Normatys
SHAPING STANDARDS

effinature
BIODIVERSITY INSIDE

EFFINATURE STANDARD

New constructions

NCO 25.05

Version in force

PUBLISHER NORMATYS, which develops, adopts and publishes the requirements

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INTRODUCTION

1 - Foreword

"Nature is declining globally at a rate unprecedented in human history - and the rate of species extinction is accelerating," warns the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) in its report published on 6 May 2019. Drawn up by 145 experts from 50 countries, the report provides an overview of global biodiversity and puts the number of species threatened with extinction at one million, out of the eight million plant and animal species estimated to date. This is not just a matter for scientists, it concerns us all. Because the disappearance of an ecosystem is not just a statistical fact; it is a direct threat to our food supply, our health and our quality of life. What is at stake is the very survival of our daily environment.

The link between biodiversity and well-being was highlighted in 2005 by the Millennium Ecosystem Assessment (MEA): "Natural ecosystems, by providing quality services to human societies, enhance the well-being of all". Indeed, this vulnerable global heritage is a direct part of our daily lives (food, raw materials, maintenance of water, air and soil quality, priceless cultural heritage, medicines, etc.). This research also highlights the fact that human beings have transformed their environment more since 1950 than at any other time in history, initiating what researchers Will Steffen, Paul Crutzen and John McNeill have called the "great acceleration".

To halt the loss of biodiversity, international commitments have been made, such as the Convention on Biological Diversity signed by 168 countries in Rio de Janeiro in 1992 at the Earth Summit, and the Nagoya World Conference on Biodiversity in 2010. Despite these international mobilisations, given the constant decline in natural capital, this is not enough to halt or even reverse this trend.

1.1 - Biodiversity : an alarming global decline

In 2024, the International Union for Conservation of Nature (IUCN) revealed a chilling figure: of the 163,040 species studied, 45,321 are threatened. Of these species, 41% of amphibians, 26% of mammals and 12% of birds are threatened with extinction worldwide. This is also the case for 37% of sharks and rays, 36% of reef-building corals and 34% of conifers[1]. Behind these figures are millions of stories. The Bornean orang-utan, whose territory once stretched for miles, is now squeezed between palm oil plantations and motorways. Bees, essential to our survival, are silently disappearing, victims of pesticides and concrete. It's not nature that's weakening, it's humanity that's suffocating it.

The five factors at the root of biodiversity loss, on which there is international scientific and political consensus, are :

- Loss and fragmentation of habitats (deforestation, agriculture, urbanisation, development of road networks, etc.);
- Pollution (chemical, light, noise, air, water, soil, etc.) ;
- Overexploitation of resources (hunting, poaching, overfishing, etc.) ;
- Climate change ;
- The proliferation of exotic and invasive species.

These pressures and their consequences are not identical depending on the ecosystems and the spatial and temporal scales considered. In order to take effective action to preserve biodiversity, it is therefore necessary to **take into account its dynamic component**, as well as **the changes in human activities** that affect its development.

However, there is a great deal of uncertainty over these environmental and socio-economic factors in the medium and long term:

- What are the future challenges for biodiversity ?
- How will urban planning policies evolve ?

[1] IUCN (2024). The IUCN Red List of Threatened Species. Version 2024-1. International Union for Conservation of Nature. Available at: https://www.iucnredlist.org

- How will changes in socio-economic dynamics affect biodiversity ?
- How will the stakeholders in the institutional and private sectors deal with it ?
- How will stakeholders position themselves when faced with economic and social choices that could hamper the efforts already made to protect biodiversity ?

1.2 - From reflection to action

Faced with the massive erosion of biodiversity, it is no longer enough to simply observe: we must act. Biodiversity is at the heart of the issues of ecological resilience, adaptation to climate change and quality of life in our regions. The urgent need to act is not just a matter for international institutions: it is a matter for all stakeholders, public and private, from citizens to developers.

Development and construction projects must now incorporate ambitious objectives for preserving and restoring living things. This implies a more systemic approach, capable of linking sober land use, ecological restoration and nature-based solutions. Preserving soils and their ecological functions (water filtration, carbon storage, micro-organism biodiversity, fertility, etc.) is a prerequisite for any credible environmental ambition.

Urbanisation, which is steadily increasing, is a major pressure. In 2024, between 55% and 57% of the world's population will live in urban areas, i.e. between 4.4 and 4.5 billion people. This figure could rise to 70% by 2050, or around 6.3 billion people, equivalent to the world population in 2002. This expansion is having a major impact on natural environments, with the destruction and fragmentation of habitats, the standardisation of landscapes, the disappearance of wetlands, the sealing of soil and the spread of pollution.

In this context, regional action, the mobilisation of professional sectors and environmental innovation are becoming major levers for the emergence of truly sustainable development models. Ambitious certification schemes are one of these levers, helping to structure the actions of the stakeholders involved.

1.3 - Biodiversity in the city : what's at stake ?

Integrating biodiversity into the city must reconcile nature with the safety and health objectives for which the public authorities are responsible. Numerous urban environments are capable of hosting biodiversity. Parks, squares and gardens are large areas that are ideal for maintaining and developing biodiversity, provided that they are designed and managed in a way that is conducive to this. Green interface areas such as the green surrounds of buildings, grassed paths and hedges can act as effective links between these large refuge areas. They link environments that are favourable to the development of biodiversity, thereby recreating **ecological continuities,** which are relatively rare in the city, as well as areas of refuge and reproduction for certain species. Roads and parking areas represent significant surfaces, which can be used to reintroduce nature into the urban environment through plant coverings.

Buildings can be designed to create habitats for biodiversity and strengthen the ecological fabric of urban environments. Shelters and nesting boxes can also be incorporated into buildings to encourage the settlement and protection of fauna.

Through all these spaces and facilities, the city is able to encourage "spontaneous" biodiversity and common species, which are not under threat but are nonetheless in serious decline. **Spontaneous biodiversity** refers to all living species (plants, animals, micro-organisms) that settle and develop naturally in a given environment, without direct human intervention, such as planting or deliberate introduction. This type of biodiversity is often observed in undeveloped areas or areas left in a wild state (wasteland, roadsides, fallow land, etc.). Spontaneous biodiversity is important for the proper functioning of ecosystems, as it contributes to the resilience of natural environments and the maintenance of ecosystem services (such as pollination, pest regulation, preservation of water resources and climate regulation). Although they are not considered threatened, these species are experiencing a real decline, often overlooked, which is undermining the long-term ecological balance.

The term **common species** refers to species that are relatively common and widespread in a given habitat or region. These are species that are not considered to be threatened with extinction, and which are often found in anthropised environments (e.g. towns, agricultural areas, parks, etc.). They play an essential role in ecosystems and help to maintain the ecological balance, but they are not always the priority in conservation programmes,

which tend to focus on rare or endangered species. However, the degradation of their habitats can also weaken them in the long term.

In short, **spontaneous biodiversity** is the result of natural dynamics, while **common species** are major components of common ecosystems, often neglected but essential to the overall health of environments.

1.4 - Ecosystem services and nature-based solutions

Preserving and restoring biodiversity means more than just saving species: it also means restoring the **ecological functions that** are essential to human life. These functions, known as **ecosystem services**, refer to the benefits that societies derive from the proper functioning of ecosystems: climate regulation, purification of air and water, soil fertility, flood mitigation, carbon storage, pollination, psychological well-being, and so on. These services highlight the profound links between the health of natural environments and the quality of human life.

In this context, **Nature-based Solutions (NBS)** represent a concrete strategy for action. Defined by the International Union for Conservation of Nature (IUCN), NBS are "actions to protect, sustainably manage and restore natural or modified ecosystems that respond to societal challenges in an effective and adaptive manner, while simultaneously delivering benefits for biodiversity and human well-being".

They differ from **grey solutions**, which rely on artificial infrastructures (pipes, dykes, concrete basins, etc.), by favouring approaches based on natural processes, which emit less, are often more resilient and generate co-benefits.

In urban environments, for example, NBS enables :

- Reduce heat islands by greening land and buildings;
- Reduce flooding through permeable soils, restored wetlands and vegetated ditches;
- Encourage soft mobility through green corridors;
- Improve public health by reconnecting residents with nature;
- Support the local economy through urban agriculture and sustainable forestry.

1.5 - International governance and the regulatory framework for biodiversity

1.5.1 International benchmarks

The protection of biodiversity is based on structuring international commitments, adopted within the framework of major conventions, such as the **Convention on Biological Diversity (CBD**), signed at the Earth Summit in Rio in 1992. This convention has three fundamental objectives: the conservation of biodiversity, the sustainable use of natural resources and the fair and equitable sharing of the benefits derived from their use.

These principles were reaffirmed and further developed at the **CBD COP15**, with the adoption of the **Kunming-Montreal Global Biodiversity Framework (GBF)**. This framework sets 23 global targets to be achieved by 2030, including :

- Protecting 30% of land and sea,
- Restoration of of degraded environments,
- Halving the pressure of human activity on ecosystems,
- Integrating biodiversity into all economic and urban sectors.

These goals are part of the momentum generated by the UN's **Sustainable Development Goals (SDGs**), in particular **SDG 15** ("Life on land"), **SDG 14** ("Life in water") and **SDG 11** ("Sustainable cities"). The 2015 **Paris Agreement** also recognises the need for nature-based solutions to climate change.

These commitments are now shaping national regulatory frameworks, investor requirements, local authority strategies and the structuring of new economic instruments.

1.5.2 Continental and national variations

In Europe, the **Biodiversity Strategy 2030**, part of the **European Green Deal**, sets ambitious targets, including protected areas, the restoration of 20% of degraded environments, a reduction in the use of chemical pesticides, and the planting of 3 billion trees. The **Natura 2000** network, as well as the **Birds and Habitats-Fauna-Flora directives,** provide a framework for action by the Member States. Urban planning policies are also being mobilised to reduce land artificialisation.

In France, the **National Biodiversity Strategy (NBS, known in French as "Stratégie Nationale pour la Biodiversité" - SNB)** articulates these commitments through legislative tools (Climate and Resilience Act, ZAN objective), regulatory tools (ERC sequence, green and blue grids), territorial tools (local biodiversity atlas), and incentive tools (Green Fund, calls for biodiversity projects from water agencies).

France is also deploying complementary operational systems:

- The **Nature 2050** programme, which finances ecological restoration projects monitored until 2050 on the basis of scientific indicators;
- The **Biodiversity Performance Contract** (BPC) enables the integration of a site's ecological actions into a multi-year improvement plan, formalised with a third-party guarantor;
- The **Territorial Biodiversity Projects** (TBPs) offer shared land-based solutions for planned ecological offsetting at the local scale.

These voluntary tools are part of the national strategy and foreshadow the emerging principles of nature-based finance.

1.5.3 Links with other regions of the world

Beyond the European and French frameworks, commitments in favour of biodiversity are being made on every continent, with a variety of approaches that are increasingly aligned with the objectives of the Global Biodiversity Framework.

Africa
In the face of desertification, deforestation and pressure on resources, several frameworks have been developed, such as the **Abidjan Convention** (coastal zones) and the **Maputo Convention** (natural resources). The **Great Green Wall is** a major long-term ecological restoration initiative. At the same time, Africa's metropolises are experimenting with strategies for greening and limiting artificial development, despite rapid urbanisation.

Asia
Demographic density and urban expansion are major challenges. **India** has structured its action around the **National Biodiversity Action Plan**, supplemented by sectoral laws such as the **Forest Conservation Act** and the **Biological Diversity Act** (2002). In **China, the "Red Line for Ecological Protection"** policy prohibits the destruction of key ecosystems. In **Indonesia**, restrictions govern the expansion of plantations, and the creation of reserves aims to protect emblematic fauna. Cities such as **Singapore** serve as a showcase for ecological urban planning, with green roofs, vertical parks and sustainable water management.

North America
Its regulatory frameworks are among the strictest in the world. In the **United States**, the **Endangered Species Act** protects more than 1,600 species. In **Canada**, the **Species at Risk Act** requires recovery plans and encourages intergovernmental cooperation. Cities such as **New York** and **Vancouver** are deploying ambitious strategies for ecological corridors and urban greening.

South America
The **Amazon** is at the heart of conservation policies. **Brazil** is promoting **sustainable development reserves** and participating in the **REDD+** programme to reduce deforestation. Other countries, such as **Ecuador** and **Peru**, are committed to reforestation programmes and the protection of endemic species. Nevertheless, intensive agriculture and urbanisation continue to exert strong pressure on natural environments.

Oceania
The conservation of island ecosystems is crucial, particularly in the face of the effects of climate change. In **Australia**, the **Great Barrier Reef** is protected by strict regulations. In **New Zealand**, legislation aims to limit invasive species, which are a major threat to native biodiversity. In the **Pacific Islands**, policies focus on restoring mangroves and coral reefs, which are essential to coastal resilience.

1.5.4 Effinature, an operational tool for implementing the GBF

Effinature certification translates the objectives of the GBF into measurable technical requirements at project level. It enables :

- Plan for the integration of biodiversity at the design stage ;
- Restore or preserve degraded environments;
- Developing functional ecological continuity ;
- Creating accessible and resilient natural spaces;
- Support the stakeholders in a coherent territorial trajectory.

Effinature is therefore a **lever for implementing international commitments**, compatible with European, national and regional frameworks.

It is also aligned with the dynamics of territorialisation promoted by the Secretariat of the CBD, by promoting the commitment of local authorities in the **CitiesWithNature** and **RegionsWithNature** programmes, supported by **ICLEI**.

1.5.5 Towards voluntary biodiversity credits

In a context of transition towards more sustainable economic models, **voluntary biodiversity credits** have been identified as an emerging source of financing. They consist of remunerating positive, measurable and verifiable results in terms of biodiversity.

A distinction must be made between :

- **Regulatory offset credits**, issued as part of legal obligations (ERC sequence);
- **Voluntary credits**, issued outside any regulatory framework, by project sponsors wishing to generate a net positive impact on biodiversity.

To be credible, these credits must meet several conditions of **ecological integrity**:

- A robust **MRV** (measurement, reporting and verification) system;
- **Additionality of** the actions carried out ;
- **Permanent** ecological effects ;
- And transparent **traceability** of results.

Effinature **does not issue credits**, but it does offer a framework consistent with these requirements. Its technical criteria, local roots, indicator-based monitoring and rigorous governance make a **benchmark that is compatible with emerging standards** and can be used as a basis for structuring future projects with a biodiversity impact.

1.5.6 Effinature's strategic position in the tools landscape

Effinature stands out for its integrated, rigorous and territorial approach, focusing on the **practical implementation of biodiversity in development, construction and renovation projects**.

Where other approaches focus on raising awareness, general commitment or promoting intentions, Effinature offers a **framework of technical requirements that can be verified and aligned with public policies**. It is based on a logic of **ecological results**, documented by indicators, and integrated into the project decision-making chain.

Its reference system makes it possible to :

- Transform biodiversity objectives into **concrete, measurable actions** at site level;

- Linking projects with **regional planning documents** (green and blue ecological corridors, Local Urban Plan, etc.);
- And to meet the growing expectations of local authorities, economic stakeholders and financiers in terms of environmental performance.

Effinature is also linked to existing contractualisation, investment and long-term monitoring tools. A number of projects are already combining certification with local initiatives or voluntary schemes, demonstrating that **Effinature complements the other levers for action to promote biodiversity**.

1.5.7 Anticipating regulatory and financial developments

Lastly, Effinature certification anticipates the financial and regulatory changes currently taking place:

- Integrating biodiversity into the **European green taxonomy** ;
- **CSRD Directive** on sustainability reporting by companies ;
- **Biodiversity plans** required by landlords, property companies and ESG investors.

In this context, Effinature enables project sponsors, public stakeholders and private operators to demonstrate measurable, credible performance that is in line with the expectations of civil society, local authorities and funders.

Against this backdrop of growing international alignment and heightened expectations in terms of biodiversity, Effinature certification offers a concrete, structured framework tailored to projects.
It enables project sponsors, public stakeholders and private operators to demonstrate a measurable, credible and recognised ecological performance.
The following section sets out the foundations, stages and criteria for this certification.

2 - Presentation of the certification

Effinature certification, whose requirements are adopted by NORMATYS and which IRICE awards as a third-party certification body (Cofrac accreditation No. 5-0655 · Certification of products, processes and services · ISO/IEC 17065 · Scope available on www.cofrac.fr), is much more than a simple environmental initiative: it is a structured framework that imposes precise requirements to ensure that biodiversity is genuinely integrated into land-use planning. Unlike a declarative approach, Effinature certification is based on a robust methodology, defining measurable commitments that are monitored at every stage of the project.

Adopting Effinature means being among the pioneers who not only build, but also repair, preserve and enhance biodiversity. It's also a winning strategy for **investors and builders**. In a world where the value of a property project is no longer measured just in square metres, but in quality of life and ecological impact, Effinature-certified buildings are becoming benchmarks, models of attractiveness and sustainability. Integrating nature into an urban development project means offering residents a healthier, more pleasant living environment that is economically more sustainable, while meeting the challenges of climate change.

The main objectives of Effinature certification are :

- To promote the integration of nature in the city;
- Improve exchanges between man and nature;
- Act on the direct causes of biodiversity loss (pollution, habitat transformation, unsustainable management, etc.);
- Implement measures to ensure the long-term benefit of ecosystem services.

2.1 - Certification based on scientific governance

Effinature certification is based on expert, independent and rigorous governance, embodied by the **Biodiversity Standard Council** (BSC). This collegiate body plays a central role in the design, development and validation of the Effinature standards. It is made up of experts from a variety of backgrounds: ecology, project management assistance, urban planning, architecture, landscape, public or private project management (social landlords, developers, promoters), local authorities, investors and associations . This diversity guarantees a balanced, cross-

disciplinary approach that is both rooted in the reality on the ground and in line with the latest scientific and regulatory requirements.

The Biodiversity Standard Council is the technical body authorised to structure the reference systems whose requirements NORMATYS adopts, to validate the criteria, to integrate feedback and to monitor changes in professional practices. Each modification or addition of an indicator to a reference system is the subject of a technical instruction, a vote in committee, followed by adoption and publication by NORMATYS. This rigorous process ensures the transparency, stability and credibility of Effinature certification tools. The BSC acts completely independently of the certification body, within a precise ethical framework, guaranteeing the neutrality of its opinions and the absence of conflicts of interest.

The Biodiversity Standard Council also has a permanent scientific watch function. It monitors developments in standards, knowledge and field data from audits, as well as research and development work. It can therefore propose the integration of new indicators, thematic modules or specific approaches adapted to emerging issues such as resilience or ecosystem dynamics in urban environments. Finally, it can be asked to give its opinion on complex or innovative projects, providing valuable expertise to both evaluators and project leaders.

2.2 - The challenges of Effinature certification

The guidelines that comprise the requirements for Effinature certification are divided into two distinct phases. In the **design phase**, the challenges of preserving urban biodiversity are taken into account right from the start of the project. The **implementation phase** ensures that the biodiversity-friendly actions and facilities defined in the previous phase are put in place. The standards also require the preservation of biodiversity during the construction phase, depending on the issues identified on the site. Specific protocols are put in place to minimise nuisance (pollution, noise, soil degradation) and to protect flora and fauna throughout the worksite.

Effinature certification brings together a common set of requirements and works to :

- Preserving living soil ;
- Development of plant heritage ;
- Reducing the impact of the project ;
- Support for local fauna;
- User well-being ;
- Valuing the skills of project teams.

2.3 - The project owner and ecological responsibility

As part of an Effinature-certified project, the project owner must manage and direct its own departments and service providers (prime contractors, contractors, etc.) in order to reduce the environmental impact of its operations and ensure the preservation of biodiversity on the site.

Effinature certification incorporates a management system designed to guarantee the environmental and ecological quality of the project.

Compliance with the ecological requirements of the project is both a question of quality management and an architectural and technical issue. One of the most reliable methods of achieving this is to rely on effective and rigorous project organisation. The implementation of this project management system makes it possible to define the ecological qualities targeted for the project and to organise it in such a way as to achieve them, while at the same time controlling all the operational processes linked to the programming, design, construction and, where appropriate, operation of the project.

Carrying out a worksite that incorporates good practice in favour of biodiversity requires organisation and preparation right from the design phase, taking into account respect for the environment, the soil, local fauna and flora and local residents. It is the subject of a commitment on the part of all those involved in the site.

2.4 - Effinature: strategic leverage aligned with ESG criteria and sustainable finance

Effinature certification is not just about preserving biodiversity: it is also a **strategic tool for meeting the challenges of sustainability and social responsibility**. Effinature is based on a structured framework, verified by independent experts, guaranteeing that biodiversity is genuinely taken into account in development, construction and renovation projects.

This methodology, based on tangible evidence, also makes it possible to combat **abusive environmental claims** and **greenwashing**, which represent growing risks for companies and stakeholders in the property sector. More and more projects are claiming a commitment to the environment without implementing concrete actions or independent verification, which can undermine the credibility of environmental initiatives and lead to regulatory sanctions. Effinature certification offers protection against such abuses, based on a strict, controlled reference system that guarantees genuinely measurable commitments in line with recognised standards.

This rigorous approach is part of a wider dynamic that includes **ESG** (Environmental, Social and Governance) **criteria**, which have become essential for investors, developers and institutional stakeholders. Effinature certification makes it possible to :

- Promoting biodiversity and integrating nature-based solutions into the built environment, thereby meeting the environmental requirements of ESG criteria;
- Improving the living environment and health of users, by promoting more resilient spaces, reducing urban heat islands and improving air quality and the living environment;
- Guaranteeing transparency and accountability, thanks to a robust methodology that secures environmental commitments and improves project governance.

In addition, Effinature certification facilitates the recognition of sustainable assets and funds, in compliance with the requirements of the **AMF** (French Financial Markets Authority). It enables investors and project sponsors to demonstrate that their approach is in line with current regulations and sustainable finance standards.

In line with international commitments to protect biodiversity, the European Union has introduced an ambitious regulatory framework to steer financial flows towards genuinely sustainable activities: the **European Green Taxonomy**. Gradually coming into force from 2022, this classification defines precise technical criteria for identifying economic activities that make a substantial contribution to environmental objectives, including the **protection and restoration of biodiversity and ecosystems**. For a project to be considered in line with the taxonomy, it must make a positive contribution to one or more of these objectives, **not significantly harm the other objectives**, and **comply with minimum social guarantees** . The aim of this system is to increase the transparency of green investments, prevent greenwashing and mobilise capital towards projects that are compatible with planetary limits. In this context, projects that integrate biodiversity are of strategic importance. Without constituting formal proof of alignment, Effinature certification is fully in line with this dynamic, providing a rigorous methodology, verifiable indicators and guarantees of ecological performance in line with the expectations of European sustainable finance.

In addition, the **European SFDR (Sustainable Finance Disclosure Regulation)** imposes transparency obligations on financial stakeholders regarding the sustainability of their products. **Funds classified as "Article 9"**, known as "sustainable objective" funds, must demonstrate their real contribution to environmental or social issues, on the basis of precise, verifiable and traceable indicators.
In this context, Effinature certification can provide **useful evidence of** the effective implementation of actions to promote biodiversity, based on structured, enforceable and independent standards. It thus helps to **secure the investment strategy** of sustainable funds or assets, by strengthening their legitimacy and consistency with the requirements of the SFDR.

Finally, this dual recognition, both environmental and financial, strengthens the credibility of companies and project owners in the eyes of stakeholders, while positioning their projects at the forefront of responsible and innovative practices.

2.5 - Prerequisites for Effinature certification

To obtain Effinature certification, a number of prerequisites must be met:

- The harmonised Green Area Factor (hGAF), which measures the proportion of surfaces favourable to biodiversity in relation to the total surface area of the plot. This coefficient includes various types of surface, such as permeable or semi-permeable pavements, green roofs and wetlands. It should be noted that if a less stringent hGAF is applied, the more demanding certification criteria must be followed ;
- Support from a qualified ecologist to carry out a complete initial assessment (study of all the taxa in the green spaces and on the buildings) of the fauna, flora and habitats present on the site. This initial study is crucial for assessing the state of biodiversity and guiding the design of the operation ;
- Support from a qualified soil specialist to carry out a detailed initial assessment of the quality and characteristics of the soil on the site. This study provides an understanding of the structure, composition and potential of the soil, so that design choices can be made to preserve it and enhance its ecological value.

3 - Certification process

3.1 - Scope of certification

The Effinature **New Constructions (NCO)** standard, version 25.05, applies **to new build projects carried out internationally**. It aims to integrate sustainable and ecological practices into the design and construction of buildings, taking into account the challenges of biodiversity, resource management and user comfort.

The operation in question must have been submitted for Effinature certification and meet the requirements of these guidelines and the Effinature brand rules of use.

3.2 - Certification process

There are several stages in the certification process:

1. **Certification contract:** For each operation, the applicant submits an **application for admission** via the IRICE website (https://irice-certification.com).

The contract specifies the type of certification and the characteristics of the project (address, surface area, etc.). Once signed, the assessment process begins with the appointed assessor.

2. **Initial assessment**: IRICE carries out an **initial assessment based on the tenders documents**. This phase is based on the initial report prepared by the Biodiversity Partner, which incorporates the criteria to be met before the companies are consulted. The initial assessment results in a report confirming the qualitative objectives pursued by the Applicant and identifying the reservations or non-conformities to be taken into account in the rest of the project.

3. **Final assessment:** Before completion of the structural works, the Biodiversity Partner analyses the **contract file** for the lots concerned by the certification, then forwards this **signed file** to IRICE.

The Effinature assessor uses this analysis to check that the contractual commitments comply with the requirements of the standards. The removal of any reservations identified in the initial phase is a prerequisite for this assessment.

If the project's conformity is confirmed, the file is submitted to the President of IRICE for examination and a decision on the issue of the **Effinature - Design Stage certificate**.

4. **In-situ compliance check:** The Effinature assessor will carry out a compliance check on delivery of the green spaces during an on-site visit and on the basis of the supporting documents expected from the implementation phase.

If the inspection reveals one or more non-compliances, the Applicant undertakes to bring the operation concerned back into compliance within 1 month, without prejudice to any penalties that may be incurred. An additional inspection, at the Applicant's expense, will then be carried out to ensure that the operation is brought back into compliance.

If there are no non-conformities, the file is resubmitted to the IRICE President for examination and a decision on whether to maintain the **Effinature - Delivery Stage certificate**.

Case of operations in tranches

In the case of an **operation carried out in stages**, it will be the responsibility of the applicant to define the planning of the operation, identifying the different stages, their duration, the order in which they are to be implemented, the milestones to be met and the tasks and responsibilities of all the parties involved in the project. In this case, the various assessments will be carried out section by section.

3.3 - The role of the Biodiversity Partner

The operational implementation of the Effinature guidelines relies on the mobilisation of qualified stakeholders, who guarantee the ecological quality of the projects. Among them, the **Biodiversity Partner** plays a central role in p roviding support, expertise and monitoring.

The Biodiversity Partner is a recognised professional, holder of the qualifying training in the Effinature standard, whose requirements are set and verified by IRICE, and listed in an official directory of approved partners. The Biodiversity Partner supports clients, designers, companies and managers throughout the life cycle of the project, from programming to management, design and implementation.

Its role is to ensure that biodiversity issues are integrated into the project in a coherent and demanding manner, in compliance with the standards. They advise the teams, take part in drawing up the technical documents, produce the supporting documents needed for assessment, and make the link between the design choices, the regulatory requirements and the certification objectives. They may be ecologists, landscape architects, town planners or environmental consultants.

A Biodiversity Partner with **valid accreditation** is required at the time of application for Effinature certification. It should be noted that a Biodiversity Partner may also be an ecologist, and vice versa, provided that they meet the training and accreditation criteria required by IRICE.

It actively contributes to the success of the certification, by guaranteeing **the consistency, traceability** and **ecological performance** of the operation.

4 - Project management system

The desire expressed by the applicant to manage a site in a way that respects biodiversity requires a set of methods and procedures that have an impact on the management and services of the stakeholders involved.

The objectives set in this area by the applicant require the adaptation of organisations, general management, operational management and procedures, as well as the choice of implementation processes, products and materials. The measures described below are part of this objective.

Each manager (of the project management team, of the operational management of the various service providers and of the contractors) ensures, within the scope of his responsibilities, that the objectives set out in the project owner's strategic commitment are taken into account by the functional and operational management at each stage of the project. Many of the requirements in the standards will cover these aspects in order to ensure that they are respected.

The applicant is accompanied by a Biodiversity Partner throughout the project, who must inform IRICE of any changes likely to have an impact on obtaining certification**. Any change after the design phase, affecting the plant palette, external lighting, landscaping, any element influencing the calculation of the Green Area Factor (GAF) or other project criteria, must be reported to IRICE. IRICE must validate these changes before they are implemented. The aim of this requirement is to ensure that the project is compliant and to preserve the ecological integrity of the site.**

4.1 - Field of application

Management takes into account the characteristics and challenges of the local authority, the site and the expectations of the manager, users and any financial partners, in line with the objectives set by the project owner.

It applies to all those involved in the construction process, for the entire duration of the project, including the programming phase, feasibility studies, development design studies, construction, acceptance operations and future management of the project.

4.2 - Definition of operation management

It is up to the project owner to define the organisation, skills, methods, resources and documentation needed to meet its objectives, the ecological requirements it has prioritised and the requirements of the standards.

4.2.1 Undertaking by the Applicant concerning technical documents

The Applicant undertakes to provide the Biodiversity Partner with all the required technical documents (plans, written and graphic documents, calculation notes, etc.) necessary for the intervention of the assessor appointed by Effinature. These documents will be kept by IRICE at the end of its intervention

4.2.2 Monitoring project progress

The Applicant undertakes to keep the assessor informed of the progress of his project on a regular basis, in order to ensure that his intervention is in accordance with the terms and conditions of the certification process.

4.3 - Compliance with legislation

The provisions of the standards must comply with the regulatory provisions in force in the country concerned, particularly with regard to :

- The environment and sustainable development ;
- Planning regulations ;
- Personal safety.

Applicants for Effinature certification must ensure that their actions comply with ecological, environmental and landscape policies at local, national and international level, by committing to follow voluntary policies, incentives and conventions in force.

The applicant must check that the project's guidelines are compatible with the local and regional procedures applicable to the operation. To do this, they must gather the expectations of the local authority(ies) involved in the project, as well as all the regulatory, study and policy documents that exist at this stage.

These requirements must be included in the special technical specifications. The Effinature reference system and its affiliated documents are not a substitute for the legislative, regulatory and/or normative requirements in force, which the project owner must also be familiar with, master and apply.

5 - Operation management system

5.1 - Initial state of biodiversity

Before taking any action, it is essential to learn more about the site and the heritage in which the project is to be located.

In order to establish relevant actions, certification sets out requirements for carrying out a complete analysis of the initial state of the site in order to guide future measures. All the criteria used to establish the initial state of the site are set out in the initial state study of these standards:

- Initial soil assessment page 23 ;
- Initial flora assessment and natural habitats page 34 ;
- Initial assessment of fauna page 53 ;
- Initial assessment of pollution page 64.

These initial assessments are carried out before any work is carried out on the site. They enable an initial assessment to be made of the biodiversity of the site and the various environments present in the project area, so that a methodology can be put in place to manage the existing biodiversity sustainably.

5.2 - Ecological programme for the operation

From the planning stage onwards, and as and when the various parties involved are appointed, the project owner's management team will provide information on the environmental and ecological objectives to be achieved with a view to obtaining certification for the project. Compliance with this requirement is guaranteed by **adherence to the** Effinature ecological charter (page 78), which sets out the criteria applicable to the **design and construction phases of** the project.

5.3 - Low-nuisance worksite

In order to limit the impact of the worksite on biodiversity, measures will have to be taken before it is set up and during its conduct. Effinature certification imposes requirements for a complete zoning of the areas to be preserved during the works through the various Site Installation Plans (SIP). All the criteria used to draw up this biodiversity preservation plan are set out in the implementation phase of these standards:

- Site installation plan (SIP) "ground section" page 84 : provides information on the location of areas of soil deterioration and areas to be protected from settlement related to site activities;
- Site installation plan (SIP) "flora section" page 87 : provides information on the location of vegetated areas to be preserved, as well as tree protection areas;
- Site Installation Plan (SIP) "fauna section" page 97 : provides information on the location of sensitive fauna areas identified during the initial assessment;
- Site Installation Plan (SIP) "pollution section" page 104 : provides information on the location of noisy equipment and polluted areas.

The compilation of these Site Installation Plans will make it possible to draw up **a plan for preserving biodiversity on the site**. This will serve as a basis for planning :

- Sweeping areas for the crane, concrete plant and aggregates yard...
- Formwork and reinforcement workshop workstations...
- The life base, machine shelters...
- Access roads, footpaths and machinery...
- Site fencing.

The compilation of these various SIPs will have to be communicated to all those involved on the site in order to guarantee the integrity of the areas to be preserved.

It is the project owner's responsibility inform all the companies involved in the project of the requirements to be met when **scheduling the work**. The works must respect the biological cycle of the species, in particular the nesting periods of the avifauna. The works schedule must therefore respect the sensitive periods defined in the following requirements:

- Sensitive periods and areas for fauna page 54.

Any work deemed "compulsory" during these sensitive periods will have to be the subject of a derogation which will be validated by the project owner.

When the work results in unplanned intervention that causes pollution or harms flora and fauna, site incident reports must be drawn up:

- Flora incident reports page 88 ;
- Fauna incident reports page 98 ;
- Pollution incident reports page 102.

It is the responsibility of the Effinature project owner to inform all those working on the site of the obligation to record all incidents during the works and to inform the ecologist.

DESIGN PHASE

Preserving living soil

Criteria	Requirements
Initial soil	Report on soil deterioration phenomena Assessing the ecological quality of soils Ecological and agronomic soil quality
Land use	Land use history Urban continuity Restoring environments and combating soil sealing Ban on the use of plastic in outdoor furniture Harmonised Green Area Factor (hGAF) Tool for determining the hGAF (harmonised Green Area Factor)
Sustainable soil management	Favouring on-site reuse of soil

1 - Preserving living soil

1.1 - Initial soil assessment

A healthy soil is a prerequisite for the vitality of vegetation. Soil and plants are closely interdependent: fertile soil meets plants' needs for water and nutrients, while vegetation protects soil from erosion, stabilises surfaces with its roots, retains water and helps to recycle nutrients.

This proper functioning relies to a large extent on subterranean biodiversity that is as discreet as it is essential. A healthy soil is home to a multitude of living organisms - earthworms, insects, mites, fungi, micro-algae, bacteria - which perform key functions: soil structuring, decomposition of organic matter, nutrient cycling and ecological resilience. Although often invisible, this soil life, also known as soil fauna, plays a fundamental role in the balance of vegetated ecosystems.

So before planning any landscaping, it's crucial to study the characteristics of the soil in order to :

- Adapting tillage practices ;
- Selecting a coherent and sustainable plant palette ;
- Determine the amount of organic matter required ;
- Improve drainage if necessary.

So preserving the ecological quality of soil means not only guaranteeing the success of green developments, but also maintaining the soil's natural functions, which are essential for biodiversity and ecosystem services.

Requirements

1.1.1 Report on soil deterioration phenomena

A report will have to present the phenomena of soil deterioration and the solutions envisaged to preserve or restore the soil.

This report must identify the phenomenon in question and its origin:

- Erosion (wind, water, bare soil, etc.) ;
- Pollution (visible and invisible waste, etc.) ;
- Compaction (heavy mechanical pressure, overgrazing, etc.) ;
- Impermeabilisation (increase in urbanisation, etc.) ;
- Flooding (urbanisation...).

The report provides a technical description of the protection, restoration or replacement solutions envisaged, such as :

- The choice of cultivation practices ;
- Adding organic matter ;
- The use of plant engineering or bioremediation ;
- Hydro-seeding ;
- A minimum of 30 cm of healthy topsoil;
- The removal of soil sealing ;
- The installation of windbreaks.

The report is accompanied by photographs that will be used to create a database for communication and awareness-raising purposes.

Assessing the ecological quality of soils is essential for understanding and preserving biodiversity. Soils play a crucial role in ecosystems, supporting vegetation, regulating the water cycle and storing carbon. They are also home to a diversity of micro-organisms, essential for the decomposition of organic matter and the nutrient cycle. Sustainable soil management, based on an accurate assessment of soil quality, helps to maintain soil fertility, support biodiversity and guarantee essential ecosystem services.

Requirements

1.1.2 Assessing the ecological quality of soils

The aim is to carry out a complete diagnosis of the ecological and agronomic quality of the soil in order to identify areas requiring special protection, to detect opportunities for soil reuse and to determine the appropriate management methods for preserving and improving soil quality

To assess the ecological quality of soils, several key elements need to be analysed:

- Physico-chemical properties :
  - Soil texture: proportion of sand, silt, clay ;
  - Soil pH: measurement of acidity or alkalinity ;
  - Organic matter (OM): quantity of organic matter present ;
  - Total nitrogen (N): total quantity of nitrogen ;
  - $CaCO_3$ content: calcium carbonate, affecting nutrient availability ;
  - C/N ratio: ratio between carbon and nitrogen, influencing the degradation of OM.
- Biological property :
  - Microbial biomass: quantity of micro-organisms.

Sample collection :

- As a minimum, one sample must be taken per **soil unit** (a homogeneous unit defined by soil origin, biotope and vegetation cover) OR **per 500 m² of green space**, <u>in future planted areas</u>;
- In the event of a change of use of the landscape to a sensitive use (e.g. food production, recreational activities, etc.), **pollutant analyses** must be carried out on the rights of way concerned. These should include hydrocarbons (PAHs, HCTs) and the 8 main heavy metals (arsenic, copper, lead, mercury, cadmium, chromium, nickel and zinc).
- When analysing the results, please refer to the directives issued by the competent environmental and public health protection bodies.
- Record the GPS coordinates of the sampling points to ensure that they can be monitored at the same positions over time.

The samples taken must be sent to a laboratory accredited by the local accreditation body for analysis.

A report will detail the sampling protocol (number and location of points) as well as the results of physico-chemical and biological analyses and, where applicable, pollutant analyses .

Note :
1. This requirement calls for soil analyses to be carried out on future planted areas. It is also recommended that these analyses be carried out on future sealed areas. If the ecological quality of the soil proves satisfactory, it is encouraged to promote its reuse on the site.
2. This service must be carried out by ecologists specialising in soil science or by an organisation qualified to carry out this diagnosis. This soil expert will help interpret the results and make recommendations for the intended use.
If the site is 100% built-up or sealed at the initial state, this criterion is not applicable.

1.1.3 Ecological and agronomic soil quality

Certain soil management practices must be respected regardless of the ecological and agronomic quality of the soil:

- Maintain ground cover throughout the year;
- Select a plant palette suited to the characteristics of the soil.

The results of the 1.1.2 criterion will be analysed. If the ecological and agronomic quality of the soil is deemed unsatisfactory, a soil management plan will be put in place to plan the necessary corrective action.

Note :
1. The ecological and agronomic quality of the soil will be considered satisfactory if the various analyses meet the criteria in the table in the *good practice guide -Soil management and enhancement page 118*). It should be noted, however, that compliance with the thresholds defined in this table must take into account possible variations linked to the future intended use of the soil. Indeed, if the results of the analyses do not comply with the optimum thresholds defined, but are deemed compatible with the planned future use, a justification must be presented to justify this choice.
2. The management plan will be drawn up in collaboration with a professional specialising in soil investigation, in order to interpret the results and make recommendations tailored to the intended use.
If the site is 100% built-up or sealed at the initial state, this criterion is not applicable.

1.2 - Land use

To determine the issues at stake on a site and its ecological potential, it is essential to study the occupation of the plot and its surroundings. Developing a project as an extension of existing urban continuity helps to limit the fragmentation of the area and the deterioration of natural spaces and ecological continuity. This helps to preserve sensitive ecosystems while encouraging the rehabilitation of degraded sites, thereby strengthening the ecological integration of projects in their environment.

Requirements

1.2.1 Land use history

The land use history must be provided, documented and illustrated in order to demonstrate that the building layout meets at least one of the following criteria:

- On a built or previously built site;
- On land that has been degraded or polluted by human activities;
- On a site with low ecological potential ;
- On a sealed site.

The land use history will be obtained from :

- Historical mapping and satellite imagery platforms to track changes in land use;
- Environmental databases listing industrial or polluted sites;
- National or regional geospatial portals providing information on land use and existing infrastructure.

The history must be as exhaustive as possible, depending on the data available. Tools and databases adapted to the region or country of the project should be used to ensure accurate and reliable documentation.

1.2.2 Urban continuity

A map of urban continuities will be drawn up. This map should clearly illustrate the geographical location of the project in relation to the existing urban fabric, highlighting its immediate proximity to urbanised areas.

Note: *The maps to be supplied must show the issues at stake at different scales: 1:50,000, 1:25,000, 1:10,000, 1:5,000, 1:2,500 and 1:1,250 depending on the issues at stake at the site.*

Requirements

1.2.3 Restoring environments and combating soil sealing

Outdoor car parks will be permeable, with or without vegetation (*e.g. stabilised sand, grass slabs, evergreen, honey-comb slabs with gravel or sand, pavers with widened joints, mixed car parks, etc.*).
A landscaped layout plan must be provided, detailing the overall layout, including the parking areas. The characteristics of the surfacing for the parking spaces will be specified in the External Works Technical Specifications.
Refer to the good practice guide - Car park surface page 152.
In the absence of off-site parking, this criterion is not applicable.

1.2.4 Ban on the use of plastic in outdoor furniture

The use of plastic in outdoor landscaping is prohibited, as it is incompatible with the proper functioning of living soil and generates polluting micro-waste.
The elements covered by this requirement include :

- Surfacing for pedestrian walkways ;
- Plastic sheeting before planting: use environmentally friendly alternatives such as coconut fibre, hemp, linen, jute felt, wood chips, etc. ... ;
- Protecting tree trunks when planting: use alternatives such as bamboo mats, jute cloth, etc
- Planters: use sustainable and natural materials ;
- Street furniture (benches, litter bins, etc.): use sustainable and natural materials;
- Educational panels.

The aim is to promote environmentally-friendly developments by reducing the use of plastics and favouring sustainable, ecological materials.
These requirements must be specified in the project's written and/or graphic documents.

Requirements

1.2.5 Harmonised Green Area Factor (hGAF)

	Building footprint	hGAF minimum
Residential buildings (individual and collective) and **community facilities** (schools, sports facilities, cultural centres, medical centres, etc.).	Up to 37	0,5
	From 38% to 49	0,4
	Above 50%.	0,3
Shops, offices, administrations	-	0,3
Industry (production sites, warehouses, logistics platforms, etc.)		0,3

In addition to complying with the expected hGAF values, the ground bordering the various constructions must include a minimum of 15% open green space[2] over the total project footprint.
All surface areas indicated in the hGAF calculation tool must be supported by a site plan or any other document enabling the accuracy of the surface areas entered to be verified.

[2] Open ground meets the following cumulative conditions:

- Its surface is free of any covering, even permeable. Soils with porous concrete slabs, wide-jointed slabs, unjointed paving stones, permeable planted honeycomb structures, etc. on the surface are therefore not considered to be open ground;
- It has a succession of horizons, including a more organic horizon at the surface and a variable depth;
- It is planted with vegetation;
- It is not interrupted at depth by an impermeable man-made interface (slabs, compacted or indurated levels, membrane, etc.). The passage of networks (cables, pipes, etc.) at depth does not preclude open-ground status;
- It is mainly made up of earthy materials: these are materials of pedological or geological origin, most often mixed, with a fine particle size (< 2 mm), sometimes with a low load of coarse elements.

Source: hGAF nomenclature drawn up by GT7 - Biodiversity as part of the Cap 2030 project.

1.2.6 Tool for determining the hGAF (harmonised Green Area Factor)

The **harmonised Green Area Factor (hGAF)** is an indicator developed as part of the **CAP 2030** project, led by the **Groupement d'Intérêt Écologique (GIE)**. This group is made up of three associations - Alliance HQE-GBC, Collectif des Démarches Quartiers Bâtiments Durables and Collectif Effinergie - and is supported by the **Direction Générale de l'Aménagement, du Logement et de la Nature (DGALN**), **ADEME**, as well as technical support from the **CSTB** and the **Plan Bâtiment Durable**.
The CAP 2030 project aims to establish a common reference framework, shared by all stakeholders in the sector, to go beyond the requirements of the RE2020, by integrating innovative approaches such as carbon neutrality, indoor environmental quality, sustainable water management and the circular economy.
hGAF is result of the work of **Technical Group 7 (GT7) on biodiversity**, led by the CSTB. Firstly, it aims to fully integrate biodiversity into urban development, construction and renovation projects. Secondly, it proposes a harmonised method for reliably measuring the biodiversity carrying capacity of projects.
By highlighting concrete actions to reduce the amount of water permeable to water, the hGAF highlights development strategies that encourage renaturation and the creation of diversified habitats, thereby contributing to more resilient and environmentally-friendly areas.
The method is accompanied by a **tool developed by the CSTB**, available in **open source**, facilitating its application and appropriation by stakeholders in the sector.
The HGAF is part of a wider set of **three complementary indicators**, including :

- A **qualitative indicator** assessing the commitment of the resources implemented to take account of biodiversity on the initial site;
- An **environmental quality and functionality indicator** to analyse the impact of projects on local ecosystems.

1.2.6.1 What is hGAF used for?

The **hGAF** is an environmental assessment indicator calculated using a specific methodology and dedicated tools. It is used to :

- **Assess the biodiversity carrying capacity of** a site by measuring the proportion of favourable surfaces in relation to the total surface area.
- **Compare different variants of a project**, by analysing alternative scenarios and comparing them with the initial state.
- **Encourage and promote multi-storey planting** to encourage the diversity of natural habitats.

1.2.6.2 Composition of the indicator

The hGAF is based on a nomenclature structured into four main categories of land use typologies:

- **Buildings:** includes green roofs (extensive, semi-intensive, intensive) and conventional roofs
- **Roadways:** includes mineral surfaces (permeable, semi-permeable, mixed) and vegetated roadways
- **Green spaces on the ground:** includes open spaces, on slabs, agricultural spaces and natural spaces
- **Bodies of water:** this includes ponds, ditches and other wetlands.

hGAF takes into account vegetated surfaces according to their substrate thickness and the combination of plant strata they support (sedums, herbaceous plants, shrubs, trees).
Each typology is associated with a coefficient, between 0 and 1, which reflects its capacity to host biodiversity. These coefficients were defined by the ecologists of Working Group 7 (GT7) to ensure a clear distinction between the different typologies. A minimum difference of 0.1 is maintained between the coefficients in order to ensure a hierarchy of typologies in terms of ecological capacity.

1.2.6.3 Methodology and calculation rules

The **hGAF** is based on a rigorous but accessible methodology, based on the weighting of areas favourable to biodiversity in a project.
To ensure that the results are reliable and ecologically relevant, there are **rules governing the calculation**:

- For green spaces (green roofs, ground level spaces on slabs or in the open ground):

- A "shrub" or "tree" layer is only taken into account if it covers at least 20% of the planted area concerned. The assessment is based on the size of the individuals at maturity.

- For roadside trees, a minimum density of 2 trees per 100 m² is required.

The aim of these rules is to ensure that planted landscaping genuinely promotes biodiversity and is not limited to purely aesthetic or technical features (such as rainwater management).

1.2.6.4 Example of calculation of the harmonised Green Area Factor (hGAF)

Parcel data

- Total surface area: 4552 m²

Category	Type of surface/ land use	Surface area (m²)	Coefficient by type of surface	Coefficient category
Building	Mineral roof	2100	0	0
Roads	Mixed	305	0,2	0,12
	Waterproof mineral	210	0	
Green space	Green space on a slab with 50 cm of substrate *(60% herb-aceous), 25% shrubs, 15% trees)*	620	0.5 *(combination of 2 strata)*	0,77
	Open green space *(55% herb-aceous), 25% shrubs, 20% trees)*	1317	0.9 *(combination of 3 strata)*	
Water body	/	/	0	0
			Coefficient Total	**0,34**

Calculation formulas

With :

- S_i: surface area of the land use type
- C_i: associated coefficient

The harmonised Green Area Factor is calculated as follows:

Where

- i =1 : Building ;
- i=2 : Roads ;
- i=3 : Green space ;
- i=4: Water body.

1.3 - Sustainable soil management

Requirements

1.3.1 Favouring on-site reuse of soil

As part of a sustainable development approach, it is essential to reduce the export and import of land as much as possible by applying the following principles:

- **Prioritise the reuse of soil on site**, aiming for zero exports, for example by integrating the creation of relief. Any reuse must be preceded by a soil analysis, carried out in accordance with the criteria 1.1.2Assessing the ecological quality of soils
- **Controlling imported topsoil**: Before any topsoil is imported during the construction phase, a physico-chemical analysis must be carried out to determine its characteristics and check for invasive plant species.

The contract documents must specify the quantities of soil reused on site and/or the alternative solutions put in place, such as reuse on other nearby sites or the use of soil from nearby projects.
A detailed report must present the results of the analyses of the reused soil, based on the diagnostic conclusions of criterion 1.1.2. In the event of insufficient quality or pollution, a soil management plan must be put in place to plan the necessary corrective action (*refer to the good practice guide - Soil management and enhancement page 118 and Assessing the ecological quality of soils page 120).*

Development of plant heritage

Criteria	Requirements
Analysis of flora	Initial flora assessment Assessment of ecological issues
Continuities and habitat characterisation	Assessment of ecological continuity and characterisation of habitats
Protected areas for biodiversity	Structured Biodiversity Area (SBA)
Plant palette	Choice of plant palette Spontaneous flora Ecological Value Index (EVI) Determining the EVI
Plant heritage management plan	Managing invasive alien plant species (IAS)
Vegetation and buildings	Greening of buildings Green roofs or facades
Water resource management plan	Sustainable rainwater management Installation of meters Watering technology
Sustainable management of plant heritage	Site Valuation Index (SVI) Determining the SVI
Environmental impact assessment	Prefectoral decree of the environmental authority "flora section"

2 - Development of plant heritage

2.1 - Analysis of flora

The site analysis, carried out before any work is carried out on the site, must enable the initial state of biodiversity to be assessed. It involves identifying the different environments and populations present in the project area and the interrelationships between species. It is based on ecological considerations during the design phase, in order to establish a methodology aimed at preserving existing biodiversity and enhancing local biodiversity on the site. Although not exhaustive, the flora inventory should make it possible to characterise the environments specific to the site under study, as well as its strengths and weaknesses. Its conclusions will help to establish a strategy for enhancing the value of the flora throughout the project. **The analysis of the initial state of the site will serve as a starting point for implementing solutions to manage, protect and enhance biodiversity.**

Requirements

2.1.1 Initial flora assessment

An initial assessment of the flora present on site must be carried out by an ecologist. An inventory sheet and a floristic survey report must be drawn up and must record the observations of the ecological surveys carried out by an ecologist on the site.

Inventory methods should be adapted to the typology of habitats present on the site (e.g. transects, quadrats, etc.), and the survey effort will have to be proportional to the value and complexity of the landscape.

For species with regulatory implications or heritage species, their numbers must be systematically assessed.

The floristic inventory report must specify :

- Threatened, rare, protected or heritage status of species;
- Inventory periods ;
- The presence or absence of invasive alien plant species (IAS), with their location on a map where appropriate;
- Plant health ;
- The number of trees and their location on the plot.

Note :

The field assessment must be carried out during the period favourable to the cycles of the plant species.

The inventories may be based on those carried out as part of an environmental impact assessment (EIA) of the site or a case-by-case assessment. An ecological study is considered to be representative for a period of 3 years, provided that the environment has not been disturbed and that surveys have been specifically carried out on the plot of land concerned by the project.
Beyond this period, as part of Effinature certification, the study can be used as a bibliographical reference, but a rapid diagnosis will be necessary to confirm that the site retains characteristics similar to those of the initial inventory. In particular, this update will make it possible to gather data on certain elements, such as the presence of invasive species.

Requirements

2.1.2 Assessment of ecological issues

In order to ensure that the ecological issues surrounding the project site are fully taken into account, it is necessary to carry out a thorough assessment of the surrounding areas. This assessment must include the following elements

- Mapping of the internal and external perimeters of the study: precise delimitation of the study zones and the areas of direct and indirect influence of the project;
- Identification of nearby protected areas. This identification must be accompanied by thematic maps highlighting these areas;
- Analysis of potential ecological impacts on protected areas and recommendations for impact management

This requirement will study the perimeters with status for fauna and flora issues.

2.2 - Continuities and habitat characterisation

Requirements

2.2.1 Assessment of ecological continuity and characterisation of habitats

An assessment of ecological continuity and habitats will be carried out. This assessment is carried out at two levels of scale:

- Local: at parcel level ;
- Regional: on a broader scale, taking account of regional and national ecological networks.

The assessment of ecological continuity includes :

- Their identification (ecological corridors, important biodiversity areas, etc.) ;
- Precise geographical location ;
- Their ecological roles (resting areas, breeding sites, etc.) ;
- Their connectivity (potential for connection between habitats, areas favourable to species movement, links between different habitats).

Habitat characterisation includes :

- Identification of the biotopes and ecosystems present on the site;
- Assessment of priority or sensitive habitats according to local and international environmental criteria;
- Conservation status of habitats ;
- Habitat nomenclature, using nationally or internationally recognised ecological classifications.

Maps must be produced to summarise the results and represent the habitats identified on the site and the ecological continuities at different scales depending on the issues at stake.

2.3 – Protected areas for biodiversity

The continuing deterioration of habitats in urban areas, coupled with the increasing artificialisation of land, means that each development must set aside a **sanctuary of space** exclusively for living things. These spaces, free from traffic and development, play an essential role as **autonomous ecological reservoirs**, evolving freely and without pressure of use. They are true islands of naturalness, favourable to the establishment, reproduction and spontaneous regeneration of local species.

Requirements

2.3.1 Structured Biodiversity Area (SBA)

Each project must include **at least one SBA**, a protected area intended exclusively for biodiversity, meeting the following conditions:

- **Location:** in the open ground, or on a roof/terrace with a substrate ≥ 60 cm, with no technical use or access.
- **Minimum surface area:** 1% of the plot, with a minimum threshold of 30 m².
- **Ecological quality**
  - No traffic, no landscaping (no paths, furniture or landscaping);
  - The presence of at least two of the following ecological components is encouraged:
    - An ecological water feature (natural pond, temporary wetland, etc.);
    - A living hedge or grove with multiple layers (herbaceous, shrubby, arborous) ;
    - Dead wood or natural shelters (piles of leaves, stones, branches, etc.) ;
    - Open vegetation cover, such as plant thickets or spontaneous mixed strata ;
    - Bare soil conducive to the establishment of local pioneer flora.
- **Unmanaged natural development**: no phytosanitary treatment, no mowing apart from differentiated mowing.

Appropriate signage (e.g. educational panels, light fencing) must be put in place to inform users and preserve the tranquillity of the site.

A site plan clearly indicating the location of the Structured Biodiversity Area (SBA), its surface area and its layout must be submitted. A sheet drawn up by the ecologist will specify the nature of the soil or substrate, the ecological elements that make up the area, and the chosen layout.

The unmanaged natural development of the SBA must be explicitly mentioned in the contractual documents for the maintenance of the green spaces. Compliance with this management policy must be ensured for the entire maintenance period following acceptance of the work.

In the event of proven technical or regulatory impossibility (e.g. plot size < 1,500 m², built-up area ≥ 80%, easement, etc.), an explanatory note from the ecologist or Biodiversity Partner must be provided.

2.4 - Plant palette

The reasoned choice of vegetation is essential, as plants play a fundamental role in supporting biodiversity, both above and below ground. To preserve the ecological balance of a site and encourage living things, it is essential to recreate a coherent and healthy plant environment, based on ecological, landscape and social criteria.

The choice of plants must take into account their adaptability to local conditions: climate, soil quality, water availability, exposure, etc. By favouring native or naturalized species adapted to the area, we limit the need for irrigation or chemical inputs, while creating a welcoming habitat for local fauna (pollinators, birds, small mammals). The inclusion of melliferous and polliniferous species is particularly important to support pollinating insects, which are essential to the proper functioning of ecosystems.

Vegetation also fulfils a number of ecological and climatic functions. Ground covered with vegetation limits the albedo (reflection of solar energy), helps to regulate the temperature of spaces and reduces urban heat islands. Plants absorb CO_2, filter fine particles and improve air quality, while producing oxygen.

But beyond these environmental functions, green spaces also generate numerous co-benefits for users. They create pleasant islands of coolness during heatwaves, as well as areas for walking, playing, picnicking and socialising. They help to calm the urban atmosphere, promote the mental and physical health of residents, and contribute to the quality of the landscape. The presence of vegetation has a proven impact on stress reduction, a feeling of well-being and a sense of belonging to the area.

Finally, sourcing plants from local producers reduces the carbon footprint associated with transport, promotes greater ecological resilience and supports local horticultural industries. This choice strengthens the local roots of the project and ensures consistency between the flora introduced and the ecosystem dynamics of the site.

Requirements

2.4.1 Choice of plant palette

The project's plant palette must :

- Take account of the site's initial ecological conditions;
- Comply with the requirements defined below for each :

	Trees, shrubs and perennials	Meadows, seedlings
Minimum % indigenous species[1]	85%	85%
	of which at least 40% must be species indigenous to the site's biogeographical region[2] . The remaining species, among these 85%, must at least originate from the national territory.	
Origin of plants	The entire plant palette must be sourced nationally[3], with at least 50% of the plants coming from within a 200 km radius of the site.	
Adapting to the local climate	All integrated exotic species[4] must be adapted to local climatic conditions .	
Maximum % of highly allergenic plants[5]	10%	15%
Minimum % of polliniferous and/or melliferous plants[6]	30%	50%
Calculation method	Based on the number of individuals	Based on surface area in m²

- Prohibit invasive alien plant species, in accordance with the lists drawn up by the local authorities responsible for managing invasive species;
- Be composed of at least three plant strata[7] (trees, shrubs, herbaceous plants) to create a structural diversity beneficial to biodiversity.

The list of plants must comply with botanical nomenclature and be used by the companies responsible for landscaping.

The bibliographical references used to draw up this plant palette must be supplied, as well as the planting plan, technical sections and/or elevations, and the Breakdown of Lump-Sum Price.

Note :

[1]: A plant species is defined as **indigenous** to a territory when it is present there as a result of natural dispersal processes. This territory is said to be its natural range. Indigenous plants include endemic plants.
In the case of **landscaping**, any failure to comply with the percentage of indigenous species must be duly justified. In the case of **shared vegetable gardens**, the local character of the plants is not required, so they are not taken into account in the calculation. In the case of meadows, there is no tolerance for the addition of non-local species. **Plants initially present** in the natural environment and which are retained are not taken into account in this calculation.

[2]: Vast area with **relatively homogeneous ecological conditions** (climate in particular) with common characteristics in terms of species.

[3]: For projects located on national borders, supplies from neighbouring countries may be an alternative.

[4]: **Species introduced** into a region where it was not naturally present before. This introduction may be due to human activity (voluntary or accidental), for example through trade, transport or agriculture.
Ornamental cultivars, although derived from native or acclimatised species, also fall into this category if they are the result of artificial horticultural selection and do not occur spontaneously in natural environments. These non-native species must be carefully selected to prevent them from becoming invasive.

[5]: **Plants with a high allergenic potential** must be identified on the basis of a nationally-recognised database, in order to minimise the risks for users and residents according to locally-recognised criteria, and must be located away from sensitive areas in order to limit the impact on human health (e.g. entrance halls, along pedestrian access routes, etc.).

[6]: Plants that produce pollen and/or nectar, playing an essential role in attracting and supporting pollinating insects (bees, bumblebees, butterflies, etc.).
This requirement does not apply to lawns. However, the inclusion of melliferous/polliniferous species remains encouraged in areas with low use constraints.

[7]: This requirement may be adapted if a natural vegetated environment is maintained and enhanced by the addition of plants. In this case, the planting does not have to involve three different plant strata, if these are already present.

Refer to the good practice guide - Choice of plant palette page 123.

Requirements

2.4.2 Spontaneous flora

Spaces dedicated to spontaneous flora must be integrated into the project. A plan of these areas will be drawn up, highlighting the zones where this vegetation can develop naturally, such as :

- Areas transformed into ecological micro-reserves ;
- Natural grasslands or areas of herbaceous vegetation ;
- Planted tree roots and other areas planted with trees;
- Brownroofs or extensive green roofs to encourage biodiversity.

Note: *Brownroofs and certain extensive green roofs must be maintained in such a way as to allow spontaneous species to voluntarily establish and prosper, without removing them. Studies carried out by Plante & Cité and Grooves show that after a few years, up to 60-70% of the species present on these roofs had not been planted.*

2.4.3 Ecological Value Index (EVI)

The intial EVI will be calculated.
The Ecological Value Indices (EVI) are calculated throughout the operation and are based on in situ observation of the habitats and the floristic inventory. They are used to assess the increase or loss in plant diversity during the various phases of the programme compared with the initial state $EVI_{initial}$.
Each stage has a specific IVE, which must always be greater than or equal to $EVI_{initial}$. All EVIs are calculated in the same way and are named accordingly:

- $EVI_{initial}$;
- $EVI_{implementation\ phase}$.

2.4.4 Determining the EVI

The ecological value of a site is calculated by taking into account the diversity of species present, the ecological quality of the habitats and the total vegetated surface area of the site . The calculation is based on the following formula:
With :

- i = 1, for common species: C_1= 1 ;
- i = 2, for vulnerable or ecologically important species: C_2= 2 ;
- i = 3, for rare or protected species: C_3= 3 ;
- Habitat diversity factor: ln(Number of habitats+1).

1. **Weighting of species by their ecological importance**: Each species is weighted according to its ecological importance, which can be determined according to criteria such as :

- Rarity: Rare or protected species have a higher ecological value;
- Ecological importance: Some species can play a key role in the ecosystem (for example, the "umbrella" species associated with urban environments, which by improving or preserving the habitats of these species, have beneficial effects for a wide range of other species).
- Vulnerability: Sensitive or threatened species also add value to the ecosystem

Common species are given a low weighting (coefficient 1), while species that are vulnerable or of regional ecological importance are given a higher coefficient (coefficient 2). Finally, rare or protected species, because of their critical contribution to biodiversity, are given an even higher coefficient (coefficient 3). This weighting system provides a more accurate reflection of the ecological value of the species present on the site.

2. **Habitat diversity factor:** The habitat diversity factor reflects the importance of the variety of habitat types present on the site. The higher the habitat diversity of a site, the more important this factor will be. The formula chosen for this factor uses the natural logarithm of the number of habitats increased by 1: (ln(Number of habitats+1)). This makes it possible to model a non-linear progression where the increase in the number of habitats has a significant impact at the beginning, but this impact becomes progressively less marked as the number of habitats increases.

For example, introducing several types of habitat to a site will increase ecological diversity, but the marginal impact of each additional habitat will gradually diminish. This non-linear relationship illustrates that, although habitat diversity remains an essential objective, the ecological gains resulting from their multiplication do not follow an infinite progression. In other words, biodiversity reaches a plateau where the addition of further habitats has an increasingly limited effect.

In addition, this choice ensures that even a single habitat has a positive value, while avoiding overweighting for sites with a very large number of habitats.

3. **Use of the natural logarithm for surface area**: Surface area is traditionally a key factor in ecological assessment for several reasons:

- Carrying capacity: a larger surface area is often associated with a higher carrying capacity for species. More space generally means more resources, more ecological niches, and potentially a greater diversity of species. Taking surface area into account in the calculation means that sites that devote a small proportion of their surface area to biodiversity are penalised, even if they are home to a large number of species;
- Fragmentation and connectivity: in land development projects, the size of habitats can influence ecological connectivity. Larger plots of land allow species to move around more easily and reduce the effect of fragmentation;

The total surface area of the site's habitats is also included in the calculation via the natural logarithm of the total surface area increased by 1: (ln(Total surface area+1)). The use of the logarithm makes it possible to limit the impact of the reduction of a given habitat, which would have little or no influence on the number of species in that habitat. The addition of 1 in the formula makes it possible to treat small areas consistently and avoid indefinite calculations for zero or very small areas.

Example:

Initial state :	**Project status** :
• Number of habitats: 1 • Surface area: 1600 m² • Number of species: 16 common species and 1 vulnerable species (16*1 + 1*2) • Habitat diversity factor: ln(1+1) = 0.693 • Ecological value = (18/ln(1600+1))*0.693	• Number of habitats: 3 • Surface area: 600+200+300 = 1100 m² • Number of species: 16+8+5 common species • Habitat diversity factor: ln(3+1) = 1.386 • Ecological value = (29/ln(1100+1))*1.386

DESIGN PHASE

Initial state - Calculation of ecological value

Types of habitat	Surface area (m²)	Number of species			Overall coefficient of ecological importance of species for each habitat
		Communes	Vulnerable or of ecological import-ance	Rare or protected	
Wasteland	1600	16	1		18

Add as many lines as habitats

Total surface area (m²)	1600
Number of habitats	1
Ecological value of the site	**1,691**

Project - Calculation of ecological potential

Types of habitat	Surface area (m²)	Number of species			Overall coefficient of ecological importance of species for each habitat
		Communes	Vulnerable or of ecological import-ance	Rare or protected	
Meadow	600	16			16
Roof green	200	8			8
Grove	300	5			5

Add as many lines as habitats

Total surface area (m²)	1100
Number of habitats	3
Ecological potential of the site	**5,739**

Δ Ecological potential	
9,321	**Compliant**

2.5 - Plant heritage management plan

For centuries, human movements have encouraged the dispersal and introduction of animal and plant species into ecosystems where they were not initially present. It is not so much the introduction of species that poses a problem, but rather the ability of certain exogenous species to proliferate to the detriment of local species. These species sometimes demonstrate a remarkable ability to adapt and thrive in a foreign environment, thanks to complex interactions between their biology and the characteristics of the environment.

The main conditions favouring the invasion of exogenous species are as follows:

- The species is introduced in sufficient quantity into an environment with conditions similar to those of its original habitat;
- It has a high reproductive capacity and spreads rapidly, often facilitated by advantageous morphological characteristics (for example, developed root systems or a structure that limits light to other plants);
- It does not encounter any limiting factors to its development, such as natural predators or herbivores likely to consume it;
- The habitats where it thrives have been disturbed, which favours its establishment in the absence of competition on bare ground.

Given the risks that these invasions represent for biodiversity, specific action plans have been implemented to inventory the species concerned, improve knowledge, detect early invasions, promote prevention techniques and support stakeholders in managing and assessing the results. These initiatives aim to reduce the impact of invasive alien species on local ecosystems and protect biodiversity.

Requirements

2.5.1 Managing invasive alien plant species (IAS)

Managing invasive alien plant species requires an approach tailored to the ecological context and the specific characteristics of each species. If theInitial flora concludes that invasive alien plant species (IAS) are present, the ecologist will have to define the management objectives:

Eradication: If the invasive alien species is deemed harmful to the local ecosystem, eradication measures will be implemented. This includes the use of appropriate control methods such as mechanical, manual or biological, followed by revegetation. In this case, a **report on the management** of these species will have to be provided and will specify:

- Waste management (transport, landfill, thermal recovery, etc.) ;
- Land management (non-use of contaminated land, management of bare soil, import and export of soil, etc.);
- Methods to reduce the spread of disease (cleaning of machinery and equipment, rapid reseeding, installation of tarpaulins, etc.);
- Suppression methods before, during and after the works (installation of surveillance, manual grubbing, grazing, stump removal, etc.).

Conservation: If an invasive alien species (IAS) plays a beneficial ecological role in the local context, is well established and difficult to eradicate in the given geographical area, and does not present an immediate threat to the ecosystem, conservative management measures will be put in place. The aim will be to maintain populations at a minimum level in order to limit impacts on biodiversity, associated ecosystem services and human health. These measures may include :

- Modification of the habitat to make conditions less favourable for IAS (e.g. light and water management);
- Planting competitive native species to compete with IASs and stabilise the ecosystem;
- Pruning the species at the right time of year to prevent it spreading, particularly in the case of sexually reproducing plants;
- The introduction of natural predators or pathogens specific to the invasive species to help control its proliferation;
- Setting up physical or biological barriers to prevent spread to new areas;
- Ongoing monitoring of the species' population and ecological impact, with minimal intervention to limit its proliferation without aiming for complete eradication.

A **management protocol** to combat the proliferation of these species will have to be provided and applied.

In the absence of invasive alien plant species, this criterion is not applicable.

2.6 - Vegetation and buildings

The greening of buildings provides an important **additional support** for biodiversity in urban environments, by recreating habitats that mimic the natural conditions that certain species use to survive and thrive. Green roofs and façades provide an essential refuge for species that are often impacted by urban development. Thanks to the diversity of plants used, such as climbers, mosses, ferns and other vegetation, they encourage the formation of micro-habitats. These areas can attract a variety of insects, birds and even small mammals, which find suitable places to nest, feed and reproduce. By incorporating specific features (nesting boxes, shelters, cavities, etc.), the greening of buildings offers species a space in which to settle, reproduce and protect themselves in an often inhospitable urban environment.

In addition to its role in promoting biodiversity, the greening of buildings considerably improves the **urban micro-climate**. By humidifying the air, providing a cooling effect and helping to regulate the temperature of buildings and the city as a whole, it helps to reduce urban heat islands. Green roofs also reduce atmospheric dust by filtering out between 10 and 20% of fine particles, thereby improving air quality.

They also play a key role in **rain water management** by absorbing part of the rainfall, thereby limiting run-off and reducing the risk of flooding in urban areas.

The performance of green roofs in terms of **thermal and acoustic insulation** is also noteworthy. They improve the energy efficiency of buildings by reducing the need for air conditioning in summer and limiting heat loss in winter. Thanks to this insulating effect, heating and air conditioning systems can operate more efficiently, reducing overall energy consumption. Acoustically, green roofs reduce noise pollution by reducing the echo by around 3 dB and improving sound insulation.

Finally, greening the built environment helps to create **ecological corridors** in urban areas. These corridors enable species to move safely through the urban landscape, linking isolated green spaces. They facilitate seasonal migrations, the dispersal of young individuals and even the escape of certain species in the face of climate change or the destruction of their habitat. Ecological corridors play a key role in maintaining urban biodiversity, as they prevent the fragmentation of habitats and enable animal and plant populations to remain connected.

The greening of buildings is a **multifunctional solution** that meets today's environmental challenges. By promoting biodiversity, improving air quality and the urban climate, reducing the energy consumption of buildings and providing greater comfort for occupants, it is an essential strategy for making our cities more resilient and more liveable.

Refer to the good practice guide - Greening of buildings page 127.

Requirements
2.6.1 Greening of buildings Where buildings (roofs and/or facades) are to be greened, a note justifying the solutions implemented to increase the potential for fauna and flora on the roof and/or facades must be provided. It must demonstrate : • Diversity in the choice of substrate (topsoil, sand, pebbles, etc.) to encourage a diversity of habitats and species; • The addition of inert elements to diversify reception capacity (dead wood, scree, artificial shelters, etc.). ***If the building is not planted with vegetation, this criterion is not applicable.***
2.6.2 Green roofs or facades The plant palette for buildings must : • Be consistent with the type of roof expected; • Comply with the requirements of the project's plant palette; • Be diversified with a minimum of 10 tall herbaceous species for semi-intensive and intensive roofs; • Detail the number of species and the number of strata; • No more than 50% sedum in the case of extensive roofs; • Take into account the development of plants to avoid pruning practices. The list of plants must comply with botanical nomenclature and must be used by the companies carrying out the work. The planting plan, technical drawings and elevations, along with the corresponding Breakdown of Lump-Sum Price, must be provided. ***If the building is not planted with vegetation, this criterion is not applicable.***

2.7 - Water resource management plan

Water and biodiversity are interdependent: a disturbance affecting one necessarily has repercussions for the other. Because all forms of life depend on water, the hydrological cycle determines the way in which the environment functions. Vegetation and soil are an integral part of the water cycle, but this resource is becoming increasingly scarce. We need to anticipate the needs and availability of water for biodiversity by designing environments that are adapted to the environment. Water consumption by plants is influenced by the climate (sun, wind, humidity), but also by the age of the plant species and the season. It can vary greatly from one day to the next. That's why it's vital to ask the question: what are the real water requirements of my planted areas? This means adopting a water management approach based on ecological realities, taking into account not only immediate needs, but also seasonal variations and long-term changes. Responsible, well-planned water management supports local biodiversity while preserving this precious resource for future generations.

Requirements

2.7.1 Sustainable rainwater management

A feasibility study must be carried out to assess the sustainable rainwater management solutions that can be implemented on the site. The aim is to give priority, wherever possible, to managing rainwater at source, with a view to reducing the need for conventional drainage systems ("zero-pipe" approach).

The study will focus in particular on :

- **Recovery of rainwater** for non-potable uses (watering, etc.), taking into account water requirements, local rainfall, seasonal variations, available collection surfaces and possible storage capacity.
- **Disconnection from the rainwater network** by installing infiltration systems such as :
  - unsealed areas ;
  - green spaces ;
  - rain gardens ;
  - ponds ;
  - vegetated channels or ditches.

The study should analyse the technical, regulatory and environmental feasibility of these developments, taking into account the specific constraints of the site (geology, topography, potential pollution, etc.). If certain solutions cannot be implemented, the reasons will have to be clearly justified, and alternatives will have to be proposed with a view to reducing water consumption.

Refer to the good practice guide - Rainwater management facilities page 171.

Requirements

2.7.2 Installation of meters

Meters will be installed on the watering network to optimise monitoring of water consumption during the operational phase and to detect any leaks.
The written documents must include this requirement. A meter installation plan, specifying their location on the network, as well as technical data sheets for the equipment installed, will be supplied.

2.7.3 Watering technology

The choice of irrigation system will depend on the type of plant and can only be :

- Occasional manual watering by the company Green spaces ;
- Drip irrigation: saves water, is easy to install and prevents water-borne diseases on the leaves (adjustable drip irrigation is recommended so that plants can be fed according to their different water needs);
- Watering via an automated system, controlled by sensors that measure soil humidity or weather conditions: a method that further optimises water management by precisely adapting water inputs to the needs of the plants.

The installation of a rain sensor is highly recommended. This device automatically interrupts the watering cycle when rainfall exceeds a predefined threshold. The sensor should be installed high up, in an open, uncovered spot, so that it is fully exposed to the rainfall.

The written documents must specify the watering technique used.

Note: *Once the strengthening period is over and plant recovery has been confirmed, the choice of plants adapted to a given soil and climate must ensure that the plants are able to cope with natural rainfall. In this case, removal of the network can be considered as soon as watering is no longer required.*

2.8 - Sustainable management of plant heritage

The tree layer is the central, structuring element of vegetated areas, playing a key role in the architecture and spatial organisation of these environments. It includes all the trees which, through their height, spread and density, not only determine the visual aspect of the landscape, but also influence environmental conditions such as light, humidity and soil composition. This stratum plays a key role in creating microclimates, regulating temperatures and providing habitats for a wide variety of plant and animal species. It is therefore essential for maintaining the ecological balance and biodiversity of green spaces.
Preserving flora in the urban environment is not limited to protecting large trees, but also encompasses the management of herbaceous and shrub layers, as well as areas dedicated to spontaneous flora. Preserving and integrating flora into urban projects thus plays a fundamental role in promoting a sustainable and harmonious city that respects its natural environment.

Requirements

2.8.1 Site Valuation Index (SVI)

The Site Valuation Index (SVI) ≥ 40%.
As there are no trees on the site in the initial state, this criterion is not applicable.

2.8.2 Determining the SVI

Enhancement in the Site Value Index (SVI) refers to any action that enables existing vegetation to be maintained or reused in order to preserve its ecological and functional value, even if it cannot be retained in its original location. It includes :

1. **In situ conservation**: keeping the trees in situ, integrated into the project layout;
2. **Transplanting**: moving trees to another location within the project perimeter, using techniques that encourage them to recover.
3. **Recycling slash**: reuse of organic matter from felling or pruning:
    - Mulching and compost for the soil.
    - Trunks and branches provide shelter for fauna.

Note that **export by necessity** applies only in the following situations:

- Sick tree ;
- Tree representing a safety hazard for site users;
- Trees presenting a significant health risk (presence of allergens, etc.);
- Tree belonging to an invasive species ;
- A tree that poses a direct threat to infrastructure such as buildings, roads, power lines or pipes, with no possibility of alternative management.

The SVI expresses the ratio between the trees preserved and/or enhanced and the total number of trees present on the site in its initial state

Objective	>40%
Total number of trees present in the initial state	

TREES		
Treatment of existing vegetation	Number	Comments
Individuals preserved	4	Healthy trees preserved
Valued individuals	8	Trees crushed and reused as mulch
Individuals exported out of necessity	2	Trees presenting a safety hazard
Individuals exported without recovery	12	
Valuation index - trees (%)	46%	Compliant

2.9 - Environmental impact assessment

Requirements

2.9.1 Prefectoral decree of the environmental authority "flora section"

If the project, or more broadly the development area in which it is located, has been subject to :

- An Environmental Impact Assessment (EIA);
- A prior assessment procedure to determine the need for a full impact study;
- An impact study for protected or sensitive areas, in accordance with local or international regulations;
- An application for a derogation to protect endangered or protected species;
- An application for authorisation for activities affecting forests or requiring land conversion;
- Or an application for authorisation to manage water resources or activities that have an impact on water;

The prefectoral decree from the environmental authority will be forwarded. All reservations and recommendations made must be strictly respected and incorporated into the project, where appropriate.

In the absence of regulatory procedures, this criterion is not applicable.

Support for local fauna

Criteria	Requirements
Fauna analysis	Initial fauna assessment Sensitive periods and areas for fauna
Fauna preservation programme	Eliminating the mirror effect Plugging of trap cavities Encouraging the free movement of fauna Integration of fauna-friendly features
Witnesses in favour of biodiversity	Ecological Coherence Index (ECI) Determining the EVI
Installation of beehives	Restriction on the number of hives Support from beekeepers Materials used to build the hives Nectar and pollen resources
Environmental impact assessment	Prefectoral decree of the environmental authority "fauna section".

3 - Supporting local fauna

3.1 - Fauna analysis

Requirements

3.1.1 Initial fauna assessment

An initial assessment of the fauna present on the site must be carried out by an ecologist. An inventory sheet and a fauna survey report must be drawn up and must record the observations of the ecological surveys carried out by an ecologist on the site.
Inventory methods should be adapted to each group of organisms (e.g. transects, quadrats, photographic traps, auditory surveys for birds, etc.), and the survey effort should be proportional to the value and complexity of the landscape.

For species with regulatory implications or heritage species, their numbers must be systematically assessed.

The fauna inventory report must specify :

- Threatened, rare, protected or heritage status of species;
- Inventory periods ;
- The presence or absence of invasive alien species.

Note :
The field assessment must be carried out during the period favourable to the cycles of the animal species.

The inventories may be based on those carried out as part of an environmental impact assessment (EIA) of the site or a case-by-case assessment. An ecological study is considered to be representative for a period of 3 years, provided that the environment has not been disturbed and that surveys have been specifically carried out on the plot of land concerned by the project.

Beyond this period, as part of Effinature certification, the study can be used as a bibliographical reference, but a rapid diagnosis will be necessary to confirm that the site retains characteristics similar to those of the initial inventory.

Requirements

3.1.2 Sensitive periods and areas for fauna

A plan showing the location of sensitive areas for fauna will be produced, together with proposals for protection measures to be put in place. This plan should identify critical areas for local fauna, such as breeding habitats, nesting sites and resting or wintering areas.

A table of sensitive periods for animal species must be drawn up, listing the months when the work is not favourable to them. This table must specify at least the periods :

- Breeding and nesting ;
- Wintering ;
- Hibernation.

A work schedule will be drawn up, specifying the planned dates of each operation and the people responsible. This schedule must take account of sensitive periods for fauna. In the event of land clearance, tree felling or building demolition, the work must be carried out in advance of the authorised period to avoid any risk of the site being blocked.

3.2 - Fauna preservation programme

The presence of equipment in a vegetated area can both provide favourable support for certain species and, in other cases, constitute a physical barrier or even a death trap for fauna. For example, structures such as fences, cables, wire mesh or drainage equipment can hinder animal movements, block ecological corridors or trap individuals seeking to cross or use these areas. Unintentional traps, such as unsecured pits, open pipes or water reservoirs, can pose serious dangers, particularly to small mammals, amphibians and reptiles.

The aim of the fauna conservation programme is therefore to minimise or even eliminate these negative effects by adapting the infrastructure and equipment on site. This can include measures such as the installation of fauna crossings, the use of materials and designs that allow animals to cross obstacles safely, and the addition of protective devices around dangerous areas. Fences, for example, can be replaced with solutions that promote ecological connectivity, while water tanks and pits can be fitted with exit ramps to prevent animals from becoming trapped.

In addition, the creation of ecological corridors allows species to move freely, ensuring their reproduction and genetic diversity. It is therefore essential to allow the free movement of terrestrial fauna through walls and fences, and to find alternative solutions. By incorporating these considerations into the design of green spaces, we are contributing to the sustainability of ecosystems and the well-being of the species that live there. This programme also aims to raise awareness among designers and project managers of the importance of integrating local fauna into the planning of green spaces, so that the facilities installed support biodiversity by creating safe and welcoming environments for all the species present.

Requirements

3.2.1 Eliminating the mirror effect

The façades of the buildings on the site will be studied in order to identify areas presenting a potential risk of mirror effect. These areas will be assessed by the ecologist.
Plans of the façades, accompanied by a descriptive note specifying the levels of risk (low to high), must be supplied.
Where the risk of mirror effect has been identified, a programme to reduce this nuisance must be drawn up. This programme will detail the measures to be put in place, such as the installation of anti-collision films, railings, or the reduction of the reflection rate of glazed surfaces (< 15%). The written documents must include these elements.

Refer to the good practice guide - Fauna traps page 134.

3.2.2 Plugging of trap cavities

A list detailing the trap cavities present on the site or on the future building, as well as their location, must be provided. These may include (but are not limited to) :

- Hollow posts for road signs, letterboxes, etc;
- Drains of all kinds, chimney flues, ventilation grilles, air ducts and some gutters;
- Open compost bins;
- Various water points;
- Site studs ;
- Plant protection sleeves;
- Etc ...

Where cavities likely to represent a trap for fauna are identified, they must be sealed or fitted with escape devices (basins, ditches, pits, etc.) to prevent any risk of trapping or drowning.

The planned shut-off devices and the solutions implemented to eliminate the risks must be provided. This documentation will ensure that the protection measures put in place are appropriate and correctly applied throughout the site.

Refer to the good practice guide - Fauna traps page 134.

Requirements
3.2.3 Encouraging the free movement of fauna In order to promote ecological connectivity and ensure the free movement of terrestrial fauna, the site must have at least two lines of fencing (north, south, east and west) permeable to the passage of fauna. The structures provided, whether fences, walls or other features, must be adapted to include devices to facilitate the free movement of fauna. These features may take the form of openings in the fences, raised areas, planted hedges, wooden ganivelles or any other arrangement enabling animals to cross the areas without obstacles. A plan detailing the facilities and locating the fauna crossings will be provided to ensure that they are effectively integrated into the project. *Refer to the good practice guide - Free movement of fauna page 140.*
3.2.4 Integration of fauna-friendly features Fauna-friendly features should be installed. These elements can provide a habitat, a refuge, a source of food or a watering place. All species can be targeted (insects, birds, reptiles, chiropterans and other mammals such as hedgehogs). The choice of target species must be consistent with the initial assessment of the fauna present on site and must follow the ecologist's recommendations. A plan detailing the location of these elements will be provided. This plan must also include a clear justification for the choice of elements in relation to the specific ecological needs identified on the site. Consideration will be given to working with a structure or organisation dedicated to the professional integration of disabled or disadvantaged people, to make the nesting boxes, cottages, shelters, etc... *Refer to the good practice guide - Fauna shelters page 143.*

3.3 - Witnesses in favour of biodiversity

Requirements

3.3.1 Ecological Coherence Index (ECI)

- ECI ≥ 5

3.3.2 Determining the ECI

The Ecological Coherence Index (ECI) is monitored at each phase of the project. It is used to assess the vegetated areas of the project in terms of :

- Ecological role (shelter, breeding site, etc.) ;
- Services rendered (cultural services, etc.) ;
- Taking account of existing ecological potential (conservation of an ecological corridor, reduction in built-up areas, etc.).

It is based on :

- Assessing ecological continuity ;
- Characterisation of habitats ;
- Preservation of the site's key ecological features.

To establish the ECI, the hGAF must first be calculated.

Calculation principle :

1. **Categorisation of criteria** :

The table assesses various aspects of biodiversity, grouped under a number of headings:

- **Preservation**: Conservation of existing species and habitats.
- **Functionality**: Capacity of the site to support biodiversity and maintain its ecological functions.
- **Restoration**: Actions aimed at improving or restoring natural environments and their ecological continuity.

2. **Points awarded** :

Each action or impact is associated with a score:

- **Negative points (-1, -2, -3)** in the event of degradation or failure to preserve key biodiversity elements (e.g. destruction of remarkable trees, disruption of ecological corridors, elimination of ecological functions).
- **Positive points (+1, +2, +3)** in the event of improvement or addition of elements favourable to biodiversity (e.g. diversification of habitats, increase in soil permeability, addition of ecological functions).

3. **Select the level obtained** :

- For each type of criterion (e.g. diversity of macro-habitats, micro-habitats, permeability, etc.), **a single level is retained.**
- This means that successive levels of the same criterion are not added together. Example: If a project presents three different macro-habitats, **2 points** are awarded, but not **1 point for two habitats + 2 points for three habitats.** Only the level corresponding to the highest score is retained.

4. **Calculating the total score** :

- The points obtained in each category after applying the above rules are added together.

- The final score is compared with a threshold (in this case 5 points) to check Effinature compliance.

			Justifications
Evidence of local rarity of plant species on the site			
No preservation of near-threatened species (NT)	-1		
No preservation of threatened species (VU, EN)	-2		
No preservation of endangered species (CR)	-3		
Building or infrastructure footprint indicator			
No preservation of remarkable trees with cavities	-2	-2	Felling a cavity tree for health reasons
No preservation of nest-bearing trees	-2		
Failure to preserve habitats identified as critical or important for the conservation of local biodiversity	-2		
Building and/or infrastructure impacting the integrity of the ecological continuities present in the initial state	-2		
Building and/or infrastructure breaking the integrity of the ecological continuities present in the initial state	-3		
Evidence of ecological functionality linked to biodiversity and support for the site's species (feeding, reproduction, refuge, migration, etc.)			
Loss of ecological functionality	-1		
Loss of at least two ecological functions	-2		
Evidence of the diversity of macro-habitats: meadows, woodland, ponds, green roofs, etc.			
Presence of at least two different macro-habitats	1		
Presence of at least three different macro-habitats	2	2	Meadow, intensive roof, fruit hedge
Presence of at least four different macro-habitats	3		
Evidence of the diversity of micro-habitats			
Presence of at least two different micro-habitats	1		
Presence of at least three different micro-habitats	2		
Presence of at least four different micro-habitats	3		
Evidence of the creation of areas			
≥ 2 SBA connected to each other or to ecological continuity			
SBA ≥ 3% of the surface area of the plot			
Permeability indicator			
hGAF > hGAF expected x 10%	1	1	hGAF: 0.35 > 0.3 (expected hGAF)*10%.
hGAF > hGAF expected x 20%	2		
hGAF > hGAF expected x 30%	3		
Evidence of ecological functionality linked to biodiversity and the support of species on the site (feeding, reproduction, refuge, migration, etc.)			
Addition of an ecological function not present in the initial state	1		
Addition of two ecological functions not present in the initial state	2	2	Refuge and feeding area for fauna
Control of the role of feeding sites			
Presence of only seasonal food sources	1	1	Fruit trees
Annual food source	2		
Evidence of ecosystem services			
At least two ecosystem services provided	1	1	Flood control (large area of open ground); supply service
	Total	**5**	
	Effinature requirements	**5**	**Compliant**

3.4 - Installation of beehives

With increasing urbanisation, over 40% of pollinator species are threatened with extinction. In response to this crisis, the installation of beehives in urban areas to reintroduce pollinators has become increasingly common.

However, the excessive establishment of beehives in cities can endanger the diversity of wild pollinators. Honey bees, such as *Apis mellifera*, are often more efficient and less selective in their choice of plants to forage on than wild pollinators, leading to increased competition for pollen and nectar resources. While the density of beehives in natural environments is generally around three per square kilometre, some urban areas record densities of up to 10 to 15 beehives per square kilometre, which is highly detrimental to wild pollinator species. It is therefore crucial to limit the number of hives in urban areas, and to ensure that they are properly managed to protect all pollinators.

Requirements

3.4.1 Restriction on the number of hives

The installation of beehives within the project right-of-way must comply with the following principles:

- Comply with current local regulations on beekeeping, as defined by the competent authorities;
- A maximum of one hive per km² may be installed within the project area.

A plan of the location of the hives is expected

As there are no beehives on the project, this criterion is not applicable.

3.4.2 Support from beekeepers

When installing beehives on the project site, the company must seek advice from a professional beekeeper or a local beekeeping association.

The beekeeper must provide a note setting out how the hives are to be installed, the maintenance required and any recommendations.

As there are no beehives on the project, this criterion is not applicable.

3.4.3 Materials used to build the hives

The building materials used must be sourced locally. Where wooden beehives are installed, the wood used must be untreated and unpainted.

As there are no beehives on the project, this criterion is not applicable.

Requirements

3.4.4 Nectar and pollen resources

The installation of beehives must be accompanied by the planting of local melliferous species in their vicinity (within a maximum radius of 1.5 km). The quantity and type of plant species planted will be decided by the ecologist.

As there are no beehives on the project, this criterion is not applicable.

3.5 - Environmental impact assessment

Requirements

3.5.1 Prefectoral decree of the environmental authority "fauna section".

If the project, or more broadly the development area in which it is located, has been subject to :

- An Environmental Impact Assessment (EIA);
- A screening procedure to determine the need for a full impact assessment;
- An impact study for protected or sensitive areas, in accordance with local or international regulations;
- An application for a derogation to protect endangered or protected species;
- An application for authorisation for activities affecting forests or requiring land conversion;
- Or an application for authorisation to manage water resources or activities that have an impact on water.

The prefectoral decree from the environmental authority will be forwarded. All reservations and recommendations made must be strictly respected and incorporated into the project, where appropriate.

In the absence of regulatory procedures, this criterion is not applicable.

Reducing the impact of the project

Criteria	Requirements
Initial pollution	Assessment of the environment in terms of pollution Demolition waste
Reducing light pollution	Assessment of outdoor lighting Night-time environment: measures implemented for outdoor lighting
Reducing noise pollution	Quietness corridor: controlling noise pollution
Quality and responsible sourcing of wood	Wood quality Origin of the wood

4 - Reducing the impact of the project

4.1 - Initial pollution assessment

Requirements

4.1.1 Assessment of the environment in terms of pollution

An analysis of light and noise pollution on the site will be carried out. It will include :

- Identifying and assessing any pollution;
- Description of the environments affected or likely to be affected;
- Maps showing the location of polluted areas;
- Pollution-emitting facilities in the vicinity or within view of the site.

4.1.2 Demolition waste

The aim of this requirement is to ensure responsible waste management, by encouraging reuse and recovery before disposal, in line with the principles of the circular economy and reducing the environmental impact of construction sites. The traceability of waste and its treatment in the appropriate channels are fundamental elements in complying with regulatory and environmental requirements. In the case of waste from demolition work, a detailed report must be drawn up, including the following information:

- Their location ;
- Their nature (wood, concrete, metal, etc.) ;
- Their quantity (quantified estimate of the volume of waste produced) ;
- Treatment costs (assessment of expenditure associated with waste management and treatment).

Priority should be given to :

- Possibility of re-using materials on site or in other projects;
- Waste recovery techniques: implementation of methods to transform waste into resources (recycling, energy recovery, etc.);
- Treatment or disposal channels: use of the most appropriate solutions, respecting environmental principles and current regulations.

This document is partly used to draw up the Construction Site Waste Management Plan during the construction phase page 91.

In the absence of demolition waste, this criterion is not applicable.

4.2 - Reducing light pollution

Artificial light profoundly disrupts ecosystems and is a major threat to living things. Although artificial lighting has improved human comfort, it has also caused significant harm to all species, whether nocturnal or diurnal, including humans. All species, with a few exceptions, depend on the natural cycles of day and night to regulate their metabolism, reproduction and behaviour. The disruption of these cycles by artificial light at night (indoor and outdoor lighting) is known as light pollution.

Light pollution has devastating consequences. It affects species at a biological, physiological and behavioural level (attraction or repulsion), and has a cascading impact on ecosystems and the relationships between species. Attracted from a distance by light sources, certain insects, for example, find themselves trapped and exposed to predation by light-tolerant bat species (pipistrelles). The latter thus have a competitive advantage over light-tolerant bat species (murins, rhinolophids), which are deprived of part of their food resources. This example

illustrates the impact on insect populations, which are decimated, the indirect impact on flora, many species of which depend on moths for pollination, and the impact on other, more discreet bat species, which are just as threatened, if not more so. The effects are also measurable on diurnal species whose sleep is disturbed by artificial light. The domino effect extends to the entire ecosystem.

To protect the night-time environment and minimise the effects of light pollution, it is crucial to design lighting systems that have as little impact as possible. This includes using well-directed luminaires, reducing light intensity, avoiding certain colours of light and limiting lighting times, in order to preserve the periods of darkness that are essential to the functioning of ecosystems.

Requirements

4.2.1 Assessment of outdoor lighting needs

A detailed report must be provided, specifying the project's external lighting requirements. This report should include information on the areas requiring lighting, the types of use associated with each area (security, regulatory, decorative lighting, functional lighting, etc.) and the times when the lighting will be used.

Requirements

4.2.2 Night-time environment: measures implemented for outdoor lighting

Outdoor lighting must meet the following requirements:

- Be sized according to **a prior assessment of actual needs**;
- **Comply with current regulations**;
- **Avoid superfluous lighting**, in particular the illumination of objects, indirect lighting and facades;
- **Do not illuminate natural areas** (green spaces, semi-natural areas, watercourses, wetlands, refuges, nesting boxes), unless required to do so by law;
- Integrate an **automated management system** to dim the light or detect presence;
- Be equipped with a **twilight clock** ;
- Install a **night-time switch-off system**;
- Use light sources with a **colour temperature ≤ 2400°K** ;
- **Do not emit light towards the sky** (ULR - Upward Light Ratio = 0%) ;
- **Exclude omnidirectional luminaires** with no optical control (e.g. non-directional reflectors).

All lighting that is not subject to a regulatory code must comply with the above requirements.
All of these requirements must be incorporated into the written contract documents. Expected deliverables include:

- Luminaire data sheets ;
- Luminaire layout plan ;
- An illuminance study ;
- A false-colour rendering map, produced using simulation software such as DIALUX or equivalent.

Refer to the good practice guide - Lighting and light pollution page 163.

In the absence of external lighting, this criterion is not applicable.

4.3 - Reducing noise pollution

Noise pollution is a major disturbance for wildlife, as it interferes with vital acoustic communication between individuals. Many species, such as birds, are forced to adapt their vocal behaviours—like singing or calling—in response to surrounding noise. In some cases, they are even driven to abandon excessively noisy habitats. This type of disruption directly affects species that rely on sound for key aspects of their life cycle, including reproduction, navigation, territorial defence, and social interaction.
By preserving the ecological continuity required by noise-sensitive species, the Quietness Corridor plays a crucial role in maintaining habitats with favourable acoustic conditions. It helps limit the impact of noise on wildlife behaviour and health, thereby contributing to the prevention of biodiversity loss. Excessive noise impairs species' ability to communicate, detect predators, or find mates—disruptions that can cascade through entire ecosystems. Reducing harmful sound levels in natural environments is therefore essential to protecting ecological balance and the interactions that depend on it.

Requirements

4.3.1 Quietness corridor: controlling noise pollution

The aim is to preserve **sensitive ecological zones** (e.g. nesting areas) on the plot by limiting the acoustic impact of the technical equipment and to **ensure the presence of quiet areas**, by preserving at least :

- 25% of the floor area (excluding the building footprint) in quiet areas (green) ;
- 50% of the surface area at tree height in the moderate zone (yellow or green) ;
- 50% of the green roof area in a moderate zone (yellow or green) OR no habitat requirements on the green roof (nest boxes).

Legend	Noise levels	Description
Quiet zone	< 30 dBA	Quiet levels, preferred area at night
Moderate zone	Between 30 and 35 dBA	Moderate levels, even calm for a daytime period
Noisy area	Between 35 and 45 dBA	Noise levels quite disturbing for fauna
Area avoided	> 45 dBA	Very noisy noise levels for fauna, but possible passage area for certain species of insects or for avifauna feeding or pollination

Noise levels will be calculated on the plot at several heights:

- On the ground, at a height of 0.5m ;
- At the height of the trees/nesting boxes (relevant height to be confirmed with the acoustician by the ecologist) ;
- Green roof terrace where applicable .

These zones will make it possible to maintain refuge areas on the plot, and to allow undisturbed crossing of the plot so as not to fragment the territory of the individuals.
The ecologist will have to ensure that the quiet zone corresponds to the areas of ecological interest identified, and that the landscape and habitat requirements are given priority in these areas.

A report will include a description of the external technical equipment and the results of the calculations, together with sound maps showing the location of noisy equipment and the distribution of the different zones - *Refer to the good practice guide - Sound maps page 154.*
If the objective of conserving sensitive ecological areas is not achieved, acoustic treatment (e.g. acoustic screen, sound trap, etc.) must be installed to achieve the required levels. A report will present the results of the calculations incorporating the treatment implemented, which must be included in the written contract documents.

Note :
1. If a residual noise measurement is carried out on the plot as part of the noise impact study on the neighbourhood, it may help to refine the weighting of the zones described above and reinforce the relevance of the analysis.
In certain special cases, which are particularly favourable from an acoustic point of view, calculations can be dispensed with in order to comply with this requirement: special case with only single flow CMV ventilation on a roof NOT covered with vegetation (no air handling unit, heat pumps, variable refrigerant volume).
2. This requirement means that **an acoustician will have to be commissioned to produce the noise maps**, but this does not require any initial noise measurements, only modelling.

In the absence of noisy external technical equipment, this criterion is not applicable.

4.4 - Quality and responsible sourcing of wood

For development projects using natural materials such as wood, it is essential to give careful thought to the type of development desired. This should include an assessment of the availability of local or regional resources capable of supplying high-quality, sustainable materials that are suited to the requirements of the project. Whether wood, stone or other natural resources are involved, the origin of the materials must be a determining criterion, ensuring that their use supports the local economy and complies with environmental and social standards.

Analysing local supply chains also involves ensuring that the materials selected are suited to the environment and climatic conditions specific to the project site. The durability, resistance and environmental impact of the materials must be taken into account in order to guarantee the long-term viability of the developments.

Requirements

4.4.1 Wood quality

The wood used comes from a farm committed to sustainable resource management, guaranteed by certification issued by an accredited body.
For example:

- FSC (Forest Stewardship Council) certification ;
- PEFC certification (Programme for the Endorsement of Forest Certification) ;
- Or any other recognised equivalent certification.

This requirement must be clearly stipulated in the contractual documents.

This requirement applies to all types of wood used in the project, whether for structures, interior or exterior fittings, joinery or any other use of wood.

In the absence of wooden fittings, this criterion is not applicable.

4.4.2 Origin of the wood

Wood should sourced as locally as possible. If regional or national supplies cannot meet the needs of the project, wood from neighbouring regions or countries will be accepted as an alternative. Justification will be required.

The use of exotic woods is not permitted.

This requirement must be included in the written contract documents.

In the absence of wooden fittings, this criterion is not applicable.

User well-being

Criteria	Requirements
User well-being indoors	Interior common areas
Sensory stimulation through landscaping	Plant diversity Food-producing spaces Natural sound Olfactory sensory experience Tactile experience and diversity of textures
Social links and awareness-raising	Strengthening social ties Raising awareness of biodiversity

5 - User well-being

Contemporary research has highlighted a scientifically recognised phenomenon: Natural Deficit Disorder, popularised by author Richard Louv in his book 'Last Child in the Woods' (2005) to describe the negative consequences for physical and mental health of a growing disconnection with nature. Scientific studies support the idea that lack of contact with nature can lead to an increase in anxiety disorders, depression and social difficulties, particularly in children and in urban environments where access to nature is limited. In response to this deficit, urbanisation that is mindful of the well-being of users is essential.
Green spaces in the urban environment become essential, not only for their ability to improve quality of life, but also for their role in regulating heat, sight, smell and sound. Scientific studies show the importance of integrating natural features both inside and outside buildings to reconnect users with nature. Whether it's through indoor plants, green walls, aromatic gardens or nourishing spaces, every initiative helps to reduce the harmful effects of urbanisation. These measures also help to raise residents' awareness of biodiversity and the need to preserve ecosystems in the urban environment.
So, in order to overcome the syndrome of a lack of nature, it is essential that urban design focuses on the well-being of users, by incorporating natural elements that stimulate the senses, foster social cohesion and enrich the urban experience by reconnecting people with the natural environment.

5.1 - User well-being indoors

Designing indoor communal spaces with natural elements offers many benefits, including the creation of soothing and aesthetically pleasing environments. These features help to improve the general well-being of users and strengthen their connection with nature. The presence of indoor plants, such as green walls, in working environments is recognised for its calming effect, reducing stress and promoting concentration and productivity.

Requirements

5.1.1 Interior common areas

The project must incorporate at least one of the following points in the interior common areas (e.g. entrance hall, vertical and horizontal corridors serving the various floors, waiting areas, etc.) accessible to all users, to improve their well-being:

- Window, ceiling panel or lightbox featuring natural landscapes or nature imagery to create a sense of well-being in the darker areas of the building
  AND potted plants adapted to indoor conditions to strengthen the connection with nature ;
- Photographs or paintings incorporating natural elements
  AND potted plants adapted to indoor conditions to strengthen the connection with nature ;
- Water fountain or water wall, to create a calming atmosphere
  AND potted plants adapted to indoor conditions to strengthen the connection with nature ;
- Green wall or green ceiling, to improve visual comfort for users.

These elements must be included in the written contract documents. A plan showing the location of the elements implemented will be provided.

5.2 - Sensory stimulation through landscaping

The sensory stimulation provided by landscaping plays a key role in reconnecting people with nature, particularly in urban environments. By mobilising the senses through natural elements such as water, mineral and plant textures, soft sounds and subtle smells, these spaces create an immersive experience that helps to soothe the mind and restore well-being. This approach is a response to Nature Deficit Disorder, a concept describing the deleterious effects of disconnection from the natural environment on mental and physical health, particularly in children and city dwellers.

Landscaping should favour sustainable, undemanding plant species that are water-efficient, low-maintenance and favourable to biodiversity. Aromatic plants, fragrant foliage, varied textures and hardy plants with discreet flowering can create a sensory-rich landscape without resorting to resource-hungry annuals.

Integrated into both public and private spaces, this landscape becomes more than a setting: it becomes a living sensory journey, stimulating sight, hearing, smell, touch - even taste - and helping to soothe, awaken and reconnect. It's a reminder of how essential regular access to well-tended natural spaces that respect living things is for overall balance, both individually and collectively.

Requirements

5.2.1 Plant diversity

Landscaping must contribute to both visual stimulation and the enhancement of local biodiversity. The choice and layout of plant species should favour a wide variety of shapes, heights, textures and colours, while encouraging species that are perennial, resilient and beneficial to living organisms (pollinating insects, birds, etc.).
The plant palette must incorporate at least two of the following three criteria:

- A combination of deciduous and evergreen species to provide visual interest throughout the year.
- A variety of shades and colours in the choice of foliage, bark and flowers, to create a living, evolving and attractive landscape.
- Staggered and continuous flowering, ideally covering the period from April to October, to maintain the attractiveness of the site while providing regular resources for fauna.

The use of local, melliferous, hardy species that consume little water will be strongly encouraged, while annual horticultural species, which are not very favourable to biodiversity, should be avoided.

A landscape note or contextual study must accompany the project, specifying the plant choices made and how they meet the objectives of aesthetics, sustainability and ecological enhancement.

5.2.2 Food-producing spaces

Nourishing landscapes – such as vegetable gardens, orchards, fruit hedges and plantations of edible species – allow users to discover and consume food-producing plants while fostering a direct connection with nature. These areas offer both practical and educational experiences, encouraging interaction with plants and active participation in food production.
The project must include at least one **food-producing space** within the outdoor green areas, accessible to all users. This space may be located directly in the ground or in raised installations, depending on soil quality and site constraints.
Examples include (non-exhaustive list):

- Fruit hedges or berry bushes ;
- Vines ;
- Aromatic plant gardens ;
- Orchards ;
- Vegetable gardens.

The food-producing area must include at least **two edible species**, suited to local conditions, and must offer users the opportunity to harvest and consume fruits, vegetables, or herbs.
A report will present the integration of this feeding area into the site's landscaping, specifying at least the type of landscaping, the choice of location, the species selected and any maintenance required.

Requirements

5.2.3 Natural sound

Natural sounds have a relaxing effect and contribute to well-being. Landscaping can be used to create soothing soundscapes that reduce urban noise and enhance the feeling of tranquillity.
The design of the project must include a dedicated landscaped area in the outdoor green spaces, accessible to all users (non-exhaustive list):

- A calm body of water or a pond, attracting wetland fauna and generating soothing sounds;
- Densely planted copses and hedges, encouraging the presence of songbirds and providing a habitat for local fauna;
- Trees with light foliage, whose rustling in the wind creates a pleasant soundscape;

- Natural materials for pathways (e.g. gravel, wood shavings), producing a soft crunch under footsteps;
- Any other element that promotes natural, harmonious sound immersion.

A report will present the integration and relevance of this development within the site's green spaces, describing at least the type of development selected, specifying its location on a plan and the objectives pursued.

The characteristics of the chosen layout will be included in the written contract documents.

5.2.4 Olfactory sensory experience

Aromatic plants and fragrant flowers enrich the olfactory experience for users. By carefully selecting plant species for their olfactory qualities, green spaces can offer a stimulating sensory journey, where each season reveals new scents. The plant palette should include aromatic plants, preferably planted at the foot of facades, at the entrance to lobbies or along pedestrian access routes, so that users can enjoy the scent of the flowers.
The planting plan and list of species will be forwarded.

Requirements

5.2.5 Tactile experience and diversity of textures

Stimulating the sense of touch in green spaces enriches the sensory experience of users, offering them opportunities to connect physically with nature. By incorporating a variety of tactile elements, such as plants with different textures, natural materials and interactive installations, landscaping can enhance overall well-being.
The design of the project must incorporate at least one feature in the outdoor green spaces, accessible to all users, to encourage them to touch (non-exhaustive list) :

- Façades planted with climbing plants rooted at the foot of the façade, preferably in the ground;
- Tree bark of various textures (e.g. birch, plane tree, cork oak, etc.);
- Furniture in untreated wood (e.g. benches, tables and sculptures in untreated wood, etc.) ;
- A garden made up of plants with downy, rough, smooth, thorny, thin or thick leaves;
- Smooth or rough rocks placed in green spaces so that users can touch them and sit on them.

A report will present the integration of this development within the site's green spaces, describing at least the type of development selected and specifying its location on a plan.

The characteristics of the chosen layout will be included in the written contract documents.

5.3 - Social links and awareness-raising

The well-being of users depends as much on the physical facilities as on the ability of the spaces to encourage social interaction and awareness of nature. Incorporating social zones, such as areas dedicated to relaxation or shared activities, strengthens community cohesion.

At the same time, raising user awareness of biodiversity through educational initiatives reconnects them with their environment and promotes behaviour that respects nature.

Requirements

5.3.1 Strengthening social ties

The project must include a space dedicated to conviviality and exchanges between the site's users (e.g. heart of the block, shared vegetable garden, communal green spaces). This space must also include at least one amenity to promote well-being, from among the following options (non-exhaustive list):

- An area for outdoor meals (picnic tables, benches, etc.);
- A relaxation area (benches, wooden deckchairs, etc.);
- A composter for bio-waste management;
- A children's play area or activity area for adults (sports course, pitch, etc.), using natural shock-absorbing surfaces such as standardised wood shavings, gravel without geotextile, or a flexible cork floor in the case of facilities accessible to people with reduced mobility.

These facilities must be designed to encourage users to take ownership of them and guarantee universal accessibility. A presentation report will be provided, specifying :

- a description of the spaces and facilities provided,
- a plan showing the location of the facilities.

The characteristics selected will be included in the written contract documents.

Requirements

5.3.2 Raising awareness of biodiversity

Sharing knowledge of biodiversity with the general public is an essential way of encouraging people to take ownership of environmental issues and to adopt practices that respect nature. The dissemination and exchange of knowledge plays a key role in educating users and raising their awareness of the site's specific ecological features.
As part of the project, at least one educational device will be integrated into the communal green spaces to inform users about local biodiversity and the measures taken to preserve it.
These materials can take a variety of forms (explanatory panels, QR codes linking to digital content, educational trails, etc.) and will include elements such as :

- Identification of local species: vernacular names of the main species in the biotope in question;
- Illustrations and visual aids (before/after comparisons);
- Accessible information content;
- Enhancing outstanding features (cavity trees, dead trees, etc.);
- A description of the facilities present (shelters, scree, nesting boxes, etc.);
- Practical advice for users: good ecological management practices, citizen involvement in the upkeep and preservation of natural areas;
- Recognition of those involved in the project: mention of the stakeholders involved in the process (local authorities, associations, consultancies, companies involved, etc.);
- Other relevant information: project developments, links to additional resources, participatory initiatives.

Note: To maximise the impact of these signs on users, IRICE encourages the personalisation of information by highlighting the auxiliaries present on the site. This can be done by creating a story around the site, identifying the main beneficials in a fun and educational way (for example: "I'm here to get rid of mosquitoes!", "I'm very useful in helping to pollinate", etc.), and involving users in the process. This approach will make the information more engaging and give users a better understanding of the essential role played by beneficial insects in the site's ecosystem.

Valuing skills

Criteria	Requirements
Support for the Effinature ecological charter	Effinature ecological charter
Raising awareness of biodiversity issues	Biodiversity Partner training and accreditation Awareness-raising session for design-phase stakeholders
Professional skills of teams	Ecologist's skills Skills of the soil scientist or qualified structure Landscaping skills Hydrological engineering skills Beekeeper skills

6 - Valuing skills

6.1 - Support for the Effinature ecological charter

For a project to be favourable to biodiversity, it is imperative that the decisions taken during the design phase are implemented on site. It is therefore necessary to adopt a methodology for informing, raising awareness and supporting companies in the implementation of an innovative and remarkable project for urban biodiversity.
Joining the Effinature ecological charter means subscribing to a list of commitments that contribute to an exemplary approach to assessing and promoting biodiversity in the property sector. By signing up, members undertake to be monitored in the field and by documentary means in their actions to promote biodiversity, in particular:

- Preservation;
- Implementing best practice ;
- Raising awareness among all stakeholders.

Membership entitles you to :

- Be identified in the directory of stakeholders taking part in an Effinature-certified project;
- Communicate on its participation in an operation to promote biodiversity .

Requirements

6.1.1 Effinature ecological charter

The Effinature ecological charter must be signed and returned.

The exhaustive list of professionals involved in the improvement plan must mention for each person involved :

- The affiliating entity ;
- Full name ;
- Role within the project ;
- Contact details.

This list is added to throughout the project during the implementation phase.

6.2 - Raising awareness of biodiversity issues

To ensure that a project is set up in a way that respects biodiversity issues, it is essential to inform and raise the awareness of every player involved in managing the project. This is why the Biodiversity Partner must be able to provide proof of an Effinature training certificate. The aim is to understand the Effinature approach, as well as the issues and methodologies involved in protecting, preserving, conserving and managing biodiversity in a property development. The Biodiversity Partner thus becomes the guarantor of the proper application of the guidelines by all those involved in the project.

Requirements

6.2.1 Biodiversity Partner training and accreditation

The Biodiversity Partner must provide valid accreditation related to the New Constructions standard. This accreditation is granted for a period of three years. When it expires, the Biodiversity Partner will have to take part in a renewal training course to maintain its accreditation, thereby extending its entitlement to work under the certification scheme for a further period of 3 years.

6.2.1 Awareness-raising session for design-phase stakeholders

An awareness-raising session will be conducted by the Biodiversity Partner, either individually or in a group setting. This session must involve at least the following stakeholders:

- The project owner ;
- The architect ;
- The landscape architect.

At the end of the meeting, a list of participants will be signed by each participant and sent to the assessor. This list of professionals sensitised by the Biodiversity Partner should include the following information:

- The affiliating entity ;
- Full name ;
- Role within the project.

The content of the awareness-raising meeting must at least make the link between :

- The challenges of urban biodiversity ;
- Data from the site's fauna, flora and soil inventories;
- Areas or individuals of trees to be preserved on the site.

Awareness-raising materials will be sent out.

6.3 - Professional skills of teams

Requirements

6.3.1 Ecologist's skills

Ecological assessments are carried out by an ecologist who must be able to demonstrate at least 3 years' significant experience in this area of expertise over the last 5 years. The CV and diplomas or references of the ecologist over the last 5 years will be provided to the assessor to verify this requirement

6.3.2 Skills of the soil scientist or qualified structure

The diagnosis of the ecological and agronomic quality of the soil must be carried out by a soil scientist or a specialist company with at least 3 years' experience in soil evaluation over the last 5 years. The service provider must demonstrate its skills by providing references from recent projects that clearly demonstrate its expertise in this field.

6.3.3 Landscaping skills

The landscaping company's skills will be assessed on the basis of its references over the last 5 years, in order to guarantee its ability to meet the specific requirements relating to the plant palette and its suitability for the quality of the soil

Particular attention will be paid to the possibility of collaborating with a structure or organisation that promotes the professional integration of people with disabilities or people in precarious situations, while respecting the specificities and the local context.

6.3.4 Hydrological engineering skills

Rain water management and infiltration schemes (e.g. valleys, ditches, infiltration trenches, etc.) must be designed and sized by a professional with proven expertise in urban hydrology.

The service provider or consultancy firm responsible for this part of the project must be able to justify :

- At least 3 years' experience in the following areas: soil permeability studies, runoff modelling (small rainfalls and ten-year rainfalls), and the design of integrated rain water management systems ;
- references from recent projects (completed within the last 5 years) demonstrating its ability to design and implement this type of functional and resilient landscaping.

In the absence of a sustainable rainwater management system on the site, this criterion is not applicable.

Requirements

6.3.5 Beekeeper skills

When installing beehives, the company is obliged to seek advice from a professional beekeeper or a local beekeeping association.

Documents attesting to competence and experience in this area of expertise will be given to the assessor to verify this requirement.

As there are no beehives on the project, this criterion is not applicable.

IMPLEMENTATION PHASE

Preserving living soil

Criteria	Requirements
Choice, quality and origin of soil inputs	Analysis of the soil brought in Traceability of inputs
Soil conservation	Soil conservation Updating the hGAF (harmonised Green Area Factor) Site installation plan (SIP) "ground section"

7 - Preserving living soil

7.1 - Choice, quality and origin of soil inputs

The success of a landscaping project depends above all on the quality of the soil. If topsoil is brought in from outside, its characteristics must be compatible with the nature of the planting (green spaces, vegetable gardens).

Requirements
7.1.1 Analysis of the soil brought in If soil is to be added, it must be : • Find out where the soil comes from by means of a delivery note; • Provide a physico-chemical analysis of the soil supplied, carried out in a laboratory accredited by the local accreditation body; • Let the ecologist demonstrate the correlation between the imported soil and the needs of the plants.
7.1.2 Traceability of inputs In line with the country's commitment to sustainable ecological management, no synthetic chemical products will be used. The expectations for the inputs are as follows: • Organic matter: the ecologist will need to check their quality and consistency in relation to the soil (pH, etc.); • Mineral elements: these should only be of natural origin (gypsum, limestone, sand, etc.). The traceability of inputs documents prove the conformity of supplies. This includes : • Invoices; • Delivery notes.

7.2 - Soil conservation

Requirements

7.2.1 Soil conservation

To preserve the soil and prevent any destruction or settling, measures must be taken during the construction phase:

- Map open spaces not affected by the project in order to protect them;
- Install traffic areas at the level of future sealed rights-of-way to limit settlement of these areas. Where it is not possible to avoid open ground areas, load distribution plates should be installed to protect the soil from heavy loads;
- Evacuate and drain rainwater to avoid stagnant water ;
- Limit the use of heavy machinery in sensitive areas to be preserved in order to reduce soil compaction, and encourage the use of manual intervention and/or light machinery in preserved areas of open ground;
- Taking account of climatic hazards (work only on dry ground and in dry weather, etc.) ;
- Decompact the soil before any re-spreading operation.

In order to justify the implementation of these measures, the following information will be provided:

- Soil management plan incorporating protection measures ;
- Mapping of open-ground areas to be preserved and temporary traffic lanes ;
- Site meeting reports attesting to the application of the measures, with dated photographs of the protections put in place (distribution plates, protective fencing, etc.).

Refer to the good practice guide - Soil management and enhancement page 84.

7.2.2 Updating the hGAF (harmonised Green Area Factor)

Compliance with the hGAF and the percentage of open ground will have to be verified, the requirements remaining unchanged.
The plan of the works carried out (as-built documentation) must be submitted to certify that the planned surfaces have actually been installed.

Requirements

7.2.3 Site installation plan (SIP) "ground section"

A site installation plan including a section dedicated to **soil management** must graphically reflect the issues at stake on the site, the location of areas of soil deterioration or risk of deterioration and the areas protected from settlement phenomena linked to site activities.

Representation on a plan of the temporary ground areas by marking the location:

- Cleaning areas, concrete plant, storage areas;
- Formwork and reinforcement workshop workstations;
- From the life base to the machine shelters ;
- Access roads, parking facilities, pedestrian and machine traffic;
- Site fencing.

The ecologist will issue an opinion on the site installation plan dedicated to soil management
Note: *It is possible to submit a global SIP including soil, flora, fauna and pollution aspects.*

Development of plant heritage

Criteria	Requirements
Preserving the original plant heritage	Measures to preserve plant heritage Site installation plan (SIP) "flora section" Site visits by the ecologist Flora incident reports
Management plan	Planning of greening works Description of pruning techniques Discovery of invasive alien plant species (IAS) during the construction phase Updating the Ecological Value Index (EVIimplementation phase)
Implementation of a Structured Biodiversity Area (SBA)	Structured Biodiversity Area (SBA)
Water resource management plan	Sustainable rainwater management systems
Green waste management	Planning and monitoring the disposal of green waste Updating the Site Valuation Index (SVI)
Choice, quality and origin of plants	Plant traceability Validation of plant health on delivery Validation of the health status of installed plants

8 - Development of plant heritage

8.1 - Preserving the original plant heritage

During the worksite, it is essential to preserve the key flora present on the site. The programme of preservation measures is based on detailed surveys carried out during the initial study phase.

Requirements

8.1.1 Measures to preserve plant heritage

In the event of work requiring the use of heavy machinery, to reduce the risk of altering the development or silhouette of the existing vegetation, it is advisable to :

- Protect tree trunks 2/3 of the way up using suitable devices (e.g. wooden planks, pipes, etc.);
- Mark out a minimum protection zone around retained trees, corresponding to the vertical projection of the crown;
- Mark the key areas identified in Initial flora assessment ;
- Prohibit parking, machine traffic and storage within one metre of the tree markers. This prohibition may be illustrated by an awareness sign posted on the worksite.

A site report including photographs must be provided to certify that the markings have been installed correctly.

Refer to the good practice guide - Preservation of existing trees during the worksite phase and soil management page 166.

8.1.2 Site installation plan (SIP) "flora section"

A site installation plan including a section dedicated to the **management of flora** must graphically show the footprints of tree protection and the fencing of sensitive vegetated areas identified by the ecologist.

The motorised vehicle network will be developed without impacting areas of ecological interest listed in Initial flora assessment. The base camp should be located away from ecologically sensitive areas (watercourses, wetlands, ecological corridors, etc.).

The ecologist will issue an opinion on the worksite installation plan dedicated to the management of flora.

Note: *It is possible to submit a global SIP including soil, flora, fauna and pollution aspects.*

Requirements

8.1.3 Site visits by the ecologist

The ecologist must carry out at least two site visits during the works to ensure that the planned environmental measures are being properly implemented. The purpose of these visits will be to check (non-exhaustive list):

- Setting up protection systems for preserved plants ;
- Waste collection and management ;
- Effective marking of the site to prevent the passage of fauna and limit disturbance ;
- The storage of hazardous products in specific, secure areas, in accordance with current recommendations.

At the end of each visit, a report must be provided. This must include at least :

- The date of the visit ;
- A list of the points checked ;
- Specific observations, particularly in the event of non-compliance with Effinature recommendations or requirements, with detailed remarks and corrective proposals if necessary.

Note: *Beyond the two visits initially planned, the number of visits by the ecologist may be adjusted according to the ecological issues specific to the site and its surroundings. For example, areas that are home to protected species, sensitive habitats or ecological corridors may require closer monitoring.*

8.1.4 Flora incident reports

When management operations result in unplanned intervention that affects the integrity of the flora, the company is obliged to seek advice from the ecologist.

Case studies:

- Excavations reveal the existence of roots essential for feeding a tree ;
- Raising soil levels by filling in and suffocating the collar ;
- Storage of equipment or materials in the root zone ;
- Earthworks causing damage to the root system (breakage, uprooting, etc.) ;
- Breakage, uprooting, injury to trunk or carpenter branch...

Data relating to the incident is recorded in the "flora" incident report, which includes :

- The date of the incident ;
- Impacts (short and medium term, temporary and permanent, etc.) ;
- The treatment used to resolve the incident...

8.2 - Management plan

Requirements

8.2.1 Planning of greening works

The contractor responsible for the external works package must provide a technical brief covering all planting works, including the following elements:

- Compliance with the planting plan defined during the design phase;
- Identification of networks that may affect planting operations;
- Transport and storage of plant materials;
- Preparation of areas to be planted;
- Planning of greening works and sequencing of planting stages in a coherent and adapted manner;
- Details of the installation of the irrigation system.

8.2.2 Description of pruning techniques

Any preparatory work on tree crowns or tree felling requiring dismantling is carried out by qualified tree trimmers.

A pruning technical brief will be provided and will contain:

- Methods of execution (deadlines, periods, safety, etc.) ;
- Damage prevention ;
- Prophylactic measures[3] ;
- Details of pruning and felling services...

In the absence of pruning on the project, this criterion is not applicable.

8.2.3 Discovery of invasive alien plant species (IAS) during the construction phase

In the event of the discovery of residual or new invasive exotic plant species during the construction phase, the measures established by the ecologist should be implemented (see page 45). The ecologist must be alerted before any work is carried out.

The site report associated with this discovery will be transmitted and will present the actions implemented.

If no invasive alien plant species have been discovered, this criterion is not applicable.

Requirements

8.2.4 Updating the Ecological Value Index ($EVI_{implementation\ phase}$)

During the implementation phase, the $EVI_{implementation\ phase}$ is updated to analyse any discrepancies with the $EVI_{initial}$.

$EVI_{implementation\ phase} \geq EVI_{initial}$

[3] Prophylactic measures are preventive actions taken to prevent the onset, spread or aggravation of diseases, infections or other risks to health and the environment.

8.3 - Implementation of a Structured Biodiversity Area (SBA)

Requirements

8.3.1 Structured Biodiversity Area (SBA)

The project must certify that the SBA is effectively implemented on site in accordance with the following conditions:

- Planted in the open ground or on roofs/terraces with a substrate of at least 60 cm ;
- Minimum surface area: 1% of the plot and at least 30 m² ;
- Unused, undeveloped space with no furniture or landscaping ;
- Visible presence of at least two ecological components: a waterhole with an ecological function, a living hedge or multi-layered copse, dead wood or natural shelters (piles of stones, leaves, branches, etc.), open plant cover, spontaneous layers or plant thickets, partial bare ground favourable to pioneer flora ;
- Free-range management, without phytosanitary products, differentiated mowing for ecological purposes authorised ;
- Signs to inform users and protect the area.

A descriptive note written by the Biodiversity Partner or ecologist must be provided to certify that the SBA has been implemented correctly.

8.4 - Water resource management plan

Requirements

8.4.1 Sustainable rainwater management systems

All the sustainable rainwater management systems provided for in the design phase (see criterion 2.7.1) must actually be installed on site. Depending on the conclusions of the feasibility study, this may involve recovery systems (cisterns, underground tanks, etc.) or management solutions at source such as valleys, ponds, rain gardens, recessed green spaces, ditches or infiltration zones.

The conformity of the installation must be certified by the supply of :

- delivery notes or invoices for equipment installed (for technical devices) ;
- and/or geotagged and dated photos, or any other proof that the landscaping or infiltration works have actually been carried out.

In the absence of rainwater management systems, this criterion is not applicable.

8.5 - Green waste management

The work usually involves removing plants. Although commonly referred to as "green waste", plants still have considerable value and can still be recycled in a specific way.

Requirements

8.5.1 Planning and monitoring the disposal of green waste

In its technical brief, the company will describe the methods used to manage green waste in a waste management plan that includes at least :

- Where waste is transported;
- Details of waste by type and estimated quantities;
- Means of control, monitoring and traceability.

8.5.2 Updating the Site Valuation Index (SVI)

Verification of SVI compliance ≥ 40%.

8.6 - Choice, quality and origin of plants

The construction of a site requires the input of materials and plants in addition to the reuse of those already present on the site. The importance attached to the origin of the plants selected reflects the project's commitment to a sustainable approach by supporting environmentally-friendly production.

To ensure that inputs are favourable to the biodiversity of a site, it is necessary to set requirements that must be met. Plants are sensitive to injury and disease, which can put them at risk and require safety measures or felling after a few years. To avoid this, it is necessary to be vigilant and demanding when receiving plants.

The presence of wounds or disease weakens trees, limiting their life expectancy and posing a safety risk. Replacing a tree in the short term is not conducive to the development of biodiversity. A disease carried by a tree is likely to develop in other trees and cause contamination in several susceptible trees through the gradual spread of the infectious factor. Physiological and sanitary quality are important factors in the choice of plant inputs.

Requirements

8.6.1 Plant traceability

The Biodiversity Partner will ensure that the plants delivered to the site comply with the contractual commitments of the holder of the Green Spaces package.

This verification will be based on the collection of delivery notes, invoices or any other equivalent document.

8.6.2 Validation of plant health on delivery

All plant deliveries will be received by the company responsible for the Green Spaces work package, assisted by the ecologist, who will check the health of the plants. If the state of health of the plants received presents an anomaly :

- Health defects: diseases, parasites, wounds, necrosis ;
- Structural weaknesses affecting the solidity or viability of the plant ;
- Root defects: deformed or underdeveloped root system, damaged root collar, unsuitable branching ;
- Other non-conformities compromising plant recovery,

The ecologist may refuse to accept them. Any anomalies will be recorded in a report and the decision must be duly justified in writing.

Requirements

8.6.3 Validation of the health status of installed plants

If any non-compliance with expected plant health standards is noted during the works, the ecologist may decide to replace them.

The list of species replaced and the list of new species to be planted as replacements should be sent.

In the absence of plant replacement, this criterion is not applicable.

Support for local fauna

Criteria	Requirements
Preserving fauna	Preventive measures Methods for earthworks/clearing operations Limiting the crushing of microfauna Site Installation Plan (SIP) "fauna section" Exemption from work during periods deemed "sensitive" Fauna incident reports Eliminating the mirror effect Filling trap cavities
Witnesses in favour of biodiversity	Updating the Ecological Coherence Index (ICE)

9 - Supporting local fauna

9.1 - Preserving fauna

In the case of green spaces of ecological interest, it is important to protect them from the nuisances and risks of destruction generated by vehicle traffic, so that they can continue to develop optimally. There are two main types of nuisance:

- Vehicles destroy surface environments through compaction;
- Motor vehicles generate pollution, most often of hydrocarbon origin, emitted directly by the vehicles (discharge of pollutants), or indirectly through pollution of run-off water, which is loaded with pollutants and infiltrates the ground.

It is estimated that on a road with 60 vehicles per hour, mortality is of the order of 90% in the absence of specific crossing infrastructure for amphibians. However, for most species, 40% mortality is enough to cause a significant decline. It is important to take into account the presence of microfauna, mainly arthropods, small mammals and reptiles. Machine traffic is a source of destruction for this fauna.

It is therefore essential to allow terrestrial fauna to move freely through walls and fences and to find alternative solutions.

Requirements

9.1.1 Preventive measures

Fauna conservation measures must be implemented in accordance with the Fauna preservation programme (page 55) and the following provisions during the construction phase:

- Elimination of the mirror effect of the glazing in the cantonment (installation of stickers, shading systems, etc.) ;
- Daily site cleaning ;
- The presence of tarpaulins on stored items in spring or during the nesting period (see Sensitive fauna periods and areas on page 54) ;
- Installation of fencing impervious to the passage of fauna (e.g. anti-batrachian netting for a project located near a wetland).

A report, including photographs, must be provided to demonstrate that these measures have been properly implemented.

Requirements

9.1.2 Methods for earthworks/clearing operations

In the event of earthworks or land clearing, and in order to prevent any risk of destruction of species, particularly reptiles, earthworks/clearings will be carried out at a slow speed (5 km/h), from the inside of the site towards the outside, to allow any fauna to escape in the right direction.

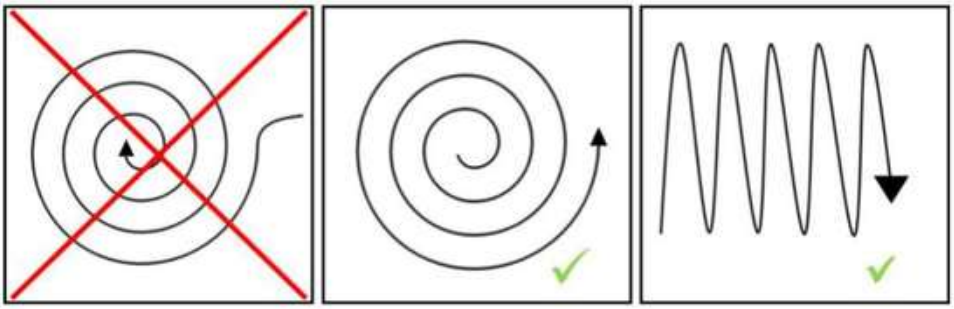


Diagram illustrating brushcutting and mowing practices that have the least impact on biodiversity (©Jérôme VOLANT)

A report, accompanied by photographs, must be provided to prove that these measures have been properly implemented. If this method of proof proves difficult to obtain, the Biodiversity Partner must justify having made the company responsible for the earthworks aware of this issue.

Refer to the good practice guide - Methodology for land clearing and earthworks page 140.

Requirements
9.1.3 Limiting the crushing of microfauna To limit the risk of crushing microfauna, machine and vehicle traffic will be limited to 20 km/h on the site. Depending on the size of the project, devices such as speed bumps will have to be installed in the traffic zones. A snapshot of the systems is expected.
9.1.4 Site Installation Plan (SIP) "fauna section" A site installation plan including a section dedicated to **fauna management** must graphically show the location of sensitive areas and fauna protection measures in relation to the site: • Sweeping areas for the crane and concrete plant; • From the life base to the machine shelters ; • Access roads, footpaths and machinery; • From site fencing... The motorised vehicle network is developed without impacting the areas of ecological interest listed in the Initial fauna assessment (page 53). **The ecologist will issue an opinion on the site installation plan dedicated to fauna management.** Note: *It is possible to submit a global SIP including soil, flora, fauna and pollution aspects.*

Requirements

9.1.5 Exemption from work during periods deemed "sensitive"

For any work to be carried out during a period designated as sensitive, proof of the obligation to carry out the work must be provided, specifying the reasons and the need for the work.
If protected or rare species are involved, certain actions may require the agreement of the instructing authorities and an assessment by a nature protection commission or equivalent environmental body. In this case, the agreement of the competent authorities will be provided.

A site visit by an ecologist is compulsory to assess the environmental issues. The ecologist's conclusions and recommendations following this visit must be respected and incorporated into the works. A contextual action plan will also be provided to demonstrate that the impact of the works on fauna will be limited. This must be drawn up by the ecologist appointed by the company responsible for the relevant work package.

Note: If work is interrupted, the land must be maintained in a state that is inhospitable to fauna
If there are vegetated areas, they must be mowed/cut twice a year, between September and October and between February and March, to ensure that this condition is maintained. Work must be resumed after these mowings, when the vegetation has not grown back.
If the work must be resumed during the summer (between May and August), regular mowing to keep the vegetation below 20 cm is authorised to prevent species from entering, provided that the discontinuity and resumption of the work are justified.

9.1.6 Fauna incident reports

Where the work involves unplanned intervention that could harm fauna, the company is obliged to seek advice from an ecologist.

Data relating to the incident is recorded in the "fauna" site incident report, which includes :

- The date of the incident ;
- Impacts (short and medium term, temporary and permanent, etc.) ;
- The treatment used to resolve the incident...

Requirements

9.1.7 Eliminating the mirror effect

It will be necessary to ensure that all glazed surfaces identified as being at risk by the ecologist have been treated. This verification will be based on the collection of proof of traceability, such as delivery notes or invoices for the treatments carried out.

In the absence of any risk of mirror effect and therefore of treatment of glazed surfaces, this criterion is not applicable.

9.1.8 Filling trap cavities

All identified trap cavities must be sealed.
This includes

- Cavities in the building (ventilation grilles, air vents, etc.) ;
- Those discovered during the construction phase (open pipes, hollow posts, manholes, waste, etc.).

Compliance will be verified on the basis of traceability proof, such as delivery notes or invoices for devices used on the building, as well as site reports for elements treated during the works.

In the absence of trap cavities, either on the building or during the construction phase, this criterion is not applicable.

9.2 - Witnesses in favour of biodiversity

Updating the Ecological Coherence Index (ECI) during the operational phase provides a means of comparison with the forecasts made. Analysis of the data reveals the causes of any discrepancies observed. Feedback will lead to the choice of more relevant project orientations from the design phase onwards.

Requirements

9.2.1 Updating the Ecological Coherence Index (ICE)

- ICE ≥ 5

The calculation method is described in "Determining the " on page 58.

Reducing the impact of the project

Criteria	Requirements
Site supervision	Biodiversity site coordinator during the construction phase
Pollution treatment and risk prevention	Prevention of pollution risks Pollution incident reports
Waste management programme	Waste management plan Waste monitoring Site Installation Plan (SIP) "pollution section"
Reducing light pollution	Site lighting management Lighting compliance installed
Reducing noise pollution	Quietness corridor: controlling noise pollution Noise and vibration management
Choice, quality and origin of wood	Wood quality Origin of the wood

10 - Reducing the impact of the project

10.1 - Site supervision

Requirements

10.1.1 Biodiversity site coordinator during the construction phase

A **biodiversity site coordinator** must be appointed for the entire construction phase. This role may be fulfilled by the site manager, the works supervisor, or the construction project manager.

The biodiversity coordinator is responsible for informing and raising awareness among the site team regarding biodiversity issues identified by the ecologist on the site and its surroundings. To this end, they will receive a short training session delivered by the ecologist.

The coordinator will serve as the key point of contact between all construction stakeholders, enabling workers to refer to them in case of doubt or unforeseen events. They will also act as the on-site lead responsible for ensuring compliance with biodiversity protection measures stipulated in the contractors' agreements. They must continuously monitor the implementation of measures aimed at avoiding and reducing impacts on biodiversity. This includes surveillance of the site perimeter and the enforcement of measures to limit disturbance to flora and fauna (e.g. tree trunk protection, fencing of sensitive zones, compliance with designated machinery paths, etc.).

If the coordinator identifies a problem, or if other workers report biodiversity-related issues, they must inform the ecologist. Together, they will determine the appropriate response strategy based on the ecological and regulatory importance of the issue, and define the actions to be taken.

The biodiversity site coordinator must then inform the relevant contractors of the required actions as soon as possible. They are also responsible for recording their observations and actions in the site meeting reports.

Their commitment will be formalised by signing the Effinature ecological charter. The training support material for the coordinator, along with the attendance sheet, must be provided.

Note : *A checklist-type document could be sent to the Biodiversity Partner, containing the elements to be checked (sealing of trap cavities, anti-batrachian net correctly installed, etc.) and an alert diagram in the event that the Biodiversity Partner finds evidence of the presence of animals (feathers, eggs, etc.) or species sheets (in the event of the presence of invasive exotic species identified during the initial assessment), so that the Biodiversity Partner can be contacted.*

10.2 - Pollution treatment and risk prevention

Requirements

10.2.1 Prevention of pollution risks

To reduce the risk of pollution on site, preventive measures must be taken:

- Management of polluting fluids (retention tank, appropriate method of use, storage, etc.) to prevent accidental spills of hazardous products (fuel, lubricant, solvent, etc.) ;
- Hazardous product tracking sheets ;
- Dust limitation (sprinkling runways in dry weather, cutting in the workshop, etc.) ;
- Protection of water resources in the organisation of cleaning operations (installation of retention tanks to collect water used to wash tools, concrete skips, decantation, etc.) ;
- Use of site machinery in good condition, equipped with anti-pollution kits ;
- Storage of chemical products (signs, fire prevention, etc.) ;
- Establishment of a follow-up procedure by the company in the event of accidental pollution ;
- Signage at the site including at least: the name and contact details of the works company's environmental manager and the Biodiversity Partner.

A report setting out all the preventive measures put in place will be provided.

10.2.2 Pollution incident reports

If the work involves unplanned intervention that could cause pollution, the company is obliged to seek advice from the Biodiversity Partner.

A site incident report must specify :

- The date and location of the incident ;
- Sources of pollution ;
- Temporary and permanent impacts and functional losses ;
- The corrective measures implemented to remedy the situation (recovery of polluted materials, pumping, containment, restrictions on use, etc.) and their justification ;
- Approvals for the final destination of pollution residues (recycling centre, storage centre, etc.) ;
- Monitoring procedures (control measures, etc.).

A map of accidental pollution will locate the source of emission and the perimeter of contamination. The background map is identical to that used for the SIPs.

10.3 - Waste management programme

Requirements

10.3.1 Waste management plan

The waste management plan must enable the company to detail the treatment of waste generated on site, specifying :

- Operating procedures ;
- Alternatives to landfill ;
- Valuation opportunities.

It must include :

- Identifying and classifying the types of waste produced ;
- The choice of treatment or disposal methods depending on the category of waste and its location;
- Organisation of waste transport ;
- Control, traceability and monitoring systems ;
- Measures to optimise waste sorting (containers indicating the nature of the waste, bins with hinged lids for household waste, planning the number and type of containers according to volume and recoverable waste, etc.) ;
- Recovery methods (reuse, recycling, composting, methanisation, etc.).

All companies must sort waste on site. The site must be equipped with signposted skips for the selective sorting of wood, metals, hazardous waste, inert waste, etc.

The management plan and visuals of the sorting bins will be provided.

10.3.2 Waste monitoring

Waste tracking slips guarantee traceability and compliance of treatment. These documents must be sent for all waste produced on site. 100% of slips are recovered.

Requirements
10.3.3 Site Installation Plan (SIP) "pollution section" A site installation plan including a section dedicated to **pollution management** must graphically show the location : • Storage areas for skips or other containers used for sorting waste; • Site access points and machinery traffic. **The ecologist will issue an opinion on the site installation plan dedicated to fauna management.** Note: *It is possible to submit a global SIP including soil, flora, fauna and pollution aspects.*

10.4 - Reducing light pollution

Requirements
10.4.1 Site lighting management The site lighting system should be directed towards the ground to limit light pollution. Motion detectors will be installed in strategic locations, such as in areas requiring occasional lighting (access to the base camp, loading and unloading areas, access to storage areas, etc.). Their precise location will be defined in consultation with the Biodiversity Partner.
10.4.2 Lighting compliance installed When the work is handed over, it should be checked that the lighting used complies with the requirements set out in the chapter Reducing light pollution (page 66). The supporting documents required for this verification are as follows: • Invoices ; • Technical data sheets ; • Delivery notes.

10.5 - Reducing noise pollution

Requirements

10.5.1 Quietness corridor: controlling noise pollution

If acoustic treatment has been necessary to achieve the levels required in accordance with Reducing noise pollution (page 67), invoices and delivery notes for the equipment installed must be supplied.

In the absence of acoustic treatment, this criterion is not applicable.

10.5.2 Noise and vibration management

Noise pollution on the site will be reduced by :

- Cutting and pre-cutting parts in the workshop ;
- The use of equipment with limited noise pollution (e.g. electrical equipment) ;
- Reducing remote communications within the worksite (e.g. use of radio links) ;
- Supply management in terms of keeping to schedules and reducing the number of vehicles (grouping deliveries) ;
- Checking that equipment is in good condition ;
- Setting up site access points and traffic routes in place of turning areas ;
- Etc ...

A report setting out all the measures put in place will be provided.

10.6 - Choice, quality and origin of wood

Landscaping a green space or communal living area requires solid materials of a certain quality. In order to use the most natural and environmentally-friendly materials, wood is chosen for all landscaping. It is therefore necessary to set requirements regarding its quality and origin. Its quality is a measure of how well it will stand up to outdoor use, and an indication of how the forest from which it comes has been managed. An eco-managed forest is much better for the environment. Its origin indicates the number of kilometres it will travel to reach its destination. Reducing this number as much as possible helps to limit transport-related pollution.

Requirements

10.6.1 Wood quality

Where wood is used (structure, fittings, joinery, etc.), traceability must be justified by :

- An invoice clearly stating :
  - Certified products concerned ;
  - The product label[1] ;
  - The certificate number associated with the certified product.
- The corresponding delivery note.

The origin of the certified wood (FSC, PEFC or equivalent) must be justified by the official **time-stamped** certificate, which can be downloaded from the official online databases:

- FSC: https://search.fsc.org/fr/
- PEFC : https://pefc.org/find-certified

The certificate provided must specify :

- Certificate number or licence code
- The expiry date of the certificate (current validity required at the time of delivery) ;
- The precise scope of the certification (products, species concerned and specific labels).

The technical data sheet for the product(s) concerned must also be supplied for further verification.

Note

[1] Labels :

- FSC: "FSC Mixed", "FSC Recycled" or "FSC 100%".
- PEFC: "PEFC Certified X%", "PEFC Origin X%" or "PEFC Recycled".

In the absence of wooden fittings, this criterion is not applicable.

10.6.2 Origin of the wood

A delivery note showing the origin of the wood is required.

In the absence of wooden fittings, this criterion is not applicable.

User well-being

Criteria	Requirements
User well-being indoors	Interior common areas
Sensory stimulation through landscaping	Plant diversity Food-producing spaces Natural sound Olfactory sensory experience Tactile experience and diversity of natural textures
Social links and awareness-raising	Strengthening social ties Raising awareness of biodiversity

11 - User well-being

11.1 - User well-being indoors

Requirements
11.1.1 Interior common areas The element(s) relating to the fitting out of **interior common areas**, selected as part of the operation (page 71), must be supported by invoices and delivery notes. Once installed, photographs should also be sent to IRICE.

11.2 - Sensory stimulation through landscaping

Requirements
11.2.1 Plant diversity Biodiversity Partner will check that the plant palette delivered to the site complies with the contract signed by the contractor responsible for the external landscaping package, in relation to **the two landscaping aspects** selected for the project (page 73). It will collect evidence, including delivery notes and invoices for the plant pallet delivered. The species covered by this criterion must be clearly identified on these documents.
11.2.2 Food-producing spaces The Biodiversity Partner will check that the plant palette delivered to the site complies with the contract signed by the contractor responsible for the external landscaping package, in line with **the landscaping chosen for** the project (page 73). It will collect evidence, including delivery notes and invoices for the plant pallet delivered. The species covered by this criterion must be clearly identified on these documents.

Requirements
11.2.3 Natural sound The element relating to the development of a **quiet zone for users**, selected as part of the operation (page 73), must be justified, depending on the development, by means of invoices, delivery notes or photographs.
11.2.4 Olfactory sensory experience The Biodiversity Partner will check that the plant palette delivered to the site complies with the contract signed by the contractor responsible for the external landscaping package, in relation to **the aromatic plants** selected for the project (page 74). It will collect evidence, including delivery notes and invoices for the plant pallet delivered. The species covered by this criterion must be clearly identified on these documents.
11.2.5 Tactile experience and diversity of natural textures The **sensory element(s)** selected as part of the operation (page 74) must be supported, depending on the layout, by invoices, delivery notes or photographs.

11.3 - Social links and awareness-raising

Requirements
11.3.1 Strengthening social ties The element(s) relating to the development of **frequented areas**, selected as part of the operation (page 75), must be justified, depending on the development, by means of invoices, delivery notes or photographs.
11.3.2 Raising awareness of biodiversity The **educational device(s)** integrated into the common green spaces as part of the operation (page 76) must be supported by invoices, delivery notes or photographs.

Valuing skills

Criteria	Requirements
Support for the Effinature ecological charter	Effinature Charter
Raising awareness of biodiversity issues	Biodiversity Partner training and accreditation Awareness-raising session for construction contractors
Proven professional skills of the teams	Green Spaces company Pruner skills

12 - Valuing skills

12.1 - Support for the Effinature ecological charter

Requirements
12.1.1 Effinature Charter The Effinature charter for the works phase must be returned signed. The exhaustive list of entities involved in carrying out the project includes all the companies involved in this phase. It mentions for each : • Name; • Its role in the project ; • Contact details.

12.2 - Raising awareness of biodiversity issues

To ensure that biodiversity issues are genuinely taken into account during the project, it is essential to train and inform all the companies involved in the worksite.

Requirements
12.2.1 Biodiversity Partner training and accreditation The Biodiversity Partner must provide valid accreditation related to the New Constructions standard. This accreditation is granted for a period of three years. When it expires, the Biodiversity Partner will have to take part in a renewal training course to maintain its accreditation, thereby extending its entitlement to work under the certification scheme for a further period of 3 years.

Requirements

12.2.2 Awareness-raising session for construction contractors

An awareness-raising session will be conducted by the Biodiversity Partner, either individually or in a group format. This session must involve at least the following stakeholders:The main contractor ;

- The main contractor ;
- The site manager of the green spaces company ;
- The site manager responsible for earthworks and external works ;
- The site manager responsible for structural works.

At the end of the session, an attendance sheet must be signed by each participant and submitted to the assessor. This list of trained professionals must include the following information:

- Affiliated company or entity ;
- Full name ;
- Role within the project.

The content of the awareness-raising session must establish a clear link between:

- Biodiversity issues specific to the construction phase ;
- Site-specific data from fauna, flora, and soil analyses.

The awareness-raising material will be provided.

12.3 - Proven professional skills of the teams

Requirements
12.3.1 Green Spaces company skills The Green Spaces company's skills will be assessed on the basis of its previous references, thus ensuring that it is able to respond adequately to specific requirements, such as respect for plants and the soil. Consideration will be given to working with a structure or organisation dedicated to the professional integration of people with disabilities or in precarious situations.
12.3.2 Pruner skills The presence of qualified tree trimmers is mandatory when working on the crown of a tree or felling that requires dismantling. Their technical skills ensure respect for the plant and safety rules, which is why the pruning company undertakes to provide : • Employee CVs; • Their references. ***In the absence of pruning operations, this criterion is not applicable.***

Ecological balance sheet

Criteria	Requirements
Estimated investment in biodiversity	The Ecological Endowment Index (EEI)
Effinature ecological report - End of operation	Ecological assessment at the end of the operation

13 - Effinature ecological report

13.1 - Estimated investment in biodiversity

Requirements

13.1.1 The Ecological Endowment Index (EEI)

The Ecological Endowment Index (EII) was developed to evaluate the financial investments made by the manager for biodiversity on operations. Comparing EDIs makes it possible to establish the trend in budgets allocated to these commitments.

It is calculated as follows: **EEI = (IB / TPO)*100**

with :

- IB = (investments for biodiversity (expressed in euros) including the costs of actions for the conservation of biodiversity) - (subsidies and financial aid)
- TPO = Total project cost (expressed in euros)

The sum of capital expenditure takes account of expenditure relating to :

- Restoring, preserving and enhancing biodiversity (black ecological corridor, cost of shelters, etc.);
- Fees paid to the Biodiversity Partner, the ecologist and the landscape architect;
- Ecological and technical studies;
- Green spaces;
- Soil analysis ;
- Training and awareness-raising;
- Certification, etc.

Subsidies and financial assistance potentially allocated to the project are deducted from the investment. The calculation must be accompanied by documentary evidence of the costs incurred (invoices, share calculations, etc.). The project owner and manager must sign the certificate stating that they are aware of the results. Impermeable surfaces and outdoor furniture (lampposts, litter bins, etc.) are not taken into account when calculating the index.

13.2 - Effinature ecological report - End of operation

Requirement

13.2.1 Ecological assessment at the end of the operation

The Biodiversity Partner must complete the ecological assessment at the end of the operation, intended to inform the site operator about the biodiversity and environments present, in order to facilitate the implementation of relevant and appropriate management actions. This report will include the following information

- A summary of initial conditions (soil, habitats, fauna, flora) ;
- Assessment of the ecological quality of the soil in its initial state (results, presence or absence of pollutants, etc.) and the soil management plan, where applicable;
- The results of the certification indices (hGAF, EVI, SVI and ICE) with the values in the design and construction phases ;
- Details of the plant palette (ground, roof, facade), specifying the number of individuals per species, the percentage of indigenous species, melliferous/polliniferous species and species with a high allergenic potential ;
- The landscape master plan ;
- A list of fauna facilities (nesting boxes, shelters, scree slopes, dead wood, etc.), with their location and number;
- Description of the Structured Biodiversity Area (SBA), including its location, surface area, nature of the soil or substrate, ecological components and planned management arrangements ;
- Information on outdoor lighting: technical data sheets on luminaires (colour temperature, ULR, etc.), their location, number, presence of motion detector, twilight clock or luminous flux dimming system, etc ;
- Photographs of the various facilities (various green spaces, green roofs, fauna shelters, outdoor lighting, etc.) ;
- The list of invasive alien plant and/or animal species identified ;
- The invasive alien species management plan, including the species for which action has been taken ;
- Any water resource management systems ;
- The device(s) for reducing the mirror effect and eliminating trap cavities ;
- Amenities for users (interior fittings, nurturing areas, landscaped frequented areas, etc.) ;
- And any other element deemed relevant to enrich the ecological assessment and contribute to the sustainable and optimal management of the site.

APPENDICES

Good practice guide	Soil management and enhancement Assessing the ecological quality of soils Choice of plant palette Greening of buildings Operational planning Fauna traps Methodology for land clearing and earthworks Free movement of fauna Fauna shelters Car park surface Sound maps Soil and water remediation Lighting and light pollution Preservation of existing trees during the worksite phase and soil management Using mulch Rainwater management facilities Maintenance of green spaces Raising awareness
Glossary	
Lexicon	
Bibliography	Websites Articles Publication
Intellectual property: Effinature standards, indicators and tools	Scope and legal liability Protection of the Effinature brand Licence and usage rights for indicators and calculation methods Management and control of digital tools associated with Effinature Protecting the contents of the Effinature repository Supervision, appeals and jurisdiction

1 - Good practice guide

1.1 - Soil management and enhancement

Like many territories, many countries are faced with a legacy of pollution where toxic substances have accumulated in groundwater, rivers and soils. Human activities such as industry, urbanisation, transport and agriculture have also contributed to soil degradation.

1.1.1 Managing floors according to the weather and equipment

To protect the soil during the works, it is essential to adopt strategies designed to minimise compaction and maintain soil permeability:

- Avoid soil compaction: The number of vehicle passages should be kept to a minimum to limit soil compaction. In the case of wet soil, it is preferable to wait until the humidity is below field capacity before taking action.
- Prefer light machinery, equipped with tracks rather than tyres, with low ground pressure;
- Preferably work only in dry weather;
- Cover areas not immediately in use with vegetation (grass), even temporarily, rather than leaving them bare or simply mulched, to help the soil dry out quickly after rain;
- Consider access roads and a traffic plan to enable people to get around the site in bad weather.

1.1.2 Recycling unpolluted earth materials

✔ **On site**

Where soil is polluted, a remediation method appropriate to its future use should be used. Unpolluted soil materials can be reused on site (depending on their physical, chemical and biological quality), as :

- Substrate for the garden or green roof ;
- Slopes as a landscape feature ;
- As a retention element for rainwater infiltration.

Storage sites need to be demarcated. The height of the piles must be adapted to the type of material and the duration of storage, to limit the risk of compacting or smothering the soil. Excavated soil should not be stored on sloping ground.

✔ **Off-site**

In the case of unpolluted surplus earth materials, they can be distributed to a composting or gardening company, to another construction company or by the same company on another site . If these earth materials are distributed to another company, the preferred choice should be the nearest one.

1.1.3 Potential for reuse of different types of soil

- **Permeable soils** (with a balanced water regime): these can be recultivated without any problems as long as sufficient drainage is ensured during earthworks. They can be reused on fertile sites where growth is good;
- **Waterlogged soils** (under the influence of slope or groundwater or perched water tables): recultivation is limited, as the soil is often not sufficiently dry to allow earthworks to be carried out for relatively short periods only;
- **Organic hydromorphic soils** (peat soils): these are very difficult to recultivate, as earthworks and the use of machinery are virtually impossible without irreversible damage to the soil structure. They can be reused in nutrient-poor locations.

- **Siliceous soils** (more than 50% silica and less than 10% clay): these can be recultivated if earthworks are carried out exclusively during the vegetation period and only after a dry period of several days. They can be reused under certain conditions for areas still under grass, as they are sensitive to erosion.

1.2 - Assessing the ecological quality of soils

Assessing the ecological quality of soils is essential for understanding and preserving biodiversity. Soils play a crucial role in ecosystems, supporting vegetation, regulating the water cycle and storing carbon. They are also home to a diversity of micro-organisms, essential for decomposing organic matter, maintaining soil structure and cycling nutrients. Sustainable soil management, based on an accurate assessment of soil quality, makes it possible to maintain soil fertility, support biodiversity and guarantee essential ecosystem services.

1.2.1 Analysis

To assess the ecological quality of soils, several key elements need to be analysed:

Physico-chemical properties :

- **Soil texture**: determined by the proportion of sand, silt and clay, it directly influences the soil's ability to retain water and nutrients, as well as its structure and aeration. Knowing the texture is essential for choosing the right plants and soil management practices;
- **Soil pH**: measures the acidity or alkalinity of the soil. Most plants and soil micro-organisms have specific pH ranges in which they thrive. A non-standard pH (4-9) can limit nutrient availability and affect microbial biodiversity;
- **Organic matter (OM)**: a key indicator of soil health, influencing its physical, chemical and biological fertility, water retention capacity and structure. Organic matter can be increased by adding compost or other organic amendments, choosing plant cover crops or limiting biomass exports (dead leaves, branches, mowing residues);
- **Total nitrogen (N)**: an essential plant nutrient. Its availability directly affects plant growth and soil productivity. Soil with a low nitrogen content may require the addition of organic fertilisers to fix atmospheric nitrogen.
- **C/N ratio**: essential indicator of the degradation of organic matter in the soil. It influences the availability of nitrogen for plants and the rate at which organic matter decomposes. A C/N ratio that is too high often indicates that the soil's organic matter is too complex for micro-organisms to break down, which is linked to a blockage in the soil's biological fertility;
- **$CaCO_3$ content**: affects pH and the availability of nutrients, such as phosphorus and iron. Soils rich in $CaCO_3$ require specific management to avoid nutrient deficiencies.

Biological properties :

- **Microbial biomass**: quantity of micro-organisms living in the soil, essentially bacteria and fungi. These organisms play a crucial role in the nutrient cycle, the decomposition of organic matter and soil structure.

1.2.2 Interpretation of results

The thresholds below are used to assess soil quality and identify the management and amendment requirements needed to maintain or improve soil fertility and its ability to support a rich and varied biodiversity, while taking into account possible variations depending on the use of the soil.

	Poor soil	Satisfactory content	Very fertile soil
Organic matter (OM)	< 2%	2% - 5%	> 5%
	Nitrogen deficiency	**Good nitrogen availability**	**High nitrogen content**
Total nitrogen (N)	< 0,1%	0,1% - 0,2%	> 0,2%
	Acid soil	**Optimal**	**Alkaline soil**
pH	< 6	6 - 8	> 8
	Rapid decomposition of OM	**Optimum ratio**	**Slow decomposition of OM**
Carbon/Nitrogen (C/N) ratio	< 9	9 - 12	> 12
	Soil with a neutral, slightly	**Chalky soil**	**Content may affect the**

	acid pH		availability of certain nutrients
Calcium carbonate ($CaCO_3$)	< 5%	5% - 15%	> 15%

✔ **Texture**

There is no specific threshold value for texture, as it depends on the needs of the plants or ecosystems in question. A granulometric analysis is required to determine the proportion of sand, silt and clay. The texture of urban soil is generally determined by the materials used in its construction (fill, waste, aggregates, etc.). For existing soils, it is not the texture that needs to be adapted to the use, but the use (i.e. the plant cover) that needs to be adapted to the texture.

✔ **pH**

A neutral pH of around **6 to 8** is generally optimal for most plants and micro-organisms. Soils with a pH below 6 are considered acidic and may require liming to raise the pH. Conversely, soils with a pH above 8 are alkaline and may require amendments to correct excessive alkalinity, but this is a relatively complex method to implement.

✔ **Organic matter (OM)**

An organic matter content of **to 5%** is generally considered satisfactory for soil fertility. An organic matter content of over can indicate a very fertile soil that is favourable to microbial biodiversity, provided that the quality of this organic matter is satisfactory. Soils with an OM content of less than are often considered poor and require soil improvers to improve their quality .
It should be noted that a satisfactory or high organic matter content is not enough to ensure the agronomic and ecological quality of a soil.

✔ **Total nitrogen (N)**

Total nitrogen levels vary according to soil type and crop. In general, a total nitrogen content **of between 0.1% and 0.2%** is indicative of good nitrogen availability for plants. Values below 0.1% may indicate a nitrogen deficiency, requiring interventions such as the addition of fertilisers or nitrogen-fixing crops .

✔ **C/N ratio (Carbon/Nitrogen)**

The C/N ratio is a key indicator of the breakdown of soil organic matter by micro-organisms and the availability of nutrients for plants. An optimum C/N ratio is generally **between 9 and 12**. Between 12 and 15, decomposition of soil organic matter is slower but still takes place. However, with a higher ratio (>15), soil organic matter is very difficult for micro-organisms to break down, which leads to a drop in soil fertility (unavailable nitrogen, reduced microbial biomass, altered microbial diversity). A lower ratio (<9) may indicate rapid decomposition, rapidly releasing nitrogen but potentially leading to losses of organic carbon in the form of CO_2 and also losses of excess nitrogen through leaching.

✔ **$CaCO_3$ (Calcium Carbonate content)**

The $CaCO_3$ content in the soil is important in determining pH and nutrient availability. Soils with a $CaCO_3$ content **above 5%** are considered calcareous. High levels of $CaCO_3$ (above 5-10%) can affect the availability of certain nutrients, such as iron and phosphorus, and require adjustments to correct nutritional deficiencies in crops.

1.2.3 Recommendations and Amendments

To guide soil management and restoration efforts, it is essential to take into account the results of soil analyses. These analyses provide crucial information on various parameters such as organic matter content, pH, C/N ratio and other quality indicators. Based on these data, different recommendations can be made for each soil quality category, whether high quality, medium quality or low quality. These recommendations aim to maintain, improve or restore the beneficial characteristics of the soil, while promoting sustainable, environmentally-friendly management practices.

✔ **Good quality soil**

Objective: To maintain and preserve the exceptional quality of these soils.

- Sustainable management practices: Limit interventions on existing land, avoiding any activity that could disrupt the structure and natural composition of the soil. This includes restricting urbanisation/sealing projects, excavation activities or landscape modification. Protecting these areas is essential to maintaining their natural state and biodiversity;
- Plant cover: Encourage the maintenance or establishment of spontaneous plant cover, which plays a key role in protecting against erosion and maintaining soil health. These practices also help to support local biodiversity and natural ecosystems;
- Monitoring and observation: Carry out regular monitoring to assess the condition of the soil and identify any potential degradation, maintaining adaptive management practices.

✔ **Low quality soil**

Objective: To improve soil quality by increasing organic matter content and balancing nutrients.

- Organic amendments: Add compost, manure or grass clippings to increase organic matter. This improves soil structure, increases water retention capacity and provides essential nutrients;
- C/N ratio: Ramial Fragmented Wood (RFW[4]) has a high C/N ratio, which means it contains much more carbon than nitrogen. When added to soil, it improves structure and moisture retention. When adding RFW, monitor changes in the C/N ratio so that it does not exceed the optimum range sought. Lowering the C/N is complex.
- pH: If the pH is too acidic, adjust with appropriate calcium supplements such as lime.
- $CaCO_3$: $CaCO_3$ induces a high pH. The main recommendation is to select plants adapted to these conditions.

These recommendations are based on an understanding of the biological, chemical and physical processes in the soil, and aim to create an ecological management of the soil. **It should be noted that these recommendations must be adapted to a number of contextual factors such as the ecological context of the site, local climatic conditions, the intended use of the soil, local regulations and the current state of degradation of the soil**. For precise recommendations tailored to the various specificities of the site, it is always advisable to consult experts in agronomy or soil ecology.

[4] RFW is the result of freshly shredded twigs with a diameter of less than 7 cm and consists mainly of deciduous trees and shrubs (with a maximum of 20% conifers).

1.3 - Choice of plant palette

✔ **Local plant species**

The choice of plants for a landscaping or ecological restoration project must first and foremost be based on the species naturally present in the region. **Local plant species**, also known as **indigenous species**, are those that have developed in a given area without human intervention and are adapted to the climatic, edaphic (soil type) and ecological conditions of the site. Their use helps to preserve the balance of ecosystems and strengthen their resilience in the face of environmental disturbances such as climate change or the appearance of invasive species.

Why favour indigenous species?

Incorporating local species has a number of advantages:

- **Better adaptation to local conditions**: these species have evolved to resist climatic variations and the specific characteristics of the soil, requiring less maintenance, irrigation and fertiliser inputs;
- **Enhancing biodiversity**: they encourage ecological interactions with local fauna, particularly pollinators and other auxiliary insects, which often depend on them for food or reproduction;
- **Ecosystem resilience**: by avoiding the introduction of potentially invasive exotic species, local plants contribute to the ecological stability of the site and reduce the risk of biological imbalances;
- **Enhancing our landscape heritage**: using indigenous plants helps to preserve the plant identity of an area and ensure consistency with the surrounding natural landscape.

Selecting and sourcing local species

To ensure that local plant species are optimally integrated into a project, it is recommended to :

- **Obtain seeds and seedlings from suppliers specialising in local plants**, to ensure that the species selected are well adapted to the region. This is particularly important for flower meadows, where the seed mixes must correspond to the native flora;
- **Favour locally-sourced varieties** in order to preserve the genetic heritage of regional species and avoid the introduction of plant populations from distant origins that may not be suited to the conditions on the site;
- **Take into account the diversity of plant strata** (herbaceous, shrubby, arboreal) to encourage a balance between the different levels of vegetation and create a functional and sustainable ecosystem.

By adopting these best practices, it is possible to design landscaped areas that are aesthetically pleasing, ecologically efficient and in harmony with their natural environment.

✔ **Allergenic potential of plant species**

When choosing plants for landscaping, it is essential to take into account their allergenic potential in order to limit user exposure to allergenic pollen. Some plant species, particularly those **pollinated anemophilously** (i.e. by the wind), produce large quantities of light, volatile pollen that can be carried over long distances and trigger allergic reactions in sensitive people.

Several strategies can be put in place to minimise the impact of allergenic species on human health:

- **Choose species that are pollinated entomophilously** (by insects), whose pollen is generally heavier and stickier, reducing its dispersal in the air;
- **Diversify plant species** to limit the dominance of highly allergenic species and thus dilute their impact on the environment;
- **Avoid dense planting of plants with a high allergenic potential in areas frequented by the public, such as parks, schools or around homes.**

By incorporating these considerations into the design of planted areas, it is possible to reconcile landscaping, biodiversity and user comfort, while strengthening the ecological resilience of the site.

✔ **Invasive and invasive species**

The fight against invasive alien plant species (IAS) is a priority for the preservation of biodiversity and the proper functioning of ecosystems. These species, introduced deliberately or accidentally outside their natural range, can develop excessively to the detriment of native species. Their rapid expansion is often due to the absence of natural predators, a high reproductive capacity and increased resistance to local conditions.

Invasive alien species pose a number of major ecological problems:

- **Competition with local flora:** they take the place of native species by monopolising resources (light, water, nutrients) and modifying the structure of plant communities;
- **Disturbance of ecosystems:** their presence can alter biological cycles, such as pollination and seed dispersal, and modify soils (depletion, acidification, changes to the water regime);
- **Reduced biodiversity:** by gradually eliminating local species, they lead to uniform landscapes and a loss of diversity in flora and fauna. Some species can also release allelopathic substances[5] that inhibit the growth of native plants.

Faced with these threats, it is essential to adopt appropriate management strategies to prevent their introduction, limit their spread and restore damaged environments. Recommended measures include

- **Monitoring and early detection:** identifying invasive species early enables action to be taken before they spread out of control;
- **Control and eradication:** depending on the degree of infestation, different methods can be used (manual removal, regular mowing, grazing, biological control by introducing specific predators, etc.);
- **Ecological restoration:** once invasive species have been eliminated, it is recommended that suitable native species be replanted to prevent rapid recolonisation and restore ecological balance.

Finally, raising awareness among local stakeholders and the general public is a key factor in limiting the introduction and spread of these species. Encouraging the use of indigenous plants and informing people about the risks associated with certain ornamental or horticultural plantings helps to reduce the pressure on ecosystems and promote sustainable landscaping.

✔ **Host plants**

Host plants play an essential role in ecosystems, providing food, shelter and breeding sites for many animal species, particularly insects. They are a key link in the life cycle of many pollinators and other arthropods, helping to maintain local biodiversity.

A **host plant** is a plant species on which an organism - usually an insect - feeds, develops or reproduces. There are two main types of host plant:

- **Feeding host plants,** which provide food directly for the larvae or adults. For example, the caterpillars of the machaon butterfly (*Papilio machaon*) feed exclusively on certain species of plants in the Apiaceae family (such as fennel or wild carrots).
- **Refuge host plants,** which provide shelter for insects and other small animals, offering them protection from predators and adverse weather conditions.

Incorporating host plants into landscaping or greening projects helps to maintain trophic chains and the proper functioning of ecosystems. In particular, they support populations of auxiliary insects (such as ladybirds, predators of aphids) and preserve the diversity of pollinators by providing them with resources adapted to their specific needs.

By selecting a plant palette that includes host plants adapted to local species, we encourage a sustainable ecological balance while limiting the use of phytosanitary treatments. Their presence thus strengthens the resilience of ecosystems and encourages an ecological management approach to green spaces.

✔ **Melliferous/polliniferous plants**

Melliferous and polliniferous plants play a fundamental role in maintaining and developing populations of pollinating insects, such as domestic and wild bees, butterflies and beetles. Their presence contributes not only to preserving biodiversity, but also to improving the resilience of ecosystems by encouraging the pollination of crops and natural areas.

A **melliferous species** is a plant that produces sufficient nectar and/or pollen to attract pollinating insects. A distinction is made between :

[5] The term allelopathic refers to the ability of a plant to produce and release chemical substances that influence the growth, development or germination of other organisms, particularly neighbouring plants.

- **Nectariferous species,** which secrete nectar, a sugary liquid rich in carbohydrates that serves as a source of energy for pollinators. By pollinating these flowers, insects transfer pollen and help plants to reproduce.
- **Polleniferous species** produce large quantities of pollen, which is used as a source of protein and nutrients by insects, particularly bees, which use it to feed their larvae.

Some plant species are of dual interest to pollinators, providing both nectar and pollen, making them particularly attractive. To encourage these essential ecological interactions, it is advisable to include a **diversity of species** spread throughout the year, taking care to **match** them to **the local characteristics of the soil and climate**.

The table below provides a non-exhaustive selection of melliferous and polliniferous plants, classified by type of plant, with an indication of their nectar and pollen content.

Common name	Scientific name	Nectar interest	Pollen interest
TREES			
Cornelian cherry	*Cornus mas*	+	+++
Field maple	*Acer campestris*	+++	+
Raspberry	*Rubus idaeus*	+++	++
Yew	*Taxus baccata*	0	++
Hazel	*Corylus avellana*	0	+++
Apple tree	*Malus dosmestica*	++	+++
Blackthorn	*Prunus spinosa*	+	++
Goat willow	*Salix caprea*	+++	+++
SHRUBS, BUSHES, CLIMBERS			
Strawberry tree	*Arbustus unedo*	++	0
European gorse	*Ulex europaeus*	++	++
Sea Buckthorn	*Hippophae rhamnoïdes*	0	+++
Hawthorn	*Crataegus monogina*	++	++
Alder buckthorn	*Frangula alnus*	+++	+
Boxwood	*Buxus sempervirens*	+	+
Heather (or Ling heather)	*Calluna vulgaris*	+++	+
Sour cherry	*Prunus cerasus*	++	+++
Honeysuckle	*Lonicera sp.*	+++	0
Rockroses	*Cistus sp.*	0	++
Dog rose	*Rosa canina*	++	++
Wall germander	*Teucrium chamaedrys*	++	0
Holly	*Aquifolium Islands*	+	++
Officinal lavender	*Lanvandula angustifolia*	++	0
Climbing ivy	*Hedera helix*	++	++
Olive tree	*Olea europaea*	++	0
Field elm	*Ulmus minor*	+++	0

Common name	Scientific name	Nectar interest	Pollen interest
Poplar sp.	*Populus sp.*	0	++
Rosemary	*Rosmarinus officinalis*	++	+
Elderberry	*Sambucus nigra*	+	++
Common thyme	*Thymus vulgaris*	+++	+
Linden	*Tilia platyphyllos*	+++	++
Wild Privet	*Ligustrum vulgare*	+++	+
Wayfaring tree	*Viburnum lantana*	0	+++

Common name	Scientific name	Nectar interest	Pollen interest
ANNUALS, BIENNIALS, PERENNIALS			
Yarrow	*Achillea millefolium*	++	0
Aster	*Aster sp.*	++	++
Borage	*Borago officinalis*	+++	+
Bellflowers	*Campanula sp.*	++	++
Brown knapweed	*Centaurea jacea*	+++	++
Thistles	*Cirsium sp.*	+++	+++
Black hellebore	*Helleborus niger*	++	++
Musk mallow	*Malva moschata*	0	+++
Lemon balm	*Melissa officinalis*	++	+
Dandelion	*Taraxacum officinale*	+++	+++
Yellow mignonette	*Reseda lutea*	+	++
Sage	*Salvia sp.*	+++	++
Stonecrop	*Sédum sp.*	+++	0

1.4 - Greening of buildings

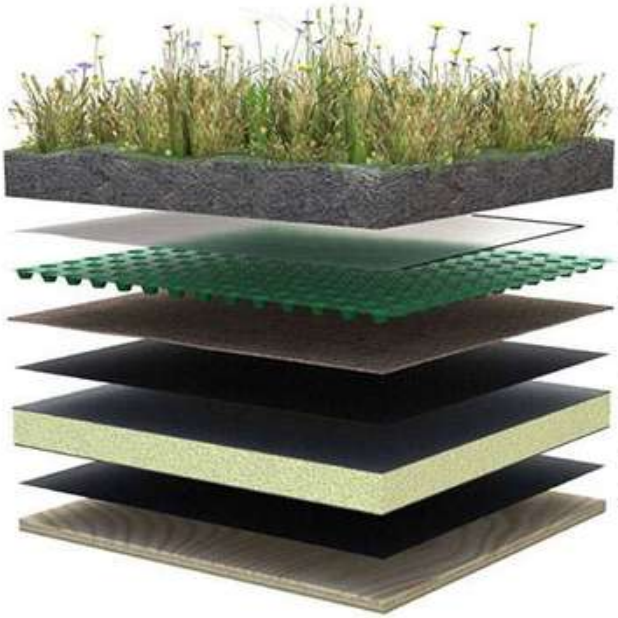
The greening of buildings provides an important additional support for biodiversity in the city, provided that it is appropriate and correctly implemented. The greening of buildings also helps to create corridors conducive to the movement and migration of species.

Green roofing can help restore ecological functions, depending on the systems chosen and how they are maintained. Similarly, the greening of facades can help to establish complementary ecosystems. However, not all systems are equally attractive to biodiversity.

1.4.1 Green roofs

Green roofing is the integration of a vegetated substrate on the roof of a building. The contribution of green roofs to biodiversity depends on three factors:

- Diversification of plant species planted ;
- Increasing and varying substrate thickness;
- The nature of the substrate.



✔

Extens to the roof. The choice of plants is limited for this type o ainly succulents such as sedum or mosses. This type o e lowest ecological impact.

Semi-i of grass, small bushes or ornamental plants. The substra ant than for an extensive roof, since watering is essential. Shrubs may have to be pruned, and more green waste is produced because the vegetation is more abundant than on an extensive roof.

Intensive roofing is similar to the creation of real gardens (substrate height > 30 cm), able to accommodate all strata, including trees. However, the weight of the roof means that installation is a major constraint, as is additional investment.

	Extensive roof	Semi-intensive roof	Intensive roof
Substrate thickness	4 cm to 12 cm	12 cm to 30 cm	>30 cm
Weight	30 to 100 kg/m²	150 to 350 kg/m²	Greater than 500 kg/m²
Slope	0 to 20% *(up to 40% if special arrangements are made)*	0 à 20%	0 à 5%
Type of substrate	Organic elements *(peat, compost, leaf compost, bulbs...)* combined with mineral elements *(lava stone, pumice, expanded clay...)*	Organic elements *(peat, compost, leaf compost...)* combined with mineral elements *(lava stone, pumice, expanded clay...)*	Earthy substrate
Type of vegetation	Sedums, mosses, perennials, grasses	Perennials, bulbs, grasses, shrubs	A wide variety of plants: flowering or foliage plants, shrubs, trees, etc.
Irrigation[6]	Irrigation if necessary	Yes	Yes
Accessibility	Inaccessible	Inaccessible	Accessible
Permitted load-bearing elements	Concrete, steel, wood	Concrete, steel, wood	Concrete
Maintenance	2 times a year	4 times a year	Maintenance of a traditional garden or green space
Reference documents	Professional recommendations for the design and construction of green roof terraces		NF DTU 43.1

Brown roofs are built without vegetation. Brown roofs work on the principle of self-colonisation by plants. Depending on the local building environment, the plant cover can take up to 18 to 24 months to develop. Once the brown roof has established itself through the addition of grain, it becomes self-sufficient.

Rooftop vegetable gardens[7] are green roofs that can be used by city dwellers for ornamental gardening (horticulture and pleasure gardening) or even urban agriculture (vegetable gardens, container gardening). Ornamental gardening is a biodiversity-friendly activity if it respects ecological management techniques (zero-phyto, permaculture, biological control, crop rotation, mixed farming and/or the use of old varieties).

✔ **Benefits**

The installation of green roofs brings many benefits that add value to a property project:

- **Aesthetics**: Enhancing the landscape and integrating buildings into their environment;
- **Thermal insulation** (reduces energy consumption for heating and air conditioning);
- **Acoustic insulation** ;
- **Improved air quality** (capture of heavy metals and VOCs) ;
- **Rainwater retention**: Reducing flooding in urban areas;
- **Protects the waterproofing of the roof**, extending its lifespan
- **Reducing the urban heat island**: Thermal comfort for users ;
- **User well-being**: Creating pleasant spaces and improving quality of life and working conditions (visual comfort);
- **Welcoming and preserving urban biodiversity** ;
- **Creation or reinforcement of ecological continuities in the city**: links up with green spaces.

[6] At least one water point is compulsory on every terrace or green roof. Any point on the terrace must be located within 30 metres of this water source. "Règles Professionnelles pour la conception et la réalisation des terrasses et toitures végétalisées, edition n°3, 2018.

[7] Source: ADIVET. Technical recommendations for urban rooftop agriculture. Edition 2018.

✔ **Substrates and biodiversity**

The substrate is the growing medium on which the flora of a green roof develops. In order to recreate a functional ecosystem, the substrate must have several characteristics:

- Lightweight and airy structure;
- A high proportion of mineral elements to ensure that it lasts over time (around 85 to 90% for extensive and semi-intensive green roofs);
- Water permeability ;
- Moisture retention and diffusion ;
- Resistant to compression and frost.

The composition and nature of the substrate will determine which plants can grow there.

One of the parameters that favours biodiversity is the variation in the type of substrate, creating different environments within a single roof, as well as the variation in substrate thickness (when the structure of the supporting element allows). Granulometry, hydrometry, thickness and exposure to the sun are all characteristics that influence floristic diversity. It is also a good idea to place areas where there is no vegetation to allow the flora to colonise.

As part of Effinature certification, substrates derived from petrochemicals, such as polyester flakes, are banned because of their high environmental impact during the production and recycling processes, as well as their low ecological value (non-nutritive, do not retain water).

In order to create a real ecosystem to replace green spaces, local plants adapted to the local climate should be used. If the type of roof chosen allows, the plant strata should be diversified (herbaceous, shrubby and arborescent). In order to maintain the plants planted, differentiated green space management will be favoured:

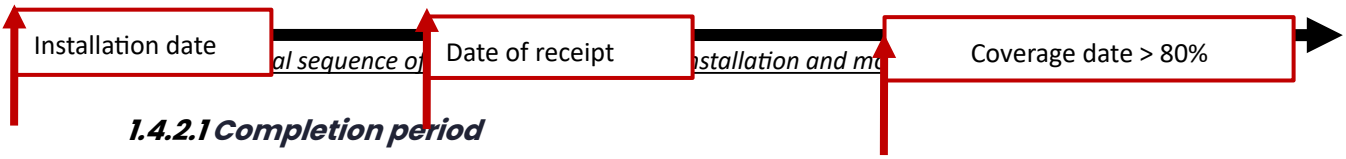
- Mowing should be preferred to mowing, and should be carried out less frequently;
- Avoid regular pruning of trees and shrubs;
- Prohibit the use of pesticides and chemical weedkillers;
- Recycle mowing and pruning waste as compost or mulch for plants;
- Use rainwater for irrigation.

1.4.2 Maintenance and follow-up

Source: adivet, https://www.adivet.net/ressources/regles-professionnelles-pour-toitures-terrasses-vegetalisees/l-entretien

✔ **Three maintenance periods for the vegetation**

Completion period	Period of reinforcement	Routine maintenance period
At the company's expense	To be paid for by the building operator under a maintenance contract	



1.4.2.1 Completion period

Under the responsibility of the contractor, the completion period runs from the installation of the vegetation to acceptance of the work. Its duration varies according to the coordination of the site. Completion work is an integral part of the works contract.

<u>Recommendation</u>: It is preferable to carry out partial acceptance as soon as the planting work has been completed, because of the living nature of the plants. At the request of the contractor, this partial acceptance or, at

the very least, the certificate of completion of the greening work should be drawn up in the presence of the client, the project manager and the contractor.
This document has two functions:

- Check the company's contractual commitments (product quality, compliance with the plan, respect for species, variety, density, etc.);
- Constitute an enforceable document in the event of accidental damage to the plant layer by third parties.

1.4.2.2 Period of reinforcement

Under the responsibility of the project owner, this is the period between acceptance of the work and the start of routine maintenance (see definition below). Its duration varies according to the vegetation method used (see tables below).

1.4.2.3 Routine maintenance period

Under the responsibility of the project owner, this period begins once a coverage rate of 80% or more has been achieved.

A single contract formalises maintenance during periods of reinforcement and routine maintenance. It is accompanied by the technical manual for the vegetation system, specifying the operations to be carried out, which should be requested from the system supplier. Annex I of the RP TTV sets out the standard technical specifications for the maintenance contract, distinguishing between the waterproofing complex, an extensive green roofing system and a semi-intensive green roofing system.

✔ **Maintaining the waterproofing complex**

Without going into the details specified in the DTU series 43, it should be remembered that maintenance of the waterproofing work involves in particular :

- General inspection of visible waterproofing (waterproofing upstands, expansion joints, various penetrations, etc.);
- Inspecting additional visible structures such as elevated walls, acroteria, railings, penetrations ;
- Checking and cleaning rainwater outlets to ensure they are in good working order;
- Removal of dead leaves, rubbish, etc. from sterile areas.

✔ **Maintenance of an extensive vegetation complex**

The main tasks during the **completion** phase are :

- Removal of waste from vegetated surfaces and sterile areas;
- Replacing the substrate if it is displaced by wind or rain;
- Controlling the development and manual weeding of undesirable plants ;
- In the event of failure to recover (partially or totally), additional sowing (seeds or fragments) or planting (of micro-buds or cups) or installation of pre-cultivated elements;
- Supplementary fertilisation in accordance with the recommendations of the owner of the vegetation system;
- Cleaning rainwater drainage systems;
- Watering if necessary in relation to climatic conditions from the watering point provided by the project owner;
- Wintering, draining and replenishing any watering system (see the two previous Echoes of the green building);
- Mowing (culms, aerial parts or dried inflorescences) ;
- Other specific work prescribed by the planting system supplier.

During the **consolidation period**, the recommendations are the same, only the responsibility changes. **The objective of the consolidation work is to achieve a coverage rate of at least 80%.** Depending on the type of vegetation, the frequency of intervention will vary.

For **routine maintenance**, the TTV PRs[8] specify the various tasks to be carried out:

- Removal of waste from vegetated surfaces and sterile areas;
- Replacing the substrate in the event of displacement by wind or rain;
- Controlling the development and manual weeding of undesirable plants (weeds) with high development potential;
- Supplementary fertilisation in accordance with the recommendations of the owner of the vegetation system;
- Cleaning rainwater drainage systems ;
- Watering if necessary in relation to climatic conditions from the watering point provided by the project owner;
- Winter storage, draining and re-watering of any sprinkler system ;
- Other specific work prescribed by the planting system supplier.

The minimum frequency - unless otherwise specified by the owner of the system - is two passes per year, regardless of how the vegetation is established.

✔ **Maintenance of a semi-intensive vegetation complex**

The recommendations for the three periods for this type of vegetation complex are identical to those for extensive vegetation, with the following additions:

- Maintain the balance between the different species so as to perpetuate the original plant palette or allow it to evolve harmoniously, bearing in mind that the use of biocidal products (pesticides, fungicides, herbicides, etc.) is prohibited;
- Semi-woody and woody plants can be pruned in the same way as if they were planted in natural soil;
- Mowing, pruning and cleaning waste can be disposed of according to volume, to avoid occasional overloading.

Maintenance is usually carried out at least four times a year, but can be more frequent depending on the system supplier's recommendations, the climate zone and weather conditions. **To contribute to the ecosystem services provided by green roofs, it is strongly recommended that trained personnel implement maintenance practices that are environmentally friendly and respect the natural cycles of the roof's flora and fauna**.

1.4.3 Green facades

✔ **Presentation**

Green façades involve the vertical development of flora from climbing plants attached to the wall or via a support structure, also known as green cladding (wood, wires, ropes, etc.). Walls can be greened either from the ground up, where the roots find water and nutrients, or by integrating the flora into the building via window boxes, planters or complex pre-constructed green wall systems. The latter system can be used in a variety of ways:

[8] ADIVET, Enveloppe métallique du bâtiment, CSFE. Règles Professionnelles pour la conception et la réalisation des terrasses et toitures végétalisées, édition n°3. 2018.

	Tailor-made vegetation	Modulated vegetation	Vegetation to be planted
Structure	Separate from the building	Substrate-filled modules planted at the factory and assembled on site	Factory-built structure, filled and installed on site
Weight	30 kg/m²	45 kg/m²	Varies according to thickness
Water consumption	Variable	2m³ per m² per year	0.2m³ per m² per year
Total thickness	Variable	10 to 15 cm (including 2 cm air space)	Variable
Maintenance	2 times a year (check drippers, timer, support fabric) and regular fertilising	2 times a year (weeding, checking timer drippers, support fabric)	2 times a year (check drippers, timer, support fabric) and regular fertilising

✔ **Benefits**

The installation of green façades has many benefits that add value to a building project:

- **Aesthetics**: Enhancing the landscape and integrating buildings into their surroundings;
- **Thermal insulation** (reduces energy consumption for heating and air conditioning)
- **Pollution reduction**: Capture of atmospheric pollutants ;
- **Reducing the urban heat island**: Thermal comfort for users ;
- **Welcoming and preserving urban biodiversity** ;
- **Creation or reinforcement of ecological continuities in the city**: Links up with green spaces;
- **User well-being**: Creating pleasant spaces and improving quality of life and working conditions (visual comfort);
- **Reduction in the mirror effect of glass façades**: lower number of bird collisions.

✔ **Substrates and biodiversity**

The substrate issue is much more complex for a green façade than for a roof. It must have a high water retention capacity, without losing volume over time. The vegetation must be varied and made up of suitable plants.

1.5 – Operational planning

The project owner must ensure that the manager has included consideration of ecological issues in the planning of clearing, earthworks and maintenance work. As part of an operation to promote biodiversity, it is necessary to plan work during the best possible period for fauna. Spring and summer are the most favourable periods for the settlement and reproduction cycles of most animals.

	J	F	M	A	M	J	J	A	S	O	N	D
Nocturnal birds of prey												
Birds (excluding nocturnal birds of prey)												
Chiropterans												
Insects												
Frogs												
Hedgehogs												
Reptiles												
Fish												

Reproduction period

Hibernation period

✔ **For birds**

Birds are more sensitive to disturbance during the nesting period than at other times in their life cycle (migration, wintering, etc.). It is therefore essential not to start clearing land at this time of year, to avoid destroying nesting sites (eggs or non-flying juveniles) or causing significant disturbance to breeding species. Once work has begun outside this period, site preparation work can continue even during the breeding season. In fact, migratory birds returning from their journeys will not settle in the area of the worksite because of the disturbance caused, and no direct destruction of individuals is to be feared.

Birds - Definition of the period for starting and carrying out work																							
J		F		M		A		M		J		J		A		S		O		N		D	

High sensitivity

Medium sensitivity

Low sensitivity

1.6 - Fauna traps

✔ **Impact of glass surfaces**

Fatal collisions with glass are one of the greatest dangers for birds in urban environments. One of the causes of this phenomenon is the transparency of the glass: the bird sees through the glass a tree, the sky or a landscape that attracts it. They fly towards it but don't see the glass, so they collide with it. The more transparent the glass and the larger its surface area, the greater the risk of collision. Glass reflection is also a problem for birdlife. Depending on the type of glass, the lighting and the interior of the building, the immediate environment of a building can be reflected in the glass surfaces. The bird therefore has the illusion of recognising a favourable environment, heads for it and collides with the glass.

✔ **Reducing the mirror effect**

Several solutions can be incorporated into the design of buildings to reduce damage to birdlife:

- **Use markings** to make transparent surfaces visible: dot patterns (coverage rate of at least 25%, minimum diameter 5mm), blurred areas, lines (vertical lines give better results than horizontal lines, minimum coverage 15%), insertion of patterned plastic film between two sheets of glass or writing on panes of glass;
- Use **translucent glass** (such as opal glass), translucent walls or glass blocks, which are safe for birds;
- Use **coloured lenses** (different coloured lenses create contrast in the landscape and make an obstacle visible);
- Install **low-reflective glass** (maximum 15% external reflection);
- Place **glass surfaces that are very inclined or curved** (even when they are highly reflective, the reflection of the environment is very distorted and hardly recognisable);
- Installing **external elements** (sunbreakers and blinds) ;
- Install **green facades ;**
- **Break down the glazed surfaces** into several elements (from a size of approximately 40cm x 40cm, the fields are too large to be effective against bird collisions);
- **Do not include transparent corners** on buildings;
- **Avoid attractive vegetation in front of** transparent or reflective **facades**.

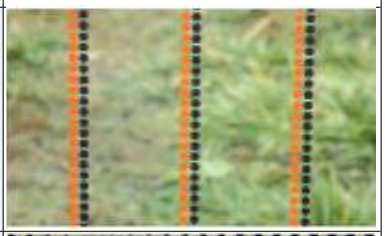
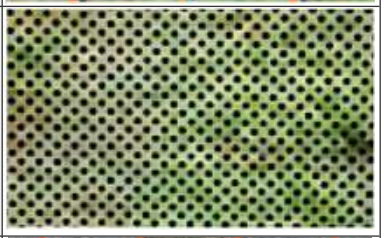
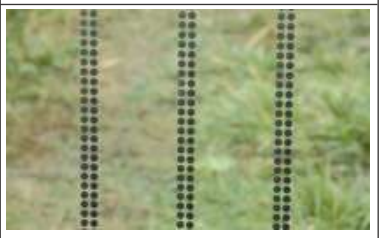
It is important to note that the black silhouettes of birds of prey glued to the windows are not very effective in eliminating the mirror effect.

Source: *Schmid, H., Waldburger, P. & Heynen,D. (2008): Birds, glass and light in construction. Swiss Ornithological Institute, Sempach (p.36 to 39)*

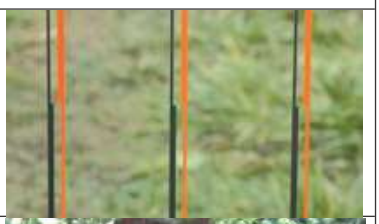
From 2006 to 2010, Martin Rössler carried out flight channel tests using the standardised method (ONR 191040) at the Hohenau-Ringelsdorf biological station (Austria). These tests are considered to be the most comprehensive. The series of tests made it possible to assess the effectiveness of the glass markings. The following comparison shows 30 (of the 38) markings tested.

3 categories agreed with international experts, based on many years of experience:

Categories	Efficiency	% of approach during tests
A	very effective - "bird protection glass".	< 10
B	appropriate subject to	10-20
C	inappropriate	20-45

N	Approaches	Description	Image
1	2,4 %	black/orange punctuation R2 covered area: 9 vertical dots, black/orange silkscreen Ø stitches: 8 mm distance between points: 10 cm patent: Eckelt 4Bird V3066	
2	2,5 %	black punctuation RX covered area: 27 diagonal punctuation, black silkscreen, Ø points: 7.5 mm diagonal distance between centre points: 12.7 mm patent: Eckelt Litex 540	
3	3,9 %	8.4v // 6 orange vertical covered area: 7.4 vertical stripes, orange screen printing strip width: 6 mm, distance between strips: 8.4 cm patent: Eckelt 4Bird V3048	
4	5,2 %	black punctuation R2 covered area: 9 vertical dots, black silkscreen Ø stitches: 8 mm distance between points: 10 patent: Eckelt 4Bird V3067	
5	5,6 %	black-orange punctuation R3 covered area: 12 vertical dots, black and orange silkscreen Ø points : 8 mm distance between points: 10 cm	
6	5,8 %	10v // 5 orange Duplicolor covered area: 4.8 vertical stripes (Lackspray Duplicolor Platinum, RAL 2009 traffic orange, three sprays) width: 5 mm distance between strips: 10 cm	

Nr.	Approaches	Description	Image
7	5,9 %	glass decoration 25 covered area: 25 irregular, non-rectilinear lines, (adhesive film, Oracal Etches Glass Cal 8510, matt, permeable to light) width: 1.5-4 cm distances: max. 11 cm	

8	6,2 %	glass decoration 50 covered area: 50 irregular, non-rectilinear lines (adhesive film, Oracal Etches Glass Cal 8510, matt, permeable to light) width: 1-8 cm distance: max. 6.5 cm	
9	7,1 %	2.8h // 2 black plexiglass filaments covered area: 6.7 plexi ® Soundstop with black, horizontal polyamide lines width: 2 mm distance: 28 mm	
10	9,1 %	1.3v // 13 white area covered: 50 vertical stripes, white screen printing width: 13 mm distance between strips: 13 mm patent: Eckelt Litex 507A	
11	9,4 %	10v // 5 rot Duplicolor covered area: 4.8 vertical stripes (Lackspray Duplicolor Platinum, RAL 3020 traffic red, three sprays) width: 5 mm distance between strips: 10 cm	
12	9,9 %	10v in white stripes on both sides covered area: ca. 5.3 on each side, vertically interrupted lines on both sides, glossy white adhesive film (Orajet 3621) width: 20 mm; distance between lines: 10 cm width of horizontal stripes: 2.5 mm ; distance between strips: 5 mm	
13	10,1 %	black-orange stripes covered area: 7.5 vertical stripes in variable width (2.5 bzw. 5 mm), screen-printed in black / orange patent: Eckelt 4Bird V3063	
14	10,7 %	2.8h // 2 black film adhesive/glass covered area: 6.7 horizontal stripes, (shiny black adhesive film) width: 2 mm distance between strips: 28 mm float glass	

Nr.	Approaches	Description	Image
15	11,1 %	10v // 5 shiny blue film covered area: 4.8 vertical strips (Avery741 blue adhesive film) width: 5 mm distance between strips: 10 cm	
16	11,5 %	2.8h // 2 black printed/plexi sheet covered area: 6.7 horizontal lines, black, 2 mm wide, 2.8 cm apart, printing on laminated sheet plexiglass, width 1.5 cm, bedruckte Seite der Folie weist zur The printed side faces the plexiglass	
17	12,(2007) 12, (2008)	10v // 20 tesa white covered area: 16.7 vertical strips (white adhesive film) width: 2 mm distance between strips: 10 cm	
18	12,9 %	10v // 5 tesa black covered area: 4.8 black strips (black adhesive film) width: 5 mm distance between strips: 10 cm	
19	13,3 %	10v // 5 yellow matt adhesive film covered area: 4.8 vertical strips (Avery 500 yellow adhesive film, matt) width: 5 mm distance between strips: 10 cm	
20	14,8 %	10v // 5 tesa white covered area: 4.8 vertical strips (white adhesive) width: 5 mm distance between strips: 10 cm	
21	14,8 %	white punctuation, adhesive film covered area: 6.3 dots (white adhesive), Ø 18 mm, grid distance between dots: 8.2 cm	
22	15,1 %	10v // 20 tesa black-white covered area: 16.7 vertical double strips, adhesive, 10 mm black, 10 mm white distance between strips: 10 cm	

Nr.	Approaches	Description	Image
23	15,9 %	10v // 20 single-sided white stripes covered area: ca. 5.3 broken vertical line, glossy white adhesive film (Orajet 3621) width: 20 mm distance between strips: 10 cm stripes interrupted by transverse stripes, 2.5 mm thick,	
24	18,3 %	15v // 20 Tesa white area covered: 1.8 vertical strips (white adhesive strips) Width: 2 cm distance between strips: 15 cm	
25	18,8 %	10v // 5 neon shiny white adhesive film covered area: 4.8 vertical strips (neon adhesive film, Avery 6002, shiny, fluorescent colour) width: 5 mm distance between strips: 10 cm	
26	21,5 %	fine grid, blue area covered: approx. 25 blue plastic grid between the two panes, width 1-2 mm distances between strips 2-3 mm	
27	22,1 %	10am // 20 covered area: 16.7 horizontal strips (white adhesive film) width : 20 mm distance between strips: 10 cm	
28	24,1 %	10v // 5 Duplicolor green covered area: 4.8 vertical stripes (Lackspray Duplicolor Platinum, green, three sprays) width: 5 mm distance between strips: 10 cm	
29	25,0 %	2.8v // 2 black printed sheet plexi covered area: 6.7 vertical lines, black width: 2 mm distance between strips: 2.8 cm print on laminated sheet, plexiglass, thickness 1.5 cm, printed side facing plexiglass	
30	35,3 %	Plexiglas covered area: 0 plexiglass, unmarked Soundstop tinted ® Smoky Brown, dark tint thickness: 15 mm	

✔ **Fauna traps**

Although gardens and buildings offer many opportunities for fauna, they can also harbour a number of traps that are fatal for certain animals. In particular, species that use cavities looking for cavities in which to nest or simply rest can enter cavities without having a way out, as is the case with unplugged posts.

Hollow posts are potential traps (barriers, hollow stakes, etc.) in the same way as cavities, pipes and open manholes. Holes in the ground can become capture pits. Small mammals and other reptiles can easily fall into them, particularly following the installation of stakes and boreholes during the survey and site installation phases. Access to them should be avoided by filling in or protecting them adequately (water meter manholes, crawl spaces, various pits, basins, swimming pools, open rubbish bins, etc.). To avoid these losses of biodiversity, a few simple actions can be taken:

- Hollow posts, plastic pipes, protective ducts, letter boxes, etc. : plugging holes with plugs ;
- Daily collection of household waste ;
- Open composters ;
- The presence of tarpaulins, in spring, at the height of the nesting period in the storage area (hollow concrete blocks, bricks or other stored material).

✔ **Open-air basin**

All facilities, even those that seem the most innocuous, can present risks for fauna. Retention basins are frequently places where many species drown when they are not adapted, due to the steep slopes of the walls and the lack of roughness when they are made from tarpaulins. A number of ponds have been built with steep walls and great depths to limit the amount of land they take up. In addition, they are often fitted with a relatively smooth, plastic-coated waterproof membrane (high-density polyethylene, etc.).

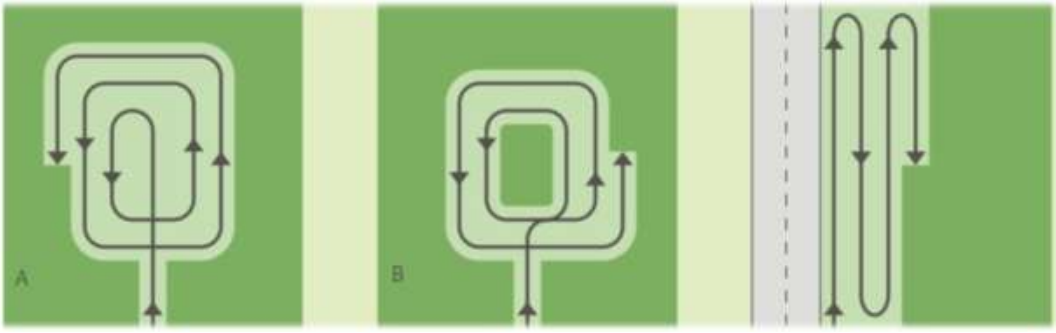
In use, these ponds always retain residual water that attracts a number of animals (amphibians, mammals, insects, etc.) to drink or breed. The slippery plastic membrane, the steep banks, the presence of algae or humidity make it impossible for these animals to get out. They exhaust themselves in the pond and end up drowning. It is therefore essential to treat this equipment.

To prevent these risks, it is essential to incorporate **escape routes or ramps** (e.g. nets, inclined grids, etc.) into these ponds to enable fauna to leave the pond easily, or to use coverings such as coconut fibre cloths, which provide a natural, adherent surface that makes it easier for animals to escape.

1.7 - Methodology for land clearing and earthworks

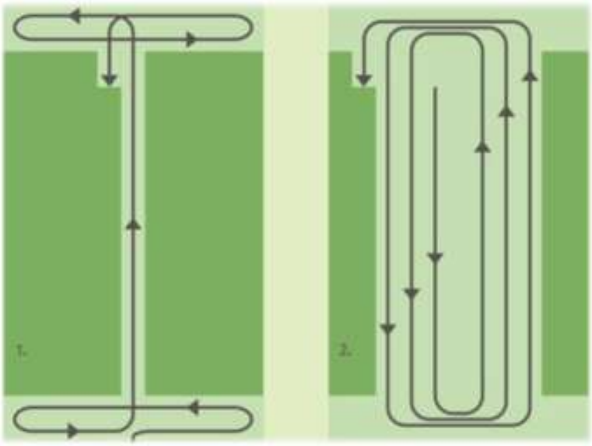
Land clearance and earthworks can have an impact on local flora and fauna. In order to limit these impacts and encourage ecological management of the areas concerned, it is recommended that environmentally-friendly practices be adopted.

Mowing must be carried out in such a way as to limit the stress and mortality of wild animals present on the plot. A number of strategies can be used to facilitate their escape and reduce the impact of mowing operations:



A. Mow large plots from the inside out so that wild animals can escape
B. Variant with an unmown refuge area in the centre

In the case of roadside meadows, start mowing along the road.



In the case of long, narrow plots, mow the edges first, then the long sides, progressing from the inside to the outside of the plot.

General recommendations :

- **Work during favourable periods**: favour periods when fauna is less vulnerable (outside the breeding season).
- **Adjusting the cutting height**: avoid cutting too short to protect the micro-fauna and limit the impact on the soil.
- **Leave areas unmown** to encourage biodiversity and provide a refuge for species.
- **Preliminary check**: before starting work, inspect the area for any animal nests, burrows or other habitats.

1.8 - Free movement of fauna

In urban and peri-urban environments, fauna movements are often hindered by fences such as walls, palisades, wire mesh and other barriers that delimit plots of land and homes. These physical obstacles restrict the movement of animals, fragment their habitats and disrupt the ecological corridors they need to survive and reproduce. To maintain the free movement of fauna and strengthen ecological continuity, it is essential to make fences more permeable.

Here are a few good practices to follow to make fences more permeable:

✔ **Creating a planted fence**

Hedges are an excellent alternative to traditional fences, allowing fauna to circulate freely while providing refuges for birds, insects and small mammals. They promote ecological corridors and contribute to biodiversity.

✔ **Choose coarse-mesh fencing**

Fences with a mesh size of at least 15 cm² allow the passage of small animals such as hedgehogs, hares, reptiles

and other species of small fauna. This type of fencing is particularly useful for gardens, parks and residential areas, where local fauna can find refuge.

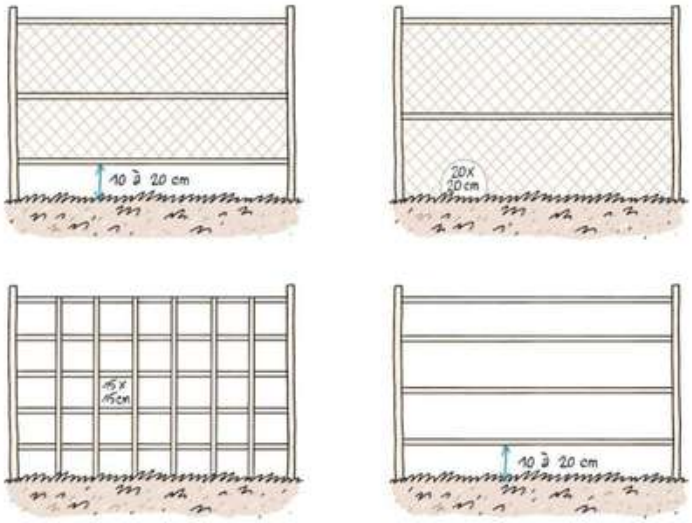
✔ **Raising the fence**

Raising the fence about 20 cm above the ground allows small terrestrial animals to pass underneath without difficulty, while maintaining an effective boundary for humans and domestic animals.

✔ **Creating openings in fences**

Installing openings of 10 to 20 cm² every 15 metres along fences can facilitate the movement of small animals while preserving the functionality of the fence.

By following these best practices, it is possible to contribute to the preservation of biodiversity while maintaining functional spaces for users. The permeability of fences is a key element in promoting ecological connectivity and guaranteeing a healthy environment for all species, human and animal, in urban and peri-urban environments.



Examples of fences to facilitate the movement of small fauna (Source: Brussels Environment)

Ganivelle fence (Castelmew project - ZAC LAUBIS - TOULOUSE (31))

Fence with catwalks (left) and coarse-mesh fence (right): collective housing project, MONTREUIL (93)

1.9 - Fauna shelters

In the face of urbanisation, thermal renovation of buildings, changes in farming practices and intensive maintenance of areas, natural habitats are becoming increasingly rare. Many animal species, particularly birds, bats and insects, are struggling to find nesting or resting sites. The installation of **suitable artificial shelters** is a simple and effective way of encouraging common biodiversity, particularly in urban and peri-urban environments.

1.9.1 Outdoor nesting boxes: enhancing biodiversity in planted areas

✔ **What is the purpose of a birdhouse?**

Nest boxes help to compensate for the disappearance of natural cavities (hollow trunks, old walls, roof cavities, etc.) by providing secure nesting places for semi-cavernolous birds. Installing nest boxes helps to maintain or bring back species such as tits, sparrows, redstarts, nuthatches and swallows.

✔ **Which model of nesting box to choose?**

There is no universal nest box. Each species is different and needs a specific nesting box that matches and meets its needs. So the size of the nesting box, the height, shape and size of the flight hole, and the materials used all need to be taken into account when choosing a nesting box.
The choice of materials is important. Ideally, you should choose nesting boxes that are hard-wearing, rot-proof and untreated. Untreated wood is very suitable, as is a small wooden hut, a hollowed-out tree trunk, etc. But other materials can also be used, such as terracotta pots hung on the wall, wooden concrete or hollow tiles.
As far as the choice of colours is concerned, it is important to opt for natural colours so that the nesting box blends into the landscape and looks natural. Bright, unnatural colours should be avoided. The nesting box can also be covered in bark or ivy to blend in with the natural surroundings. A nesting box with a removable roof will be very practical for cleaning the inside once a year.
There are three main types of nesting box in the shape of a small hut:

❖ Closed nesting box

This is the letterbox type, closed on all 4 sides, with just one flight hole, preferably round rather than square and located in the upper part of the nesting box. The hole is generally small, attracting small birds such as sparrows, nuthatches, chickadees and starlings.

❖ Semi-open nesting box

In this case, the facade is largely open. It can accommodate larger birds, such as the black redstart or the kestrel.

❖ Open nesting box

This is a completely open, balcony-type nesting box. Suitable for blackbirds, for example.
A diversity of nesting boxes is encouraged. **The installation of nesting boxes for the same species in close proximity to each other should be avoided.**

A. B.

C.

D.

A. "Letter box" nesting box B. Open nesting box, C. Semi-open nesting box, D. Colonial nesting box

Species	Type	Flight hole diameter	Height interior	Distance between flight hole and base of nesting box	Installation height
Blue Tit	Letterbox	25 to 28 mm	23 cm	17 cm	2 to 5 m
Black tit	Letterbox	25 to 27 mm	17 cm	11 cm	2 to 4 m
Sparrow domestic	Colonial nesting box	32 to 40 mm	23 cm	17 cm	3 to 8 m
Robin familiar Grey wagtail Black Redstart	Semi-open	150x70 mm	20 cm	-	1.5 to 2 m
White-fronted Redstart	Letterbox	Oval 32x46 mm	23 cm	17 cm	1.5 to 4 m
Starling sansonnet European nuthatch	Letterbox	46 to 50 mm	28 cm	21 cm	8 to 12 m

✔ **What criteria need to be met to encourage nest box occupancy?**

❖ Number of nesting boxes

To avoid inter- or intra-species competition, nesting boxes should be at least 30 m apart.

❖ Location of the nesting box

- Exposure is important: the nest box should never be in full sun or shade;
- Out of reach of a person or pet ;
- Avoid fixing nesting boxes just above a horizontal branch on which any predator could lean;
- Avoid placing nesting boxes for the same species close together.
- Avoid fixing nesting boxes to poplars (fragile branches) and beech trees (trunks often damp).

❖ Orientation of the nesting box

The flight hole should be positioned away from the prevailing winds, so generally in an east/south-east direction. Care must be taken to ensure that the nesting box faces away from the wind, even if heavy rain is falling, which could enter the nesting hole and drown the brood. It is therefore advisable to tilt the nest box slightly towards the front to prevent it from filling with water

The flight holes will vary by a few millimetres for each nesting box.

✔ **When should a bird nesting box be installed?**

The best time to install a birdhouse is in autumn or possibly winter, so that the birds can get used to it and feel comfortable. What's more, they can use them in winter for shelter. But in the spring, in March or April, it's still a good idea if you haven't had time to install them beforehand.

1.9.2 Building-integrated nesting boxes: reconciling energy renovation and biodiversity

✔ **The issues**

Every window nook, every crack in the wall and every tile represents a potential habitat for various species living in buildings, including birds and bats. However, thermal insulation from the outside eliminates irregularities, cracks and expansion joints that could harbour fauna. By insulating a building, you cover it with materials that obstruct the cavities necessary for animal life. What's more, existing nests are often removed during the work.

This situation has dramatic consequences for the species associated with human constructions: swallows, swifts, sparrows, night raptors, bats, etc. A number of breeding bird species are now experiencing worrying declines, with marked falls in the population of certain species that were once common, such as the common sparrow.

This decline is the result of several cumulative factors: land artificialisation, destruction of ecosystems, use of pesticides, pollution, etc., but the impact of energy renovation work is also significant. At a time when many homes need to be renovated to improve their thermal performance, this dynamic could lead to a massive loss of habitats if no compensation measures are put in place.

So how can the protection of species living in buildings be combined with the demands of energy renovation?

✔ **Why install nesting boxes in external thermal insulation?**

The integration of wood concrete nesting boxes into external thermal insulation (ETI) is a major step forward in sustainable construction. This innovative approach makes it possible to reconcile the energy performance of buildings with the preservation of biodiversity in urban environments. Nesting boxes can be incorporated into the external insulation of a building in both new-build and renovation projects.

Nesting boxes for integration into external insulation (ETI) are fitted with adjustable brackets to adapt to the thickness of the insulation. To respect the ecology of the bird, a minimum of 13 cm is required. The brackets are fixed to the wall before the insulation is laid.

A dual challenge: ecological and thermal

In the face of increasing urbanisation and the disappearance of natural habitats, we offer an effective solution by integrating bird sanctuaries directly into the ETI. This initiative promotes the conservation of biodiversity while

guaranteeing optimum thermal insulation. Thanks to the properties of wood concrete, which combines solidity and insulating performance.

Advantages of nesting boxes in ETI

- Durability and resistance: Designed to withstand extreme weather conditions, these nesting boxes provide long-lasting protection for bird species.
- Aesthetics and architectural integration: Their modular design makes it easy to integrate them harmoniously into facades, enhancing the visual appearance of buildings.
- Compatibility with insulation materials: Their installation is designed to preserve the effectiveness of commonly used thermal insulation materials (mineral wool).

Implementation and benefits for biodiversity

The installation of nesting boxes in the ETI must be carefully studied to optimise their ecological effectiveness, taking into account the orientation and height of the installation. Their presence in the urban environment encourages an increase in bird populations and raises public awareness of the importance of preserving species.

Conclusion

By integrating the wood concrete nesting boxes into the ETI, it is possible to meet the challenges of eco-construction. This approach enables the building industry to reconcile energy efficiency with environmental commitment, thereby contributing to more sustainable towns and cities that respect biodiversity.

Example of a wooden concrete nesting box for swifts in the ETI

✔ **Why put wooden concrete nesting boxes in the building?**

Incorporating wooden concrete nest boxes into building design has a number of advantages, both ecological and aesthetic. Firstly, they provide a safe habitat for birds and other species, contributing to urban biodiversity. By integrating these structures directly into the building, nesting spaces are created without compromising architectural integrity, while promoting cohabitation between humans and fauna. Nest boxes can also be used as awareness-raising devices, educating occupants about the importance of species conservation. By using durable materials such as wood concrete, these nesting boxes blend harmoniously into the built environment, while remaining weather-resistant and low-maintenance. In short, integrating nesting boxes into buildings is an innovative and responsible approach that contributes to a more harmonious living environment that respects nature.

Wooden concrete nest boxes

Low-carbon cement, wood chips and bio-sourced hemp

Thermal insulation

Weatherproof

Lighter than concrete alone

Long durability

✔ **How to install nesting boxes in buildings?**

To install wood concrete nesting boxes integrated into a building, it is essential to follow several key steps to ensure their effectiveness and durability. Firstly, choose a strategic location, ideally on east- or south-east-facing façades, to benefit from natural light and protection from the elements. Next, prepare the nesting boxes by checking that the dimensions are suitable for the target species, and make sure that the wood concrete is treated against damp and insects. During installation, fix the nesting boxes securely to the structure of the building, using appropriate supports to prevent water seepage. Don't forget to include natural elements such as climbing plants nearby, to make the nesting boxes more attractive to birds.
Examples of nesting boxes integrated into buildings:

A.

B.

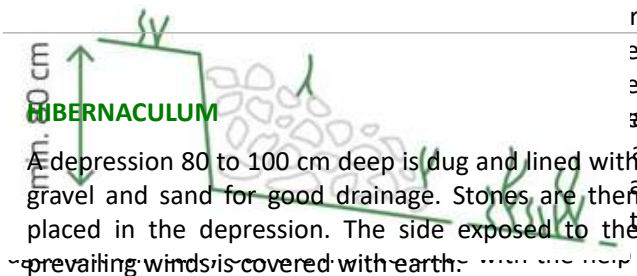
A. Wooden concrete bat shelter "to be integrated into the building and/or installed in a battery", B. Wooden concrete 2-chamber sparrow nesting box.

Species	Dimensions to be integrated	Dimensions for ETI	Diameter of flight hole
Blue and great tits	Dimensions (L x W x H) cm : 17 x 17 x 28 Bedroom dimensions (L x W x H) cm : 14 x 14 x 26	**Prof. 12 :** Exterior (W x H x D): 17.5 x 23.5 x 12 cm Dressing room (W x H x D): 14.5 x 20.5 x 9 cm **Prof. 14** Exterior (W x H x D): 17 x 27 x 14 cm Dressing room (W x H x D): 14 x 24 x 11 cm	28 mm / 32 mm
Sparrow 2 dressing rooms 3 dressing rooms	**2 Lodges :** Dimensions (L x W x H) cm : 32 x 19.5 x 17.5 Room dimensions (L x W x H) cm : 16.5 x 14 x 14.5 **3 boxes :** Dimensions (L x W x H) cm : 35 x 19.5 x 19 Room dimensions (L x W x H) cm : 17.5 x 10 x 15	**2 dressing rooms :** External dimensions (W x H x D): 32 x 20 x 14 cm Dressing room dimensions: 14 x 17 x 11 cm **3 Lodges :** External dimensions (W x H x D): 35 x 20 x 14 cm Dressing room dimensions: 10 x 17 x 11 cm	2.5 x 5 cm
Swift 2 dressing rooms 3 dressing rooms	**2 dressing rooms :** Dimensions (L x W x H) cm : 65 x 16.5 x 15 Room dimensions (L x W x H) cm : 30 x 13.5 x 12 **3 dressing rooms :** Dimensions (L x W x H) cm : 96 x 16.5 x 15 Bedroom dimensions (L x W x H) cm : 29 x 13 x 11.5	**2 dressing rooms :** - External dimensions (W x H x D): 76 x 15 x 14 cm - Dressing room dimensions (W x H x D): 36 x 12 x 11 cm **3 dressing rooms :** - External dimensions (W x H x D): 96 x 15 x 14 cm - Dressing room dimensions (W x H x D): 36 x 12 x 11 cm	2.8 x 6.5 cm
Redstart	Dimensions (L x W x H) cm : 17 x 17 x 28 Bedroom dimensions (L x W x H) cm : 14 x 14 x 26	External dimensions (W x H x D): 17 x 27 x 14 cm Dressing room dimensions (W x H x D): 14 x 24 x 11 cm	10 x 8 cm
Bats	Dimensions (H x W x D) cm : 20 x 47 x 11 Bedroom dimensions (H x W x D) cm : 17 x 30 x 8 **Optional 2 or 4 cm board**	External dimensions (H x W x D) : 47 x 20 x 11 cm Bedroom dimensions (H x W x D) cm : 17 x 30 x 8 **Optional 2 or 4 cm board**	7 x 17 cm

1.9.3 Stones

In order to improve the ecological quality of the environment and create refuge areas for reptiles, specific structures can be put in place during the operational phase. These features, such as scree slopes, dry-stone walls and piles of branches and leaves, provide reptiles with areas where they can thermoregulate in summer and hibernate in winter. To limit the risk of predation, particularly by domestic cats, it is advisable to protect these shelters with thorny branches or other deterrents .

PILE OF STONES



HIBERNACULUM

A depression 80 to 100 cm deep is dug and lined with gravel and sand for good drainage. Stones are then placed in the depression. The side exposed to the prevailing winds is covered with earth. With the help of the layer within a 3 m radius of the scree should be left. Every 5 y debris (branches only).

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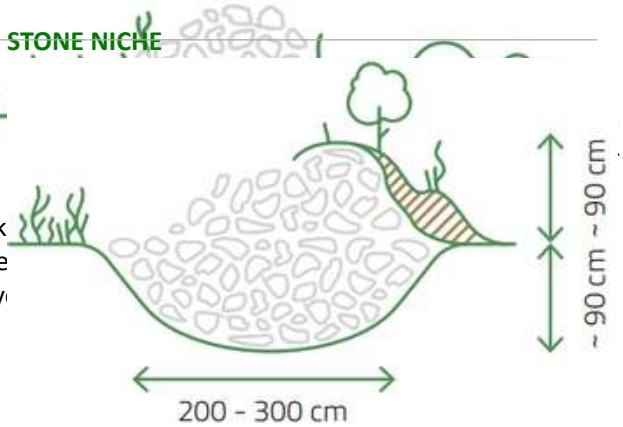
STONE NICHE



1.9.4 Hedgehog shelters

✔ **What criteria need to be met to encourage occupancy?**

❖ Location

The shelter should be installed in a quiet, protected spot, away from busy areas (such as roads) to reduce the risk of crushing, away from prevailing winds, direct sunlight and rain (under a hedge, against a wall), with the entrance facing south-east if possible.

❖ Size and construction

A simple upturned box, covered with straw and leaves, with an entrance 15 cm wide may be enough to accommodate the hedgehog. Cover the box with branches and dead leaves

Simple nest for a European hedgehog. The entrance to the wooden box must measure 15 cm on each side to prevent dogs and/or foxes from entering the nest - drawing © Nicolas Macaire LPO

1.9.5 Piles of dead wood

Dead wood is a much sought-after habitat for many animals and plants, providing both shelter and food. It plays a major ecological role, since it is estimated that one forest animal in five depends on dead wood for its survival, not to mention the mosses, lichens and thousands of fungi that also use it as a substrate...

✔ **They feed on dead wood**

Wood-eaters are organisms that feed on wood. Among xylophages, saproxylophages are those that feed on decomposing wood.

- Fungi: they break down the cellulose in the wood and make it more digestible for other species;

- Beetles: in particular bark beetles (which bore holes and lay their eggs in dead wood) and the famous kite beetle (a protected species);
- Many insect larvae (butterflies, certain hymenoptera, etc.).

✔ **They live in dead wood**

Many other animals use dead wood for shelter, wintering, hunting, nesting or laying eggs:

- Insects: ladybirds, earwigs, millipedes, ants, butterflies, solitary bees and wasps, etc ;
- Mammals: https://www.gerbeaud.com/faune/chauves-souris,839.htmlloirs, hedgehogs, etc;
- But also slugs, snails, spiders, reptiles, rodents ...

Piles of dead wood or branches left in place

1.9.6 Beehives

Bees play a crucial role in biodiversity, transporting pollen and ensuring fruit production. However, their populations have declined drastically in recent years. Bees are victims of predators, such as the Asian hornet, as well as disease, pesticide poisoning and the scarcity of green spaces that provide flowering plants throughout the year.

However, the multiplication of hives containing colonies of domestic bees of exotic origin is not desirable. It is preferable to favour landscaping and flower meadows adapted to local black bees, or to concentrate efforts on improving the food resources available to various pollinators.

✔ **What are the regulations?**

Siting distances for apiaries are generally regulated by local or national laws to ensure public safety and welfare. As a general rule, hives stocked with bees should be sited at recommended minimum distances, such as:

- 100 metres from collective or public establishments (e.g. schools, hospitals, recreational areas) ;
- 20 metres from public roads ;
- 10 metres from neighbouring properties.

These distances may vary according to local regulations, so it is essential to consult the guidelines in force in each country or region before installing hives.

Hives isolated from neighbouring properties or public roads by a wall, a board fence, a hedge or a dry hedge are not subject to any distance requirements. These fences must be two metres high above the ground and extend for at least two metres on each side of the apiary.

✔ **Place of installation**

In order to create an effective refuge area, it is important to check that the bees have the following minimum conditions:

- Set up the hive so that it is protected from the cold and damp, but in a sufficiently open area;
- Flight corridor (front of the hive) at least 10 m clear and correctly oriented in relation to the rain and prevailing winds;

- Proximity to a water source accessible all year round, with a few floating objects (such as corks) to avoid drowning;
- Sufficient flowers all year round to feed the hive within a radius of 3 kilometres;
- Installation in a location away from a busy area.

✔ **Management & operations**

The management and operation of the hives must be entrusted to a professional beekeeper or to a person or group able to provide proof of appropriate training.

Beehives also have great educational value and can be a tool for raising people's awareness of the issues involved in maintaining biodiversity.

1.10 - Car park surface

The aim of this criterion is to allow air and water to infiltrate into the ground. Permeabilising and revegetating the ground maximises surface water run-off, which limits the risk of flooding, the heat island effect and the accumulation of pollutants and dust in the air. It is also beneficial to the growth of biodiversity, and therefore the stability of the soil and the surrounding environment.

Examples of compliant car parks

✔ **With vegetation**

The vegetation concerned here is exclusively herbaceous to allow direct access to the ground for the infiltration of rainwater. Several configurations and materials can be envisaged:

Grass slabs

Type Evergreen

Stone slabs

Mixed car park

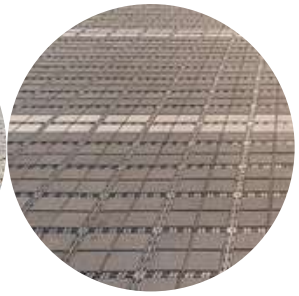
✔ **Without vegetation**

It is also possible to allow water and air to infiltrate into the ground using porous materials and/or a regular alternation of impermeable/permeable materials:

Gravel

Stabilised sand

Honeycomb concrete slab


Concrete slabs with wide joints

Where semi-permeable areas are created on parking surfaces, the slopes must be designed to direct run-off water towards suitable infiltration areas (such as recessed green spaces, planted valleys, etc.). Particular attention must be paid to the size of these rainwater management structures, so that they are consistent with the surface area to be collected and the volumes of water to be infiltrated.

✔ **With pergolas or green shade**

Examples of non-compliant car parks

The car park must be greened at the level of the parking spaces. A planted median strip at the edge of the driveway is not sufficient to meet the Effinature requirement. Asphalt should therefore be avoided.

1.11 - Sound maps

The aim is to preserve sensitive ecological zones (e.g. nesting areas) on the plot by limiting the acoustic impact of technical equipment and to ensure the presence of quiet areas, by preserving at least :

- 25% of the floor area (excluding the building footprint) in very quiet areas;
- 50% of the green roof area in the moderate zone ;
- 50% of the green roof area in the Moderate Zone (Yellow or Green).

In view of the hearing thresholds (and sensitivity frequency bands) of the various taxa, and the fact that technical equipment emits mainly low frequencies between 63 and 500 Hz, it is proposed to separate the noise zones on the plot into 4 categories:

Legend	Noise levels	Description
Quiet zone	< 30 dBA	Quiet levels, favoured area at night
Moderate zone	Between 30 and 35 dBA	Moderate levels, even calm for a daytime period
Noisy area	Between 35 and 45 dBA	Noise levels quite noisy for fauna
Area avoided	> 45 dBA	Very noisy noise levels for fauna, but possible passage area for certain species of insects or for avifauna feeding or pollination

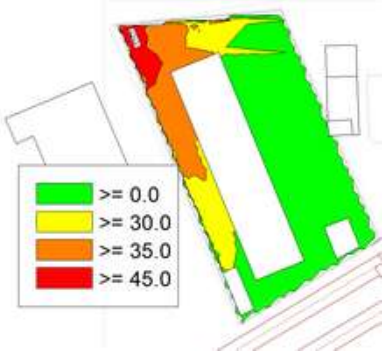
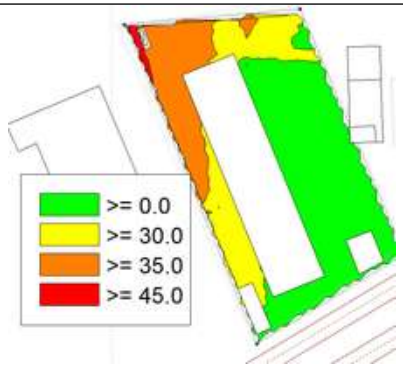
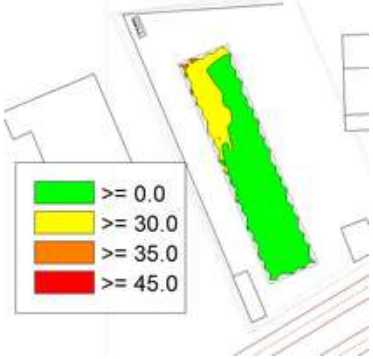
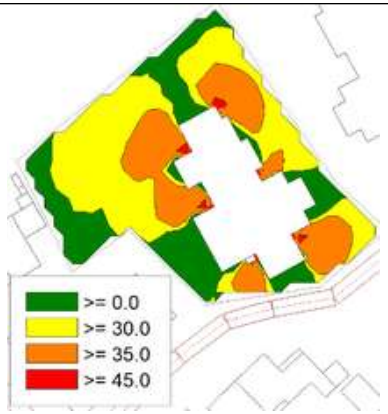
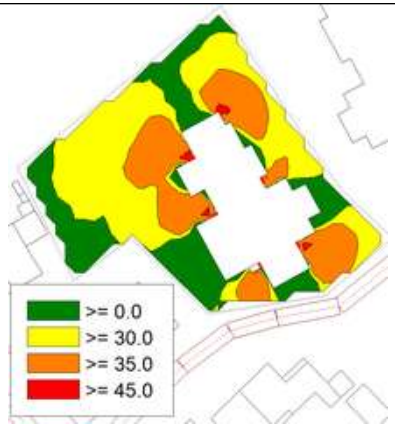
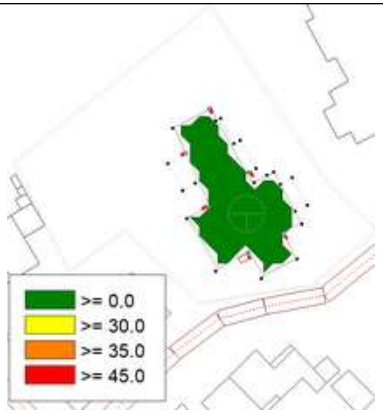
These zones will make it possible to maintain refuge areas on the plot, and to allow undisturbed crossing of the plot so as not to fragment the territory of the individuals.

If the ecologist identifies areas of interest/ecological corridors or a white ecological corridor on the project, they will have to be the subject of additional sound mapping, which will make it possible to guide the landscape prescriptions and the creation of habitats in these areas.

Noise levels will be calculated on the plot at several heights:

- On the ground, at a height of 0.5m ;
- At the height of the trees/nesting boxes (relevant height to be confirmed with the acoustician by the ecologist) ;
- Green roof terrace where appropriate.

The acoustician appointed will have to produce **sound maps** (see table below) to highlight the different zones.

	Ground mapping	Tree-level mapping	Terrace roof mapping	Conclusions
Ground-mounted collective equipment				**Ground target**: 25% in Quiet Zone→ **OK** **Tree target**: 50% Moderate→ **OK** **Green roof target**: 50% in Moderate→ **OK**
Individual facade equipment				**Ground target**: 25% in Quiet Zone→ **barely met**, may lead to one or two additional treatments **Tree target**: 50% Moderate→ **OK** **Green roof target**: 50% in Moderate→ **OK**

Collective equipment on roofs				**Ground target**: 25% in Quiet Zone→ **OK** **Tree target**: 50% Moderate→ **OK** **Green roof objective**: 50% in Moderate→ **NOT met**, so possibility of keeping green roof without installation of lodges (only food and certain insects, and pollination).

1.12 - Soil and water remediation

Many derelict sites or changes in development methods mean that land that has previously been contaminated by elements that have polluted ecosystems has to be opened up for development. Here again, it is possible to use biodiversity to enable them to host activities again without risk to users.

1.12.1 Soil remediation

Soil is home to a wide variety of living organisms, the majority of terrestrial biodiversity. It supports vegetation and ensures the stability of the environment. Particular attention is therefore paid to the quality of the soil, which is essential to life on earth. In addition to the soil pollution diagnostic study, the project owner must ensure that previous industrial activities on this site have not altered the quality of the soil.

If pollution is present, it must be dealt with effectively by means of a management plan that complies with local environmental regulations.

A management plan consists of :

- Elements for controlling sources of pollution ;
- Elements to control the impact of pollution ;
- The various management measures: clean-up treatment techniques, any containment or mitigation measures, restrictions on use, etc.
- Organisational elements (work organisation, control measures) ;
- If any residual exposure is found, it will be checked regularly during the development project;
- If these residual exposures reflect unacceptable risks, the management plan will be modified to contain or eliminate them.

There are several environmentally-friendly methods of soil remediation. They can be physical, chemical or biological.

Biological treatments	
Phytoextraction	**Definition**: the use of plants to extract pollutants from the environment, such as metals. Once the plants are saturated with pollutants, they are harvested and sent to a recycling facility.
	Examples of plants used: Stinkweed (zinc), Brassica (copper, lead), Thlaspis (zinc, nickel, cadmium), Streptanthus (copper, nickel), Barley, Oats.
Phytostabilisation	**Definition**: the use of plants to reduce the bioavailability, mobility or leaching of pollutants. The pollutants are thus "confined" in the soil.
	Examples of plants used: Poaceae (Festuca arvernensi/rubra, Agrostis capillaris and Koeleria vallesiana), Fabaceae (Anthyllis vulneraria and Clover), Willow, Poplar.
Phytodegradation	**Definition**: use of plants that produce enzymes (dehalogenase, oxygenase, etc.) which catalyse the breakdown of adsorbed substances (adsorb = to retain/fix to the surface). These are transformed into less toxic or non-toxic substances by the metabolisation of the contaminants in the plant tissues and/or by organisms in the rhizosphere maintained by the plant.
	Examples of plants used: Coriander, Hyacinth, Maize, Vetch
Phytovolatilisation	**Definition**: the use of plants to volatilise metal pollutants. The pollutants are absorbed by the plants through evapotranspiration, then transformed and released into the atmosphere.
	Examples of plants used: Scirpus lacustris, Glyceria spectabilis, Phragmites communis, Typha latifolia, Phalaris arundinacea, Carex.
Phytostimulation	**Definition**: acceleration of natural biodegradation by stimulating micro-organisms thanks to the natural supply of oxygen and nutrients by the root system of higher plants, i.e. in the rhizosphere.
	Examples of plants used: most hyperaccumulative plants (a plant capable of storing a high or even very high quantity of one or more elements in its tissues).

Physical treatments	
Biosparging	**Definition:** elimination of biodegradable pollutants in groundwater and possibly also in the unsaturated zone of the soil by adding oxygen to accelerate biodegradation. It is often combined with venting.
Bioventing	**Definition:** technique for treating a polluted substrate (soil) in an unsaturated zone which consists of aerating the substrate by injecting air or oxygen in order to encourage microbial activity and the volatilisation of pollutants.
Biostimulation or Bioaugmentation	Definition: in-situ biological technique for treating groundwater that consists of inducing the biodegradation of pollutants using micro-organisms that are endogenous (belonging to the environment) or exogenous (foreign to the environment) to the environment. It applies to organic pollutants.

1.12.2 Water depollution

✔ **Operating principle**

Phytoremediation is one of the various forms of phytoremediation. This term defines the principle of soil, wastewater and air remediation using the decontaminating power of plants combined with microbial activity. Also known as lagooning or planted filters, it is interesting in more ways than one:

- Reducing pollution of surface water and groundwater ;
- Lower investment and maintenance costs than a conventional system;
- Integration into the landscape ;
- Effective treatment of phosphates and nitrates used by plants;
- Simple control of discharges, unlike buried systems;
- Water savings (the water recovered can be used to water plants in the garden).

Phytoremediation is based on the use of two types of planted filters with different roles:

✔ **The vertical filter**

The vertical flow filter (VF) receives loaded wastewater, and consists of two parallel beds that are used in turn. The sand on the surface of the filter allows the water to pass through, blocking the large particles. Alternating the beds from one week to the next allows the material to compost on the surface of the filter. The water percolates through the gravel and is collected by a drain at the bottom of the filter. It spends 4 to 8 hours in this first stage. The medium is not submerged in water, so it is rich in oxygen, which stimulates the aerobic bacterial activity needed to mineralise the organic particles. Mineralization is a series of complex chemical reactions based on the principle of oxidation of organic compounds. This mineralisation transforms an element that cannot be assimilated by a plant into an element that can be assimilated.

✔ **The horizontal filter**

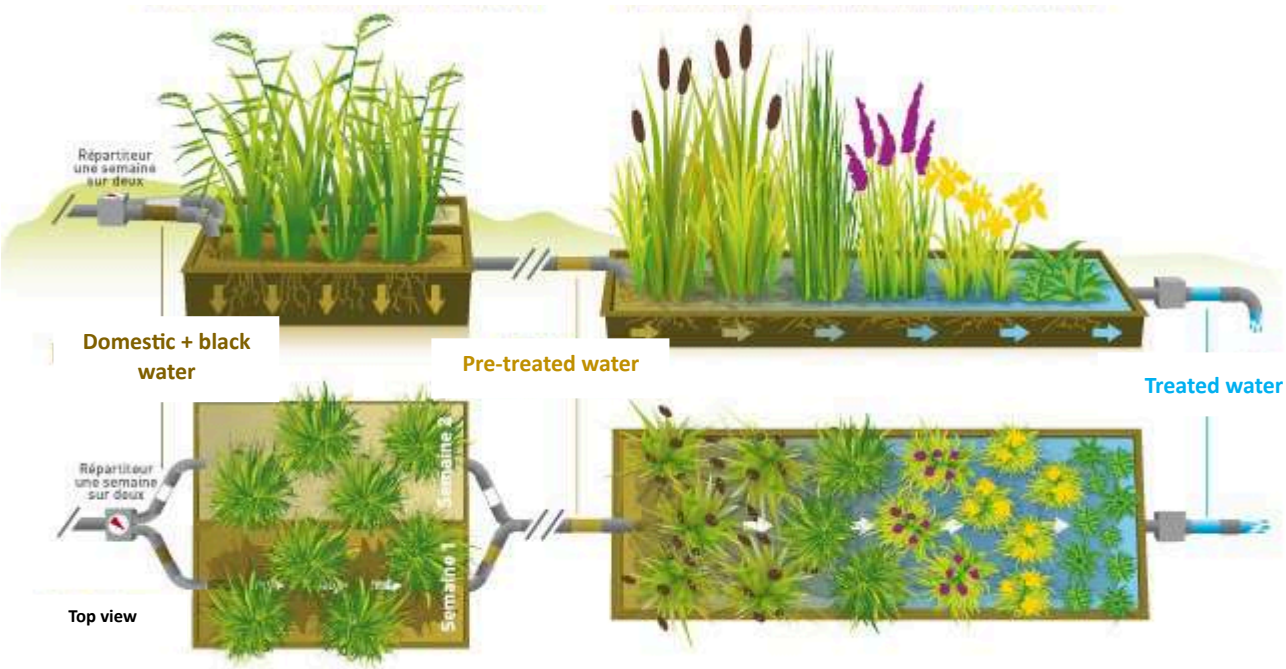
The horizontal flow filter (HF) recovers the wastewater filtered after the vertical filter. The horizontal filter works "under load", meaning that the substrate is almost permanently saturated with water. In the absence of oxygen, anaerobic bacteria denitrify the water: they take the oxygen they need from the nitrate molecules, which are transformed into nitrogen.

In order for the system to be completely autonomous and consume no energy, gravity is used to feed the two filters. The top of the vertical filter must therefore be lower than the building's wastewater collection point. Similarly, the top of the horizontal filter must be lower than the bottom of the vertical filter. The installation will therefore probably be in the lower part of the garden. If this is not possible because the land is flat, a lift pump must be installed between the collection point and the vertical filter, which will be above ground, while the horizontal filter will be buried. This filter provides the final filtration. The water stagnates in this basin and is then evacuated via an overflow.
The purified water then flows into a retention basin and is used to water the garden.

Note that the filters must be installed more than 3 metres from trees, as their roots could puncture the watertight membranes.

Pre-treatment: **vertical** flow reed filter

Treatment: filter planted with macrophytes with **horizontal** flow



How a planted filter or phytoremediation works

✔ **The importance of a soil study in a phytoremediation project**

Soil analysis is essential to the success of a phytoremediation project. This initial study assesses the physical, chemical and biological properties of the soil on a specific site, which is crucial to the design of a wastewater treatment system that is both effective and sustainable. Without a detailed understanding of soil characteristics, a phytoremediation system could face major problems, such as inefficient removal of pollutants or structural damage to the system itself.

Soil investigation

For a phytoremediation project, soil analysis includes a series of detailed analyses such as permeability tests, assessment of soil composition (clay, silt, sand), pH, presence of organic matter and cation exchange capacity. These data are crucial for predicting the soil's interactions with treated wastewater and its ability to filter and break down contaminants.

Determining filtration capacity

The soil's filtration capacity is crucial in a phytoremediation system, as it influences the speed at which water infiltrates. Soil that is too permeable can cause water to flow too quickly, reducing contact with plant roots and the micro-organisms that carry out the purification process. Conversely, poorly permeable soil can cause water to stagnate, creating anaerobic conditions that are not conducive to effective wastewater treatment.

Selecting the right plants

Soil analysis directly affects the choice of plants for the phytoremediation system. Some plant species require particular types of soil for optimum growth and effective purification. Knowing the soil composition allows you to choose suitable plants that will thrive in local conditions and maximise the efficiency of the system.

Preventing structural problems

A thorough soil analysis also helps to prevent potential structural problems. For example, soil that is prone to erosion or compaction may need to be reinforced before the plant purification system is installed. Neglecting these factors could lead to damage or failure of the system, resulting in significant repair costs.

Optimising system design

Soil analysis is essential for optimising the design of a phytoremediation system. It helps determine the optimum size and depth of treatment basins, the layout of planted areas, and the possible addition of materials such as filtration substrates. A design that is well adapted to the specific characteristics of the site's soil ensures not only treatment efficiency but also minimal impact on the landscape and the local environment.

✔ **Basin sizing**

The size of the plant is determined by its dimensions. The number of main rooms in the house must be taken into account. In other words, the number of bedrooms, offices, playrooms or other living areas in the house.

1 room = 1 Population Equivalent.

The regulations require a surface area of **2m² per inhabitant equivalent**. For example, a house with 4 bedrooms + 1 living room will need a 10m² plant purification system.

✔ **Which plants for phytoremediation?**

Plants used in phytoremediation :

Plant name	Purification value	Decorative value
Azolla hydrocharis	*90*	*90*
Ceratophyllum	*100*	*50*
Glyceria maxima	*75*	*75*
Hippuris vulgaris	*85*	*75*
Iris pseudacorus	*50*	*100*
Juncus conglomeratus	*50*	*100*
Lemna minor	*100*	*20*
Mentha aquatica	*75*	*75*
Nuphar lutea	*90*	*90*
Phragmite australis	*70*	*60*
Ranunculus flammula	*80*	*80*
Sagittaria japonica	*80*	*100*
Scirpus maritimus	*50*	*100*
Stachys palustris	*80*	*100*
Typha latifolia	*70*	*90*

1.13 - Lighting and light pollution

✔ **Understanding the impact of light pollution**

Natural light, with its circadian and seasonal variations, has accompanied the evolution of life on Earth. The alternation of day and night and the rhythm of the seasons have forged physiological processes and biological and behavioural adaptations. Diurnal and nocturnal ecological niches have been created within ecosystems, with complex relationships. Some species, such as humans, are adapted to life during the day with very poor night vision, while others have acquired senses that enable them to understand their environment in very low light.

The recent expansion of artificial light has disrupted ecosystems and the species that interact within them. The disappearance of the night sky also represents a loss of cultural reference points for mankind. Today, more than 80% of the world's population lives in illuminated areas (99% in Europe and North America) and 60% of Europeans can no longer see the Milky Way.

Artificial light at night is a further threat to biodiversity, alongside the artificialization of natural environments and pesticides. There are many causes:

- too much light; even natural moonlight, at less than 1 lux, has a cyclical influence on species. This brightness can be direct or due to the luminous halo resulting from inadequate lighting;
- a spectrum that mimics daylight, resulting in an inadequate physiological response. The blue component of white LEDs thus acts as an endocrine disruptor by inhibiting melatonin secretion in all vertebrates and probably in all living organisms for which the blue component is a signature of daylight. Blue light also diffuses further into the atmosphere; in recent years, the advent of white LEDs has led to an increase in light pollution.

The scientific literature on the impact of artificial lighting at night on biodiversity is exponential. More and more studies are being carried out on insects, birds, bats, plants (...), as well as on terrestrial and aquatic ecosystems. Studies on human health are not to be outdone, with proven links to certain diseases.

All artificial lighting has an impact on the environment. At the same time, we need lighting to continue our activities after dark and to make us feel safer at night. So we need to find a compromise. The challenge is to reconcile our real lighting needs while greatly reducing the disruption to biodiversity.

✔ **How can we reduce light pollution?**

Light pollution, which obscures the stars and disrupts the night-time environment, can be significantly reduced by responsible lighting practices. It's not necessarily a question of stopping lighting up at night, but of lighting up better. By adopting the following four principles, everyone can help preserve the night sky and minimise the impact on fauna, flora and human health.

1. **Orientation**: Opt for luminaires that are oriented exclusively towards the ground, eliminating any light directed above the horizon. This limits glare, improves luminous efficiency and reduces star fogging.
2. **Colour**: Prefer amber or warm light (≤ 2000 K), which is less aggressive and more respectful of the environment and the human biological rhythm.
3. **Intensity**: Adapt the wattage of luminaires to actual requirements for moderate, uniform lighting that provides better visibility without excessive contrast.
4. **Period**: Control the duration of lighting using timers, astronomical clocks, motion detectors or simply turning off the lights after a certain time.

These simple gestures help to reconcile night-time lighting with respect for the environment.

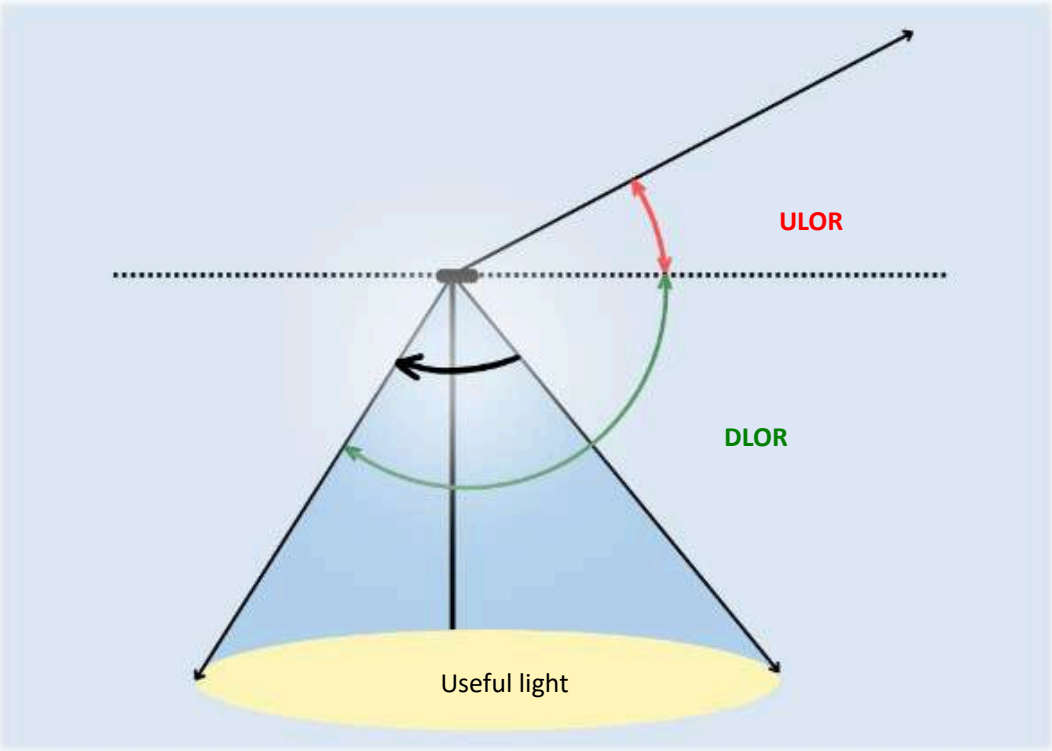
According to cieletoilemontmegantic.org

✔ **Upward Light Ratio**

The **Upward Light Ratio** (ULR) represents the percentage of light emitted by a luminaire towards the sky, which is essential for assessing and limiting light pollution. It is determined by taking account of actual installation conditions, including the orientation of the luminaire and the inclination of its support.

Why is it important to check the ULR?

- **Reducing light pollution**: Light directed upwards contributes to the veiling of the night sky, making stars invisible and disrupting nocturnal ecosystems. A low ULR, ideally 0%, minimises these effects.
- **Energy efficiency**: By directing all the light towards the ground, we maximise useful lighting while reducing energy wastage.
- **Respect for the nocturnal environment**: misdirected light can disorientate nocturnal animal species, disrupt their behaviour and affect natural cycles.



Where ULOR = Percentage of luminous flux emitted above the horizontal plane
and DLOR = Percentage of luminous flux emitted below the horizontal plane

✔ **Preferred lamps**

The least disruptive lamps for biodiversity are :

- **Narrow-spectrum amber LEDs** (≤ 2000 K) have a reduced impact thanks to their absence of short wavelengths (blue);
- To a lesser extent, **high-pressure sodium lamps (1800 K HPS)** and 2200 K LEDs, which have a limited proportion of short wavelengths.

1.14 – Preservation of existing trees during the worksite phase and soil management

The aim of this note is to establish **best practice for limiting the impact of works on existing trees** and ensuring the conservation of their root systems. In particular, it applies to earthworks, the laying of underground networks, soil protection and tree maintenance work carried out in the vicinity of remarkable vegetation.

1.14.1 General protection of trees during work

The protection of existing trees must be anticipated at the design stage and put in place before the start of the works. The following rules must be observed:

Protection of the trunk :

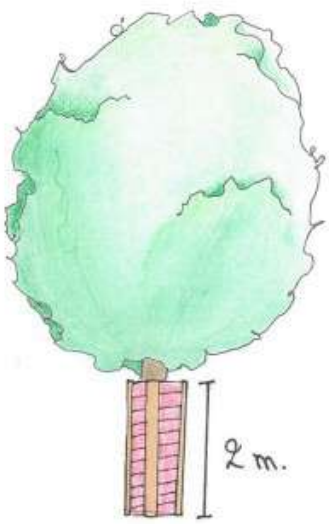
- Install a protective device covering **2/3 of the height of the trunk or a minimum height of 2 metres** (e.g. wooden planks, protective tubes, reinforced netting).

Delimitation of a protection zone

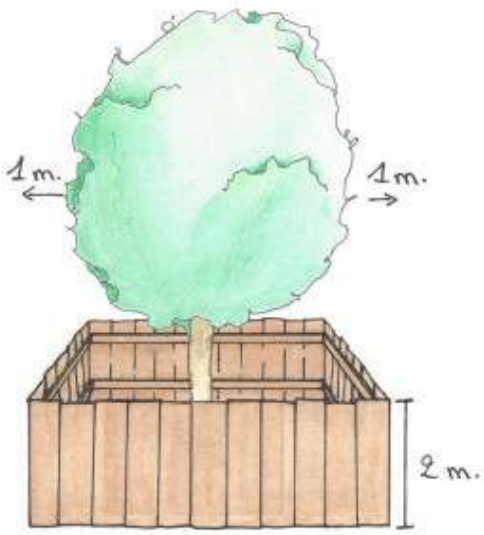
- A protective perimeter must be marked out around the retained trees, corresponding to **the vertical projection of the crown.**
- **Sensitive areas identified** in the Initial Flora Survey must also be protected.

Prohibitions in the protection zone :

- No **parking or use of machinery** within 1 m of the markings.
- **Storage of materials** prohibited in this zone.
- A **notice** should be posted on the site to remind people of these instructions.



Enclosure for protection to be fitted



(in addition to trunk protection)

Protec on of the trunk

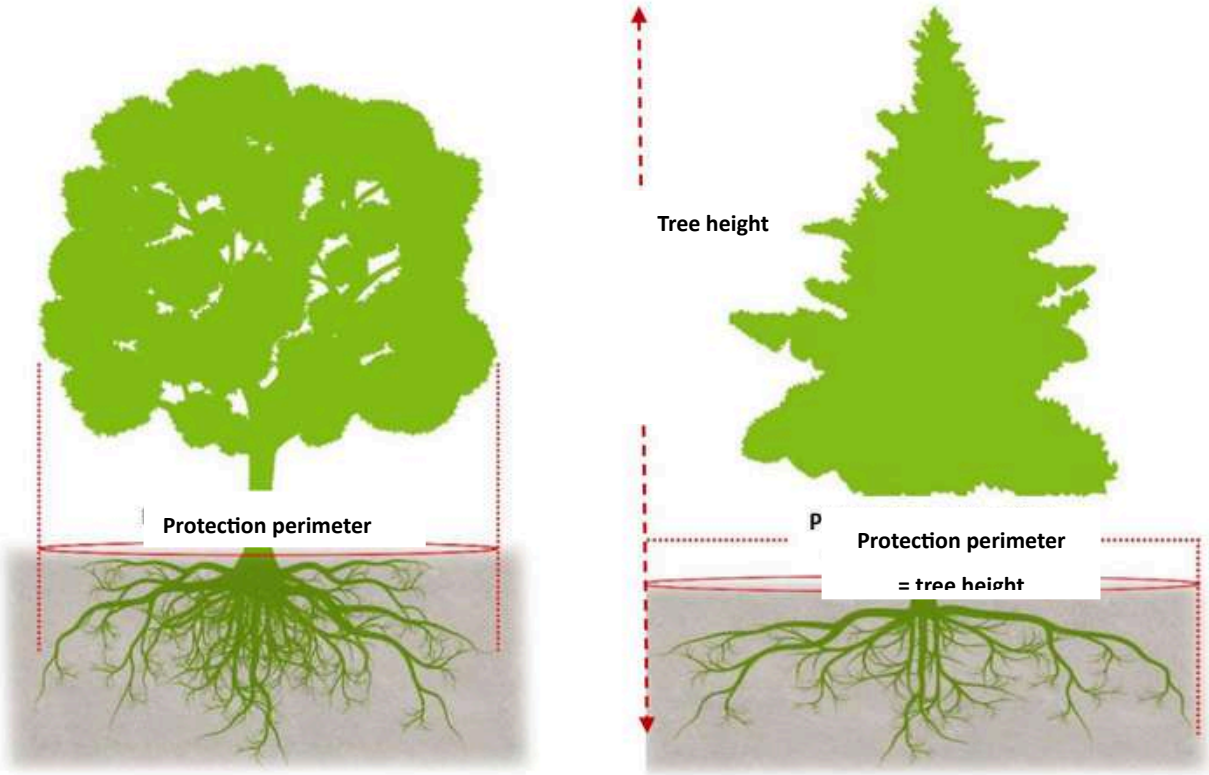
1.14.2 Root protection during earthworks

✔ **Preferred earthmoving techniques**

When work has to be carried out near existing trees, it is essential to preserve the integrity of the surface roots. In fact, **70 to 80% of roots** are located in the **first 70 centimetres of soil**.

✔ **Root protection perimeter**

- The **minimum zone of protection** corresponds to the vertical projection of the crown. However, it is recommended that the diameter of the protection corresponds to the height of the crown (all branches and foliage).
- **We strongly advise against opening a trench less than 2 metres from the trunk**. If work is necessary, it should be carried out **manually.**



✔ **Preferred earthmoving techniques**

- **Using a vacuum excavator:** Vacuum excavation is one of the techniques known as the "soft method". This method enables earthworks to be carried out in congested areas without damaging "sensitive" networks.
  - Extracts soil **without damaging roots**, thanks to a powerful air flow that replaces mechanical excavation.
  - Particularly recommended for excavations to **install underground networks** or for **landscaping work in wooded areas**.

✔ **Protection of exposed roots**

- **Exposed roots** must be **protected immediately** to prevent them drying out**.**
  - Use of **wet tarpaulins or temporary mulching** to maintain hygrometry.
  - Install a **protective screen (e.g. wood, biodegradable canvas)** if exposure lasts several days.
- **Any severed roots should be trimmed cleanly** with a disinfected tool and covered with a **healing mastic** t avoid infection and the risk of rotting.

✔ **Laying underground networks under existing trees**

- **Minimum recommended depth**: 1 metre to limit the impact on the root system.
- **Use of anti-root film** around the pipes to prevent future root intrusion.
- **Root system bypass** recommended where technically possible.

1.14.3 Restoration of compacted soil and desiltation

✔ **Effects of soil compaction**

Excessive soil compaction prevents **water infiltration**, limits **soil oxygenation** and **inhibits root growth**.

✔ **Decompacting techniques adapted to trees**

- **Using an air spade**
  - Works with a high-pressure air jet to **break up compaction without damaging fine roots**.
  - Particularly effective for **removing water from soils** and **restoring degraded vegetated areas**.
- **Organic amendment to revitalise the soil**

After decompacting, a **compost + biochar mixture** is recommended to improve soil structure and its ability to retain water, promote the biological activity of soil micro-organisms, and boost root resilience by providing a richer, more stable substrate.

1.15 - Using mulch

1.15.1 Advantages of using mulch

✔ **Limit watering of the soil**

Mulching reduces the need for watering. Bare soil evaporates more moisture than covered soil. This phenomenon can be reduced by covering the soil with mulch, particularly in summer. By conserving soil moisture, watering is less frequent, so water consumption can be controlled.

✔ **Reducing weed pressure**

Mulching limits the soil's exposure to light, reducing the germination and development of weeds.
The mulch will therefore have to be added regularly to maintain a thickness of 4-5 cm. If the volume of green waste produced is insufficient to meet the mulching requirements, the manager will have to supply additional material.

✔ **Preventing the formation of capping and improving soil structure**

Soil mulching helps to improve the surface of the soil. Mulching prevents water from falling directly onto the soil and, in clay soils, creating a settling effect known as "battance". This prevents the formation of a "croute de battance" on the surface of the soil, which cracks as it dries and, becoming impermeable, no longer allows water to penetrate the soil properly.

In addition, this method of managing green spaces reduces the leaching of elements from the soil. Leaching is the transport of elements by rainwater. Clay particles can be washed away during heavy rainfall, damaging the soil structure and hindering plant growth and soil fauna. Other elements, in soluble form, can be leached out, particularly nitrogen, which is an essential component of plant growth (this is known as leaching).

Bare soil also causes erosion. This is because the capping prevents water from infiltrating the soil, so it will run off and carry away large quantities of soil particles. Soil structure is improved when organic mulch is used. Decomposition by micro-organisms enriches the soil in organic matter and improves its condition (resistance to compaction, better water storage, return to plants, etc.).

✔ **Encouraging fauna and microbiological life in the soil**

Mulching improves the growth and health of plants and encourages microbial life in the soil by maintaining a stable temperature, humidity and concentration of organic compounds that are conducive to the development of the micro-organisms that are essential for the growth of plant species. Mulching creates a shelter for the soil's fauna, which in turn stimulates the biodiversity of the planted area, because a species is not isolated but is part of a whole ecological complex.

✔ **What materials should be used for mulching?**

Many organic materials (wood chips, bark, straw, green waste) or mineral materials (gravel, pozzolan, pottery debris, crushed slate) can be used as mulch. It's best to choose locally produced materials.

Type of mulch	Benefits	Disadvantages
Wheat straw	Low cost	Renew every year Presence of seeds, so wheat grows back on its own Large thickness required
Hay	Contains nitrogen	Can form a crust in high humidity
Pine barks (large)	Effective, long-lasting	Acidifies the soil[9]
Pine bark (small)	Contribution of humus when it decomposes	Less durable over time
Pozzuolana	Rot-proof, provides the minerals needed for plant growth.	High cost
Slate	Sales-resistant, pH-neutral	Difficult to handle
Pieces of wooden pallets	Can be coloured	Chemical treatment often applied
Linen sequins **Hemp flakes**	Low cost, adds humus when it decomposes	Blowing in the wind Not very durable over time
Cocoa bean pods	Very nurturing	High cost Not local

Note: The thickness of the mulch must be taken into account when designing the green spaces. The level of the ground must be adjusted so that the mulch is flush with the finished ground, without creating any extra thickness, in order to ensure good integration into the landscape and avoid the risk of unevenness, water stagnation or damage to the planting.

[9]Care should be taken to avoid this. The presence of trace metal elements (TMEs) in the soil (such as lead, cadmium or mercury) can present a contamination risk. They come from both natural and man-made sources (industry, fertilisers, sludge, etc.). The pH of the soil influences their mobility: the more acidic the soil, the more mobile these pollutants become and the more likely they are to contaminate plants, water... and ultimately humans.

1.16 - Rainwater management facilities

In urban areas, the sealing of soil disrupts the natural water cycle, increasing run-off, the risk of flooding and the pollution of receiving environments. In response, sustainable and natural rain water management offers an integrated approach that combines volume control, progressive purification, local infiltration and ecological enhancement of urban spaces.

Careful management of slopes and run-off is highly recommended: it allows rainwater to be guided from the sealed surfaces towards a series of successive structures, such as recessed green spaces, rain trees, ditches, valleys and natural retention basins. This progressive approach reduces run-off, encourages infiltration and helps to recharge groundwater, while enhancing biodiversity.

When well designed and maintained, these structures help to create connected natural or semi-natural environments, reinforcing the green and blue webs within the urban fabric. They help to limit ecological fragmentation, provide a home for local flora and fauna, and can be integrated into multifunctional public spaces (parks, pathways, recreation areas, etc.).

The diversity of forms and uses is an important lever: a retention basin combined with a varied plant palette and soft uses (walking, contemplation, games, etc.) will bring far more benefits than a mineral or standardised basin. These systems must therefore be designed as ecological, social and landscape infrastructures in their own right.

1.16.1 Different ways of managing rainwater

✔ **Water retention basins**

This type of pond temporarily stores rainwater and run-off after a rainy spell, allowing it to be released in a regulated manner or partially infiltrated. Their presence in permanent water creates a living aquatic ecosystem (fauna, flora), contributing to the natural purification of water through decantation, absorption of pollutants by plants, and biological filtration via bacteria. These ponds can be integrated into urban parks, providing a perfect setting for a stroll.

✔ **Dry retention basins**

A dry retention basin is designed to temporarily collect rainwater and run-off during rainy events, then gradually release it by infiltration or towards an outlet. These basins are often dry outside rainy periods. They also play a role in water purification by helping pollutants to settle. The bottom can be laid with grass or covered with spontaneous vegetation, providing a multi-purpose area such as a park or play area. The banks, which are often soft, can be stabilised with geogrids to limit erosion and make them easier to integrate into the landscape.

✔ **Troughs and ditches**

A ditch is a wide, shallow, gently sloping ditch that collects rainwater, stores it temporarily and allows it to infiltrate gradually, purifying it of potential pollutants (e.g. hydrocarbons from run-off from car parks and roads) or leading it slowly to a network for treatment. The water in these areas is generally temporary, but overcrowding can be used to retain areas of water that are favourable to biodiversity. Vegetation, whether planted or spontaneous, helps to maintain the infiltration capacity of the environment thanks to the rhizomes and roots that aerate the soil.

✔ **Drainage/infiltration trench**

The drainage trench is a linear structure that collects rainwater, stores it temporarily and infiltrates it into the ground while retaining pollutants through a filtration process. It is made up of gravel or honeycomb structures surrounded by a geotextile to prevent clogging. The surface can be covered with pebbles, grass or paving stones that allow water to pass through. It can be integrated into the landscape in a number of different ways: as a discreet feature or as part of a green space.

✔ **Infiltration wells**

An infiltration well is a vertical structure designed to infiltrate rainwater directly into the permeable layers of the ground. This type of structure helps to recharge the water table while filtering the water through aggregates and geotextiles. The well is often covered by a secure buffer, and can be discreetly integrated into the landscape. Although only functional on the surface, they are an effective solution for urban areas with limited available space.

1.16.2 Characteristics to be taken into account

In order to have a beneficial impact on biodiversity, particular attention must be paid to the management of landscaped water retention basins. As a general rule:

- Dredging every 5 to 10 years, depending on the degree of silting. Please note that this operation may require applications for a "protected species" exemption, particularly for amphibians;
- Cleaning up leaves and rubbish in autumn.

✔ **Slope of retention basins**

Retention basins can present risks for fauna, as many species drown in them if they are not properly designed. To limit the amount of land required, a number of retention basins have steep walls and are very deep. In use, these ponds always retain residual water that attracts a number of animals (amphibians, mammals, insects, etc.) to drink or reproduce. The slippery plastic membrane, the steep banks, the presence of algae or humidity make it impossible for these animals to get out. They exhaust themselves in the pond and end up drowning. It is therefore essential to limit the risks by adapting the slopes of the ponds. Gentle slopes also make it possible to comply with regulations on public access, so that the area around the ponds is not fenced off (maintaining ecological continuity for the movement of species)**.**

✔ **Choice of plants**

If a water retention basin is to function ecologically, a coherent choice of vegetation is essential. The choice of vegetation should be based on the characteristics of the soil and the type of structure being created. It is important to select :

- Woody plants that tolerate hydromorphic conditions and variations in water levels;
- Herbaceous plants that can withstand alternating wet and dry conditions (in the case of dry retention basins that empty completely after a rainfall event towards an outlet);
- Herbaceous plants that tolerate hydromorphic conditions and variations in water levels:

  - Helophytes: Plants whose stems, leaves and flowers develop mainly outside water. They are found on water-covered or simply damp soil. The plant feeds in the soil but can sometimes establish its roots at the soil-water interface (examples of helophytic plants: reeds, cattails, purple loosestrife, iris or willowherb).

  - Hydrophytes: Plants whose root system is always in the water. The leaves are either totally or partially submerged. Some, such as water lettuce, float and have roots that are only in the water.

  - Amphibians: These develop an intermediate strategy, with some species, such as aquatic knotweed, displaying both forms of development.

The choice of plants also depends on the soil:

- **Highly draining sandy soils**: Choose plants capable of withstanding periods of drought *(e.g. purple willow);*
- **Low-porosity silty soils**: If signs of hydromorphy are observed *(black/blue marks*), planting plants resistant to root asphyxia, such as willows, is particularly appropriate;
- **Clay soils**: Clay has a high water retention capacity, but also a low macroporosity, leading to a high risk of root asphyxia in the wet season. On the other hand, during periods of severe drought, this water may be difficult for plants to mobilise. In such cases, the plants must have developed a root system deep enough to obtain water. (*Examples: oak and nannyberry or helophytes such as rushes and barnacles).*

The installation of allochthonous plants *(which come from a different place, which have been transported*) and in particular those which are potentially invasive should be prohibited. They will become invasive and colonise the environment to the detriment of local plants. This will lead to a loss of biodiversity, and even present a high risk of malfunctioning vegetated structures. It is important to install local plants.

At the same time, in addition to planting a varied range of vegetation, it is a good idea to leave bare areas to encourage spontaneous flora to colonise. Finally, staggering flowering and fruiting throughout the year will have a beneficial effect on pollinating insects and birds.

✔ **Mowing periods**

Grassed areas in water retention zones *(ditches, ponds and basins) must* be mown once or twice a year. Mowing green areas must respect the plant cycle and must not interrupt it. In order to encourage the establishment of a

wide variety of flora and fauna, this work must be carried out outside the periods of reproduction and flowering/fruiting *(i.e. from mid-August to March).* This approach to delayed or selective mowing helps to :

- Allowing plants to complete their vegetative cycles;
- Facilitating the establishment of fragile plants ;
- Creating and preserving ecological niches;
- Creating habitats favourable for fauna (pollination, refuge areas, food, etc.).

1.17 - Maintenance of green spaces

Not all maintenance methods have the same impact on biodiversity. Certain choices can lead to environmental degradation or a reduction in ecological diversity. It is therefore essential to anticipate maintenance practices at the design stage, to ensure that they are compatible with the site's ecological objectives.
Generally speaking, it is important to change the way we look at spontaneous flora, which is often wrongly perceived as a sign of neglect or dirtiness, whereas it constitutes a reservoir of local biodiversity and plays a functional role in urban ecosystems.

1.17.1 Biological control and amendment

Whether they are called "phytosanitary products", "pesticides" or "phytopharmaceutical products", these inputs refer to substances or preparations used to protect plants or plant products against all harmful organisms or to prevent their actions (fungicides, herbicides, insecticides/acaricides, rodenticides) based on chemical products. These products are not without consequences for the environment and the flora and fauna of the treated site. In some cases, they are also found in groundwater when they are incorrectly dosed.
To implement sustainable pest management, it is necessary to identify the threats in order to propose a targeted and proportionate response that does not endanger other species that do not present a threat. Integrated biological control is a means of reducing animal or plant populations by using natural predators or parasites. These are generally bacteria, fungi, viruses, nematodes and insects.

✔ **Organic amendments**

The natural and organic fertilisers used are of organic origin (compost, manure, etc.) or mineral (lime, sand, etc.). They are used sparingly when planting so as not to generate pollution. The plants installed on the site do not require any external inputs after the recovery period.

✔ **Biological control**

Crop protection agents are specific to a particular type of intervention. It is necessary to consult a professional to identify, depending on the attack, the right auxiliary to use and in what quantity. These organisms are then responsible for reducing the animal population or that of the target plant. The example of the ladybird as a predator of aphids is well known to everyone.
Another method is to use companion planting, or the art of combining crops to take advantage of natural repellents. In agriculture, this technique is based on the association of at least two plants that have beneficial reciprocal effects. The plants can protect each other against attacks (diseases, predators, etc.) or help each other grow. This symbiosis can also be found between a plant and an animal species, which is then called a crop aid. The best-known example is the ladybird larva, which rids infected plants of aphids.

✔ **Weed control techniques**

Knowing that there are no weeds or that spontaneous vegetation is not dirty, it is important to raise awareness so that pioneer plants can have their place in our landscaping. It is sometimes necessary, for reasons of durability or safety, to weed specific areas *(mineral surfaces, etc.)*. However, not all weeding methods have the same impact on biodiversity. The use of phytosanitary products is not authorised.

Method of weeding	Efficiency experimental	Annual frequency of intervention	Environmental impact
Thermal flame weeding	Limited	High	Medium
Thermal weeding - hot water / steam	Satisfactory	Average	Medium
Mechanical weeding	Satisfactory	Average	Medium to high
Manual weeding, hoe	Satisfactory	High	Low

✔ **Mechanical maintenance**

Manual methods can be used to select certain species that should not be uprooted. The above list is not exhaustive; there are as many weeding methods as there are areas to be worked on. However, the methods that cause the least pollution, both in terms of carbon footprint and noise, are usually the most favourable to biodiversity.

Mechanical maintenance should only be carried out once or twice a year to encourage biodiversity. By choosing the right species and the right planting distances (dimension of the plant at adult size on the plans), it is not necessary to prune trees and shrubs every year, except for heritage reasons (trellising, etc.) or for safety reasons.
The choice of maintenance techniques depends on the means available, the staff available, the frequency of intervention required, its effectiveness and the equipment required: thermal weeding (hot water/steam), mechanical weeding and manual weeding (by hand or hoe). The methods can be mixed.

✔ **Differentiated mowing**

Mulching prevents light from reaching the soil surface, which prevents weeds from germinating and developing.
Differentiated mowing involves varying the height and frequency of cut. Reducing the number of times the mower is run or mowed and adapting the cutting height protects access while encouraging the natural cycle of vegetation. This makes it possible to reconcile the different uses of lawns and turf with the enhancement of biodiversity (higher and less frequent mowing is better for plants and animals). As it grows, the vegetation develops natural defences against environmental aggression (drought, insect attacks, etc.). As a result, less maintenance is required and water resources can be conserved intelligently.
The height and frequency of mowing must be determined in the light of ecological planning so as not to destroy habitats or species that are harmful to the site's biodiversity. Higher mowing (above 6 cm) at the foot of trees, near hedges, orchards, etc. will create real shelters for microfauna and limit the risk of drying out.

Depending on the site, it is advisable to export the mowing products in order to impoverish the soil. This stimulates greater biodiversity and leaves more room for the seeds present in the soil. Conversely, on soil that is already poor, it may be preferable to retain the mowing products to maintain the existing balance. The management plan should make it possible to determine the method of intervention on the site.

Depending on the biodiversity issues at stake, certain felling periods should be avoided so as not to harm the fauna or flora present on the site. The following table summarises the periods to be avoided:

Biodiversity issues	Cutting period to be avoided
Flowering	April to June
Fructification	May to July
Development period for grassland insects	April to August
Nesting season for ground-nesting birds	April to July

1.18 - Raising awareness

To ensure the long-term ecological performance of a certified site, it is essential to educate and train users, owners and operators in biodiversity issues. Sustainable management that respects ecosystems requires an **understanding of ecological interactions** and **the commitment of those involved on the site**. Only by operating in a way that preserves living things can biodiversity be effectively restored to an urban environment.

1.18.1 Educational and awareness-raising tools

Awareness can be raised through a range of **educational tools** tailored to the target audience. The aim is to raise **awareness** and actively involve site users.

✔ **Educational panels and signage**

Signs explaining local biodiversity issues, the species present and good management practices are an effective way of informing the public. These signs can be placed in strategic areas, such as site entrances, footpaths or shared gardens.

✔ **Interactive QR codes**

The integration of **QR codes** on the educational panels provides direct access to enriched content:

- Detailed fact sheets on the local flora and fauna;
- Videos explaining good ecological practices;
- Links to participatory science databases ;
- Interactive map of the site with points of ecological interest

QR codes allow information to be **updated regularly** without the need to replace the physical panels, guaranteeing **an evolving and interactive** way of **raising awareness**.

✔ **Workshops and training**

Training courses for managers, operators and users can be organised to pass on **good ecological management practices** (differentiated maintenance, choice of species, respect for natural cycles). **Educational workshops** can also be offered to schools, businesses and residents to raise awareness of ecological interactions and the preservation of flora and fauna.

✔ **Awareness-raising events**

The organisation of **nature days**, conferences, documentary screenings and meetings with ecologists or local associations encourages the involvement of users and the dissemination of knowledge about the site's biodiversity.

1.18.2 Participatory programme

A participatory programme set up by site users and/or the operator is both **a tool for raising awareness and for monitoring biodiversity**. This type of initiative makes it possible to directly involve the site's inhabitants and stakeholders, making them **active stakeholders and responsible for** their environment.

The actions implemented may include :

- **Collecting and monitoring naturalist data**: taking part in participative sciences (birdwatching, pollinator monitoring, amphibian counting, etc.);
- **Inventory programmes**: identification and census of the plant and animal species present on the site;
- **Setting up refuges**: installing bird boxes, insect hotels, hedgehog shelters or educational ponds to encourage local fauna.

These actions do not generally require **in-depth knowledge of nature**. Everyone can make a contribution, whether they're a **beginner or an expert**, in town or country.

Participatory science can also help **to improve knowledge of local biodiversity** and contribute to databases useful for research and ecological management of the region.

1.18.3 Impact of pets

Pets, particularly cats and dogs, can have a **significant impact** on local biodiversity. It is essential to make residents aware of their effects on fauna and how to limit these impacts.

Domestic cats are formidable predators of birds, small mammals and reptiles. Their presence in an urban or natural environment puts significant pressure on fauna. In several countries, studies have shown that cats are responsible for the predation of millions of animals every year, contributing to the decline of certain local species. Their impact is particularly worrying on islands and in fragile ecosystems, where endemic species are more vulnerable to predation.

1.18.4 Ongoing and evolving awareness-raising

Raising awareness should not be a one-off action, but an **ongoing process** that adapts to changes at the site and to environmental issues. It is recommended to :

- **Regularly evaluate the effectiveness of the systems put in place** (questionnaires, feedback from users, biodiversity monitoring);
- **Renew and diversify educational initiatives** to reach different audiences and maintain long-term commitment;
- **Collaborate with naturalist associations and experts** to ensure that knowledge and practices are kept up to date.

By incorporating these tools and good practices, awareness-raising becomes a **powerful lever for promoting biodiversity on the site** and ensuring harmonious cohabitation between man and nature.

2 - Glossary

Acronym	Meaning	Definition
AMF	French Financial Markets Authority	French financial market regulator.
BSC	Biodiversity Standard Council	Scientific committee of NORMATYS, for which IRICE provides the secretariat without taking part in votes, which takes part in developing the Effinature standards and validates their final versions.
CBD	Convention on Biological Diversity	International treaty adopted in Rio in 1992 for biodiversity conservation and sustainable use.
CSRD	Corporate Sustainability Reporting Directive	EU directive on ESG reporting for companies.
ECI	Ecological Coherence Index	Indicator of ecological network coherence.
EEI	Ecological Endowment Index	Ratio of financial effort dedicated to biodiversity, relative to the total project cost.
EIA	Environmental Impact Assessment	Assessment of a project's environmental impact.
ERC	Avoid – Reduce – Compensate	Regulatory mitigation hierarchy: avoid, reduce, compensate.
ESG	Environmental, Social and Governance	Environmental, social, and governance criteria.
EVI	Ecological Value Index	Assessment of overall ecological performance.
FSC	Forest Stewardship Council	Label certifying responsible forest management.
GBF	Global Biodiversity Framework	Global biodiversity framework adopted at COP15.
hGAF	Harmonized Green Area Factor	Indicator of a project's ecological hosting capacity.
IAS	Invasive Alien Plant Species	Non-native invasive plant species threatening local biodiversity.
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services	Global science-policy platform on biodiversity and ecosystem services.
IRICE	Institute for Ecological Coherence Engineering	Certification body that assesses operations and decides on Effinature certification.
ISO 17065	ISO/IEC 17065 Standard	International standard for product/service certification.
IUCN	International Union for Conservation of Nature	Global authority on biodiversity status and conservation.
MRV	Measure, Report, Verify	System for environmental traceability and verification.
NBS	Nature-based Solutions	Nature-based solutions to societal challenges.

Acronym	Meaning	Definition
NCO	New Constructions	Effinature framework for new construction projects.
PEFC	Programme for the Endorsement of Forest Certification	Forest certification system promoting sustainable management.
SBA	Structured Biodiversity Area	Dedicated, protected biodiversity space.
SDG	Sustainable Development Goals	United Nations Sustainable Development Goals.
SFDR	Sustainable Finance Disclosure Regulation	EU regulation on ESG transparency in finance.
SIP	Site Installation Plan	Site layout and logistics planning document.
SNB	National Biodiversity Strategy	French national biodiversity strategy.
SVI	Site Valuation Index	Assessment of tree heritage conservation.
TPO	Total Project Cost	Total investment cost of the project.
ULR	Upward Light Ratio	Ratio of upward-directed light emissions.
ZAC	Concerted Development Zone	Designated area for coordinated urban development.
ZAN	No Net Land Artificialisation	Zero net land take objective.

3 - Lexicon

Amendment : Addition of organic or mineral matter to improve soil structure, fertility and water retention capacity.

Artificial surfaces: artificial surfaces refer to areas removed from their natural, forestry or agricultural state. They include built-up land, paved land and other areas used for human activities such as quarries, landfill sites, urban green spaces and sports facilities.

Biodiversity: refers to the variety and variability of living organisms on Earth, encompassing all forms of life across terrestrial, marine and other aquatic environments. It includes diversity within species (genetic diversity), between species (specific diversity), and diversity of ecosystems (diversity of habitats and ecological processes).

Black ecological corridor: ecological network designed to preserve the nocturnal continuity necessary for fauna and flora, by limiting light pollution. It aims to protect species that are sensitive to artificial light, such as nocturnal insects, amphibians, bats and certain birds, which depend on darkness for their life cycle, particularly for reproduction, feeding, migration or navigation. By encouraging areas of darkness and regulating artificial lighting, the black ecological corridor contributes to maintaining nocturnal biodiversity and the proper functioning of ecosystems.

Common biodiversity: in ecology, common biodiversity refers to species that are common and abundant in an ecosystem, often referred to as common species. It differs from "extraordinary" biodiversity, which includes rare or highly threatened species, whatever their biological group.

Differentiated green space management: an approach to maintaining green spaces that adapts practices according to the uses and ecological challenges of each area.

Ecological continuity: corresponds to all the vital areas (biodiversity reservoirs) and elements that enable a population to move around and access vital areas (ecological corridors).

Ecological network: the ecological network is made up of all the natural elements that contribute to the creation of a network of links between green or aquatic areas, necessary for the development and survival of flora and fauna.

Ecosystem: an ecosystem is a biological system consisting of a biotope (a biological environment with homogeneous living conditions) and all the species (biocenosis) that live, feed and reproduce there.

Ecosystem services: all the services we derive from ecosystems: pollination, fermentation, filtration, climate regulation.... There are four of them:

- Support services: services necessary for the production of other services, i.e. those that create the basic conditions for the development of life on earth (water cycle, nitrogen cycle, soil formation and evolution processes, etc.);
- Supply services include the resources provided by ecosystems (food, fresh water, wood, cotton, pharmaceutical products, etc.);
- Cultural services include the intangible goods provided by ecosystems (landscape, nature-based recreation, ecotourism, spiritual and religious values, etc.);
- Regulating services: services covering the natural processes regulated by ecosystems (air quality regulation, CO2 sequestration, water purification and waste treatment, erosion regulation, pollination, rainfall regulation, etc.).

Evapotranspiration: quantity of water transferred to the atmosphere by plant transpiration.

Extensive maintenance: management method that limits human intervention to allow ecosystems to evolve in a more natural way.

Fragmentation of territories: the fragmentation of ecosystems or ecological habitats refers to artificial phenomena that create a fragmentation of space and prevent species from moving as they could in the absence of the fragmentation factor. There are several types of factor that cause fragmentation of territories: human infrastructures (railway lines, roads, hydraulic dams, wind turbines, urban areas with little vegetation, etc.), but also agricultural areas or areas subject to chemical, light and noise pollution.

Green and blue ecological corridors: a network of terrestrial and aquatic ecological continuities identified by regional ecological coherence schemes and by planning documents drawn up by the State, local authorities and their groupings. The green and blue ecological corridors contribute to improving the conservation status of natural habitats and species and to the good ecological status of water bodies. It applies to the whole of France, with the exception of the marine environment.

Late mowing: ecological management practice consisting of delaying grass cutting to allow the full development of the flora and encourage the associated fauna.

Macrofauna: all the medium- to large-sized animals that are part of the ecology of an environment. Individuals range from 4 to 80 mm in length and can modify the physical structure of the soil by digging galleries or ingesting soil.

Microfauna: antonym of "macrofauna", these are all animals smaller than one millimetre that live in a particular environment.

Microorganism: living beings invisible to the naked eye, unicellular or multicellular. In this case, the cells are not differentiated into tissues.

Mulching: technique of covering the soil with organic or mineral matter to limit evaporation, prevent weed growth and improve fertility.

Organic waste: another name for fermentable waste. This is residue of plant or animal origin that can be broken down by micro-organisms for which it represents a source of food. It includes: plants, putrescible kitchen waste and waste collected from canteens and company restaurants, soiled paper and cardboard under certain conditions. This waste is used to make compost.

Phytoremediation: soil remediation, wastewater treatment or indoor air purification, using vascular plants, algae or fungi, and by extension the ecosystems that support these plants. In this way, contamination is eliminated or controlled. The degradation of harmful compounds is accelerated by microbial activity.

Plant cover: a group of plants covering the soil, protecting it from erosion and helping to improve water retention and soil quality.

Protected biodiversity area: a planted area left to evolve freely, protected from any regular human intervention, with no function of use, and dedicated exclusively to biodiversity.

Silent ecological corridor: refers to ecological corridors that promote the continuity of habitats for species dependent on sound communication and acoustically preserved environments. It aims to limit noise pollution in ecosystems in order to protect the vital exchanges of species that use acoustic signals for their life cycle, such as

reproduction, navigation, territoriality and social relations. By reducing noise pollution, the silent ecological corridor helps to maintain conditions favourable to biodiversity and preserve essential ecological interactions.

Soil sealing: Soil sealing refers to the permanent covering of soil by an impermeable artificial material such as asphalt or concrete. This phenomenon is one of the main causes of soil degradation.

Substrate: the substrate is the support on which the plants grow.

Specific diversity: biological component that provides information on the variety and number of species in a given area.

Urban heat island: a localised rise in temperature in an urban area compared with neighbouring rural areas. Heat islands are artificial microclimates caused by human activities (power stations, heat exchangers, etc.) and urban planning (dark surfaces that absorb heat, such as tarmac). This phenomenon can exacerbate heatwaves and affect biodiversity, by repelling certain species and attracting others that are more thermophilic.

4 - Bibliography

4.1 - Websites

- Professional news website for the environment sector
- Afnor website (relating to the development, approval and promotion of French standards)
- Website of the French Committee of the International Union for Conservation of Nature (on the conservation of flora and fauna)
- Global information site for sustainable development
- Website of the United Nations Educational, Scientific and Cultural Organization (on global biodiversity)
- CSA website (on French opinion polls on biodiversity)
- Portal site for Agenda 21 initiatives in France
- Website of the Ministry of Ecology, Energy, Sustainable Development and the Sea (on sustainable development and biodiversity)
- French portal for the International Year of Biodiversity
- Ligue ROC website (on fauna conservation)
- Website of the French National Institute for Agronomic Research (on promoting biodiversity)
- Grenelle Environnement website (on the Grenelle Environnement principles concerning biodiversity and urban planning)
- Site of Cerqual, certification body (about housing certifications)
- Website "the Environmental Assessment Method for Buildings Around The World" (UK) (about building certification in the UK)
- Site on environmental observation and statistics (relating to information and data on the environment and biodiversity)
- French legislation website (relating to regulations on planting plant species on property and the decree for species diversity in the PACA region)
- SIETREM website (information on individual composting of green and household waste)
- France Assainissement website (on soil permeability)
- Website of the "Respectons notre sol" association
- ADIVET association website
- NATURPARIF website
- IUCN Red List of Threatened Species (about threatened species worldwide)

4.2 - Articles

- Aubertin C. et Vivien FD. (1998). Les enjeux de la biodiversité, Éditions Poche environnement – Economica, p. 112.
- Barbault R. (2004). Biodiversité et crise de croissance des sociétés humaines : L'horizon 2010, Chevassus-au-Louis.
- Bird, W. (2004). Can Green Space and Biodiversity Increase Levels of Physical Activity ?
- Bratman G. et al. (2019). Nature and mental health : An ecosystem service perspective. Sciences advances.
- Brenneisen S. (2003). Space for Urban Wildlife: Designing Green Roofs as Habitats in Switzerland, University of Applied Sciences Wädenswil
- Cavailhès (2005). The landscape from house : seeing and being seen. A GIS-based hedonic price valuation.
- Cherqui F. (2005). Thèse : « Méthodologie d'évaluation d'un projet d'aménagement durable d'un quartier, Méthode ADEQUA ». Soutenue le 14 décembre 2005, Université de la Rochelle, p. 59-67/85-99.

- Clergeau P., Savaed JPL., MENNECHEZ G. et Falardeau G. (1998). Bird abundance and diversity along an urban-rural gradient : a comparative study between two cities on different continents, Condor 100, p. 413-425.
- Clergeau P., Désiré G. (1999). Biodiversité, paysage et aménagement : du corridor à la zone de connexion biologique, Mappemonde 55, P. 19-22.
- Costanza R., Arge R., Groot R., Farber S., Grasso M., Hannon B., Limburg K., Naeem S., O'Neill RV., Paruelo J., Raskin RG., Sutton P. et Van den Belt M. (1997). La valeur des services de l'écosystème mondial et du capital naturel, Nature Vol. 387, p. 253-260.
- Croci S. (2007). Thèse : « Urbanisation et biodiversité : traits biologiques et facteurs environnementaux associés à l'organisation des communautés animales le long d'un gradient rural urbain ». Soutenue le 15 juin 2007, Université de Rennes, p. 13-26/129-148.
- Health Council of Netherlands. Nature and Health. (2004).The influence of nature on social psychological and physical well-being.
- Hilal M., Jean Cavailhès, Thierry Brossard, Daniel Joly, François P. Tourneux, Pierre Wavresky (2008). Les métriques paysagères utilisées pour déterminer le prix des paysages, Inra, Lille.
- Houdet J. (2008). Intégrer la biodiversité dans les stratégies des entreprises, Guide Oree et FRB.
- Levrel H. (2006). Thèse : « Biodiversité et développement durable : quels indicateurs ? ». Soutenue le 23 octobre 2006, Ecole des hautes études en sciences sociales, p. 19-65/143-176.
- Lotfi Mehdi, Francesca Di Pietro (2009). L'espace vert public, lieu d'interactions entre société et biodiversité.
- Luttik J. (2000). The values of trees, water and open space as reflected by houses prices in the Netherlands, Landscape and Urban Planning (NL). Vol. 48, p. 161-167.
- Marzluff JM. (2001). Worldwide urbanization and its effects on birds, Avian ecology and conservation in an urbanizing world. Kluwer Academic Publishers, Boston, P. 19-47.
- Mcdonnell MJ. Et Picket STA. (1990). Ecosystem structure and function along urban-rural gradients: an unexploited opportunity for ecology, Ecology 71, p. 1232-1237.
- McKinney ML. (2006). Urbanization as a major of biotic homogenization, Biological conservation 127, p. 247-260.
- Outrequin P. (2007). Le coût global partagé d'un projet de construction, dossier de présentation du modèle CoParCo, Crdd – La Calade, p. 45-50.
- Paillat G., Butet A. (1994). Fragmentation et connectivité dans les paysages : importance des habitats corridors pour les petits mammifères, Arvicola, n°6, p. 5-12.
- Shanahan, D. F. et al. (2016). Health Benefits from Nature Experiences Depend on Dose. Scientific Reports.
- Ramade F. (2002). L'érosion de la biodiversité, Etude rétrospective et prospective des évolutions de la société française (1950-2030), Futuribles.
- T. Lundholm J. (2006). Green Roofs and Facades : A Habitat Template Approach, URBAN HABITATS, VOLUME 4, NUMBER 1 ISSN 1541-7115.
- Venn SJ., Kotze DJ. Et Niemela J. (2003). Urbanization effects on carabid diversity in boreal forests, European Journal of Entomology 100, p. 73-80.
- Voogt JA. Oke TR. (2003). Thermal remote sensing of urban climates, Remote sensing of environment, p. 370-384.

- Wilcox BA. Murphy DO. (1985). Conservation strategy : the effects of fragmentation on extinction, American naturalist 125, p. 879-887.
- Wilson EO. (1993) - La diversité de la vie. Editions Odile Jacob, Paris. p. 496.

4.3 - Publication

- ADEME. Approche environnementale de l'urbanisme : le guide méthodologique. 2008.
- ADEME. Réussir un projet d'urbanisme durable, méthode en 100 fiches pour une approche environnementale de l'urbanisme AEU. Éditions du Moniteur, 2006.
- ADIVET, Enveloppe métallique du bâtiment, CSFE. Règles Professionnelles pour la conception et la réalisation des terrasses et toitures végétalisées, édition n°3. 2018.
- ADIVET, CSFE. Recommandations techniques pour l'agriculture urbaine. 2018.
- ADIVET. Recommandations professionnelles pour les bardages rapportés végétalisés. Édition décembre 2024.
- ADIVET. GreenRoofScore : un référentiel pour mesurer les performances des toitures végétales en termes de services écosystémiques. 2023.
- AFNOR. DTU 43.1. Étanchéité des toitures terrasses et toitures inclinées avec éléments porteurs en maçonnerie en climat de plaine ». 2004.
- ARFAS et les chambres d'agriculture de l'Eure et de Seine-Maritime. Mare tampon, réguler les débits de ruissellement. 2008.
- Assemblée parlementaire du Conseil européen. La pollution sonore et lumineuse. 2010.
- Atelier d'urbanisme parisien. Développer le végétal à Paris. 2004.
- Barra M., Johan H. (coord.). Écologie des toitures végétalisées. Synthèse de l'étude GROOVES (Green roofs verified ecosystem services). 2021.
- Barra M.. Intégrer la biodiversité dans les projets de construction et de rénovation. 2022.
- Biodiversity Impulsion Group by OID. Construire une stratégie biodiversité en immobilier. 2024.
- Boucher, Isabelle et Nicolas Fontaine. La biodiversité et l'urbanisation, Guide de bonnes pratiques sur la planification territoriale et le développement durable, ministère des Affaires municipales, des Régions et de l'Occupation du territoire, coll. «Planification territoriale et développement durable». 2010.
- BruitParif. Bruit et biodiversité. 2020.
- Building Research Establishment. Ecohomes 2006 – The environmental rating for homes. 2006.
- CAUE de la Vendée. La biodiversité dans les nouveaux quartiers. 2009.
- CAUE de la Seine-et-Marne. La protection du système racinaire des arbres lors des travaux de terrassement. 2017.
- Centre Urbain de Bruxelles. Verdure et biodiversité pour un développement durable, champs d'action au niveau de l'habitat. 2007.
- CEREMA. Choisir une source d'éclairage en considérant l'impact de son spectre lumineux sur la biodiversité. 2020.
- Cerqual. Habitat & Environnement, Référentiel Millésime 2008. 2008.

- Clergeau P. (dir.). Urbanisme et Biodiversité, Vers un paysage structurant - le projet urbain. 2020.
- Commissariat Général du Développement Durable. Vers des indicateurs de fonctions écologiques – Liens entre biodiversité, fonctions et services. 2010.
- Conseil du bâtiment durable du Canada. Guide de référence LEED Canada pour la conception et la construction de bâtiments durables. 2009.
- Deboeuf De Los Rios, G., Barra, M., Grandin., G.. Renaturer les villes. Méthode, exemples et préconisations. ARB îdF, L'Institut Paris Region. 2022.
- DIREN PACA. La fragmentation des milieux naturels - État de l'art en matière d'évaluation de la fragmentation des milieux naturels. 2008.
- DIREN PACA. La fragmentation des milieux naturels, Élaboration d'une méthode d'analyse dynamique et prospective de la fragmentation. 2008.
- DIREN PACA. Les mesures compensatoires pour la Biodiversité, principe et projet de mise en œuvre dans la région PACA. 2009.
- Direction Régional de l'Equipement Ile-de-France. La végétalisation des bâtiments. 2009.
- ECOCERT. Référentiel EVE – Espaces verts écologiques. 2008.
- Flandin, J. & Parisot, Chr.. Guide de gestion écologique des espaces publics et privés – Natureparif. 2016.
- Flégeau M. Plan Urbanisme Construction Architecture. Formes urbains et biodiversité – Un état des connaissance. 2020.
- Frene. Syndrome de manque de nature – Du besoin vital de nature à la prescription de sorties. (s.d.).
- Gueymard S.. Le rôle des espaces verts dans les arbitrages résidentiels des ménages. Une étude exploratoire menée dans trois communes du Val-de-Marne, Mémoire de DEA réalisé sous la direction de Guillaume Faburel, Institut d'Urbanisme de Paris. 2004.
- Institut d'Aménagement et d'Urbanisme – Ile-de-France. Les îlots de chaleur urbains. 2010.
- Jault F., Divo A.. Traité d'écopaysage : Gestion écologique des parcs, jardins et paysages – Production de biodiversité. 2013.
- Jérôme Cortet, Sarah Paquet, Philippe Billet, Nolwenn Bougon, Coralie Calvet, et al.. Mieux intégrer les sols dans la séquence "Éviter–Réduire–Compenser". Étude et Gestion des Sols. 2023.
- Louv R.. Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder. 2006.
- LPO. Guide technique Rénovation du bâti et biodiversité.2024.
- LPO. Supprimons les cavités dangereuses pour la faune. (s. d.).
- Marcon E.. Mesures de la biodiversité. 2014.
- Ministère de l'Agriculture et de l'Alimentation. Liste des plantes attractives pour les abeilles. 2017.
- Ministère l'Ecologie, de l'Energie, du Développement durable et de la Mer. Atlas 2010 de la biodiversité dans les communes. 2010.
- Ministère de l'Ecologie, de l'Energie, du Développement durable et de l'Aménagement du territoire. Référentiel pour l'évaluation des projets territoriaux. 2009.
- Ministère de la Transition Ecologique. Stratégie Nationale Biodiversité 2030. 2022.

- Ministère de l'écologie, de l'énergie, du développement durable et de la mer. Stratégie nationale pour la biodiversité - Présentation des indicateurs de suivi de la biodiversité proposés pour la métropole. 2009.
- Ministère du développement durable. Plan « Restaurer et valoriser la nature en ville ». Rapport de synthèse de l'Atelier n°3 « Formes de villes, échelles de territoires, trame verte et bleue ». 2010.
- Ministre des Approvisionnements et Services, Canada. Guide sur la diversité biologique et l'évaluation environnementale. 1996.
- Mission Economie de la Biodiversité, Association Nationale pour la Protection du Ciel et de l'Environnement Nocturnes, CDC Biodiversité. Les cahiers de Biodiv'2050 – Eclairage du 12ème siècle et biodiversité. Pour une meilleur prise en compte des externalités de l'éclairage extérieur sur notre environnement. 2015.
- Nantes métropole. Guide de protection des arbres en phase chantier. (s. d.).
- Naturparif & ODBU 93. Réaliser des toitures végétalisées favorables à la biodiversité. 2011.
- OCDE. Manuel d'évaluation de la biodiversité. 2002.
- OCDE. Mobiliser les marchés au service de la biodiversité. 2003.
- OCDE. Manuel pour la création de marchés de la biodiversité : principaux enjeux. 2005.
- PLANTE & CITÉ. Référentiel ECOJARDIN – Référentiel de gestion écologique des espaces verts. 2018.
- Réseau National de Surveillance Aérobiologique. Végétation en ville : guide d'information sur les pouvoirs allergisants des plantes. (s.d.).
- Secrétariat de la Convention sur la Diversité Biologique. Perspectives mondiales de biodiversité biologique. 2006.
- Service des parcs et domaines de la Ville de Lausanne. Toiture végétalisée, Guide de recommandations, Pourquoi et comment accueillir la nature sur son toit. 2014.
- Schmid, H., Waldburger, P. & Heynen,D. Les oiseaux, le verre et la lumière dans la construction. Station ornithologique suisse, Sempach.2008.
- TEEB. L'économie des écosystèmes et de la biodiversité, Rapport d'étape. 2008.
- UNEP & IPSOS. Enquête : les espaces verts de demain, usages et attentes des Français. 2008.
- UPGE. Guide des habitats et refuges de substitution pour la faune en milieu urbain. 2025.
- Ville de Paris. Direction des Espaces Verts et de L'environnement. Agence d'Ecologie urbaine. Plan biodiversité de Paris 2018-2024, synthèse 2ème réunion. 2019.
- Zufferey A., Febbraro I.. La pollution sonore. 2005.

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