



## GREEN BUS STOP AND BICYCLE SHELTERS with a system of biological rainwater retention



**GREEN BUS STOP SHELTER**  
– Jagielloński Square opposite  
Galeria Słoneczna



**GREEN BICYCLE SHELTER**  
– Radomskie Centrum Sportu



**GREEN BICYCLE SHELTER**  
– Primary School No. 33



### INNOVATIVE DESIGN in accordance with EU standards

- original, innovative design (captures and enables flow of rainwater between the elements of the shelter)
- reinforcement of the construction (allows safe installation of additional greenery)



### GREENERY WATERING SYSTEM with rainwater

- retains rainwater from the bus stop and adjacent sidewalks
- provides water to green areas (improves aesthetics and reduces greenery maintenance costs)



### 10 m<sup>2</sup> PLANT ROOF i 9 m<sup>2</sup> PLANT WALL of sedums and climbers

- shadows the bus stop on hot days and lowers the temperature thanks to the evaporation of plants (soothes the microclimate, improves well-being, more friendly to people with cardiovascular diseases, the elderly and children)
- safer for birds (green elements reduce the number of collisions with the glass sides of the construction)



## ClimaPond - Biological pond collecting rainwater from roofs



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### Public Kindergarten No. 16

A small urban pond with a retention and infiltration section, creates a place for the development of biodiversity, supporting plants and animals with water collected from over 200 m<sup>2</sup> of the roof.



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### Public Primary School No. 11

Small urban pond capturing water from over 300 m<sup>2</sup> of roof. An enclave of biodiversity and a place of relaxation for school students and staff during hot weather.



## ClimaBox - biological reservoir collecting rainwater from roofs



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### CONCRETE CLIMABOX Public Kindergarten No. 4

biological above-ground reservoir in the form of a vegetated concrete box with water plants and small urban architecture. Captures water from over 80 m<sup>2</sup> of roof.



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### METAL AND WOODEN CLIMABOX XI Secondary School

two biological above-ground reservoirs in the form of metal and wooden boxes with water and reed vegetation. They capture water from over 300 m<sup>2</sup> of roof.



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### METAL AND WOODEN CLIMABOX Nursing Home, Struga St

two biological above-ground reservoirs in the form of metal and wooden boxes with water and reed vegetation and drainage of excess water to rain gardens. They capture water from over 180 m<sup>2</sup> of roof.



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### BRICK CLIMABOX Nursing Home, Wyścigowa St

two biological above-ground brick reservoirs with floating vegetation, connected to rain gardens. They capture water from over 170 m<sup>2</sup> of roof.



## RAIN GARDENS - various forms of land arrangement collecting rainwater



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**CASCADE** - rain garden with a total area of 27.6 m<sup>2</sup>, collecting rainwater from 80 m<sup>2</sup> of the kindergarten roof.

Public Kindergarten No. 11



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**TREE TRENCH** - a lowering of the area collecting rainwater from the roof and irrigating trees.

Primary School No. 33



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**THREE INFILTRATION BASINS** - collecting rainwater from the surface of the square.

The square between streets: Bema, Jasińskiego and Słowińskiego

### CLIMATE BENEFITS RESULTING FROM THE IMPLEMENTATION OF SMALL BGI



- onsite stormwater retention
- reduction of fees for discharging rainwater into surface waters
- improvement of the microclimate



- relief of the rainwater drainage system
- reducing flush floods in the city during heavy rainfall
- protection against flooding of the facilities' premises



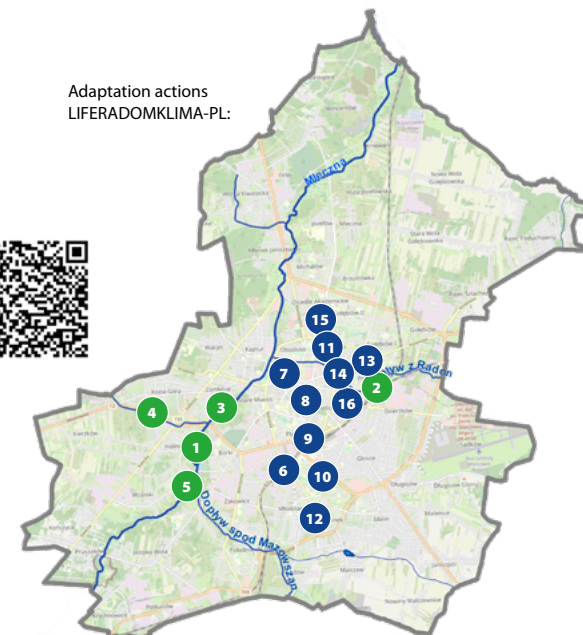
- improvement of biodiversity (plants, aquatic invertebrates, insects, birds)
- securing water for plants and animals for the drought period



- creating an attractive play and relaxation space for children, parents and facility employees, environmental education.



Adaptation actions  
LIFERADOMKLIMA-PL:



Map source: OpenStreetMap.org

### Large BGI (blue-green infrastructure):

- Adaptation of the Borki reservoir and colimation ponds
- Construction of a multifunctional reservoir on the Potok Północny river with a sequential sedimentation and biofiltration system (SSSB) (between Olsztyńska St and railway tracks)
- Remeandering of the Mleczna river (at the boulevards over Mleczna)
- Floodplain polders on the Cerekwianka river (at NSSZ Solidarności St. - behind Jana Łaskiego Roundabout)
- Canal A0 and SSSB on the Mleczna river above the Borki reservoir (at Sucha St)

### Small BGI (blue-green infrastructure):

- Climapond Public Kindergarten No. 16 (3 Grenadierów St)
- Green bus shelters (Struga St opposite Galeria Słoneczna)
- Rain garden - Public Kindergarten No. 4 (23 Jana Kilińskiego St)
- Rain Garden and Climapond - Public Kindergarten No. 11 (10 Kościuszki St)
- Climapond - Public Primary School No. 11 (19 Gagarina St)
- Absorptive basins (Square Bema St/Jasińskiego St)
- Rain gardens - Nursing Home (16 Wyścigowa St)
- Rain gardens - Nursing Home (88 Struga St)
- Green bicycle shelter - RCS at (63 Struga St)
- Rain Gardens and Climapond - XI LO (27 11 Listopada St)
- Tree trench and Green bicycle shelter - Public Primary School No. 33 (5 Kolberga St)



Flood prevention



Onsite stormwater retention



Drought mitigation



Improvement of biodiversity



Improving water quality



Reduction of CO<sub>2</sub> emissions



Multifunctional recreation area



## Adaptation to climate change through sustainable management of water of the urban area in Radom City

Project co-financed by the European Union under the LIFE Programme and the National Fund for Environmental Protection and Water Management.

LIFE14 CCA/PL/000101

RadoKlima

LIFERADOMKLIMA-PL

# BGI BLUE-GREEN INFRASTRUCTURE IN ADAPTATION TO ANTHROPOGENIC CLIMATE CHANGE OF RADOM CITY



The project implemented by the Municipality of the City of Radom together with:  
Municipal Waterworks in Radom Ltd., University of Lodz and FPP Enviro Ltd.

Radom  
siła w precyzji

wodociąg  
miejskie

UNIWERSYTET  
ŁÓDZKI

FPP  
ENVIRO



### ANTHROPOGENIC CLIMATE CHANGE:

Man-made carbon dioxide (CO<sup>2</sup>) causes an anthropogenic climate change called global warming. It intensifies extreme weather phenomena such as heavy rainfall, floods, droughts and gales.

### IMPACT OF CLIMATE CHANGE ON CITIES:

Anthropogenic climate change in cities strongly impacts their inhabitants. A large amount of sealed surfaces intensifies the heat and adversely affects health. Sealed surfaces prevent rain from soaking into the ground, causing flooding.

### ADAPTATION TO CLIMATE CHANGE:

Adaptation to anthropogenic climate change aims in reducing the inconvenience associated with the occurrence of extreme weather events.

In cities, adaptation activities often consist in increasing the number of green areas, water reservoirs and collecting rainwater in natural and artificial landscape elements, i.e. creating the so-called blue-green infrastructure (BGI).

**BLUE-GREEN INFRASTRUCTURE (BGI)** in cities includes all areas related to urban greenery and surface waters as well as small constructions that support onsite stormwater retention, such as: urban parks and forests, river valleys, rain gardens, infiltration basins, green roofs, green walls, or measures developed and implemented for the first time as part of the LIFERADOMKLIMA-PL project, such as ClimaBox, ClimaPond and others.

## PROJEKT LIFE RadoKlima

**Title:** LIFERADOMKLIMA-PL „Adaptation to climate change through sustainable management of water of the urban area in Radom City” LIFE14 CCA/PL/000101

**Duration:** 16/07/2015 – 31/12/2022

Project co-financed by the European Union under the LIFE Program and the National Fund for Environmental Protection and Water Management

**Total cost:** 24 291 746 PLN

• co-financing from the EU: 12 207 760 PLN

• co-financing from the National Fund for Environmental Protection and Water Management: 6 494 305 PLN



[www.life.radom.pl](http://www.life.radom.pl)

### PROJECT GOALS

The main objective of the LIFERADOMKLIMA-PL project was to create an urban space in Radom with increased resistance to climate change by building a demonstrative blue-green infrastructure. Adaptation activities were carried out in the built-up city center (the so-called small BGI) and within rivers and their valleys (the so-called large BGI).

**Small BGI** – these are measures that support onsite stormwater retention in those parts of the city where the risk of overloading the stormwater drainage system and flooding resulting from urban flash floods is the greatest. Thanks to their construction, attractive places are created for residents as well as biodiversity enclaves.

**Large BGI** – these are measures that increase the retention capacity of rivers and their valleys, strengthen flood safety, improve biodiversity in river ecosystems and their valleys, and create a new, natural recreational space for city residents.

**Do you want to see where BGI was implemented in Radom as part of the LIFERADOMKLIMA-PL project?**

The location map of our BGI projects is on the last page of the leaflet.



## 1 Adaptation of the Borki reservoir and colmatation ponds



Adaptation of the Borki reservoir



Adaptation of colmatation ponds



### ADAPTATION ACTIVITIES AND BENEFITS:



- construction of structure regulating the inflow of river Mleczna water to the Borki reservoir and colmatation ponds
- removal of sediments accumulated at the bottom of colmatation ponds
- reconstruction of the weir in the main Borki reservoir



- construction of a fish pass at the main weir of the Borki reservoir



- a sequential system for purifying river water supplying colmatation ponds
- bottom water aeration system in colmatation ponds
- installation of water aeration and mixing devices (fountains and diffusers) in the Borki reservoir



- installation of renewable energy devices (windmills, solar panels) to power aeration devices

## 2 Construction of a multifunctional reservoir on the Potok Północny river

Multi-purpose reservoir



### ADAPTATION ACTIVITIES AND BENEFITS:



- construction of a multifunctional dry pond with an area of approx. 2 ha



- meandering the northern stream bed with numerous stagnant zones to increase habitat diversity



- sedimentation and flotation zone to clean the water



- transforming the site into a multifunctional area

## 3 Renaturalization of the Mleczna river



Meandering of the riverbed



Floodplain



### ADAPTATION ACTIVITIES AND BENEFITS:



- reconstruction of meanders of the Mleczna river bed on the section of 315 m
- 4 artificial oxbows acting as hide-out for the water fauna during high flows
- 10 systems acting as riffle-like (shallows) and stream pool-like (deeps) systems in the riverbed



- gravel heaps in the riverbed raising the water level and improving landscape and river bed retention



- reconstruction of the outlet of the rainwater collector to the river into a purifying hydrobotanic system using water plan

## 4 Floodplain polders on the Cerekwianka river



Floodplain polders after rainfall



Floodplain polders in the rainless period



### ADAPTATION ACTIVITIES AND BENEFITS:



- a flood polder (dry reservoir) with an area of 1.7 ha with a system that captures excess rainwater, in the place of former fish ponds on the Cerekwianka river



- sequential sedimentation and biofiltration system consisting of a sediment section and two biofiltration sections with natural aquatic vegetation on the Cerekwianka River

## 5 Channel A0 and SSSB on the Mleczna river above the Borki reservoir



Adaptation of the drain from the pumping station of the A0 stormwater channel into a biofiltration system. Water from the underground rainwater channel, after pre-treatment, is directed into the Borki reservoir as additional source of water during its low level in the reservoir

### ADAPTATION ACTIVITIES AND BENEFITS:



- sealing of the A0 underground channel to increase supply of rainwater to the Borki reservoir
- sedimentation and biofiltration system at the pumping station of the A0 channel to the Mleczna river, above the Borki reservoir to improve its quality
- planting vegetation with nutrient-reducing properties
- creating a recreational space for residents to rest on hot days