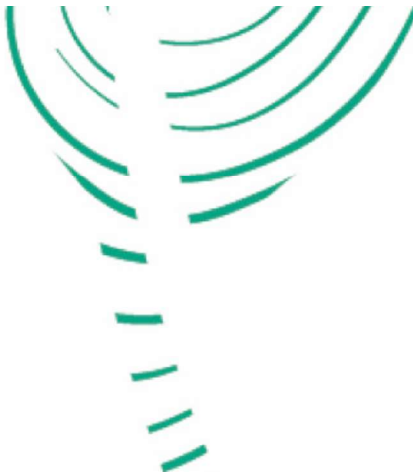




Infographics

Water snob & Water smart Nature-based-Solutions



Version 2

19th December 2024

<https://urwan.interreg-euro-med.eu>





Acknowledgements

URWAN – Urban Regenerative Water Avant-garde(N)

A project financed under the Interreg Euro-MED programme

Programme priority: Greener MED

Specific objective: Promoting climate change adaptation and disaster risk prevention, resilience, taking into account eco-system based approaches

Mission: Promoting green living areas

Deliverable 1.3.1: Infographics and Chart Makers

Work Package 1: Harmonise knowledge on nature-based solutions (NBS)

Activity 1.3: Developing a Catalogue for Harmonising Knowledge on NBS

Partner in charge: IRIDRA srl

Partners involved: all

Abstract

This deliverable presents a collection of infographics and printable poster-style fact sheets based on the nature-based solutions (NbS) described in Output 1.1, “Urban Nature-Based Solutions and Water: A Catalogue from the URWAN Project”. The infographics are designed to make the content more accessible and engaging for a wider audience, while effectively conveying key information to the project’s target groups.

The 20 concise fact sheets focus on NbS for urban regeneration, emphasising their ecosystem services and value as key strategies for climate change adaptation. Particular attention is given to their interaction with water resources and the need to consider their specific water requirements.

The fact sheets classify urban NBS into two types:

- Water “snob” NBS, which rely on potable water from public networks without addressing their own water needs.
- Water “smart” NBS, which use alternative sources and, in some cases, also purify water (e.g., wastewater) in volumes exceeding their own consumption.





List of infographics:

WATER SNOB NBS

- Green roof
- Living wall vertical garden
- Green façade vertical garden
- Green Balcony
- Urban trees
- Green pergola
- Urban vegetable garden
- Urban Park
- Artificial pond/wetland

WATER SMART NBS

- Bioretention area
- Rain garden
- Infiltration trench
- Vegetated swale
- Tree boxes
- Detention basin
- Storage pond
- Treatment wetlands
- Water recycling living wall
- Water recycling green facade
- Rooftop treatment wetland



WATER SNOB NBS



water
SNOB
NBS

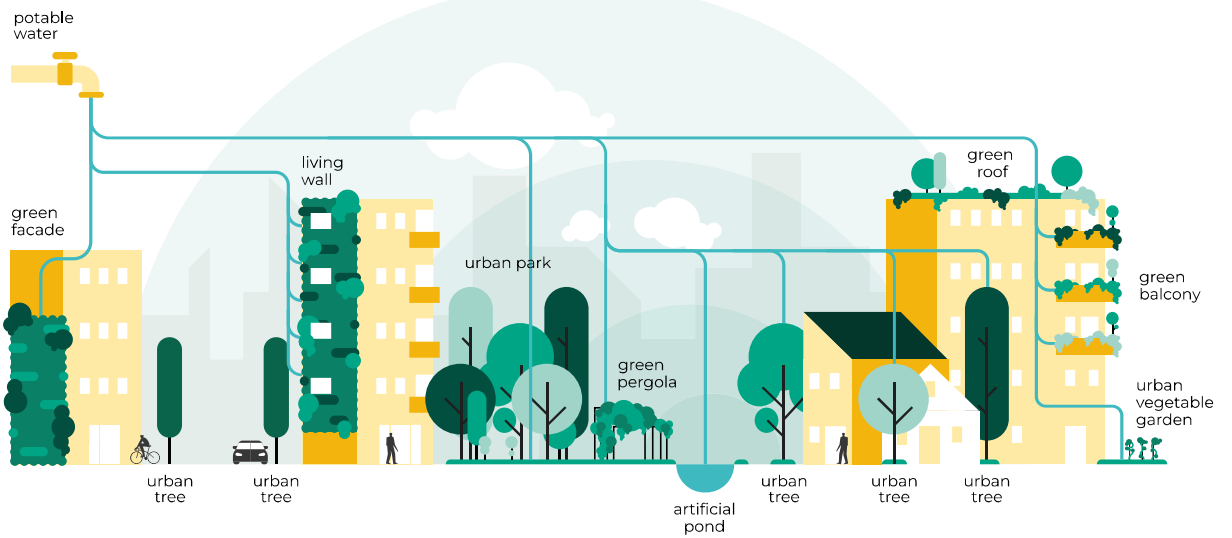


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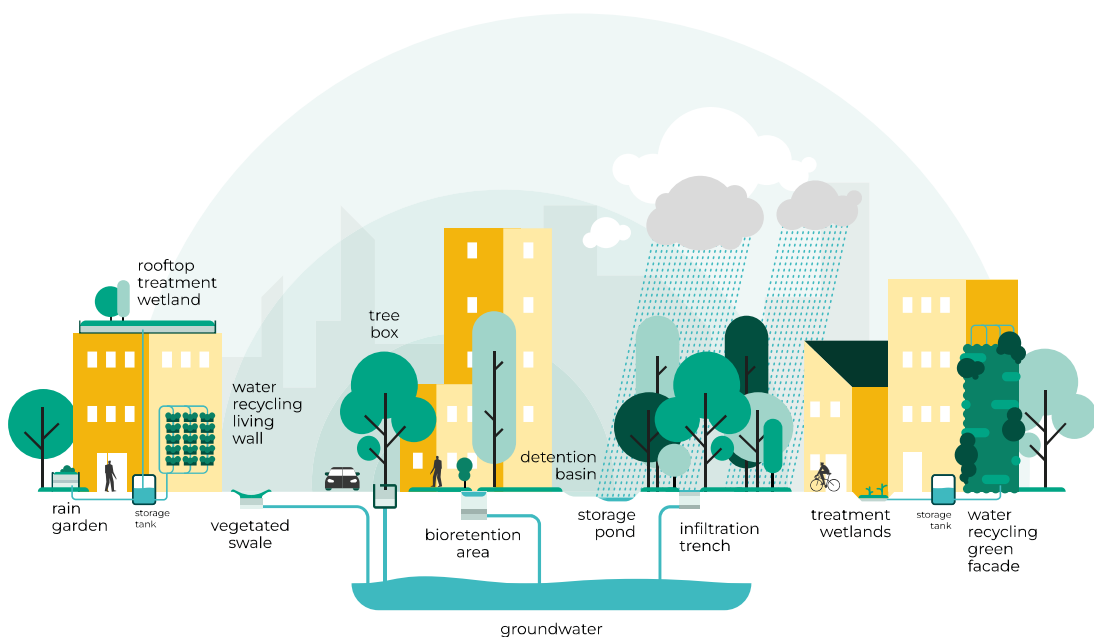
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WATER SMART NBS



water
SMART
NBS



GREEN ROOF

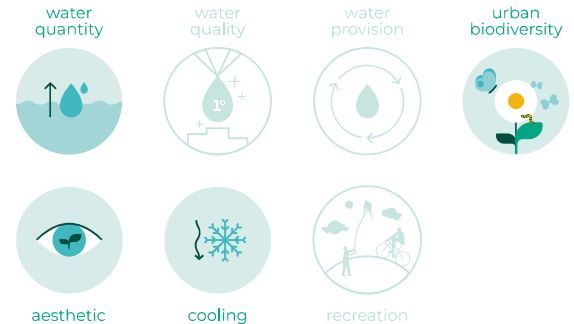
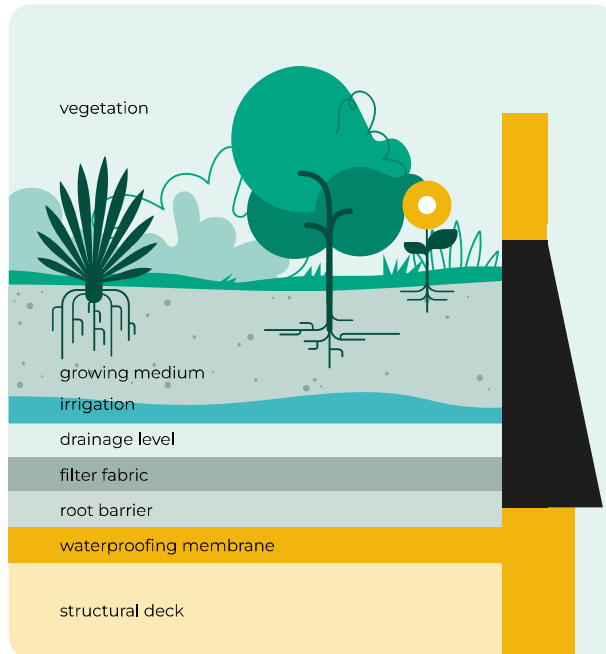


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A green roof is a **lightweight, vegetated roof** over a **protective root barrier** and a **roof membrane**. There are two types of green roofs, depending on the depth of the substrate and the type of vegetation planted: **Extensive** and **Intensive**. Either type will **need temporary watering** for establishment and **regular irrigation** depending on the climatic conditions.

Green roofs can transform rooftops into **multifunctional spaces**, offering benefits such as **insulation for cooling**, reducing urban air temperatures, **enhancing biodiversity**, and **providing aesthetically pleasing landscapes** or **leisure areas**. They also aid in **stormwater management** by retaining rainwater in vegetation and soil, gradually releasing excess water after rainfall.

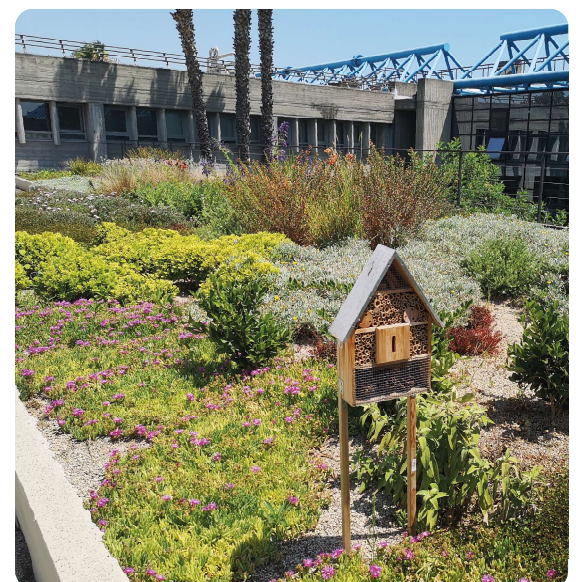
Green roofs generally fall into **two categories**, distinguished by factors such as weight, growing media, plant diversity, maintenance and irrigation needs, accessibility, usage, and costs.

Extensive green roofs are detailed to minimize the additional load on the roof structure, with only thin layers of soil (< 15 cm), have **minimal plant diversity** and require **minimal maintenance**, they are generally planted with grass, sedum or low plants. They are typically not designed for foot traffic or occupancy except for maintenance. These features result in **the lowest capital cost** of the different green roof types. Extensive roofs may 'brown-out' over dry summers, but dormant plants revive once the rainy season begins.

Intensive green roofs may be **accessible as a roof garden**. This type of green roof will have **deeper layer of soil** (> 15 cm), and therefore **heavier weight**. Deeper soil allows for a greater variety of plants, such as grasses, herbs, shrubs and (small) trees, thus making intensive green roofs more "attractive" but **higher maintenance** than extensive green roofs.



application
scale:
building



ARTIFICIAL POND / WETLAND

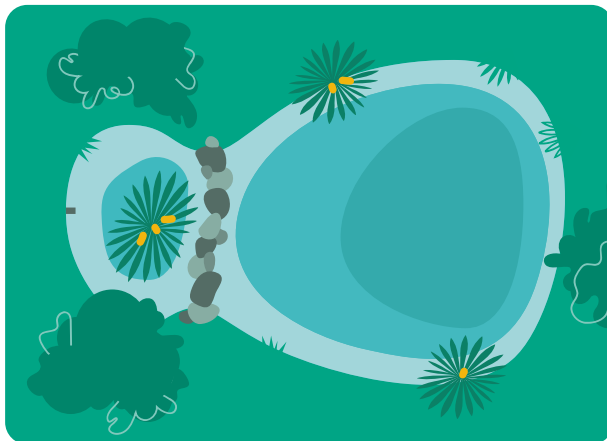
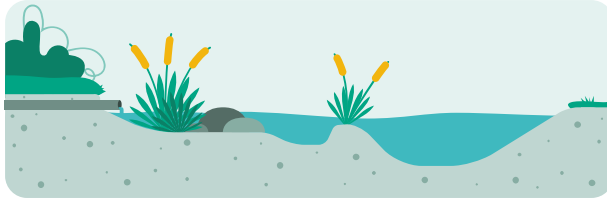


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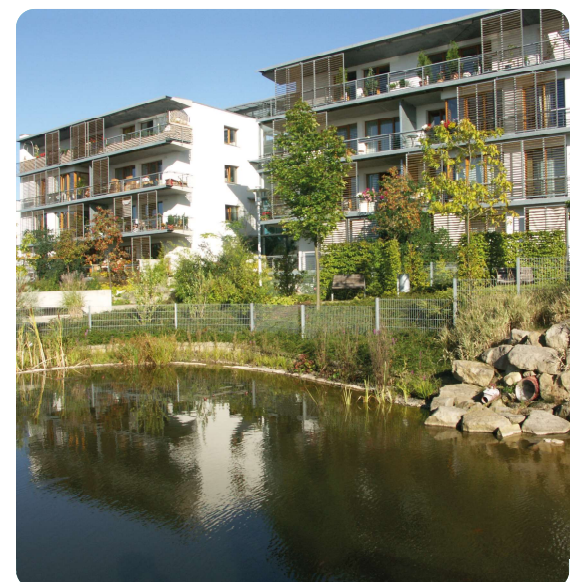
Ponds and wetlands are **basins with a permanent sheet of water** supplied with water from the aqueduct or wells. They can have areas at **different depths**, so that **different plant species** can be planted, and biodiversity can be increased. Typically designed for **new development areas**, ponds and wetlands can be easily integrated into usable public spaces, such as parks.

Ponds and wetlands are basins that contain a **permanent water layer**, sustained through regular replenishment from the aqueduct or nearby wells. The term “ponds” typically refers to areas where deeper open water predominates, while “wetlands” describe shallower, vegetated areas. These features enhance urban environments by providing **recreational spaces** for activities such as walking and birdwatching, improving **aesthetic appeal**, offering **cooling effects** through evaporation, and supporting **urban biodiversity** by creating habitats for plants, insects, birds, and aquatic life.

The design should provide for **natural shapes**, adaptable to the specific topography and soil conditions on the site, as well as its orientation, appearance and proximity to other landscape features, buildings, etc. In the case of very extensive ponds or wetlands, **they can be divided into several sub-basins** to facilitate management and maintenance operations. It is advisable to provide for wetland areas **different depths** to maximise biodiversity, by planting different plant species, with **helophytes** in shallow areas (maximum 40 cm in dry periods) and hydrophytes in deeper areas (typically 1 m). It is important, especially for wetlands that have a shallower water depth, to **estimate a water balance** in order to verify that the inputs are sufficient to compensate for evapotranspiration, so as to prevent the risk of periods without water or with excessively stagnant water, which can encourage the proliferation of insects. Maintenance involves **regular cleaning**, **water quality monitoring**, **vegetation management**, and **infrastructure upkeep** to ensure functionality, aesthetic appeal, and ecological health.



application
scale:
urban



BIORETENTION AREA

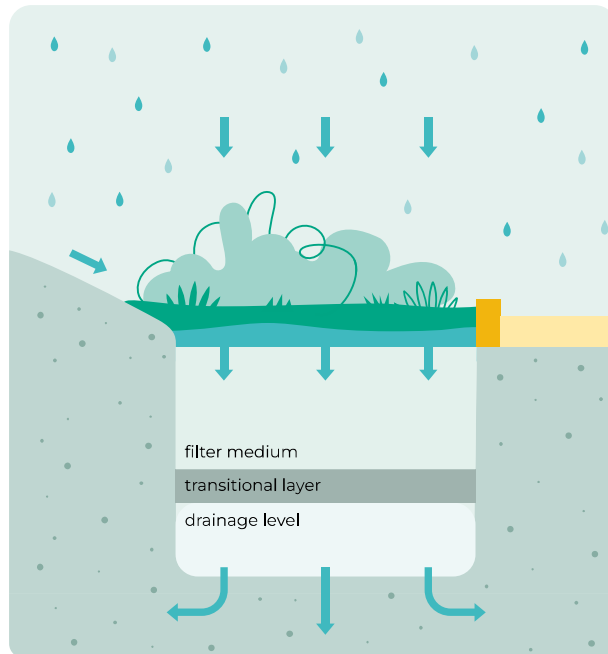


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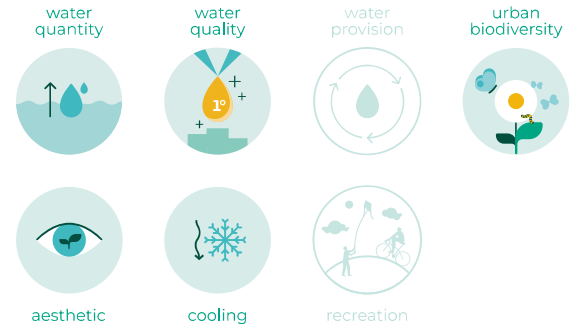
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Bioretention areas allow **completely natural filtering** and **treatment of the water** collected with excellent removal of the main pollutants carried by rainwater runoff. Moreover, bioretention areas also have a beneficial effect in terms of **reducing hydraulic risk, increasing biodiversity**, as well as being used as an element of **urban design**. They contribute to **cooling** by promoting **evapotranspiration** from plants and moist soil, reducing ambient temperatures in urban environments.

Runoff from surrounding impermeable surfaces, such as roads, parking lots, and rooftops is conveyed via surface runoff to the vegetated bioretention area. The grass-covered strip performs a **filtering action** of the coarser material and slows down the runoff velocity. In the forebay area, there is a **temporary accumulation** and further deposition of transported material. The **layer of organic material** performs an **initial filtration** of the rainwater and encourages the growth of microorganisms that provide degradation of the transported organic matter. The **vegetative soil layer** acts as a **filtration system**; the clay particles in the soil provide sites for the adsorption of pollutants. Vegetation ensures soil stability and participates in the retention of pollutants. The **bioretention area** can be contained by a **layer of geotextile** and allow the water to infiltrate into the underlying soil, or it can be sealed and the water discharged into the sewer via a drainage pipe.

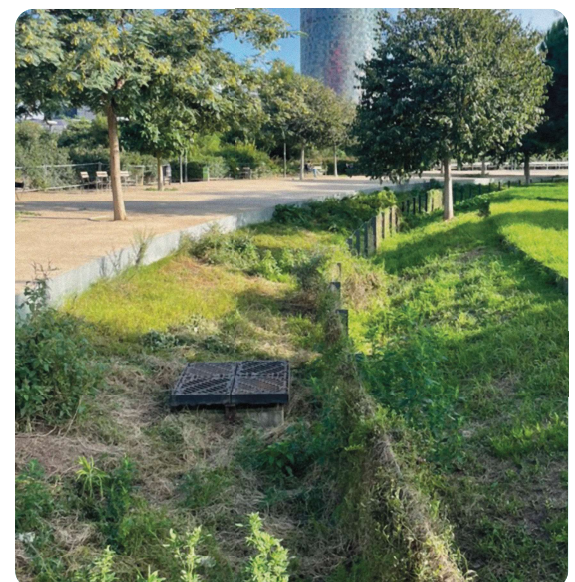
Maintenance includes **regular removal of debris, weeding, mulching, inspecting and cleaning** inflow/outflow structures, ensuring proper **plant health**, and **monitoring soil permeability**.



Bioretention areas are slight depressions in the soil covered with greenery, aimed at **collecting and treating rainwater** drained from surrounding impermeable surfaces **by filtering and removing pollutants**. Treated rainwater can either infiltrate in the soil below or be discharged in the sewer system. In addition to managing stormwater effectively, bioretention areas **enhance urban greenery and support biodiversity**.



application
scale:
building



RAIN GARDEN

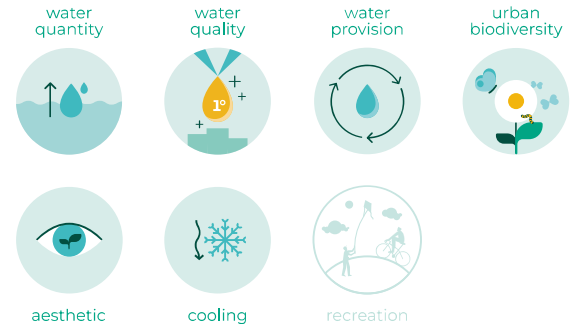
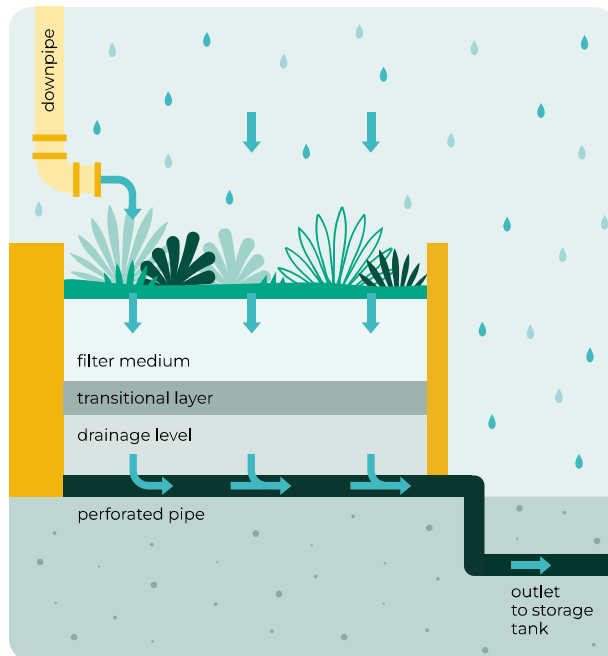


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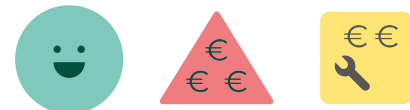


Rain gardens are slight depressions in the soil filled with vegetation, designed to **collect and treat rainwater** drained from surrounding impermeable surfaces by filtering and removing pollutants. The treated water is then directed into a connected **storage tank**, where it can be **collected and reused** for purposes like **irrigation or non-potable water needs** reducing reliance on municipal water supplies.

Rain gardens are smaller bioretention areas serving a single dwelling or building, with the aim of **harvesting treated rainwater for reuse**. Rain gardens usually **receive runoff from building roofs via downpipes**, and they allow completely **natural filtering and treatment of the water** collected with excellent removal of the main pollutants carried by rainwater runoff. Moreover, rain gardens also have a beneficial effect in terms of **reducing hydraulic risk, increasing biodiversity**, as well as being used as an **element of urban design**. They contribute to **cooling** by promoting **evapotranspiration** from plants and moist soil, reducing ambient temperatures.

The grass-covered strip performs a **filtering action** of the coarser material and slows down the runoff velocity. In the forebay area, if present, there is a temporary accumulation and further deposition of transported material. The layer of organic material performs an initial filtration of the rainwater and encourages the growth of **microorganisms** that provide degradation of the transported organic matter. The vegetative soil layer acts as a filtration system; the clay particles in the soil provide sites for the **adsorption of pollutants**. Vegetation ensures **soil stability** and participates in the **retention of pollutants**. Rain gardens are **sealed**, at the bottom there is a drainage pipe to channel the filtered water to the **storage tank**. The collected water can then be **used for non-potable purposes**, such as irrigation, filling toilet cisterns, etc.

Maintenance includes **regular debris removal, ensuring plant health, inspecting and cleaning** inflow/outflow structures and storage tanks, and **monitoring soil permeability**.



INFILTRATION TRENCH

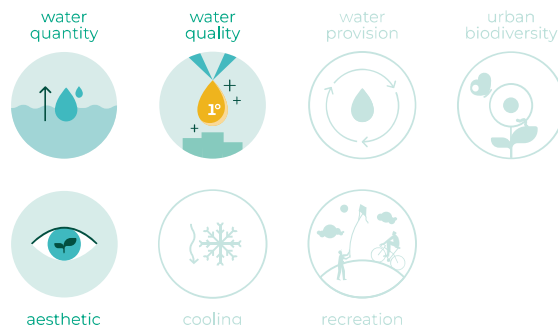
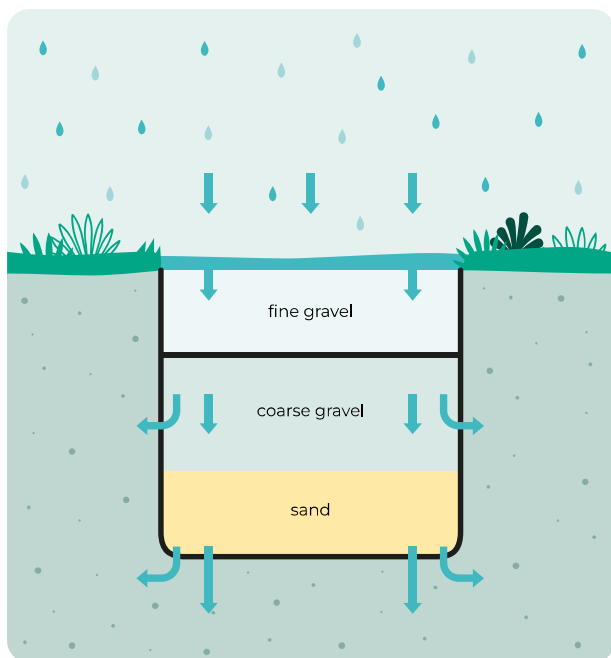


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Infiltrating trenches are **excavated structures**, filled with **permeable gravelly and sandy materials**, designed to facilitate runoff infiltration through their top surface and filtration into the subsoil through their sides and bottom. These systems effectively **reduce surface runoff**, **minimize flood risks**, and **ease pressure on urban drainage**. They also improve water quality by **filtering pollutants**.

Infiltration trenches are designed to **facilitate the absorption of runoff** through their top surface, allowing filtered water to percolate into the subsoil through the sides and bottom. They effectively **remove a wide range of pollutants** from rainwater through **absorption, precipitation, filtration**, and **chemical and bacterial degradation mechanisms**.

These trenches serve as **effective stormwater management solutions** by **reducing surface runoff**, **minimizing flood risks**, and **easing the burden on urban drainage systems**. By filtering sediments and pollutants, they also **improve water quality** before the water reaches natural bodies or groundwater reserves. Additionally, when integrated into urban landscapes, **infiltration trenches can provide aesthetic benefits**. Incorporating vegetation, such as grasses or native plants, around the trenches allows them to integrate seamlessly into parks, green spaces, or streetscapes.

Structurally, infiltration trenches consist of excavated trenches filled with **highly permeable natural gravel** and sandy inert material. Infiltrated water is transported along the trench either through the backfill material or via a drainage pipe placed at the trench's base. To prevent clogging, the trench is completely covered with layers of non-woven fabric. The trench is sized to ensure complete drainage of filtered water into the underlying soil within 12 to 24 hours after rainfall, depending on site-specific soil conditions. This process also **supports groundwater recharge** and helps maintain the local water balance.

Maintenance involves **periodic removal of debris** and **inspection for clogging** to ensure continued functionality and **aesthetic appeal**.



application
scale:
urban



VEGETATED SWALE

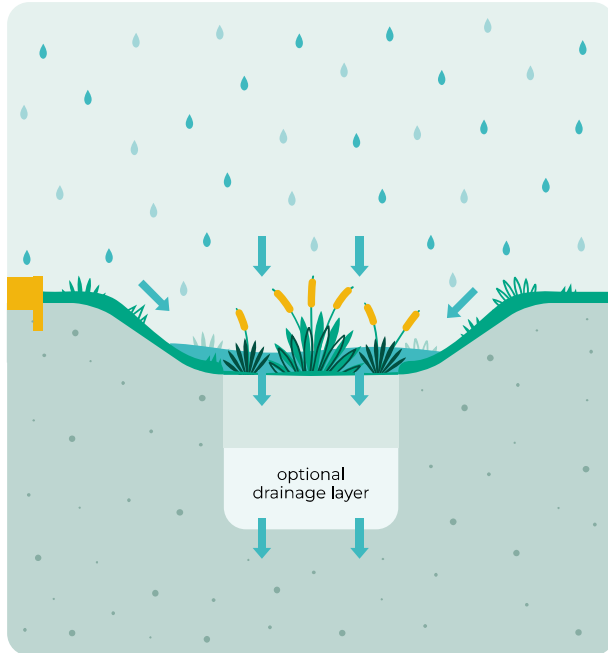


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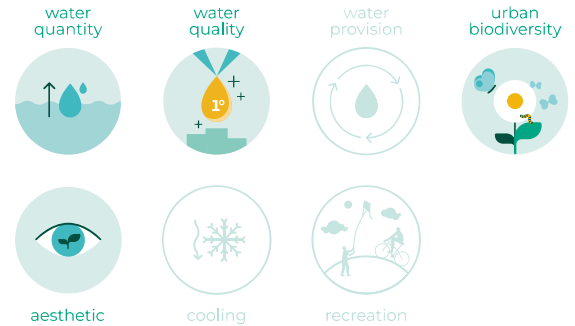


Vegetated swales can be wet or dry and appear as **open, shallow, trapezoidal or parabolic-shaped linear swales**. The banks are grassed or vegetated with **flood- and erosion-resistant plants**. Within the vegetated swales, water runoff is attenuated, causing it to flow at a lower, controlled speed. It functions primarily as a **filtering medium** and **removes pollutants** by capturing the flow of rainwater. **Dry swales** primarily facilitate infiltration and conveyance, while **wet swales** function as permanent water features, offering enhanced treatment and ecological benefits. Their wide application is a significant contribution to **local stormwater management and control**.

The water flowing through it along its length moves slowly through the grass, which slows and filters surface water flows, allowing some of the water to infiltrate into the subsoil and exerting a lamination effect with a consequent reduction in water velocity. Water that is temporarily stored in the swale is eventually released into a storage or drainage system.

Vegetated swales can replace classic sewer pipes, enabling rainwater to be conveyed without the use of storm drains, kerbs or manholes. They are typically used to **direct rainwater to other SuDS (Sustainable Drainage Systems) components** such as bioretention areas, detention basins, or ponds and wetlands. However, an overflow pipe is typically included to manage intense rain events.

Maintenance of vegetated swales includes **regular removal of debris, mowing or pruning vegetation, inspecting for erosion, and ensuring proper water flow**.



Vegetated swales are designed to **manage a quantity of runoff from a large impermeable area** as car parks or roads. They absorb, store and convey surface water runoff, as well as **remove pollutants and sediment** as the water flows through the vegetation and soil layer. The choice of vegetation is variable, but rooted native plants are common and preferred.



application
scale:
urban



TREE BOXES

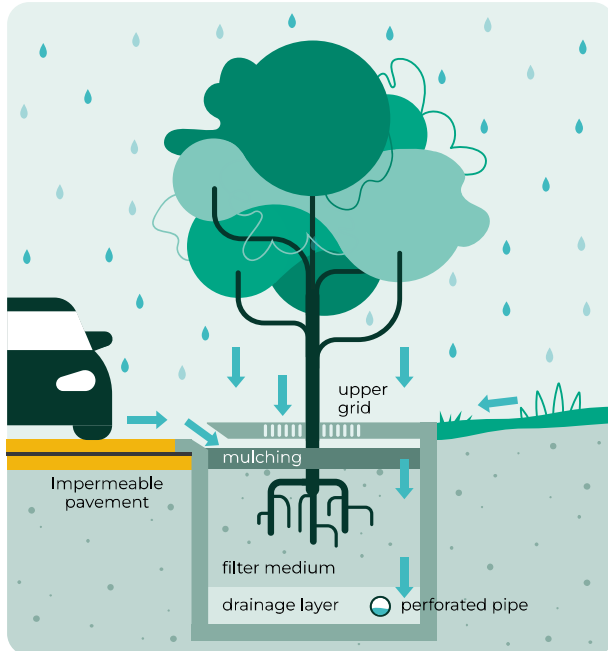


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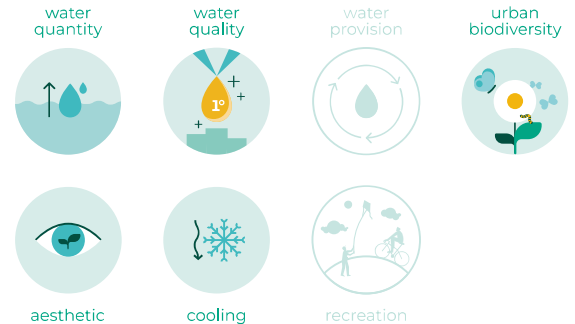


Tree boxes consist of **underground boxes** made of, for example, precast concrete structures, and can be closed or open-bottomed chambers depending on whether or not the water can infiltrate the soil. The soil inside is composed of a **special mixture of substrates and filter materials** specially formulated to filter the water it receives. Tree or shrub species are grafted into the soil, preferably indigenous, that can withstand stressful conditions, resulting from alternating periods of rainfall and thus soil wetting, and periods of drought. The filling medium must be both **capable of draining the rainwater** and guarantee a **sufficient supply of nutrients** to the tree.

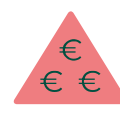
The tree box filter system allows the **removal of pollutants in the rainwater**, filtering it before release into the sewer system or underground. These vegetated filter systems are designed to drain the accumulated water, after the weather event, in no more than 48 hours, to avoid compromising the health of the tree. The choice of trees depends on both technical (adaptability to dry/wet conditions) and aesthetic/landscape/fruitle components and must always be supported by a landscape architect or agronomist.

Tree filter boxes offer multiple advantages such as **reducing urban heat islands**, **improving air quality**, and **enhancing the aesthetic appeal of urban spaces**. They also support **biodiversity** and contribute to greener, more sustainable cities by integrating nature-based solutions into urban infrastructure.

Much of the maintenance of these solutions concerns the **state of health of the tree**, so it does not differ from **ordinary maintenance work** for urban trees.



Tree filter boxes are **compact biofiltration systems** made up of a **box**, **soil**, and a **tree or plant**. They naturally filter stormwater, **removing pollutants** as water passes through the soil and root zone. These systems combine **stormwater management** to the benefits of trees in urban environments, such as **reducing heat islands**, **improving air quality**, **enhancing aesthetics**, and **supporting biodiversity**.



application
scale:
urban



DETENTION BASIN

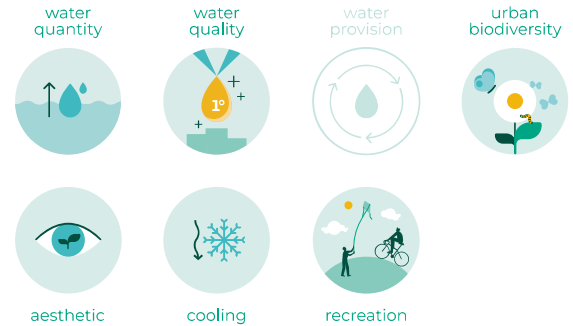
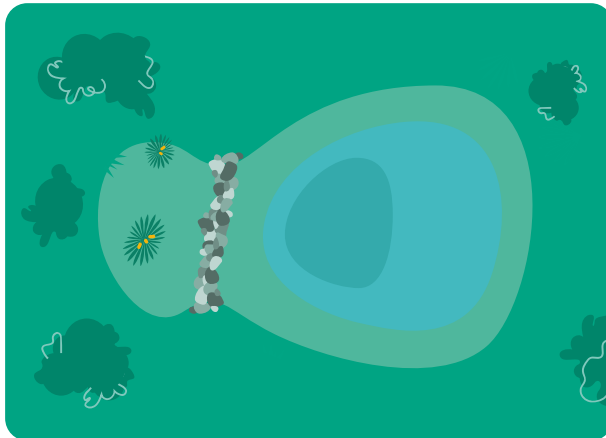
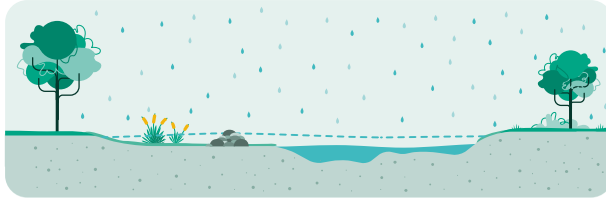


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Detention basins are **slightly depressed areas** in the ground or pavement designed to **temporarily hold and regulate the release of stormwater runoff**. These basins, typically featuring a permeable bottom, **remain dry most of the time** and may or may not be vegetated. Used for **flood mitigation, erosion control, and water quality management**, they help regulate water flow during and after rainfall events.

The purpose of detention basins is to **temporarily receive and retain rainwater during and after storm events**, gradually releasing it over 24–48 hours through filtration systems that prevent debris from entering downstream waterways. They serve both to **control surface water runoff** and to **allow sedimentation of suspended solids** in the first flush, requiring careful sizing to fulfil both functions. Essentially, they act as **stormwater detention tanks**, integrated into the urban fabric with a multifunctional approach.

When incorporated into urban environments, detention basins provide additional benefits such as **recreational spaces, aesthetic enhancement, and habitat creation for biodiversity**. Typically unsealed to promote natural infiltration, they are only waterproofed in areas with high groundwater vulnerability. Their runoff treatment capacity can be enhanced by adding small basins or wetlands at their outlets, which further **filter pollutants** and support **ecological functions**.

Detention basins are often vegetated with grass, but introducing diverse plant species can enhance landscape value, stabilize banks, and support local ecosystems, significantly **increasing biodiversity benefits**. A minimum of 100 mm of soil is required for vegetated basins to ensure both functionality and environmental integration.

There are two main types: **dry detention basins**, which remain empty between storms, and **wet detention basins**, which maintain a permanent water level—each serving specific urban and ecological needs. These systems not only manage stormwater but also contribute to greener, more resilient cities by seamlessly integrating infrastructure with nature.



STORAGE POND

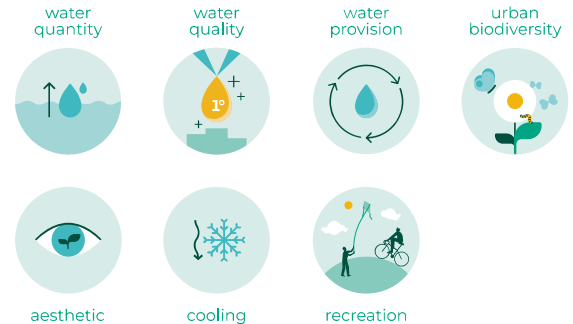
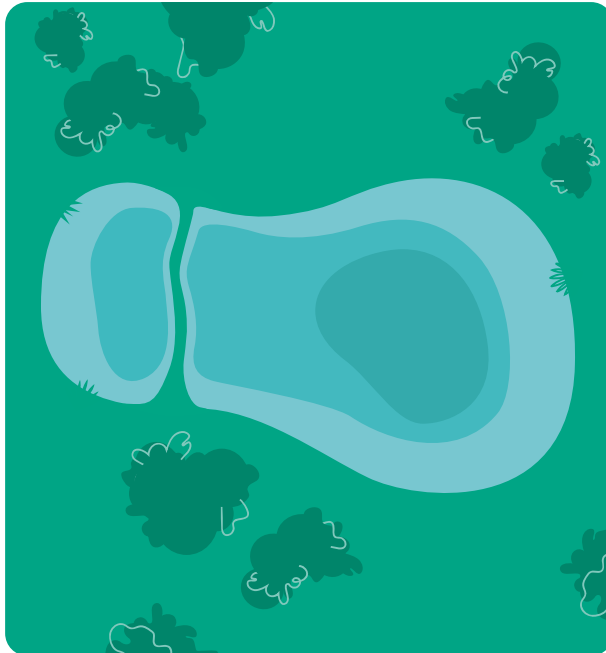


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Storage ponds are **deep basins** with a **permanent water level**, designed to **collect and retain rainwater** during rainfall events. By temporarily storing excess water, they help **reduce flood risk** and allow for controlled release or **reuse for non-potable purposes**, such as irrigation. These systems play a key role in **mitigating runoff** and promoting the **sustainable use of water resources**.

Storage ponds are designed to **collect and store runoff water**, primarily to provide a reliable **supply water for other uses**, such as irrigation of public green spaces or street cleaning. They are a versatile and cost-effective solution for addressing both agricultural and urban water challenges while delivering environmental and social benefits.

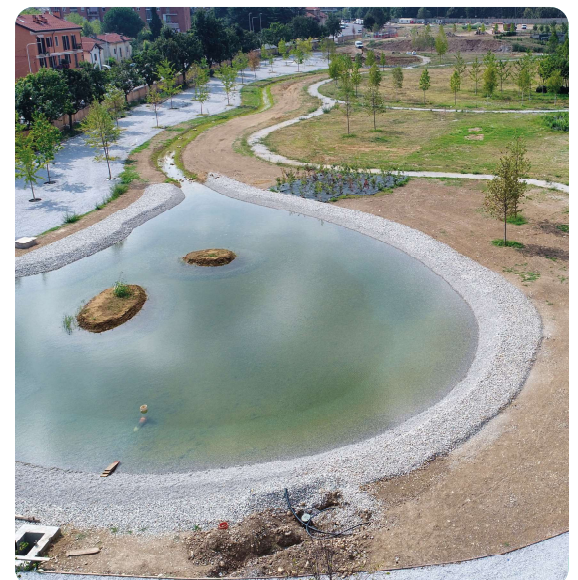


In urban settings, storage ponds play a crucial role in **urban water management**. They help **mitigate flooding** by temporarily holding excess rainwater during heavy storms, **alleviating pressure on drainage systems** and **reducing infrastructure damage**. By capturing and storing rainwater, they reduce the demand for potable water resources, supporting **sustainable urban water management** and resilience. They also **improve water quality** by allowing sediments and pollutants to settle before reuse or discharge. In addition, storage ponds can be integrated into urban landscapes as multifunctional features, providing **aesthetic value** and **recreational opportunities** for communities. Moreover, storage ponds **enhance urban biodiversity**, creating habitats for aquatic and terrestrial species while **improving green spaces and ecological balance**.

As water loss in storage ponds can occur through infiltration, to mitigate this, they can be constructed in **clay-rich soils**, which naturally reduce permeability, or lined with impermeable membranes in highly permeable areas. Additionally, storage ponds can be strategically designed by leveraging natural slopes, with dams or dikes built at the lowest points to maximize water storage capacity.



application
scale:
urban



TREATMENT WETLANDS

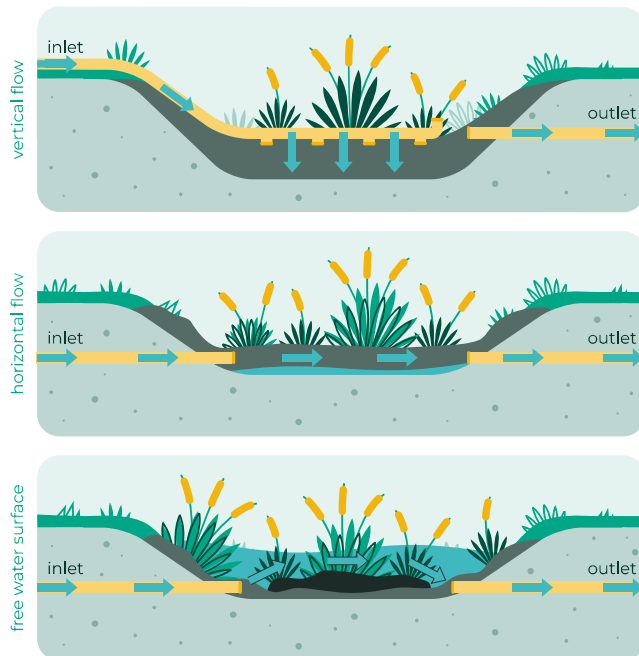


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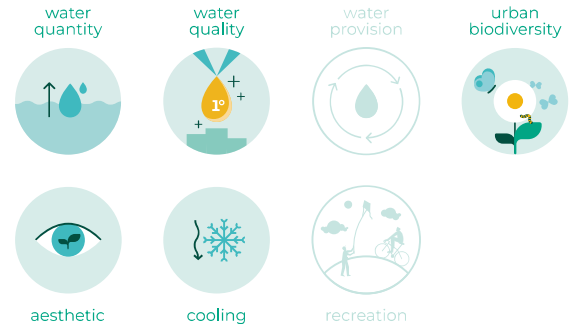
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Treatment wetlands are **natural treatment technologies** that efficiently treat many **different types of polluted water**. They mimic the self-treating capacity of natural wetlands by exploiting complex biochemical, physical and physiological treatment processes. **Surface flow wetlands** (or Free Water Surface wetlands) consist of densely vegetated units where water flows above the media bed. **Subsurface flow wetlands**, in contrast, operate below the surface within impermeable tanks filled with inert materials (gravel or sand, without soil), allowing macrophyte roots (typically *Phragmites australis*) to develop. **Subsurface flow systems** consist of impermeable tanks filled with inert material (gravel or sand, no soil), within which the roots of emerging macrophytes are allowed to develop. **The water flow is constantly below the surface**, ensuring high treatment efficiencies and the absence of odour diffusion.

Treatment wetlands are among **the most widely adopted techniques for treating grey water for reuse** and overflows from combined sewers. The shape of treatment wetlands can be chosen on a case-by-case basis, so that the system can be pleasantly inserted as an element that does not compromise the aesthetics of the surrounding landscape.

In urban settings, they can be integrated into urban planning as **green infrastructure**, providing both **water treatment** and additional **ecological and social benefits**. They can be incorporated into parks, green roofs, or along riverbanks, where they not only treat polluted runoff but also **enhance biodiversity** by creating habitats for wildlife. They help **mitigate the urban heat island effect** by introducing vegetation and water bodies into built environments, improving local microclimates.



Treatment wetlands are systems designed for the **treatment of wastewater**, they consist of an **excavation filled with inert material** or with free surface water through which wastewater flows, planted with appropriate vegetation. They are particularly valued for their **low operational and maintenance costs**, energy efficiency, and ability to integrate seamlessly into natural landscapes.



ROOFTOP TREATMENT WETLAND

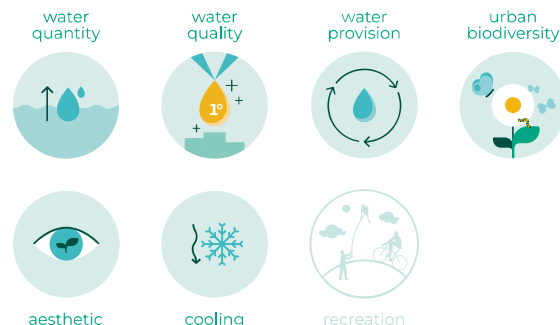


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Rooftop treatment wetlands are **green roofs retrofitted to replicate constructed wetland processes for greywater treatment**, combining the benefits of both treatment wetlands and green roofs. Various bed compositions and designs are possible depending on the building structure and climatic conditions, among other factors.

Rooftop treatment wetlands are green roofs retrofitted to reproduce constructed wetland processes to **treat and reuse greywater**. These systems combine the benefits of treatment wetlands, such as **efficient water purification through natural processes**, with those of green roofs, including **thermal insulation** and **urban greening**.



Designed with various bed compositions and configurations (e.g., horizontal or vertical flow systems filled with lightweight, selected-grain materials), rooftop treatment wetlands can be tailored to suit different building structures and climatic conditions. A major advantage is their **minimal land use**, as they are built on rooftops, making them ideal for space-constrained urban areas. However, they require **buildings with high load-bearing capacity** to support the additional weight.



application
scale:
building

In urban environments, rooftop treatment wetlands offer numerous benefits. They provide **building insulation**, reducing energy consumption for heating and cooling, and help **mitigate the urban heat island effect**. By introducing vegetation and water features, they enhance **urban biodiversity**, offering habitats for birds, insects, and other wildlife. Additionally, they **improve air quality** by capturing pollutants and particulate matter, and aid in stormwater management by retaining rainwater in vegetation and soil, promoting rainwater conservation. **The treated water can be reused for non-potable purposes**, such as irrigation or toilet flushing, promoting water efficiency and reducing demand on municipal water supplies.

