AWARD

Alternative Water Resources and Deliberation processes to renew water supply strategic planning

Alternative Water Resources and Deliberation process to renew water supply strategic planning

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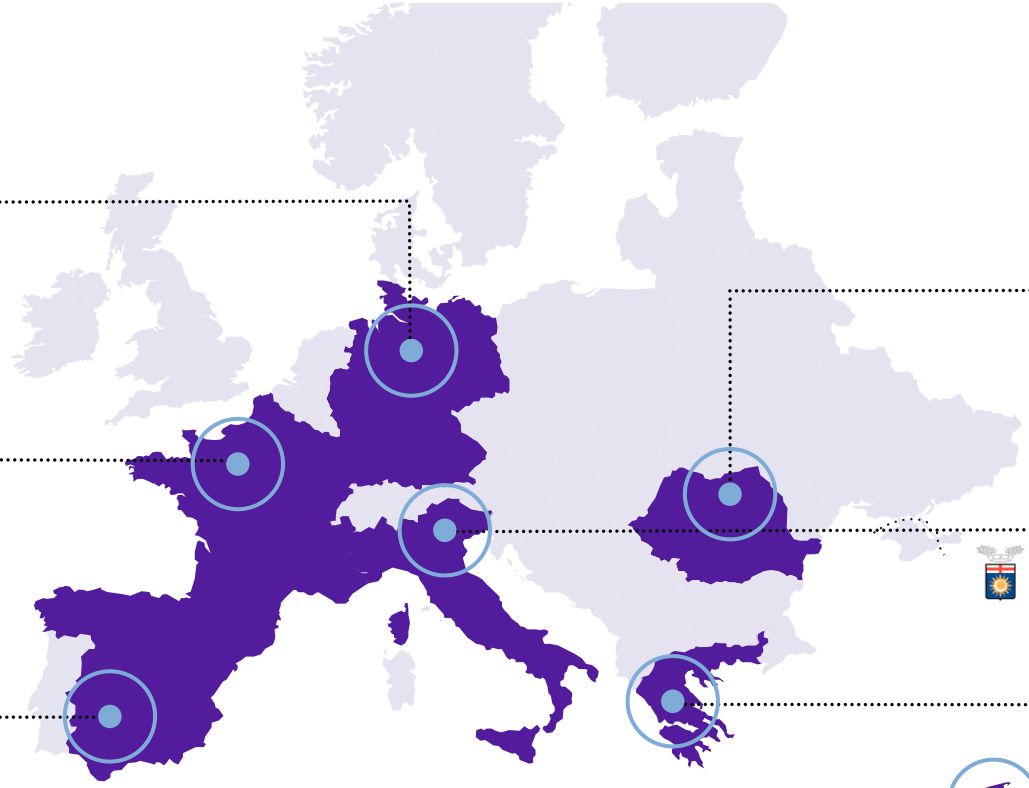
IRIDRA S.r.l.

circularsummit fryslân2025.frl

AWARD CONSORTIUM



GERMANY

InterSus SUSTAINABILITY SERVICES

FRANCE

OiEau Office International de l'Eau · AQUA VALLEY · université PARIS-SACLAY · UVSQ

SPAIN

aimen TECHNOLOGY CENTRE · CETAQUA WATER TECHNOLOGY CENTRE · ViAQUA

ROMANIA

BDG Business Development Group · UTCB

ITALY

Città metropolitana di Milano · IRIDRA · CAP

GREECE

CYPRUS

Συμβούλιο Αποχετεύσεων Παραλιμνίου

AWARD

EXPECTED RESULTS

Raising awareness on AWR* context, issues & solutions

Socio-political engagement based on Local Water Forum and networking

Test and monitor AWR* in 4 demo cases

Down scaling strategic plan measures into water users every day actions

*AWR: Alternative Water Resources
**DST-TSD: Deliberation Support Tool for Territorial Sustainable Development

Catalogue of AWR* solutions

AWARD DST-TSD** platform to support decision on AWR solutions

Social Innovation to reconcile technological and non-technological dimensions

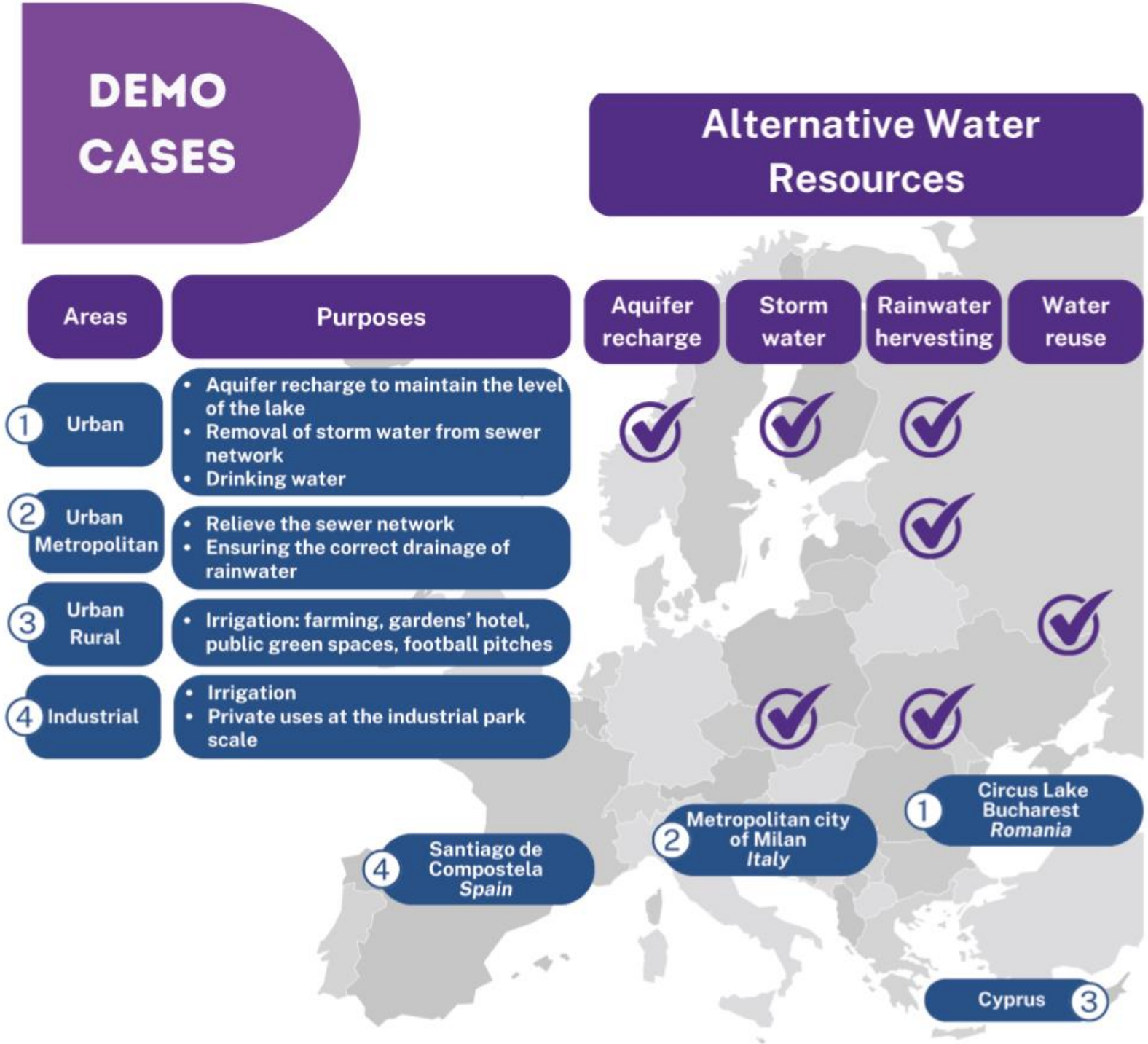
Training to assist AWARD's target audiences in changing practices

Exploitation roadmap for AWARD market potential, social impact & policy goals

Multi-scale tailored policy recommen-dations

Handbook for integrating AWR* into water supply strategic plan from the 4 DC

DEMO CASES


Alternative Water Resources
Areas
Purposes
Aquifer recharge
Storm water
Rainwater hervesting
Water reuse
1 Urban
• Aquifer recharge to maintain the level of the lake
• Removal of storm water from sewer network
• Drinking water
2 Urban Metropolitan
• Relieve the sewer network
• Ensuring the correct drainage of rainwater
3 Urban Rural
• Irrigation: farming, gardens' hotel, public green spaces, football pitches
4 Industrial
• Irrigation
• Private uses at the industrial park scale
1 Circus Lake Bucharest Romania
2 Metropolitan city of Milan Italy
3 Cyprus
4 Santiago de Compostela Spain

Demo case presentation: Location of CMM

Metropolitan City of Milan

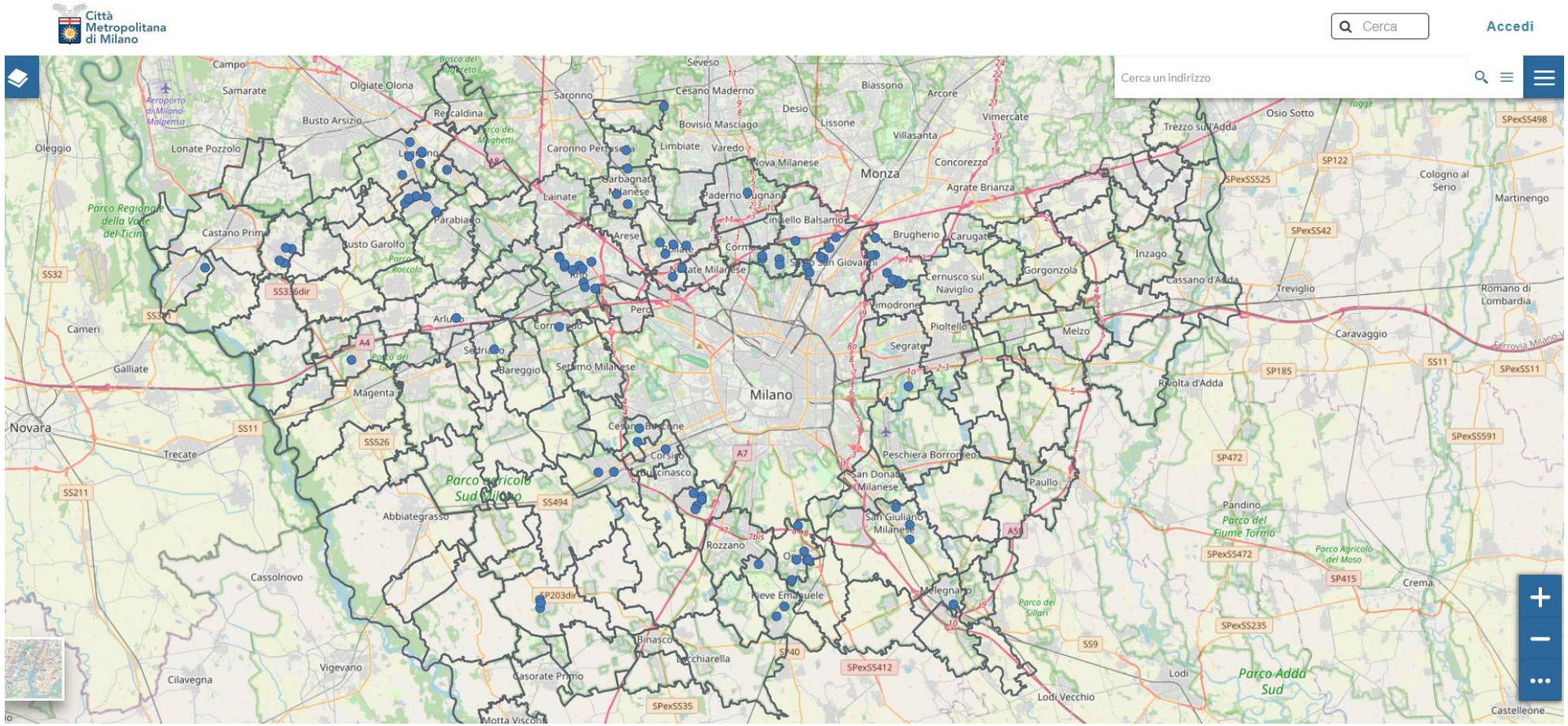
- 133 municipalities
- 1575 kmq

Città metropolitana di Milano

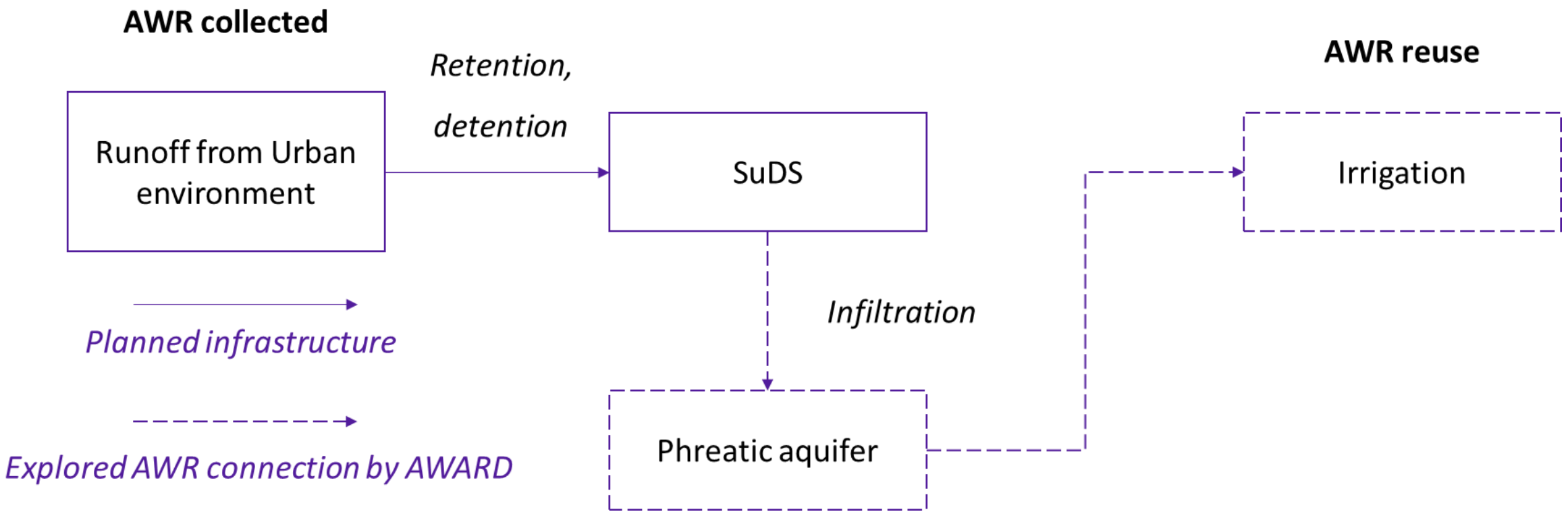
Demo case presentation: CMM Sponge city

Metropolitan Sponge City of Milan

- 90 Suds interventions planned and under implementation in 32 Municipalities to study (PNRR (Next Generation EU)



Demo case presentation: CMM Sponge city



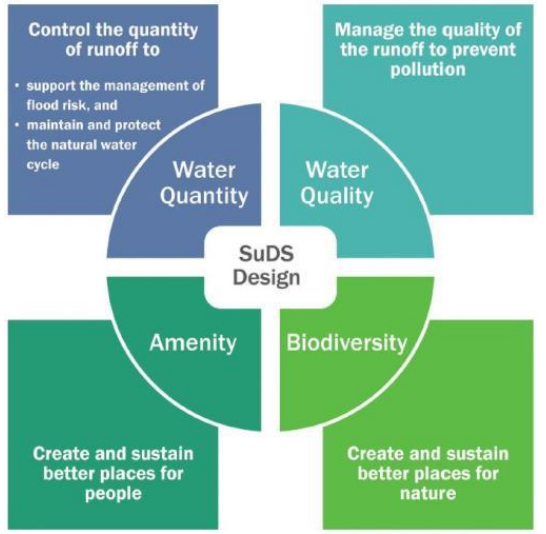
Demo case presentation: Ambition of AWARD

Main issues

- Flooding due to storm water linked to heavy rains.
- Developing the alternative water resources supply systems to recharge directly or indirectly the shallow urban aquifers strata

AWR solutions

- Rainwater and storm water collection, treatment
- Aquifer recharge



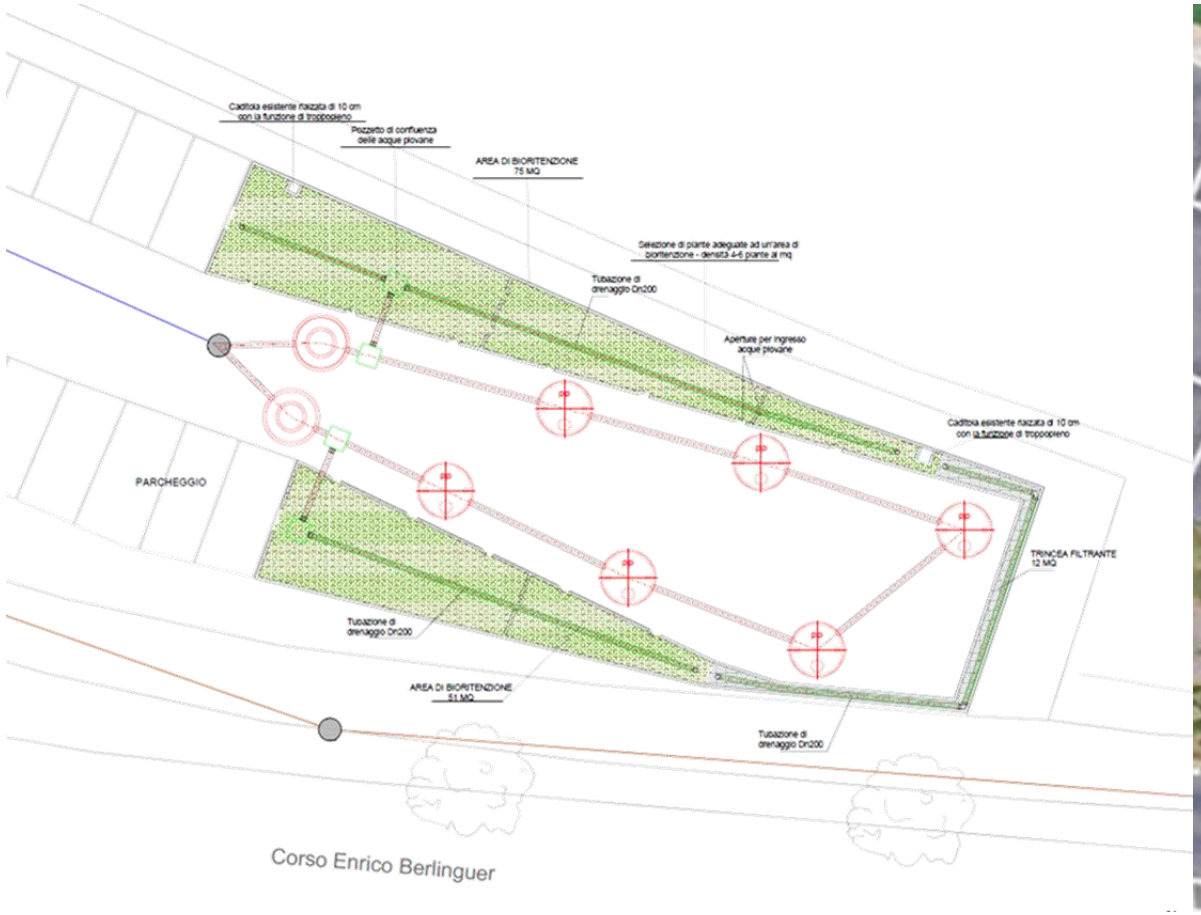
Source: Woods Ballard et al. 2015. "The SuDS Manual"

DEMO monitoring: multipurpose simplified low cost monitoring

- Water quantity: soil moisture + water balance for infiltration estimation (KPI: artificial recharge 5600 m3/y)
- Water quality: pollutant load removal and interception (proxy rainfall) plus monitoring groundwater quality
- Amenity: heat island reduction with low cost temperature sensors (citizen science)
- Biodiversity: low cost approaches (citizen science)

DEMO monitoring (CMM sponge city): estimating impact of sponge city at metropolitan city scale

DC2 - Water Quantity: SOLARO



DC2 - Water Quantity: SOLARO

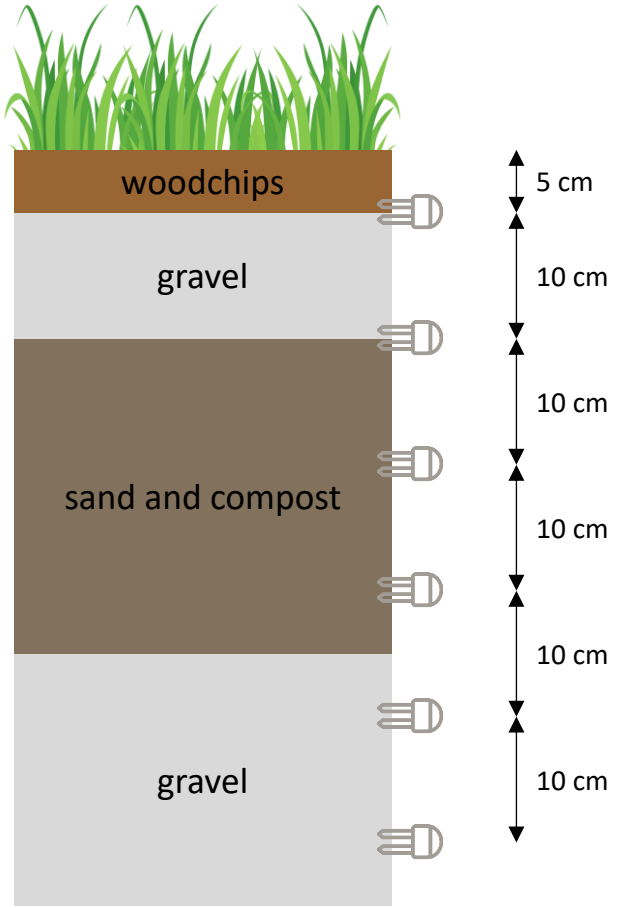
DC2 - Water Quantity: Monitoring system

Soil moisture sensors were installed to monitor water infiltration within the raingarden.

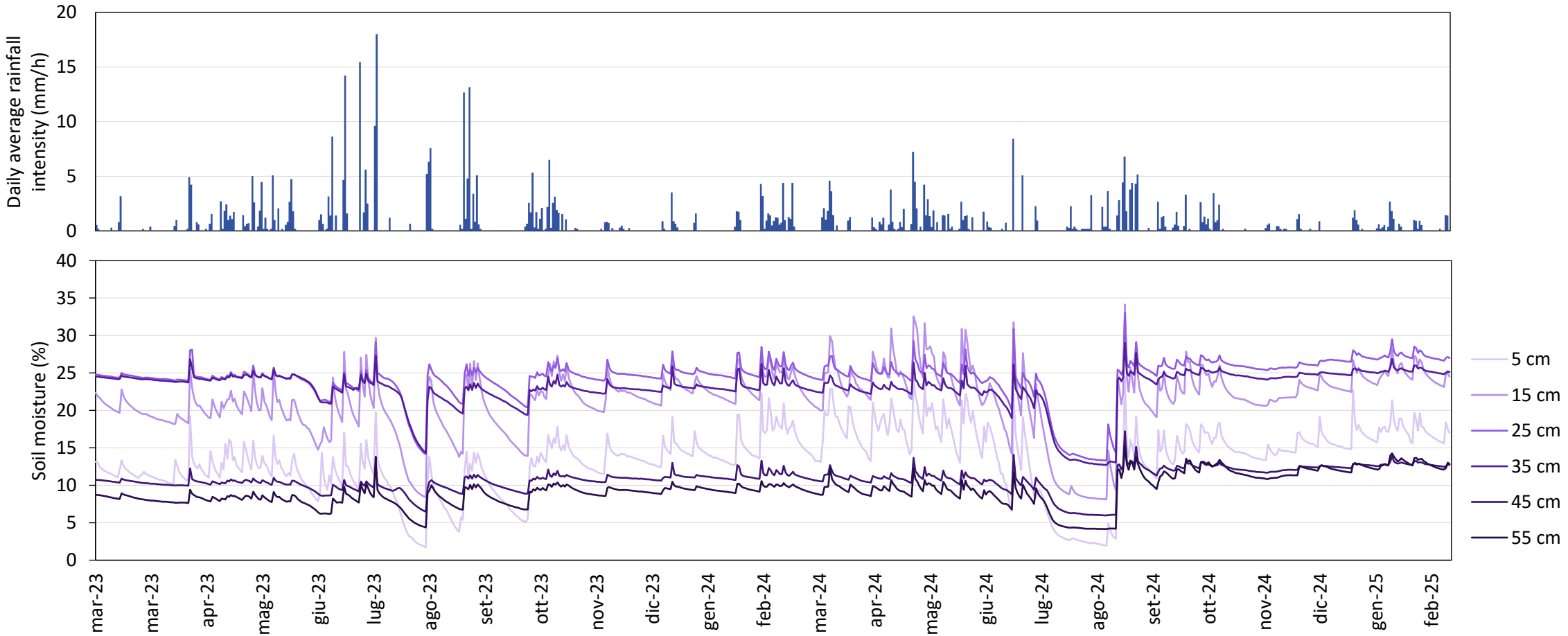
Specifically, moisture was measured at six different depths, ranging from 5 cm to 55 cm, spaced 10 cm apart.

Water content readings were taken every 10 minutes over a period of two years.

Rainfall data were collected from a rain gauge installed near the demo case.

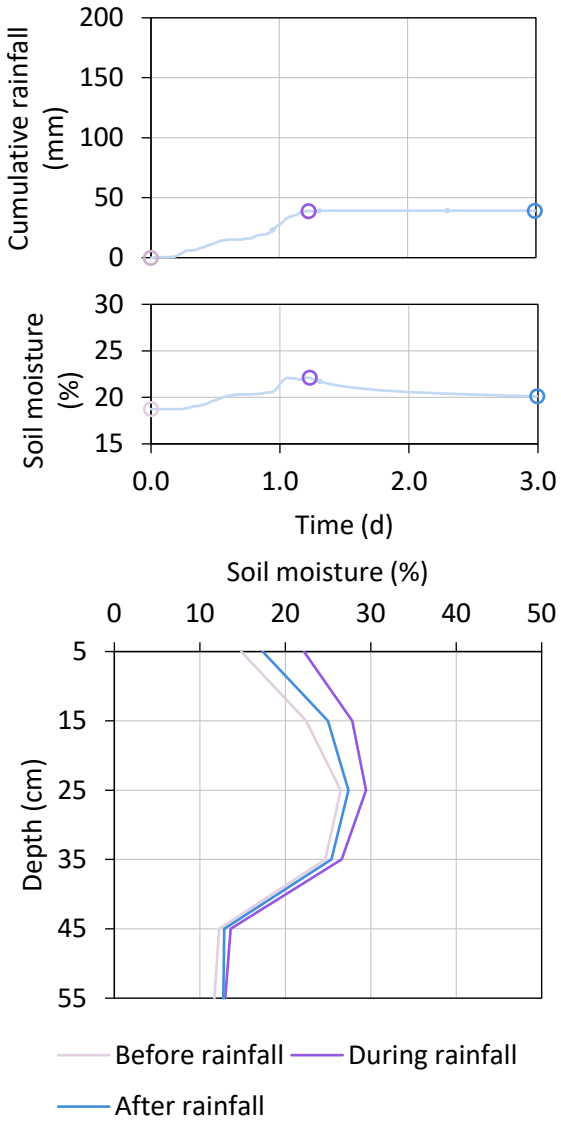


DC2 - Water Quantity: Monitoring data

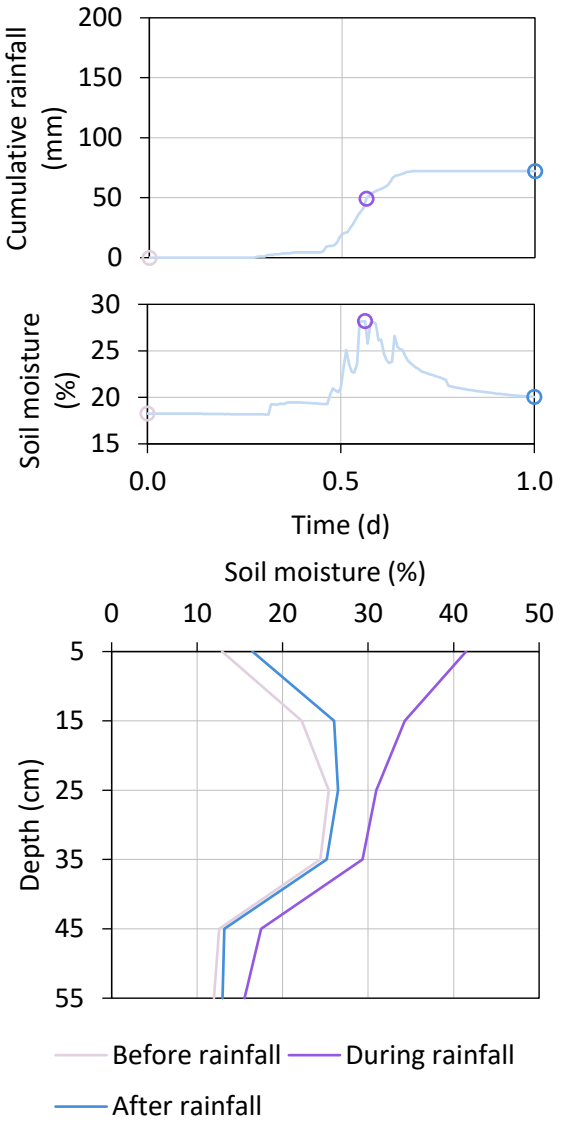


DC2 - Water Quantity: Raingarden behaviour

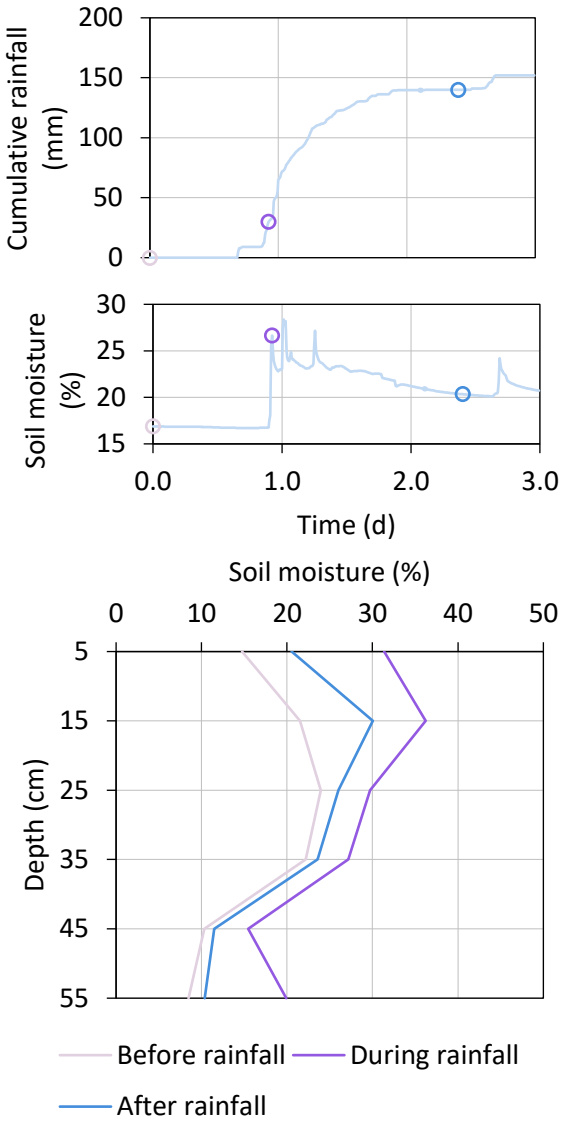
Return Period <2 years



Return Period 2-5 years



Return Period 10-20 years

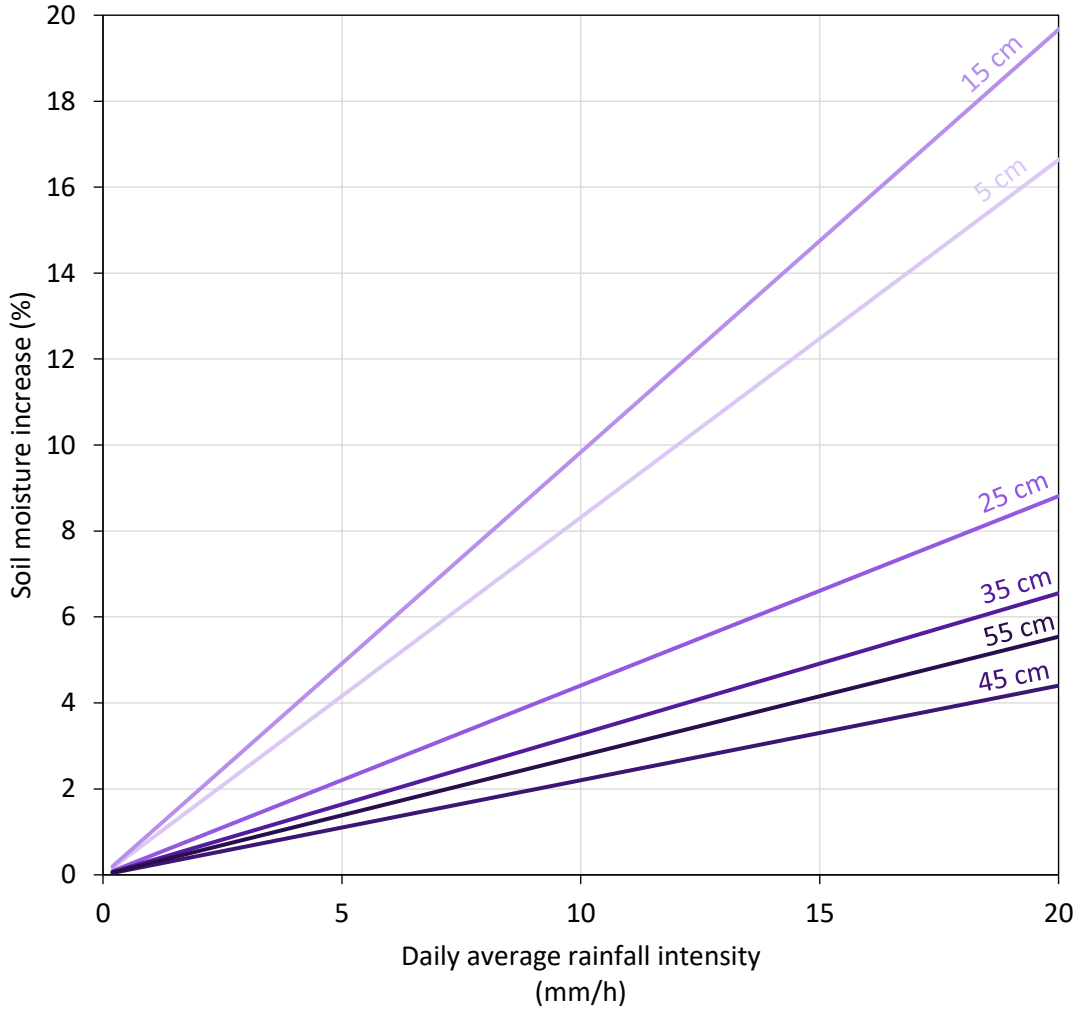


DC2 - Water Quantity: Soli moisture VS Rainfall

There is a linear relationship between rainfall intensity and soil moisture variation, which changes depending on the depth at which the sensor is installed.

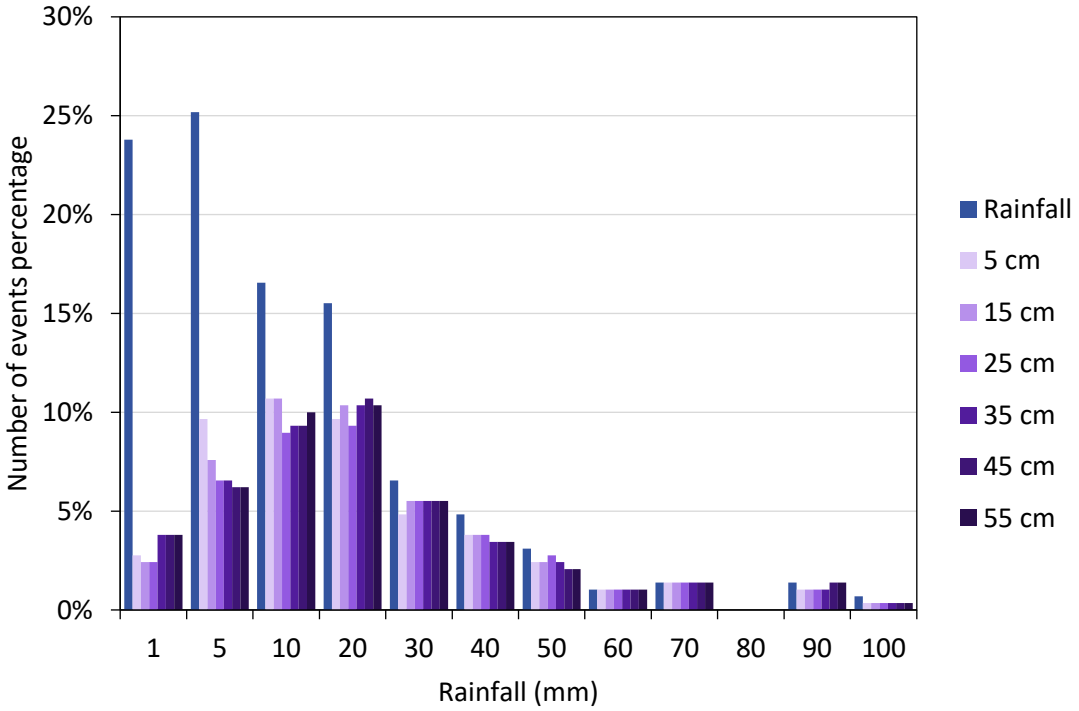
The moisture sensor serves a dual purpose:

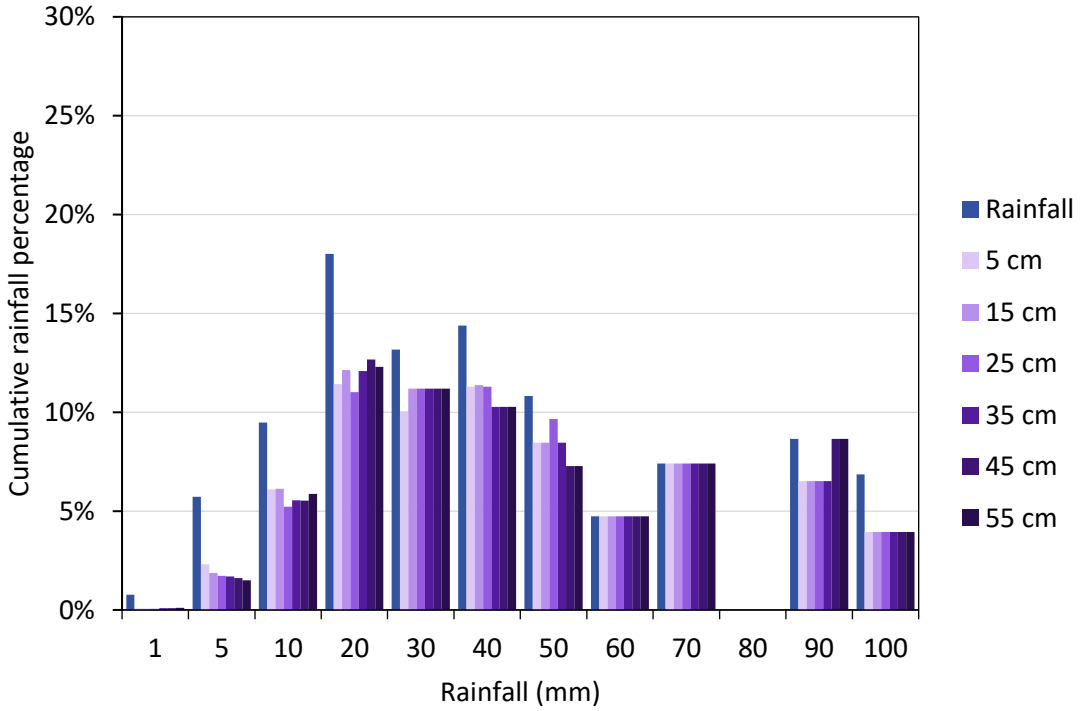
- to verify the proper functioning of the raingarden (since its activation indicates that rainwater is passing through the sustainable urban drainage system)
- to quantify rainfall intensity and, consequently, the amount of infiltrated water by monitoring soil moisture changes at the sensor installation depth.



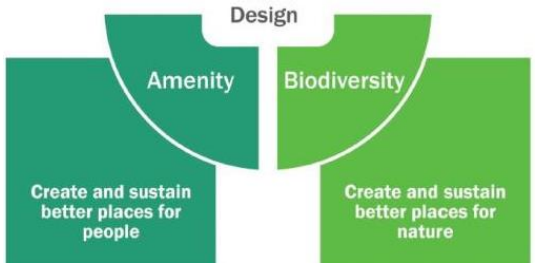
DC2 - Water Quantity: Raingarden-Activating Rainfall

From the histograms showing the rainfall intensities measured by the rain gauge and those detected by the moisture sensors at different depths, it is evident that not all rainfall events are detected by the sensors—particularly those with intensities below 20 mm per day. However, when comparing the rainfall events to the cumulative rainfall, it becomes clear that the amount of water not detected by the sensors is negligible.





Amenity and biodiversity: Paderno Dugnano



SuDS

- N° 9 Tree box filter
- N° 1 Bioswale of 280 m^2
- N° 1 dry detention basin of 30 m^3
- N° 4 soakways

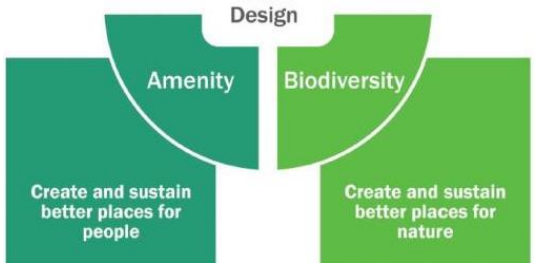
Monitoring

- Amenity (temperature, heat wave) and Biodiversity (e.g. visual inspection) with citizen science

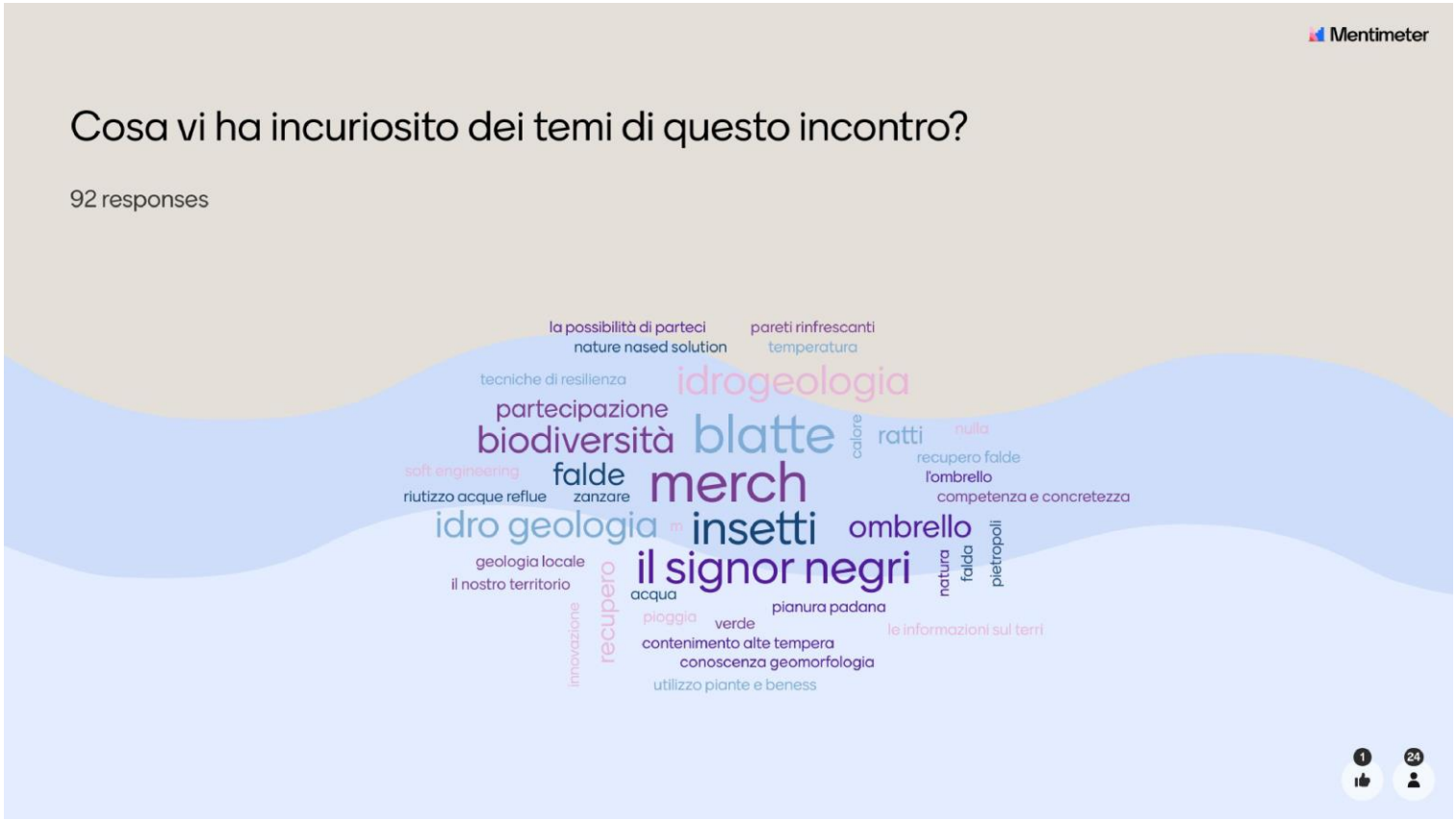
Steps

- Presentation of the AWARD project to the citizens with Local Water Fora (2) – **done**
- Definition of citizen science campaign by **CMM** and **IRIDRA**, including materials and timing – **ongoing**

Amenity and biodiversity: Local Water Fora



DEMO CASE 2 – Pilot: Municipality of Solaro (29th Oct 2024)



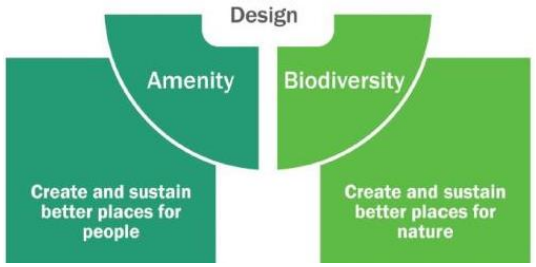
120 c.a.

- Middle and High School Students
- Municipal Technicians
- Sports Associations Linked to the Sports Center
- Local Environmental Organizations

Main Interests around the Meeting

- The Public Administration's Approach in Case of Flooding/Inundation
- Operation of the Parking Lot on Via Berlinguer
- Key/Potential Negative Effects of Choosing NBS Instead of Traditional Interventions
- What NBS Means

Amenity and biodiversity: Local Water Fora



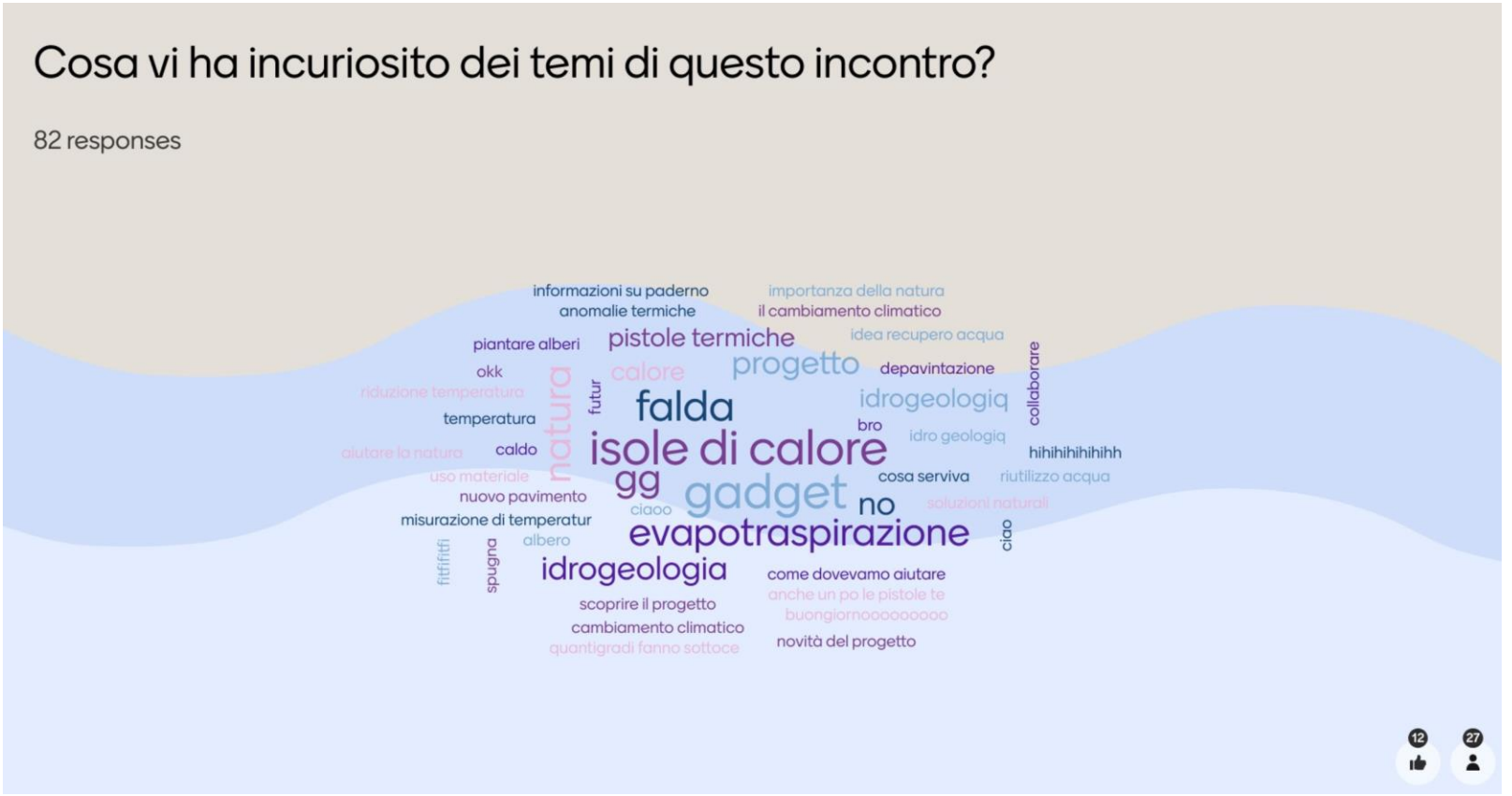
DEMO CASE 2 – Pilot: Municipality of Paderno Dugnano (12nd Dec 2024)

100 c.a.

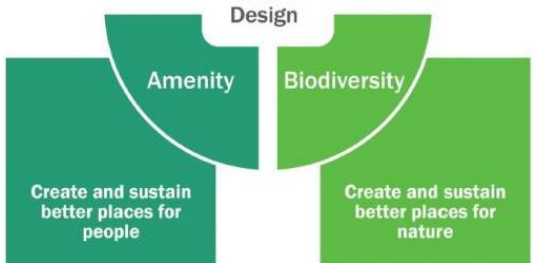
- Middle School Students
- Municipal Technicians
- Citizens
- Local Environmental Organizations

Main Interests around the Meeting

- Operation of the Parking Lot on Via Serra
- Meaning of NBS and AWR
- The Public Administration's Approach in Case of Flooding/Inundation
- Key/Potential Negative Effects of Choosing NBS Instead of Traditional Interventions
- What NBS Means



Amenity and biodiversity: Citizen Science



Last 1° August CMM and CAP started to set the CS activities on the 2 Pilots, in particular on heat monitoring, thanks to a thermal camera

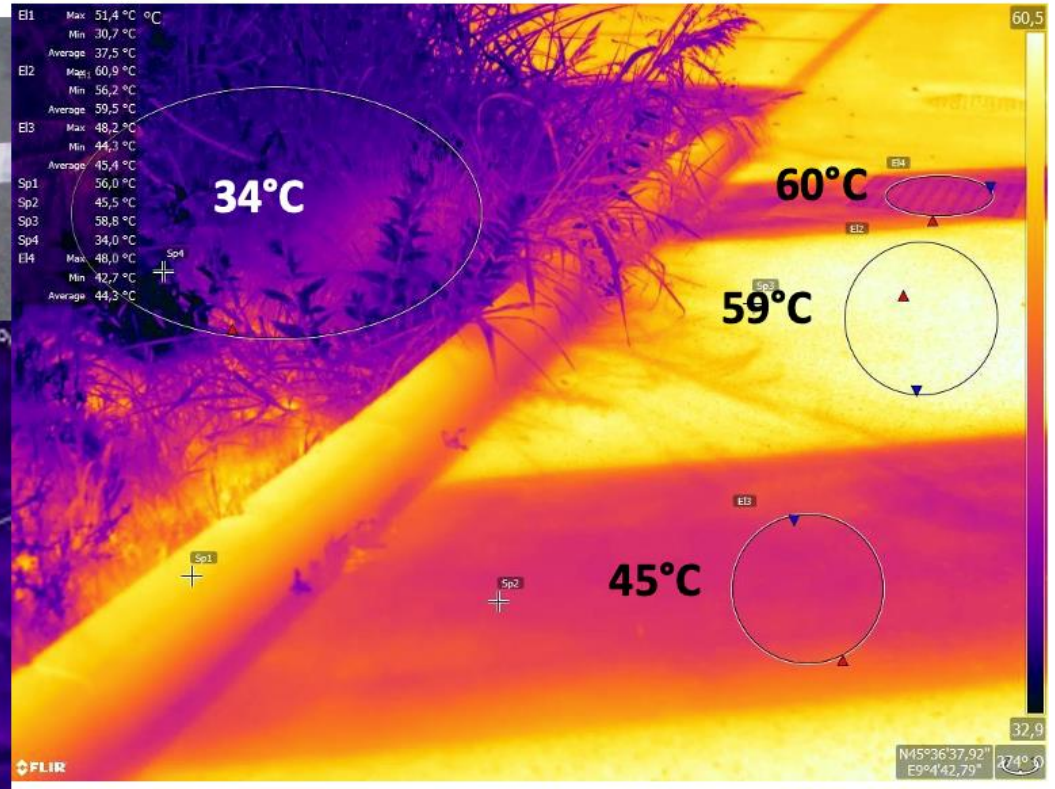


Photo credits: Prof. Eugenio Morello, Politecnico di Milano

AWARD

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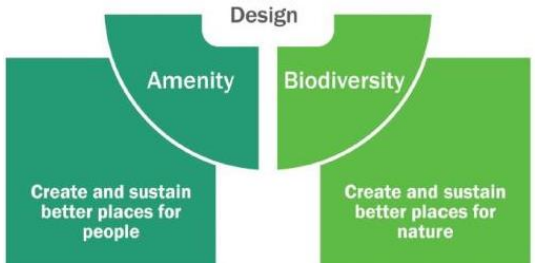
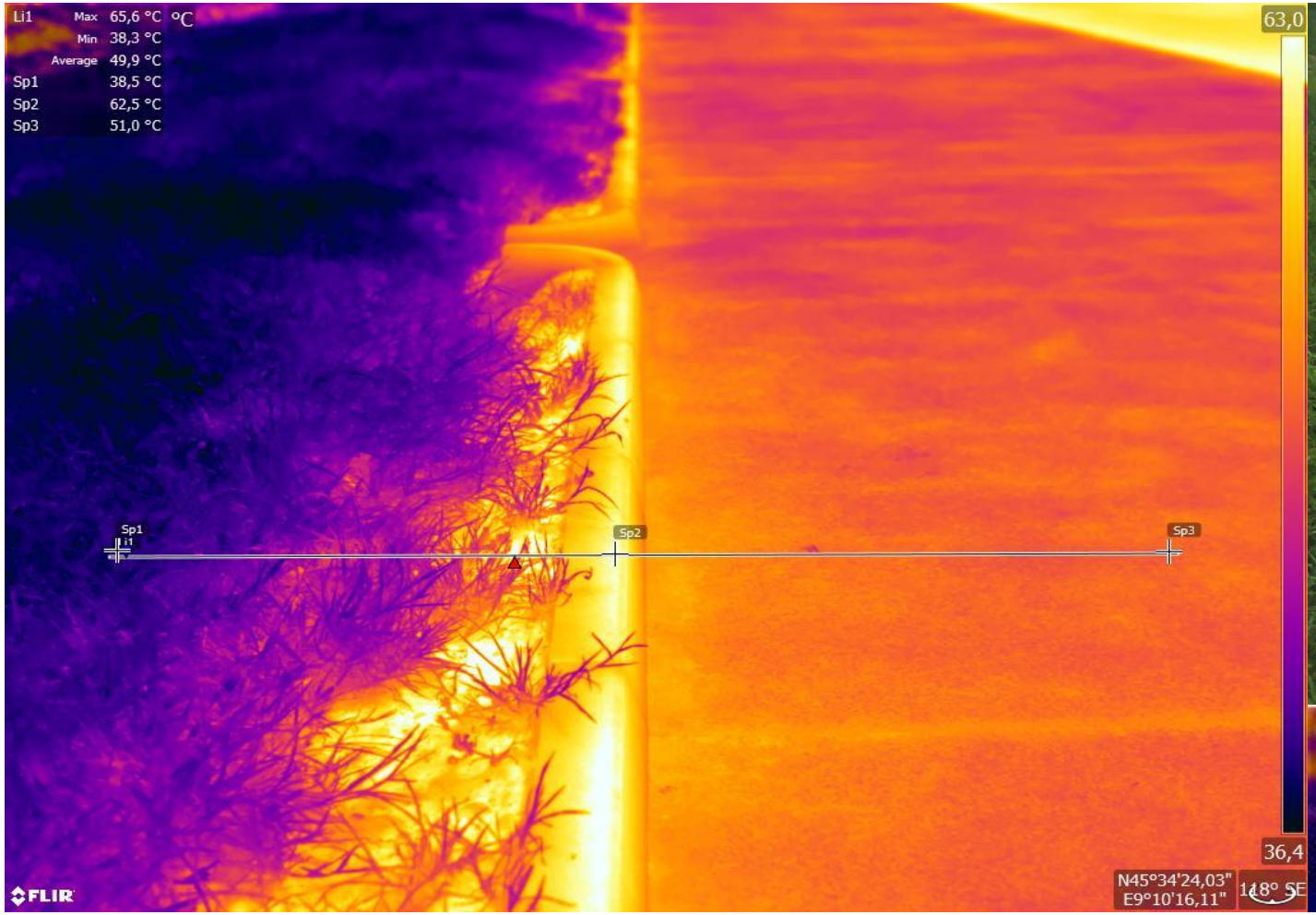
Amenity and biodiversity: Local Water Fora



Preliminary survey for Citizen Science activities



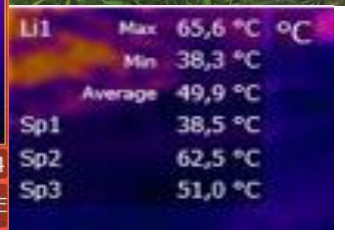
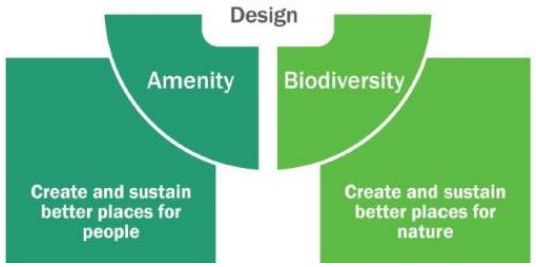


Photo credits: Prof. Eugenio Morello, Politecnico di Milano

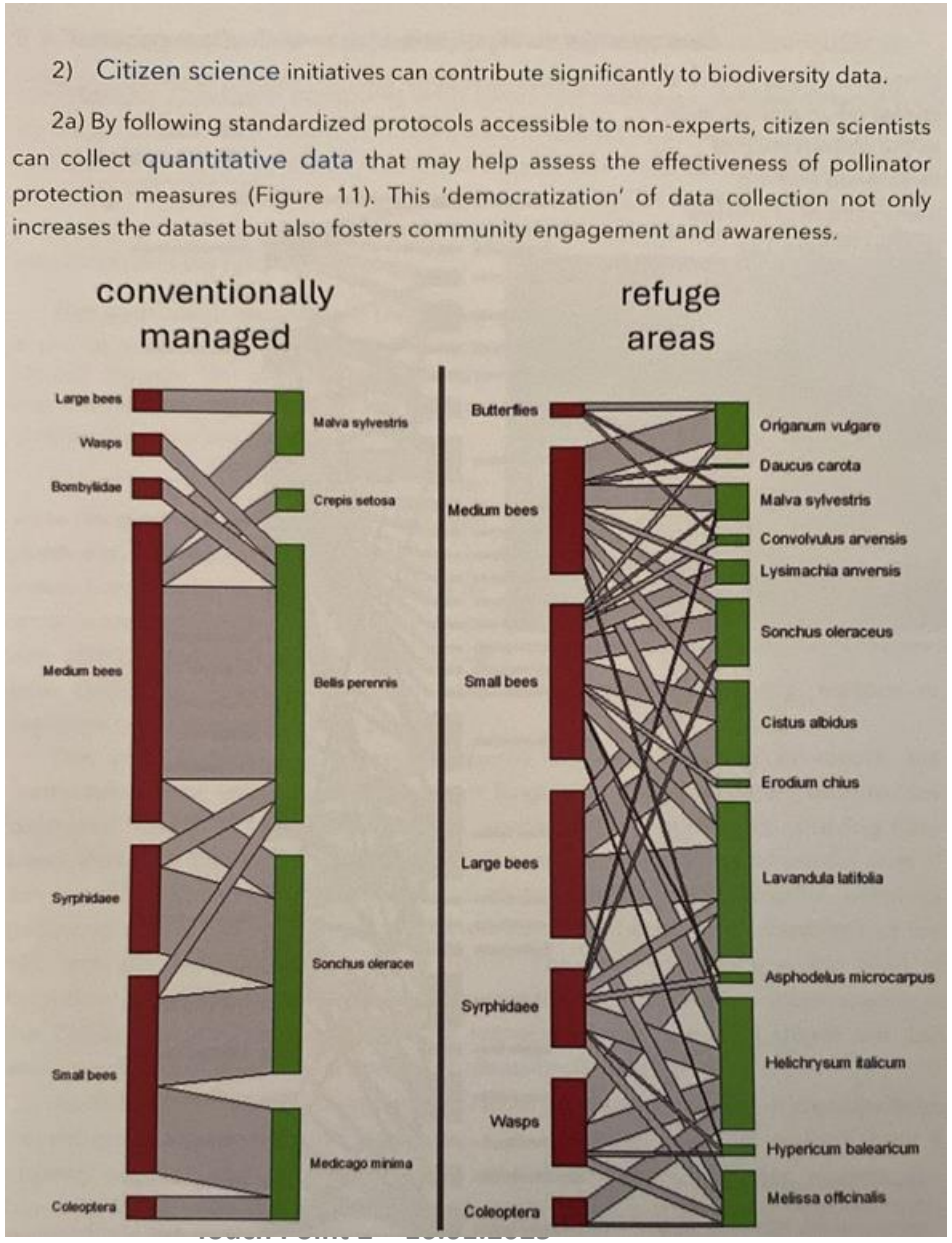
Municipality of Paderno Dugnano

Amenity and biodiversity: Citizen Science



Biodiversity monitoring activity is under conceptualization:

- Involve schools and young sport organisation
- Focus on insects
- iNaturalist app
- Compare monitored list of species with a theorical list of «expected» species



2) Citizen science initiatives can contribute significantly to biodiversity data.

2a) By following standardized protocols accessible to non-experts, citizen scientists can collect quantitative data that may help assess the effectiveness of pollinator protection measures (Figure 11). This 'democratization' of data collection not only increases the dataset but also fosters community engagement and awareness.

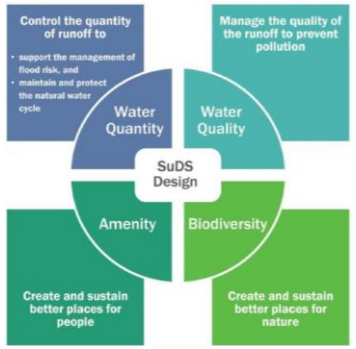
CMM sponge city overall impact

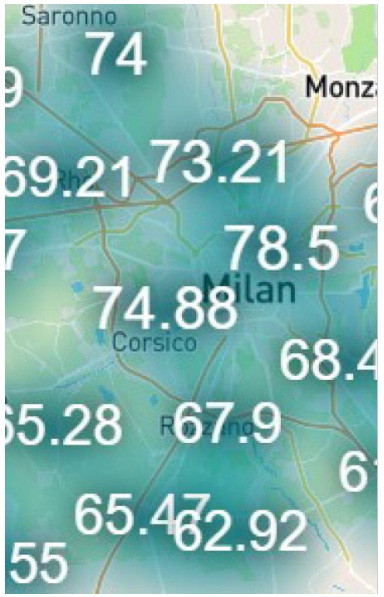
Planned

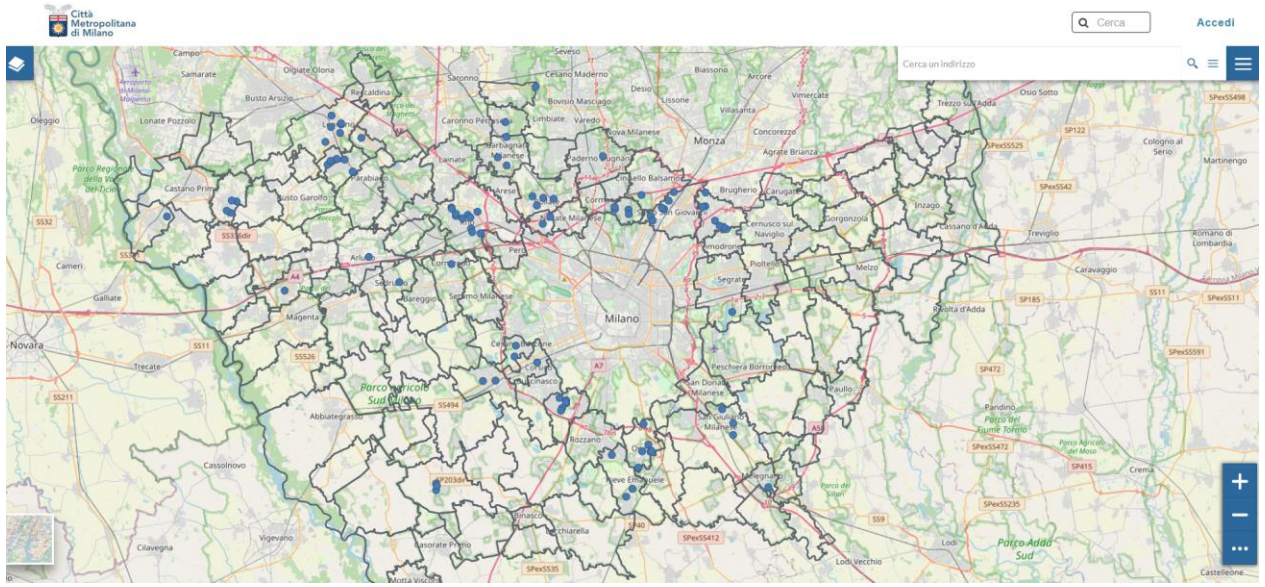
- Simplified water balance by **CMM** (additional hydrogeologist expert added to the team) – can the CMM Sponge City be considered a provider of AWR for phreatic aquifer used for not potable uses (e.g. green irrigation)?
- Multiple benefit impact estimation

Next steps

- Collection of available GIS information among **CAP** and **CMM** (e.g. rain gauges, phreatic aquifer wells and hydrodynamic etc.)
- Revision of CMM Sponge City design by **IRIDRA** (e.g. hydraulic conductivities, groundwater table, SuDS schemes)



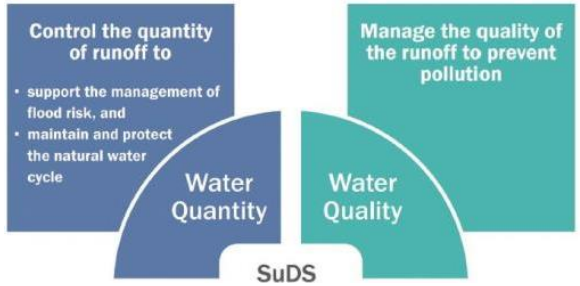


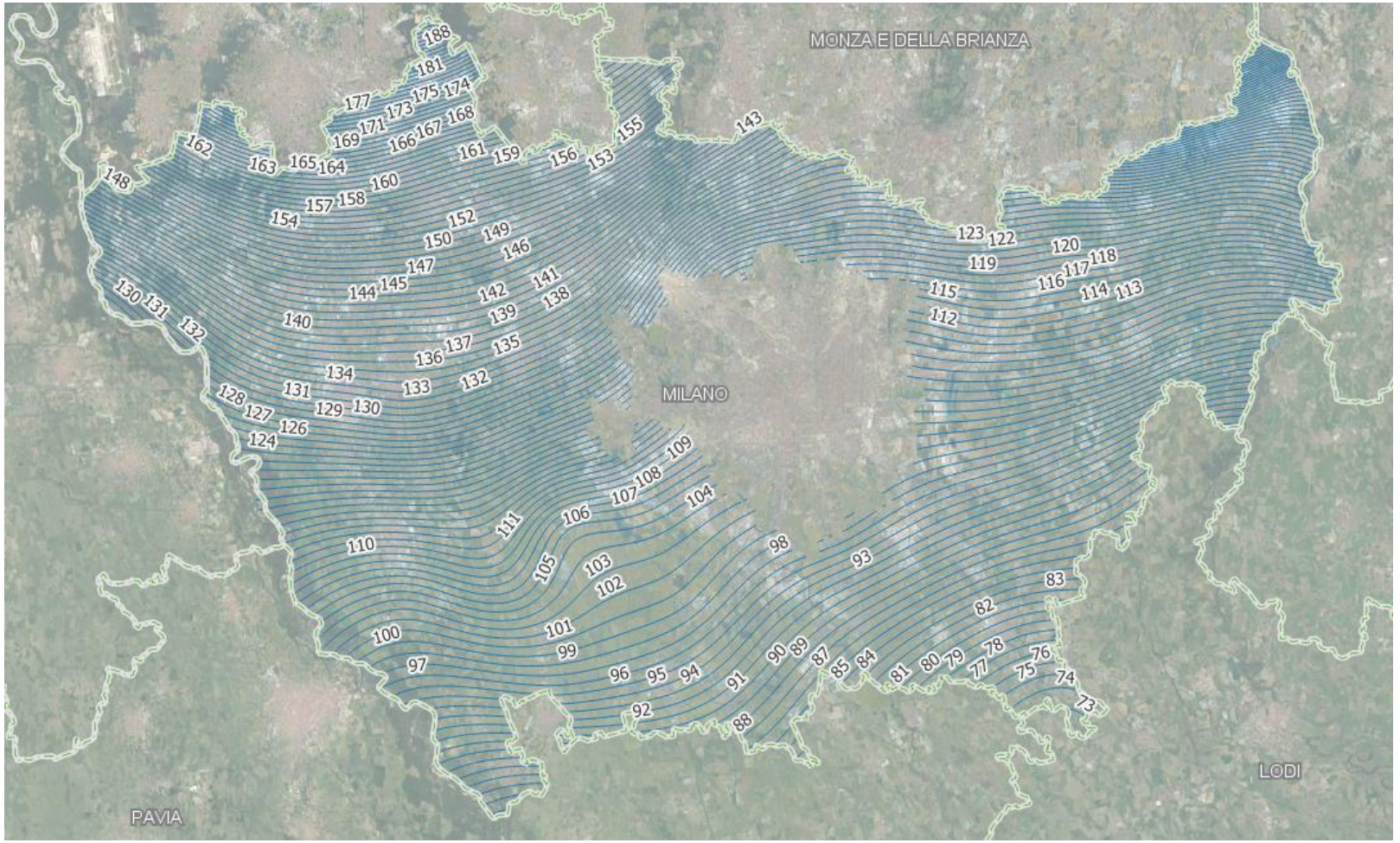


CMM sponge city overall impact

GIS map

- Aquifer depth (isopieze)

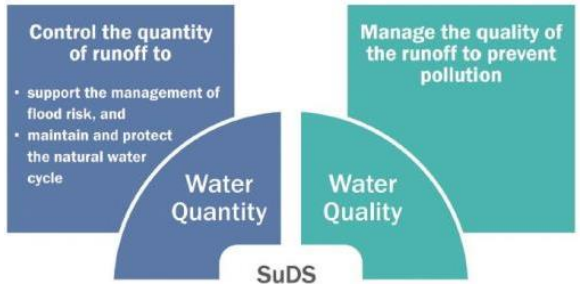


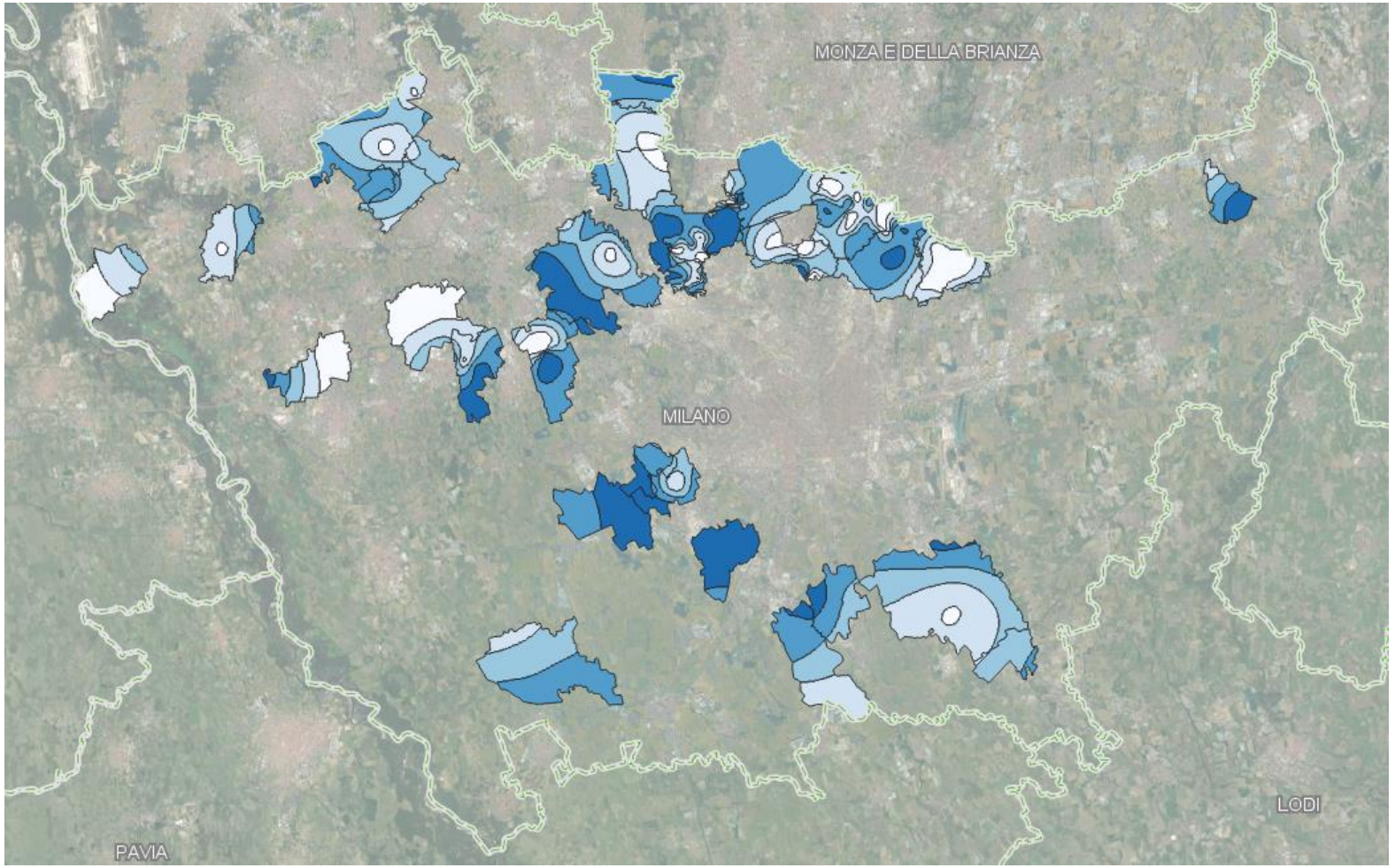


CMM sponge city overall impact

GIS map

- Hydraulic conductivities classes in the towns with SuDS interventions





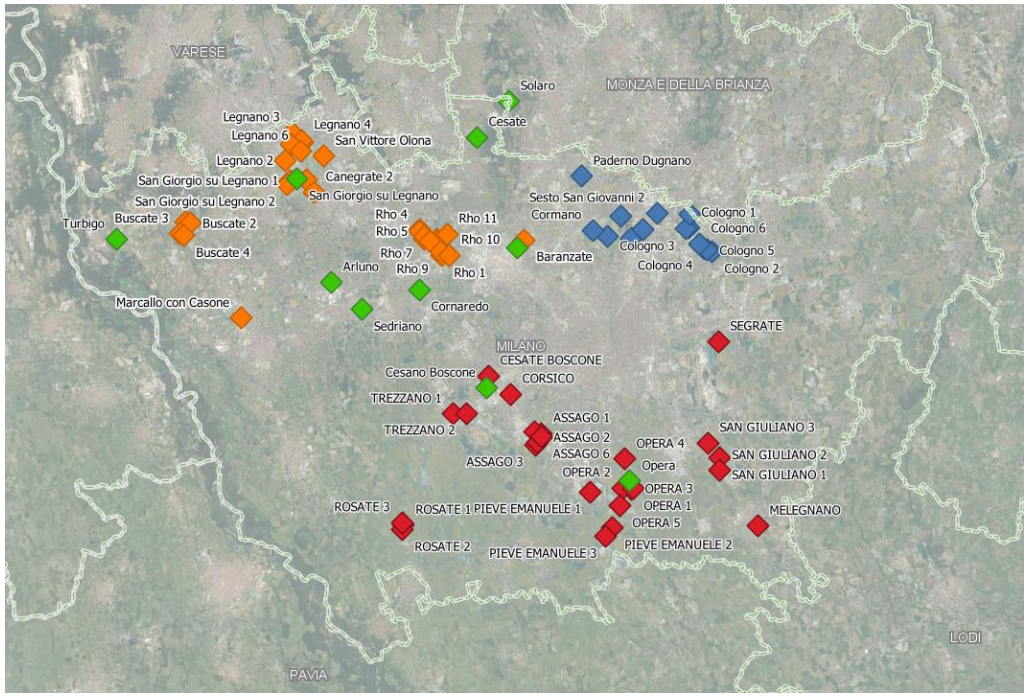
CMM sponge city overall impact

Manage the quality of the runoff to prevent pollution

Water Quality

GIS map

- CMM sponge city interventions
- Revision of detailed design (3 out of 4 lots)
  - Location
  - SuDS treatment train
  - Infiltration (yes/no)
  - Hydraulic conductivity (based on local geological survey)
  - Water table depth of the phreatic aquifer
  - Catchment area and type



CMM sponge city interventions

LOT	CODICE COMMES	TERVEN	COMUNE	nome GIS	INDIRIZZO	SUDS TREATMENT TRAIN PROGETTO 1	2	3	4	INFILTRAZIONE	K_s [m/s] 3m	5m	PRIMA FALDA [m dal p.c.]
2	9743_05	15	Assago	Assago 5	via 1 Maggio	pavimentazione permeabile				sì	2.27E-04	3.70E-04	4
						bacino di detenzione	trincea infiltrante			sì	2.27E-04	3.70E-04	4
2	9743_04	16	Assago	Assago 6	via Matteotti 16-18	disoleatore	moduli geocellulari infiltranti			sì	3.37E-04	6.71E-06	4
2	9743_51	17	Opera	Opera 1	via Bozzini	pavimentazione permeabile	trincea infiltrante			sì	2.91E-07	5.91E-06	8
						aree di bioritenzione							
						aree di bioritenzione	trincea infiltrante						
2	9743_48	18	Opera	Opera 2	via Gramsci, Sogliani, F	bacino di detenzione	trincea infiltrante			sì	9.70E-06	4.17E-07	8
						pavimentazione permeabile							

CMM sponge city overall impact

Manage the quality of the runoff to prevent pollution

Water Quality

Monitoring

- Phreatic aquifer wells managed by **CAP**

Steps completed

- Identify phreatic aquifer wells close to CMM sponge city SuDS interventions
- Verification of the accessibility of the phreatic aquifer wells for water sample collection
- Development of a matrix outlining sponge city interventions and their features, along with sampling points associated with water catchments and the potential connections to the phreatic aquifer
- The possibility of using some existing piezometers for monitoring has also been investigated → undisturbed sampling
- Selection of proxies/ main pollutants (PAHs)

CMM sponge city overall impact: Water quality – monitoring plan

Next steps

Monitoring plan of phreatic acquifer water quality by **CAP**

→ involvement of different departments to set up monitoring plan and feasibility

Parameters analysed:

- Chemical and physical analysis
- Metals
- Anions
- Cations
- Halogenated solvents
- Aromatic solvents
- Micro-pollutants
- Microbiology

R&D

- Coordination of CAP activities

Hydraulic invariance and sewer network

- NBS design, Geo locations, modelling of sewer network

Geological modeling

- Aquifer and wells characteristics, modelling of the aquifer

Aqueduct and WSP

- first aquifer uses and wells locations, sampling potentialities,

Potable water lab

- Samples analyses

N. of sampling points	Location	Frequency	Starting date
5 wells	- **Solaro** - Canegrate - Trezzano S/N - San Vittore Olona - Melegnano	3 months	January 2025
2 piezometers	- Turbigo - Assago	2 months	November 2024
1 new piezometer to be verified	- Cologno Monzese	3 months	March 2025
1 well soon to be activated	- Sedriano	3 months	June 2025

Lessons learnt: technical and policy

- Link between AWR and SuDS less studied and not recognized, collecting evidence can be considered a big innovation of AWARD
- AWR not aligned with Green Transition EU policy
- Lack of expertise on AWR in the local sector, especially in the public and water utilities one

Lessons learnt: social

- High Interest by young generation on AWRs
- Citizen science – heat island: difficult in finding experts on heat island, but CMM and Polimi is developing expertise (innovation point for AWARD)
- Citizen science – biodiversity: many associations expert in biodiverisity, but not ready on wetlands and SuDS in urban environment (engineered soil), but CMM and IRIDRA are developing expertise (innovation point for AWARD)

AWARD

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Thank You

IRIDRA Team

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Funded by the European Union

under the GA n° 101136987