

INVESTMENT FACT SHEET

I4 Rainwater utilisation via rooftop rainwater harvesting serving rain gardens in Bydgoszcz

Project index number and acronym	CE1578 CityWaterCircles
Responsible partner (PP name and number)	PP7 Bydgoszcz
Linked to pilot action (number and title)	I4 Rainwater utilisation via rooftop rainwater harvesting serving rain gardens in Bydgoszcz
Project website	https://www.interreg-central.eu/Content.Node/CWC.html
Delivery date	02.2020 - 06.2022

Description and technical characteristics of the investment

The pilot was realised in two locations:

- ✓ Location 1 - Museum of Waterworks (Palace building),
- ✓ Location 2 - Building A of the City Hall at Grudziądzka Street.

Location 1:

Museum of Waterworks - Demonstration system of rainwater management based on green - blue infrastructure for the building of the Palace of the Museum of Waterworks at Gdańska 242 in Bydgoszcz.

The main goal of the project was to create an exemplary, demonstrative management of rainwater from the roof of the Waterworks Museum building in the "Las Gdański" water treatment plant in Bydgoszcz. The assumption is primarily to inspire the city's residents who want to disconnect their property from the municipal rainwater drainage system and manage rainwater within their property.

The design includes rainwater management in a few types of solutions:

- 1) rain garden in sealed container;
- 2) sealed rain garden in the ground;
- 3) infiltration rain garden in natural permeable soil,
- 4) barrels that take over the runoff of rainwater from downpipes connected to the municipal rainwater drainage system.

All three types of rain gardens are connected to each other by a system of surface dry streams / gutters, and the rainwater reserve accumulated in barrels can be used for additional irrigation of local vegetation or rain gardens in the event of a longer rainless period.

To calculate the capacity of individual reservoirs (gardens), the rainfall for Bydgoszcz with a height of 35.5 mm was assumed, which is a heavy rain occurring once in 5 years and lasting 120 minutes. From the roof area of 265 m² we will get over 9 m³ of rainwater of which it can be assumed that about 8 m³ will flow into our solutions.

Materials and technologies of good quality and local origin were used, matching the historic character of the building and the area:

- solid wood barrels - larger barrels are 400l each, and one 200l
- copper drain pipe extensions
- rain garden in a container - reinforced concrete tank finished with brick in the color of the building. The vessel is sealed, filled with drainage layers, and then with vegetation layers - soil mixed with sand, in which wetlands are planted. The container has area of 1.9 m² and a capacity of about 1 m³. An overflow goes by the dry stream to the next rain garden.
- dry streams and rain gardens lined with local river stone The rain garden in the ground has been divided into two parts - a sealed one from the side of the building and an infiltration one where water is released into the ground. The sealed part has an area of 4 m² and a capacity of 1.2 m³, the infiltration part has an area of 16.5 m² and a capacity of 5 m³.
- Rain gardens have been planted with hydrophytes, which can resist flooding or dry periods. There are 30 species of plants, including ophiuchus knotweed, iris, cattail, comfrey, aquatic mint, semolina, common loin.

Location 2:

Building A of the City Hall is a three-storey building which is almost surrounded by sealed areas. Rainwater from the roof of the building is usually discharged via a system of gutters and downpipes into the stormwater sewer. The total roof surface area which drains into the rain garden is 275 m² discharged via two major downpipes.

The pilot includes:

- ✓ The rain garden - designed in 10 connected containers (pots) made of concrete and mantled with an extruded foundation membrane made of a special high-density polyethylene and placed at a distance of 50 cm from the wall of the building. The rain garden has a total area of approx. 12 m² (12 x 1 x 0.85 m) and an estimated retention capacity of 3.37 m³. More than 170 hydrophytic plants, which purify and retain water, were planted;
- ✓ New piping system;
- ✓ Monitoring system

The pots are supplied via new downpipe sections to a horizontal irrigation pipe located in the pots with perforations for even water flow in the pots.

Excess water is discharged through a grating - overflow screen mounted in the upper part of the pot and two drainage pipes laid on the bottom of the pots. The rainwater from one of them is directed to the rainwater drainage system and the other pipe goes out to the free space - the unpaved area around the pots.

The base for the production of flower pots/containers is exposed polystyrene commonly called polystyrene. The polystyrene frame is reinforced with a plastic finishing mass. This makes the pots light yet strong, resistant to damage, fungi, mould, UV rays and frost. The walls of the pots were protected with PVC foil. Between the walls of the pots and the PVC foil a bucket foil was used to increase the frost resistance of the pots and to limit the freezing of the plants.

The bottom of the box is filled with a layer of expanded clay aggregates up to the height of 30 cm. The aggregate layer is covered with 45 cm of coarse sand with supplements that will help to keep the container moist and purify rainwater. The rest is completed with garden soil, gravel and humus. Flat stones are placed on top. The pots are planted with hydrophytic plants.

The rain garden is monitored using:

- a compact weather station with a built-in solar panel for long-term monitoring of environmental measurements via GSM network,
- two sensors measuring soil moisture, designed to work with a wireless network,
- a rain gauge - a smart, hourglass rainfall level sensor.

The monitoring station described above was launched on April 25, 2022, at 08:05 a.m. and is operating continuously, taking measurements of precipitation [mm] and soil moisture [m3/m3] in two of the ten pots of the rain garden. Measurements are recorded at 5-minute intervals.

The results of the measurements are available to anyone at:

<https://www.hobolink.com/p/9c8ec0581f1357af2b097054e50460f9>

Investment costs (EUR) including a break-down of main cost items

Cost type (e.g. planning, construction)	Description of cost (what is included into the contract, what was delivered, etc.)	Real amount (based on contract) EUR
SUM		47 643,10 EUR
Location 1		
Construction	Examples of costs:	21 364,42
	rain garden in a container with an overflow to the garden in the ground	2 273,71
	rain garden in the ground sealed and unsealed	3 298,87
	dry streams	7 000,46
	supply, installation of rainwater barrels	3 044,27
	planting the gardens and dry streams with hydrophytic plants	5 154,03
	cutting down trees and shrubs with disposal, supplementing the soil, sowing grass	593,08
Location 2		
Construction		26 278,68
	delivery and installation of fiberglass pots along with wooden lamellas	14 453,28
	delivery and assembly of a bench	1 709,18
	irrigation system with drainage	3 578,60
	filling the pots with filter material and soil	1 576,72
	delivery and planting of hydrophytic plants in pots	1 734,82
	purchase and installation of a monitoring system	1 196,43
	Additional works (removal of shrubs, relocating the mailbox, painting the lower section of the building wall along the rain garden)	1 709,18
	Delivery and installation of the information board	320,47

Investment location

NUTS 3	Address (Street, house number, postal code, city, country)	GPS coordinates
Location 1	Gdańska 242, 85-674 Bydgoszcz	53°08'54"N 18°01'38"E
Location 2	Grudziądzka 9-15, 85-102 Bydgoszcz	53°07'15"N 17°59'36"E

Duration and process of investment implementation

Start date	End date
Location 1:	
02.2020	11.2021
Location 2:	
06.2020	06.2022 (including monitoring)

Major milestones of investment implementation

Location 1:

Activity	Start Date	End date
Initial Concept	03.02.2020	17.02.2020
Development of executive project	27.02.2020	31.03.2021
Specification for works	04.01.2021	31.03.2021
Selection of contractor and signing the contract for works	07.2021	09.2021

Investment works /supervision and approval	09.2021	11.2021
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Location 2:

Activity	Start Date	End date
Initial Concept Location 2 and 3	06.2020	09.2020
Announcement of inquiry: development of a design and cost estimate documentation for rain gardens (Location 2 and 3)	1.05.2021	14.05.2021
Signing a contract and development of a design and cost estimate documentation for rain gardens (Location 2 and 3)	21.06.2021	16.08.2021
Obtaining a certificate of no objection to the implementation of the project (Location 2 and 3)	7.09.2021	18.11.2021
Selection of contractor: tender for works - construction of rain gardens at public buildings in Bydgoszcz (Location 2 and 3)	28.09.2021	18.11.2021
Investment works /supervision and approval (Location 2)	11.2021	02.2022
Monitoring of the rain garden (precipitation and soil moisture)	04.2022	06.2022

Ownership and durability of the investment (e.g. maintenance, financing)

Location 1:

City of Bydgoszcz is the owner of the pilot raingarden till 31.12.2028. Municipal Waterworks (MWiK), a city-owned company is the owner of the plot. City of Bydgoszcz and MWiK, on 01.10.2020 have signed the agreement which contains the following content: „in order to meet the requirements of the Programme, the land and/or buildings where the construction works will be carried out should be owned by the beneficiary or the beneficiary must have them under a legally binding agreement covering the period allowing to meet the requirements regarding project durability (including maintenance) described in chapter E2 Implementation Manual. The City of Bydgoszcz holds 100% of shares in MWiK. Therefore, the parties declare and undertake that the condition of having the land on which the investment works will be carried out will be met for a minimum of 5 years from the receipt by the City of Bydgoszcz of the last payment (reimbursement) from the ERDF, i.e. at least until December 2028.

In the signed agreement, MWiK undertook to maintain the investment for a period of 5 years, the City undertook to leave the fixed asset in the fixed asset books until December 31, 2028. For one year contractor which built the facility is responsible for maintenance, and for one more year there is a warranty on the pilot installation with the exception of plants. After these two years MWiK will fully take care of the raingarden maintenance.

The durability of the investment is hard to estimate but with proper maintenance it should last for decades.

Location 2:

City of Bydgoszcz is the owner of the pilot raingarden. For one year contractor which built the facility is responsible for maintenance. After the year City Hall will fully take care of the raingarden maintenance.

References to related pilot action (output fact sheet) and relevant deliverables (e.g. pilot action report, studies) and web-links.

If applicable, additional documentation, pictures or images to be provided as annex

D.T2.7.1 FINAL SELF-EVALUATION REPORT

D.T2.5.3 JOINT PEER REVIEW REPORT

D.C.5.1 CWC public consultation workshops for targeted citizen groups

D.T2.1.4 Finalised CWC transnational online handbook also including the pilot showcases and their conclusions

D.T2.1.6 Tailored CWC online handbooks translated to national languages

Public pilot description: <https://www.interreg-central.eu/Content.Node/Raingarten-in-Bydgoszcz.html>

Public pilot video: <https://www.youtube.com/watch?v=j2Zkk7J8SCE&feature=youtu.be>









