OID ŒUVRER POUR L'IMMOBILIER DURABLE

CREATING RAINWATER MANAGEMENT BASINS

HAZARD

HEAT

RAINFALL AND FLOODS

WILDFIRES

IMPLEMENTATION STEP

CONSTRUCTION

RENOVATION

TERRITORY

AREA OF ACTION

OUTDOORS

COST

€ € €

low **medium** high

LEVEL OF SKILL

high

There are three types of basin: wet, dry, and underground (see table below). The aim of using basins to manage rainwater is to reduce the risk of flooding and alleviate the pressure on collective networks. Open-air and underground ponds both fulfil several functions and have different characteristics.

These basins can be designed to temporarily store rainwater and run-off without allowing the water to infiltrate into the ground. The water collected is gradually evacuated by evaporation or towards outlets at a regulated rate (retention basin).

Another option is to infiltrate rainwater and run-off into the ground (infiltration basin or drainage basin when the ground doesn't allow sufficient infiltration).

Lastly, the basin can both infiltrate and store rainwater and run-off. The volume of water is then discharged at a regulated rate to an outlet while also infiltrating into the permeable soil (mixed basin).

IMPACTS

Basins help to **delay the arrival of water**, relieve congestion in sewerage systems, and reduce the intensity of flooding. During heavy rainfall events, collective networks become saturated. In combined sewer systems, rainwater is mixed with wastewater and discharged untreated into the natural environment. In separate sewer systems, rainwater runs off, becomes polluted and is discharged into the natural environment without treatment.

The basins **clean up rainwater** run-off, either by decantation (to separate suspended matter) or by phytodepuration (which uses the bacteria present in plant root systems to purify the water).

When rainwater is reused, basins help to build resilience by **reducing the dependence** on water networks likely to be damaged during violent climate events. They can also be useful in the event of fire.

Dry basins featuring vegetation help to **improve air quality**, while wet basins help to cool down the surrounding area and encourage local biodiversity.

INSTALLATION GUIDE

The characteristics, advantages and disadvantages of the three types of basin are summarised in the table below.

CLICK HERE TO CONSULT THE GUIDE TO ACTION FOR CLIMATE CHANGE ADAPTATION

	FEATURES	ADVANTAGES	DISADVANTAGES
DRY BASIN	• Doesn't normally contain water • Is covered with vegetation or a watertight geomembrane	• Can be developed for other uses (playground, car park, etc.) when not in use	• Deposit must be cleaned after use • Takes up space • Risk of unpleasant odour
WET BASIN	• Permanent water body • Installation of a watertight geomembrane, especially for small basins	• Cools down surrounding area • Presence of an aquatic ecosystem • Landscape feature • Collected rainwater can be reused	• Takes up space • Risk of proliferation of insects and amphibians • Risk of unpleasant odour
UNDERGROUND BASIN	• Doesn't normally contain water • Underground storage facility	• Doesn't take up space • Discreet structure • Collected rainwater can be reused	• More expensive than an open basin • Accessibility and maintenance issues

WEAK POINTS AND STRONG POINTS

⊖ Because they require a **large area of land**, unburied basins are best suited to peri-urban or rural environments.

⊕ This system is most often **implemented on a regional scale**. At building level, other rainwater storage solutions, such as a green roof or a rainwater harvesting tank, can be used to combat flooding.

⊕ As water resources become increasingly scarce, the installation of a retention basin can **reduce drinking water consumption** by reusing rainwater. Retention basins can also be part of a cooling strategy using water.

⊕ At this stage, there is no regulatory obligation at French national level to ensure the security of these structures. Under article 1384 of the French Civil Code, security is the responsibility of their owners. Some basins are subject to the 2.1.5.0 "*Rejet des eaux pluviales*" section of the Environment Code.

MALADAPTATION

Maladaptation

Wet, dry and underground basins have varying characteristics and different uses depending on whether they are infiltrating, draining, retention or mixed. Depending on their use, all or part of the water can be collected and reused or infiltrated into the soil.

Maladaptation can result from the following:

Groundwater pollution:

Local infiltration is to be preferred, since it most closely resembles the natural water cycle. However, if the water conveyed has run off polluted areas such as roads, there is a risk of polluting the soil and the water table during infiltration. Particular attention must therefore be paid to the **design of the conveyance system.** In the case of moderate pollution, semi-aquatic plants (cattails, reeds, irises, etc.) can be planted for their remedial properties. If the water is too heavily polluted, impermeable basins should be used, with the water drained off to a treatment system.

Changes to the natural water cycle:

If the retention basins are made impermeable (using a geomembrane or naturally impermeable soil), some of the buffered water can be collected and reused, while the rest is discharged towards the outlet. In this configuration, there is a risk that by not returning the water to the natural environment, **local water tables will no longer have the capacity to recharge**. In this case, drought events are likely to be more intense locally and longer-lasting. This is why it is vital to strike a balance between the amount of water abstracted and the amount returned to the natural environment.

MONITORING INDICATORS

ESSENTIAL RECOMMENDATIONS WORTH THINKING ABOUT

- FAVOUR PERMEABLE AND VEGETATED BASINS WHEN THE ENVIRONMENTAL, PHYSICAL AND TECHNICAL CONDITIONS ARE MET
- FOR DRY BASINS, THINK ABOUT WHAT THEY CAN BE USED FOR WHEN NOT UNDER WATER (LEFT FREE TO HOST BIODIVERSITY, SPACE FOR LEISURE, SPORT, CULTURAL ACTIVITIES, ETC.)
- RUN AN AWARENESS CAMPAIGN TO EXPLAIN THE BENEFITS OF RETENTION BASINS
- MAKE THE SPACE ACCESSIBLE TO THE PUBLIC

MONITOR MY ACTIONS FOR CLIMATE CHANGE ADAPTATION

+/– : Quantitative indicator ★ : Qualitative indicator

	INDICATORS OF MEANS	INTERPRETATION
+/–	Basin capacity (m³)	To be maximised
+/–	Leakage rate (l/s.m²) (see Definition section, "Creating a green roof")	-
+/–	Soil infiltration capacity (mm/h)	To be maximised in the case of an infiltration basin
+/–	Percentage of essential recommendations followed (%)	To be maximised

	INDICATORS OF RESULTS	INTERPRETATION
+/–	Number of events in the year when the capacity of the basin is too low to contain the rainfall event	To be minimised
+/–	For dry basins, number of days under water during the year	-
+/–	Percentage of collected rainwater reused (%)	Balance between reuse and discharge into the natural environment
+/–	Percentage of rainwater discharged into the natural environment (%)	Balance between reuse and discharge into the natural environment
+/–	Comparison between the temperature of the area near the basin and that of a control area* (°C)	Temperature of the area near the basin < temperature of the control area
+/–	For a space open to the public, average number of users per day depending on the season	Balance between well-being for users and harm to biodiversity

**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.).*

CONCEPT / DEFINITION

What are mega-basins?

Mega-basins are gigantic water storage structures (8 hectares on average and several thousand cubic metres), designed to meet the needs of the agro-industry, particularly during the summer months. Creating these reservoirs involves digging a crater in the ground that completely destroys the soil (which supports biodiversity and natural cycles: oxygen, carbon, organic matter, nutrients, etc.) and installing a tarpaulin to store the water without it seeping through. The water cycle necessary for the proper functioning of ecosystems and the availability of drinking water is thus broken. Rainwater is not sufficient to fill these structures. During the winter, water is pumped from water tables and rivers, increasing the pressure on resources and further altering the natural water cycle.

Once the running water is stored in the basin, it becomes stagnant. A large proportion of it evaporates (between 20% and 60% of the total volume) and the quality of the water is altered, particularly through eutrophication (a process by which nutrients accumulate, leading to excessive growth of plants and algae).

Mega-basins can meet the water needs of agriculture during a number of droughts, but the amount withdrawn is far greater than the recharge capacity of the water tables pumped. This is not a sustainable solution, and only delays the impact of future droughts, which will be longer and more intense because the water tables will not be recharged.

The use of mega-basins generates problems regarding conflicts of use and the privatisation of water resources.

Mega-basins and retention basins are not the same! Unlike mega-basins, retention basins don't pump water for later use, and only very small quantities of water are not returned directly to the natural environment compared with mega-basins. The aim is to buffer the water in order to reduce the risk of flooding.

FIND OUT MORE

Grand Lyon (2008), *Méthode de gestion des eaux pluviales – Présentation des ouvrages*

Wallonie Ediwall (2023), Référentiel – Gestion durable des eaux pluviales