



BOP TOOLBOX FOR MEDITERRANEAN SITES

Catalog of actions for biodiversity enhancement in the
Mediterranean.

Mediterranean multi-site management



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1 Presentation of the LIFE BooGI-BOP project

The EU project LIFE BooGI-BOP¹ (*LIFE Boosting Urban Green Infrastructure through Biodiversity-Oriented Design of Business Premises*) is supported by seven partners across Europe and promotes a biodiversity friendly design in urban, industrial and commercial areas.

The *Biodiversity-Oriented Design of Business Premises* is a practical approach which promotes the protection and enhancement of biological diversity. BOP provides with tools and solutions for the implementation of permanent or temporal habitats for fauna and flora in business premises and the implementation of green infrastructures, thus improving the connectivity with nearby green corridors.

Through BOP actions, the business premises involved in the project will contribute, among others, in the following areas:

- Contribute to biodiversity protection
- Increment the functionality of the business premise
- support the ecological infrastructure of the surroundings
- create an inspiring and pleasant working atmosphere for workers and visitors
- new opportunities for sensibilization and actively involve workers and other interest groups with biodiversity protection.

Project partners are:

Lake Constance Foundation, Global Nature Fund e Institut für Lebensbezogene Architektur e. V. (ILbA, Germany), Amt der Vorarlberger Landesregierung —Abteilung Umweltund Klimaschutz (IVe)— (Austria), Ecoacs Reserva de Biodiversidad y la Universidad Politécnica de Madrid (Spain), y Ekopolis Foundation (Slovak Republic).

Together they support businesses in all sectors in their efforts to promote biodiversity-oriented premises.



¹ [LIFE BooGI-BOP](#).

2 Presentation of the BOP Toolbox for Mediterranean multi-site management

Companies with multiple business sites can manage them through corporate real estate management. By doing so, standardized development and maintenance systems are applied to reduce the complexity of their management, as well as their cost. Due to their national or even international operational scope, they may work with gardeners or planners who may not be specialized in the management of "biodiversity-oriented premises" (BOP) facilities. Therefore, in most cases, green structure and biodiversity planning that supports on-site planning and maintenance is not part of the standards of this type of property management.

These companies need a "BOP toolbox" with standardized design alternatives, maintenance schemes, bidding procedures and general principles with high applicability to sites in different settings. To facilitate implementation, the resources contained in this toolbox should be flexible and adapted to the specific conditions of each site to maximize the biodiversity enhancement potential of each site.

The measures proposed to integrate these BOP concepts into the companies' real estate management will be based on an analysis of the companies' real estate holdings, bidding procedures and requirements for site development and maintenance. These measures take into account common functional needs and other requirements such as aesthetics, complexity and intensity of maintenance and the time frame for which a given area is available.

The BOP Toolbox for Mediterranean multi-site management proposes biodiversity enhancement actions grouped according to their impact on restoration, management or species enhancement and does so taking into account the specificity of these spaces in a Mediterranean environment.

We hope you find it useful.

3 Classification of biodiversity enhancement actions

The BOP actions to improve biodiversity proposed in this document, which we call the "BOP Toolbox", are divided into three main areas:

1. **BOP actions related to restoration:** focused on the creation of new habitats or the improvement of existing ones. They include actions aimed at reconstructing or resembling the surrounding natural systems, generally tending to green the company's facilities. These actions range from simple actions, technically easy to carry out -such as planting local species- to more complex interventions -such as the installation of green roofs and facades.
2. **BOP actions related to site management:** focused on promoting improvements in the maintenance of what are usually called company green areas. These actions are very much focused on the management of water resources, since water scarcity is one of the greatest environmental challenges in Mediterranean climates with marked periods of summer drought, even more so in a context of climate change. However, this section also includes other actions, such as those aimed at reducing the use of herbicides, pesticides and other phytosanitary products on the site.
3. **BOP actions related to species improvement:** aimed at promoting specific measures to improve the life cycles of the different species that may already be in the territory or that may be attracted by the installation of, for example, nesting boxes, insect hotels, etc.; measures that will mostly serve to promote local fauna. Also considered as improvement actions are those that involve the creation of natural structures such as stone walls or pruning and wood remains that act as quasi-natural refuges for the development of local fauna. Finally, this category includes actions to improve connectivity through participation in green corridors and green infrastructure networks.

4 Description of actions

4.1 BOP actions related to restoration

Installation of green facades

DEFINITION OF THE ACTION

Green facades contribute to improving biodiversity in urban environments in a direct way, especially in areas where there is limited space that makes it difficult to increase green areas. In addition to greening buildings, birds and insects benefit from the presence of vertical gardens as a source of shelter and food. Some of the advantages of installing green facades for workers and the company are the following:

- Solar protection: helps regulate the temperature inside buildings. Reduction of electricity consumption by reducing the use of air conditioning. This feature is very relevant in Mediterranean environments.
- Improved air quality: acts as a filter for fine particles.
- Reduction of outside noise.
- Aesthetic improvement of buildings constructed in many cases in a pragmatic way for industrial use.
- Its installation scores favorably for obtaining some of the LEED sustainability certificates.



There are a multitude of options available to find the green facade that best suits the existing site design:

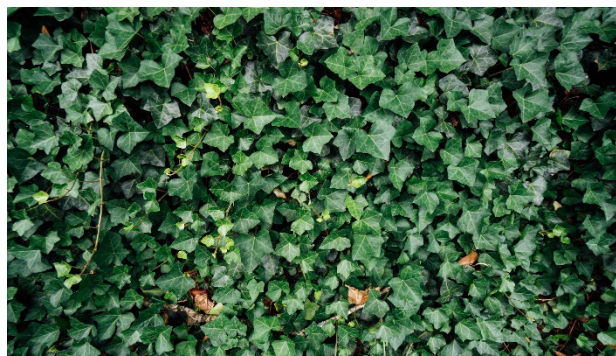
- 1. Depending on the rooting of the plants:**
 - Above-ground plantings, in which the roots of the plants develop directly in the soil near the base of the building. Planters can also be used if the pavement is asphalted.
 - Plantings on the wall. In this case we need to build a structure containing the necessary substrate for plant growth. They are usually organized forming hives, in which each cell contains a different plant.
- 2. Depending on the root substrate:**
 - Hydroponic cultures, in which the roots develop in an inert medium - for example, in gravels or foams among other materials, but in the absence of soil.
 - Substrate crops, in which the roots develop in soil.
- 3. Depending on the element of attachment to the wall:**
 - In green facades on the ground we can use meshes screwed to the wall so that the plants climb from the base of the wall, cables anchored at the top and bottom of the building or an intermediate solution between the two, without covering the entire wall.
 - In plantings on the wall, we can create cells similar to pots with the plants placed vertically or in perforated materials (like bricks), with the plant growing horizontally.



Green facade on a wall



Green facade on the ground



Detail of a green ivy facade

RECOMMENDATIONS FOR IMPLEMENTATION

- Plantations on the wall allow a much greater variety of species than on-ground plantations, up to one different species in each cell.
- Hydroponic crops are much lighter than the option of using soil as substrate.
- Plantings on the wall have a much more immediate effect, as on-ground plantations need much more time to reach the desired height.
- It is necessary to consider the water requirements of a green facade; an absolutely transcendental issue in a Mediterranean environment. For this reason, it is essential to use local species of ivy and other vines that will substantially limit the amount of water necessary for their development.
- As a general rule, the plantations on the wall present a much more aesthetic and appealing aspect as they contain a greater number of species, although they will also require a greater contribution of water and fertilizer. On this aspect, there are hydroponic walls that incorporate a water tank at their base in which rainwater is collected, transported and distributed over the plants by means of a pump. Therefore, it will be necessary to evaluate if the aesthetic improvement that we will achieve can be maintained without increasing water consumption.
- Consult with the company's architect or planner if there are any safety limitations for its installation, such as strong gusts of wind.

<p>SUITABLE FOR</p> <p>All types of buildings</p>	<p>LIMITATIONS</p> <p>Windows and glass</p> <p>Water availability</p>
<p>COST AND DIFFICULTY</p> <p>Medium, for plantings on the ground; and medium-high, for plantings on the wall.</p>	<p>MAINTENANCE</p> <p>Low-medium</p>

Installation of green roofs

DEFINITION OF THE ACTION

Green roofs contribute to improving biodiversity in urban environments in a direct way and their implementation is starting to be regulated on new buildings in countries such as France. In addition to greener buildings, birds and insects benefit from their presence as a food source.

Some of the advantages of installing green roofs for the company are as follows:

- Increases the life span of the structural roof by protecting it from wind, rain and direct solar radiation.
- Solar protection: helps regulate the temperature inside buildings. Reduced electricity consumption by reducing the use of air conditioning.
- Improved air quality: acts as a filter for fine particles.
- Reduction of outside noise
- Aesthetic improvement of constructed buildings which, in most cases, only follow pragmatic criteria oriented to their industrial use

Depending on the amount of substrate required for vegetation, green roofs are classified as follows:

- 1) Extensive: they have a soil layer of between 5 and 15 cm. They need to support a load of at least 50 kg/m² and are typically composed of mosses and herbaceous plants. They are the most common as they require less maintenance.
- 2) Intensive: they are distinguished by having a soil layer of more than 15 cm and their lining can accommodate a load capacity of at least 300 kg/m². They accept any design planned by the company, including larger plant species.



Ejemplo de tejado verde extensivo



Example of extensive green roof



Example of an intensive green roof

RECOMMENDATIONS FOR IMPLEMENTATION

- Always use local plants adapted to the climatic conditions of the green roof site, especially plants with low water requirements in the case of Mediterranean environments.
- Consult a company specialized in the installation of green roofs.

SUITABLE FOR

All types of buildings that have a roof load-bearing capacity of at least 50 kg/m²

LIMITATIONS

Roofs with low load-bearing capacity (< 50 kg/m²) or with a rainwater collection system.

COST AND DIFFICULTY

The cost of installation is higher than that of a conventional roofs and it is essential to consult a specialist company. However, its temperature regulating function allows for greater energy efficiency inside buildings by helping to maintain a constant temperature of 20°C and saving on heating and cooling costs. Some studies estimate a payback of the initial investment in just over 10 years.

MAINTENANCE

Low on extensive green roofs if the recommendation to use plant varieties adapted to the environment is followed. On intensive roofs, maintenance is constant and therefore higher.

Use of native plants and control of invasive species

DEFINITION OF THE ACTION

The use of native plants in all possible planting actions aims to recognize the use of native plants as one of the essential aspects to combat biodiversity loss, ensure that green areas are adapted in a context of global change and provide food and sustenance for local wildlife communities. Today, the effects of rising temperatures and changes in water regimes as a result of climate change are visible in the development of most of the planet's plant species, which are forced to seek adaptive strategies or move to other latitudes in the face of water scarcity. Therefore, the more adapted the vegetation is to the local climatic characteristics, the greater the probability of its survival during the coming decades; in addition, it will also contribute to connectivity with other surrounding habitats and, therefore, to the generation or strengthening of green infrastructures.

One of the most frequent actions taken during the management and maintenance of a green area is the replacement of vegetation. These are caused by the death of plant species that are not adapted to the environment, as a consequence of site management, or by the substitution of species for design reasons.

When replacing individual gaps in green areas, as well as when repopulating larger areas of land, it is advisable to take into account four fundamental aspects:



Replanting at different heights

- 1) *Encourage local vegetation: Using native plant species is the key to minimizing the effects of climate change and not depending on the scarcity of water resources; ensuring that plants are less prone to pests or diseases and thus favouring the presence of entomological fauna, which has an essential pollinating function.*
- 2) *Control invasive species: Invasive alien species, both flora and fauna, are one of the main drivers of biodiversity loss. Control of alien species is accomplished by managing the species to levels where the damage to the ecosystem is the least possible. The best system is early detection and response to prevent the species from becoming invasive.*
- 3) *Promote the presence of a high number (at least five) of different native species, both shrubs and trees.*
- 4) *Promote the presence of vegetation at three heights: Consists of planting patches of native vegetation whose ecological optimum can present ecological niches with three different heights: a) a central part formed by taller arboreal vegetation; b) lower shrub species around it; and c) ground shrubs surrounding the whole group.*

RECOMMENDATIONS FOR IMPLEMENTATION

- Promoting varied ecosystems following the four guidelines indicated in this action will result in green areas of high ecological value. However, there are other design criteria widely followed for green spaces, such as purely aesthetic criteria, their medium- and long-term prospects, or the space and resources available.
- Consult with the service provider (gardener, botanist, landscaper, NGO...) on the composition of the vegetation patches created so that they have a high ecological value and are fully adapted to the local habitat typology.
- Problematic plant species - such as invasive or overly competitive plants - should be eliminated. Their seeds can remain for years or even decades, so in order to maintain plantations in the long term it will be necessary to control invasive species on a regular basis over time.
- Always communicate to workers or visitors the plant restoration work carried out, its ecological function, the composition of species present in the facilities, etc. through the installation of information panels, web pages or any other means of internal communication.

Invasive species of flora and fauna compete with and threaten other species to the point of causing hundreds of local species to be included on the red list of endangered species. In addition to the direct effects on nature, the problem has repercussions for people, for example, by facilitating the spread of diseases

The control of invasive species is specifically included in section 2.2.10 of the European Biodiversity Strategy 2030 and the complete list of invasive species in Spain can be found on the website of the Ministry for Ecological Transition and the Demographic Challenge:

<https://www.miteco.gob.es/es/biodiversidad/temas/conservacion-de-especies/especies-exoticas-invasoras/ce-eei-catalogo.aspx>

The most common invasive species in Spain are:

PLANTS

- Cat's claw (*Carpobrotus edulis*, *Car-pobrotus acinaciformis*)
- Camalote, bora flower or water hyacinth (*Eichhornia crassipes*)
- Ailanthus (*Ailanthus altissima*)
- Eucalyptus (*Eucalyptus* sp.)
- Mimosas (*Acacia dealbata*)

ANIMALES

- Argentine Parakeet (*Myiopsitta monachus*)
- Kramer's Parakeet (*Psittacula krameri*)
- Asian wasp (*Vespa velutina*)
- Florida tortoise (*Trachemys scripta elegans*)

List of plants suitable for use in Mediterranean environments that favor the presence of pollinating insects (*):

NECTAR-RICH PLANTS

- *Lonicera etrusca* (honeysuckle)
- *Borago officinalis* (borage)
- *Rosmarinus officinalis* (rosemary)
- *Lavandula sp.* (lavender)
- *Salvia sp.* (sage)
- *Centranthus ruber* (herb of thousand flowers)
- *Daucus carota* (wild carrot)
- *Lonicera periclymenum* (woodland honeysuckle)
- *Lonicera xylosteum* (honeysuckle)
- *Allium sp.* (onion)

PLANTS RICH IN POLLEN

- *Thymus sp.* (Thyme)
- *Erica sp.* (Heather)
- *Calluna vulgaris* (heather)
- *Calendula officinalis* (marigold)
- *Prunus spinosa* (blackthorn)
- *Medicago sativa* (alfalfa)
- *Petroselinum crispum* (parsley)
- *Geranium sanguineum* (blood geranium)
- *Malva sylvestris* (common mallow)

*Modified from "Guía de los polinizadores más comunes de las zonas verdes de Madrid", (CSIC, 2018).

A varied composition of shrubby plants selected with ecological criteria will favour the presence of organisms that fulfill an essential pollinator function and reduce maintenance costs, in addition to fulfilling their ornamental function.

SUITABLE FOR

Large areas, separation of areas on site, perimeters, creation of different environments.

LIMITATIONS

Avoid non-native species or those with high water requirements.

COST AND DIFFICULTY

Low. Prior soil preparation is required before planting. It is essential to consult with a specialist on the most suitable varieties of plants according to the type of habitat.

MAINTENANCE

It can be incremental if there is a large presence of invasive species or if they are difficult to detect by company employees.

During the first year, moderate irrigation of new plantations may be necessary.

Recological restoration of degraded areas

DEFINITION OF THE ACTION

Ecological restoration is defined as the induced process that restores the structure and/or functionality of degraded ecosystems, thus reducing the fragmentation of the territory and increasing its ecological connectivity. An ecologically developed zone is one with the capacity for self-regulation, regeneration and maintenance (ecological resilience).

- Restoration can be of two types:

1) Natural or passive. This is based on the concept of ecological succession, in which the composition of plants and animals in an area change through different stages in a natural way, in which pioneer plants of rapid growth appear first and, gradually, new species are introduced as the degree of development of their predecessors increases. It is the most economical option as it requires less intervention, however, it usually requires considerable time lapses, which is why, in very degraded areas, it is recommended to actively assist the process.

2) Artificial or active. Requires a high degree of intervention and usually involves multidisciplinary teams. In considerable areas, massive reforestation is used, but not as the only measure. As a first step, it is essential to initiate a diagnostic stage, in which the causes of degradation are identified and addressed, and in which an ecosystem is selected as a reference and target for action. In addition, the development of the restored area should be continuously monitored.

In both types of restoration there are activities that can be adopted to favor natural processes, such as the protection of adjacent areas that are in a good state of conservation, fencing or perimeter fencing of the restored areas to avoid interference, or carrying out preliminary soil preparation and adaptation tasks.

RECOMMENDATIONS FOR IMPLEMENTATION

Ecological restoration involves a conceptual approach for which the work of a specialist is essential. It is not recommended to approach it without sufficient theoretical and technical knowledge of environmental restoration projects.

SUITABLE FOR

All types of situations are appropriate with the intervention of a specialist who plans actions focused on ecological restoration.

LIMITATIONS

Those derived from the environmental constraints of each site, which the specialist will identify and guide appropriately.

COST AND DIFFICULTY

Varied. Depending on the characteristics of the site and the level of ambition defined in the restoration project.

MAINTENANCE

The project will define the maintenance requirements, but the BOP approach will always keep in mind that maintenance should be as low as possible, as long as it is well adapted to the site conditions.

Monitoring of indicator species

DEFINITION OF THE ACTION

Indicator species (both plants and animals) are considered to be those species that are identified with a certain quality criterion of the habitat where they are found, i.e., environmental conditions suitable for the establishment of ecological stages with a certain level of development.

Therefore, monitoring the presence of indicator species at the site serves to determine the ecological quality of the site, as well as the effectiveness of the ecological restoration measures developed. In the case of plants, the presence and correct development of an indicator tree species is a sign that the site is at an advanced stage of ecological succession, otherwise the species would not thrive.

As an example, the following list of indicator species was developed by the BooGI-BOP project partners to monitor BOP zones in typical Mediterranean environments.

- Rabbit (*Oryctolagus cuniculus*)
- Pollinating insects (bees or others) (*Apis mellifera*)
- Dragonfly (*Anisoptera* spp.)
- Garden dormouse (*Elyomys quercinus*)
- Lavandula (*Lavandula* spp.)
- Field mouse (*Apodemus sylvaticus*)
- Rosemary (*Rosmarinus officinalis*)
- Junipers and junipers (*Juniperus* spp.)
- Durillos (*Viburnum* spp.)
- Climbing plants (*Lonicera* spp.)
- Serbales, mustard plants (*Sorbus* spp.)

RECOMMENDATIONS FOR IMPLEMENTATION

The monitoring implies a commitment to maintenance over time, which commits the necessary means for its implementation over time horizons of at least 5-10 years. In return, the results of the monitoring of these indicator species will inform the company about the consequences of the actions it is carrying out in terms of biodiversity promotion. It is recommended that specialists who can propose relevant indicator species be present at the head of the monitoring.

SUITABLE FOR

To have concrete information on the results of the BOP actions, which makes it appropriate if an assessment is to be made over time.

LIMITATIONS

Those derived from the need to address in the company a task that exceeds the annual planning.

COST AND DIFFICULTY

Varied. Depending on the quality of the monitoring carried out, it can be done by your own personnel with basic knowledge in the identification of plants and animals, or by specialists in local flora and fauna.

MAINTENANCE

The maintenance of this action is the realization of the same over the time horizon to be decided: 5 or more years.

Creation of blooming meadows

DEFINITION OF THE ACTION

Bare soils are prone to erosion and have a very low moisture retention capacity. On the contrary, vegetation covers considerably improve infiltration and retention of soil moisture content; in addition to other benefits, such as increasing soil organic matter and reducing soil compaction, they are also a source of food for birds and insects. On the other hand, the herbaceous substrate is the first stage of vegetation successions towards more developed plant communities, providing structure and nutrients to the soil.



RECOMMENDATIONS FOR IMPLEMENTATION

The choice of plants depends on factors such as soil type, nutrient availability or solar radiation. Species such as grasses or legumes can be used and nowadays there are also options to create ground covers with moss species. There are many seed banks that offer seed mixtures of wildflower meadow species well adapted to the local climatology. It is recommended to rely on companies specialized in this type of actions.

SUITABLE FOR

Areas where the soil has a certain development, especially in the organic horizon, with a minimum capacity to retain water to offer to the herbaceous community to be established.

LIMITATIONS

Textural, nutritional or chemical imbalances in the soils need to be corrected in advance. The visitor should understand that these grasslands will present a different visual state that will seasonally change spontaneously.

COST AND DIFFICULTY

Varied, linked to the environmental peculiarities of each site and to the level of ambition established in the action.

MAINTENANCE

As they are made up of seeds of native species, the maintenance of these meadows will be limited in Mediterranean environments to reducing the danger of fire when the specimens are drier.

Creation of biodiverse hedgerows

DEFINITION OF THE ACTION

The introduction of hedgerows in the site, provided that the correct selection of plants is made, promotes the provision of two fundamental ecosystem services, such as pollination and biological pest control.

Other advantages of the presence of biodiverse hedgerows are that they function as an element of connectivity between fragmented habitats and provide food and winter shelter for birds, insects and small mammals.

Native species such as hawthorn (*Rhamnus* sp.), lavender (*Lavandula* sp.), albaida (*Anthyllis cytisoides*), bocha (*Dorycnium pentaphyllum*) and genisteas (*Genista* sp., *Cytisus* sp., *Retama* sp.) are examples of plants that favor the presence of ladybugs, spiders, ants and other invertebrates that are natural enemies of many pests that affect crops, plantations and garden species.



Hedge with native species

RECOMMENDATIONS FOR IMPLEMENTATION

The choice of plants depends on factors such as soil type, nutrient availability and solar radiation. However, numerous species from the families of legumes, rhamnaceae, rosaceae, cistaceae, labiatae and a long etcetera can be used, given the great biodiversity of the Mediterranean region in species of this type. Some species are even specially adapted to difficult environments such as saline, gypsiferous, clayey soils, etc.

The list of plants rich in pollen and nectar presented in this action can also be used in the composition of the biodiverse hedge, among other options, such as rockroses (*Cistus* sp.), brooms (*Retama* sp.) or climbing ivy covering the existing fence (*Hedera* sp.).

SUITABLE FOR

Almost any type of condition, as long as the right species are used.

LIMITATIONS

Provided that there is a good selection of species, there are practically no limitations, except for those that may arise from the technical safety requirements of the site.

COST AND DIFFICULTY

Varied, depending on how easy it is to find the necessary species and specimens with the technical characteristics that guarantee their correct rooting in the site.

MAINTENANCE

As native species are used, the maintenance of these hedges will be limited in Mediterranean environments to the reduction of fire hazards and to pruning, if necessary.

Recreation of riparian environments

DEFINITION OF THE ACTION

In those sites where the creation of water ponds or other types of more or less temporary water pools is being considered, the installation of vegetation characteristic of these areas can also be considered, with riverside vegetation, both algae and plants in the first line that serve as a refuge and food source for animal species such as invertebrates, fish and amphibians. Secondly, the presence of riparian trees and shrubs can be encouraged.

The introduction of native fish and amphibians can also be considered once the pond is full and the water quality is good. The presence of shelter and food is essential for the development of these animal populations.



Installation of *Arundo donax* on the edge of an artificial pond.

RECOMMENDATIONS FOR IMPLEMENTATION

The recreation of this type of environment must first analyze to verify the seasonality of the water that will accumulate, a circumstance that depends on the impermeability achieved, but also and fundamentally on the precipitation received directly and indirectly in the pond. Once the permanence of the water has been checked, the recreation of the riverbank environment should consider the maximum level of ponding reached and the different species that will be able to withstand the influence of the water.

Pond management can be combined with other species enhancement actions suggested in this "toolbox", such as the installation of nesting boxes and hotels for insects that will benefit from these water reservoirs as a source of water and food.

It is recommended to have a landscaper or landscaping specialist carry out these actions.

Another option is to let time set in motion the processes of ecological succession, taking advantage of the favorable effect of the presence of water in Mediterranean environments.

SUITABLE FOR

Sites that guarantee a spontaneous seasonal presence of water for at least 10 months of the year.

LIMITATIONS

Marked by possible contamination phenomena linked to the dragging of the waters that will reach the ponds, as well as by possible eutrophication processes that may cause small environmental crises with the death of the animals and plants that may have developed in the ponds.

COST AND DIFFICULTY

It does not necessarily have to be an action with high implementation cost and difficulty.

MAINTENANCE

The use of autochthonous species should imply a low level of maintenance due to the existence of water ponds.

Creation of urban gardens

DEFINITION OF THE ACTION

This is a collaborative action that seeks to involve the center's workers. It involves the use of an area of land located inside the site, where they will carry out manual cultivation work, basically of horticultural plants intended for human consumption, following the principles of organic farming, i.e. avoiding the use of pesticides and other phytosanitary products.



Huerto urbano

RECOMMENDATIONS FOR IMPLEMENTATION

In the case of having a plot of land with the possibility of creating these urban orchards with water, it could be suggested that it be prepared by installing a fence to delimit the area that will house the activity, as well as some terraces and a minimum number of farming tools to be used by those employees of the center who show interest in the initiative.

It should be emphasized that a large area of land is not necessary.

SUITABLE FOR

To bring workers closer to the natural environment and to demonstrate to them the company's interest in biodiversity and care for the environment, as well as attention to the well-being of workers.

LIMITATIONS

The limitations would be defined by the prohibition of the use of pesticides or other phytosanitary products.

COST AND DIFFICULTY

Low. The added value will be provided by the company's employee.

MAINTENANCE

In principle, there is no maintenance beyond the fruit and vegetable harvesting itself.

Creation of butterfly gardens

DEFINITION OF THE ACTION

This is an action with a high aesthetic value. The list of pollen- and nectar-rich species included in the action "use of native plants" can be used to introduce them, not in isolation, but to form a flowering garden with avenues crossing it, water points for the entomological fauna and informative signs indicating the composition of the species that make up the garden.

An appropriate garden design that includes all these elements will attract a large number of entomological species such as butterflies.



RECOMMENDATIONS FOR IMPLEMENTATION

Aromatic plant species can also be introduced, as always of local origin.

SUITABLE FOR

Promote actions involving the use of native species, biodiverse hedgerows and the creation of flowering meadows.

LIMITATIONS

A large area of land is not necessary, the size of the garden can be adapted to the available space.

COST AND DIFFICULTY

Low.

MAINTENANCE

It is hoped that once the presence of the butterflies is promoted, they will find in the area the possibility to repeat their biological cycles spontaneously.

Restoration of slopes

DEFINITION OF THE ACTION

Frequently, the irregularities of the terrain where the sites are located imply the appearance of a series of slopes that are usually devoid of any type of vegetation cover and often experience small erosion processes. It is in these situations that this type of action is particularly useful.

The restoration of small and medium-sized slopes can be approached through direct planting of shrub species and geophytes, as well as through the sowing of herbaceous species.



RECOMMENDATIONS FOR IMPLEMENTATION

The choice of species to be incorporated is fundamental for the repopulation of slopes.

To this end, two essential aspects must be taken into account: 1) use local plants adapted to the environment and 2) ensure that the species chosen, even if they are native, meet the necessary conditions for their development (such as, for example, the space available, the amount of nutrients or protection from direct exposure to the sun). The aim is to ensure the resilience of the vegetation cover, i.e. its ability to overcome adverse phenomena such as erosion and to regenerate over time.

In the case of using hydroseeding, it is recommended that planting be divided into two phases:

- a first sowing with commercial species that settle, shape the soil and fix nutrients, and a second sowing with one or more commercial species.
- a second planting, one or two years later, with selected species suitable for the environment, whose permanence will be long term.

Planting all at once may result in some plants not developing correctly due to competition with other species, because the soil is not fertile or is not adequately developed.

SUITABLE FOR

Situations in which the size of such traplines is not very relevant

LIMITATIONS

Sites where torrential rainfall processes are excessively high

COST AND DIFFICULTY

Medium or high.

MAINTENANCE

Medium

4.2 BOP actions related to site management.

e

Integrated management of water resources

DEFINITION OF THE ACTION

The scarcity or irregularity of rainfall during most of the year is undoubtedly an important limiting factor for the development of vegetation in typical Mediterranean environments. Because it is such a scarce resource, in many Spanish autonomous communities there are water limitations for irrigation of public spaces, so it makes sense to propose alternatives for use with recycled water. The systems proposed in this action make it possible to reuse up to 90% of the site's water consumption:

- 1) Recycling of grey water
- 2) Rainwater collection system
- 3) Urban sustainable drainage systems

Water collected through these systems can be reused in three different ways:

- 1) Creation and maintenance of artificial ponds within the perimeter of the company, thus promoting biodiversity of plants and animals such as birds or insects.
- 2) Irrigation of green areas
- 3) Non-potable use to supply the company's sanitary water system (bath cisterns, etc.).



Grey water recycling

Gray water recycling consists of the installation in buildings of two differentiated hydraulic circuits, one for drinking water and the other for recycled water. To build the recycled hydraulic circuit, first, a tank is installed on the ground floor of the building. In this tank, the water from the building's toilets is collected and filtered for its subsequent non-potable use - such as for the cistern or the garden irrigation. Filtering does not use chemicals, making it an odorless process. Before entering the tank, the larger particles are collected mechanically. Subsequently, a biological treatment breaks down the dirt particles and, finally, the water is disinfected by subjecting it to ultraviolet rays.

Rainwater collection in the roofs

The second system consists of collecting and channeling rainwater from the roof of buildings. The collected water is filtered and can be stored for later non-potable use or used to create an artificial pond.

Urban sustainable drainage systems

- Sustainable urban drainage systems are green infrastructures designed to improve the infiltration of the land, filter and accumulate excess rainwater through pipes for its subsequent non-potable use. Like traditional urban drainage systems, its main function is to avoid the accumulation of water and avoid runoff, but the main difference is the use of vegetation as a control element and the use of permeable pavements placed following the configuration of the land, taking advantage of the slopes and natural valleys.
- Vegetated surfaces accumulate part of the rainwater until the land reaches field capacity, in addition to filtering part of the polluting particles that carry rain in the cities. Permeable pavements improve the water infiltration process by allowing the filling of underground urban aquifers, which is not the case with traditional drainage systems.

RECOMMENDATIONS FOR IMPLEMENTATION

- The installation of artificial ponds is relatively simple. It is only necessary to dig a hole in the ground and cover it with an impermeable material that prevents leakage.
- All the water management systems presented in the action require the installation of a storage tank to store the recycled water for later use. The tank can be placed above ground or subway depending on the space available.
- There are different sizes of graywater recycling systems, so it is recommended to choose the size according to the needs of the company.
- Over time, the savings on the water bill will offset the initial investment.
- Roof water collection is incompatible with green roofs.
- Communicate through the installation of information panels, web pages or any other means of internal communication on the improvement of water resource management, the water savings achieved and the transformations to be achieved.

<p>SUITABLE FOR All types of buildings</p>	<p>LIMITATIONS None</p>
<p>COST AND DIFFICULTY High. Consult with specialized companies</p>	<p>MAINTENANCE Low. One of the advantages of water recycling systems is their low maintenance.</p>

Use of permeable pavements

DEFINITION OF THE ACTION

Permeability is the ability of a material to allow a fluid to pass through it. The use of permeable pavements is part of the trend in sustainable construction. Among its main advantages are improved traffic safety, noise reduction, vegetation preservation, improved water quality and non-interference with the water cycle and fluid exchange between terrestrial ecosystems and the atmosphere. In this way, the recharge of subway urban aquifers is allowed.



RECOMMENDATIONS FOR IMPLEMENTATION

- The design of permeable pavements must be carried out according to their location and executed with the highest possible quality control.
- The type of pavement to be applied is determined by two aspects: the type of pavement, discontinuous (paving stones with grooves and grass) or continuous (porous concrete/porous bituminous mixture) and the management of infiltrated water (infiltration into the ground, storage in a reservoir or deferred drainage). The appropriate type should be chosen according to the intended use.
- For the installation of vegetated discontinuous pavements, several layers are superimposed, a first layer of empty cells on gravel or gravel, a geotextile mesh covered with soil in the middle and another layer of cells with substrate on which the vegetation is seeded.

SUITABLE FOR

All types of pavements: light vehicle parking lots (vegetated parking lots) and roads with low traffic intensity. Recreational areas, roads and sidewalks.

LIMITACIONES

Its use is not recommended in roads with high traffic density, eroded areas or areas with abundant loose material, due to clogging problems, contaminated industrial areas - due to the risk of groundwater contamination - and regions with abundant freeze-thaw cycles. Nor is their installation recommended in areas with steep slopes.

COST AND DIFFICULTY

High, however, it does not imply an additional cost, since this action is planned to be carried out when the existing pavement is replaced due to maintenance works or when the utility cycle of the current pavement is over.

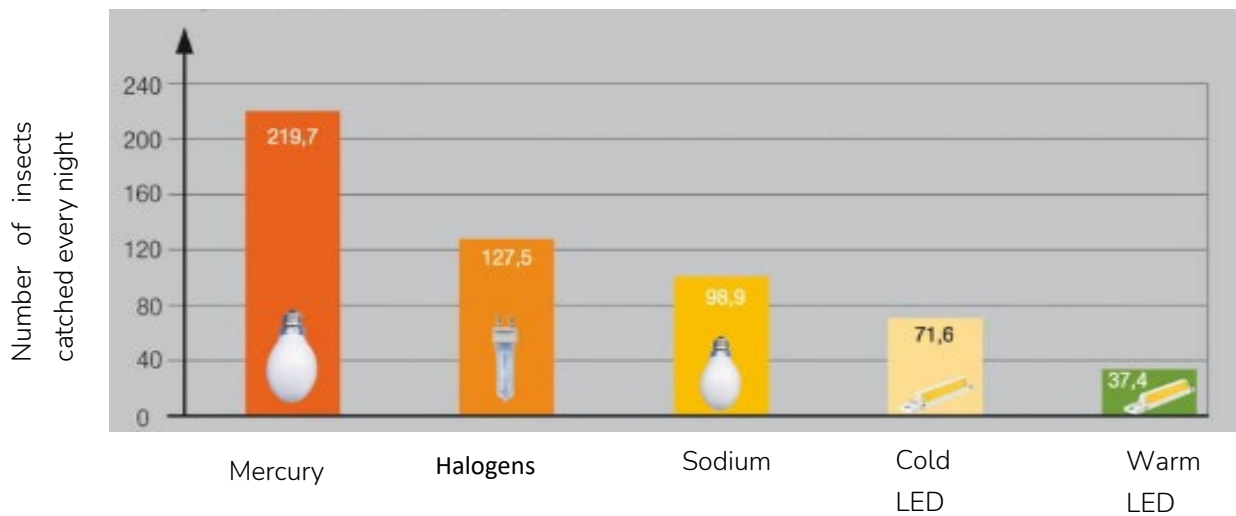
MAINTENANCE

Medium/high. Permeable pavements should be inspected regularly during the first months after installation. With proper maintenance - consisting of cleaning the sediments on the pavement - their life cycle can be up to 20 years. Without proper maintenance, there is a high risk of clogging, which would significantly reduce the life cycle.

Animal friendly lighting

DEFINITION OF THE ACTION

Birds and insects use the natural light reflected by the moon to orient themselves in the dark. Too intense artificial lighting disorients birds and attracts insects, causing obvious negative effects on the nocturnal cycle of these organisms. In contrast to the typical mercury vapor lamps (intense white light), halogen or gas-filled lamps with strong insect attraction, there are other more environmentally friendly options on the market. An LED lighting system (3000-6000k) is the best alternative to combine less negative impact on birds and insects and reduce economic costs by consuming less energy. High pressure sodium lamps attract up to 80% less insects and are also a good alternative.



RECOMMENDATIONS FOR IMPLEMENTATION

- The lamps should be placed inside a closed compartment and be focused exclusively downwards.
- Combine them with motion sensors to keep them off when they are not needed to minimize their use.

SUITABLE FOR

All exterior lighting

LIMITATIONS

None

COST AND DIFFICULTY

Low. Reduction of electricity consumption and reduction of the monthly economic cost in the long term.

MAINTENANCE

The same as conventional lighting.

Integral pest control

DEFINITION OF THE ACTION

A pest is understood as the excessive presence of any living organism, both plants and animals (insects, mice), as well as pathogens (fungi, bacteria and viruses) that cause serious damage to human activity and to the natural resources that men need. Integrated pest management is a strategy that limits the use of pesticides and other phytosanitary products as a last resort to control the spread of the pest, minimizing the risk of the application of these products on human health and the environment.

Integrated pest management is a very widespread concept in the agricultural sector, since pests cause millions of dollars in losses every year in the sector (loss of crops and livestock as a result of diseases...). However, the mechanics proposed by integrated pest management can also be applied in gardening or urban environment management.

The use of pesticides to control pests leads to a direct loss of plant and animal biodiversity, since their application affects all living organisms equally, without differentiating between those that are beneficial to the ecosystem. In addition, there is a risk of contamination of subway aquifers by infiltration of the product.

Therefore, before resorting to the application of chemical products, four previous phases should be considered:

1) Study phase: First identify the pest to be treated and estimate the potential damage it may cause, identifying the areas of the site that may be affected. Collect as much information as possible on how to act if necessary and establish a tolerance threshold, i.e., from what incidence we will act to control the pest. This phase requires continuous monitoring of the evolution of the pest.

2) Prevention phase: The best prevention is to always use native plant species adapted to the climatic conditions of the area, as has been pointed out in the rest of the actions of this "Toolbox". Local plant varieties are more resistant to diseases and are less affected than other less adapted species.

Once the pest has been identified, specific prevention measures can be established. For example, the spider mite, a common visitor to our gardens, requires very dry environments for its development. Therefore, if we wet the leaves of the plants during the hottest days, its development will be greatly hindered.

3) Mechanical control phase: Examples of mechanical control are insect or rodent traps, the installation of fences or physical barriers, the pruning of branches affected by the disease or the hunting of birds and mammals to move them away from the site.

4) Biological control phase: Consists of combating both plant and animal pests with their natural competitors. In the case of plants, the proliferation of invasive species will be avoided. In the case of insects, in some cases (although not always) there are other insect predators to combat them. Birds are predators of insects and small mammals such as rodents. Similarly, plant diseases caused by pathogens such as fungi can be combated with other organisms that act as biological control.

5) Chemical control: This option will be used when all else fails. The most suitable pesticide for the pest to be eradicated will be chosen and generic pesticides will be avoided, since the information gathered during the study phase will be available.

RECOMMENDATIONS FOR IMPLEMENTATION

The systematic application of pesticides and other phytosanitary products is very common in the maintenance of urban green areas as a pest prevention measure and to avoid greater evils. However, the environmental damage caused by these products must always be weighed in the balance.

- Therefore, the study phase is essential to know which specific pests to treat, the potential damage they can cause and to establish the tolerance threshold above which action will be taken. The use of chemical products should be, as has been pointed out, step five, but not step one.

- If pesticides are used systematically without much information on the pests to be treated, pesticides can be stopped for at least one year and a study of the evolution of the pest can be started.

- Some pests occur regularly every year, while others occur sporadically. Therefore, observation should be continuous and spraying should be used only in years when it is necessary.

<p>SUITABLE FOR</p> <p>All areas where pesticides are applied</p>	<p>LIMITATIONS</p> <p>None</p>
<p>COST AND DIFFICULTY</p> <p>The cost is low, but the difficulty is much higher than using pesticides.</p>	<p>MAINTENANCE</p> <p>Constant observation and monitoring is required.</p>

Selective pruning and clearing of vegetation

DEFINITION OF THE ACTION

This action focuses on tree and shrub pruning operations and the clearing of bushes and herbaceous plants.

In general terms, selective treatments seek to encourage the development of a certain type of vegetation through actions that affect other competing species. For example, if we eliminate shrubs from a mature forest, we are favoring tree species, since they will have more water and nutrients available for their own growth.

However, if what we want is to encourage the presence of trees and shrubs in an area devoid of vegetation, we must take into account the concept of vegetation succession. Herbaceous species first appear on a bare area and begin to form the soil structure with their roots and provide nutrients to the soil. Once the soil evolves and becomes richer in organic matter, species with a greater amount of biomass appear: first shrubs and, later, larger trees. For example, holm oaks require the shade provided by shrub species during the first years of their development, so it is not a good idea to plant holm oaks directly on bare soil.

Furthermore, all actions carried out on any plant community will have a direct influence on the fauna of the area.

Below are some tips on how to contribute to the improvement of biodiversity through selective pruning and clearing of herbaceous and shrub communities:

1. Selective pruning of shrub stands. Excessive pruning of shrub species - for example, for aesthetic reasons - limits the development of the species, but also of the entomological and ornithological fauna, by reducing their food source. It also limits the supply of nutrients to the soil. Therefore, to favor biodiversity, we must reduce the intensity and frequency of pruning as much as possible.

Another important aspect is to consider the time of year to prune depending on each species, since, if pruning is done before the flowering of the plant, there will be no seed production for the following year. Therefore, it is advisable to avoid pruning during the vegetative period of the plants and, if possible, it is recommended to adjust the pruning calendar after the bird breeding season.

2. Selective clearing of grasslands and shrub masses. Bare soils have a low water and nutrient retention capacity and, therefore, have a very low ecological value. In addition, the risk of erosion is very high in sloping areas. One way to avoid this is by 1) controlling the height at which the grass is mowed and even establishing different heights and 2) practicing rotations so that each year we leave different patches of our site unmowed.

RECOMMENDATIONS FOR IMPLEMENTATION

If green areas are to be expanded by planting new trees, pruning and clearing of the area should be limited and the presence of herbaceous and shrub species should be encouraged from before planting and at least during the first years of seedling development.

If possible, it is recommended not to remove tree and shrub pruning debris from the soil. This will minimize the loss of nutrients from the soil and will also help to retain moisture.

Each year pruning should be done to 30-50 % of the total area to ensure different stages of development of the cover.

<p>SUITABLE FOR</p> <p>All types of locations</p>	<p>LIMITATIONS</p> <p>Site safety constraints, such as fire risk, if vegetation is not pruned.</p>
<p>COST AND DIFFICULTY</p> <p>Low</p>	<p>MAINTENANCE</p> <p>None</p>

Substitution of herbicides

DEFINITION OF THE ACTION

This action is recommended in those places where it is not allowed to have any type of vegetation, either for safety reasons, because they are areas of machinery transit or for any other reason. We propose replacing the use of herbicides with the installation of an anti-grass or geotextile mesh, which performs the same function by preventing the sun from passing through, thus hindering the germination of new plants.

The use of netting has the following advantages over chemical treatments:

- Reduced costs and maintenance.
- Reduction of soil contamination due to the use of herbicides. A high concentration of herbicides can be toxic to many animal species, including man in exceptional cases.



Geotextile net

RECOMMENDATIONS FOR IMPLEMENTATION

A layer of gravel is usually placed on top of the geotextile so that it is not visible.

When choosing the mesh, make sure that it is made of a material with good drainage and resistant to tearing and breakage.

There are several options on the market depending on the intended use, of different colors and materials such as raffia, opaque or polypropylene fibers (suitable to prevent the proliferation of herbaceous vegetation) or those made with geotextile materials (more resistant and suitable for larger plants).

SUITABLE FOR

Any surface and dimensions. The exact amount needed can be purchased by the cut.

LIMITATIONS

None

COST AND DIFFICULTY

Low, there are several very economical versions on the market.

MAINTENANCE

None

Environmentally friendly fertilization

DEFINITION OF THE ACTION

The use of chemical fertilizers implies a supply of nutrients (especially nitrogen, phosphorus and potassium) essential for the growth of vegetation, the availability of which is immediate after the application of the product. However, it is well documented that a concentration above the values that can be absorbed by plants contaminates the soil and groundwater with the excess of these elements and causes an increase in the emission of greenhouse gases.

It is therefore recommended to replace the use of chemical fertilizers with other organic options such as manure, worm castings, compost, etc., whose nutrient supply is no different from that of chemical fertilizers, but whose release is slower and therefore generates less impact on the environment.



RECOMMENDATIONS FOR IMPLEMENTATION

The use of peat as a substrate should be strictly avoided.

Peat is a material derived from the decomposition of plant remains that is widely used in gardening as a substrate due to its high water retention capacity. However, it has the following disadvantages that discourage its use:

- It has a very low nutrient content, so it will be necessary to fertilize the plantations to a greater degree than using other types of substrates.
- Peatlands are very valuable natural ecosystems that are destroyed when the material is extracted and their regeneration is very slow.
- Peat, when dry, emits a large amount of greenhouse gases.

<p>SUITABLE FOR</p> <p>All types of green areas.</p>	<p>LIMITATIONS</p> <p>None</p>
<p>COST AND DIFFICULTY</p> <p>Low</p>	<p>MAINTENANCE</p> <p>None</p>

4.3 BOP actions related to species improvement.

Installation of nesting boxes for birds and bats

DEFINITION OF THE ACTION

The pressures of all kinds currently affecting forests, such as urban pressure or agricultural pressure (e.g., fruiting pruning that seeks smaller trees to facilitate harvesting) have contributed to the almost total absence of aged stands and with them of mature trees, with the disappearance of mature tree hollows that facilitate the nesting of many species of birds. In the case of Spain, we should add to this phenomenon the high frequency of forest fires.

The use of nest boxes increases the chances of finding refuge for many species and, after their installation, it has been observed in different studies an increase in breeding during the following years.

Other advantages of their installation are:

- Safe refuge for birds in areas without cavities, which reduces their predation.
- Biological control of insect and rodent pests. Reduction in the use of insecticides
- Facilitates ornithological work, such as species identification, behavioral studies, etc.



Bird nesting box

Many species of birds are finding accommodation in urban environments in the face of the degradation of their natural habitats. However, in recent years there has been a dramatic decline in the populations of common urban birds such as sparrows. Among the causes of these phenomena are pollution, the use of pesticides, the lack of roof tiles and green roofs that facilitate their movement, and the proliferation of artificial grass in parks and gardens. Artificial grass, although much easier to maintain, deprives birds of their main source of food (seeds and invertebrates).

RECOMMENDATIONS FOR IMPLEMENTATION

Use rope or wire to secure the nest box, avoiding perforations that could damage the tree.

Be careful with the part of the tree where it is going to be installed. It is recommended to look for vertical branches isolated from other branches that may facilitate the entrance of predators.

Pallets and recycled wood scraps can be used for its manufacture.

There are boxes with different sizes and diameters of the entrance hole depending on whether it will house a larger or smaller species. The ideal is to place boxes of different sizes to attract different species of birds.

Ensure the presence of water and food sources in the vicinity by installing feeders and drinkers if they do not exist naturally.

Communicate through the installation of information panels, web pages or any other means of internal communication about the installation of nest boxes. Include names and photos of the bird species present.

SUITABLE FOR All types of habitats and recreational areas	LIMITATIONS Areas without water and food sources.
COST AND DIFFICULTY Low	MAINTENANCE Replacement of deteriorated elements.

Installation of insect hotels

DEFINITION OF THE ACTION

This action aims to contribute to a paradigm shift in the way we perceive the presence of insects in our environment. The vast majority of insects are harmless, even beneficial, if not essential for life.

In Spain there are more than 800 species of insects, many of which are threatened by the reduction of their habitats. Insect hotels can make up for some of the shortcomings of different groups of insect populations in finding hollows that facilitate their accommodation, development and winter survival. Wasps and bees seek galleries produced in structures in nature, such as hollows in dead wood or stone walls, so they will be the main tenants of insect hotels.

Bees play an essential pollinating role in the maintenance of all types of ecosystems. Wasps also have a pollinating function, although to a lesser extent than bees, while their main function is to control caterpillar pests of Lepidoptera (butterflies) and Coleoptera (weevils). Apart from bees and wasps (Hymenoptera), the most common pollinators are beetles (Coleoptera), flies (Diptera) and butterflies (Lepidoptera).



Insect hotels

RECOMMENDATIONS FOR IMPLEMENTATION

- Place them in sunny places and protected from the wind.
- March-April is the right time for installation.
- Each compartment of the hotel can be filled individually. The ideal is to place materials with hollows of different diameters and lengths, such as wooden trunks perforated to form galleries, hollow reeds, bricks, etc.
- For example, female solitary bees use horizontal cavities in the form of tubes, while carpenter bees build their nests in galleries in trunks 15 cm or more in diameter.
- Communicate through the installation of information panels, web pages or any other means of internal communication about the placement of insect hotels, with photos and names of the species that inhabit them.

SUITABLE FOR

Agricultural areas
Pasture areas with flowering

LIMITATIONS

Locations with scarce water and food sources in the surrounding area.

COST AND DIFFICULTY

Low. Hotels can be purchased or built by the company's own employees.

MAINTENANCE

Minimal, occasional backfilling of materials

DEFINITION OF THE ACTION

The stone or wooden structures are dry and warm habitats as a result of the sun's heat stored in the stones and emitted at night.

They therefore represent biotopes for local species that find in such stone piles resting habitats, but also hunting grounds for nocturnal insects and reptiles. They provide valuable hiding and basking places for many different heat-dependent animals, such as lizards. Mammals also use larger holes near the ground.

These structures also provide habitats for thermophilic plant species.

In addition to the habitat functions mentioned above, stone structures can also be used as a design feature for slope reinforcement.



Stone structure

RECOMMENDATIONS FOR IMPLEMENTATION

- Use a volumen of minimum 2-3 m²
- Locate them in sunny and wind protected locations
- Use already available recycled materials from the campus

SUITABLE FOR

Green roofs, sunny locations, sloping sites

LIMITATIONS

None

COST AND DIFFICULTY

Low. Can be made with reused materials

MAINTENANCE

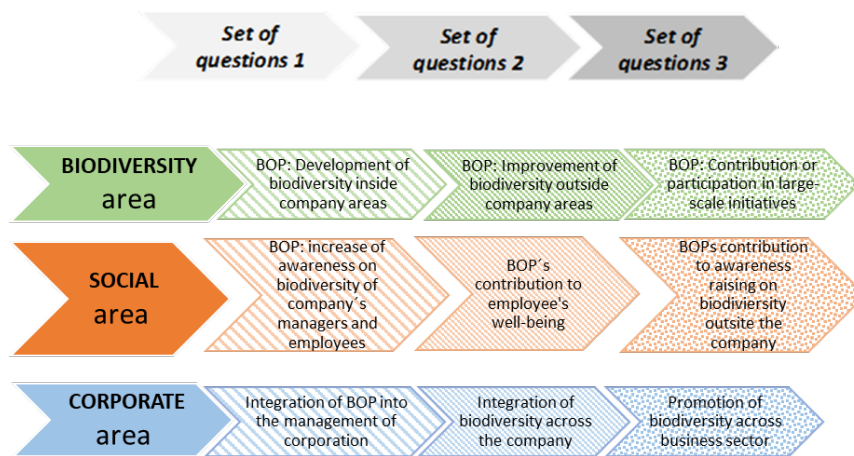
Low, occasional removal of vegetation that may grow in the immediate vicinity

Implementation of a monitoring system

DEFINITION OF THE ACTION

Members of the LIFE BooGI-BOP project team have developed a monitoring system to support and accompany companies interested in tracking the development of biodiversity over time. This monitoring system focuses on three areas:

- 1) Biodiversity area - monitoring the evolution following the implementation of the different measures for the promotion of biodiversity applied by the company,
- 2) Social area - where the impact of the measures on visitors and employees of the center and public awareness is evaluated, and
- 3) Corporate area - where the company's interactions with other organizations, institutions, environmental initiatives, etc. are evaluated.



Monitoring system schematic

The monitoring system provides quantitative and qualitative information to companies on the performance of their facilities in terms of biodiversity, as well as the contribution of this to generate work environments that produce social value and contribute to better management of green areas by the company, becoming another element in the generation of corporate image and brand value.

This monitoring can be systematized using the www.natureincorporate.com platform.

RECOMMENDATIONS FOR IMPLEMENTATION

As already indicated in the indicator species monitoring actions, this monitoring implies a commitment to maintenance over time which, on the one hand, commits the necessary means for its implementation over time horizons of at least 5-10 years. On the other hand, the results of the monitoring will provide the company with information on the results of the actions it is carrying out to promote biodiversity. It is recommended that the monitoring be led by specialists who can address the different issues covered by a monitoring system.

<p>SUITABLE FOR</p> <p>This action is especially relevant to have concrete information on the results of the BOP actions, then it is appropriate if you want to have an assessment over time.</p>	<p>LIMITATIONS</p> <p>Those derived from the need to address in the company a task that exceeds the annual planning.</p>
<p>COST AND DIFFICULTY</p> <p>Varied. Depending on the quality of the monitoring, it may be carried out by in-house personnel with basic knowledge of biodiversity or by specialists in the field.</p>	<p>MAINTENANCE</p> <p>The maintenance of this action is the realization of the same, throughout the time horizon to be decided: 5 or more years.</p>

Improving connectivity with the environment

DEFINITION OF THE ACTION

Ecological connectivity is defined as the capacity of living organisms inhabiting a territory to exchange ecological processes (such as species dispersal or pollination) with other populations located in neighboring territories with which they do not have spatial continuity.

Territorial fragmentation is one of the most important direct causes of biodiversity loss in the world. Today, most of the protected areas of the Natura 2000 Network are isolated, without the capacity to expand or interact with other nearby habitats, which can lead to the extinction of many of the species that inhabit them. In addition, this may mean limiting the adaptive options of vegetation at a time of pressing global change. To address this problem and improve connectivity between vegetation islands, the most effective strategy consists of translating good biodiversity restoration practices that are carried out on small-scale business sites outdoors and vice versa, incorporating plant and animal species present in the immediate vicinity of the site indoors. There are two fundamental concepts for this:

- Ecological corridor: territory with a variable extension and configuration that, due to its conservation status and spatial arrangement, functionally connects various natural spaces for flora and fauna that would otherwise be separated, thus allowing the ecological and genetic exchange of the populations that comprise them, in addition to migration between territories among other processes.
- Green infrastructure: network of natural and semi-natural areas strategically planned, designed and managed to provide ecosystem services. It includes terrestrial green zones (forests, agricultural zones, etc.) or blue zones (aquatic ecosystems) among other elements, such as coastal zones or urban infrastructure elements.
- Ecological connectors are those structural elements, natural or artificial, that connect functional habitats, so that the species that inhabit them share an ecological and genetic flow with other nearby habitats.

RECOMMENDATIONS FOR IMPLEMENTATION

1) Characterize the green areas around the site.

- Compile all available cartographic information such as vegetation, fauna and soil maps.
- Obtain information on land management and land use, nearby protected areas and roads that may be an obstacle to species connectivity, such as roads, industrial areas, etc.

2) Monitor the presence and population development (whether the population is increasing, decreasing or stagnant) of indicator species in the vicinity of the site.

- This can be done using the list of indicator species provided in Annex I of this "Toolbox" and performing the same observation work as inside the site.

3) Locate the presence of ecological corridors and green infrastructure near the site. Analyze the elements that make them up (forests, riverbeds, pastures, etc.). Analyze whether the location where the company is located has the potential to connect two or more protected natural areas.

- To obtain the information, consult WWF's guide to biotope corridors, among other possible sources of information available through administrations, NGOs, etc.

4) Assess the incorporation of ecological connectors at the site based on information obtained from outside.

- Throughout this Toolbox, several actions have been proposed that indirectly serve to improve the site's connectivity with the outside world. Both the BOP actions related to species enhancement (nest boxes, insect hotels) and the actions related to restoration (ecological restorations, green infrastructure elements such as green roofs and green roofs) can be used for this purpose by providing structural elements and green areas that are useful for species dispersal and interconnection.

- BOP actions related to management (e.g., insect-friendly lighting or the creation of artificial ponds) also contribute to improving connectivity by decreasing the impact of artificial light on bird and insect migrations and providing a water source.

5) Assess the implementation of actions to improve connectivity around the site.

- It is recommended to assess whether the company has the capacity to act not only within the site but also in the surrounding area, in order to connect the habitats present at the site with ecological corridors and regional and national green infrastructures.

- Ideally, the same biodiversity enhancement actions promoted within the site will be carried out, but outside the company's boundaries, within a radius of at least 500 meters. For example, if ecological restoration is carried out by planting trees on the site, this can be extended by planting the same species outside. This can be applied in general for all biodiversity enhancement actions proposed in this Toolbox such as nesting boxes, project hotels, etc.

Priority will be given in restoration actions such as replanting, replacement of clumps or installation of green roofs to the use of the same plant species present in the eco-logical corridors or protected natural areas near the site.

SUITABLE FOR

Sites located in privileged areas close to natural areas of high ecological value.

LIMITATIONS

Those derived from the characteristics of the environment and possible environmental constraints

COST AND DIFFICULTY

Varied, depending on the level of connectivity to be achieved

MAINTENANCE

As it is oriented to the use of species adapted to local conditions, maintenance is expected to be minimal.

5 Annex 1. List of indicator species

Common name (Spanish)	Common name (English)	Scientific name
Cotorra argentina	<i>Monk parakeet</i>	<i>Myiopsitta monachus</i>
Cotorra de kramer	<i>Rose-ringed Parakeet</i>	<i>Psittacula krameri</i>
Avispa asiática	<i>Asian vesp</i>	<i>Vespa velutina</i>
Tortuga de Florida	<i>Slider turtles, Florida turtles</i>	<i>Trachemys scripta elegans</i>
Uña de gato	<i>Cat's claw</i>	<i>Carpobrotus edulis</i> <i>Carpobrotus acinaciformis</i>
Camalote, flor de bora o jacintos de agua	<i>Water hyacinth</i>	<i>Eichhornia crassipes</i>
Ailanto	<i>Tree of heaven</i>	<i>Ailanthus altissima</i>
Eucalipto	<i>Eucalyptus tree</i>	<i>Eucalyptus</i> ssp.
Mimosas	<i>Mimosa tree</i>	<i>Acacia dealbata</i>

<https://www.miteco.gob.es/es/biodiversidad/temas/conservacion-de-especies/especies-exoticas-invasoras/ce-eei-catalogo.aspx>

Editor: Agustín Rubio

Authors: Sergio Álvarez, Javier Tejedor, Agustín Rubio

Translation: Julia Ramsauer

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