CREATING A RAIN GARDEN

HAZARD

HEAT

RAINFALL AND FLOODS

GEOTECHNICAL DROUGHTS

IMPLEMENTATION STEP

CONSTRUCTION

RENOVATION

TERRITORY

AREA OF ACTION

OUTDOORS

COST

€ € €

low medium high

LEVEL OF SKILL

high

A rain garden is a landscaped area featuring desealed soil and a small planted garden. It is located and designed to capture run-off water from a permeable surface. Feeding a rain garden with harvested water (from gutters, natural or artificial drainage channels, etc.) creates a water buffer effect by increasing the rainfall period (the time between the impact of the rain falling on the ground and its inflow into the water supply system). It also allows water to infiltrate locally into the ground.

IMPACTS

There are several advantages to designing a rain garden:

- Less **flooding**: by increasing rainfall time and infiltrating water locally, rain gardens reduce the pressure on the water supply system.

- Reduced **thermal discomfort**: by creating islands of coolness thanks to green spaces and water features.

- Reduced **drought**: by allowing rainwater to infiltrate into the ground, recharging the water table and limiting periods of drought.

- Home to **biodiversity**: by recreating ecological characteristics similar to those of wetlands, rain gardens provide a haven for many species.

- **Natural water treatment**: rain gardens filter water in the same way as a natural wetland.

- **Well-being**: thanks to all the advantages listed above, rain gardens help to improve the well-being of users.

INSTALLATION GUIDE

Rain gardens can be designed as part of public space planning, or integrated into private plots. They need to be installed downstream from a natural or artificial water conveyance system. It is therefore important to take into account the morphology of the land (relief, hydrography, permeable areas, etc.). The gardens can be located on small areas, but it's advisable to maintain a minimum distance from buildings or to seal the nearby underground façade to prevent seepage. It's also advisable to avoid buried pipes and to keep a distance from any onsite vegetation that is not adapted to wet conditions.

A rain garden comprises draining material that ensures that water doesn't stagnate and that the garden can perform its hydraulic functions. It is therefore necessary to determine the infiltration capacity of the land and adapt the project according to the following parameters: garden capacity, location, soil composition, etc. Particular attention should be paid to the choice of plant palette, to ensure that it is suited to wet soils. The diversity and indigenousness of the species chosen are factors that will promote the garden's resilience.

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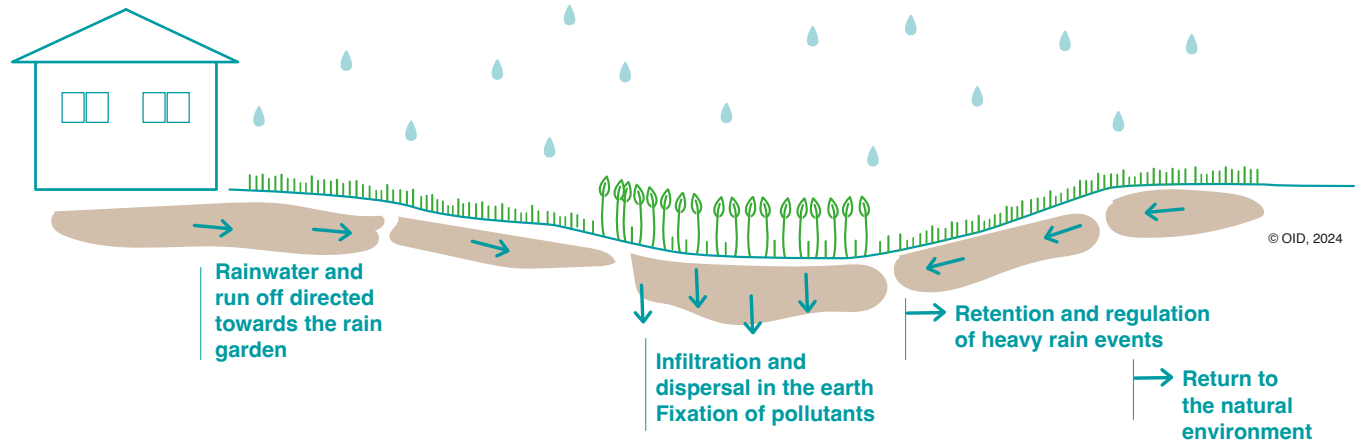
HOW A RAIN GARDEN WORKS

Source : Aquatiris



We strongly recommended to install **overflow system** to redirect water to the water supply system to avoid flooding during extreme rainfall events. An effective way of doing this is to incorporate an overflow pipe at the desired maximum level.

WEAK POINTS AND STRONG POINTS

- ⊖ The presence of sensitive equipment nearby can be an obstacle to setting up a rain garden.
- ⊖ Rainwater can't be managed solely at plot level. Depending on the surrounding environment, the creation of a rain garden won't always be sufficient to completely eliminate the consequences of an extreme rainfall event.
- ⊖ Users may be reluctant to use rain gardens for fear of a proliferation of mosquitoes. This argument is unfounded, as mosquitoes are attracted to stagnant water, and rain gardens are designed to be submerged for a maximum of 48 hours. It's therefore important to calculate the infiltration capacity of the land in order to properly size the project.
- ⊕ To size the rain garden appropriately and maximise the co-benefits, employ **experts** and carryout a study to assess the nearby environment (relief/slope, nature of the soil, etc.).
- ⊕ **An awareness-raising campaign** using educational fact sheets can increase the project's acceptability and reduce preconceived ideas.
- ⊕ The **educational** aspects of raingardens can be shared with children.
- ⊕ Raingardens contribute to improving the **well-being of** users.

! MALADAPTATION

Maladaptation can result from the following:

Project undersizing

The capacity, drainage material, shape and location of the rain garden are all parameters that need to be defined according to the topography and type of soil in order to adequately size the project. This is a necessary step to ensure that it performs its hydraulic functions properly. In the absence of a pedological, hydraulic and topographical analysis, there's a risk that the project will be undersized which could result in a transfer of vulnerability. This is one of the reasons why the **choice of location is crucial** and why installing a drainage system is recommended.

Unsuitable vegetation

A **plant palette suited to** the wet conditions of rain gardens is essential to the survival of the species planted and therefore to the successful operation of the garden. With the increasing number of dry spells, the vulnerability of these plant species and associated ecosystems may increase. You should therefore choose species that correspond to the humid characteristics of rain gardens, while taking into account the area's exposure to the risk of drought. In general, plant diversity increases the resilience of the system by increasing the chances of adaptation to extreme events.

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MONITORING INDICATORS

ESSENTIAL RECOMMENDATIONS WORTH THINKING ABOUT

- USE LOCAL SPECIES AS MUCH AS POSSIBLE
- ADAPT THE PLANT PALETTE TO CURRENT AND FUTURE CLIMATES
- CHECK THE SIZE OF THE OVERFLOW SYSTEM TO AVOID RUN-OFF OUTSIDE THE RAIN GARDEN

MONITOR MY ACTIONS FOR CLIMATE CHANGE ADAPTATION

+/– : Quantitative indicator ★ : Qualitative indicator

INDICATORS OF MEANS	INTERPRETATION
+/– Maximum number of hours the garden is submerged	To be minimised, must be less than 48 hours
★ State of health of the vegetation planted (to ensure that the plant palette is suited to the proposed conditions)	-
+/– Number of plant species	To be maximised
+/– Volume of water to be managed by the rain garden (or volume of rain channelled into the garden) (m^3)	-
+/– Volume of water remaining to be managed (or volume of rain that runs off impermeable surfaces and is not treated by the rain garden) (m^3)	-
+/– Percentage of essential recommendations followed (%)	To be maximised

INDICATORS OF RESULTS	INTERPRETATION
+/– Measurement of volume of water passing through the drain pipe using a water meter (m^3)	To be minimised while avoiding run-off outside the rain garden
+/– Rainfall abatement for the plot (%)	To be maximised
+/– Percentage of users who consider that the design contributes to improving their well-being (%)	To be maximised

**The control situation is defined by the parameters set to isolate the influence of the adaptive action (similar conditions: weather, time of measurement, space, etc.).*

DÉFINITION

● A **species** is defined as **indigenous** to a geographical area when it occurs naturally in that area without human intervention. Outside its natural range, it is referred to as an introduced or exotic species.

FIND OUT MORE

University of Nebraska-Lincoln (2013), Rain garden design

Lyon Métropole (2022), *Méthode de gestion des eaux pluviales*

Credits: Agence TN+

REAL-LIFE EXAMPLE

CITÉ INTERNATIONALE UNIVERSITAIRE DE PARIS

CITÉ INTERNATIONALE UNIVERSITAIRE DE PARIS

ADAPTAVILLE Des solutions pour s'adapter au changement climatique

LOCATION : CITÉ INTERNATIONALE UNIVERSITAIRE DE PARIS (CIUP), PARIS 14TH

USE: PUBLIC AND EDUCATION

COST: 290,000 €

This feedback comes from the AdaptaVille.fr project, from the *Agence Parisienne du Climat*.

In 2023, the *Agence Parisienne du Climat* met with the TN+ landscape agency, a member of the project management team in charge of redesign the park of the *Cité Internationale Universitaire de Paris*. As part of this work on green spaces, 4 rain gardens were developed in the park. The rain gardens have been designed to reduce the first 8 millimetres of usual rainfall, as required by the City of Paris' rainwater zoning. The rain gardens receive run-off water from neighbouring impermeable or semi-impermeable areas. Some of the water is collected directly via drain grids, which redirect it to the capping areas. The bottom of the rain gardens is made up of 40 cm of topsoil, 20 cm of drainage material and a layer of waterproofing, as infiltration is not possible due to the presence of old quarries in the subsoil. Beyond normal rainfall and for a ten-year rainfall, a slightly raised grid collects the water and sends it progressively either to the public network or to a retention structure. The choice of vegetation was made to use diverse and local species with a high evapotranspiration capacity, so that the stored water can be quickly drained and the surrounding area refreshed. These species come from wetland and semi-wetland associations: megaphorbia, reedbeds and sedge meadows. These new wetlands have been designed to form a discontinuous 'Japanese patches' ecological corridor extending all the way to the Parc Montsouris.

More information on this feedback on AdaptaVille.fr

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