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In its general organisation as in its realisation, this report is the fruit of a common work. It is mainly the synthesis of preparatory work carried out by subcontractor for each European Union country. We would like to acknowledge all participants and especially the following experts :

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GLOSSARY

Historical investigation, Historical review, Desk study, Records review: *collection and technical examination of existing and available information in order to identify the (probable) presence of hazardous product on a site, in conditions indicating that discharges do or have existed, or that there is risk of discharge into structures or the environment (soil, groundwater, surface water, air). The information to gather involves the activities (installations, processes, products, etc.), environmental management practices (discharges, waste, etc.), accidents or incidents (fires, explosions, loading/unloading, etc.). The reconstitution of the site history must be conducted by taking into account changes over time (uses and activities of the site and its surroundings, property limits).*

Geochemical anomaly: *high concentrations due to natural causes*

Aquifer*: permeable rock containing groundwater and sufficiently conductive to allow significant hydraulic flow and impoundment of appreciable quantities of water.*

Clay*: term designating a particle size fraction (all particles smaller than 2 µm), either a mineral (family of silicates in leaflets whose crystals are sometimes larger than 2 µm and having very special properties, in particular concerning the binding and exchange of ions), or a rock.*
Claystone: *very fine grained sedimentary or residual rock containing at least 50% clayey minerals.*

Authorisation to operate an installation, Plant permitting*: part of a written decision granting the right to operate all or a part of an installation under the stipulations imposed for the protection of the environment and public health*

Full use, Reopening (of a site)*: the possibility, based on available data and the state of knowledge at the time of the simplified risk assessment, of using a given site for one or several uses (residential, farming, commercial, industrial, etc.) uses with no additional investigations or special work.*

Background**:** ambient concentration of an element, a compound or a substance in a given medium. It takes into account natural concentrations (natural geochemical background) and those that may arise from human sources other than those of the site in question.

Target, receptor*: physical or environmental receptor and living beings (humans, fauna, flora, water, structures, etc.) exposed to the direct or indirect effects of a hazard or subjected to a risk.*

Climate*: fluctuating set of atmospheric conditions characterised by the states and changes in weather in a given spatial domain.*

Pollution, observation of*: determination of a state:*
(1) qualitative (e.g. strong odour, visual indication),
and/or (2) with respect to references (e.g. reference values).

Contamination*: abnormal presence of a substance in a medium which in turn may become a source or vector of pollution for the surrounding area (meaning applied to the management of potentially polluted sites). More generally: an increase in levels of trace elements resulting from human activity. This term does not judge the deleterious nature of this increase or the risk it may entail for humans or the ecosystem —analyses are required to define this.*

Contamination and anomaly: *refers only to the overall concentration of an element. This does not judge the physicochemical or biological availability of the trace elements.*

Waste, spoil*: excavated material.*

Landfill*: deposit or accumulation of waste. Currently, in France, this term is applied to three types of situation:*
- *deposits of inert waste,*
- *deposits of urban waste and assimilated ordinary industrial waste, regardless of their administrative situation (unauthorised, uncontrolled, authorised discharge),*

- *deposits of collective or private industrial waste related to a given industrial site (collective or internal).*

Waste, refuse*: any residue of a production or transformation process or from utilisation. Any substance, material, product or more generally any goods that have been or will be abandoned by their owner. Any substance or object whose owner is forced to discard. French regulations distinguish inert, ordinary (household and assimilated), and special industrial waste.*

Deposit (pile)*: accumulation of diverse products (raw materials, finished products, waste, etc) stored in the same place, in bulk or in containers*

Environmental audit*: action intended to prepare an inventory (assessment of impacts on the environment) and to propose objectives. The audit covers the totality of the following steps:*
- *acquisition of data on past activities and the present context,*
- *observation of effects (values taken by various relevant criteria),*
- *analysis of phenomena (endogenous, exogenous) related to the effects,*
- *analysis of the risks involved (extent of critical damage),*
- *recommendations for improvement, treatment or emergency and prevention measures.*

Domestic (tap) water*: water used by humans for domestic needs (cooking, toilets, bathroom, etc).*

Industrial water*: water used in an industrial plant (process water, cooling water).*

Run-off: *rainwater flowing over the surface of the ground.*

Liquid waste*: water having been used by man for his domestic or industrial activities.*

Surface waters: surficial fresh water (all stagnant and running water on the surface of the ground upstream from the fresh water limit), estuaries (transition zone at the mouth of a river between fresh and coastal waters) and coastal waters (water beyond a line of which every point is at a distance of one nautical mile beyond the closest point of the baseline used to measure the distance of territorial waters and which in the cases of watercourses extends to the outer limit of the estuary, if applicable).

Groundwater*: all water under the surface of the ground in the zone of saturation in direct contact with the soil (proposal for framework directive on water - COM project 97-49, 26 February 1997)*

Effluent*: liquid, processed or not, arising from urban waste systems, individual installations (septic tanks), industrial or agricultural activity, and that is discharged into the environment.*

Emission*: discjarge into a medium, from a source, of solid, liquid or gaseous substances, of radiation, or of various forms of energy.*

Waste audit*: In France, this audit is composed of three parts: (1) description of the current situation in the installation or in the company (waste production, management and disposal), (2) technical/economic examination of alternative solutions to reduce the flow of and residual harm from waste, (3) presentation and justification of the adopted choices.*

Preliminary investigation, Preliminary assessment: *preliminary investigation of a (potentially) polluted site aiming to:*
(1) identify the potential pollutions, even to observe the impact on human health and the environment, of past or present activities carried out on this site,
(2) obtain the essential information for implementing the simplified risk assessment and site classification methods to rank the intervention priorities.
Refer to the organisation flow diagram for the presentation of national policy concerning the management and rehabilitation of polluted sites and soils.

Risk assessment*: four-step process involving 1. identification of the hazardous potential of the substance(s), 2. determination of the dose–effect relationship, 3. assessment of the exposure, and 4. characterisation of the risks.*

***Operator**: any person or organisation that operates an installation, as well as that either holding or receiving authority for a determining economic power over it.*

***Natural geochemical background**: natural concentration of an element, a compound or a substance in a given medium, in the absence of any outside contribution such as from human activity.*

***Derelict land**: temporarily or definitively abandoned space following the cessation of an activity such as farming, ports, industrial, service, processing, military defence, storage, transport.*

***Heap, dump** the area where mine waste or spoil materials are disposed of or piled.*

***Impact**: effect of an action, such as a development, the mining of raw materials, etc., on a natural medium, organisms, an ecosystem, the countryside, etc.*

***Installation, plant**: technical unit within which one or several activities or processes are carried out.*

***Leaching**: the drawing of substances fixed on fine particles through soil layers by water.*

***Loam, silt**: term designating either a particle size fraction (individual particles between 2 and 50 µm in size) or unconsolidated deposits with sizes intermediate between sand and clay, of fluvial, lagoonal or eolian origin (in the last case generally called loess).*

***Lithology**: description of the composition of sediments or rocks, including physical and chemical characteristics such as colour, mineralogical composition, hardness and grain size.*

***Leaching:** movement of dissolved substances caused by percolation of water through a solid medium (soil, rock, tailings, etc).*

***Medium**: air, soil, water and biota (fauna, flora and micro-organisms).*

***Ore:** rock having a sufficiently high concentration of useful minerals for it to be considered as profitably extractable under reasonably imaginable economic conditions, or when it is present in sufficient quantity. By extension, a rock having a fairly high concentration of useful minerals for it to be mined at a given period of time. An ore may also contain minerals with no value that constitute the gangue.*

***Run of mine ore:** ore arriving at the start of the concentration process; this is generally at the entry of a plant (ore washing). In the past, initial operations could be carried out inside the mine by **cobbing (sorting)**, the resulting ore being called **cobbed ore**.*
In contrast, and more generally, we call "run of mine ore" the ore as it is extracted from the mine, i.e. a mixture of the ore itself and barren rock that could not be separated during mining.

***Groundwater**: underground water completely filling the pores of permeable rock (aquifer) such that there is always a water link between the pores. Groundwater is in opposition to the overlying unsaturated zone. Groundwater may be attributed several qualifications in terms of its origin (alluvial groundwater, etc.), its hydrodynamic conditions (captive or free groundwater, artesian, etc), or the characteristics of the water (saline, thermal, etc).*

***Guideline**: reference value for a parameter (concentration of a given element) given to assist in background studies or decision making. In general, it is a value recommended by an authority, but with no legal obligation, used (with professional judgement) when assessing a polluted site.*

***Waste list**: regulatory document for classifying waste according to a numerical code as a function if the waste's origin and category.*

***Standard**: technical specification approved by a recognised standards organisation for rational, repeated or continuous application, on the basis of current operational techniques, but which it is not mandatory to observe.*

***Permeability**: capacity of a medium to be traversed by a fluid under the action of a hydraulic gradient (difference in hydraulic head between two points of an aquifer per unit of distance, along a given direction); this permeability is reflected either by a rate of infiltration or by a coefficient of permeability to water, which*

depends on the degree of water saturation of the medium. Permeability is expressed as a volume of water per unit of time and per unit of surface, or more generally per unit of velocity.

***Piezometer, Observation well**: device used to measure a piezometric head at a given point of the aquifer, indicating the pressure at that point. It is used to observe or record a free-water or a pressure level.*

***Piezometric level (or piezometric surface)**: ideal surface represented by the distribution of hydraulic heads of groundwater with two-dimensional flow, or heads expressed on the basis of a determined surface. It is represented by a set of pressure head contours.*

***Pollutant:** product, substance or chemical element responsible for a pollution. We distinguish primary pollutants discharged directly into the natural milieu, and secondary pollutants arising from the degradation of the former.*

***Pollution:** when contamination presents potential risks, it is called pollution. In the literary sense, it is the action of dirtying or rendering improper (Petit Larousse dictionary). A less subjective definition is the degradation of a given medium or milieu by the introduction of a physical, chemical or biological agent (general meaning in the Petit Robet dictionary). Any (human) action contributing to the increase of the natural concentrations of elements naturally present in the different receptor media (water, soil air) that may have a (negative) impact on a medium (air, soil, subsoil, surface or ground water, ecosystem) or on a physical object, thereby rendering them unfit for a determined use.*

***Rehabilitation, remediation**: set of operations (redevelopment, pollution abatement treatment, resorption, institutional controls, etc.) carried out in order to render a site suitable for a given use. This operation includes both pollution abatement operations, and those of confinement and resorption of waste on a polluted site to enable a new use.*

***Fill**: material deposited as opposed to material in place (in situ). Volume constituted by this material.*

***Risk**: Probability that an unwanted effect occurs in given conditions of exposure.*

***Surface runoff**: portion of atmospheric precipitation (rain, snow) that flows on the surface of the ground and slopes.*

***Site**: a geographical area in which pollution of the environment may be encountered because of former activities carried out there.*

***Cobbing**: manual ore sorting.*

Abandoned mine site (Orphan mining site) **: site whose owner is unknown or insolvent (particularly as a result of the cost of work to be done to suppress observed risks). A site is recognised as being an 'orphan' by decision of the Ministries concerned (Environment, Industry) that may order surveys, treatments or any other type of action in order to control, as far as possible, the impact on public safety and health and on the environment.*

***Soil**: "Upper layer of the earth's crust composed of inorganic particles, organic matter, water, air and organisms" (according to the international draft standard ISO/TC 190 on soil quality).*
This draft standard also mentions that "in the context of soil protection, attention must be paid to the surface soil, subsoil and deeper layers, and to the mineral deposits associated with groundwater. Attention must also be paid to material resulting from human activity introduced on or in the soil, such as domestic or industrial waste, sludge, mud from watercourse cleaning and mining residues. These are important because they may affect certain functions of the soil and constitute a source of substances dangerous for the soil and affect surrounding natural soil. Pedologic processes may, in time, affect these man-made materials in the same way as natural parent rock and surface deposits ".

***Pedologic sense**: part of natural surficial formations subjected to pedologic processes and undergoing varying degrees of change in chemical composition and mineralogical constitution. The type of soil that will progressively form will depend on (1) the nature of the original parent rock (lithological conditions), (2) the nature of attacking reagents (physicochemical conditions), (3) the value of the parameters governing the thermodynamic equilibrium (thermohydral conditions).*

***Hydrogeological sense**: part of pedologic and lithologic formations between the surface and the groundwater (unsaturated zone), whose functions or use may be negatively affected by the supply of dangerous substances or pollutants.*

***Speciation**: definition of the chemical form or bearing phase in which an element is found (ionic form, molecular structure, physical combination, inorganic or organic support).*

***Substance**: see Product.*

***Transfer:** migration of substances, dissolved or otherwise, within, through or across a soil, caused by water, air and human activities, or else by soil organisms.*

***Waste heap, mine dump:** deposit of barren substances. Generally conical, and built up by periodic discharges.*

***Process unit, installation**: Unit including the equipment required to implement a process or a part of a process*

***Water use*:**
- *the catchment, distribution and consumption of surface or ground water,*
- *any other use of surface or ground water likely to have a perceptible influence on the ecological status of the water*

***Use (of a site)**: The use of a site, its equipment or building, to fulfil a need or a service.*

***Pollution vector, pollution pathway**: medium, organism, matter that is inorganic or organic, liquid or solid or gaseous, likely to transmit a polluting or infectious element towards a target, from a source of pollution, by way of identified transport processes.*

***Stock pile (ore), Waste dump (waste):** deposit of products whose upper part is flat.*

***Vulnerability**: capacity of a medium, property or person to be harmed following a natural or man-made event.*

***Groundwater vulnerability**: set of characteristics of an aquifer that determines the facility of access to and propagation within the reservoir of a substance considered as undesirable.*

Sheet no. : **Date of creation :…/…./……**
Sheet author :……. **Date of modification :…/…/…….**
Organization :…….

1.- MINE, QUARRY AND PROCESSING PLANT INVENTORY

1.1.- IDENTIFICATION :

CUSTOMARY SITE NAME :.....
SITE NUMBER: □ □ □ □ DISTRICT :……..

1.2.- LOCATION :

TOPOGRAPHIC MAP :..... Scale :.....Year of publication :.../…/….
UTM or ECSA: Coordinates (in km) : X : ..... Y : .....
Centroid altitude (in m) :.....

1.3.- STATUS :

APPROXIMATE AREA OF THE MINING CONCESSION :.....km^2

CURRENT OWNER :.....
LAST ORERATOR :.....

1.4.- ACTIVITY DETAILS

EXPLOITED COMMODITY:…….……..SITE IN ACTIVITY □
Date of start of activity :…..../……./……. SITE CLOSED □
Date of end of activity :……./……../……. RECLAIMED SITE □

TYPE OF ACTIVITY:
Surface mine □ Underground mine □ Mineral …….
processing plant □ Extractive metallurgy plant □ (At the Mine site Yes □ no □)

CATEGORY OF MINED COMMODITY :
Metallic □ Non -metallic □ Ferrous □ Non ferrous □
Coal □ Energy minerals □
Industrial Minerals □ Aggregates □ Decorative stones □
Run-of-mine annual production : …….(Ton/year)

PROCESSING TYPE:
Size reduction and/or classification □ Physical/Physicochemical separation □
Chemical treatment □ Smelting & Refining □
Other □:…….(specify)

PROCESSING FEED
Raw Ore □ Processed Ore □ Tailing □
TYPE OF FINAL PRODUCTS
Raw Ore □ Concentrate □
Metals □ Calcined Material □ Other □ ……..

STORAGE AND HANDING OF FINAL PRODUCTS:……

Sheet no. : **Date of creation :…/…./……**
Sheet author :…….. Date of modification :…/…/…….
Organization :…….

TYPE OF WASTE :

Barren overburden □ Barren rock □
Exploitation tailings □ Selected mineralized tailings □
Processing waste □

Type	Volume produced	Volume stored on site
……..……	……..	……
……..……	……..	……
……..……	……..	……
……..……	……..	……

Waste disposal/usage:
Dam □ stockpile □
Backfill □ Construction Purposes □ Other □……..(specify)
Was chemical characterization undertaken ? yes□
no □

Waste type	Detected pollutant elements	Concentration	Origine
……	…….	……...	…….
……	……..	……...	…….
……	……..	……...	…….
……	……..	……...	…….
……	……..	……...	…….
……	……..	……...	…….

Presence of leachates : yes □ treatment :……
no □
Chemical characterization yes □
no □
In accordance with discharge legislation : yes □
Environmental legislation : yes □ no □Mining legislation no □

CURRENT ACTIVITY (IF MINING SITE IS USED IN A NEW WAY):

Landfill
Public □
Internal□
Type of waste
Industrial □
Domestic □
Demolition □

Industrial site □
Type :…….
Other □
Specify :……
Rehabilitated □ Rehabilitation Project □
Specify :……..

ACCIDENTS

Date	Type	Known/suspected pollution	Affected environment	Impact on lines	Analyses
…/…/…	……	…….	…….	…….	…….
…/…/…	……	…….	…….	…….	…….
…/…/…	……	…….	…….	…….	…….
…/…/…	……	…….	…….	…….	…….

Measures taken :…….

Sheet no. : **Date of creation :…/…./……**
Sheet author :…….. Date of modification :…/…/…….
Organization :…….

1.5.- ENVIRONMENTAL SETTING

Air :

Dust source yes□ no□
Emissions yes□ no□

Surface water :

Streams yes □ no □ Distance (m) :…….Flowrate :……
Use : swimming □ pisciculture □ drinking water supply □
Irrigation □ Direct waste discharge : yes no
Not usable□

Groundwater

Presence of a groudwater body yes □ Control system yes □ no □
no □

Aquifer type :……..
Minimum depth :…….. amplitude :……..
Use : industrial supply □ drinking water supply□
Private wells □ Distance from the nearest catchwork :…….
Presence of preferential circulation (faults, fractures, karst, etc.)

Flood zone yes □
no □

Type of geological substratum :…….
Type of unsarated zone :…….

Housing zone Distance (m) :……

1.6.- ENVIRONMENTAL IMPACT

Present state of the wastes ……
Measures taken to prevent environmental hazards :……
……
studies already made on the environmental impacts of the wastes…… yes □ no □
Main results…….
…….

Security aspects ……
Geotechnical hazards □ Erosion □ Stability □
Environnemtal hazards □ specify ……

1.7.- BIBLIOGRAPHY

Sources of information :…….
Chronology of informationS :……
Other sources to be used :…….

Auteur :……
Organisme :……

2.- CURRENT LEGISLATION AND PRACTICES

1.- MAIN TEXTS
Mining code : yes □ no □ diffusion date :…/…/…
Specify :……
……
……
……

General laws concerning hazardous installations : yes □ no □ diffusion date :…/…/…
Principles :……
……
……
……
Advantages :……
……
Drawbacks :……
……
2.- SPECIFIC TEXTS yes □ no □
Specify :……
……
……

3.- GENERAL STATUS OF MINING SITES : IPPC :…..yes □ no□

4.- ADMINISTRATIVE RESPONSIBILITY :…….

5.- SPECIFIC STATUS OF MINING WASTE :……...

	Type	**Nature**
……	Industrial waste □	Waste suitable for unconditional release □
……	Industrial waste □	Waste suitable for unconditional release □
……	Industrial waste □	Waste suitable for unconditional release □

Control undertaken yes □ no□ Controlling organization :……

Collection :…..yes □ no□ Organization :…….Authority responsible ……
Transport : Organization :……. Authority responsible ……
Type :…….

Exploitation control yes □ no□ Organization ……
End of exploitation control yes □ no□ Organization…….
6.- CURRENT PRACTICES
……
……
……
7.- QUALITY CONTROL yes □ no □ specify……. Environmental Management System □

Operator/Administration voluntrary agreement yes□ no□

Annex 4 :Production of different industrial metals and minerals

1. Energy substances

a) Oil and gas

In 1997, world oil production, including crude oil and oil extracted from oil shales and tar sands, or recovered from natural gas, rising to nearly 3475 Mt, saw its sharpest growth in the last ten years (+3.1%). The European Union accounted for 9.4% of world production. Barely 2% of reserves (estimated worldwide at 140.9 Gt) are located in Europe (not including former USSR).

b) Coal and lignite

World production of coal-lignite rose slightly in 1997. The major producers include, in Europe, Germany with 223.5 Mt. These production tonnages, all grades combined, cover various situations in energy: lignite accounts for 80% of German production.

In terms of tonnage, 1997 world production was 3892 Mt of coal and 915 Mt of lignite corresponding to 2321 Mtoe (+2.5%). In energy value, the world share of the European Union was 12.2%. For the 15-member European Union, coal consumption fell from 281 Mt in 1995 to 269 Mt in 1996. In the same period, production dropped from 135 Mt to 128 Mt, due in particular to the decreases in France, Great Britain (48.5 Mt), Spain (26.5 Mt) and Germany (223.5 Mt) where company mergers are under way.

c) Uranium

World uranium production grew slightly (1.7%) in 1997 to 35,989 tU (35,381 t in 1996) but still only accounted for 55% of world consumption of nuclear reactors (70,000 t). In the European Union, France is the only country among the world's ten biggest producers, with 748 t in 1997, 20% below 1996. In France, however, the assays of the reserves are too low to withstand competition from other deposits. Despite exploration efforts in recent years, no producible reserve has been identified.

Primary energy

The acceleration of world primary energy consumption was confirmed in 1997. Among the ten biggest energy markets, the 15-member European Union has Germany (3.9%), France (2.8%), Great Britain (2.6%) and Italy (<2%).

European consumption fell slightly (1,782.2 Mtoe). Oil remains the primary source and accounts for 41.9% (746.9 Mtoe). The nuclear share is 13.7% (245.1 Mtoe). Coal consumption dropped from 17% to 15.9%.

2. Metallic ores

Iron-steel

World steel production was about 795 Mt, more than in 1996 (750 Mt). Stainless steel production grew more than 11%. Production of the 15-member European Union rose from

147 Mt in 1996 to 160 Mt in 1997. Prospects for the world iron and steel market are not very bright, due to overcapacity in Europe, among other factors.

In the 15-member European Union, the leading steel producing countries are Germany, Italy, Great Britain and France.

Nickel

World mining production of nickel (metal content) rose in 1997 to 1,086.8 kt (1,069.5 kt in 1996). In Europe, mining production declined slightly to 32 kt (36 kt in 1996), mainly from Greece (18.4 kt) and small plants in Finland (3.3 kt), Norway (2.5 kt) and Yugoslavia. Mining output of the European Union in 1996 was 150 kt of ore and 147 kt of nickel content.

Manganese

Manganese finds its main use in desulfurization and the manufacture of hard steels. This use represents 95% of world production. The battery, ferrite and agribusiness industries share the remaining 10%. Most of the mines are located outside Europe.

Aluminium

World bauxite production was about 126.4 Mt against 123.6 Mt in 1996. However, Europe supplied 6.8 Mt of primary aluminium. In 1996, the European Union slightly boosted its production of bauxite with 2,395 kt (2,342 kt in 1995) and aluminium with 2,097 kt (2,063 kt in 1995).

Magnesium

Magnesium in a minerallurgical substance. Total world magnesium production was 427,400 t in 1997 (404,400 t in 1996). Pechiney Electrometallurgy is now the European Union's only producer of primary magnesium.

Lead, zinc and copper

World mining output of **lead** was stable (3.05 Mt). The main producers in Europe are Sweden (108.6 kt), Poland (54.8 kt) and Ireland (45.1 kt).

Zinc mining output rose from 7.36 Mt of metal content in 1996 to 7.42 Mt in 1997. The European producers are Ireland (193 kt), Sweden (155 kt), Poland (158 kt) and Spain (147 kt).

World **copper** mining production reached 11,448 kt of metal content for 11,063 kt in 1996. The main producers are located outside Europe.

Gold

In 1997, world production continued its rise initiated in 1996. With 2,388 t, it grew more than 5% over 1996 (2,278 t). In the European Union, continental France produced 4,953 kg (against 5,655 kg in 1996).

Silver

World mining production continued to grow to 16,112 t (15,077 t in 1996). Only 22% of primary silver (3,533 t) is produced by silver mines, and the rest is obtained as a by-product. Europe produced 2,093 t.

3. Industrial minerals[i]

a) Barite

World production of barite grew sharply (14%) in 1997 to 6.83 Mt, compared with 5.98 Mt in 1996. The leading producer in Western Europe in Germany. The barite is used in drilling muds for petroleum exploration.

In Western Europe, production declined to 399 kt. The other European producers are Great Britain, France, Italy, Spain and Belgium. North Sea drilling operations accounted for a large share of the European market.

In 1996, the European Union produced 443 kt (428 kt in 1995) including 121 kt from Germany and 102 kt from Great Britain.

France and Belgium are among the few exporting countries of Western Europe.

b) Talc

World talc production rose in 1997 to 8.3 Mt. Finland and France are among the medium-scale producers (3 to 500 kt per year). Other significant countries include Italy. In 1996, production of the 15-member European Union dropped slightly (-1.7%) with a total of 1.12 Mt against 1.14 Mt in 1995. The paper industry, which remained stable, is the main consumer of talc. Demand from the rubber and cosmetics industries fell.

c) Sulphur

World sulphur production in 1997 was slightly over 57 Mt, just above the 1996 level (54.5 Mt). Non-elemental sulphur is obtained in the form of sulphur dioxide by roasting pyrite, as in Spain. The sulphur is mainly used in the form of sulfuric acid for the production of fertilisers. Note that the sulphur market and the phosphate market accordingly display similar trends.

d) Salt

With 197 Mt, world salt production in 1997 has been more or less stable since 1994. The large producers include Germany and France, as well as Great Britain. France produced 7.3 Mt.

e) Potash and bromine

World potash production rose to 25.4 Mt K2O in 1997 (23.2 Mt in 1996). Germany produced 3.4 Mt of potash in 1997. European production remained virtually unchanged in 1996, with increases in Germany, Great Britain (0.6 Mt) and Spain (0.6 Mt), and a drop in France. Production in the European Union in 1996 was 5552 kt.

World bromine production rose from 496 kt in 1996 to 519 kt. Significant producers included Great Britain, which processes seawater (28 kt).

f) Asphaltic limestone

The drop in production worldwide has continued steadily for more than 20 years. The tonnage of merchant products is now no more than 22.1 kt. Société Française des Asphaltes produced 18.26 kt.

g) Andalusite, disthene and sillimanite

Andalusite, disthene and sillimanite are three polymorphous minerals of anhydrous aluminosilicate, used exclusively in the refractory industry: iron and steel, foundry, cement, glass, ceramics, etc.

World production of these minerals has dropped sharply since the early 1990s. Since then, world production seems to have stabilised at around 450 kt/year.

Among these three minerals, **andalusite** is the most important with world production of 320 kt in 1997. France alone produced 67 kt. France has the only European deposit.

Production of **disthene** was stable at 130-150 kt/year. Spain is one of the big producers.

World production of **sillimanite** is very small and none is produced in Europe.

h) Diatomaceous earth

World production of diatomaceous earth has been about 1.5 Mt/year from 1993 to 1995. In the European Union, producers include France (230 kt), Denmark (95 kt) and Spain (40 kt). Our neighbouring countries import it: Germany with 5 kt, Italy with 4 kt and the United Kingdom with 3 kt.

i) Kaolin and kaolinitic clays

World kaolin production in 1995 was about 30 Mt, according to the European Minerals Yearbook 1997. Among the main producers are the United Kingdom with 2.65 Mt. Next comes Germany with 600 kt, France (350 kt) and Spain (300 kt).

j) Micas

Mica production in 1997 was about 225 kt, divided between 220 kt for waste and flakes and 5 kt of sheets. French production of flakes is estimated at 17 kt/year.

k) White carbonates for fillers

World production is very difficult to determine, since limestones are used for many purposes other than fillers (cement, lime, aggregates, etc.). The difficulties are identical in Europe: production can nonetheless be estimated at about 6 Mt in 1995, with Austria as the leading producer.

l) Feldspars, syenite, nephelinite, phonolite

World production of feldspars, syenites and phonolites is about 7 to 8 Mt/year. The leading producers include Italy (1,800 kt), France (600 kt) followed by Germany (375 kt) and Spain (225 kt).

Type of material or ore	Main minerals concerned	Main potential elements																											
		Ag	As	B	Ba	Bi	Br	Cd	Co	Cr	Cu	Hg	K	Li	Ni	Pb	Sb	Se	Sn	Sr	Te	Ti	Zn	N compound	Fluorides	Iodides	Chlorides	Phosphates	Sulfates	Other possibl elements
Arsenic ores	Arsenic Arsenopyrite Realgar Orpiment	X	X			X			X		X				X	X	X												X	Ni, Va
Nitrogren ores	Natronite																							X						
Group of borates	Borax Colemanite Boracite			X																							X			
Coal, Graphite	Pyrite, Mispickel		X																										X	
Group of chlorides	Rock salt Sylvine Carnallite Kaïnite						X						X											X		X	X		X	U, Rb, Cs,
Feldspars thoïdes	Sodalite																										X			
	Noseane, Haüyne, Lazurite																												X	
Quadratic feldspars	Certain wernerites																												X	

Table 1 Main potential elements in ores

Type of material or ore	Main minerals concerned	Main potential elements																														
		Ag	As	B	Ba	Bi	Br	Cd	Co	Cr	Cu	Hg	K	Li	Ni	Pb	Sb	Se	Sn	Sr	Te	Ti	Zn	N Compound	Fluorides	Iodides	Chlorides	Phosphates	Sulfates	Other possibl elements
Fluorine ores Lithium ores Phosphorus ores	Fluorine, Fryolite Amblygonite Apatite Sedimentary phosphat --													X											X X X			X X X		Miscell metals, U,
Sulfur ores Group of sulfates	Sulfur Alunite Pyrite and other sulfides Thenardite Glaserite Mirabilite Glauberite Polyhalite Anhydrite Gypsu Epsomite		X						X	X	X	X X X	X		X		X					X		X		X			X X	As, Se, Te, bitume Mo, V, W, miscella metals Pb, Cu, Sr, Ba, Ni, Co, Mn, Zn,
Zeolites				X	X							X	X							X				X	X		X			

Table 2 Main potential elements in ores (contd)

Type of material or ore	Main minerals concerned	Main potential elements																														
		Ag	As	B	Ba	Bi	Br	Cd	Co	Cr	Cu	Hg	K	Li	Ni	Pb	Sb	Se	Sn	Sr	Te	Ti	Zn	W	N Compound	Fluorides	Iodides	Chlorides	Phosphates	Sulfates	Other possibl elements
Antimony ores	Antimony Stibine Valentinite	X							X		X					X	X						X							X	
Silver ores	Native silver Argyrose, Polybasite, Pyrargyrite, Proustite, Céeargyrite	X	X			X	X				X	X				X	X						X					X		X	I, Se, Te,
Baryum ore	Barite				X																									X		
Berylliu ōre	Beryl													X																		Cs
Bismuth ore -	Bismuth Bismuthine Cosalite		X			X					X					X	X				X									X	
Chromiu ōre	Chromite									X													X								Mn,
Cobalt ore	Cobaltine		X						X		X				X	X	X													X	

Type of material or ore	Main minerals concerned	Main potential elements																														
		Ag	As	B	Ba	Bi	Br	Cd	Co	Cr	Cu	Hg	K	Li	Ni	Pb	Sb	Se	Sn	Sr	Te	Ti	Zn	W	N Compound	Fluorides	Iodides	Chlorides	Phosphates	Sulfates	Other possibl elements
Copper sulfide ores	Bournonite, Native copper, Grey coppers, Chalcopyrite Chalcosine, Enargite, Erubescite, Stannine	X	X			X					X	X			X	X	X		X				X							X	Ge
Copper oxide ores	Cuprite, Atacamite, Malachite										X												X					X			
Tin ore	Cassiterite																		X												Ta, Nb,
Iron ores	Native iron, Goethite, Limonites, Oligiste, Siderose								X		X											X							X	X	P, S,
	Magnetite									X					X							X									V, Mn
Iridium, osmium, and/or platinum ores	Native Iridosmine		X								X				X																Os, Ir, Pt, Pd, Rh,
Lithium ores	Amblygonite													X												X			X		

Table 4 Main potential elements in ores (contd)

Type of material or ore	Main minerals concerned	Main potential elements																											
		Ag	As	B	Ba	Bi	Br	Cd	Co	Cr	Cu	Hg	K	Li	Ni	Pb	Sb	Se	Sn	Sr	Te	Ti	Zn	W	N Compound	Fluorides	Iodides	Chlorides	Phosphates	Sulfates	Other possibl elements
Manganese ores	Pyrolusite, Psilomelane, Dialogite, Franklinite, Hausmanite, Braunite Wad				X				X		X		X	X	X	X							X							V
Mercury ore	Cinabar							X				X																X	X	Bitumens Se, Te,
Molybdenum ore	Molybdenite, Wulfenite															X								X					X	Mo
Nickel silicate ore	Garnierite														X															
Nickel sulfide ores	Pentlandite, Pyrrhotine Nickeline		X						X		X				X		X												X	
Nobium and tantalum ores	Tantalite, Columbite, Microlite, Pyrochlore																		X			X		X						Rare earths, U, Th, Pb
Gold ores	Or natif, Calaverite, Sylvanite	X	X			X					X					X	X		X											Rh, Ir, Te,

Table 5 Main potential elements in ores (contd)

Type of material or ore	Main minerals concerned	Main potential elements																										
		Ag	As	B	Ba	Bi	Br	Cd	Co	Cr	Cu	Hg	K	Li	Ni	Pb	Sb	Se	Sn	Sr	Te	Ti	Zn	W	N Compound	Fluorides	Iodides	Chlorides	Phosphates	Sulfates	Other possibl elements
Lead and zinc ores	Galena, Cerusite, Blende	X	X			X		X			X	X				X	X	X	X				X							X	
Strontium ore	Celestine Strontianite																			X										X	
Rare earth ores	Allanite, Baestnaesite, Monazite, Xenotime																												X		Rare earths, Th, U
Thorium, rad and/or uranium ores	Samarskite, Euxenite, Thorianite, Betafite, Pitchblend,															X			X			X									Rare earths, Ta, Nb,
	Chalcolite, Autunite, Carnotite		X		X						X		X			X													X		V
Titanium ore	Rutile									X									X			Ti									Cb, Ta, V
Tungsten ore	Scheelite Wolfram Wulfenite															X							X								Ta, Mo, Cb, Va
Vanadium ore	Vanadinite		X													X												X	X		

Table 6 Main potential elements in ores (contd)

Type of material or ore	Main minerals concerned	Main potential elements																												
		Ag	As	B	Ba	Bi	Br	Cd	Co	Cr	Cu	Hg	K	Li	Ni	Pb	Sb	Se	Sn	Sr	Te	Ti	Zn	W	N Compound	Fluorides	Iodides	Chlorides	Phosphates	Sulfates	Other possible elements
Zinc silicate ores	Calamine, Willemite																					X								
Zinc carbonate or oxide ore	Smithsonite, Zincite							X														X								In
Zirconiun ore	Zircon																													Rare earths

Table 7 Main potential elements in ores (end)

Catalogue of hydrogeologic contexts

Opening remarks: 1) For each hydrogeologic context presented in the sheets n° 1 to 16, the mentioned risks could be due to a deposit of waste (case a), and to the presence of polluted soils (case b). The term "soil" can also include part of the underground, possible embankments and waste on the surface.

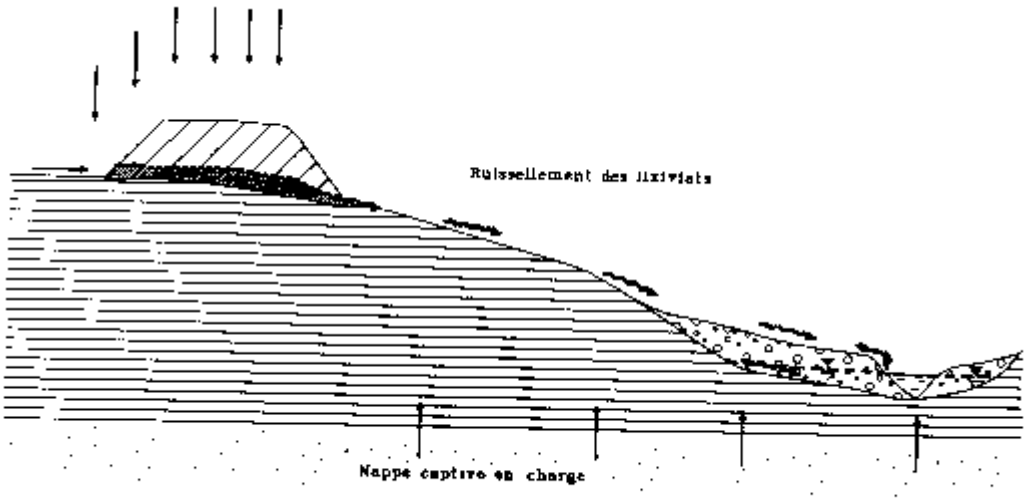
2) In the mediums which are slightly permeable, the principal way of migration of the pollutants is not the movement of water (convectif flow), but molecular diffusion (diffusive flow) due to the gradient of concentration on both sides of the passive isolation device.

A great thickness of the clay layer (under the bottom of a deposit) constitutes an optimal safety for the subjacent aquifers,

In all the contexts in the sheets n° 1, 2, 3, 4 and 7, it is recommended to verify the low permeability of the first underground layer, but also the thickness of clay between the bottom of the discharge (or of the polluted underground) and the highest piezometric level of the confined water table

SHEET N° 1

AERIAL DEPOSITT ON CLAY FORMATION



a) Meteoric water infiltrating in the heap of waste, generates leachates which will stream starting from the low point of the discharge.

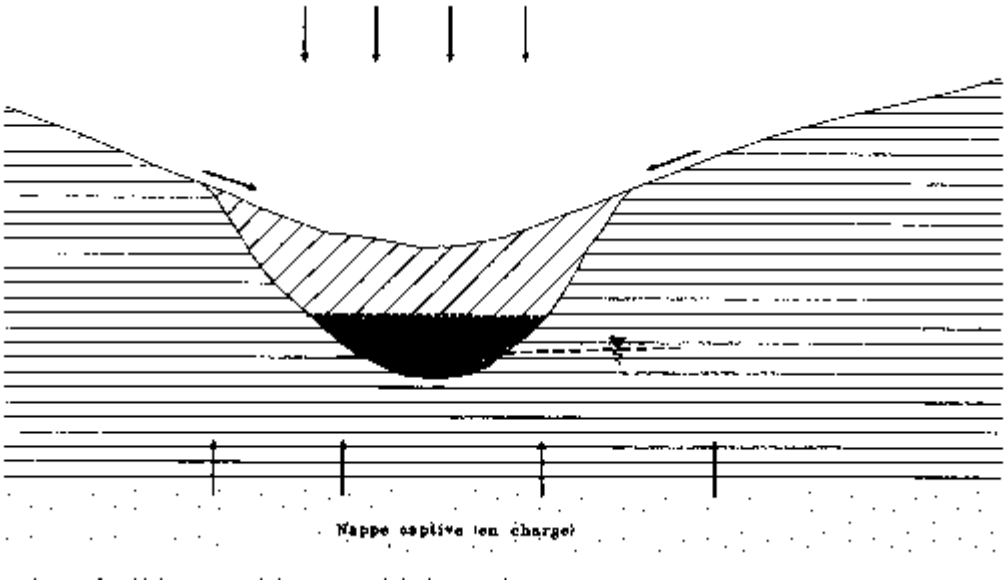
---> The risk is a possible pollution by surface stream of the nearest river and of the free alluvial water table which is associated.

---> The captive water table is a priori protected but it is necessary to take into account the molecular diffusion of the pollutants if the clay layer is not very thick.

b) A polluted soil, in the same context, can be gullied by stormy showers and carried towards the nearest river. The risk is the same one as previously.

SHEET N° 2

HIDDEN DEPOSIT (TOPOGRAPHY IN HOLLOW) IN AN CLAY FORMATION ON CONFINED WATER TABLE CONTAINED IN SOFT OR COMPACT ROCKS



a) The discharge receives meteoric water which will generate leachates, which will remain confined in the discharge**.**

---> The quantity of leachates can be increased by ascending, drainance if the piezometric level is at a higher level than the one of the bottom of the discharge.

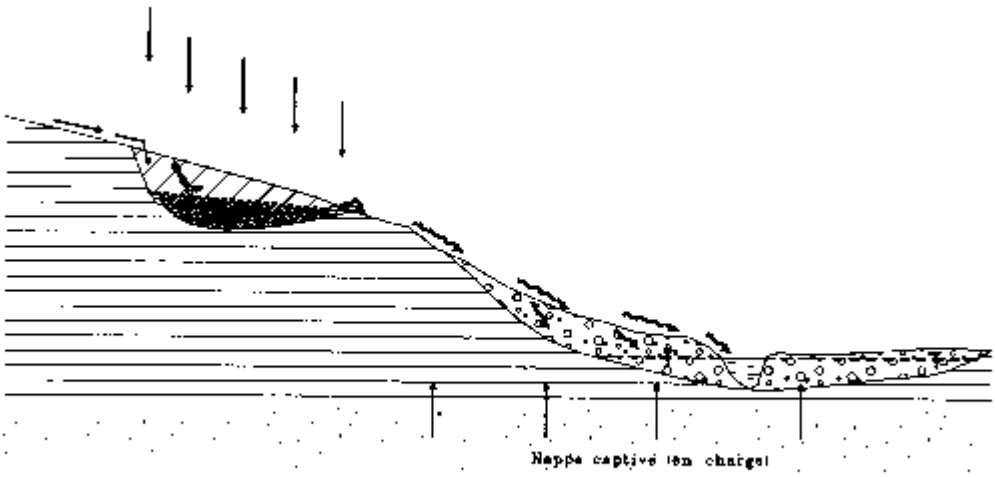
---> In rainy period, the leachates could completely fill the hole of the deposit and constitute an accessible polluted pond on the surface.

---> The confined water table is protected but it is necessary to take into account the molecular diffusion of the pollutants if the impermeable layer is not very thick.

b) A topography in hollow on a clay layer will allow the meteoric ponding. If the soils are polluted, there will be production of leachates whose accumulation will constitute, as in the previous case, an accessible polluted pond on the surface.

SHEET N° 3

HIDDEN DEPOSIT IN A CLAY FORMATION ON CONFINED WATER TABLE CONTAINED IN SOFT OR COMPACT ROCKS



a) Whatever the piezometric level of the confined water table is (i.e. the discharge is fed or not by the bottom, by vertical ascending drainance), leachates resulting from the infiltration of meteoric water in the deposit will stream on the surface starting from the low point of this one.

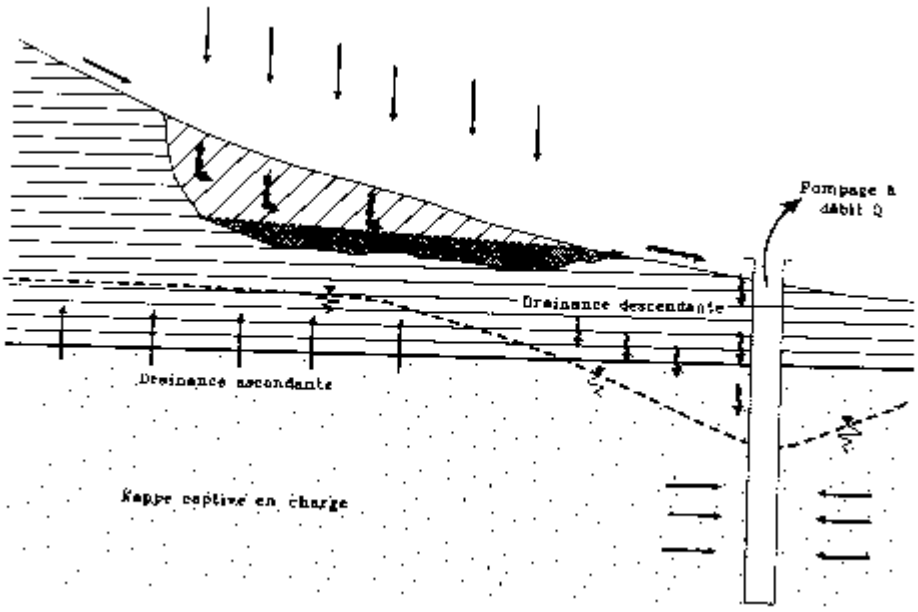
---> The risk is a possible pollution, by surface streams, of the nearest river and to the free alluvial water table which is associated.

---> The confined water table is protected but it is necessary to take into account the molecular diffusion of the pollutants if the impermeable layer is not very thick.

b) A polluted soil on a slope can, as in the case of the context n° 1, be gullied by stormy showers and be carried towards the nearest river. The risk is similar to the previous case (a).

SHEET N° 4

HIDDEN DEPOSIT IN AN CLAY FORMATION ON CONFINED WATER TABLE CONTAINED IN SOFT OR COMPACT ROCKS, UNDER INFLUENCE OF A CLOSE PUMPING



a) The risk of pollution of the confined water table can be considered in two ways:

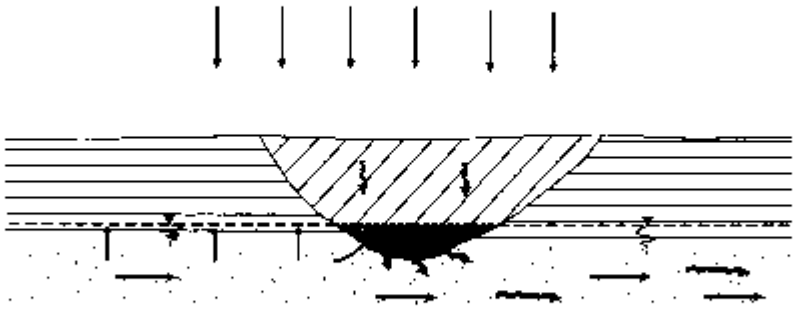
1. A bad sealing along the wall of drilling can allow the infiltration of pollutants from streamings of surface.

2. Pumping creates a folding of piezometric surface, the zone included in the cone can be related to a phenomenon of downward drainance which can allow the passage of some polluants through clays. This convectif flow may be added to a possible diffusive flow if the bed of clay is not very thick.

b) A polluted soil placed in the same context can be carried by streamings and to infiltrate along the wall of a defective drilling.

SHEET N° 5

HIDDEN DEPOSIT IN A NOT VERY THICK CLAY FORMATION ON A CONFINED WATER TABLE NOT SPOUTING OUT CONTAINED IN SOFT OR COMPACT ROCKS



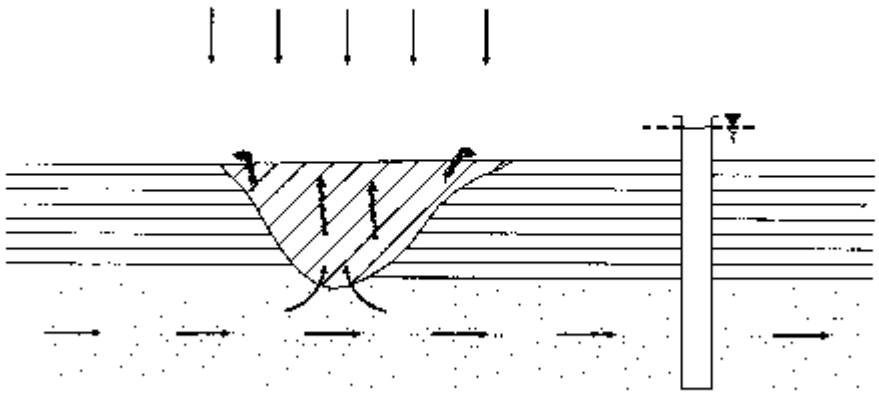
a) The bottom of the discharge"crossed the argillaceous layer ". The piezometric level of the water table, in charge, is just over the bottom of the discharge, which is in contact directly with the aquifer. The transfers can, in this case, be carried out directly without delay to the one from the other.

---> The risk is a possible pollution of the aquifer by the bottom of the discharge. The risk is similar to the one of the deposits hidden (whole or part) in a free aquifer (case n° 7 to 10).

b) A polluted soil in this context, on a clay layer would present the same case as the sheet n° 1. If the underground soil is also polluted, by filling material, roots of trees, the same risks as the previous case are present.

SHEET N° 6

HIDDEN DEPOSIT IN A NOT VERY THICK CLAY FORMATION ON A SPOUTING OUT CONFINED WATER TABLE CONTAINED IN SOFT OR COMPACT ROCKS



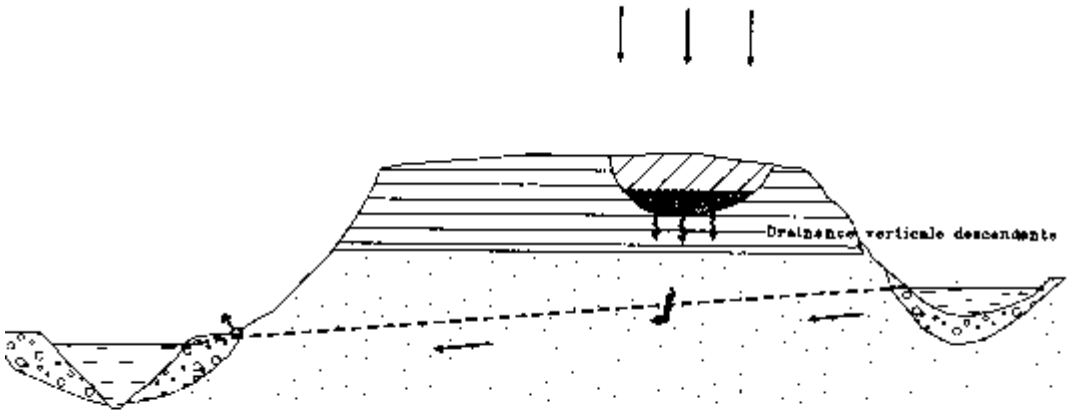
a) The bottom of the discharge crossed the clay layer. The water table can become, in the near future, in charge and of Artesian type spouting out. This case can be considered for the old mining fields which are reached at the same time by a phenomenon of subsidence because of collapse of the underground mines, and by the stop of pumping out which involves a general increase of the water table.

---> The risk is, in far future, an overflow on the surface and the constitution of polluted ponds. The risk is similar to the deposits hidden in a zone of resurgence (case n° 11...).

b) A polluted soil in this context can generate the same risks.

SHEET N° 7

HIDDEN DEPOSIT IN A THICK CLAY FORMATION ON A FREE WATER TABLE CONTAINED IN COMPACT OR SOFT ROCKS



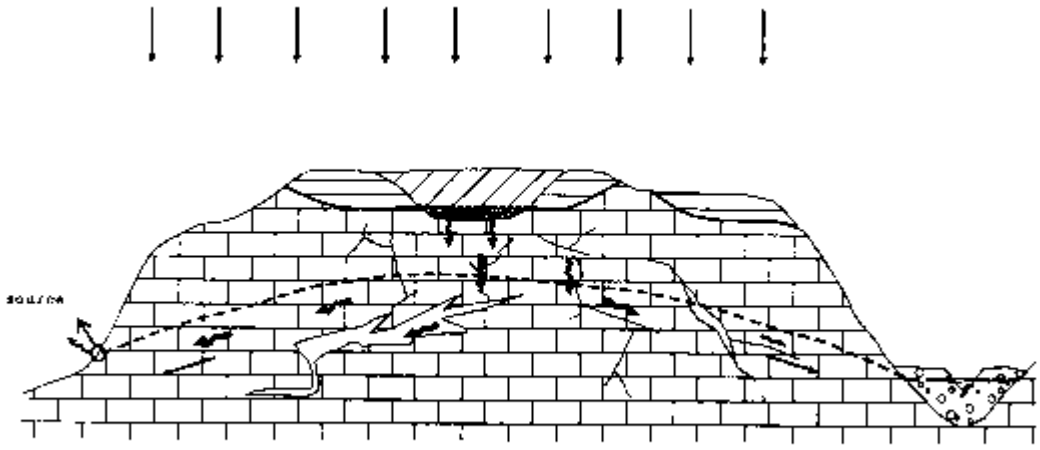
a) The discharge receives meteoric water which will generate leachates.
Some chemical substances contained in the deposit could cross over the clay layer remaining under the bottom of the deposit, by a phenomenon of downward drainance and reach the subjacent aquifer

---> The aquifer is initially protected.

---> According to the chemical nature of the substances contained in the deposit, thickness and permeability of layers constituting the bottom of the discharge, the subjacent aquifer could be polluted

b) A polluted soil in this context on the impermeable formation, would present the same case as the sheet n° 1. If the underground soil is also polluted, by filling materials, by roots of trees, the same risks as previous case (a) are present.

HIDDEN DEPOSIT IN A COMPACT AQUIFER, OR HIDDEN DEPOSIT IN A CLAY FORMATION NOT VERY THICK ON A FREE WATER TABLE CONTAINED IN COMPACT ROCKS



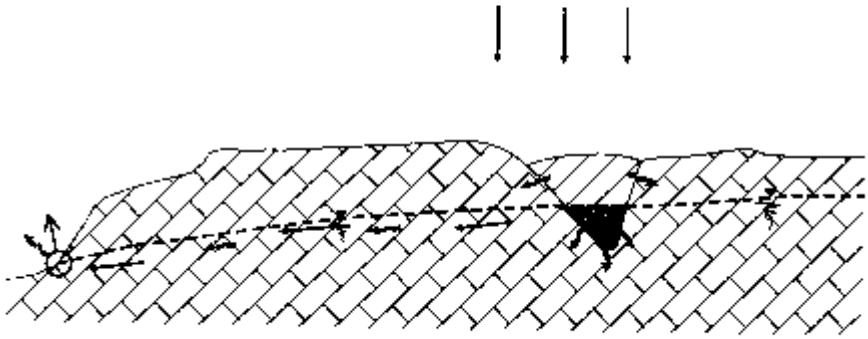
a) The bottom of the deposit crossed the impermeable layer in which it is hidden and is in contact with the subjacent aquiferous formations.

---> Whatever the karstic, fissured, porous subjacent medium, saturated or not saturated, it can be affected by infiltrations, through the bottom of the discharge, of leachates or of pollutants contained in the deposit.

---> The sources and surface aquifers supplied with this water table can be polluted.
---> In the event of total absence of clay, the infiltrations of leachates can also take place by the sides of the discharge (see sheet n° 9).

b) In this context, a polluted soil will present the same risks.

DEPOSIT EMBANKING A TOPOGRAPHY IN HOLLOW IN COMPACT OR SOFT ROCKS CONTAINING A FREE WATER TABLE (DOLINE, QUARRY, SMALL VALLEY)



a) The leachates and chemical substances can infiltrate through the breaks of the rock, even in the karstic media and pollute the underground water table.

---> The risk is a pollution of the free aquifer. The transfer of the pollutants will be faster since the underground medium will be strongly fissured.

b) Polluted soils in this context generate the same risks.

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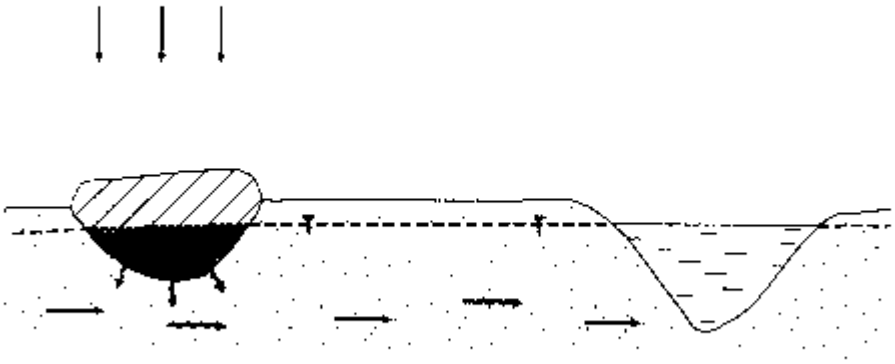
10/17

SHEET N° 10

AERIAL DEPOSIT OR HIDDEN DEPOSIT IN AN AQUIFER OF SOFT ROCK CONTAINING A FREE WATER TABLE



a) **--->** Whatever the depth of the piezometric level, the leachates or the pollutants can infiltrate through the water table. There are risks of pollution of the wells and the surface water

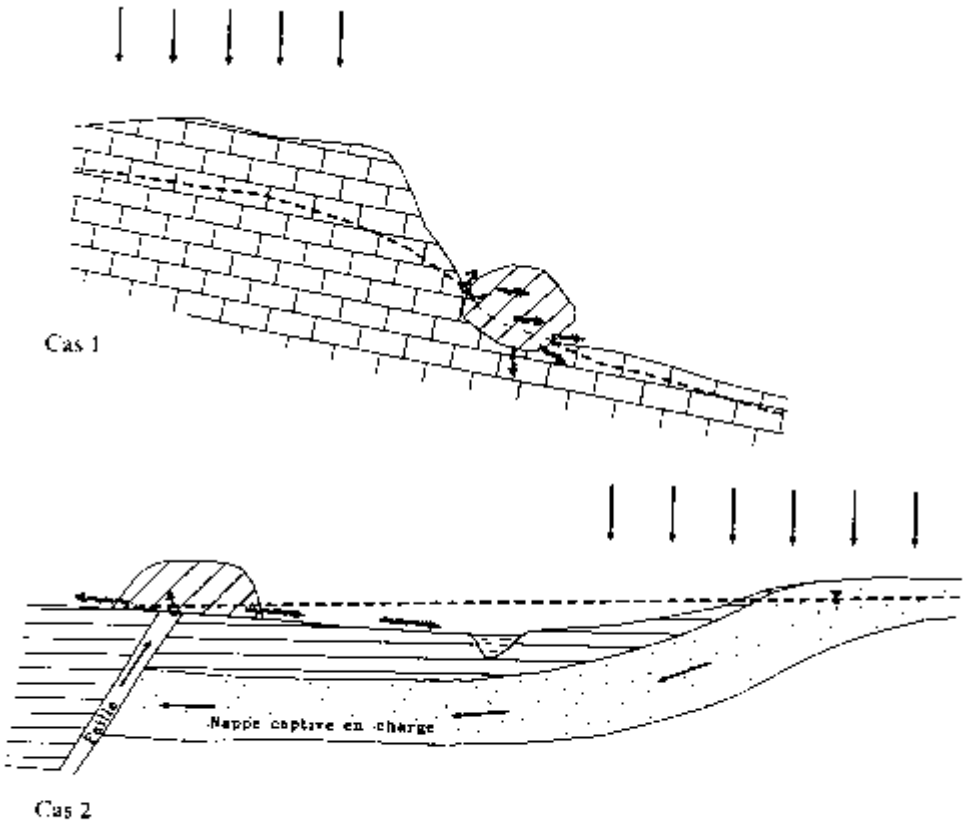
---> In the event of rising of the river, waste can be carried if the deposit is in the bed of the river.

b) Polluted soils in this context generate the same risks.

11/17

SHEET N° 11

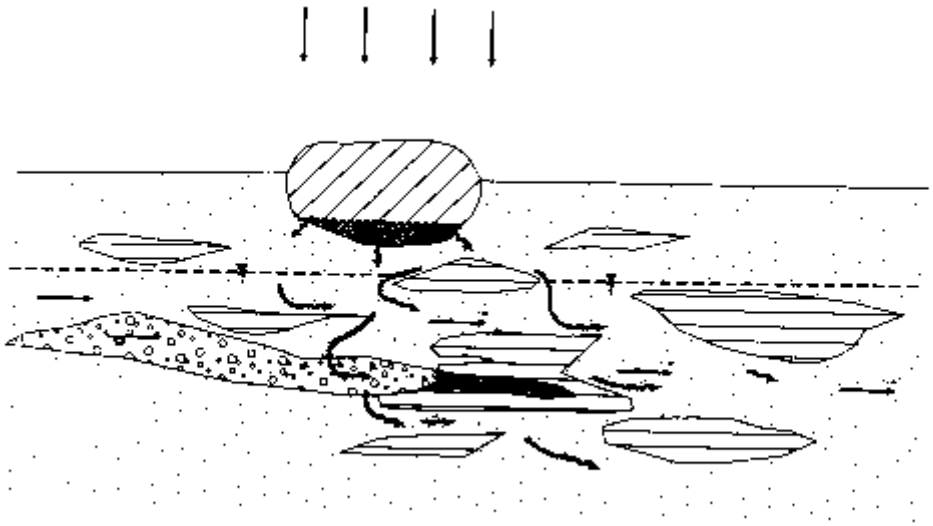
AERIAL DEPOSIT OR HIDDEN DEPOSIT ON A ZONE OF RESURGENCE (2 CASES)



a) The risk is a possible overflow of the leachates and streaming on the surface, in period of high waters.

b) Polluted soils located in this context will generate leachates, which will stream on the surface.

AERIAL DEPOSIT OR HIDDEN DEPOSIT IN A SOFT AND HETEROGENE AQUIFER



a) Case of the morraines and the heterogeneous alluvia with gravel-sand lenses (even of peats) frays to clay lenses.

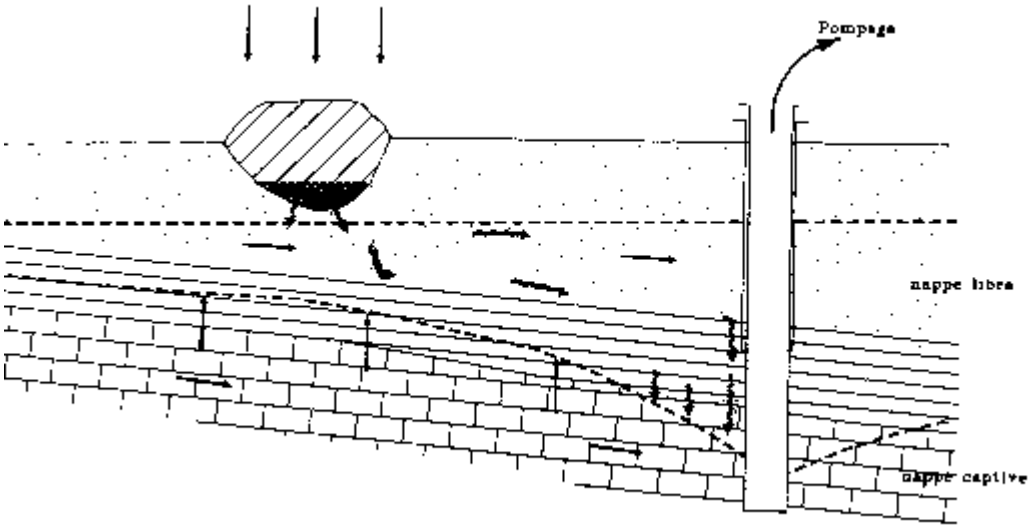
---> The leachates can reach the free water table. Polluted water (or not) circulates in preferential ways (beds with greater permeability).

b) Polluted soils located in this context can generate similar risks.

13/17

SHEET N° 13

AERIAL DEPOSIT OR HIDDEN DEPOSIT IN A FREE AQUIFERE SOFT OR COMPACTS, COVERING A CONFINED WATER TABLE UNDER INFLUENCE OF A CLOSE PUMPING



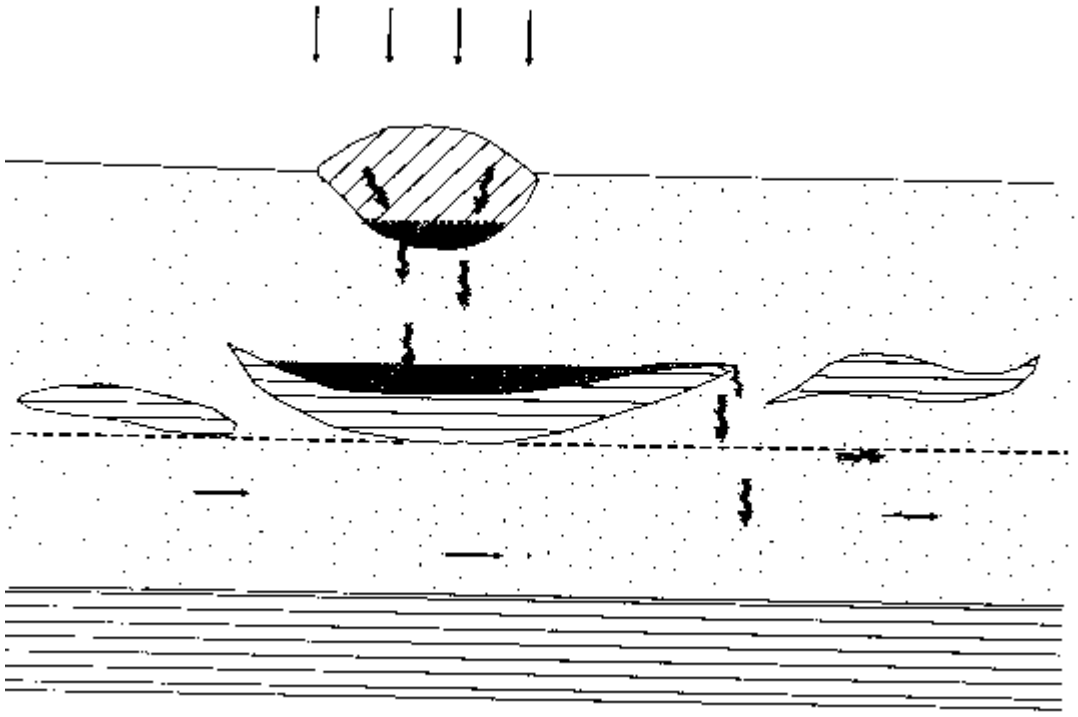
a) **--->** The upper free water table being polluted, there is a risk of pollution of the subjacent confined water table by downward drainance in the zone included in the cone, or by infiltration along the wall of drilling (this case is connected with the sheet n° 4).

b) Polluted soils in this context will generate similar risks.

14/17

SHEET N° 14

AERIAL DEPOSIT OR HIDDEN DEPOSIT IN A FREE PERCHED AQUIFER



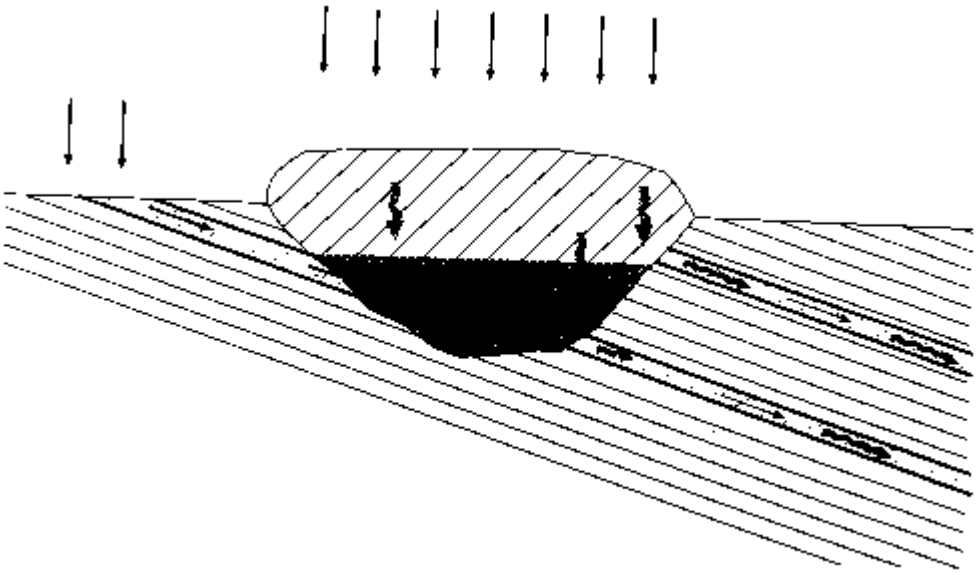
a) **--->** The leachates or polluting substances can remain trapped locally on clay lenses before polluting the free water table.

b) **--->** Polluted soils in this context will generate similar risks.

FICHE N° 15

AERIAL DEPOSIT OR HIDDEN DEPOSIT

IN CLAY FORMATIONS BUT WITH POROUS OR FISSURED ALTERNANCES



a) The case can apply to soft layers(clays with sandy lenses) or to compact layers clays" schists " with sandy benches.

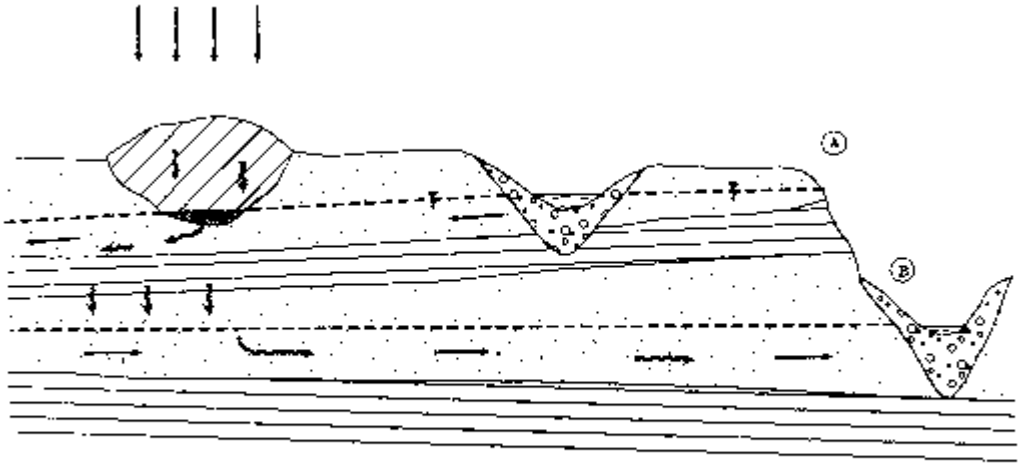
---> These porous benches, even not very thick, can play the part of drain for the leachates resulting from the deposit. The pollutants can, by this way, reach a spring or a well, if there is no discharge system, accumulate in these natural drains.

b) Polluted soils can generate similar risks.

16/17

SHEET N° 16

AERIAL DEPOSIT OR HIDDEN DEPOSIT IN AN AQUIFER WITH A FREE WATER TABLE COVERING ANOTHER FREE WATER TABLE



a) The two aquifers are free and they can flow or not, in the same direction.

---> Aquifer A is likely to be polluted directly by the leachate resulting from waste (same case as sheets n° 8, 9 and 10)

---> The aquifer B is likely, in the future, to be affected by some pollutants having crossed over the clay horizon bydownward drainance

b) Polluted soils located in the same context can generate the same risks.

EU COUNTRIES LEGISLATION ON MINING WASTE

a.Austria

In Austria materials deriving form exploration, mining, storage and processing of mineral raw materials (as far as these activities are subject of the "Mineralrohstoffgesetz-MinroG" = mineral raw material law) is governed by following laws:

"Abfallwirtschaftsgesetz" (Austrian waste law)
These materials deriving from mining are termed "barren rock" and are excluded from the purview of this law. This means that these materials are not part of the collective of wastes and are not considered as waste (i.e. are not subsumed under any waste statistics). As a consequence, all laws dealing with checking, handling, storage etc. of wastes are not applicable for these materials.

"Mineralrohstoffgesetz-MinroG" (mineral raw material law)
These materials are within the scope of the MinroG. Not usable materials deriving from mining operations (top soil removal, overburden, processing tailings, slimes, etc.) have to be deposited in dumps, tailing ponds, etc. or have to be used for technical and safety measures within the mining operation such as backfill. These deposit sites (dumps, ponds) are defined in MinroG as mining facilities. This means that for each of these facilities a permission has to be gained. Requirements for permission, in particular the procedure, the required documents and plans, preconditions, state of the art of measures, etc. are defined in § 119 des MinroG in detail. Beside the technical examination the authorities are obliged to make sure, that in respect of environmental issues no impairment beyond an acceptable level will occur (this is very well defined in the MinroG)

In respect of the environmental impact analysis of a mining facility the most dominant issues for the permission are:
- Existence of detailed description of the facility including maps and plans.
- Estimation of all expected emissions, proof that the best possible technology is used to avoid emissions
- evidence that there is no peril for the life and health and no unacceptable decrease of quality of life (encumbrance) for persons arises
- evidence that there is no peril for subjects not ceded for utilization exists and that no unacceptable impairment of environment and water occurs
- there is a democratic permission procedure, which involves property owners and neighbors and requires the statements of effected authorities and administrative bodies to be heard and considered. In case of a possible impairment of waters (rivers, etc.) or the water household hydrological expert opinions are required or even there could be the necessity of an additional permission by the relevant water administrative bodies.

If there are any doubts that the operation of the facility or the corresponding effects could be subject of change in long terms, the authorities are obliged to check and investigate the proper state and operation of this facility in regular intervals. In case of any inadequacies the rehabilitation and reconstruction of the facility has to be executed by order of the authorities.

If none-usable materials deriving from the mining operation are utilized as backfill for reasons of technical or safety requirements or for reasons of landscaping (reclamation,

reutilization), a comprehensive investigation of the environmental impacts of these measures is required. This has to be done within the “mine operation plan” or the “mine closure plan” as defined in MinroG. The most important issues in this respect are:

- thrifty and considerate usage of surface and warranty of sufficient measures for the safety and protection of the surface respectively.
- evidence of the best available technology used in order to avoid emissions (dust, noise, vibrations, water, air, etc.)
- evidence that – according to the current knowledge of the medical or other relevant sciences – no peril for the life and health and no unacceptable decrease of quality of life for persons is to be expected.
- evidence that no unacceptable impairment of environment and water is to be expected.

Additional preconditions are defined for mineral processing facilities (which have to be approved by a separate permission procedure) in accordance with the EU IPPC-directive (96/61/EG, 26.September 1996). Besides other this relates to the significant effects of emissions to the environment and the enumeration of planned measures to monitor the emissions

b. Belgium

Minerals are classified as either “mined” or “quarried substances”. Mined substances are of high value or national importance and include metalliferous and energy minerals. Both exploration and extraction rights to these are state owned. Quarried substances are defined in a residual way as « working which extract and make use of mineral or fossil substances contained within the earth or existing at its surface which are not classified as mines ». Rights to extract quarried materials belong to the owner of the land. The method of extraction (whether underground or open cast) does not therefore provide an indication of the legislative framework applicable to a particular mineral.

For legislation, it is necessary to comply with both specific mining or quarrying laws and land use planning legislation. Starting out from the same basic Zoning and Planning Act of 1962, the three regions have developed their own distinct planning laws. In both Flanders and Walloonia, the regional services responsible for protecting natural resources, cultural heritage, landscape and water are all be consulted, as are the authorities for controlling noise, dust and traffic.

Environmental and planning standards for individual mineral operations are largely controlled through attaching conditions to authorisations. In Walloonia, a document is entitled “Standar Operating Conditions for New Extraction Permits”. In Walloonia, minerals operations are monitored by the municipality, together with the regional Division of Prevention of Pollution and Management of the Subsoil, the Water Division and the Industrial Pollution Division. Emissions standards have been set. Quantities of dust must be restricted by taking appropriate measures such as reducing free fall heighs, dust extraction and water spraying. In Flanders, water protection zones are indicated in development plans and taken into consideration when determining applications. The same is true for the Wallon region, where a permit for water extraction is also required.

In the Wallon region, all backfilling of quarries with waste (of whatever nature, and including overburden) originating outside the operating site is subject to autorisation for the operation of a controlled dump under the decree of 5.7.85. The control of waste disposal is the

responsibility of the regional waste authority, which is part of the Department of Natural Resources.

To date, there are no powers in Belgium to ensure that the operator or other party (such as the landowner) manages a site once it has been restored.

c. Denmark

The first raw materials act was passed in 1972 in connection with the Danish accession to the European Common Market. In 1977 major changes of the act were introduced and Danish raw material production is now regulated by Act no. 237 of 8th June 1977 with later revisions that also regulates the exploration and exploitation of sea-floor deposits (Brix 1981).

The raw materials act does not regulate the exploration and exploitation of deep-seated subsurface deposits such as oil, natural gas and salt. In Denmark the she sub-surface is owned by the State, while the shallow deposits are the property of the individual landowners (Brix 1981).

The raw materials act pertain to near surface raw materials such as Quaternary deposits of clay, sand, gravel and peat, and shallow deposits of Pre-Quaternary rocks and sediments such as Precambrian granites, Jurassic quartz sands and fire-clay, Cretaceous and Tertiary limestone, diatomite and quarts sand.

The overall scope of the raw materials act is to assure that raw material planning and production is balanced against other planning needs and also takes into consideration various environmental and socio-economic aspects (Brix 1981).

Raw materials planning rests with the regional authorities (Amtskommune ~ County administration). The raw materials planning is published as separate sector plans that are revised every four years and incorporated into the overall land-use planning. In this way the needs for raw materials are balanced against the needs for water supply, for farming and forestry, urban development, nature conservation and environmental protection.

Permission for raw materials extraction is granted for a limited time and on specified conditions that among others will include that operations are carried out according to the stipulated detailed plans for the exploitation and after-treatment of the site. The licence holder will normally have to give security for the after-treatment. The annual production has to be reported to the authorities.

d. Finland

Mineral legislation and regulations are covered under the **Mining Act** (503/1965), the **Mining Decree** (663/1965), and **Amendments to the Mining Law** (1427/1992, 1625/1992, 474/1994, 208/1995, 561/1995, and 1076/1995), referred collectively as the Mining Law.

The mineral substances covered by the Mining Law include about 50 metals and 30 minerals, as well as gems, marble and soapstone. When the mining certificate has been issued, the concession holder has the right to process and utilize all the extractable minerals within the concession (*mining operations*). The right also includes waste remaining from previous excavation within the mining district.

Besides the extractable minerals, the concession holder may also utilize other material from the rock and soil to the extent required for the expedient running of the mining operations or processing connected thereto, or such material as are obtained as by-products and waste in the mining or processing of the extractable minerals. Any ***overburden***, ***gangue*** and ***processing sand*** which are stored within the concession or an auxiliary area and will be of service in mining operations or which can be further processed shall be taken to be mining by-products in the sense of this act (Amendment to the Mining Law 208/1995).

The environmental protection is not particularly taken into consideration in the Mining Law. However, an application for a mining concession must include an evaluation of environmental impacts (Amendment to the Mining Law 474/1994). After cessation of the mining work, the concession holder shall, without delay bring the district into condition required by public safety.

The Ministry of Trade and Industry is responsible for the development of the Mining Law. The revision of the Mining Law is currently under preparation.

The Waste Act (1072/1993) applies to waste, i.e., the prevention of its generation and the reduction of its hazardous or harmful properties. Additionally, it covers the promotion of waste recovery and any other activities related to waste management, the prevention of littering and soil contamination, and the cleaning of sites which have become littered or contaminated.

The Waste Act also includes sections for the organization of waste management, such as waste collection, transport, recovery and disposal, and on the prevention of waste generation and reduction of its quantity and harmfulness. The Council of State can issue general regulations on the organization of waste management. The Waste Act contains provisions on littering and soil contamination, prohibitions on littering and soil contamination and, for instance, the obligation to take action to clean up littered or contaminated areas. The Council of State can issue regulations on littering and soil contamination. A waste permit is required for the recovery or disposal of waste in a facility or on a commercial basis, and for the collection of hazardous waste on a commercial basis, and other operations of importance to waste management. The waste permit is processed in the order provided by the Environmental Permit Procedures Act.

The Health Protection Act (763/1995) presupposes that wastes are stored, collected, transported, treated and utilised in the manner that they cause no harm to public health. Activities, which may cause harm to health must a have a siting permit.

The Air Pollution Control Act (67/1982) came into force in 1982. An air permit is required for activities which may cause air pollution, these activities being specified in more detail in the Air Pollution Control Decree (716/1982). Applications for air permits are processed in accordance with the Environmental Permit Procedures Act. The Air Pollution Control Act also includes provisions for surveillance and monitoring.

The aim of the **Environmental Permit Procedures Act** (735/1991) is to harmonise the processing of certain permits pertaining to environmental protection, to intensify supervision and to speed up permit procedures. The environmental permit incorporates the siting decision of the Adjoining Properties Act, the siting permit of the Health Protection Act, the air permit of the Air Pollution Control Act and the waste permit of the Waste Act. The Environmental

Permit Procedures Act does not include water issues, which are regulated under the Water Act. The permit authorities are the Regional Environment Centres and the local environmental permit authorities. The act also covers permit procedure, permit consideration and supervision. More detailed provisions regarding the division of authority between the permit authorities and the processing of permit matters are stipulated in the Environmental Permit Procedures Decree (772/1992). The Environmental Permit Procedures Act and the Decree will be repealed when the new Environmental Protection Act enters into force in March 2000.

The Water Act (264/1961) was passed in 1961 and has since been revised several times. The act aims to control strictly the polluting, altering and damming of water bodies. Any activities likely to damage water bodies are subject to permit. Applications for permits are processed individually and permits are granted on terms laid down separately case by case. The new Environmental Protection Act will also cover water pollution.

The Act on Environmental Impact Assessment Procedure (EIA) (468/1994, 267/1999) came into force on 1 September 1994. Its aim is to further the assessment of environmental impact and the consistent consideration of this impact in planning and decision-making, and at the same time to increase the information available to citizens and their opportunities to participate in decision-making.The act is applied to projects where compliance with international agreements involving Finland requires assessment to be carried out, or which may have significant adverse environmental impacts on Finnish wildlife or other special features of the environment. The environmental impact of programmes, policies and plans by the authorities must be assessed and taken into account, which requires all spheres of government to re-assess their own operations.

Certain projects always require an EIA procedure. These include oil refineries, pulp, paper and board mills, large harbour projects, motorways and major hazardous waste disposal facilities. The procedure can also be applied in individual cases to a specific project or in the case of an essential change in an already completed project. In such cases, the Ministry of the Environment decides on the need for an EIA.

The Chemicals Act (744/1989) came into force in 1990. The act covers all chemicals, although it mainly focuses on chemicals hazardous to health and the environment. The enforcement of the Chemicals Act is the joint responsibility of the Ministry of Social Affairs and Health (health impacts of chemicals), the Ministry of the Environment (environmental impacts of chemicals) and the Ministry of Trade and Industry (industrial handling and storage of dangerous chemicals). The polluter is responsible to clean the buildings and the environment, so that there is no longer danger to helth or environment.

The Act on Compensation for Environmental Damage (737/1994) entered into force in 1995.

Conpensation is paid for a loss defined as an environmental damage. Damage can be caused by activities carried out in a certain area and can result from 1) pollution of water, air or soil; 2) noise, vibration, radiation, light, heat or smell, or 3) other similar nuisance. Compensation is also paid for environmental damage in accordance with this act if it is shown that there is a probable causal link between the activities and the loss. The responsible party will pay the costs of environmental damage to people or property, or economic losses. Additionally, the act requires compensation for the costs of reasonable measures taken to prevent or limit

environmental damage and for clean-up and restoration of the environment to its previous state.

The Environmental Damage Insurance Act (81/1998) came into force on 1 January 1999. This act guarantees full compensation for environmental damage in cases where those liable for compensation are insolvent, or the liable party cannot be identified. Thus, the act creates a complementary compensation scheme for environmental damage occurring in Finland. The act guarantees full compensation not only to those suffering from environmental damage, but it also covers the costs of measures taken to prevent or limit the damage and to restore the environment to its previous state. Among the EU countries, only Sweden has a similar system based on the Swedish Environmental Code. However, the new act is not retroactive. This means that it is applicable only to damage occurring after its entry into force. The scheme is financed by special insurance which is compulsory for the companies whose activities cause risk to the environment. All parties holding an environmental permit are obliged to take out insurance. The system is run by the insurance companies, which have established the Environmental Insurance Centre, handling all the claims for compensation under the new scheme.

A proposal for the new **Land Use and Building Act** was given to Parliament in August 1998. It contained a total revision of the existing Building Act (originally from 1958, with numerous amendments). The new act will come into force on 1 January 2000 . Amendments guiding the siting of commercial premises greater than 2000 m^2 and the Natura 2000 compansations already came into force on 1 March 1999. The overall goal of the new act is to promote sustainable community development and construction. The Mining Law will be revised to be in accordance with the new Land Use and Building act.

Regulation of the radiation practices is based on the **Radiation Act** (592/1991) . The act is aimed to prevent and limit the impact of radiation to helth, environment etc.

The proposed revision of environmental protection legislation will contain an **Act on the Protection of the Environment**. This act holds provisions for the protection of soil, water and air, which are now contained in separate acts. The purpose of the new act is to compile all the separate provisions under one act, i.e., the overriding principles, responsibilities and prohibitions, overall regulations and guidelines, environmental permits, notification procedures, compensations, supervision and monitoring, and appeals. The new act refers to the European Commission directive on Integrated Pollution Prevention and Control, known as the IPPC directive. The proposed act would implement those requirements in the IPPC directive not yet met in Finland‘s national legislation. The new legislation is expected to come into force in the beginning of March 2000.

A decree supplementing the act will hold more detailed regulations on activities and functions which require an environmental permit. Permits will be required for water-polluting activities and for professional or institutional waste treatment or recycling. The bulk of the permit-holding activities will continue under the previous legislation, providing that environmental protection requirements are fulfilled. This renewal would also mean less administration since the present permits required from any plant or activity will now be combined into one.

The Ministry of the Environment supervises and controls over the enforcement of the emvironmental legislation. It is responsible for ensuring that the environmental perspective is given proper consideration in society and and at all levels of government, as well as in

international cooperation. The Ministry formulates environmental policies, carries out strategic planning and makes decisions in its own sphere of interest. It is also responsible for preparing legislation and for result management and setting binding standards.

The Regional Environment Centres (13) form a regional enviromental organisation unit, functioning under the Ministry of the Environment. They are participatory and guiding authorities, directing, developing, monitoring and supervising waste issues at the regional level. They are responsible for environmental protection, land use and building, nature conservation, protection of the cultural environment and exploitation and management of water resources within their own areas. The local environmental authorities (**provincial governments and municipial authorities**) supervise these at the local level. The permit authorities for the activities likely to damage water bodies are the regional **Water Courts**.

The Finnish Environmental Institute (FEI) is the national environmental research and development centre of the environmental administration. It provides information on the state of the environment and its development, as well as factors affecting it. The Institute´s work is carried out in close co-operation with the users of environmental information. The Institute is the focal point concerning transboundary movements of waste. The tasks of FEI include, e.g., monitoring and assessing the state of the environment and the pollution load, land use and water resources, investigating changes taking place in the environment and their causes, and the prevention and reversal of detrimental change, promoting coherent, nationwide standards of environmental protection, and providing expert services for the Ministry of Environment and the Ministry of Agriculture and Forestry, the Regional Environment Centres and others. It also also participates in preparation of legislation.

e. France

Minerals of high value or of national importance such as gold, silver, lead, copper, zinc, coal, and lignite are defined as “mined substances” in Article 2 of the French Mining Code. Both exploiration and extraction rights to these are state owned. Minerals not specified in Article 2 are classified as “quarried substances”, and include aggregates such as limestone, igneous rock, and both sand and gravel. Rights to extract quarried minerals belong to the owner of the land.

The King’s declaration of 17 march 1780 and the law of 17 march 1791 appear to be the earliest texts on the mineral extraction industry in France. These were then supplemented by the Mining Code of April 1810. The Code Minier introduced a distinction between mined and quarried substances, which still provides the basis for French mining law.

Mining laws in France have been designed to take account of the continuity of exploitation, and the social and environmental acceptance of the industry. The environmental objective is “that mineral extraction, use and reintroduction into waste stockpiles should ensure appropriate confinement, i.e. that throughout the cycle, emissions into the environment, particularly the air and water, should be limited and controlled”.

Legislation has been enacted obliging departements to produce plans for quarried minerals. Article 1 specifies that the plan must include the following :

- Inventory of known resources,
- Analysis of the demand for minerals,

- Impact of existing quarries on the environment,
- Evaluation of future local needs,
- Setting of objectives to ensure the wise use of resources and to minimise impacts on the environment,
- Examination of transport networks,
- Environmentally protected areas,
- Preferred afteruse for mineral extraction sites.

Environmental and planning standards for individual mineral operations are firstly controlled through the attaching of conditions to permissions. For quarries these are in the form of "arrêtés préfectoraux" and for mines the equivalent are "ministériels complémentaires". These may cover a wide range of environmental concerns, such as noise and dust generation. The protection of surface and ground water quality is also believed to be of key importance.

There is no specific text relating to emissions form quarrying and mining activities. The prefet may define thresholds which must not be exceeded, and in addition the operator may be obliged to measure the fallout of dust and to forward the results to the prefet. All measurement costs are charged to the operator.

The section of the French mining code VII bis, (law N).77-620 of 16 June 1977, art.31) carries on operation of tailing dumps and spoil heaps and quarry waste. The article n°130 says :
"Subject to the cases specified by administrative order of the Council of State, the operation of mine tailing dumps and spoil heaps and of quarry waste is subject to the provisions of law N°.76-663 of 19 July 1976 concerning installations classified for protection of the environment with respect to quarries. The same applies to waterway dredging and soil caving covering a surface area or a quantity of materials at least equal to thresholds set by administrative order of the Council of State, when the materials extracted are marketed or used for purposes other than construction of the work on the site form which they were extracted."

This article, by the law Nà.95-101 of 2 February 1995, art.29, was supplemented by the following paragraph :
"For waterways in mountainous regions, the flow surplus is evaluated per river basin by the government's departments. In the light of this evaluation, and after obtaining the opinion of the quarries commission, the Prefect grants temporary extraction rights when obstruction of the river bed is detected and considered to be liable to cause flooding. These extraction authorisations are in particular granted for he performance of bank consolidation or dyke construction work."

Under the law of 1976, relating to classified installations, the restoration of quarries is obligatory. Powers to ensure that a mine operator carries out works necessary for correcting any nuisance or disruption caused, are laid down in Article 83 and 85 of the Code Minier, although restoration of mines is not an obligation. Site restoration is discussed at an early stage in the authorisation procedures, and is subject to consultation.

To date, there are no powers in France to ensure that the operator or other party "(andowner, for example) manages a site once it has been restored.

f. Germany

„Mining, Quarrying and Ore Processing Waste Management in Germany“

The present evaluation of the German part of the project „Mining, Quarrying and Ore Processing Waste Management“ occurred appropriate to the legislative special features of the Federal Republic of Germany.

Mining structural activities by means of the deposit contents are distinguished by surface inherent and unimpeached for mining mineral resources (BbergG § 3).

The unimpeached for mining mineral resources are of economical importance. The individual mining industry ranges are placed in accordance with their importance in the study.

The used definition of the mining structural residues (mining wastes) was based on the definition of the drop (waste) from the German circuit economy law (KrW/AbfG), based on all residues of industrial and public processes either used (waste to recycling) or to eliminated (waste to removal).

This is a definition of terms which on the one hand is non-typical in European comparison, since the term „waste” only determines drops for elimination and not possible recycling residue.

On the other hand it is non-typical because „mine waste to removal” falls into the range of different laws, it is therefore treated with different ways of licensing procedures to the operation of the systems.

Hence, within this study both are treated equally, the mining companies under mines inspectorates (BBergG) as well as those mines „mining waste to removal” according to the drop law and the mining law.

The Federal mining law (BBergG), the drop law (AbfG) and water supply law (WHG) as essential laws complement each other and are applied in Germany, according to the legal frame requirements and the existing EU law.

Unfortunately, the practised questionnaire action only ran into small resonance (10%), caused by its volume and its complexity. Therefore, all further results were prepared from information from associations, employees of the DMT and independent experts.

A Europe-wide summary of the results from the national investigations is on account of the different definitions of the terms „mining waste and „waste as well as the administrative responsibilities is rather difficult.

It is therefore advisable for the preparation of the Europe-wide summary of the results, that the criteria are reconsidered and reconciled beforehand.

g. Greece

The basic legislation framework, which covers all aspects of mining and quarrying activities in Greece, is the Joint Ministerial Decision (JMD) 17402/31-12-84 "Regulation of mining and quarrying works". In that law, which was enacted on Dec.1984, revision on specific articles of the previous mining legislation pieces, notably the Legislative Decree 210/1973 "mining Code" and the law 274/1976, were made. Specific provisions were also included regarding air, water, soil and the environment protection from mining and quarrying activities in the Greek territory.

Apart from the JMD 17402, mentioned above, main parts of the Greek legislation referring to mining and quarrying activities are included in the following legal pieces:

- Law 2115/1993 referring to quarrying activities for aggregate production.
- Law 998/1979 "for the protection of forested areas"
- The basic environmental Law 1650/86 which covers all aspects of environmental protection.
- JMD 69269/5387/24-10-1990 "Classification of activities into categories and content of different types of environmental impact assessment study" (EEC directive 85/337).
- Circular 17/1999 "Guidance's for the JMD 69269 arrangements implementations.
- JMD 69728/829/1996 "Waste Management Act",
- Law 1739/87 "Water management act".
- JMD 4699/1352/1986 : Guidelines values for various parameters relating to surface water quality for different uses (drinking waters, swimming, fish farming, etc).
- JMD 49541/1929/86 "Solid Wastes" (EEC directive 75/442).
- JMD 26857/553/88 "protection of groundwater from hazardous substances discharge. (EEC directive 80/68).
- Council of ministers ACT 144/2-9-87 "Water protection from hazardous substances (Cd, Hg, HCH) discharged in internal waters (rivers, lakes, sea).
- JMD E1B 221/65 : Sanitary proviso referring to the liquid and industrial wastes disposal.
- JMD 8243/1113/1991 : Measures and methods for the prevention of environmental pollution from asbestos (EEC directive 87/217).
- JMD 98012/2001/1996 : Measures and provisions for waste oil management (EEC directive 87/101).
- Council of ministers ACT 98/10-7-87: Pb threshold values in air quality.
- Council of ministers ACT 99/10-7-87 : SO2 upper limit and guideline values in air quality.
- Council of ministers ACT 25/18-3-88 : NOx upper limit and guideline values in air quality.
- JMD 56206/1613/86 : determination of noise level from worksite's machinery.
- JMD 69001/1921/88 : upper limit and guideline values for noise level from worksite's machinery.
- JMD 19396/1546/1997 "Hazardous waste management Act"

The "Hazardous waste management Act", was enacted in July 1997. This Act defines hazardous wastesand refers, among other thinks to the duties of the producer or holder of hazardous wastes to avoid contamination of land from hazardous wastes disposal.

Hazardous and industrial waste disposal in Greece includes co-disposal in municipal landfills for those hazardous wastes which are similar in composition to household waste. Other types of hazardous waste may be stored in controlled places within the installation where wastes are produced or they may be exported for specialist disposal. The latter is applied in cases of high risk wastes such as PCBs, cyanide wastes and pesticides (Isakidis/Boura/Liakopoulos 1999)

Specific provisions referring to the land rehabilitation from mining and quarrying activities are included , mainly, in the following pieces of regulation:

- Law 274/1976,
- Law 2115/1993
- Law 998/79
- JMD 17402/31-42-84.

h. Ireland

Minerals Development Acts 1940-1999; Local Government (Planning and Development) Acts 1963-1993; Local Government (Planning and Development) Regulations 1994 (S.I. No. 86 of 1994) and 1995 (S.I. No. 69 of 1995)

Sites such as these are subject to restrictions under derelict sites, conservation, and waste management legislation. The Minister for MNR has power to make safe such workings; the local authority may assume management of the site ifhazardous and declared derelict; alterations by landowners may be prohibited or controlled where sites occur in SAC's, NHA's etc. on recommendation by Dúchas to planning authorities that such alterations would harm the environment; CC's may also require alterations to minesites to be authorized by the EPA through prior procurement of a Waste Management Licence.

Prior to commencing operations, applicants must submit an Environmental Impact Statement (EIS) to a) local authorities for planning permission, b) the Environmental Protection Agency (EPA) for an Integrated Pollution ControlLicence (IPCL). Best available technology not entailing excessive costs (BATNEEC) should be used by applicants.Waste is managed under permit from local authority until IPCL is granted.

Specific text Minerals Development Act, 1940, Section 32(1); Derelict Sites Act, 1990, Sections 9/10; European Communities (Environmental Impact Assessment) and (Natural Habitats) Regulations 1994 and 1997; Waste Management Act,1996.

Specific status of waste Non-hazardous industrial waste; EWC cover code 01 00 00

Wastes are transferred by owners through sale or inheritance of land; further legal procedures have not arisen to date at these sites. Collection or transport of the waste do not occur. The workings and wastes of this site lie within cSAC #623 (Sligo); farming and other land use activities must be in accordance with an approved agri-environmental plan
a)Alternative means of processing/transporting ore/concentrate are considered prior to commencing operations; b)Site restoration and post-restoration management provided for; c)Future land uses proposed

Avoca Mine is unique in that both former mining companies became insolvent, whereupon the State subsidized operations for a number of years until closure. The receivership process, including transfer of lands where appropriate, has not yetbeen finalized. On completion of legalities, an integrated site management strategy is to be put in place, under the aegis of the local authority, and based on an extensive technical database built up over almost thirty years. Legislation governing conservation/heritage as well as waste management is relevant in the execution of this programme. For one site, Permits to Treat, Tip and/or Store Waste are registered with Kilkenny CC, and figures are reported yearly both to the local authority and to the EPA as part of the IPCL application process currently under way by these operations. A detailed EIS was presented which included a mine closure and rehabilitation plan. The operation is currently subject of an IPCL application, but in the interim discharges trade effluent and emissions under licence (see 2. Specific Texts above) Wastes are transferred by owners through sale or inheritance of land; further legal procedures have not arisen to date at these sites. Collection or transport of the waste do not occur.

Legal status of metalliferous waste still to be determined, and its relation to land ownership and mineral ownership at sites such as Gortdrum. Overriding considerations in case of any alterations to the waste would be environmental, as mentioned above.

i. Italy

Although generally poor in mineral resources, extraction takes place across most mineral types, with the exception of peat, tin, copper, silver and gold. Minerals are divided into two categories under national legislation approved in 1927. The first category comprises minerals which had strategic importance when the original law was passed. The second categories comprised all other materials and are the property of the land owner.

From principal legislation and legislative control of mineral development, the principal planning act is the Town Planning Act 1942, which makes provision for a hierarchy of plans at the provincial and municipality levels. A regional level was added in 1970 under Law 16 May 1970, N° 281.

As far as minerals are concerned, the main national laws are as follows :

- Regio Decreto N°1443/29 July 1927 « Statutory regulations governing the prospecting for and extraction of minerals in the Kingdow » which divided the minerals into strategic and non-strategic.
- DPR. N°2/14 Jan 1972 « Transfer to Ordinary Statute Regions of the national administrative functions relating to minerals, thermal waters, quarries,…

In addition, a myriad of laws exists at the regional level. There are numerous laws which have a bearing on mineral extraction in Italy. This can make the whole process of gaining permission extremely complex, and is often contadictory between regions.

In most cases, different regional and provincial regulations have provided dimensional thresholds for mineral extraction activities above which an application must be accompanied by an ES.

A survey by the Commune of Modena found that the most common reasons for failure to comply with standards or conditions were :

- Non-compliance with the depth of excavation exposing aquifers,
- The high slope angle on excavation faces and abandoned faces,
- Lack of enclosure or maintenance of enclosures surrounding excavations,
- Failure to comply with specified materials used for backfilling,
- Failure to observe boundary limits, river defence works, and public land without autorisation.

Law n°221/1990 (art. 9) provides for legislative powers to ensure that the holders of prospecting permits and working licences are responsible for making good the environmental effects of their activities. This law also allows for state grants to be released for this purpose, administered by local authorities.

A subsequent decree from the Ministry of the Environment laid down the specific requirements regarding restoration and for monitoring the activities of the projects themselves.

j. Luxembourg

Sand and gravel, largely dredged from the Moselle River, are the only minerals extracted in significant quantities. Both limestone and sandstone are quarried in small quantities, but neither are particularly suited to aggregate use. The ownership of mineral rights dates back to the Napoleonic Code. Resources deeper than six metres are owned by the state, and subject to the payment of royalties, whilst above this, resources are privately owned.
Considerable importance is attached to environmental considerations when preparing policies and determining planning applications. Despite this, there are no specific sustainable development policies. The issues of recylcing and the use of secondary materials in construction have not yet been included in government policy.

Whilst the practice of undertaking Environmental Assessment was introduced to Luxembourg prior to formal adoption of the EC Directive, Eas are now carried out under the terms of the law of May 1990 concerning the control of dangerous, dirty and noxious installations. For projects covered by the law of May 1990, the developer has first to provide a summary assessment, which describes the environmental effects of a project.

The mineral operator is responsible for the costs of restoration, and may have to provide a bank guarantee to ensure that such work is carried out..

k. Netherlands

Fill sand is extracted throughout the country and from the North Sea, whereas the finer concrete and mortar sand is mainly extracted in the southern provinces.

Under the Mining Act of 1810, a concession from the Crown is needed for extraction by deep mining as mineral rights are separate from the surface ownership of the land. However, this only applies to gas, oil, salt, and until closure of the last mine in 1965, coal.

The national minerals plan states that “the concept of sustainable development is an essential element of government policy. This involves the economical use of raw materials and the rational reuse of waste materials in building. “This includes the reuse of concrete and brick debris, pavement debris, and both blast-furnace and steel slag. By the year 2010, a total national consumption of 25 million tonnes of recycled material a year is intented. Policies encourage the economical use of surface minerals are also supported at the regional level :

- Replacement of clay in the production of external-wall bricks by fly ash and cleaned sludge from rubble washing,
- Replacement of gravel in concrete production by rubble granulates, synthetic gravel from fly ash and imported hard core,
- Replacement of fill sand in road building and land reclamation projects by the cleaned coarse fraction obtained from dredging spoil.

Powers to ensure that a mineral operator restores the site once extraction has been completed are contained in both Article 22 of the Excavation Act and chapter 18 of the Environmental Law.

l. Portugal

The dumping of mine and quarry residues is regulated in Portugal through Law Decree nº 544/99 dated 13/12/99.
In summary this diploma establishes the guidelines and rules relative to the construction, exploration and closure of dumps for these residues excluding these from the extraction of natural petroleum and gas.
The dumps are classified according to their volume (large or small) and their characteristics (inert or non-inert).
The licensing entities are Direcção Regional de Economia that is territorially liable when dealing with mineral masses and the IGM in all other cases.
A favourable recommendation from the Direcção Regional de Ambiente (environmental regulatory office) of the region or from the Instituto dos Resíduos (Residue Institute) is necessary.
The license holder, in the case of non-inert dumps, must report annually on the volume of residue dumped and existing capacity, the characteristics of the residue, the results of the control measures adopted and anomalous occurrences and solutions adopted. In the case of large non-inert dumps their report takes place every three years.
The license holder is also requested to name a bank guarantee of 5.000 Euro, which is destined to guarantee its obligations.
The dumps should obey all conditions laid down by law taking into account the minimum protection distance, permeability coefficient, the thickness of the basal layer and the construction of run-off dikes.

m. Spain

Traditional metals mining is gradually declining although intensive exploration for complex metallic sulphurs is occurring in the Iberian Pyrenean belt. Non-metallic mining is growing although its development is highly sensitive to currency exchnage rates. Coal mining is anticipated to fall, although the mining of industrial stone is seen as having a bright future.

The primary mining laws at state level are : The mines act (Ley de Minas), 22/1973: the mining development Act 6/77 and the Royal Decree 476 (2/93). Plans for the mining industry essentially begin at state level, with the national mining plan. This comprises an Investigation Plan, an Exploitation Plan, and a social policy on mining.

For non-opencast extraction, factors taken into consideration when determining the need for an EA include several conditions related to earth movements, aquifers, surface water, …
Exploitation licences can only approved if accompanied by a Reinstatement Plan, the preparation of which is the responsibility of the operator.

n. Sweden

The mining waste is treated under the environmental legislation as are the entire operations at the mines. At present it is under The Environmental Code (1998:808), which has been in force since the beginning of 1999. The Decision-making authorities are the Environmental Courts. Inspection is usually laid on the County Administrative Boards (länsstyrelse). Responsible for the over-all supervision is the Swedish Environmental Protection Agency. The present system in general is outlined in Appendix

Between 1999 and 1969 the Environmental Protection Act (1969:387) was in force. Decisions were made by the National Licensing Board for Environmental Protection.

Inspection authorities were the County Administrative Boards with the Swedish EPA as overall supervisor.

Before 1969 the environmental rules were set by the County Administrative Boards, which also were responsible for the inspection.

o. United Kingdom

In Britain legislation is enacted by Acts of Parliament, which set out the general areas addressed by the legislation. These are further refined by Regulations, which explain, extend or amend the parameters to which the relevant Act will apply. Legislation governing the mining industry has grown over the years, often following a major event or disaster which has led to calls for specific legislation to control or eliminate certain operations within the industry. Until recently, legislation was mainly concerned with the working environment of the pit or quarry and little heed was paid to the environmental consequences of mining. Almost all land, including the mineral rights, was privately owned and there were few regulations governing the environment beyond the actual mine site. The early legislation in the nineteenth century provided a safer working environment for the miners with the introduction of regulations regarding the control of ventilation to prevent gas explosions and restrictions on the employment of young people and women. As the mining industry grew and prospered additional legislation was introduced to ensure the provision of working mine plans, mine abandonment plans and the creation of a Mines Inspectorate to enforce the regulations.

The first serious attempt to control the environmental consequences of mining, apart from local initiatives to control a specific nuisance, was in respect of the Jurassic ironstone workings in the East Midlands. These were the first large-scale mechanised opencast workings in Britain and produced a major alteration of a smooth agricultural landscape to alternating hill and valley topography. Following the report of the Kennet Committee, which was set up in 1938, and the Waters Committee in 1946, the **Mineral Workings Act 1951** was passed. This set up the Ironstone Restoration Fund which was based on producers and mineral rights owners contributing a per ton raised fee from which they could draw to pay for subsequent restoration of currently and previously worked land.

Opencast coal operations did not require formal planning consent until the **Opencast Coal Act 1958** and **The Town and Country Planning Act 1962** which authorised the then Department of the Environment to make the planning decision. This removed it from the control of the local authority. The 1958 Act was concerned with authorising the activity of opencast coal working, including the rights of surface owners, compensation for loss of land and rights of way. It did not address any environmental aspects.

The environment is therefore a recent addition to legislation governing mines and quarries and their attendant waste tips. Interest in this subject has grown in Britain since the Aberfan disaster of 1966 which led to the passing of **The Mines and Quarries (Tips) Act 1969**. This states that it is ‘An Act to make further provision in relation to tips associated with mines and quarries; to prevent disused tips constituting a danger to members of the public; and for purposes connected with those matters’. This Act is an extension of **The Mines and Quarries**

Act 1954 which did not mention tips specifically in its provisions. In fact, the only reference in the 1954 Act to the safety of the public beyond the mine or quarry is a section dealing with the fencing of abandoned and disused mines and of quarries. This was designed to prevent people falling into mines, not to stop the adjacent tips falling on them. The Aberfan disaster was, in fact, not required to be formally reported under the 1954 Act. The detailed requirements to implement and conform with the 1969 Act are laid out in **The Mines and Quarries (Tips) Regulations, 1971.** Subsequently **The Quarries Regulations 1999** state that tips must be designed, constructed, operated and maintained so that instability or movement likely to cause risk to the health and safety of any person, is avoided**.** They also specify the geotechnical and other measures to be taken to ensure this. Other legislation which may have some bearing on the construction, operation and disposal of mineral waste tips include the Rivers (Prevention of Pollution) Acts and the Clean Air Acts.

As well as the legal framework for the health and safety of workers and local residents, and the environment, there is a planning framework. As in other developed countries, Britain is subject to planning controls governing most forms of 'development' of land, including mining activities, under the guidance of the Department of the Environment, Transport and the Regions (DETR). This began with **The Town and Country Planning Act 1932** which, for the first time, sought to bring mining activities under the control of the local planning authority, albeit on a voluntary basis. This was modified in 1946 with the introduction of an **Interim Development Order** (IDO) which compelled companies to apply for planning permission for any new site. Currently, the planning framework in England and Wales is provided by **The Town and Country Planning Act 1971**, as amended by **The Town and Country Planning (Minerals) Act 1981**. Day-to-day responsibility for administering the planning system as it relates to minerals rests with the mineral planning authorities (MPAs). These are mainly the county councils, although there are exceptions in Greater London and the Metropolitan Areas. In the Peak District and Lake District National Parks, the Peak Park Joint Planning Board and the Lake District Special Planning Board, act as the MPAs.

In Scotland, the relevant Act is the Town and Country Planning Act (Scotland) 1972, as amended by **The Town and Country Planning (Minerals) Act 1981**. There is no separate regime for mineral planning. Proposals for mining activities are dealt with by the authority responsible for all forms of development control. In Highland, Borders, Dumfries and Galloway Regions and Orkney, Shetland and Western Isles, planning control is exercised by the Regional Council or Island Authority. Elsewhere it is the responsibility of the District Council, although Regional Councils have reserved powers related to structure planning responsibilities.

There are also a series of Mineral Planning Guidance Notes (MPGs) issued by the Department of the Environment, Transport and the Regions (DETR) which provide information for local authority mineral planning officers to reach decisions on mineral planning issues. These contain background information, together with examples of current best practice and suggestions for future directions in regard to planning applications. They are not legal instruments, but carry considerable weight in any dispute over the interpretation of planning regulations. The relevant MPGs for mineral waste control are

MPG3 Coal Mining and Colliery Spoil Disposal
MPG5 Stability in Surface Mineral Workings and Tips