(%)	29,4	32,6	31,9	30,8	Na	na
Feldspars (t)	2 443 131	2 556 021	3 008 049	3 572 682	3 651 495	+ 49,4 %
(%)	42,4	40,7	45,1	47,5	46,0	+ 8,5
Fluorite (t)	447 446	404 471	427 175	477 241	439 533	- 1,7 %
(%)	11,2	10,4	12,2	12,2	11,3	+ 0,9
Phosphates (kt)	555,0	627,6	646,6	671,2	500,0	- 9,9 %
(%)	0,4	0,5	0,5	0,5	0,3	- 11,8
Sodium sulphates (t NaSO ₄)	668 335	658 741	741 508	813 242	850 000	+ 27,2 %
(%)	30,5	27,4	30,4	29,8	32,1	+ 5,4
Graphite (t mineral)	25 749	8 583	16 693	17 233	Na	Na
(%)	3,8	1,3	2,5	2,5	Na	na
Lithium (t Li)	140	115	100	85	96	- 31,4 %
(%)	1,7	1,4	1,2	0,9	1,0	- 43,9
Magnesite (t mineral)	1 886 429	1 723 323	1 660 471	1 840 894	1 350 000	- 28,4 %
(%)	18,5	18,6	18,9	19,6	14,8	- 20,1
Mica (t)	7 081	5 840	11 797	22 623	Na	Na
(%)	3,2	2,7	5,2	8,9	Na	na
Pumice (kt)	7 272	6 704	7 874	7 352	7 135	- 1,9 %
(%)	65,3	62,4	69,1	67,4	67,0	+ 2,7
Potash (kt K ₂ O)	5 811	4 967	5 416	5 295	5 381	- 7,4 %
(%)	24,2	24,2	23,8	21,9	22,8	- 5,2
Salt (kt)	35 035	34 390	35 567	36 223	35 585	+ 1,5 %
(%)	20,2	19,6	19,7	20,1	19,4	- 3,6
Talc (t)	1 115 519	1 001 516	1 084 770	1 195 671	Na	Na
(%)	16,4	15,1	16,9	18,4	Na	Na
Fuller's earth (t)	1 615 749	1 593 294	1 567 907	1 400 000	Na	Na
(%)	37,2	36,1	34,8	31,8	Na	Na
Peat (kt)	16 617	14 548	19 792	18 154	Na	Na
(%)	11,2	10,4	14,2	13,4	Na	na

The statistics show that the European mineral economy is not well balanced and they outline a trend of continual reduction in coal, uranium and metallic mining in Europe. However they show a reasonably good economic outlook for several industrial (non-metallic) minerals. In some of these commodities, the EU holds a significant part of the world supply - well above 20% of the total world availability in 1996. For example **pumice** (67%), **feldspars** (46%), **natural sodium sulphate** (32,1%), **sepiolite-paligorskite** (around 32%), **diatomite** (around 31%), **celestite** (24,8%), **potash** (22,8%) and **kaolin** (20,9%), and over 10% in **aluminium silicates**, **bentonite**, **fluorite**, **magnesite**, **salt**, **talc** and **peat**.

The EU is not a major **metal** mining region but some new mines have opened - as indicated by the **Neves Corvo base metal** mine in Portugal and the **El Valle gold** mine in Spain.

The EU is also a significant producer of **industrial rocks (aggregates, gypsum, dimension stone, clay, cement raw materials, etc)**, and the mining subsector is by far the most important and active of all. The strong current growth of the construction industry will enhance the

results of this type of mining. Europe produces 20% (3000 Mt) of the total world **aggregates** production, which is estimated in 15 000 Mt with an average per capita consumption of 7,1t.



With regard to **dimension stone**, the EU produces almost 40% (21,7 Mt) of the global production, estimated at 55,2 Mt. The world market is based in EU countries, with Spain, Italy, Greece and France as the foremost stone producing (i.e. net exporting) area of the world.

Europe produces 250 mt of **cement**, almost 17% of the global production, and consumes around 400 mt of raw materials (limestone, clay, gypsum, etc) in the process. The EU also produces 21% (22,2 mt) of the total world production of **gypsum** (107 mt), used in plasters. Future income from industrial rocks is likely to rise steadily with the increasing need for new housing across the EU.

3. The effects of mining: The land-use dilemma

Obviously the processes used to obtain all the above-mentioned mineral products from the Earth have an impact on our **environment**.

However, modern mining can be carried out in an environmentally friendly way. Today, mining authorities and environment agencies keep a careful joint watch on each step of a new mining development scheme, allowing a new production process to go on stream only after a thorough environmental impact study has been carried out.

The impact exerted by mining on our environment is wrongly exaggerated. The statistics given below (Tables 2 and 3) show how the attitude of the general public to mining is based on the erroneous assumption that **adverse visual impact** is the same as **severe environmental impact**.

For example, In the Madrid capital region, a heavily populated part of Spain with many active mining operations, a recent survey estimated the following land-use distribution (5:Table 2):

Table 2

Land use	Surface (km ²)	%
Urban	918	11,4
Communication network	22	0,28
Natural spaces	1032	12,9
Mining	314	3,9
Agricultural/Forestry	4571	57.1
Other	1143	14.2
Total	8000	100

Source: (5 : Marchán, 1997)

Out of the 314 km² of the surface affected by mining exploitations, currently 40% have been subjected to reclaiming, thus the real surface affected by the quarries is in fact only 188 km² (2.35%).

In Germany, 1700 km² (0,5%) of the total land area is under planning permission for surface mineral extraction. However at present only 33 km² (0,01%) of the land is annually used for active mining. In England, the area of planning permissions for surface mineral workings in 1999 was about 0.7% of the total land area and about half of it had been restored in compliance with current sustainable development policies (6).

Currently available EU land use statistics show that most of the European land area is used for agricultural activities, which obviously represent a heavy impact on the original land. However although agriculture causes continuously damaging environmental effects such as soil contamination and water pollution the media regards them as “necessary” impacts which are of no interest.

Recent estimates cited by the European Environment Agency (7) indicate that the total land area affected in Europe by nitrate and pesticide pollution resulting from agriculture is 600 to 1200 times greater than that affected by mining-related pollution, as indicated in Table 3 below:

Table 3

Pollutant Source /type	Potentially contaminated area km ²	% land area of Europe affected	Source
Mining	15 000 –30 000	0.015-0,03	EEA (6:1995)
Nitrates	17 000 000	18%	Olderman & others in EEA (6:1995)

Pesticides	18 000 000	19%	
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It must be remembered that the EU is a net subsidiser of agriculture - most of the EU agricultural production is currently receiving subsidies from the Commission. Such products are being financially supported because they are economically uncompetitive. The EU is thus financing not only uneconomical projects, but also products that in many cases are overproduced, proving the fact that they are not needed by the European consumers.

This **subsidised overproduction by European farms consumes 80% of the available water resources** (surface and underground), thus resulting in an extraordinary waste of both financial and natural resources.

If we now compare the real impact in sustainable development of agriculture versus mining, we find that **mining adds more value and makes a greater contribution to rising real incomes and economic growth**, for smaller long-term environmental impact, than any other resource industry. **Mining produces long-term employment** and fixes population in mining areas which in many cases would not be able to support a growing community.

As an example, the global output of Rio Tinto, a world-wide operator, was in 1997 US\$ 7700 m, involving a disturbance of 45 000 ha, a ratio of 171 111 US\$/ha. Creating the equivalent output value from modern farming would require at least 13 m ha, meaning a ratio of 592 US\$/ha with all its attendant loss of biodiversity, use and contamination of water and requirements for intensive energy input (8).

5. The effects of outsourcing

The current 'pro-environment' anti-mining trend of public opinion, encouraging the adverse publicity due to rare mining accidents such as Aznalcollar (Spain) and Sasar (Romania), is **gradually driving the mining industry out of Europe**. The process usually starts at municipality level. Quarries are banned either directly by local regulations, or their operations are not favoured by administrative procedures. In wealthy municipalities **urban land produces much more direct income** and is thus regarded as a better option. Elsewhere, 'nature reserves' are declared over land with useful mineral resources. Underdeveloped municipalities, on the contrary, favour mining because it is seen as a seed for industrial development.

A similar scheme can be seen at federal, regional and national levels all around Europe. This 'not-in-my-back-yard' (NIMBY) policy has a strong environmental impact in return. It has been proved, for example, that in Germany the transportation of quarried material from one Länder to another causes higher environmental impact than that which it is intended to avoid. As aggregate is a bulk commodity of only low unit cost it is uneconomic to transport it over long distances, and the outsourcing policy thus represents increasing construction costs for the outsourcing community as well as a extremely high air, noise and traffic pollution, due to the additional numbers of trucks on the roads.

6. Conclusions:

6.1 Europe needs to maintain a healthy and sustainable mineral industry

The concept of sustainable development, resting on the three pillars of economics, environment and social development has become an increasingly important factor in the European mining sector and a major influence on the related policies of the European Union.

The present situation

Although the modern extractive industry (post 1960s) does not embrace the most polluting sectors of industry, it is viewed with a tarnished image by the media and public opinion. However, this image is mostly unjust and warped. Like any other industry, some types of mining activity may affect sectors such as tourism and culture detrimentally if the profitability of these sectors at European level depends on the preservation of high quality scenic and heritage resources. But it is also true that the approval, implementation and development of recent European Union environmental Directives has increasingly **limited the access of industry to essential geological resources**, which is disadvantageous because the geographical location of a geological deposit of high economic value is controlled by natural Earth processes and can not be chosen.

With regard to the sustainable development of the European mining sector, EuroGeoSurveys feels that the above factors have provoked an unbalance in favour of the environment pillar, which has forcibly increased the production costs even for those industries which have taken technological steps to minimise their environmental impact. This fact, associated with the recent slump of the metals market, has further accentuated the disequilibrium in the economics pillar (competitiveness) and has at times also threatened the social development pillar since in many places in Europe the mining sector is the only local employer.

6.2 A way forward

EuroGeoSurveys believes that a good practical application of these concepts will result from the development of a **European Metals and Minerals Mining Institute**, to be established as a virtual research and development institute which will link researchers and institutions from the European Union and Central and Eastern Europe. The creation of this type of dedicated network will help to achieve within the short to medium term a critical mass of experts capable of tackling three projects of the highest social relevance for the European Union and indeed the accession candidate countries:

1. The integration of considerations in order to plan for balanced mineral supply for the European Union into the **European Community's policy on land-use**, as laid down in the **European Spatial Development Perspective** (9) adopted by the Council of Ministers in February 1999.
2. The development of a **European Inventory** of abandoned mine sites and an assessment tool for establishing a priority list (controlled by environmental risk considerations) for remediation work, and the creation of an expert advice panel and examples of Best Available Technologies (BAT) for remediation.
3. The analysis of the environment, health and safety management systems which are currently available for the SMEs at work in the sector, the development of a model and the discussion of this model with SMEs.

6.3 The role of the European Geological Surveys

EuroGeoSurveys believes that its member Geological Survey organisations (GSOs) can play a pivotal role in the three pillars which support sustainable development because the GSOs meet the following criteria:

- Their staff have a high level of scientific competence and are objective and publicly accountable.
- They possess publicly accessible archived knowledge of geological and mining issues as well as the related environmental problems which in some cases has been accumulated and progressively updated over a century of continuous activity: this makes the GSOs a unique and impartial resource of information and knowledge.
- The archiving, organisation and management of GSO geological information corresponds to a very large dataset which has been progressively digitised and integrated in Geographical Information Systems (GIS) such as GEIXS which can now be accessed on the Internet.
- The GSOs have good technical and professional relations with industrial companies in the sector, based on the objective technical support which they provide or which has been derived from the GSOs' competencies.
- The GSOs have good international relations with similar GSOs and universities and mineral sector companies in countries that are in the forefront of mineral production - such as the USA, Canada, Australia, China and Russia.
- The GSOs have good knowledge of mining and environmental legislation and the accompanying conception and application of such legislation.

6.4 The contribution of EuroGeoSurveys

The EuroGeoSurveys member organisations can intervene in various activities related with the mining sector with the objective of sustaining the already mentioned pivotal role and know-how itemised above, aimed to provide practical benefits for the user groups once such groups have been identified:

- Actions related to the exploration, evaluation and economic valuation of European mineral resources.
- Actions related to the correct diagnosis of environmental problems related to abandoned mines and their recuperation.
- Actions related to land use planning from the mining industry and environmental agency perspectives.
- Awareness actions and technical support for the extractive industry in order to enable the adoption of "green" mining measures.
- Actions related to promoting mining tourism in a perspective of preservation, publicity and cultural valuation of assets as well as the environmental recuperation of the sites.
- Actions which contribute to balancing the triangle 'competitiveness, environment and social development' at the mining and environmental legislation level

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