



MIFA
IN QUARRIES

**MANAGEMENT
OF BIODIVERSITY
IN ACTIVE QUARRIES**

2015-2021



A PHILOSOPHY

For 6 years, from 2015 to 2021, the LIFE in Quarries project (LIFE14 NAT/BE/000364) has been demonstrating, developing and securing the potential for biodiversity in a regional network of 27 active extractive sites. This project has laid the foundations for the transfer of biodiversity management practices to new quarries.



The key factors for the success of the project were:

- I. A sector commitment to biodiversity and implementation by and for operators
- II. A strong partnership promoting the sharing of expertise
- III. Training and awareness-raising for the sector's actors
- IV. Setting up didactic monitoring and reporting tools
- V. Providing the legal security necessary for the implementation of dynamic biodiversity management

By conducting initial biological inventories of the 27 participating quarries, it was possible to confirm their biological interest and the contribution they could make to regional biodiversity. This observation has led to the development of actions for the management and creation of temporary habitats - favoring a diversity of pioneer species - and of permanent habitats - allowing long-lived species to colonize - in order to integrate the management of biodiversity into the daily activity of quarries.

In addition to the creation and management of temporary and permanent habitats, an important component of the LIFE in Quarries has been the **training of quarry staff**, which helped to increase their skills and awareness of the biodiversity present on their site(s).

AN INNOVATIVE PARTNERSHIP FOR BIODIVERSITY



The LIFE in Quarries project brings together five partners from different backgrounds on a project to promote biodiversity.

FEDIEX

Born from an initiative of the Belgian Federation of the extractive industry, (FEDIEX), the LIFE in Quarries has set up actions in active Walloon quarries to promote biodiversity. The voluntary participation of quarries illustrates the sector's desire to rethink its cohabitation with the biodiversity hosted by its sites.

The Biodiversity and Landscape unit of Gembloux Agro-Bio Tech (University of Liège)

The University of Liège, through its Biodiversity and Landscape Unit, was able to contribute significant scientific expertise to the project but also to provide training and tools adapted to the appropriation of biodiversity by the sector.

Natagora

Natagora, as the main nature conservation association in the Walloon Region, has enabled the project to make an important contribution to the knowledge of biological challenges of the participating quarries. It also contributed to the development and implementation of relevant actions for the target species and to the biological monitoring to establish their impact.

The Scheldt Plains Nature Park

The Scheldt Plains Nature Park was able to transpose the approach implemented in the rest of the Walloon Region to the Park and its surroundings. It has actively contributed to the development of the human dimension of the project through his historical collaboration with the operators, while raising their awareness of the stakes and actions in favor of biodiversity.

The Walloon Region

The project is associated with the partnership of the Public Service of Wallonia in a bid to integrate the quarries to the regional network for biodiversity. The Region is also a co-financier of the project up to approximately 20%.

The LIFE Programme

The European Union's LIFE Programme, the funding tool for environmental and climate projects, made the project possible with an European Union co-financing representing 56% of the project's € 5,036,188 budget. The project fell under the Nature and Biodiversity strand of the LIFE programme.

BIODIVERSITY IN QUARRIES

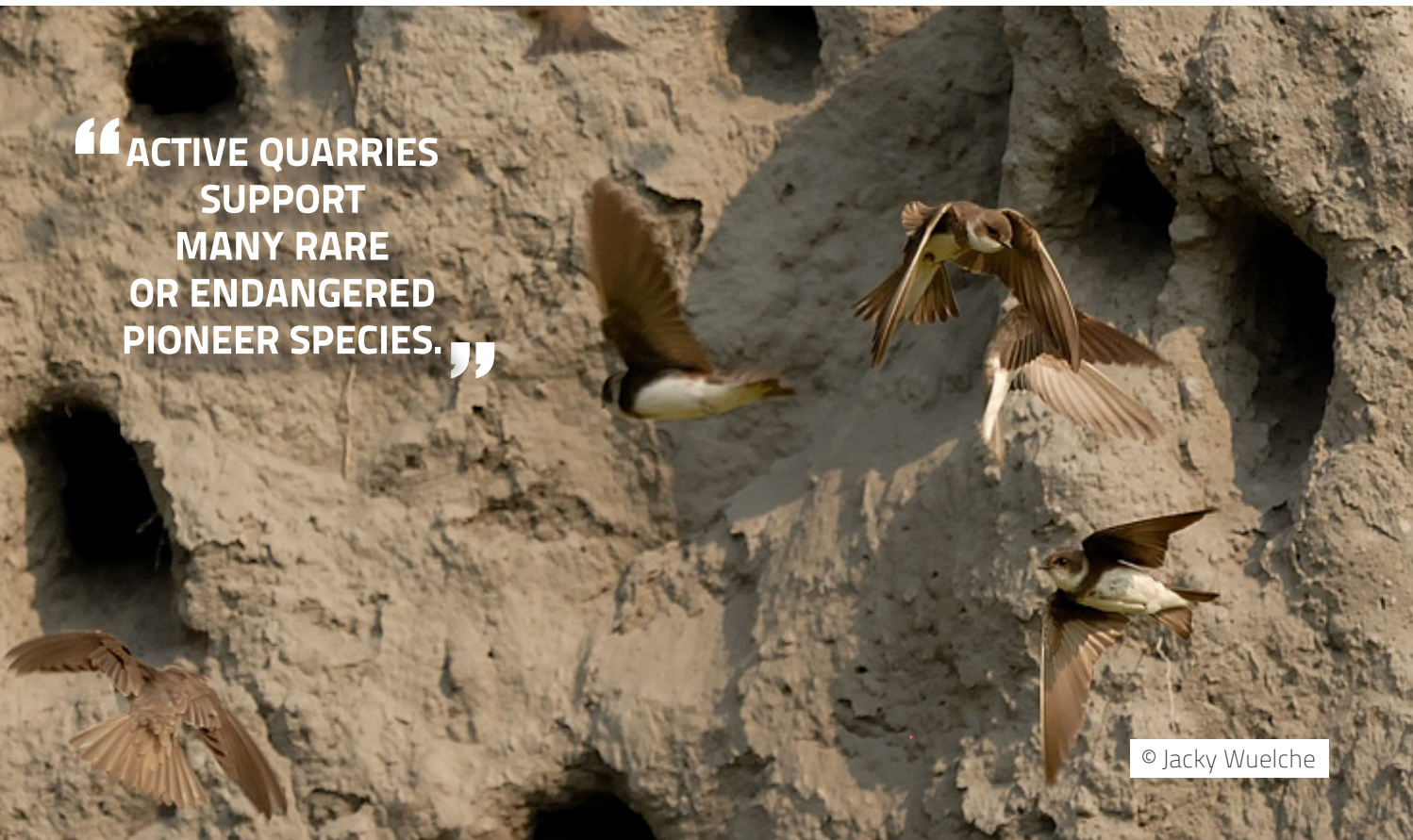
Quarrying inevitably causes significant disruptions to the topography, land use and ecosystems in place. The development of open-cast quarries leads to the modification of existing habitats (forests, meadows, etc.) in favour of mineral ones. Daily exploitation generates numerous recurrent disturbances that constantly rejuvenate the substrate. These conditions impacting the biodiversity in place may seem, at first glance, unwelcoming for the fauna and flora.

In reality, quarries offer a significant potential for the development of biodiversity. Through its daily activity, quarrying creates environmental conditions that are rare in landscapes strongly influenced by human activity: frequent disturbances generating dynamic processes of habitat succession, heterogeneity of substrates (mineral areas, rocky cliffs, spoil heaps with organic soil, ...) and oligotrophic soil and water conditions. Thanks to these conditions, a great diversity of environments is generated, ranging from pioneer habitats in the most active areas of the operation to more permanent habitats in disused areas. They can be the result of active ecosystem restoration activities or of the spontaneous development of nature. A growing number of studies and projects demonstrate that, with appropriate management, extraction sites can thus promote an interesting biological diversity throughout their life cycle. Quarries host species from a variety of taxonomic groups (plants, birds, insects, amphibians, etc.) and can favor the development of populations of threatened and/or protected species.

Among the wide variety of habitats present in an active quarry, pioneer habitats are of utmost interest. Typical of extraction sites, they include pioneer ponds (benefiting amphibians and dragonflies), bare grounds, pioneer grasslands (attracting insects and birds), vertical faces and sand banks (benefiting birds and solitary bees) along with a variety of hiding places and shelters (used by reptiles, amphibians and insects). These habitats are of paramount importance for the biodiversity of active quarries, benefiting many rare or threatened species such as the Sand martin (*Riparia riparia*), the Natterjack toad (*Bufo calamita*), Stoneworts (*Charas sp.*), the White stonecrop (*Sedum album*), the Common centaury (*Centaureum erythraea*), solitary bees, the Great crested newt (*Triturus cristatus*), the Smooth snake (*Coronella austriaca*) or the Midwife toad (*Alytes obstetricans*).

These habitats fall under the European Commission's definition of «TEMPORARY NATURE» meaning that, in an area where an extractive activity is to be developed, the establishment of nature can be temporarily allowed while allowing for further impact by extractive activities. This is conditioned by anticipatory habitat replacement measures set within a legal framework securing the activity.

“ ACTIVE QUARRIES
SUPPORT
MANY RARE
OR ENDANGERED
PIONEER SPECIES. ”

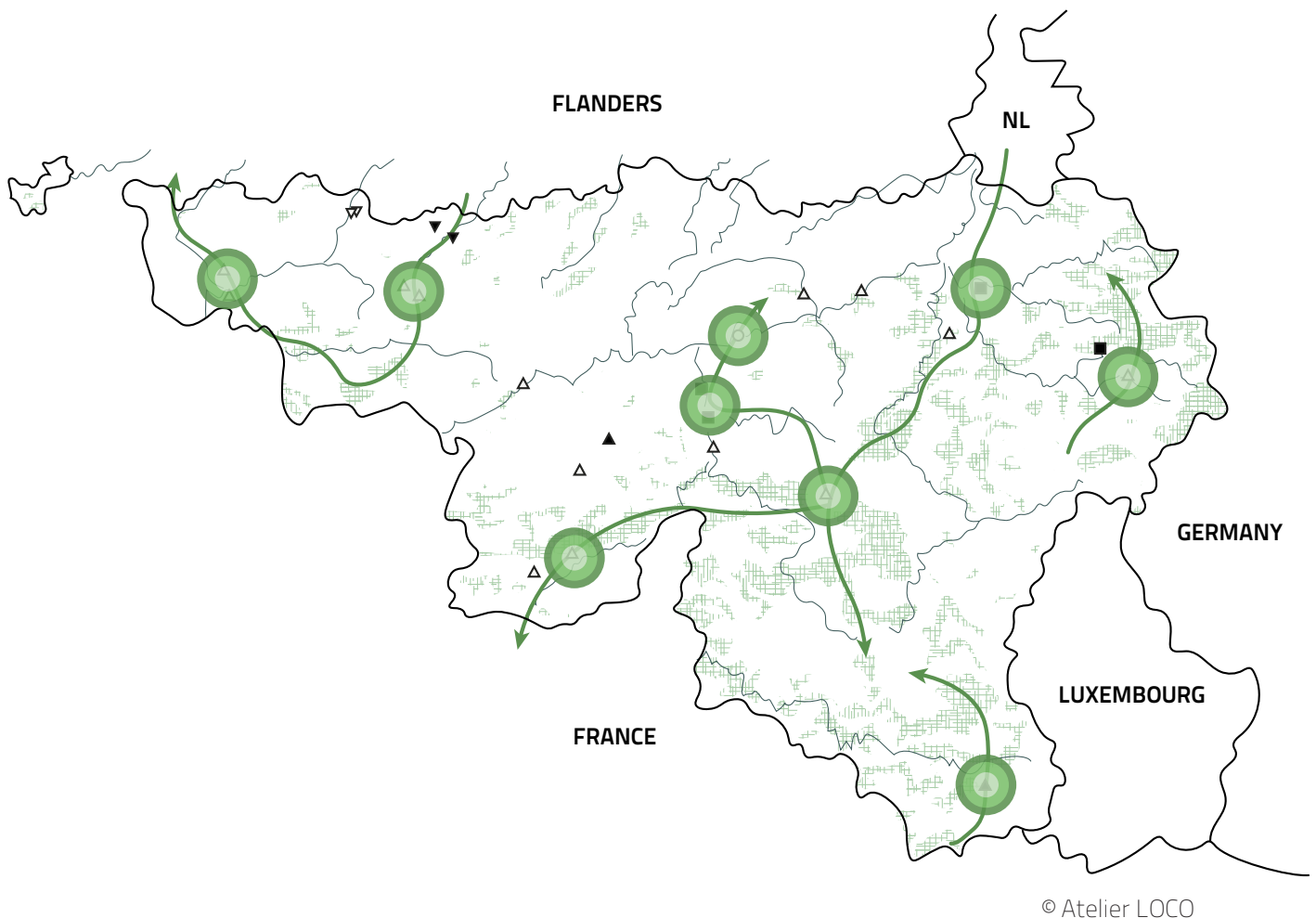


A NETWORK OF QUARRIES FOR DYNAMIC BIODIVERSITY

The main innovation of the project was to implement a «**dynamic biodiversity management**» strategy in 27 sites allowing the development of a quarries' network contributing to regional biodiversity conservation stakes while maximizing the extractive sector's contribution.

This management model is based on an evolutionary system of creation and conservation of a network of temporary habitats, managed in parallel with the extractive activity, and aimed at maintaining environments suitable for the development of specific pioneer biodiversity.

By enabling a better cohabitation between animal and plant species and the extractive activities, the LIFE in Quarries ensures the development of nature in active quarries.

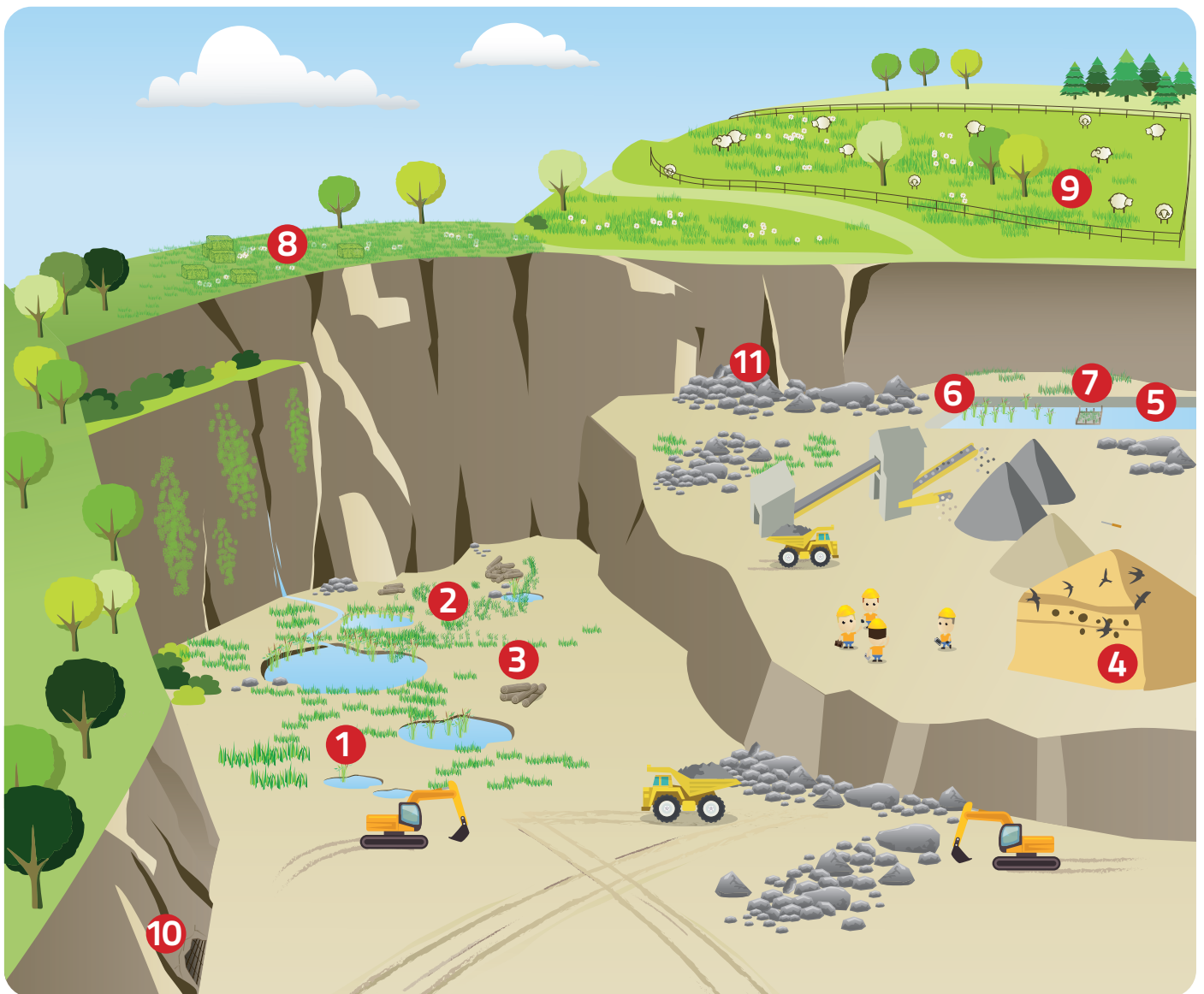


In order to raise quarry staff awareness of the LIFE in Quarries actions in place, signs «A biodiversity action is being carried out at this location» were installed next to them. Other information boards related to eco-pasture areas and bat hibernation sites.

THE ACTIONS OF THE PROJECT

Temporary actions (from 1 to 4), mainly intended for pioneer species, have a relatively short life span (2 to 5 years) and require regular maintenance to limit the development of vegetation and the arrival of predators.

The other category of actions (from 5 to 11) consists of developments of a permanent nature, intended to last in space and time. These actions contribute to the development of diversified habitats, hosting populations of rare or threatened long-lived species, completing the regional ecological network and allowing a natural recolonization of disused areas.



Created and developed to facilitate the monitoring of actions implemented by the sites, the AMBRES management platform is a key tool for the continuity of dynamic management.

This didactic tool allows a coherent follow-up of the project actions by the operators and facilitates the management of biodiversity actions within the sites.



AMBRES
We care for Life in Quarries

1 Pioneer ponds

The creation and dynamic management of water in active quarries aims at the development of small or large pioneer ponds with little vegetation. These habitats are home to specific communities of amphibious annual plants, amphibians and rare and threatened dragonflies. Of particular interest, these *oligo-* and *meso-*trophic ponds have become rare at European level. Left to their natural evolution, they lose their pioneer characteristics within a few years.

The target species quickly colonized the **403 pioneer ponds** set up as part of the project. These include Stoneworts (*Charas sp.*), Natterjack Toad (*Bufo calamita*) and the target dragonflies and damselflies: Southern skimmer (*Orthetrum brunneum*), Keeled skimmer (*Orthetrum coerulescens*), Small bluetail (*Ischnura pumilio*) and Common Winter Damsel (*Sympecma fusca*).



2 Pioneer grasslands

Stripped of their vegetation and soil, quarries' benches and pit bottoms are important habitats for a variety of pioneer plant communities. When set aside for a few years, these areas quickly become home to pioneer species. The level of humidity conditions the colonization by thermophilic or amphibious plants, while the invasion by shrubs and trees inevitably leads to shading and competition that is detrimental to the targeted pioneer species.

The **30.75 hectares of pioneer grasslands** under temporary protection are home to a diversity of rare and threatened plant and animal species such as the Stinking Hawk's-beard (*Crepis foetida*), the Lesser centaury (*Centaureum erythraea*), the Blue-winged grasshopper (*Oedipoda caerulescens*) and the Little ringed plover (*Charadrius dubius*), whose nests have been



3 Shelters

Stones, stumps and sandpiles can provide daytime or winter hiding places but also serve as important food and egg-laying sites. They provide sunny spots for reptiles, moist substrates for amphibians and protection from predators for insects and small mammals. The creation of shelters makes it possible to diversify the structure of habitats and favours the development of these species. In quarries and sandpits, their creation is both facilitated by the availability of rocks or sand and necessary in areas smoothed by exploitation.

403 shelters were set up in the project quarries. Specific monitoring of 112 of these confirmed their interest, with the presence of target amphibian species: the Midwife (*Alytes obstetricans*) and Natterjack (*Bufo calamita*) toads both using them as daytime hiding places.



4 Vertical faces and sand banks

In quarries, the maintenance or intentional creation of vertical faces and sand banks aims to develop nesting sites for the Sand martin and solitary bees. A variety of birds and insects benefit from these sandy habitats: the European Bee-eater and the Kingfisher also regularly use these types of cliffs in quarries. In highly urbanised and stabilised landscapes, quarries play a role in maintaining their populations. The conservation, intentional creation and maintenance of vertical faces and sand banks provide an ideal habitat for these curious diggers. Without intervention, vertical faces eventually collapse and vegetation invades these bare sands, rendering the habitat unsuitable.

14 vertical faces and 18 sand banks were managed by the participating quarries. These cliffs and slopes are home to the Sand martin (*Riparia riparia*) and solitary bees. Among the species found on sand banks are the Early colletes (*Colletes cunicularius*) and the Grey-backed mining bee (*Andrena vaga*).



5 Permanent ponds

In the disused peripheral zones or upon spoil heaps completion, the creation of large pools of up to a few hundred square metres enhances the diversity of habitats. These deeper, permanent bodies of water are naturally colonised by aquatic vegetation, providing a valuable habitat for long-lived amphibians as well as a wide variety of aquatic birds and dragonflies.

The **143 permanent ponds** of the project are also regularly colonised by the targeted amphibians, including the Midwife toad (*Alytes obstetricans*) and the four species of Walloon newts. On the sites where it is present, the Great crested newt (*Triturus cristatus*) is also found in 28% of the ponds. It is accompanied by a variety of dragonfly and damselfly species.



6 Gently sloping banks

On the largest bodies of water, the installation of **682 metres of gently sloping banks** lead to softening the slopes in order to facilitate reedbeds' installation, home to a wide variety of waders.

7 Floating platforms

30 floating platforms and an islet have been built on the large permanent water bodies and serve as potential breeding sites for waterbirds such as the Common tern (*Sterna hirundo*) or the Common gull (*Larus canus*).



8 Hay meadows and 9 grazed grasslands

Natural succession leads the pioneer areas towards grasslands supporting a wide variety of flora and fauna. Orchid-rich calcareous or acidic grasslands are reclaiming these poor substrates.

However, appropriate management is needed to maintain and enhance their interest. Established partnerships with shepherds or farmers will allow these plots to be managed by extensive grazing or late while returning agricultural land to local communities.

108 hectares of open herbaceous habitats were restored on former spoil heaps and in sites' surrounding areas. After shrub removal and diversification of the flora by seeding, the management of 28.5 ha by mowing was entrusted to local farmers, while 78.5 ha were fenced and entrusted to shepherds. These diversified habitats are home to orchid species including the Bee Orchid (*Ophrys apifera*), Fuchs' Orchid (*Dactylorhiza fuchsii*) and the Pyramid Orchid (*Anacamptis pyramidalis*).

10 Bat galleries

The quarries also host numerous cavities resulting from the exploitation: technical galleries, underground storage, old tunnels, etc. In the project sites, at least 8 different bat species have been identified, such as the rare Greater horseshoe bat (*Rhinolophus ferrumequinum*), Geoffroy's bat (*Myotis emarginatus*), Brown long-eared bat (*Plecotus auritus*) or the more common Whiskered bat (*Myotis mystacinus*).

12 galleries have been secured for the long term to prevent any destruction and to ensure bats' tranquillity.



11 Stones

By transferring and storing rock material outside of future impacts, quarries can create an interesting combination of screes and edge habitats for reptiles. Raw material laid out in rows can act as dispersal corridors for reptiles between biodiversity rich areas.

The project created approximately **5,400 metres of linear screes** in 14 sites. Operators and naturalists had the opportunity of encountering the project's principal target species of reptiles: the Wall lizard (*Podarcis muralis*), the Grass snake (*Natrix natrix*) but also the Smooth snake (*Coronella austriaca*), rarely observed in Wallonia. In addition to being useful for reptiles, plants can grow on these stony structures, sometimes several hundred metres long.



REINTRODUCTION AND TRANSLOCATION OF SPECIES

In addition to the implementation of temporary and permanent actions, the project's conservation actions also included the seeding of heritage flora species and the translocations/reintroduction of three amphibian species.

The aim was to take advantage of habitats created by quarries to develop new populations of threatened species. In doing so, the project enabled these species to cross distances and barriers preventing spontaneous colonisation and to take over these optimal habitats. A selection of candidate sites based on the criteria of the International Union for Conservation of Nature (IUCN) allowed the best sites to be chosen for these introductions. Sites are committed to maintaining conditions that will allow the development of new populations of these species.



Heritage flora

A variety of rare patrimonial plants are linked to pioneer conditions such as those found in quarries. The development of seedlots for 10 species of heritage flora led to the sowing of new populations of rare or threatened species in the pioneer grasslands of 21 quarries.



Natterjack Toad

The Natterjack toad is particularly fond of the sunny pioneer ponds and grasslands of the project. In 3 years, more than 170.000 eggs and 35.000 tadpoles were collected and introduced into 5 new quarries. In 2021, detailed monitoring allowed confirming that new populations were established with evidence of adults and of spontaneous breeding at all the receiving sites, bringing the number of participating sites occupied by the species to 15.



Great crested newt

The Great crested newt prefers to live in vegetated pools dug in the post-exploitation areas. Originally only present in 4 project sites, the species has been successfully introduced in 4 new quarries. The first adults returning to the ponds have already been observed during biological monitoring.



Yellow-bellied Toad

Critically endangered in the Walloon Region, the Yellow-bellied toad, a species of toad that breeds in muddy puddles, is known elsewhere for its ability to thrive in quarries. A breeding programme in partnership with the Domaine des Grottes de Han has led to the release of over 1,350 tadpoles in a project quarry in 2020 and 2021. The first adults observed bode well for the development of this new population.



THE FUTURE OF LIFE IN QUARRIES

At the end of LIFE in Quarries, the quarries agreed to maintain and continue their commitment to biodiversity for at least the next 15 years. The long-term commitment of the participating quarries is articulated in 3 axes: a biodiversity management plan, a derogation to the Nature Conservation Law to legally secure the approach and a commitment in the framework of an individual charter.



AXE 01

Individual Charter

Formalises the quarries commitment to maintain and continue actions (temporary - permanent nature) in favour of biodiversity for a period of 15 years .

AXE 02

Derogation

The derogations established within the framework of the project allow the legal implementation of the management plan in line with the European guidance for the application of the Habitats Directive.

AXE 03

After-LIFE management plan

Specifies the long-term commitments of operators and sets out the requirements for annual monitoring and control of commitments on a five-year basis.

The actions implemented by this management plan are additional to any constraints imposed by existing permits. This approach enables the operators to ensure the present species long-term survival thanks to proactive management. It entrusts quarries to participate in conservation issues at the regional level while guaranteeing the legal security necessary for the continuity of the actions implemented and of the industrial activity.

INSURED REPLICABILITY

Through the monitoring of its actions, the LIFE in Quarries project has also demonstrated the effectiveness of its achievements.

Biological monitoring¹ of the actions has demonstrated a rapid response of species to the actions implemented on the sites. Project's target species: Natterjack toad, Sand martins, Little ringed plover, Skimmers and heritage flora quickly colonise temporary habitats such as new ponds and pioneer grasslands, shelters and vertical faces. On the other hand, permanent actions gradually evolve towards rich and diversified habitats. In this way, biological monitoring also helps to confirm to scientific and naturalist partners the interest of active quarries for biodiversity and the added value of a constructive partnership with the sector in favour of biodiversity.

The LIFE in Quarries project also studied the **contribution of a regional network of quarries to the Green Infrastructure through the evaluation of ecosystem services**² provided by quarries during their life cycle and influenced by the implementation of the project. The analyses that result from this study are intended to integrate a multi-service approach and to the concrete actions to be undertaken to maximise ecosystem services both during the sites' extractive activity and over their rehabilitations.

The participating quarry operators were able to demonstrate, through the implementation of a simplified biological monitoring system, that the sector could **take ownership of the management and monitoring of biodiversity** through appropriate training that included all the actors in the company, regardless of their hierarchical position. The proactive engagement of quarries through **voluntary charters** guarantees the continuity of these commitments in the long term.

The collaboration between quarry operators and scientists/naturalists has also led to an **evolution in the awareness of the extractive sector** of the potential contribution it can make to regional biodiversity³. Contributing to the implementation of the project actions and monitoring its effects on biodiversity has brought well-being at work, satisfaction, awareness and pride. For the vast majority of participants, LIFE in Quarries actions have had a positive effect on their relationship with nature. These results, together with the demonstration that day-to-day management can be done at an **acceptable cost to the sector**⁴, should encourage the implementation of actions.

By committing to a coherent implementation within 27 sites, the Walloon extractive sector is proving that it can contribute to the conservation of regional biodiversity at the very heart of its active sites, in a partnership with scientific and nature conservation stakeholders.

The large number of extraction sites across Europe, combined with the inherent characteristics of the industry, make it a major player in the EU's economic and environmental challenges. As an integral part of the EU's Green Infrastructure strategy, quarries represent an important potential for biodiversity conservation during rehabilitation at the end of operations, but also during the extraction phase, through the implementation of dynamic biodiversity management.

Today, by committing to a biodiversity management approach at the European level, the sector wishes to generalise the knowledge gained from the many case studies of biodiversity development on its sites⁵. The LIFE in Quarries provides a concrete implementation formula for this desire in a process compatible with the Habitats Directive⁶.

 **Consult the synthesis of the inventories on the following link :**

¹ Life in Quarries Synthetic report on biodiversity and ecosystem functions monitoring – Available at <http://hdl.handle.net/2268/266063> (in French)

² Ecosystem services assessment in the Extractive sector – Lessons from the Life in Quarries project – Available at <http://hdl.handle.net/2268/266158>

³ Biodiversity perception in the Extractive sector – Lessons from the Life in Quarries project – Available at <http://hdl.handle.net/2268/266146>

⁴ Costs related to the dynamic management of biodiversity in quarries in the framework of the Life in Quarries – Available at <http://hdl.handle.net/2268/268000> (in French)

⁵ Extractive Sector Species Protection Code of Conduct – Available at https://www.birdlife.org/wp-content/uploads/2021/10/Code-of-conduct_With-signatures_Digital-low-res.pdf

⁶ Guidance document on the strict protection of animal species of Community interest under the Habitats Directive – Available at [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PL_COM:C\(2021\)7301](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PL_COM:C(2021)7301)





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