





Consensus KPIs Framework for Gypsum Quarries

	71
	INDICATOR / KEY QUESTION
1	Number of native species in selected taxonomic group How is evolving native species richness in the quarry? Is the quarry management maintaining or ameliorating species richness?
2	Abundance of selected species in the quarry How is abundance of species representative of ecosystems wellbeing evolving in the quarry? Is the quarry management maintaining or ameliorating species abundance?
3	Number of protected species in the quarry How is evolving protected species richness in the quarry? Is the quarry management maintaining or ameliorating protected species richness?
4	Number of Red list species in the quarry How is threatened Red list species richness evolving in the quarry? Is the quarry management maintaining or ameliorating protected species richness?
5	Abundance of protected/red list species in the quarry How is abundance of protected and threatened (Red list species) evolving in the quarry? Is the quarry management maintaining or ameliorating species abundance?
6	Number of habitats in the quarry (Wanderbiotopes) How is habitat diversity evolving in the quarry? Is the quarry management maintaining or ameliorating the habitat diversity?
7	Surface of selected habitats in the quarry (Wanderbiotopes) Is the surface of important habitats maintained throughout quarrying?
8	Numbers of invasive alien species in the quarry Does the quarry management prevent establishment of invasive exotic species or reduce their occurrence?
9	Freshwater quality Is the freshwater quality of the quarry answering to the European Ground Water Directive (Directive 2006/118/EC) and the Water Framework Directive (Directive 2000/60/EC)?
10	Surface of habitats restored after use or for natural purposes How much surface of habitats has been restored in the quarry after exploitation?
11	For one quarry, state of the communication and participation activities organised for the last five years What are the actions of communication and participation to the public led by the quarry?

This Key Performance Indicators (KPIs) Framework to **report biodiversity** for the Gypsum Industry at the European level is the result of **participatory processes** including different **stakeholder's** groups:

- ► Eurogypsum stakeholders
- ► European and local authorities
- ► Scientific panel: universities and consulting offices
- ▶ European and local associations for the conservation of nature
- ► Stakeholders from the mining sector

The result is eleven indicators which are the **most acceptable set of indicators** for all the stakeholders. It answers to **European legislation and strategies** for biodiversity.

It is intended to improve **sustainability** in the quarries and to help to **manage biodiversity** allowing setting up of appropriate **reporting** systems in order to **maintain the biodiversity status** of gypsum quarries.

It is a **flexible** framework **adaptable** given the local context of each gypsum quarry.

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Photos

The photos of this brochure belong to Siniat international, Saint-Gobain Gypsum- KNAUF Gips KG.







Quarry Markt Nordheim (Germany)

Key messages about biodiversity indicators

Biodiversity is: "the variability amongst living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" by the Convention on Biological Diversity, during the Earth Summit in Rio de Janeiro in 1992 (1).

Biodiversity covers all the variety of life on Earth, embracing all the genetic variabilities, all the differences between living organisms and all the diversity of ecosystems and habitats. Since it is really complex and includes a lot of different aspects, it cannot be encompassed in a single biodiversity indicator (13).

An indicator can be seen as "a measure based on verifiable data that conveys information about more than itself" (2). An indicator is consequently **purpose-dependant**; this means that "the interpretation or meaning given to the data depends on the purpose or issue of concern" (2).

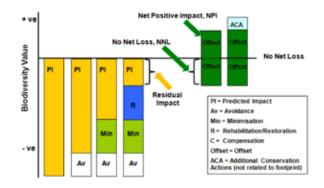
Since biodiversity indicators are purpose-dependant, it implies making choices for values and measures and to focus on some aspects of biodiversity. "The development or selection of biodiversity indicators should start with identifying the issue or decision-making need that the indicator will address. Describing this need in the form of a **'key question'** helps to guide indicators selection and communication" (2).

"Indicators are **part of a process** and should lead on to informed decisions – they are not ends in themselves" (2). The **participatory process** which includes all the stakeholders involved to the development of biodiversity indicators facilitates reaching a functional indicator framework which meets all expectations.

FOREWORD

This project is a voluntary initiative launched by the Quarry WG of Eurogypsum, the European Association for Plaster and Plaster-board Manufacturers, and has been sponsored by Eurogypsum. The Quarry WG decided to launch cooperation with the Biodiversity and Landscape Unit of the University of Liege to define a set of biodiversity indicators that may be used by the Gypsum Industry throughout Europe.

Since 1992, the awareness of biodiversity has risen throughout the world and a lot high-level delegations allowed commitments to halt or reduce the rate of biodiversity loss (3, 4). In May 2011, the European Commission adopted a new EU biodiversity strategy for 2020: "Halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020 and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss" (5). The cornerstone of this strategy is the concept of No Net Loss which exists to "maintain the biodiversity in an equivalent or better state than that observed before the project begins" (6). Indicators are, more than ever, needed to assess whether the progress is achieving these ambitious 2020 targets (4).



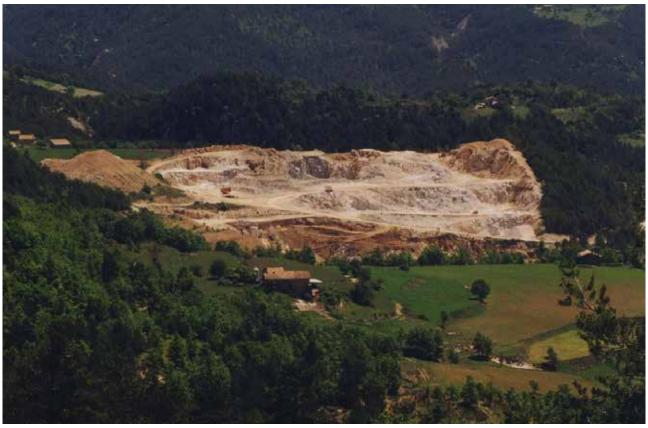
The achievement of No Net Loss in relation to the mitigation hierarchy, directly from the IEEP (3)

At the same time, environmental issues have become progressively important in mining business. The sustainability of a mining project has to be focused from the exploration throughout the mine opening, operation and closure. "Sustainability implies the use of clean technologies, minimisation of raw materials and energy demand, reduction of emissions and effluent discharge into the environment and maximisation of social benefits" (7). Eurogypsum is already dealing with all those subjects. The Gypsum Industry makes no exception to this objective of No Net Loss and raises its awareness about biodiversity to be part of all those commitments about biodiversity.

To develop biodiversity indicators for the Gypsum Industry, an original approach of participatory process was developed, including the stakeholders involved, to the elaboration of biodiversity indicators in order to integrate the different opinions and to reach a consensus framework. Participatory processes allow validating the elaborated framework step by step and bringing it a significant added value. Stakeholders involved in the elaboration of the KPIs are: direct actors of the Gypsum Industry (Quarry WG, local quarry managers and future users of indicators), experts (gypsum's experts, external experts), policy makers and public representatives.

This report is divided into five sections:

- ► The first section expands on the context of mining/gypsum and biodiversity.
- ► The second section focuses on what is biodiversity and why Eurogypsum cares about biodiversity, what is an indicator and what is a good biodiversity indicator.
- ► The third section explains the method used to reach the consensus KPIs framework for gypsum quarries.
- ► The fourth section presents the KPIs framework obtained and contains the factsheet of all the indicators developed.
- ▶ The last section includes some recommendations for a future implementation of this framework.



▶ Quarry guixer (Catalunia-Spain) 1999



▶ Quarry Guixers after restoration 2008.

MINING AND BIODIVERSITY

Mining and biodiversity

In past decades, the conception that quarries were dusty and sterile environments where animals and native plants were absent has switched slowly to places where a real potential for biodiversity exists. In reality, quarries promote wildlife in being refuges for biodiversity as they construct non-permanent and diversified habitats in sometimes homogeneous landscapes. Careful quarry management can significantly enhance biodiversity (8).

Given the International Council on Mining and Metals, mining represents a significant economic activity in many countries over the world, and as the demand for raw materials is still accelerating with the constant population growth, it is obvious that the mining sector will continue, and will expand into ever more remote regions (9).

As gypsum activities can occur in places that are environmentally sensitive and where there is a high potential for biodiversity, public awareness is focused especially on biodiversity conservation performance of quarries (10). At the same time, environmental issues have become progressively important in mining business. The sustainability of a mining project has to be focused throughout all the mining activities: exploration, mine opening, operation and closure. "Sustainability implies the use of clean technologies, minimisation of raw materials and energy demand, reduction of emissions and effluent discharge into the environment and maximization of social benefits" (33). And more particularly, mining and metals industry has to demonstrate their commitments to biodiversity as part of their sustainable development (33).

Gypsum Industry

The European Plaster and Plasterboard Industry resource is gypsum - an abundant mineral rock - from which you make (gypsum) plaster - commonly found in the earth's crust and quarried in many European and non-European countries.

The process to make plaster is straightforward and requires a relatively low temperature, almost 200 degrees centigrade, which means it could be homemade in your domestic oven. The chemical process is 100% reversible!

In 9000 BC in Asia, the production of plaster indeed started in an oven... and plaster was used, for instance by the ancient Egyptians to plaster the pyramid of Cheops in Gizeh.

The beauty of gypsum is its sustainability throughout the life-cycle of the raw material, from extraction to end-of-life. Gypsum is an extraordinary and well-known mineral for its splendid chemical and physical properties and endless recyclability. Gypsum products can be counted amongst the very few construction mate-

rials where "closed-loop" recycling is possible, i.e. where the waste is used to make the same product again. Gypsum as such is 100% and eternally recyclable. You can always reuse gypsum because the chemical composition of the raw material in plaster-boards and blocks always remains the same.

For many years, the European Gypsum Industry has been addressing the societal life-cycle impacts of its processes, products and systems for enhancing a pleasant, healthy and comfortable environment.

Gypsum is extracted from open-cast mines or underground mines using room and pillars mining methods. The extraction process implies an unavoidable impact on the landscape and the natural environment. However, human activity does not necessarily mean loss of biodiversity and danger for eco-systems. Human activity can also result in a richer biodiversity. Indeed, the development of a gypsum quarry creates favorable conditions that can provide habitats for rare species. In Europe, the Gypsum Industry has around 160 quarries.

Plasterboard, the main gypsum construction product, is virtually indispensable for the interiors of homes and offices and all types of building where people congregate, such as schools, shops, airports, etc. Its superior performance in providing everyday comfort, in fire resistance, and in insulation, heralds an ever greater role for it in buildings of the future. In fact, the safety and protection of people and property against fire, and effective thermal and acoustic insulation of buildings depends, more often than not, on the unique properties of gypsum. And many of the attractive features of the modern interior would be impossible without the versatility of gypsum as a building material.



Gypsum mineral







▶ Quarry Markt-Nordheim (Germany)

SECTION 2

BIODIVERSITY INDICATORS

What is biodiversity?

Biodiversity was defined by the United Nations in 1992 at the Convention on Biological Diversity during the Earth Summit in Rio de Janeiro. The CBD defined biodiversity as: "the variability amongst living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (1).

Diversity within	Diversity between	Diversity of
species	species	ecosystems

Biodiversity covers all the variety of life on Earth, embracing all the genetic variabilities, all the differences between living organisms and all the diversity of ecosystems and habitats. It ranges all the way from the golden eagle to varieties of maize, from unicellular bacteria to tropical forest. It includes a lot of different aspects and deals with three scales that are difficult to combine: genes, organisms and landscape.

Biodiversity is essential for human livelihoods and for life itself. Biodiversity brings essential **ecosystem services** on which all the balance of life depends (10). The Millennium Ecosystem Assessment (MA) listed in 2003 such services as: provisioning services, like food; regulating services, like water purification or the control of pests; cultural services, like recreation; supporting services, like nutrient cycling and soil formation (11). Biodiversity itself also has an **intrinsic value** (it has to be valued for its own value). Our society often takes all those services for granted, but they are intrinsically linked to the well functioning of ecosystems, and with it, the biodiversity (10).

In the recent past, human activities have more than ever threatened biodiversity in exerting significant pressure, such as habitat destruction, pollution, overexploitation and climate change. Given the MA, **biodiversity loss** is increasingly alarming with a rate of species extinction that has never been so high. This biodiversity loss is due to the increasing human pressures all over the world (11). As a **response to the biodiversity loss**, since 1992, the awareness of biodiversity has been increasing worldwide and a lot of high-level political and societal commitments have been taken to halt or reduce the rate of biodiversity loss.

Why does Eurogypsum care about biodiversity?

In addition to the moral and ethical considerations, which are increasingly at the heart of corporate policies nowadays, companies are also addressing biodiversity for sound business reasons. A lot of mining companies encompass biodiversity in their commitments to establishing and maintaining a social or functional "licence to operate" (10).

Given the IMCC, "adopting responsible practices with respect to biodiversity management is increasingly viewed as important" in the mining industry with respect to the access to land, reputation, and the access to capital (10).

In this context the key issue about biodiversity for Eurogypsum is to improve **sustainability** in the quarries. It follows that Eurogypsum wants an efficient framework of indicators which demonstrate that the quarries may be **managed for biodiversity** through the setting-up of appropriate **reporting** systems in order to **maintain or improve the biodiversity status** of gypsum quarries.

What is an indicator?

Given Heink & Kowarik, 2010 "An indicator in ecology and environmental planning is a component or a measure of environmentally relevant phenomena used to depict or evaluate environmental conditions or changes or to set environmental goals. Environmentally relevant phenomena are pressures, states, and responses as defined by the OECD" (12). Moreover, the principal aim of a Key Performance Indicator (KPI) is to provide "the specific criteria from which the attainment of result can be planned and their accomplishment can be measured" (2).

Indicators represent then a summary of information about the characteristics of systems and are used to know what is happening in those systems. They are a simplification of complex phenomena in order to **tell stories** about a specific question asked. An indicator is consequently **purpose-dependant**, this means that "the interpretation or meaning given to the data depends on the purpose or issue of concern" (2).

Since biodiversity is really complex and includes a lot of different aspects, it cannot be encompassed **in a single biodiversity indicator**. As biodiversity indicators are purpose-dependant, choices have to be made for values and measures and to focus on some aspects of the biodiversity (13).

The development or selection of biodiversity indicators should start with identifying the issue or decision-making need that the indicator will address. Describing this need in the form of a **'key question'** helps to guide indicator selection and communication (2, 13). Indicators are **part of a process** and should lead on to informed decisions – they are not ends in themselves (2).

Attributes of the indicators developed in the gypsum framework

The indicators developed here are **Key Performance** Indicators (KPIs) whose aim is to **track performance**. The roles of the indicators aren't to discriminate among competing hypotheses (scientific exploration) or alternative policies (decision analysis).

This framework used **simple** indicators (or **one-dimensional**) instead of composite (or complex) indicators because they provide more information about environmental factors that are interesting for management.

This framework focused on the **compositional** biodiversity aspects instead of the structural or functional aspects of biodiversity. Duelli & Obrist argue that in all likelihood, structural and functional diversity are based on a compositional biodiversity and, at the same time, lead to compositional biodiversity (13). Moreover, the functional and structural aspects are more difficult and less feasible to implement.

The indicators developed are indicators **for** biodiversity instead of from biodiversity, because the aim of this project is to measure the biodiversity itself.

Eurogypsum stakeholders are interested in a **higher scale** of biodiversity than only the quarry footprint (alpha-diversity).

In this add framework, **mainly normative** indicators are used instead of descriptive ones because our aim is to monitor biodiversity. The indicators of this framework are also "as **measure of ecological attributes**" instead of "indicators as ecological components", because values are needed to compare and demonstrate the evolution of biodiversity among different periods.







SECTION 3

KPIS FRAMEWORK DEVELOPMENT FOR GYPSUM QUARRIES

In 2011, the BIP¹ has established guidance for the development and the use of biodiversity indicators at a national level (2). This guidance detailed a methodology to follow in order to have a relevant framework. The methodology of this study is inspired from that development framework. It has been adapted to the time and budget available, the scale and the kind of stakeholders involved.

Step 1 First consensus framework within Eurogypsum Quarry

Reaching a consensus framework with all stakeholders and evaluating feasibility

Step 2.1: Policy Delphi Survey

Step 3

Step 2.2: Existing initiatives in the Environmental Impact Assessment (EIA) Step2.3: Testing feasibility with quarry managers

Most acceptable framework for all the stakeholders

Step 1. First consensus framework within Eurogypsum Quarry WG

This step is divided into two parts. The first action is to **build** a **first framework** based on institutional frameworks already existing and frameworks of the **mining sector**. The second action is to **validate** this framework with the **Quarry WG of Eurogypsum**.

The framework developed relies on the SEBI (Streamlining European Biodiversity Indicators) 2010 framework, because that framework "was set up in response to a request from the EU Environment Council. Its aim is to streamline national, regional and global indicators and crucially to develop a simple and workable set of indicators to measure progress and help reach the 2010 target" (34). It proposes 26 biodiversity indicators. Moreover, the SEBI 2010 is explicitly linked to biodiversity policy contexts. At a European level, it responds to:

- ► The 'Message from Malahide'
- ▶ The EU Council Conclusions of 28 June 2004
- ▶ The EU Habitats and Birds Directives
- ▶ The EU Strategy for Sustainable Development
- ► The Lisbon Agenda
- ► The EU biodiversity strategy

And at a Pan-European level it is consistent with:

- ► The Kiev Resolution on Biodiversity
- ► The UNECE² Environment for Europe process
- ► The Pan-European Biological and Landscape Diversity Strategy (PFRLDS)



SEBI indicators are derived from the CBD (Convention on Biological Diversity) indicators. SEBI 2010 works in conjunction with the 2010 BIP (Biodiversity Indicators Partnership). It involved a lot of stakeholders like the UNEP-WCMC, the GEF3-funded project called 'BINU'4 (which involves more than 40 partner organisations around the world).

The indicators developed in the framework are based on the SEBI 2010 which relies on the Focal CBD areas (Worldwide Biodiversity Target) and the European indicator headline (European Biodiversity Target). In addition to SEBI 2010, indicators issued from the OECD, the CBD and the GRI (Global Reporting Initiative) are also included. This first list also includes the biodiversity indicators developed by the Swedish International Development Cooperation Agency (SIDA) (7), by the Centro de Tecnologia Mineral Ministério da Ciência e Tecnologia (CETEM) (33), by Rademacher & al. (16) for HeidelbergCement, by HeidelbergCement Technology & al. (35) for Cement International and developed by the Cement Sustainability Initiative (CSI) (16). These general headline indicators form a complete set of indicators to report biodiversity. From those headline indicators, specific Eurogypsum indicators were proposed.

The framework obtained was discussed during a Focus group with Quarry WG members and Gypsum Industry environmental experts. This resulted in a set of 23 indicators distributed in classes of indicators (The focal CBD areas).

Step 2. Reaching a consensus framework with all stakeholders and evaluating feasibility

This step is divided into 3 parts: policy survey among stakeholders, existing initiatives in Environmental Impact Assessments (EIAs), feasibility on the field with local actors.

Step 2.1. Policy Delphi survey

The aim of this step is to **prioritise the 23 indicators** obtained to match the expectations of the stakeholders in term of feasibility and relative importance. It includes all the stakeholders, to compare the expectations and opinions of different stakeholder's groups. Only the Eurogypsum stakeholders are not represented in this step because their opinion about the feasibility and relative importance has been discussed with them in the Focus group and during the three case studies on the field.

The method used is a Policy Delphi approach using an online survey addressed to all stakeholders. The survey includes three different methods to rank indicators that allow cross validation of the answers of stakeholders: i) evaluation of importance and feasibility of indicators individually (no comparisons), ii) selection of most important indicators and classes of indicators (indirect comparisons), and, iii) pairwise comparisons of indicators importance (AHP method) (direct comparisons). In addition a section is dedicated to open comments and self-evaluation of the level of expertise of stakeholders.



- Quarry Robertbridge UK
- 3. Global Environment Facility
- 4. Biodiversity Indicators for National Use



The stakeholders involved:

Non Energy Extractive Industry Panel (NEEIP) members - 19 persons

The stakeholders involved:			
EUROPEAN COMMISSION			
Directorate General	Directorate	Unit	
DG Environment (ENVI)	B: Nature	Unit 2: Natura 2000	
	A: Legal Affairs and Cohesion	Unit A3: Cohesion Policy and EIA (environmenta impact assessment directive)	
DG Enterprise (ENTR)	F: Resource based and consumer goods industries	Unit: raw materials, steel and metals	
	B: Sustainable growth and Europe 20	Unit: Sustainable industrial Policy and construction	
SCIENTIFIC PANEL			
Scientists at universities	45 scientists selected on the basis of the liter	ature about biodiversity and quarry	
Consulting offices or independents experts	43 consulting offices on the basis of the Director research for France and international contact	ctory of Environment of Belgium (31), internet s	
EUROPEAN NGO'S FOR NATURE CONSERV	ATION		
International Union for Conservation of Nature	(IUCN)		
European Network for Nature Conservation (EC	NC)		
Fondation Faune Sauvage			
United Nations Environment Programme (UNEP)			
Earthmind			
World Wide Fund for Nature Europe (WWF EU)			
BirdLife			
BELGIAN AUTHORITIES			
Département de la Nature et des Forêts (DNF)			
Département de l'Etude du Milieu Naturel et Agricole (DEMNA)			
ASSOCIATIONS FOR THE CONSERVATION OF NATURE IN BELGIUM			
Natagora			
Natagora/Aves			
Ardenne et Gaume			
Cercles des Naturalistes de Belgique (CNB)			
Faune & Biotopes			
Fédération Inter-Environnement Wallonie (des associations au service de l'environnement)			
Naaturpunt			
MINING SECTOR			
Fédération des Industries Extractives de Belgique (FEDIEX)			
Conseils et Recherches en Ecologie Appliquée, de l'Université de Liège (aCREA-Ulg)			
HeidelbergCement	-leidelbergCement		

Main conclusions:

The Delphi survey demonstrated the difficulty to reach a high degree of consensus on the most important indicators among all stakeholders. Indicators that reach a majority of similar opinions in regard to their importance and feasibility were identified.

Indicator highlighted for bieng highly important:

- 1. Abundance of selected species in the quarry
- 2. Number of Red list species in the quarry
- 3. Abundance of protected/Red list species in the quarry
- 4. Number of habitats in the quarry
- 5. Are there adjacent protected areas or areas of high biodiversity value outside the quarry
- 6. Impact due to quarry activities on water quality in freshwater and riparian environments outside the quarry
- 7. Number of invasive alien species in the quarry
- 8. Fragmentation of natural and semi-natural areas
- 9. Freshwater quality
- 10. Area of habitats protected or restored

Indicator highlighted for being important:

- 1. Number of species in selected taxonomic group
- 2. Number of protected species in the quarry
- 3. Size of habitats in the quarry
- 4. Number of protected habitats in the quarry
- 5. Size of protected habitats in the quarry

Indicator highlighted for having a low feasibility:

- 1. Is there an impact due to noise on animal disturbance outside the quarry
- 2. Impact due to lighting on animals outside the quarry
- 3. Impact due to dust emission on animals or on habitats outside the quarry

Step 2.2. Existing initiatives in the Environmental Impact Assessments (EIAs)

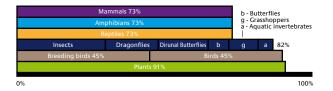
Indicators included in the Eurogypsum framework proposal were compared to the different indicators already included in the EIAs in the Gypsum Industry. This comparison allows **highlighting** which are the **indicators already used** in the Gypsum Industry and what data are **already available**. In general in the EIAs no indicators or indices are clearly defined, but different aspects of the environment (fauna and flora, soil, aquatic system, etc) are precisely determined. Consequently, some aspects of biodiversity are measured and can be considered as biodiversity indicators. The data collected in the EIAs aren't measurements; they are prognosis and not monitoring. Eleven EIAs have been received from quarries of different countries: France, Germany, Italy, Spain and UK.

Main conclusions:

Eleven indicators are already used in the EIAs.



More than 70% of the EIAs are presenting a list of all the taxonomic groups founded in the EIAs: plants, birds, reptiles, amphibians, mammals and insects. The following diagram presents the percentage of EIAs for which there is a list of species and a list of protected species for the following taxonomic groups or species:



Step 2.3. Testing feasibility with quarry managers

The aim is to confront the Europgypsum framework proposal to the reality of the field and to the quarry stakeholders. This step allows collecting the key elements that will guide the choice of the most suitable scenario for users. Three quarries from France, Spain and Germany were selected by the Quarry WG which belongs to the three main players in the Gypsum Industry: Siniat, Saint-Gobain and Knauf.

In those three quarries, meetings and visits have been conducted with quarry directors or managers and future users of indicators, Gypsum Industry environmental experts and sometimes Quarry WG members.

Main conclusions:

The conclusions of the opinion about the implementation on the field in the three case studies have been summarised into five categories:

- ▶ The indicators that reached a consensus among the three quarries: 8 indicators;
- ▶ The indicators for which some different opinions are expressed: 5 indicators;
- ▶ The indicators for which doubts are expressed and more explanations are needed: 3 indicators;
- ▶ The indicators that aren't applicable everywhere: 4 indicators;
- ▶ The indicators that are judged impossible to implement currently as a lack of literature on the subject exist: 3 indicators.



Quarry Puchberg-Scnheeberg Austria

In France, the main focus is on water, because this quarry deals a lot with surface and ground water for its production. In Spain, the main concern is restorations because a lot of studies have been conducted by the Polytechnical University of Madrid about the ecological restorations on the site. The focus isn't on water or forests because the quarry doesn't have either forest habitats on the site, or ground or surface water. Meanwhile, in Germany the main issue was the system of indicator already implemented there: the system of indicator of Tränkle and Rademacher presented by Rademacher & al. (16). All this diversity of situation shows that the framework has to be the most flexible possible in order to be equally applicable to every quarry throughout Europe and to meet the expectations of all the local contexts.





Concensus of agreement on the field

- 1. Number of species in selected taxonomic group
- 2. Number of Red list species in the quarry
- 3. Number of habitats in the quarry
- 4. Surface of habitats in the quarry
- 5. Numbers of invasive alien species in the quarry
- 6. Area of habitats restored
- 7. % of quarry that calculate biodiversity indicators
- 8. % of quarry that implement communication and participation actions

Different opinions are expressed

- 1. Abundance of selected species in the quarry (indicator species)
- 2. Abundance of protected/Red list species in the quarry
- 3. Number of protected species in the quarry
- 4. Number of protected habitats in the quarry
- 5. Surface of protected habitats in the quarry

Precisions needed

- 1. Are there adjacent protected areas or areas of high biodiversity value outside the quarry
- 2. Fragmentation of natural and semi-natural areas
- 3. Trophic integrity of ecosystems

Not applicable everywhere

- 1. Impact due to quarry activities on water quality in freshwater and riparian environments outside the quarry
- 2. Fragmentation of river systems
- 3. Freshwater quality
- 4. Forest: growing stock, increment and felling

Impossible to implement currently

- 1. Is there an impact due to noise on animal disturbance outside the guarry
- 2. Impact due to lighting on animals outside the quarry
- 3. Impact due to dust emission on animals or on habitats outside the

Step 3. Most acceptable framework for all the stakeholders

On the basis of all the conclusions of the analysis of the **EIAs**, the survey and the **case studies**, a first proposal of the most acceptable framework for all the stakeholders was built. It included sixteen indicators, within six were highlighted by the survey and reached a local consensus – those were put forward in the proposal.

On this proposal, the **Quarry WG** took its final decisions about the indicators to implement (Quarry WG Ccl). The Quarry WG decided in the end to keep fourteen indicators, including three that are postponed until the experts agree (P), and one that was adapted (A). The final framework contains, consequently, **eleven indicators**.

The following table shows the main results which lead to the first proposal set of indicators and to the final decision of the Quarry WG (Quarry WG Ccl). The results of the EIAs analysis are presented in percentages of EIAs that are dealing with the subject of the indicator.

The results of the Policy Delphi Survey (Survey) are presenting the indicators that have been highlighted as highly important (X green) important (X orange) and for having a low feasibility (LF).

The result of **the three case studies** in the field are presenting the different opinions:

- ► agreement (x),
- ▶ agreement but indicator may be expensive (exp),
- ▶ doubt about the feasibility (o),
- impossible to implement currently by lack of knowledge (nothing),
- ▶ already implemented in the quarry (T-R, WB, AU). The first proposal presented the indicators that have been highlighted by the stakeholders and highlighted by the survey and reached a local consensus.

NOTE:

- ► T-R: indicators according to Tränkle and Radermacher
- ► WB: covered by Wanderbiotopes assessment according to Tränkle and Radermacher
- ▶ AU: covered by after use assessment

Policy Delphi Survey Results

- **X Green:** highly important in the Delphi survey results
- ▶ **X Orange:** important in the Delphi survey results
- ▶ **LF:** Low feasibility in the Delphi Survey results
- ► X: agreement
- **Exp:** agreement but indicator may be expensive
- ▶ **0:** doubt about feasibility
- ▶ **Nothing:** impossible to implement currently by lack of knowledge
- ► T-R, WB-Au: already implemented in the quarry
- ▶ **P:** postponed until experts agree

Indicator			Results			First Proposal	Quarry WG Ccl
	EIAs	Survey	C	ase studi	es		
			Fr	Sp	Ge		
Number of species in selected taxonomic group	91	Х	Х	Х	T-R	х	Х
Abundance of selected species in the quarry		Х	Х	exp	0	х	Х
Number of protected species in the quarry	91	Х		Х	Х	Х	Х
Number of Red list species in the quarry		Х	Х	Х	Х	X	Х
Abundance of protected/Red list species in the quarry	9	Х	Х	exp	0	х	х
Number of habitats in the quarry	100	Х	Х	Х	WB	Х	Х
Surface of habitats in the quarry	9	Х	Х	Х	WB	Х	Х
Number of protected habitats in the quarry	82	Х		Х	WB	х	Р
Surface of protected habitats in the quarry		Х		Х	WB	х	Р
Are there adjacent protected areas or areas of high biodiversity value outside the quarry		×	0	х	0	х	
Is there an impact due to noise on animal disturbance outside the quarry	91	LF					
Impact due to lighting on animals outside the quarry	36	LF					
Impact due to dust emission on animals or on habitats outside the quarry	82	LF					
Impact due to quarry activities on water quality in freshwater and riparian environments outside the quarry		х	Х	~	0		
Numbers of invasive alien species in the quarry	36	Х	Х	Х	Х	х	Х
Fragmentation of natural and semi-natural areas: Connectivity		х	0	0	0	х	Р
Fragmentation of river systems: Connectivity			0	~	~		
Trophic integrity of ecosystems			Х	0	0		
Freshwater quality	64	Х	Х	~	~	х	Х
Forest: growing stock, increment and felling			Х	~	Х		
Surface of habitats restored: "after use" or for natural purposes		х	х	х	AU	х	х
% of quarry that calculate biodiversity indicators			Х	Х	Х	Х	
% of quarry that implement communication and participation actions			Х	х	х	х	А
Total						16	14



SECTION 4

KPIS FRAMEWORK RESULTS FOR GYPSUM QUARRIES

General consensus KPIs framework for gypsum quarries

The final consensus KPIs framework for gypsum quarries contains eleven indicators which are the **most acceptable set of indicators** for all the stakeholders and answers to **European legislation and strategies** for biodiversity. This framework is intended to improve sustainability in the quarries and to help to **manage biodiversity** allowing setting-up of appropriate **reporting** systems in order to **maintain the biodiversity status** of gypsum quarries. Those **reporting systems** to the companies, Eurogy-

psum and to the public will needed **trainings** in quarries to build biodiversity knowledge and awareness to the indicators users and reporters, and to train people on how to implement reporting systems at their scales: have contacts with experts to collect the needed data's, to follow and write the reporting independently.

It is a **flexible** framework **adaptable** given the local context of each gypsum quarry. That means that it is a set that may be implemented differently given the **local context** of each quarry. It is developed to follow the **biodiversity management** at a scale of a quarry over time, in order to be able at the closure of the quarry to establish if a global **No Net Loss** is reached.

Consensus KPIs Framework for Gypsum Quarries 1 Number of native species in selected taxonomic group 2 Abundance of selected species in the quarry 3 Number of protected species in the quarry 4 Number of Red list species in the quarry 5 Abundance of protected/Red list species in the quarry 6 Number of habitats in the quarry 7 Surface of selected habitats in the quarry 8 Numbers of invasive alien species in the quarry 9 Freshwater quality 10 Surface of habitats restored 11 For one quarry, state of the communication and participation activities organised for the last five years

The quarry is divided into **different zones** inside the surface owned by the quarry. First of all, the quarry includes exploited areas. It is the zone where there are current mining activities. Secondly, old and future exploited areas. And finally, other areas that are part of the surface owned by the quarry, but that will never be affected by mining activities. Those indicators are developed at the scale of the quarry, for each zone separately except for the indicators dealing with the habitats and the participation and communication actions that are measured at the scale of the quarry as a whole.

The **update frequency** of the indicators isn't defined. It directly depends on the taxonomic group or species selected (if they are responding more or less quickly to changes and depending on their life cycle speed), the operating speed of the quarry and the extraction phase considered.





Quarry Caresse France (Pyrénées atlantique)

Factsheet of the eleven indicators

Factsheet content

Indicator Name	Name of the indicator (Number of the indicator)
Lead agency	Institution responsible for calculating and communicating the indicator.
_	

European ID

The indicators developed in the framework are based on the SEBI 2010 which relies on the Focal CBD areas (worldwide biodiversity target) and the European indicator headline (European biodiversity target). Each indicator is set in the DPSIR model.

Focal CBD area: "The CBD agreed upon a first headline indicator list in 2004, grouped in seven focal areas (Decision VII/30)" (34).

European indicator headline: The CBD list was "adapted to the European context and presented in the Message from Malahide (2004) as a first set of 15 European headline biodiversity indicators" (34).

Indicator type, DPSIR: Classification of the indicator in one of the DPSIR categories. "A number of approaches have been used to develop and structure indicators. One of the commonly used causal frameworks for describing the interactions between society and the environment is the driver, pressure, state, impact and response (DPSIR) model, based on the PSR framework model proposed by OECD in 1993" (34).

Use an interpretation

Key Eurogypsum question

The key Eurogypsum question the indicator helps to answer.

Definition

Definition of the indicator

Definitions of the terms used in the definition

Description of source data

Units in which it is expressed: (e.g. km2, number of individuals, % change)

Data availability in gypsum quarry: Main result analysis of the eleven EIAs received from the Gypsum Industry.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Main result about the opinions of all the stakeholders thought the survey.

Gypsum actor's opinion: Main result of the opinions of the local stakeholders about the implementation of the indicator on the field.

Implementation

What is taken into consideration for a future implementation

	Number of native species in selected taxonomic group (1)
Lead agency	Eurogypsum - guarry

Focal CBD area: Status and trends of the components of biological diversity.

European indicator headline: Trends in the abundance and distribution of selected species.

Indicator type, DPSIR: State.

Use an interpretation

Key Eurogypsum question

How is evolving native species richness in the quarry? Is the quarry management maintaining or ameliorating species richness?

Definition

Definition of the indicator

This indicator shows trends in the number of native species of selected taxonomic group over time in a quarry and on the different zones existing in a quarry.

Definitions of the terms used in the definition

Taxonomic group: Any group of species from a given taxonomic level (families, class, order etc.) that has recognizable characteristics. Example: plants, birds, reptiles, butterfly (Lepidoptera), dragonflies (Odonata) and bats.

Species: "A group of organisms capable of interbreeding and producing fertile offspring of both genders, and separated from other such groups with which interbreeding does not characteristically occur: however, for asexual organisms, a distinct species may be considered a collection of organisms which have very similar DNA or physical characteristics. Certain species are further subdivided into subspecies" (14). Example: within butterflies: Monarch butterfly (Danaus plexippus), the Red Admiral (Vanessa atalanta).

Native: a species is defined as native (or indigenous) to a given region or ecosystem if its presence in that region is the result of only natural processes, with no human intervention. Every natural organism (as opposed to a domesticated organism) has its own natural range of distribution in which it is regarded as native. Outside this native range, a species may be introduced by human activity; it is then referred to as an introduced species within the regions where it was anthropogenically introduced.

Species richness: "The number of species in a community, in a landscape or marinescape, or in a region" (15).

Description of source data

Units in which it is expressed: Number of species (most often with a list of species names)

Data availability in gypsum quarry:

91% of the EIAs analyzed established a list of species of selected taxonomic groups: plants, birds, reptiles, amphibians, mammals and insects. All the EIAs are presenting a list of minimum four taxonomic groups. Taxonomic group's plants, birds and insects, meanwhile, are the most established lists with more than 80% of the EIAs.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Highlighted for being important.

Gypsum actor's opinion: Reached a consensus of agreement. In Germany the Gypsum Industry is already evaluating this indicator with the system of Dr Trankle/Rademacher (16).

Implementation

Some taxonomic groups should be monitored in all quarries: plants, one group of insect, birds. Those groups are considered in the majority of environmental assessments. They are representative of different trophic levels and of well being of ecosystem.

Other taxonomic groups should be considered depending on the local context. For example dragonflies or amphibians when aquatics habitats are created, or some groups for which the diversity level is high (hotspots) in the eco-region.

	Indicator Name	Abundance of selected species in the quarry (2)
	Lead agency	Eurogypsum - quarry
	F ID	

Focal CBD area: Status and trends of the components of biological diversity.

European indicator headline: Trends in the abundance and distribution of selected species.

Indicator type, DPSIR: State.

Use an interpretation

Key Eurogypsum question

How is the abundance of species evolving, representative of ecosystems wellbeing in the quarry? Is the quarry management maintaining or ameliorating species abundance?

Definition

Definition of the indicator

This indicator shows trends in the abundance of selected species over time in a quarry and on the different zones existing in a quarry.

Definitions of the terms used in the definition

Abundance: "Number of individuals observed" (17).

Selected species: Species that play an important role in the functioning of the quarries ecosystem or tell something about the wellbeing of ecosystems, like: key species, indicator species, umbrella species, engineer species or invasive species.

Key stone species: "A taxon whose impact on the ecosystem or community studied is disproportionately large relative to its abundance" (18). The loss of these species will significantly impact upon the population sizes of other species in the ecosystem, potentially leading to further species loss ('cascade effect').

Indicator species: "A species that is of narrow amplitude with respect to one or more environmental factors and that is, when present, therefore indicative of a particular environmental condition or set of conditions" (19).

Umbrella species: A species with large area requirements for which protection of the species offers protection to other species that share the same habitat (20).

Invasive plants: exotic species that are naturalized and "that produce reproductive offspring, often in very large numbers, at considerable distances from parent plants (approximate scales: > 100 m; < 50 years for taxa spreading by seeds and other propagules; > 6 m/3 years for taxa spreading by roots, rhizomes, stolons, or creeping stems), and thus have the potential to spread over a considerable area" (21). Measuring the abundance of invasive plants is complementary to the indicator "Numbers of invasive alien species in the quarry".

Description of source data

Units in which it is expressed: Number of mature individuals on a given area. For some taxonomic groups the abundance may be approximate by the coverage, the biomass, density, etc.

Data availability in gypsum quarry:

Currently, no EIAs are dealing with the abundance of species.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Highlighted for being highly important.

Gypsum actor's opinion: Two quarries agreed on a possible implementation, but highlight that it may be expensive. The third quarry emits some doubt on the feasibility of implementation.

Implementation

The preferred input would be sets of quantitative data on the population size (or proxy of population size) of selected species within a given area, assessed at suitable time intervals using a standardised method.

Data can include total number of individuals over the quarry, density estimates (e.g. the number of birds per km of transect, number of orchids per square meter), and proxies of population size (e.g. number of nests of Bank Swallow or biomass of an invasive plant species).

	Indicator Name	Number of protected species in the quarry (3)
	Lead agency	Eurogypsum - quarry
	Furonean ID	

Focal CBD area: Status and trends of the components of biological diversity.

European indicator headline: Change in status of threatened and/or protected species.

Indicator type, DPSIR: State.

Use an interpretation

Key Eurogypsum question

How is protected species richness evolving in the quarry? Is the quarry management maintaining or ameliorating protected species richness?

Definition

Definition of the indicator

This indicator shows trends in the number of protected species over time in a quarry and on the different zones of the quarry defined.

Definitions of the terms used in the definition

Protected species: any species that has protected status in legislation at the European, national or regional level. Example: At a regional scale of Wallonia (Belgium), the Great Egret (Casmerodius Albus) is under protection given the Directive 79/409 or the Annex XI of the Decree on the Conservation of Natura 2000 sites (6 December 2001).

Description of source data

Units in which it is expressed: Number of protected species (most often with a list of protected species names).

Data availability in gypsum quarry:

91% of the eleven EIAs analyzed are establishing a list of the protected species of the quarry.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Highlighted for being highly important.

Gypsum actor's opinion: Two quarries agreed on a possible implementation, but the third quarry believes not for future implementation because the definition of protected species is difficult.

Implementation

Number of all the protected species at a European, national or regional level in the quarry.

Indicator Name	Number of Red list species in the quarry (4)
Lead agency	Eurogypsum - quarry

Focal CBD area: Status and trends of the components of biological diversity.

European indicator headline: Change in status of threatened and/or protected species.

Indicator type, DPSIR: State.

Use an interpretation

Key Eurogypsum question

How is the threatened Red list species richness evolving in the quarry? Is the quarry management maintaining or ameliorating protected species richness?

Definition

Definition of the indicator

This indicator shows trends in the number of threatened Red list species over time in a quarry and on the different zones of the quarry.

Definitions of the terms used in the definition

IUCN Red list species: Species that have been assessed as Critically Endangered, Endangered, and Vulnerable in the IUCN Red List of Threatened Species (also known as the IUCN Red List or Red Data List). This list is defined at a regional, national or global scale.

Description of source data

Units in which it is expressed: Number of Red list species (most often with a list of Red list species names)

Data availability in gypsum quarry:

Currently, none of the EIAs are dealing with the Red list species.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Highlighted for being highly important.

Gypsum actor's opinion: Reached a consensus of agreement.

Implementation

The Red list species taken into account depends on the knowledge level. At least, threatened species include all species listed in the global IUCN data base (http://www.iucnredlist.org/) or regional or national Red list when they exist. Because Red lists are evolving with knowledge development and are not assessed for all taxonomic groups, threatened species should also be identified on the basis of up-to-date existing scientific literature or adhoc studies (see for example Saad & al., 2009 (22); Faucon & al., 2010 (23) and Martínez-Hernández & al., 2011 (24)).

Indicator Name	Abundance of protected/Red list species in the quarry (5)
Lead agency	Eurogypsum - quarry
_	

Focal CBD area: Status and trends of the components of biological diversity.

European indicator headline: Change in status of threatened and/or protected species.

Indicator type, DPSIR: State.

Use an interpretation

Key Eurogypsum question

How is the abundance of protected and threatened (Red list species) evolving in the quarry? Is the quarry management maintaining or ameliorating species abundance?

Definition

Definition of the indicator

This indicator shows trends in the abundance of threatened (Red list species) and protected species over time in a quarry and on the different zones existing in a quarry.

Definitions of the terms used in the definition

Abundance: "Number of individuals observed" (17).

IUCN Red list species: Species that have been assessed as Critically Endangered, Endangered, and Vulnerable in the IUCN Red List of Threat-ened Species (also known as the IUCN Red List or Red Data List). This list is defined at a regional, national or global scale.

Protected species: any species that has protected status in legislation at the European, national or regional level. Example: At a regional scale of Wallonia (Belgium), the Great Egret (Casmerodius Albus) is under protection given the Directive 79/409 or the Annex XI of the Decree on the conservation of Natura 2000 sites (6 December 2001).

Description of source data

Units in which it is expressed: Number of mature individuals of threatened (Red list species) and protected species in a given area. For some taxonomic groups the abundance may be approximate by the coverage, the biomass, density, etc.

Data availability in gypsum quarry:

Currently, none of the EIAs are dealing with the abundance of protected or Red list species.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Highlighted for being highly important.

Gypsum actor's opinion: Two quarries agreed on a possible implementation, but highlight that it may be expensive. The third quarry emits some doubt on the feasibility of implementation.

Implementation

The preferred input would be sets of quantitative data on the population size (or proxy of population size) of selected threatened (Red list species) and protected species within a given area, assessed at suitable time intervals using a standardised method.

Data can include total number of individuals over the quarry, density estimates (e.g. the number of birds per km of transect, number of orchids per square meter), and proxies of population size (e.g. number of nests of Bank Swallow or biomass of an invasive plant species).

Focal CBD area: Status and trends of the components of biological diversity.

European indicator headline: Trends in extent of selected biomes, ecosystems and habitats.

Indicator type, DPSIR: State.

Use an interpretation

Key Eurogypsum question

How is the habitat diversity evolving in the quarry? Is the quarry management maintaining or ameliorating the habitat diversity?

Definition

Definition of the indicator

This indicator shows trends in the number habitats over time in a quarry.

Definitions of the terms used in the definition

Habitat: Habitat type is defined as follows: "Plant and animal communities as the characterising elements of the biotic environment, together with abiotic factors operating together at a particular scale" All factors included in the definition are addressed in the descriptive framework of the EUNIS habitat classification. (http://eunis.eea.europa.eu/about.jsp).

Description of source data

Units in which it is expressed: Number of habitats (most often with a list of habitats)

Data availability in gypsum quarry:

All the eleven EIAs analyzed deal with the number of habitats and establish a list of habitats within the quarry. All the French quarries identify habitats with the system of Corinne Biotope and all the other quarries are dealt with under other systems.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Highlighted for being highly important.

Gypsum actor's opinion: Reached a consensus of agreement. In Germany Gypsum Industry is already evaluating this indicator with the system of Dr Trankle/Rademacher (16).

Implementation

Any measure of habitat diversity should be based on adequate typology. Specific local or regional typology can be developed but should be referred to the Eunis classification.

Indicator Name	Surface of selected habitats in the quarry (7)
Lead agency	Eurogypsum - quarry
Furonean ID	

Focal CBD area: Status and trends of the components of biological diversity

European indicator headline: Trends in extent of selected biomes, ecosystems and habitats

Indicator type, DPSIR: State

Use an interpretation

Key Eurogypsum question

Is the surface of important habitats maintained thoughout quarrying?

Definition

Definition of the indicator

How is the surface of habitat of interest evolving in the quarry? Is the quarry management maintaining or ameliorating the habitat diversity?

Definitions of the terms used in the definition

Selected habitat: habitats that host protected or Red list species or that host a high number of species or that contains an original composition of species.

Description of source data

Units in which it is expressed: Area of habitats.

Data availability in gypsum quarry:

Currently, none of the EIAs deal with the surface of selected habitats.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Highlighted for being important.

Gypsum actor's opinion: Reached a consensus of agreement. In Germany Gypsum Industry is already evaluating this indicator with the system of Dr Trankle/Rademacher (16).

Implementation

In any case the priority habitats given the Habitats directive should be considered. Priority habitats means natural habitat types in danger of disappearance and the natural habitats types of community interest (Annex I of the habitat Directive 92/43EEC). The other habitats to be monitored are habitats hosting protected or threatened species. Additionally, habitats of interest (high species richness or originality) can also be identified on the basis of up-to-date existing scientific literature or ad hoc studies at a regional scale.

Indicator Name	Numbers of invasive alien species in the quarry (8)
Lead agency	Eurogypsum - quarry
European ID	

Focal CBD area: Threats to biodiversity

European headline indicator: Trends in invasive alien species

Indicator type, DPSIR: Pressure

Use an interpretation

Key Eurogypsum question

Does the quarry management prevent establishment of invasive exotic species or reduce their occurrence?

Definition

Definition of the indicator

This indicator shows trends in the number of invasive species over time in a quarry and on the different zones of the quarry.

Definitions of the terms used in the definition

Exotic (synonyms: alien, species, non-native plants; nonindigenous plants): species "in a given area whose presence there is due to intentional or accidental introduction as a result of human activity" (21).

Invasive plants: exotic species that are naturalized and "that produce reproductive offspring, often in very large numbers, at considerable distances from parent plants (approximate scales: > 100 m; < 50 years for taxa spreading by seeds and other propagules; > 6 m/3 years for taxa spreading by roots, rhizomes, stolons, or creeping stems), and thus have the potential to spread over a considerable area" (21).

Description of source data

Units in which it is expressed: Number of invasive species (most often with a list of invasive alien species names)

Data availability in gypsum quarry:

36% of the eleven EIAs analyzed are dealing with invasive alien species. The presence of some invasive species is only highlighted in the EIAs, but there is never a comprehensive inventory of all the invasive species in the guarry.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Highlighted for being highly important.

Gypsum actor's opinion: Reached a consensus of agreement. Local stakeholders propose to focus on the plant species because they are often favored by the temporary biotopes that a quarry generated.

Implementation

Identifying the invasive alien species could be challenging due to taxonomic complexity. For Europe, lists of problematic invasive species are provided by regions in the DAISY project (http://www.europe-aliens.org/regionSearch.do). In addition, systems of black list, grey list and watch list have been developed regionally (e.g. see http://ias.biodiversity.be/species/all).

Indicator Name	Freshwater quality (9)
Lead agency	Eurogypsum - quarry
Furopean ID	

Focal CBD area: Ecosystem integrity and ecosystem goods and services

European indicator headline: Water quality in aquatic ecosystems

Indicator type, DPSIR: Pressure

Use an interpretation

Key Eurogypsum question

Is the freshwater quality of the quarry answering to the European Ground Water Directive (Directive 2006/118/EC) and the Water Framework Directive (Directive 2000/60/EC)?

Definition

Definition of the indicator

This indicator shows trends in the achievement of the European Ground Water Directive (Directive 2006/118/EC) and the Water Framework Directive (Directive 2000/60/EC).

Definitions of the terms used in the definition

Freshwater: includes surface and ground water.

Description of source data

Units in which it is expressed: no units, descriptive indicator.

Data availability in gypsum quarry:

64% of the eleven EIAs analyzed are dealing with the freshwater quality. In those EIAs the freshwater quality is used for the ground water and/or the surface water. Only one of the EIAs dealing with the freshwater considered only the surface water.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Highlighted for being highly important.

Gypsum actor's opinion: This indicator is not applicable everywhere as two quarries visited didn't have freshwater issues. The third quarry agreed on the possible implementation.

Indicator Name	Surface of habitats restored (10)
Lead agency	Eurogypsum - quarry

Focal CBD area: Sustainable use

European indicator headline: Habitats protected or restored

Indicator type, DPSIR: Responses

Use an interpretation

Key Eurogypsum question

How much surface of habitats has been restored in the quarry after exploitation?

Definition

Definition of the indicator

This indicator shows trends in the surface of restoration after exploitation over time in a quarry.

Definitions of the terms used in the definition

Ecological restoration: "Is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed" (25).

Restored habitat: It will then demonstrate resilience to normal ranges of environmental stress and disturbance. It will interact with contiguous ecosystems in terms of biotic and abiotic flows. The SER (25) lists the attributes that a restored quarry should have. Restored habitats may be similar to the habitat before quarrying, exploitation (like-like), or may be new habitats created by quarrying condition (like-unlike) also designed as rehabilitated habitats.

Description of source data

Units in which it is expressed: Surface of habitat restored by type of habitats.

Data availability in gypsum quarry:

Currently, none of the EIAs are dealing with the surface of habitats restored.

Description of the opinion expressed by the stakeholders

Stakeholder's opinion: Highlighted for being highly important.

Gypsum actor's opinion: Reached a consensus of agreement. Local stakeholders insisted on the fact that it is important to develop an indicator which assesses the success of restoration in addition with the area restored. In Germany for this purpose they used the indicator of "After use" that divides the restorations into three types: restoration for nature, for agriculture and for forest.

Implementation

The habitats to take into considerations are the habitats corresponding to the attributes of the selected habitats described in the indicator "Surface of selected habitats in the quarry".

Indicator Name	For one quarry, state of the communication and participation activities organized for the last five years (11)		
Lead agency	Eurogypsum - quarry		
European ID			
Focal CBD area: Public opinion			
European indicator headline: Public awareness and participation			
Indicator type, DPSIR: State			
Use an interpretation			
Key Eurogypsum question			
What are the actions of communication and participation to the public led by the quarry?			
Definition			
Definition of the indicator			
For one quarry, state of the communication and participation activities organized for the last five years.			
Definitions of the terms used in the definition			
Participation and communication activities: actions that are led by the quarry and promote public awareness of biodiversity. Example: Open days to the public with specific biodiversity activities, folders for communicating biodiversity issues, TV reportage about biodiversity.			
Description of source data			
Units in which it is expressed: Number of communication and participation activities organised for the last five years.			
Data availability in gypsum quarry:			
Currently, none of the EIAs are dealing with that indicator.			
Description of the opinion expressed by the stakeholders			
Stakeholder's opinion: Not highlighted for being highly important.			

Gypsum actor's opinion: Reached a consensus of agreement.

APPENDIX

Participants and Contributors

The members of the different Stakeholder's Groups and institutions are listed below:

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SG 3 - Sites

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SG 6 - Wallonia

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SG 8 – Scientific panel

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Glossary of terms

- Ecosystem: "Means a dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit" (1). "An ecosystem is a community of organisms interacting with each other and with their environment such that energy is exchanged and system-level processes, such as the cycling of elements, emerges" (26).
- ➤ **Taxonomy:** "Is the scientific classification scheme of grouping and categorising organisms, including the concepts of genus or species" (27).
- ▶ Ecological processes or ecosystem functions: "Are the dynamic attributes of ecosystems, including interactions among organisms and interactions between organisms and their environment. Ecological processes are the basis for self-maintenance in an ecosystem" (25).
- Biogeographical region or eco-regions: Areas of relatively homogeneous ecological conditions with common characteristics and which contains distinct assemblages of natural communities and species (28)
- ▶ Ecosystem services: "The benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth. The concept "ecosystem goods and services" is synonymous with ecosystem services" (11).
- Provisioning services: "The products obtained from ecosystems, including, for example, genetic resources, food and fiber, and fresh water" (11)
- Regulating services: "The benefits obtained from the regulation of ecosystem processes, including, for example, the regulation of climate, water, and some human diseases" (11).
- ➤ Supporting services: "Ecosystem services that are necessary for the production of all other ecosystem services. Some examples include biomass production, production of atmospheric oxygen, soil formation and retention, nutrient cycling, water cycling, and provisioning of habitat" (11).
- ▶ Monitoring: "Intermittent (regular or irregular) surveillance carried out in order to ascertain the extent of compliance with a predetermined standard or the degree of deviation from an expected norm" (29)
- Protected area: "Means a geographically defined area which is designated or regulated and managed to achieve specific conservation objectives" (1).
- Mitigation: "Is an action that is intended to compensate environmental damage" (11).
- Mitigation hierarchy: "The principle that appropriate actions to address potential biodiversity impacts are taken in the following order of priority: (1) avoidance of impacts; (2) reduction of negative impacts; (3) rehabilitation/restoration measures; and (4) compensation measures for significant adverse residual impacts." (3). See Figure 11.
- Avoidance: measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity." (3).
- Minimization: measures taken to reduce the duration, intensity and / or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible." (3).

- Rehabilitation/restoration: measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised." (3).
- Offset (Compensation): "Measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored, in order to achieve NNL or a net gain of biodiversity." (3).
- ▶ **Descriptive indicators** (versus normative): "Indicators used to describe environmental states or changes" (12).
- ▶ Normative indicators (versus descriptive): "Indicators are not only used to describe environmental states or changes but also to evaluate them and to set objectives" (12).
- ► Indicators as measures of ecological attributes (versus as ecological components): "Indicator that are measures of ecological attributes (e.g., species richness)" (12).
- ▶ Indicators as ecological components (versus as measures of ecological attributes): "Indicator that are components of ecological attributes (e.g., a certain taxon)" (12).
- Participation or participatory process: In this thesis participation is defined as a "process where individuals, groups and organisations choose to take an active role in making decisions that affect them". "This definition focuses on stakeholder participation rather than broader public participation" (30).
- Stakeholder: "Any group or individual who can affect or is effected by the achievement of the organisation's objectives" or decisions (31).

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