
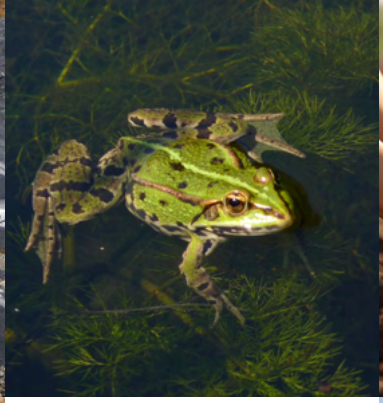

IMA-EUROPE: BIODIVERSITY CASE STUDIES

November 2024





IMA Europe

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Foreword

The European Industrial Mineral sector recognises the crucial role that biodiversity and healthy ecosystems play for our planet and society. Therefore, IMA is committed to contribute to ecosystem well-functioning.

This brochure presents numerous examples of the sector's projects that demonstrate how extractive activities can effectively coexist with nature throughout their entire life cycle, and that post-extraction restoration can even strengthen existing ecosystems through habitat diversification and enhancement.

Some of these initiatives include the conservation of ecosystems from: **1.** Early exploration phases, using preventive approaches and offsetting strategies; **2.** During exploitation operations, active management practices help mitigate impacts and facilitate the compatibility of extractive activities with biodiversity; **3.** Finally, in the decommissioning phases; **4.** Post-closure life of our sites, restoration projects not only enhance the original ecosystems but also bring added value and new uses for communities.

Illustrating how sourcing sustainably raw materials and the habitat management/restoration as integral part of our activities, the industrial minerals sector serves as an example on how to reconcile growth and prosperity with nature.

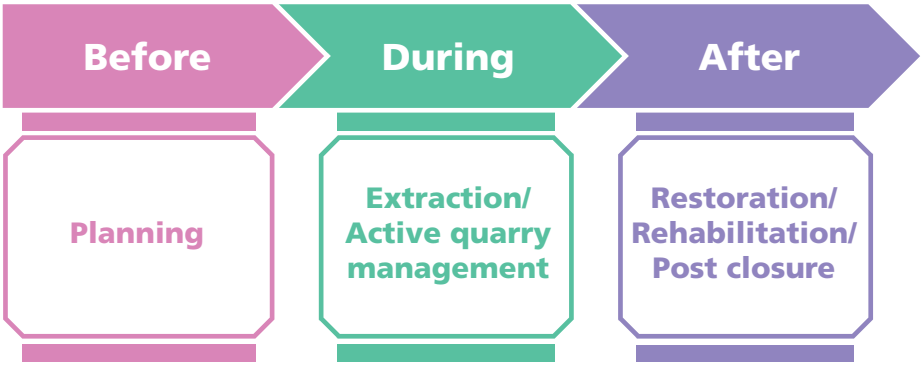
Brendan CLIFFORD
PRESIDENT
IMA–EUROPE
October 2024

Policy background

In the framework of the transition to a sustainable economy and as a central element of The European Green Deal (2019), the European Commission has stepped up the EU's ambition to preserve and restore ecosystems and biodiversity.

This objective was initially illustrated in the Biodiversity Strategy 2030, and it has also been reflected across multiple policy frameworks, such as the Common Agriculture Policy, the Zero Pollution Action Plan, the Pollinator Strategy and the Nature Restoration Law.

The extractive industry has for a long time been amongst the frontrunners in ecosystem restoration, as this is an integral part of our operations cycle:



The present document showcases a collection of initiatives that, whilst acknowledging the impacts of extractive activities on biodiversity, demonstrate that with adequate planning and management practices, the sector can effectively coexist with nature and return to society healthy ecosystems and create added value for the local inhabitants.

By sharing these experiences, we hope to not only strengthen the visibility of our work in this area but also inspire operators and authorities in other regions of the world to step up their nature restoration efforts.

Mineral extraction is a cornerstone of our industrial fabric and the pillar of countless value chains. Maintaining Europe's industrial capacity and security of raw material supply against global disruptions is as essential as ensuring that these activities are carried out sustainably. The main objective of this brochure is to demonstrate how this could be done during the different stages of an extractive project.

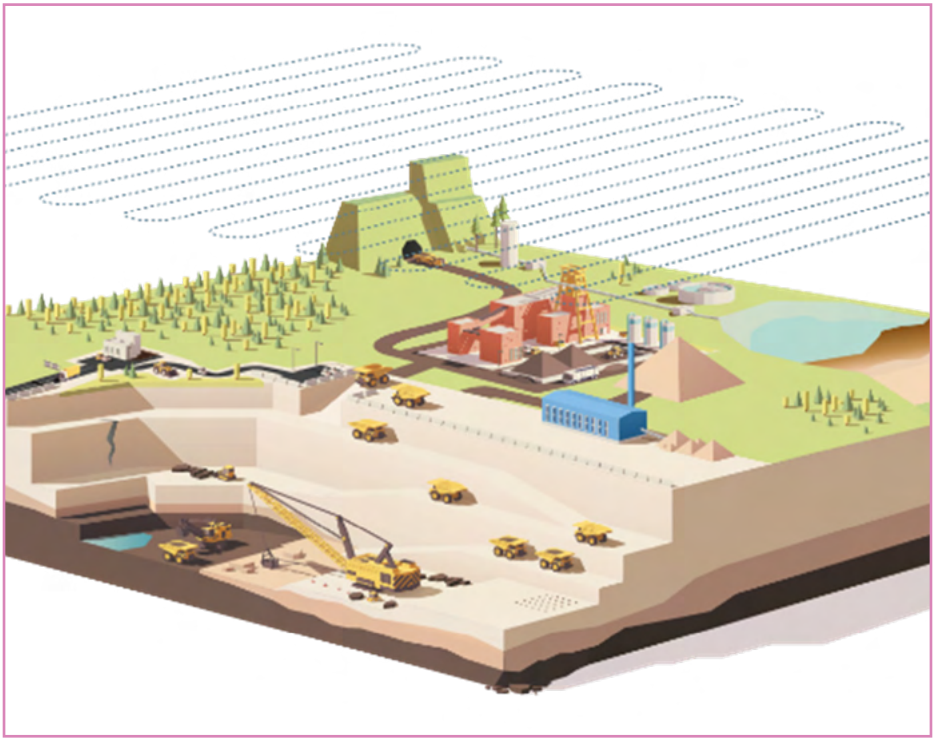
Phase 1: Before (Planning)

Most extraction projects start from the exploration phase, where geologists locate the target deposits and assess the feasibility of their extraction in a sustainable and economically viable manner.

Once this assessment conducted, a thorough plan, stating the areas that would be subject to extraction, the management of the top-soil removed, and the restoration of the site once extraction are closed.

In order to facilitate habitat restoration, a dedicated team of experts study the area in detail to:

- identify the existing species,
- monitor ecological trends,
- quantify ecosystem services,
- develop a plan to avoid, mitigate and offset impacts in line with the Environmental Impact Assessment Directive (2014/52/EU).



Source: wingtra.com/drones-for-mining/

Phase 1: Planning

Apollo and large blue butterfly project (SE)

In connection with Nordkalk's latest limestone quarry permit application for a new quarry area on Gotland, an island situated in the Baltic Sea, the EIA study found two rare butterflies, the Apollo (P*arnassius apollo*) and Large Blue (*Maculinea arion*), at the planned quarry. Nordkalk developed a special protection and conservation programme aiming to increase the natural areas of the two rare butterfly species at a suitable overgrown nature area close to the quarry. A detailed plan on how to trim bushes and trees to create the right habitat conditions for the butterflies and their host plants and host ants was developed with help of experienced ecological experts. This project is the first of its kind in the Swedish mining industry that applies protection and conservation measures according to the Habitat Directive (Council Directive 92/43/EEC), based on a Swedish Environmental Court decision. The court decision stated that such an approach was considered to comply with the Habitats Directive's overall aim of biological diversity and restoration work.

Apollo butterfly at Gotland Quarry (SE)

Large Blue butterfly from Gotland Quarry (SE)

Nordkalk

Increase quarry acceptance in a sensible region (FR)

Omya's quarry in Orgon is nearby an old typical Provencal village in Natura 2000 area, and part of Alpilles regional natural park. "Alpilles" mountains a are a place for tourism, olive oil and wine production. The mining activity in the region is not well accepted, various associations were against quarry development. In early 2000, Omya tried to extend its historical quarry and lost in court the mining permit. A change in Omya's way of communication to local communities was initiated to have better acceptance. A local quarry council with village representatives, a local association, Alpilles regional park, an administration representative and Omya was created and meet together at least once a year. Those meetings allow the local association to participate in quarry recultivation and for Omya to understand their worries better. Different projects were put in place, considering the remarks and demands of local authorities, and associations.

The project's purpose is to show to the local community that mining profesisonals truly care for the environment: Create a viewpoint of the quarry with direct access from the village and open to anyone, anytime; Involve the local school in the recultivation; a school class came to plant lavender as part of the recultivation strategy; Install specific habitats (stone boulders) in the recultivated area for timon lipidus; Take the occasion of changing the pre-grinding installation to answer to environmental improvement demands; Take part in local events in partnership with Orgon museum, like open days for palaeontology or European heritage days.

Spider web in Orgon quarry (FR) © Pawlowski

Quarry view-point for public in Orgon quarry (FR) © Pawlowski

Omya Gummern, Austria – Best Practices in terms of restoration and renaturation (AT)

In 2004, in partnership with WWF Austria, Omya started to evaluate the impact of its restoration and renaturation practices at the Gummern site with the aim of adopting best practices. A first assessment showed a higher biodiversity, especially where the company had allowed nature to gradually take over the area with minimum intervention.

A follow-up project with the help of an environmental consultancy measured the impact of the quarry on the local biodiversity compared with the surrounding area. The external partner has helped us to introduce a Long-term Biodiversity Index (LBI), in line with the principles of the European Impact Assessment (EIA) Directive.

Core to the project was the comparison of the current state with the original state. The findings and iterative evaluation campaigns confirmed the higher biodiversity in the renaturated area of the Gummern site.

The outcome of this study helped Omya develop an up-to-date renaturation strategy.

This strategy has been integrated into the restoration plans of the Gummern site and validated by the authorities.

Helicopter view of quarry and operations at Gummern site (AT)

Restored areas in Gummern quarry (AT)

Phase 1

Ecological connectivity in Arcos de la Frontera (ES)

Sibelco Spain has developed a Biodiversity Management Plan in the quarry of "Arcos de la Frontera". The plan was developed as a tool, it will be a guidance of the ecological balance in the quarry area. The plan involves the different life stages of the quarry: the area where operations take place, the areas that are being restored and the areas that already have been restored. We will also take care of management of exotic species (*Acacia farnesiana*) and specific actions to ensure the survival of some species (Bee-eater, Cork oak). The quarry of Arcos is creating several lagoons in the area that function as an important connectivity between larger water bodies in the surroundings. In a short-term view, the lagoons can be important resting or foraging areas for migratory animals (birds and mammals). In the long-term view, these lagoons will upgrade the structural ecological connectivity of the land, because the lagoons will form an important stepping stone between larger water bodies. There are 4 lagoons and 1 lagoon in front of exploitation ("lacunar system dredger"). Lagoon 1 and 2 are in the restored area and have developed marsh vegetation dominated by reed (*Phragmites australis*) and cattail (*Typha domingensis*) with some poplar tree (*Populus alba*), willow (*Salix* species) and tamarisk (*Tamarix africana*). It hosts a large community of waterfowl, indicating stability and water quality. Lagoon 3 is located in the area that is being restored, actions that will be taken here are in function of the bee-eater (*Meriops apiaster*), which likes to make nests in the steep sandy slopes near the water. Especially flowering plants will be used for the vegetation, plants that flower in spring and autumn, to guarantee the presence of the bees (e.g. *Dittrichia viscosa* and *Phillyrea angustifolia*).

Arcos de la Frontera quarry (ES)

SIBELCO

Source: Sibelco - Ransbach (DE)

Phase 2: During (Extraction operations)

The extraction phase, often involves the relocation of large volumes of soil and subsoil, altering the existing landscape topography and creates new landscapes on the site.

During this phase, the active management of biodiversity facilitates the mitigation of impacts and prepares the ground for post-closure restoration.

Through gradual reforestation efforts, operators ensure the continuity of the original ecosystem, ensures the maintenance of local biotopes and preventing the settlement of invasive species.

Concepts such as 'temporary nature' allow operators to actively invest efforts in protecting biodiversity while reducing legal uncertainties and minimising potential conflicts between extractive activities and biodiversity protection, ensure a fruitful coexistence of both spheres.

Comprehensive legislation established at the EU, and transposed into national/regional law determines the species and habitats on which these management strategies should focus on. This ensures that activities are carried out respecting the needs of the most sensitive species, adapting the works in a case-by-case manner, and apply tailor adapted solutions such as seasonal halts, habitat relocation, or facilitated re-colonisation.

Source: Clariant - S'Aliderru Bentonite Mine, Sardinia (IT) © Fabio Granizio

Phase 2: Extraction operations

Life in Quarries (BE)

Exploiting a quarry creates environments that have become rare in Belgium, such as cliffs, rocky or sandy surfaces, rockslides, temporary stretches of water, chalk grasslands or sparse meadows. These habitats, generated by mining activity, enable the appearance and development of populations of pioneer species with a high biological value.

The general objective of the Life in Quarries (European project driven by FEDIEX including 25 quarrie) is to develop and make sustainable the hosting capacity of biodiversity in various quarries in Wallonia. The originality of this project is based on the implementation of dynamic biodiversity management measures during the extractive phase and not only as part of rehabilitation at the end of works.

Life In Quarries (BE) – Life project

Life In Quarries (BE)

Roselière programme in quarries (FR)

Phase 2

The Roselière programme aims to monitor and evaluate biodiversity in the extraction sector. It is organised with a partnership approach between Roselière, naturalist associations, quarry exploiters including Sibelco, and scientific partners like the Muséum National d'Histoire Naturelle. It started in 2006, since then a total of over 50 quarries, both softrock and hardrock, have been enrolled in the Roselière programme. Sibelco joined this programme in 2017 with five quarries in different regions of France.

Within this programme, 11 taxonomic groups of species (amphibians, reptiles, land vegetation) are monitored, with a standardized protocol for the monitoring of each group that specifies the methods and frequency. Based on this monitoring, the biodiversity of these quarry sites can be compared with the initial state and other territories. The standardized monitoring protocols also allow researchers to add up the observations made within the Roselière programme and other observations (for Environmental Impact Assessments for example) to get an even better view of the biodiversity in an area. In 2021, 1000 observations were made within the Roselière programme for Sibelco's quarries, and with other observations added a total of nearly 7000 observations of 1032 species were made at Sibelco's participating sites.

Several scientific publications have been published based on this research, for instance an article has been written about the "Potential of restoration of gravel-sand pits for Bats". The increased scientific knowledge about nature in quarries has led to exploitation, management and restoration that is better for nature. This is visible in, for instance, the higher amount of species observed in zones that have been restored when compared to zones that haven't been exploited yet and in the increasing amount of species observed over time.

The Violet dropwing or *Trithemis annulata*, a photograph taken during the monitoring in one of our quarries

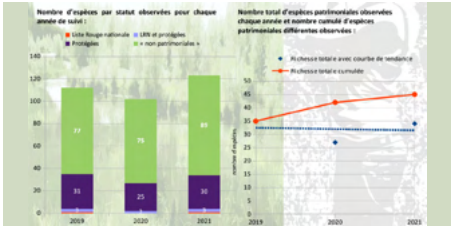


Figure 1: Example of graphs shown in the result sheets that are created every year for every site.
Source: Sibelco – Multiple sites (FR)

SIBELCO

The Owl Project (BE)

The Owl Project monitors the presence of eagle owls, increasing in numbers, which have returned to an area comprising active and closed quarries. The mines represent important secondary habitats in a densely-populated area for this endangered and closely protected species. In the excavation sites, an expert ornithologist studies owl habitats, population development and breeding, new generations, and hunting practices. The project also seeks to improve habitat conditions for the owls. The project is being carried out in collaboration between the lime industry and local authorities; all parties have signed a public law contract.

Barn Owl. **Source:** Lhoist (BE)

Sa Matta Mine nature trail – increasing the awareness of biodiversity treasures (IT)

IMI Fabi follows a code of practice consistent with policies of sustainable development. The company supports several programmes aimed at biodiversity conservation and builds on its previous successful experiences. The biodiversity project Sa' Matta Mine consists of the creation of a nature trail located in the charming Mediterranean area adjacent to the Sa' Matta mine with the aim to increase awareness about life form varieties within this specific geographic region. After a careful analysis of the environmental aspects of the area around the Sa' Matta mine has been carried out, the locally most widespread trees and shrubs were identified. Next, the educational trail was designed along a lake and up the hill opposite the mine entrance.

A floating pier was positioned on the lake and is used as an observation deck. Information panels have been placed at key locations along the trail, highlighting the area's natural resources. Another observation point has been built on top of the hill, from where one can enjoy a spectacular view showing the mining activities below. The Sa' Matta nature trail has become an educational trail. Eight educational panels describe the main characteristics of this habitat and highlight its natural aspects: information on the local fauna and flora, the pond's vegetation, the Mediterranean low and high scrubs, as well as the site's restoration techniques and mining activities.

Source: IMIFABI – Sa Matta Mine (IT)

IMIFABI

Clays quarries as biodiversity hotspots (DE)

In May 2009, the German Ceramic Raw Materials and Industrial Minerals Association „Bundesverband Keramische Rohstoffe und Industrieminerale e.V. (BKRI)" and the Ministry of Environment, Agriculture and Forestry of Rhineland-Palatinate (Ministerium für Umwelt, Forsten und Verbraucherschutz in Rheinland-Pfalz) signed an agreement to protect Natura 2000 species. Today, amphibian monitoring covers a total of 42 open-cast clay pits inside and outside this area. These sites are the home of species such as the yellow-bellied toad (*Bombina variegata*) and great crested newt (*Triturus cristatus*), both of which are strictly protected and endangered.

Yellow-bellied toad (*Bombina variegata*) © Stefan Backes

Other amphibians like the natterjack toad, green toad or midwife toad, as well as bird species such as the eagle owl, whinchat, stonechat, meadow pipit, and little ringed plover also benefit from the project. The aim is to permanently maintain stable amphibian populations in the clay pits by preserving and optimizing the populations identified during the extraction phase. For 30 years now, a mutual and trusting cooperation has developed between the clay industry and the nature conservation authorities.

Thanks to its success, this project was included as a „Best Practice" in the European Commission's guidance document of non energy mineral extraction in Natura 2000 sites (page 123).

Tree frog (*Hyla arborea*) © Elmar Schmidt

BKRI
BUNDESVERBAND KERAMISCHE ROHSTOFFE UND INDUSTRIEMINERALE e.V.

Diversification of habitats as a way of improving biodiversity (BE)

Two projects have delivered on biodiversity in Belgium due to very fruitful cooperation between public, private and non-governmental partners. The creation of the Frasnes wetland follows the project pilot WALPHY (2009-2013) and aims to restore quality physical and biological characteristics of Eau Blanche and its tributaries and recover aquatic habitats rich in biodiversity. Ponds and wetlands, once very numerous in the valley, have become rare today. A wetland of +/- 1.6 ha with large permanent ponds, with a depth of up to 1.50 meters, has been developed on land belonging to Carmeuse, in the immediate vicinity of the settling ponds of the quarry. The creation of a vast network of ponds has allowed the recreation of aquatic habitats rich in plant and animal species. For example, the Crested Newt, the Midwife Toad, the Redshank or the Grass Snake will find a first-class refuge. This increasingly rare species comes back to nest each year at the heart of the quarry's industrial facilities, and Carmeuse's desire is to perpetuate the experience. The quarries have become alternative habitats and host more than 95% of the Swallow bank population in Wallonia. The colony that returns each year to nest at the quarry of Frasnes is one of the largest in Wallonia.

Source: Carmeuse Seille Quarry (BE)

CARMEUSE

NaSa explorers (Nature and Sand) (DE)

At their Frechen site, Quarzwerke launched in 2014 a successful environmental education project for school children. NaSa explorers (Nature and Sand)" is reaching out to 600-700 childern annually with diverse activities. As "Nature and Sand explorers" (NaSa), the children enjoy exploring local nature habitats and learning about biodiversity conservation compatible with silica sand extraction. Equipped with an exploration bag and tools, the children go out into the woods & fields, to pools and ponds, and into the laboratory and the quarry. Quarzwerke's biologist and a teacher specialised in providing environmental education for children guides them during these exploratory site visits.

Source: Quarzwerke – Frechen site (DE)

Source: Quarzwerke – Frechen site (DE)

Quarzwerke Group

Himalayan Balsam (*Impatiens glandulifera*) control (BE)

Phase 2

Himalayan Balsam is an invasive species that develop itself on riverbanks. Its small seeds are easily carried by water, which facilitates its propagation. Forming dense populations, it tends to stifle indigenous species. Furthermore, its nectar is attractive to insects, diverting them from the indigenous species.

Since 2012, Carmeuse has collaborated with the "Contrat Rivière Meuse aval et affluents" (local sorganisation aiming at protecting water bodies) to eliminate the Himalayan balsam along creeks close to the Moha Quarry. Every spring, before the blooming of the flowers, we uproot every plant we can find, preventing them from reproducing.

While we could fill an entire pick-up trunk of plants in 2012, for the last 2 years we didn't find any plants in our sector.

Himalayan Balsam (*Impatiens glandulifera*) **Source:** Carmeuse (BE)

Himalayan Balsam (*Impatiens glandulifera*) **Source:** Carmeuse (BE)

CARMEUSE

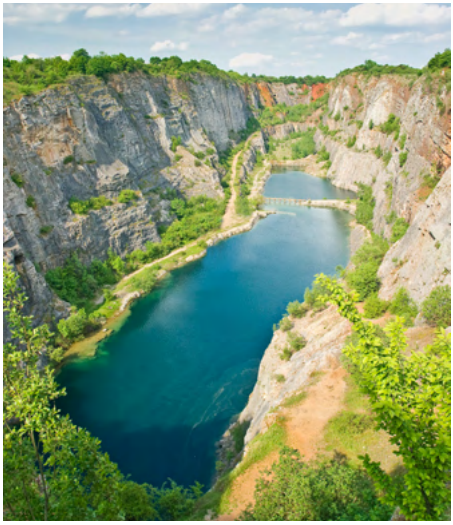
The Vaiolo Alta 10 years biodiversity monitoring program (IT)

Unicalce has been operating a limestone quarry in a mountain woodland sub-urban area in Lecco, North Italy, close to Lake of Como since 1970. During the extension application process of the permit, concerns were raised by local citizens relating to the impact of the flora and fauna.

Therefore, Unicalce, has developed, as part of the expansion project, a 10-year biodiversity monitoring program involving several environmental experts. The monitoring program includes biodiversity transect-surveys, and cross-cutting different stages of the evolution of environmental reclamation. It starts from the active quarry benches and then, moving backwards, goes through the recently reclaimed benches and then again, the benches reclaimed years before, ending up with the surrounding natural woodland area.

The first one-year monitoring session (one/season) was completed in 2021-2022 to check the current flora and fauna biodiversity status before the beginning of the new expansion project. The results were encouraging, indicating higher-than-expected biodiversity in the surroundings. The biodiversity monitoring campaign is planned to be performed with the same criteria every other year, starting from the onset of the operations, to check any evolution in biodiversity caused by the impact of mining activity.

In addition, Unicalce improved communication and engagement with local communities. Polytechnic University of Milan sorganised a competition of ideas on the final reclamation of the mining area. Several communication activities were sorganised to show the population how the site is professionally managed, and all the efforts that are made regarding any environmental aspect of the quarry.



Source: Dreamstime.com © Jan Hamadak

UNICALCE
Innoviamo la tradizione

Sand martins and sand quarries (BE, FR, NL, UK)

Sand martins like to nest in active sand extraction sites because they like the fresh, clean, vertical sand faces free of vegetation to reduce the threat of predators. Sand martins migrate to warmer African areas during the European wintertime, but the breeding season and warmer spring temperatures lead them back to the north.

In our sand quarries in France and Belgium, local site teams refresh slopes regularly to guide sand martins to a suitable location. The sand martins often go back to slopes they have been using in previous years. Therefore, vegetation from slopes gets removed yearly, so the slopes are free to use again. It is even possible to build nesting sites from scratch at places where birds won't be disturbed by quarry activities. These are just some of the actions Sibelco takes to ensure a good balance between site operations and site inhabitants.

In the UK, a reserve is created from a restored sand extraction site. Surrey Wildlife Trust has begun a nature conservation project to build a giant 20-metre-wide sandcastle for sand martins, to welcome them and nest at a Surrey nature reserve in the UK. Sibelco has supported the conservation project by clearing the bank of scrub on the new nest bank site and offering extra manpower and machinery for the main sandcastle build.

In the Netherlands, an artificial wall for sand martins was created at one of the plant sites. This project was interesting to provide nesting spots next to a river where no natural river banks are present.

Source: Sibelco (NL)

SIBELCO

ECOVAL: Measuring the ecological equivalence between impacts and offsets (FR)

Biodiversity compensation is required to counterbalance the negative impacts of quarrying activities that could not be avoided or minimised. These ecological offset measures aim to reach a "no net loss" of biodiversity, which demands making sure that offset gains are equivalent to impact-related losses: all the elements that were impacted are correctly compensated in a proportional quantity and quality to ensure that at least no biodiversity loss will remain.

Assessing the ecological equivalence is a difficult task since, in most European countries, there is no recommended and available standardised method for evaluation. This is why Imerys and its partner PatriNat currently test ECOVAL, a tool developed by INRAE, EDF and MNHN in order to develop a practical, science-based, operational and comprehensive quantitative assessment framework. This tool encompasses a set of indicators, ensuring that biodiversity is evaluated at a general level before focusing on the species and habitats at stake and that the landscape context is considered.

Imerys works in collaboration with PatriNat to test ECOVAL in 3 quarries in France where extension projects led to the implementation of the mitigation hierarchy and offsets. This will enable Imerys to verify if a no-net-loss is being attained when matching ecological losses in the impact site with biodiversity gains in the compensation site, to monitor how the ecological operations progressively allow to reestablish biodiversity values in the long-term and finally to identify the components where corrective measures should be adopted.

Source: Imerys (FR) © S. Forero

Source: Imerys (FR) © S. Forero

IMERYS

Old Soviet military airfield turned into a sea of orchids (EE)

Mining areas provide an excellent environment for plants thriving in limestone rich soil, where several rare plants, such as orchids, can be found. While extraction is going on, rare species can be moved and replanted in new areas that correspond to natural conditions near the quarry and later re-established in the post-mining areas. Former mine areas can serve as new environments or neo-landscapes, favouring unique biodiversity. Deforestation of the Kurevere quarry area brought up orchids. In the nearby old Soviet airfield the soil is also rich in dolomite, and full of orchids. Nordkalk left the airfield out of the mining permit. The company takes care of the airfield by cutting grass twice a year to maintain favourable orchid conditions. Unlike real estate development that forever changes the land, mining is a transitional/temporary process that ultimately returns the ground to a landscape that is environmentally harmonious with its surroundings thanks to mitigation measures and sustainable practices. The mining company support of universities engaged in the study of geology, hydrogeology, restorative ecology, and regulatory policy underscores our commitment to a sustainable and environmentally sound future for the mining and mineral processing industry. Kurevere site is near a Natura 2000 area. Nordkalk has had discussions with bird watchers and researched the impact quarrying has on birds. The research found there to be no impact. Nordkalk also built a bird-watching tower in a nearby bird protection area Matsalu Bay.

Source: Nordkalk – Small Plovers baby birds (EE)

Source: Nordkalk – Restored Kamariku quarry (EE)

Nordkalk

Amphibian project (DE)

Nature conservation and the raw materials industry work together to protect amphibians. With close and contractually regulated cooperation, protection and development opportunities for amphibians in bentonite pits can be created together. The protective measures include, for example, the preservation and creation of spawning waters and small structures such as dead wood, rootstocks, sand and rubble piles in which these often nocturnal amphibian species (Kreuzkröte, Laubfrosch, Wechselkrötecan) stay during the day and in the winter months.

The project was developed in cooperation between Clariant and BIV and LBV.

Source: Clariant

Source: Clariant

Source: Clariant

CLARIANT

Phase 3: After (Rehabilitation)

At the end of the life-cycle of a mine or quarry, the area is prepared for the final rehabilitation or ecological restoration. These include the rehabilitation for new business opportunities, the enjoyment of the local inhabitants, such as the development of hiking trails, or ecological restoration such as, grassland, forestry, freshwater ponds, lakes, etc.

The rehabilitation and ecological restoration are structural aspects of licenses for extractive operations, and financial guarantees are adapted during the years of activities to ensure that nothing is left unattended.

Public participation has a particularly strong value in these rehabilitation and ecological restoration processes, as it allows local communities to express their needs and interests for the next opportunity projects, allowing them to propose interesting ideas that bring added value to often neglected rural areas, giving their inhabitants more possibilities and opportunities for development.

Source: Sibelco quarry (ES)

Phase 3: Rehabilitation

Heathland restoration in an integrated life cycle approach (BE, FR, NL & UK)

Heathland restoration is an important aspect of Sibelco's whole-of-life approach for making closed quarries & passive assets a legacy to Nature as demonstrated by many projects in quarries all over Europe (e.g. Belgium, France, UK, Netherlands) before, during and at the end of life of the quarry. Heathlands play a crucial role in the traditional European landscape, adding to many ecosystem services, such as food and water supply, landscape conservation and historical nature. Maintaining and restoring heathland areas requires appropriate active management such as grazing, control of invasive species, etc and therefore, exchange of expertise, experience and knowledge with scientists, nature associations, authorities, and local communities. Threatened plants and animals are attracted and start scolonising thanks to heathland restoration. Through heathland protection and restoration, the business gives back to nature and neighbour communities, creating and enforcing bridges with stakeholders. Information boards, site visits and synergies with community groups, authorities, environmental associations and scientific researchers are also organised to increase awareness. Heathland restoration project is the winner of the IMA-Europe 2018 Award on Biodiversity.

Source: Sibelco (UK; FR)

Source: Sibelco (UK; FR)

SIBELCO

Habitat diversification in a bentonite mine (IT)

The Uri mine in Sardinia closed in 2001 and gave way to a rehabilitation project that allowed to develop multiple habitats across the mine, in order to attract diverse local wildlife, increasing biodiversity.

Source: Clariant

The northeastern fronts of the mine were reshaped to allow the development of wetlands. Water flow is regulated to avoid water stagnation and three small permanent lakes were created. The area has now a high ornithological value, hosting up to 68 species, many of which remain on the site during their reproduction. The steep walls on the eastern side of the mine allowed for the development of spontaneous vegetation which has also become the nesting and resting space for several bird species of conservation interest (wild pigeon, Lesser Kestrel, Magnanina, Shrike small, red-backed Shrike, Poiana etc.). Small depressions at the base of the rocky walls, the impermeable substrate of the soil and the absence of recent tampering have led to the development of small temporary wetlands and the formation of ecological niches important for the rest and reproduction of numerous passerines. The vegetation survey led to the identification of 64 species, which are part of the natural botanical heritage in the bordering areas, constituting an evident environmental continuity, which is always ideally aimed at in an environmental redevelopment project that envisages the greening of an area stripped of its original vegetation.

Source: Clariant – Uri mine (IT) © Fabio Granizio

Source: Clariant – Uri mine (IT) © Fabio Granizio

Phase 3

CLARIANT

Landscape integration and restoration of a bentonite mine (ES)

The rehabilitation of this mine took place inside the Cabo de Gata UNESCO Biosphere Reserve, in Almeria (Spain). Its exploitation, during the 60s, was carried out with little environmental or landscape perspectives, lacking mitigation measures which led to an untidy and disorganized accumulation of barren material.

During the geomorphological restitution of the landscape, it was decided to leave the front unfilled to favor landscape integration, preserving a natural rocky front that is observable in the surroundings. In addition to the topographical reconstruction, the project also included actions aimed at reducing erosion. In this regard, the mine slopes were smoothed, and stone terraces and dikes in streams were created, reducing rain runoff in case of violent storms, which are typical in the local climate.

The reconstruction of a fertile soil layer, able to sustain the arid climate vegetation typical of the area, helped stabilize the slopes and reduced the visual impact of the rehabilitated surface.

The reforestation was based on native seeds from the surrounding areas, favored species with a strong water collection and retention capacity. Artificial irrigation, fertilization, and the removal of invasive species we carried out during the first stages of the reforestation phase.

Once the restoration concluded, the land was successfully returned to the local authorities. The complete rehabilitation project lasted from 2018 to 2021, and was part of the TECMINE project of the LIFE Program. This work led by Clariant has been recognised with two prizes so far:

- **2022: National Sustainable Development Awards in Spain:** First prize in the Environment Restoration Category for "other extractive industries"
- **2024: Company committed to Sustainable Development Award** granted by the Federation of Enterprises of Toledo region, Spain.

Photo 1. Clariant – Cabo de Gata site in Almeria before (ES)

Photo 2. Clariant – Cabo de Gata site in Almeria after (ES)

CLARIANT

Restore former perlite quarry to organic vineyard in Milos (GR)

The site of Milos is located in Greece, in the Cyclades island.

Due to climate and local natural conditions, the rehabilitation faces numerous difficulties: high salinity, water stress, low rainfall, low available topsoil and overgrazing that can affect the success of revegetation operations. The site has experimented with a panel of natural techniques to bring nature back and recreate ecosystem services. For example, due to soil disturbance and its low organic matter content, the site works with Nature-based Solutions to enhance soil revegetation with microbial communities improving plants performance, growth and survival rate.

Indigenous and endemic plants and propagation material are produced in the company's plant nursery for the rehabilitation areas according to needs.

The site nursery has an annual capacity of 30.000 plants, All these endemic seeds are collected locally, selected, separated, stored and then planted, using soil inoculation techniques with symbiotic bacteria and fungi.

Based on the observation of the surrounding nature and collaborations with universities, These local species have been selected by the local team because of their capacity to face the local conditions and their ability to develop mechanisms to survive and grow up in hard conditions. For example, some species are resistant to drought, fire, grazing, salinity and salt spray, while others (*Phrygana* species) fall into a peculiar hibernation (dormant state) during the summer season, surviving without water.

Working on these rehabilitation issues for decades, the site team has acquired a precious and strong expertise in rewilding and now helps at the group level to implement rehabilitation strategies in other locations worldwide.

Source: Imerys – Milos quarry restored as vineyard (GR)

Source: Imerys – Plant nursery in Milos (GR)

IMERYS

Omya Gummern, Austria - Transformation of an old quarry part into a biotope area (AT)

Within 12 years, an old quarry area at Gummern was transformed into a biotope area. With the help of a local school, small biotopes & dragonfly ponds were created through careful mapping exercises and planting. The former waste dump area is now an area of wildlife and hosts many rare and endangered species.

Source: Omya – Gummern site insect hotel (AT)

Source: Omya – Gummern site biotopes & dragonfly ponds (AT)

Rehabilitating a quarry into a wetland (FR)

Imerys Murat has operated diatomite quarries in France's Auvergne Volcanoes National Park – one of Europe's largest protected natural reserves – since the 1950s. In 2016, work at its Foufouilloux North quarry finished, and the plant was responsible for rehabilitating the space. Showing a willingness to go beyond regulatory requirements, the Murat team offered to do more than a standard mandatory rehabilitation and worked hard on rehabilitating a wetland with the local ecological expert.

To create a suitable wetland, the site first filled its quarry. It then installed a wetland outlet to regulate water flow and allow temporary and permanent wetland habitats to exist, with an hydraulic gradient. Part of the old quarry was rehabilitated as meadows for grazing or mowing for local farmers. The local team worked with experts such as engineering firms, universities and ecological specialists to ensure the actions implemented were sustainable.

Creating partnerships with local organisations was also important for the long-term management of the space – we don't expect to have a presence in the area forever, so we want to make sure whoever takes it over will protect what's we recreated. Since establishing the wetland, the site has observed the gradual but rich return of biodiversity, such as birds (such as curlews and red kites), amphibians, mammals, insects, crayfish and flora (over 120 species). The site has chosen to create a special management plan to push for resettlement of some particulars species, hoping it will help them breed, for example.

The local community was interested in the rehabilitation work and were regularly communicated with throughout. Now that the wetlands are complete, Murat works with ecological experts to assess and further improve the functionality of wetlands and with the tourist office to run weekly visits during the summer months and is developing new functionalities. As part of these trips, visitors can also see the Murat plant and its active quarries. The site would like to further educate the community on the biodiversity found in the wetland by creating a dedicated space in the "Fauna's house museum" in Murat and allowing guided tours to the wetland with ecological experts. All of this will be done without disturbing biodiversity.

Source: Imerys – Foufouilloux North Quarry (FR)

IMERYS

Local school visits on biodiversity (BE)

The plant of Carmeuse Aisemont has organised school visits in the restored part of the quarry where biodiversity is thriving (orchids, butterflies, reptiles, falcons, owls etc.). This visit was made for local school groups with the support of local nature associations that provide scientific help in the communication to children. This is a very pragmatic example of a close relationship between the industrial operator and its social environment. Education of young students on how the industry can integrate nature into its day-to-day life is an important part of the sustainability program. It also helps the professor to illustrate with concrete examples to students, how they contribute on biodiversity enhancement in their surroundings.

Source: Carmeuse – Areal view of Aisemont Quarry (BE) ©S.Schmitt

CARMEUSE

Grassland restoration (BE)

Carmeuse has recreated calcareous grassland in a former quarry that closed in the late 80's. The restored quarry helped put the soil into light. A specific flora and fauna srecolonised the area. To date, the site houses a wide variety of butterflies, crickets In a former quarry that closed in the late 80's, Carmeuse has recreated calcareous grassland. The restored quarry technique helped to highlight the new soil restored rare habitats.

A specific flora and fauna recolonised the area. The site today houses a flora and fauna typical of these rare habitats. To date, the site hosts a wide variety of butterflies, cricket sand grasshoppers and different species of orchids, including a dozen beautiful *Himantoglossum hircinum*.

Source: Carmeuse – Aisemont quarry (BE)

CARMEUSE

Bundled measures for high biodiversity in the open pit and renaturation at the Frechen site (DE)

Over the past 140 years, Quarzwerke has developed 100 hectares of land to extract the industrial mineral quartz. Most of this area used to be agricultural land, and a small part was forested. Over the next 90-100 years, it will be mainly forest. The recultivation focuses on replacing the old forest in the opencast mining area, which is getting smaller and smaller. In addition, a location in the neighbouring forest has been "converted" into a forest to protect certain species. To promote rare open landscape species , there are areas for rewilding and open wetlands. Due to different soil types, modelling of the landscape and many different possibilities, both for nesting birds and as resting places for migrant birds, the open open-cast mining area and recultivation is a region with enormously high biodiversity.

The actions carried out in this site include the construction of a bat cave, a tunnel for amphibians, the renaturation of the forest integrating protected species, the construction of different ponds (both in a recent quarry but also in renaturated areas), the increase of the deadwood in the forest.

The results are very promising, including the only manmade winter quarters for bats in the region, facilitating toads road crossing into their spawning waters in the recultivation area, creating a forest circle for old forest dwellers around our opencast mine, setting up many dry and wet open landscape species that would have no habitat if was not for this project, and facilitating the setting of woodpeckers into dead tree trunks, whose holes also quickly become nesting rooms for bats.

The brown long-eared bat is one of the bat species that have found both a place for hibernation and maternity rooms in the recultivation.
Source: Quarzwerke – Frechen site (DE)

Quarzwerke Group

Caminau case study (DE)

The biotope network in Caminau is a special mix of opportunities for people and nature. On an area of 33 hectares, some local recreational attractions for families have been built. At the same time, many biotopes have been created in which many - in some cases very rare - species have settled in recent decades.

Kaolin has been produced in Caminau since 1904, and since 1995, the site has belonged to the Quarzwerke Group. The recultivation there is really very special. On an area of 33 hectares, many different biotopes have been developed over the last decades, which are an asset to nature and to the region's local residents, too. About half of the area has been designed for the use of the public: a dendrological nature trail, a forest playground, a castle ruin and an amphitheatre attract many visitors to the recultivated opencast mining area every year. Ponds have been created on a total area of 5 hectares. A total of 244 animal species, 45 of which are on the red list of endangered species have been counted.

Source: Quarzwerke – Caminau (DE)

Source: Quarzwerke – Caminau (DE)

Source: Quarzwerke – Caminau (DE)

Biotopverbund CAMINAU

Caminauer Kaolinwerk

"Zandloperpad" Footpath in Maasmechelen (BE)

Located in the Mechelse Heide National Park in Maasmechelen (Belgium), the "Zandloperpad" (hourglass road) footpath is now available through Sibelco's partnership with local organisations and national governments. As part of the National Park's mission to ensure nature is available to all, this new 1.5 km paved path is now available to people with disabilities, wheelchair users and families with infants in prams. From the path, there is a great view of the old Sibelco quarry of Maasmechelen. The Maasmechelen plant was removed and rebuilt a bit further. This is a unique project in Flanders (Belgium), not only in terms of creating a footpath but also for the total makeover of the landscape. After consultation and agreements with all parties about mining in the Hoge Kempen, Sibelco removed its operations in the area, which included replacing 5.000 m^2 of asphalt as well as demolishing buildings to make the plant surroundings blend into nature. The official opening was attended by the Flemish Minister of Welfare, Health and Family, the local Mayor, a director of Nature and Forests as well as local partners. The path was open to the public at the beginning of May 2014 with more than 1.000 visitors on the Opening Day.

Source: Sibelco – Maasmechlen (BE)

Source: Sibelco – Maasmechlen (BE)

SIBELCO

Hedges project (BE)

Hedges play an important role in favour of biodiversity, creating green communication roads between different environments, welcoming an important number of different species (vegetation and animals), reducing erosion and flood risks or protecting crops and cattle from heavy wind, rains or harsh sun.

In 2019, the Walloon Government launched the "Yes We Plant" program with a goal of 4000 km of hedges to be planted by 2024.

With 13 km of double row hedges planted in or around our different sites between 2020 and 2023, Carmeuse is one of the major private contributors to the project. This represents 37 475 trees planted.

Source: Carmeuse – (BE)

Source: Carmeuse – (BE)

CARMEUSE

Sponsoring the "Trees for Future" project (BE)

Lowering or impact on global warming by limiting our CO_2 emissions is an important goal for our organisation. Nevertheless, we already know that we will have to adapt to a certain degree to the consequences of climate change. And so does nature. When the extraction operations arrive at their end, it is our responsibility to ensure that the rehabilitation measures we implement stay functional throughout time. That is the reason why an important question for us is, "what trees should we plant to ensure the stability of the rehabilitation measures?"

The "Société Royal Forestière de Belgique" (Belgian Royal Forest Society) is trying to answer this question with their "Trees for future" program, and that is why we choose to be one of the major sponsors of this study.

This program consists of a network of experimental parcels where southern Europe varieties of indigenous species and non-indigenous species are tested if they would adapt to our climate or future climate, resist pests (insects) and pathogens, produce lumbers of quality and if there is any effect on biodiversity (fauna and flora welcoming capacity and invasiveness risks). At the end of 2021, 118 parcels gathering 18 species and 23 varieties had been planted. The project will last for at least 20 years.

Source: Carmeuse – (BE)

Source: Carmeuse – (BE)

CARMEUSE

Quarry restoration in function of badgers (NL)

When restoring a part of the sand quarry in Heerlen, the Netherlands, some unexpected guests were discovered: a group of badgers. It's one of Sibeclo's focuses to care for wildlife and nature in and around the sites. This can be challenging, but together with the local team, some smart biodiversity management actions were taken to protect the badgers and their main nests.

Badgers like to live in sandy soils and build 'castles' with holes and hallways connecting their homes underground. This makes a sand quarry an ideal location for the badgers since it is a quiet environment. Badgers are nocturnal, meaning they like to be active at night and sleep during the day.

We aligned the restoration planning to the location of the natural habitats of the badger families, so the local animal law to protect wildlife (nature conservation act) could also be respected. The badgers will now be able to keep enjoying their Sibelco homes. The area is now restored and given back to the local nature organisation (Natuurmonumenten).

The transfer of the Sibelco quarry is an important building block in this project as it enlarges and strengthens the existing 'Brunssummerheide' nature reserve. Sibelco will continue to operate the remaining parts of the quarry until 2032. So, in the next few years, a lot of work will be done to continue the sand extraction and realise the agreed rehabilitation targets.

Adult-badger. **Source:** Sibelco – Heerlen quarry (NL)

SIBELCO

Creating a natural neserve (BE)

Lhoist's excavation of limestone stopped after more than a century of activity. In cooperation with the city council of Amay (Belgium), the Department of Nature and Forests Administration and the Walloon Region, we launched an initiative to create an official natural reserve spanning 28 ha. The former quarry will encourage the colonization of protected species in a natural open habitat that includes a stretch of water and the earlier cliffs. Only part of the grounds will be open to the public. A more protected area will be open to the public via a guided tour. All parties have signed a charter to continue their cooperation for at least a 30-year period.

Source: Dreamstime.com

Source: Dreamstime.com

Lhoist

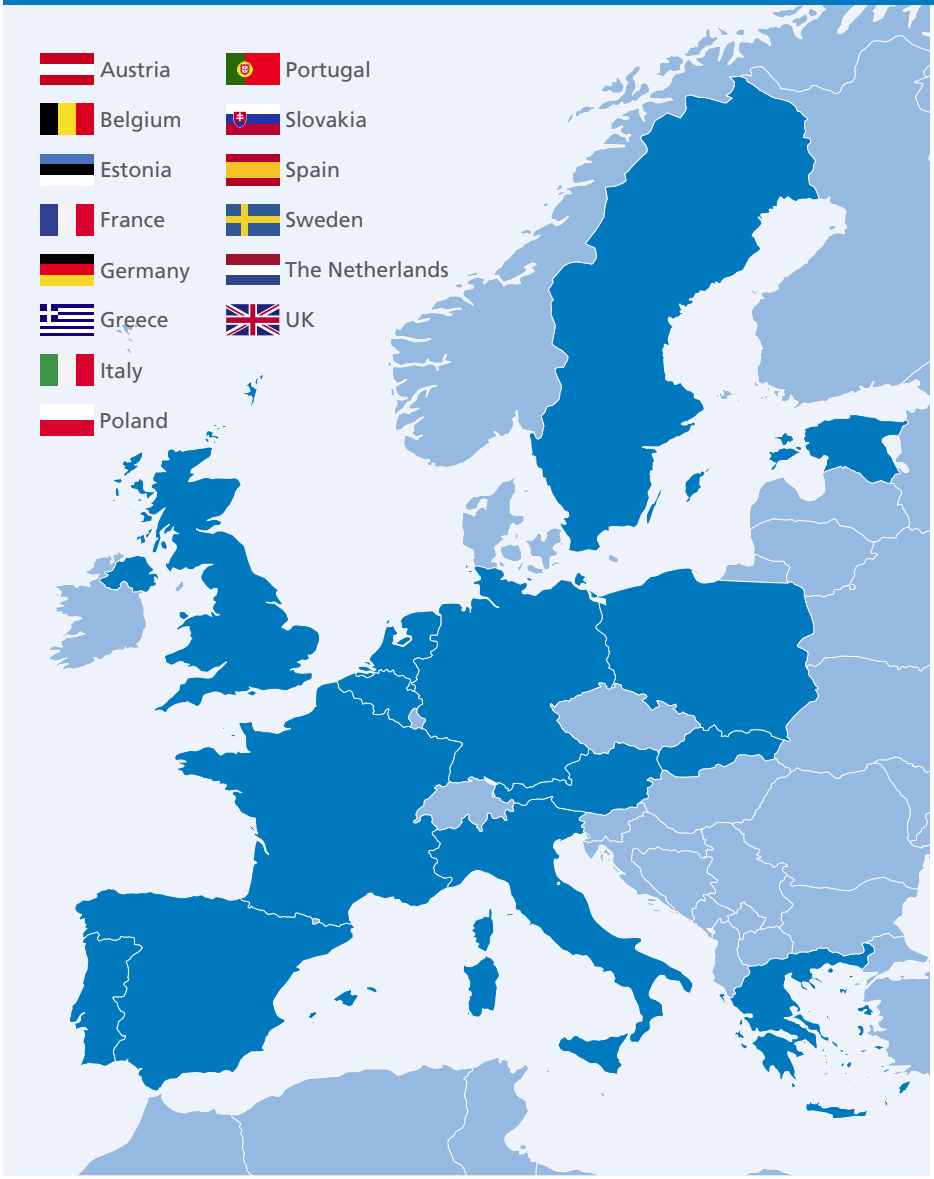
Five million tree planting contributes to policy objectives (EU & UK)

Industrial Minerals sector is an active player in the forestration efforts also in line with the permit requirements. In the period between 2020 – 2023, thirteen IMA member companies have planted a total of **5 million trees across EU (Belgium, France, Germany, Italy, Poland, Portugal, Slovakia, ...) and UK.**

- **60%** of the trees are planted as part of ecological restoration activities (closure of mines) and
- **40%** in the active mine areas or as compensation in other areas agreed with authorities & stakeholders.

Source: Dreamstime.com

Map of Europe with case studies reporting sites



Case studies overview

Project	Pp	Company	Country	Project type	Before Extraction	During Extraction	After Extraction	Monitoring Post Closure	Surrounding of extraction sites
Phase 1: Before (Planning)	**4**								
Apollo and large blue butterfly project	5	Nordkalk	Sweden	Special protection and conservation programme aiming to increase the natural areas of the two rare butterfly species at a suitable overgrown nature area close to the quarry	X				X
Best Practices in terms of restoration and renaturation	7	Omya	Austria	Omya started to evaluate the impact of its restoration and renaturation practices at the Gummern site with the aim of adopting best practices. A first assessment showed a higher biodiversity, especially where the company had allowed nature to gradually take over the area with minimum intervention.Core to the project was the comparison of the current state with the original state. The findings and iterative evaluation campaigns confirmed the higher biodiversity in the renaturated area of the Gummern site. The outcome of this study helped Omya develop an up-to-date renaturation strategy for other sites.		X	X		

Ecological connectivity in Arcos de la Frontera	8	Sibelco	Spain	Sibelco Spain has developed a Biodiversity Management Plan in the quarry of "Arcos de la Frontera". The plan was developed as a tool, it will be a guidance of the ecological balance in the quarry area. The plan involves the different life stages of the quarry: 1. The area where operations take place, 2. The areas that are being restored and 3. The areas that already have been restored.		X	X	X	

Project	Pp	Company	Country	Project type	Before Extraction	During Extraction	After Extraction	Monitoring Post Closure	Surrounding of extraction sites
Phase 2: During (Extraction operations)	**10**								
Life in Quarries	11	Carmeuse / Lhoist	Belgium	The general object of the Life in Quarries project is to develop and make sustainable the hosting capacity of biodiversity in various active quarries in Wallonia. The originality of this project is based on the implementation of biodiversity management measures during the extractive phase and not only as part of rehabilitation at the end of works.		X	X		
Roselière programme in quarries	12	Sibelco	France	Within this programme, 11 taxonomic groups of species (amphibians, reptiles, land vegetation) are monitored, with a standardized protocol for the monitoring of each group that specifies the methods and frequency. Based on this monitoring, the biodiversity of these quarry sites can be compared with the initial state and other territories. The standardized monitoring protocols also allow researchers to add up the observations made within the Roselière programme and other observations (for Environmental Impact Assessments for example) to get an even better view of the biodiversity in an area.	X	X			X
The Owl Project	13	Lhoist	Belgium	The Owl Project monitors the presence of eagle owls, increasing in numbers, which have returned to an area comprising active and closed quarries. The extraction sites represent important secondary habitats in a densely populated area for this endangered and closely protected species.		X	X		

Sa Matta Mine nature trail – increasing the awareness of biodiversity treasures	14	IMI FABI	Italy	The biodiversity project Sa' Matta Mine consists of the creation of a nature trail located in the charming Mediterranean area adjacent to the Sa' Matta mine with the aim to increase awareness about life form varieties within this specific geographic region.		X			X
Clays quarries as biodiversity hotspots	15	BKRI	Germany	In May 2009, the German Ceramic Raw Materials Association "Bundesverband Keramische Rohstoffe e.V. (BKR)" and the Ministry of Environment, Agriculture and Forestry of Rhineland-Palatinate (Ministerium für Umwelt, Forsten und Verbraucherschutz in Rheinland-Pfalz) signed an agreement to protect Natura 2000 species. Today, amphibian monitoring covers a total of 42 open-cast clay pits inside and outside this area. These sites are the home of species such as the yellow-bellied toad (Bombina variegata) and great crested newt (Triturus cristatus), both of which are strictly protected and endangered.		X		X	
Diversification of habitats as a way of improving biodiversity	16	Carmeuse	Belgium	The creation of the Frasnes wetland follows the project pilot WALPHY (2009-2013) and aims to restore quality physical and biological characteristics of Eau Blanche and its tributaries and recover aquatic habitats rich in biodiversity. Ponds and wetlands, once very numerous in the valley, have become rare today. A wetland of +/- 1.6 ha with large permanent ponds, with a depth of up to 1.50 meters, has been developed on land belonging to Carmeuse, in the immediate vicinity of the settling ponds of the quarry.		x	X		X

Project	Pp	Company	Country	Project type	Before Extraction	During Extraction	After Extraction	Monitoring Post Closure	Surrounding of extraction sites
NaSa explorers (Nature and Sand)	17	Qwarzwerke	Germany	At their Frechen site, Quarzwerke launched in 2014 a successful environmental education project for school children. NaSa explorers (Nature and Sand)" is reaching out to 600-700 childern annually with diverse activities. As "Nature and Sand explorers" (NaSa), the children enjoy exploring local nature habitats and learning about biodiversity conservation compatible with silica sand extraction. Equipped with an exploration bag and tools, the children go out into the woods & fields, to pools and ponds, and into the laboratory and the quarry. Quarzwerke's biologist and a teacher specialised in providing environmental education for children guides them during these exploratory site visits.		X			
Himalayan Balsam (Impatiens glandulifera) control	18	Carmeuse	Belgium	Himalayan Balsam is an invasive species that develop itself on riverbanks. Its small seeds are easily carried by water, which facilitates its propagation. Forming dense populations, it tends to stifle indigenous species. Furthermore, its nectar is attractive to insects, diverting them from the indigenous species. Since 2012, Carmeuse has collaborated with the "Contrat Rivière Meuse aval et affluents" (local sorganisation aiming at protecting water bodies) to eliminate the Himalayan balsam along creeks close to the Moha Quarry. Every spring, before the blooming of the flowers, we uproot every plant we can find, preventing them from reproducing. While we could fill an entire pick-up trunk of plants in 2012, for the last 2 years we didn't find any plants in our sector.		X			X

The Vaiolo Alta 10 years biodiversity monitoring program	19	Unicalce	Italy	Unicalce, has developed, as part of the expansion project, a 10-year biodiversity monitoring program involving several environmental experts. The monitoring program includes biodiversity transect-surveys, and cross-cutting different stages of the evolution of environmental reclamation. It starts from the active quarry benches and then, moving backwards, goes through the recently reclaimed benches and then again, the benches reclaimed years before, ending up with the surrounding natural woodland area.		X	X	X	X
Sand martins and sand quarries	20	Sibelco	Belgium France The Netherlands United Kingdom	Sand martins like to nest in active sand extraction sites because they like the fresh, clean, vertical sand faces free of vegetation to reduce the threat of predators. Sand martins migrate to warmer African areas during the European wintertime, but the breeding season and warmer spring temperatures lead them back to the north. In our active sand quarries in France and Belgium, local site teams refresh slopes regularly to guide sand martins to a suitable location. The sand martins often go back to slopes they have been using in previous years. Therefore, vegetation from slopes gets removed yearly, so the slopes are free to use again. It is even possible to build nesting sites from scratch at places where birds won't be disturbed by quarry activities. These are just some of the actions Sibelco takes to ensure Sand martins and sand quarries (BE, FR, NL, UK) Phase 2 a good balance between site operations and site inhabitants.		X			

Project	Pp	Company	Country	Project type	Before Extraction	During Extraction	After Extraction	Monitoring Post Closure	Surrounding of extraction sites
ECOVAL: Measuring the ecological equivalence between impacts and offsets	21	Imerys	France	Imerys and its partner PatriNat currently test ECOVAL, a tool developed by INRAE, EDF and MNHN in order to develop a practical, science-based, operational and comprehensive quantitative assessment framework. This tool encompasses a set of indicators, ensuring that biodiversity is evaluated at a general level before focusing on the species and habitats at stake and that the landscape context is considered. Imerys works in collaboration with PatriNat to test ECOVAL in 3 quarries in France where extension projects led to the implementation of the mitigation hierarchy and offsets. This will enable Imerys to verify if a no-net-loss is being attained when matching ecological losses in the impact site with biodiversity gains in the compensation site, to monitor how the ecological operations progressively allow to reestablish biodiversity values in the long-term and finally to identify the components where corrective measures should be adopted.	X	X	X	X	

Old Soviet military airfield turned into a sea of orchids	22	Nordkalk	Estonia	Nordkalk left the airfield out of the mining permit. The company takes care of the airfield by cutting grass twice a year to maintain favourable orchid conditions. Unlike real estate development that forever changes the land, mining is a transitional/temporary process that ultimately returns the ground to a landscape that is environmentally harmonious with its surroundings thanks to mitigation measures and sustainable practices. The company support of universities engaged in the study of geology, hydrogeology, restorative ecology, and regulatory policy underscores our commitment to a sustainable and environmentally sound future for the mining and mineral processing industry. Kurevere site is near a Natura 2000 area. Nordkalk has had discussions with bird watchers and researched the impact quarrying has on birds. The research found there to be no impact. Nordkalk also built a bird-watching tower in a nearby bird protection area Matsalu Bay.	X	X			X
The amphibian project				xxxxxx xxxxxxxx xxxx		X	X		

Project	Pp	Company	Country	Project type	Before Extraction	During Extraction	After Extraction	Monitoring Post Closure	Surrounding of extraction sites
Phase 3: After (Rehabilitation)	**24**								
Heathland restoration in an integrated life cycle approach	25	Sibelco	Belgium France The Netherlands United Kingdom	Heathlands play a crucial role in the traditional European landscape, adding to many ecosystem services, such as food and water supply, landscape conservation and historical nature. Maintaining and restoring heathland areas requires appropriate active management such as grazing, control of invasive species, etc and therefore, exchange of expertise, experience and knowledge with scientists, nature associations, authorities, and local communities. Threatened plants and animals are attracted and start scolonising Heathland restoration in an integrated life cycle approach (BE, FR, NL & UK) thanks to heathland restoration. Through heathland protection and restoration, the business gives back to nature and neighbour communities, creating and enforcing bridges with stakeholders. Information boards, site visits and synergies with community groups, authorities, environmental associations and scientific researchers are also organised to increase awareness. Heathland restoration project is the winner of the IMA-Europe 2018 Award on Biodiversity.			X	X	X

Habitat diversification in a bentonite mine	26	Clariant	Italy	The Uri mine in Sardinia closed in 2001 and gave way to a rehabilitation project that allowed to develop multiple habitats across the former mine, in order to attract diverse local wildlife, increasing biodiversity. The northeastern fronts of the mine were reshaped to allow the development of wetlands. Water flow is regulated to avoid water stagnation and three small permanent lakes were created. The area has now a high ornithological value, hosting up to 68 species, many of which remain on the site during their reproduction. The steep walls on the eastern side of the mine allowed for the development of spontaneous vegetation which has also become the nesting and resting space for several bird species of conservation interest (wild pigeon, Lesser Kestrel, Magnanina, Shrike small, red-backed Shrike, Poiana etc.).			X	X	

Project	Pp	Company	Country	Project type	Before Extraction	During Extraction	After Extraction	Monitoring Post Closure	Surrounding of extraction sites
Landscape integration and restoration of a bentonite mine	27	Clariant	Spain	The rehabilitation of this mine took place inside the Cabo de Gata UNESCO Biosphere Reserve, in Almeria (Spain). During the geomorphological restitution of the landscape, it was decided to leave the front unfilled to favor landscape integration, preserving a natural rocky front that is observable in the surroundings. In addition to the topographical reconstruction, the project also included actions aimed at reducing erosion. In this regard, the mine slopes were smoothed, and stone terraces and dikes in streams were created, reducing rain runoff in case of violent storms, which are typical in the local climate. The reconstruction of a fertile soil layer, able to sustain the arid climate vegetation typical of the area, helped stabilize the slopes and reduced the visual impact of the rehabilitated surface. The reforestation was based on native seeds from the surrounding areas, favored species with a strong water collection and retention capacity. Artificial irrigation, fertilization, and the removal of invasive species we carried out during the first stages of the reforestation phase.			X	X	

Restore former perlite quarry to organic vineyard in Milos	28	Imerys	Greece	Due to climate and local natural conditions, the site of Milos located in the Cyclades island in Greece, the rehabilitation faces numerous difficulties: high salinity, water stress, low rainfall, low available topsoil and overgrazing that can affect the success of revegetation operations. The site has experimented with a panel of natural techniques to bring nature back and recreate ecosystem services. For example, due to soil disturbance and its low organic matter content, the site works with Naturebased Solutions to enhance soil revegetation with microbial communities improving plants performance, growth and survival rate. Indigenous and endemic plants and propagation material are produced in the company's plant nursery for the rehabilitation areas according to needs. The site nursery has an annual capacity of 30.000 plants, All these endemic seeds are collected locally, selected, separated, stored and then planted, using soil inoculation techniques with symbiotic bacteria and fungi.		X	X		
Transformation of an old quarry part into a biotope area	29	Omya	Austria	Within 12 years, an old quarry area at Gummern was transformed into a biotope area. With the help of a local school, small biotopes & dragonfly ponds were created through careful mapping exercises and planting. The former waste dump area is now an area of wildlife and hosts many rare and endangered species.		X	X	X	

Project	Pp	Company	Country	Project type	Before Extraction	During Extraction	After Extraction	Monitoring Post Closure	Surrounding of extraction sites
Rehabilitating a quarry into a wetland	30	Imerys	France	Imerys Murat has operated diatomite quarries in France's Auvergne Volcanoes National Park – one of Europe's largest protected natural reserves – since the 1950s. In 2016, work at its Foufouilloux North quarry finished, and the plant was responsible for rehabilitating the space. Showing a willingness to go beyond regulatory requirements, the Murat team offered to do more than a standard mandatory rehabilitation and worked hard on rehabilitating a wetland with the local ecological expert. To create a suitable wetland, the site first filled its quarry. It then installed a wetland outlet to regulate water flow and allow temporary and permanent wetland habitats to exist, with an hydraulic gradient. Part of the old quarry was rehabilitated as meadows for grazing or mowing for local farmers. The local team worked with experts such as engineering firms, universities and ecological specialists to ensure the actions implemented were sustainable.			X		X
Local school visits on biodiversity	31	Carmeuse	Belgium	The plant of Carmeuse Aisemont has organised school visits in the restored part of the quarry where biodiversity is thriving (orchids, butterflies, reptiles, falcons, owls etc.). This visit was made for local school groups with the support of local nature associations that provide scientific help in the communication to children. This is a very pragmatic example of a close relationship between the industrial operator and its social environment. Education of young students on how the industry can integrate nature into its day-to-day life is an important part of the sustainability program. It also helps the professor to illustrate with concrete examples to students, how they contribute on biodiversity enhancement in their surroundings.			X		X

Grassland restoration	32	Carmeuse	Belgium	Carmeuse has recreated calcareous grassland in a former quarry that closed in the late 80's. The restored quarry helped put the soil into light. A specific flora and fauna srecolonised the area. To date, the site houses a wide variety of butterflies, crickets In a former quarry that closed in the late 80's, Carmeuse has recreated calcareous grassland. The restored quarry technique helped to highlight the new soil restored rare habitats. A specific flora and fauna recolonised the area. The site today houses a flora and fauna typical of these rare habitats. To date, the site hosts a wide variety of butterflies, cricket sand grasshoppers and different species of orchids, including a dozen beautiful Himantoglossum hircinum.			X		
Bundled measures for high biodiversity in the open pit and renaturation	33	Qwarzwerke	Germany	To promote rare open landscape species, there are areas for rewilding and open wetlands. Due to different soil types, modelling of the landscape and many different possibilities, both for nesting birds and as resting places for migrant birds, the open-cast mining area and recultivation is a region with enormously high biodiversity. The actions carried out in this site include the construction of a bat cave, a tunnel for amphibians, the renaturation of the forest integrating protected species, the construction of different ponds (both in a recent quarry but also in renaturated areas), the increase of the deadwood in the forest. The results are very promising, including the only manmade winter quarters for bats in the region, facilitating toads road crossing into their spawning waters in the recultivation area, creating a forest circle for old forest dwellers around our opencast mine, setting up many dry and wet open landscape species that would have no habitat if was not for this project, and facilitating the setting of woodpeckers into dead tree trunks, whose holes also quickly become nesting rooms for bats.		X	X		

Project	Pp	Company	Country	Project type	Before Extraction	During Extraction	After Extraction	Monitoring Post Closure	Surrounding of extraction sites
Caminau case study	34	Caminauer Kaolinwerk	Germany	The biotope network in Caminau is a special mix of opportunities for people and nature. On an area of 33 ha, some local recreational attractions for families have been built. At the same time, many biotopes have been created in which many - in some cases very rare - species have settled in recent decades. Kaolin has been produced in Caminau since 1904, and since 1995, the site has belonged to the Quarzwerke Group. The recultivation there is really very special. On an area of 33 ha, many different biotopes have been developed over the last decades, which are an asset to nature and to the region's local residents, too. About half of the area has been designed for the use of the public: a dendrological nature trail, a forest playground, a castle ruin and an amphitheatre attract many visitors to the recultivated open-cast mining area every year. Ponds have been created on a total area of 5 hectares. A total of 244 animal species, 45 of which are on the red list of endangered species have been counted.			X	X	X

"Zandloperpad" Footpath in Maasmechelen	35	Sibelco	Belgium	Located in the Mechelse Heide National Park in Maasmechelen (Belgium), the "Zandloperpad" (hourglass road) footpath is now available through Sibelco's partnership with local organisations and national governments. As part of the National Park's mission to ensure nature is available to all, this new 1.5 km paved path is now available to people with disabilities, wheelchair users and families with infants in prams. From the path, there is a great view of the old Sibelco quarry of Maasmechelen. The Maasmechelen plant was removed and rebuilt a bit further. This is a unique project in Flanders (Belgium), not only in terms of creating a footpath but also for the total makeover of the landscape.			X		X
Hedges project	36	Carmeuse	Belgium	Hedges play an important role in favour of biodiversity, creating green communication roads between different environments, welcoming an important number of different species (vegetation and animals), reducing erosion and flood risks or protecting crops and cattle from heavy wind, rains or harsh sun. In 2019, the Walloon Government launched the "Yes We Plant" program with a goal of 4000 km of hedges to be planted by 2024. With 10 km of hedges planted in or around our different sites between 2020 and 2022, Carmeuse is one of the major contributors to this program. Objective is to have a total of 15km of hedges planted by the end of 2023.			X		X

Project	Pp	Company	Country	Project type	Before Extraction	During Extraction	After Extraction	Monitoring Post Closure	Surrounding of extraction sites
Sponsoring the "Trees for Future" project	37	Carmeuse	Belgium	Sponsoring the "Trees for Future" project (BE) lead by the "Société Royal Forestière de Belgique" (Belgian Royal Forest Society) was a major milestone for Carmeuse. This program consists of a network of experimental parcels where southern Europe varieties of indigenous species and nonindigenous species are tested if they would adapt to our climate or future climate, resist pests (insects) and pathogens, produce lumbers of quality and if there is any effect on biodiversity (fauna and flora welcoming capacity and invasiveness risks). At the end of 2021, 118 parcels gathering 18 species and 23 varieties had been planted. The project will last for at least 20 years.			X	X	X
Quarry restoration in function of badgers	38	Sibelco	the Netherlands	When restoring a part of the sand quarry in Heerlen, the Netherlands, some unexpected guests were discovered: a group of badgers. It's one of Sibeclo's focuses to care for wildlife and nature in and around the sites. This can be challenging, but together with the local team, some smart biodiversity management actions were taken to protect the badgers and their main nests.			X	X	

Creating a natural neserve	39	Lhoist	Belgium	Lhoist's excavation of limestone stopped after more than a century of activity. In cooperation with the city council of Amay, the Department of Nature and Forests Administration and the Walloon Region, Lhoist launched an initiative to create an official natural reserve spanning 28 ha. The former quarry will encourage the colonization of protected species in a natural open habitat that includes a stretch of water and the earlier cliffs. Only part of the grounds will be open to the public. A more protected area will be open to the public via a guided tour. All parties have signed a charter to continue their cooperation for at least a 30-year period.			X	X	
Mineral sector, tree planing accross EU is directly contributing to multiple policy objectives (Forestration efforts, Contribute to combating climate change)	40	Multiple IMA members (BKRI, Carmeuse, Clariant, Elementis, Imerys, Mota, Nordkalk, Omya, Quarzwerke, Sibelco, Tolsa, Unicalce)	EU-27 (Belgium, France, Germany, Italy, Poland, Portugal, Slovakia, (...) UK	For the period between 2020 - 2023, IMA member companies have planted a total of 5 Million trees across EU & UK. • 60% of the trees are planed as part of ecological restoration activities (closure of mines) and • 40 % in the active mine areas or as compensation in other areas agreed with authorities & stakeholders.		X	X		X


BKRI
BUNDESVERBAND KERAMISCHE ROHSTOFFE
UND INDUSTRIEMINERALE e.V.


Lhoist


akw
Caminauer Kaolinwerk
EIN UNTERNEHMEN DER QUARZWERKE GRUPPE


MCS
PORTUGAL


CARMEUSE


Nordkalk


CLARIANT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IMA Europe

IMA-Europe AISBL
Rue des Deux Eglises 26
box 2 (6° floor)
B-1000 Brussels, Belgium

tel: **+32 2 210 4410**
mail: **secretariat@ima-europe.eu**