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CLIMATE PROOFING
URBAN MUNICIPALITIES

URBANPROOF TOOL: A DECISION SUPPORT TOOL FOR CLIMATE PROOFING URBAN MUNICIPALITIES

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2nd International Conference, ADAPTtoCLIMATE,
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THE PROJECT

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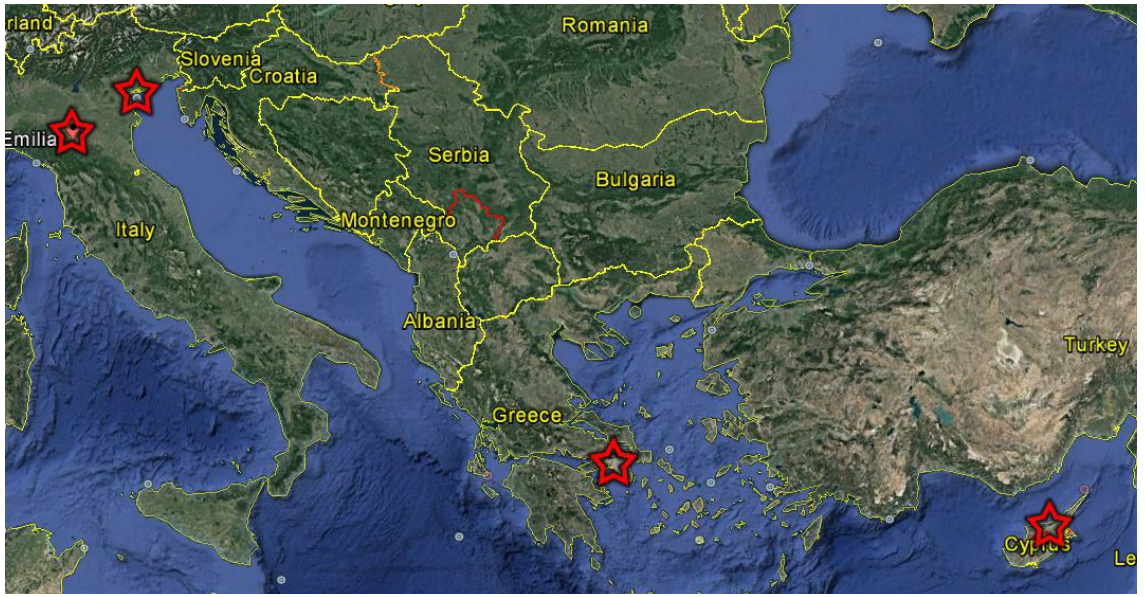
Areas of implementation: **Cyprus, Greece, Italy**

Budget: **1,854,000 € (60%** EC Co-funding**)**

Duration: **44 months**

Start Date: **01/10/2016**

End Date: **31/05/2020**



The overall aim of the UrbanProof project is to increase the resilience of municipalities to climate change equipping them with a powerful tool for supporting better informed decision making on climate change adaptation planning.

PARTNERS

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Government Body

Department of Environment, Ministry of Agriculture, Rural Development and Environment

Coordinator

Research Institutes

National Technical University Of Athens

National Observatory of Athens

Università Iuav di Venezia

University IUAV of Venice

Municipalities

STROVOLOS MUNICIPALITY

LAKATAMIA MUNICIPALITY 1986

Municipality of Peristeri

COMUNE DI REGGIO NELL'EMILIA

METHODOLOGY & GOALS

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- Εκτίμηση των επιπτώσεων της κλιματικής αλλαγής στους Δήμους του έργου.
- Αξιολόγηση των διαθέσιμων επιλογών προσαρμογής για την αντιμετώπιση των επιπτώσεων
- Ανάπτυξη και εφαρμογή του εργαλείου UrbanProof για την υποστήριξη των Δήμων και την ενίσχυση της συμμετοχής των ενδιαφερόμενων φορέων στη διαδικασία της προσαρμογής
- Υλοποίηση και επίδειξη πράσινων και ήπιων μέτρων προσαρμογής μικρής κλίμακας στους Δήμους του Έργου
- Ανάπτυξη τοπικών στρατηγικών προσαρμογής στην κλιματική αλλαγή για τους Δήμους του Έργου

The URBANPROOF toolkit

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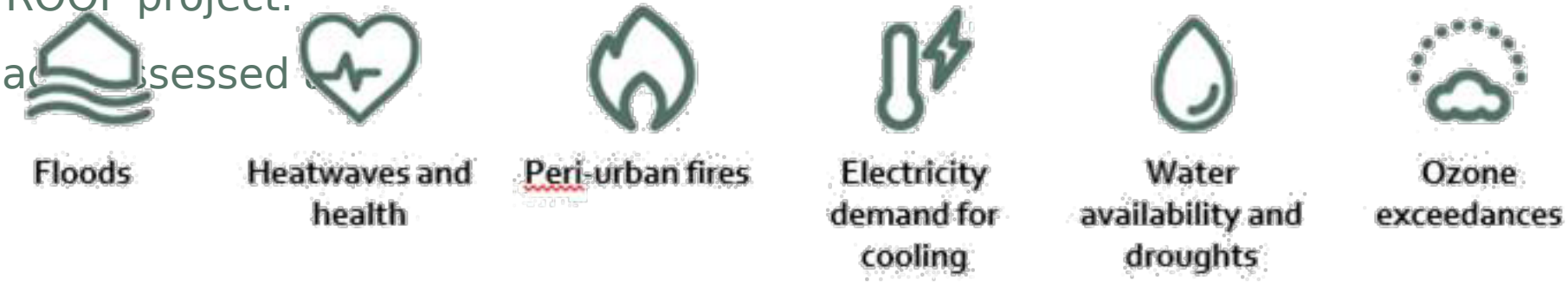
- The URBANPROOF toolkit is a powerful decision support system aimed to enable better informed decision making for climate change adaptation planning.
- The user is guided though the different features of the toolkit in order to gain insight into the climate change impacts to the urban environment, to explore and evaluate the available adaptation options and to investigate the effect of adaptation interventions in increasing climate change resilience.
- The tool currently may be used for conducting an impact and adaptation assessment for every urban municipality in Italy, Greece and Cyprus.
- Higher resolution data are provided in the cases of the municipalities of Reggio Emilia (Italy), Peristeri (Greece) and Strovolos and Lakatamia (Cyprus) which are partners of the LIFE URBANPROOF project.
- The impacts assessed are:



METHODOLOGY USED FOR CLIMATE CHANGE IMPACT ASSESSMENT IN URBAN MUNICIPALITIES

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- The impact assessment is based in the terminology adopted in IPCC (2014)
- Impacts are considered to result from the interaction of **hazard** and **vulnerability**, while the latter is considered to be a function of the **exposure**, **sensitivity** and **adaptive capacity** of population and infrastructure.
- **Hazard** indicators are used to reflect the relevant climatic information
- **Exposure** indicators used are population density, land use and critical infrastructure and are estimated with the use of geospatial databases
- **Sensitivity** indicators are used to reflect the population groups which are considered sensitive to climate change while the **adaptive capacity** indicators may refer both to the population and the infrastructure. Examples of such indicators are: age (elderly people and very young children/infants); illiteracy; population with chronic diseases; low income (population at poverty risk, regional Gross Domestic Product); health care (hospital beds per capita)

GEOSPATIAL DATA USED

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Geospatial data	Databases
Climatic data	CORDEX regional climate model (RCM) simulations for the European domain (EURO-CORDEX) database
Population density (urban block resolution)	Urban Atlas database - Copernicus Land Monitoring Service
Population density (grid resolution: 500x500m)	Global Human Settlement (GHS) Population grid (LDS) – Joint Research Centre
Urban trees, urban green areas	Urban Atlas database - Copernicus Land Monitoring Service
Land use	Corine Land Cover - Copernicus Land Monitoring Service
Schools, Hospitals, Cultural units	OpenStreetMap - Open Data Commons Open Database License Geodata.gov.gr
Floods hazard zones	EIONET Reporting Obligations Database (ROD) - European Environment Agency
Soil-hydraulic properties	European Soil Data Centre (ESDAC) - Joint Research Centre
Socio-economic data	Eurostat, National Statistical Services

STAGES OF URBANPROOF TOOLKIT

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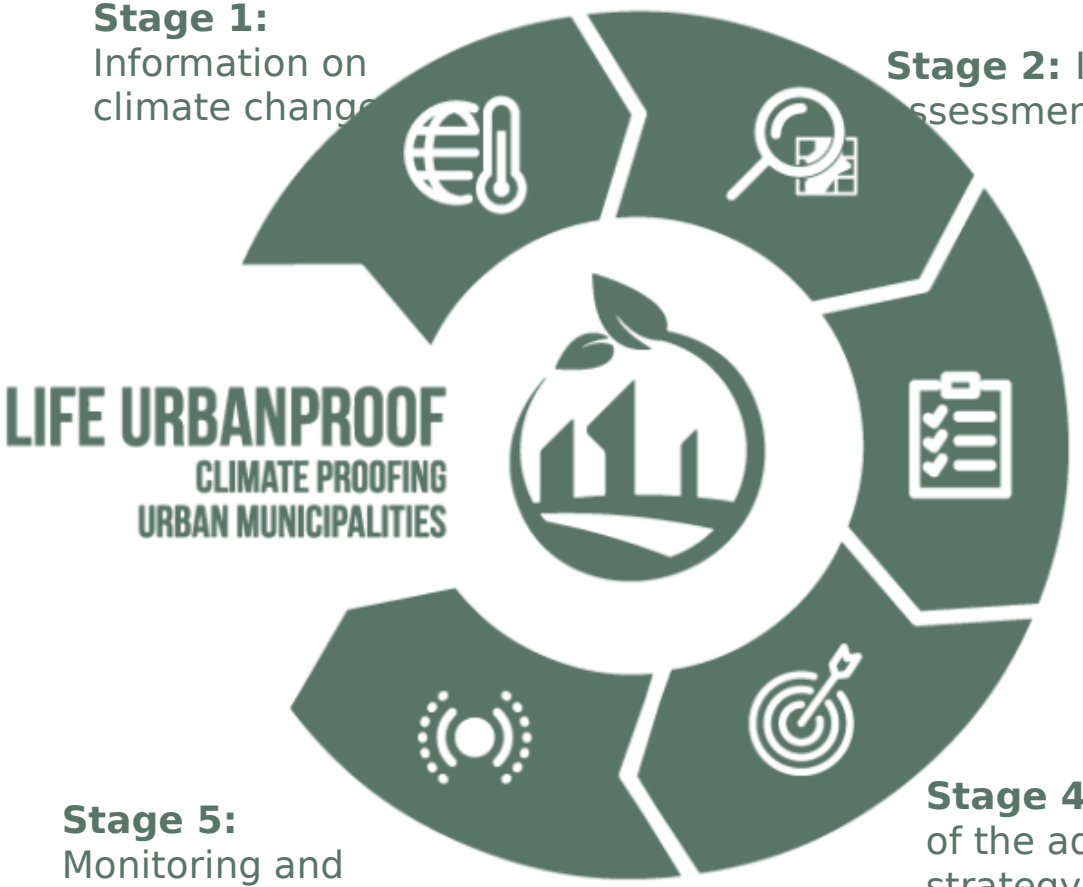
The UrbanProof toolkit consists of five interdependent modules/stages which, altogether constitute the adaptation process:



Stage 1: Information on climate change

Stage 2: Impact assessment

Stage 3: Exploration and evaluation of adaptation options

Stage 4: Development of the adaptation strategy

Stage 5: Monitoring and review

STAGE 1: INFORMATION ON CLIMATE CHANGE

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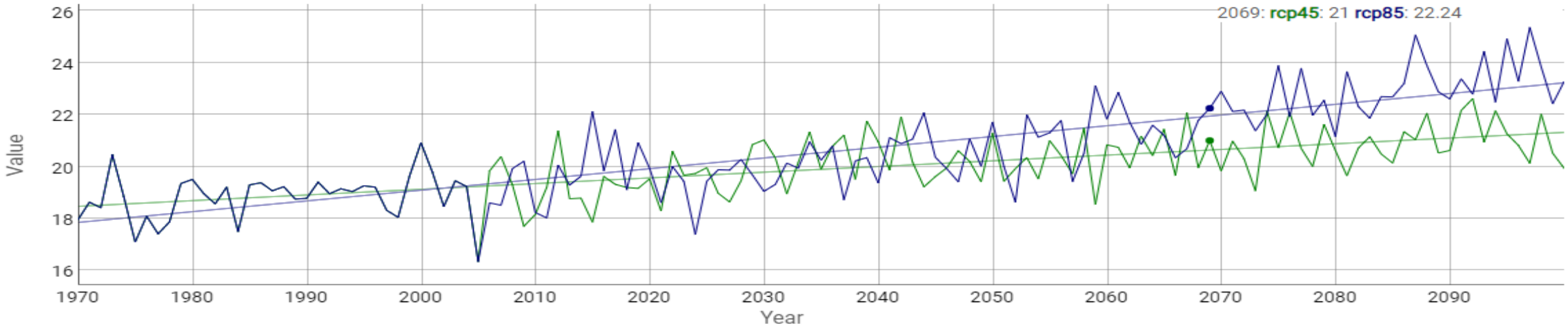
Please select area, climatic indicator and emissions scenario and click submit to view the time series graph.

Select Area: Municipality of Reggi... **Select climatic indicator:** Maximum Temperat... **Select climatic scenario:** × RCP 4.5 - Low to mediur × RCP 8.5 - High emission

Submit



Show trendline Clear trendline

Time series of climate indicators of all project municipalities for the period 1970-2100. Future projections are based on two emission scenarios: RCP4.5 & 8.5

STAGE 2: IMPACT ASSESSMENT

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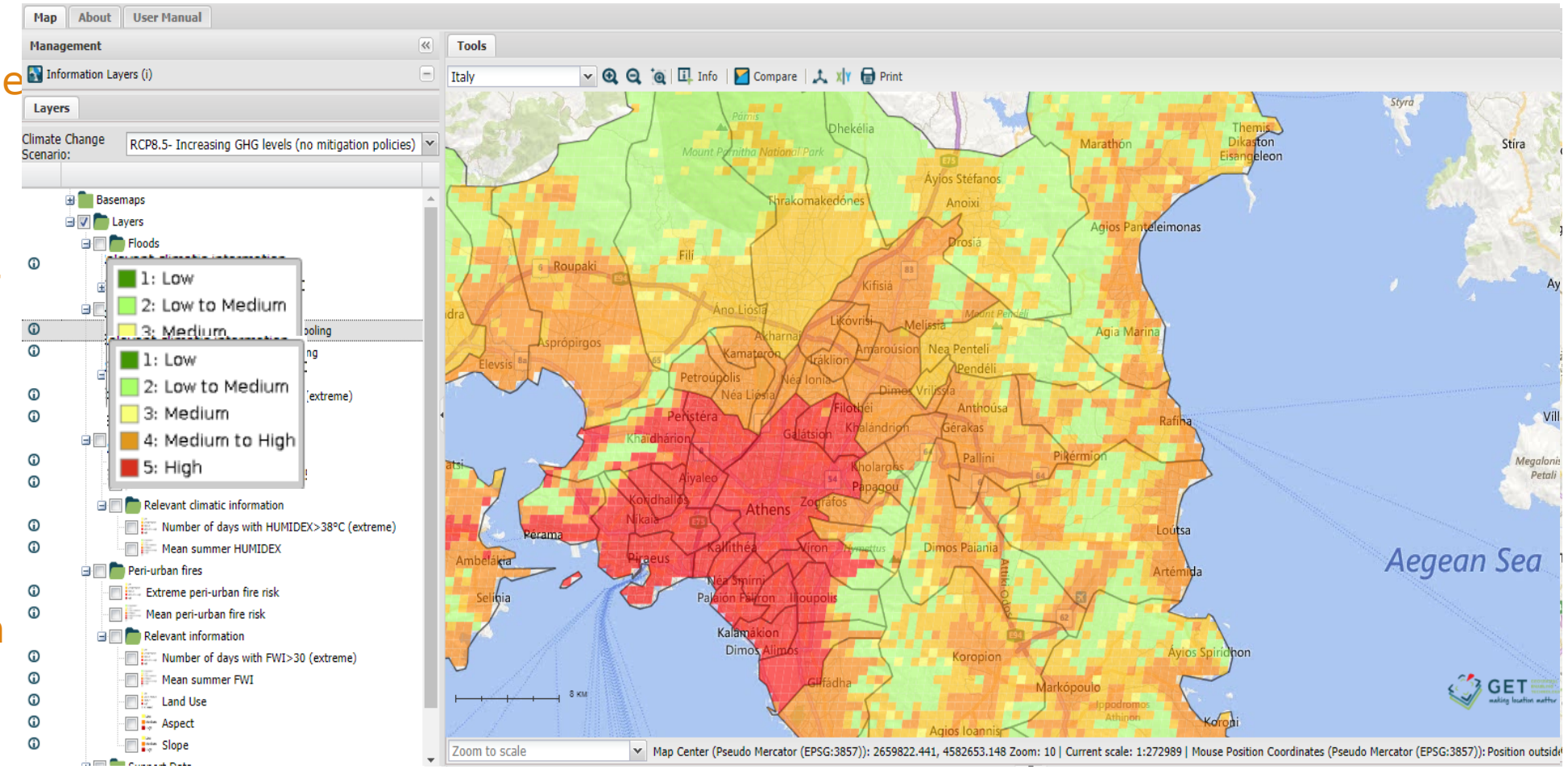
✓Explore the climate change impacts on the urban environment and gain insight into the individual parameters (physical, structural & socio-economic) contributing to the creation of these impacts.

✓The information is available for all urban municipalities of Cyprus, Greece and Italy, while for the project municipalities



STAGE 3: EX… EVALUATION …

The user can:

- Explore of the available adaptation measures for addressing climate change impacts
- Evaluate of the adaptation measures based on different criteria (MCA)
- Apply the ratings provided by a pool of experts from different stakeholder groups
- Set weights to the different evaluation

Green roofs

Traditional roofs absorb sunlight and radiate heat into the surrounding air. Vegetation on green roofs shades the roof and cools the air through evapotranspiration. These effects cool green roofs by 37°C compared to traditional black roofs. The cooler roofs transfer less heat to the ambient air. Green roofs do not have as great a cooling effect on air temperatures as groundlevel vegetation does, but they have the advantage of not taking up additional land and of keeping building occupants cooler

Green roofs are made up of several layers: a waterproof membrane to protect the underlying roof, a drainage layer, a growing medium such as soil, and the plants themselves. There are two basic types of green roof -extensive and intensive- vary in the depth of growing medium and

the amount of vegetation. Extensive green roofs have a thinner layer of soil and vegetation and are the simpler, lower-maintenance option. Plants used on these roofs include sedum (a hardy flowering plant) and/or herbs that have minimal maintenance requirements.

On the other hand, intensive green roofs have deep layers of growing media that can support a diverse array of plants from herbs and sedum up to full-grown trees. Intensive green roofs are much heavier than extensive roofs because of their added depth, heftier plants, and retained water. As a result, they require more structural support. They also require irrigation and fertilization to maintain the plants. Intensive green roofs work well for commercial buildings or parking garages that have the necessary structural strength.

Impacts

Green roofs reduce the heat flux through the roof, and less energy for cooling or heating can lead to significant cost savings. Shading the outer surface of the building envelope has been shown to be more effective than internal insulation.

Other impacts are as follows:

- In summer, the green roof protects the building from direct solar heat.
- In winter, the green roof minimizes heat loss through added insulation on the roof.
- Energy conservation translates into fewer greenhouse gas emissions.

In addition, a concentration of green roofs in an urban area can even reduce the city's average temperatures during the summer, combating the urban heat island effect. Traditional building materials soak up the sun's radiation and re-emit it as heat, making cities at least 4 °C hotter than surrounding areas. A modeling study found that adding green roofs to 50 percent of the available surfaces in downtown Torodo, Canada would cool the entire city by 0.1 to 0.8°C (EPA,

2008a)

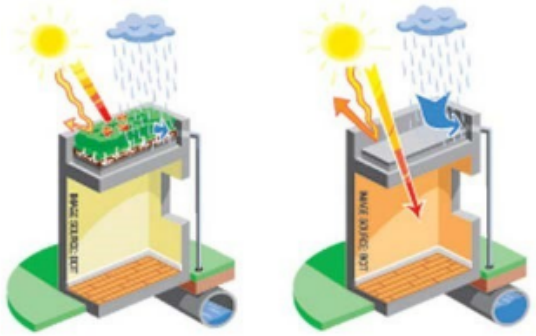


Figure 1: Benefits of a green roof compared to a traditional roof.

STAGE 4: DEVELOPMENT OF THE ADAPTATION STRATEGY

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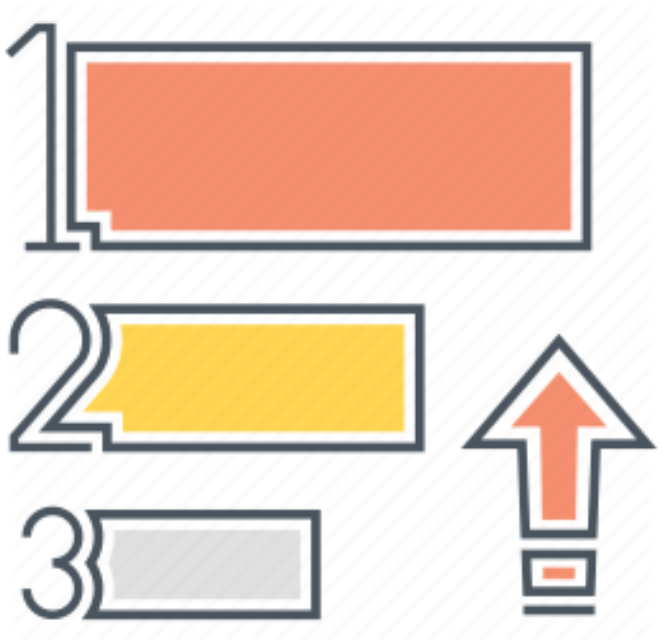

- Prioritization of adaptation measures based on the ratings provided during Stage 3 for the multi-criteria analysis (MCA).
- The measures gathering the higher ratings (above a predefined threshold) may be included in the Local Adaptation Plans

STAGE 5: MONITORING AND REVIEW

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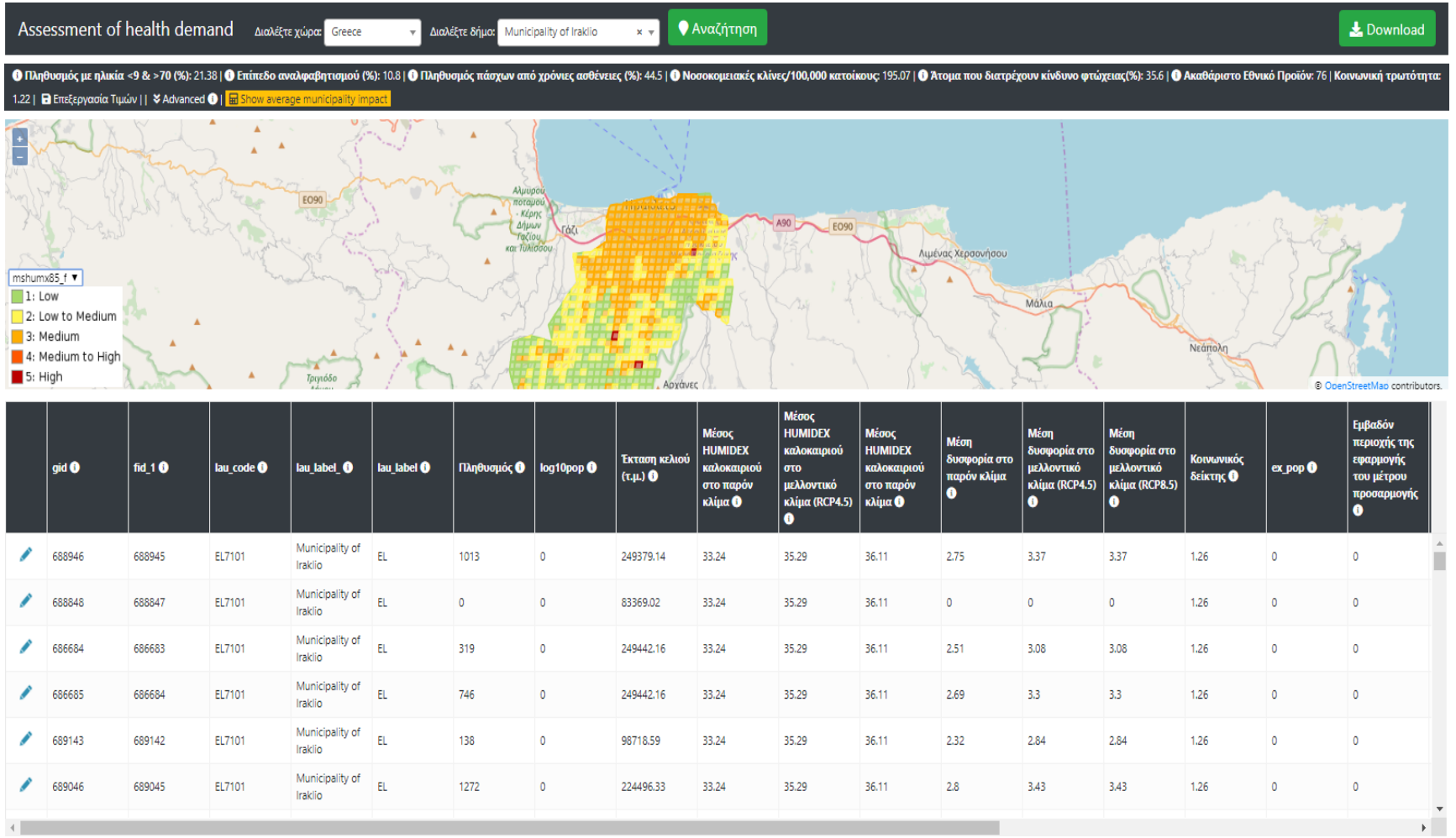
- ✓Investigation of the effect of adaptation measures in enhancing climate change resilience
- ✓Ability to edit the existing data in order to update them or to modify the weights applied
- ✓Useful both during preparation of the adaptation plan and monitoring of its implementation
- ✓Available for all urban



	gid	fid_1	lau_code	lau_label_	lau_label	Πληθυσμός	log10pop	Έκταση κελιού (τ.μ.)	Μέσος HUMIDEX καλοκαιριού στο παρόν κλίμα	Μέσος HUMIDEX καλοκαιριού στο μελλοντικό κλίμα (RCP4.5)	Μέσος HUMIDEX καλοκαιριού στο παρόν κλίμα	Μέση δυσφορία στο παρόν κλίμα	Μέση δυσφορία στο μελλοντικό κλίμα (RCP4.5)	Μέση δυσφορία στο μελλοντικό κλίμα (RCP8.5)	Κοινωνικός δείκτης	ex_pop	Εμβαδόν περιοχής της εφαρμογής του μέτρου προσαρμογής
	688946	688945	EL7101	Municipality of Irakliο	EL	1013	0	249379.14	33.24	35.29	36.11	2.75	3.37	3.37	1.26	0	0
	688848	688847	EL7101	Municipality of Irakliο	EL	0	0	83369.02	33.24	35.29	36.11	0	0	0	1.26	0	0
	686684	686683	EL7101	Municipality of Irakliο	EL	319	0	249442.16	33.24	35.29	36.11	2.51	3.08	3.08	1.26	0	0
	686685	686684	EL7101	Municipality of Irakliο	EL	746	0	249442.16	33.24	35.29	36.11	2.69	3.3	3.3	1.26	0	0
	689143	689142	EL7101	Municipality of Irakliο	EL	138	0	98718.59	33.24	35.29	36.11	2.32	2.84	2.84	1.26	0	0
	689046	689045	EL7101	Municipality of Irakliο	EL	1272	0	224496.33	33.24	35.29	36.11	2.8	3.43	3.43	1.26	0	0

IMPLEMENTATION OF GREEN INFRASTRUCTURE PROJECTS: MUNICIPALITY OF REGGIO EMILIA

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Run off reduction & green projects

- Arena Campovolo
- Piazza Vallisneri» regeneration
- Via Guasco regeneration
- Piazza Roversi regeneration
- Via dei Servi regeneration

Educational & informational projects

- «Nilde Iotti park» project
- Pests' guideline – informational brochure project

Planning measures

- Greening guidelines
- Building Environmental Impact Reduction index
- Land analysis to plan new green areas

Flooding – dryness phenomena reduction measures

- Municipal dog shelter renovation
- Reservoir of Marmirolo Oasis
- Food Forest "Sorelle Sbveglieri" park

Green roof projects

- Green roof for San Pellegrino' Library

Repaving – albedo projects

- Via Guasco regeneration
- Piazza Roversi regeneration
- Via del Carbone street stone pavement

IMPLEMENTATION OF GREEN INFRASTRUCTURE PROJECTS: MUNICIPALITY OF LAKATAMIA

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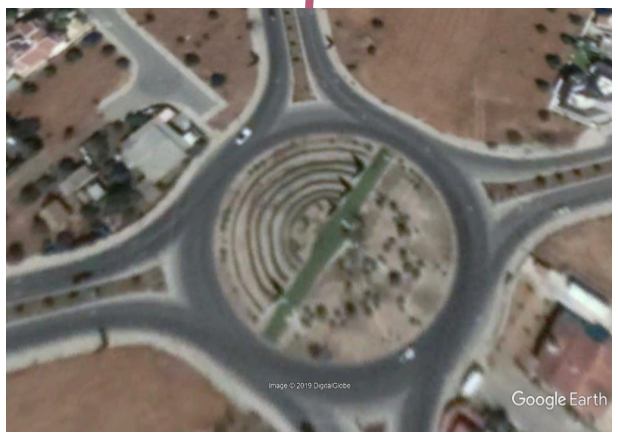
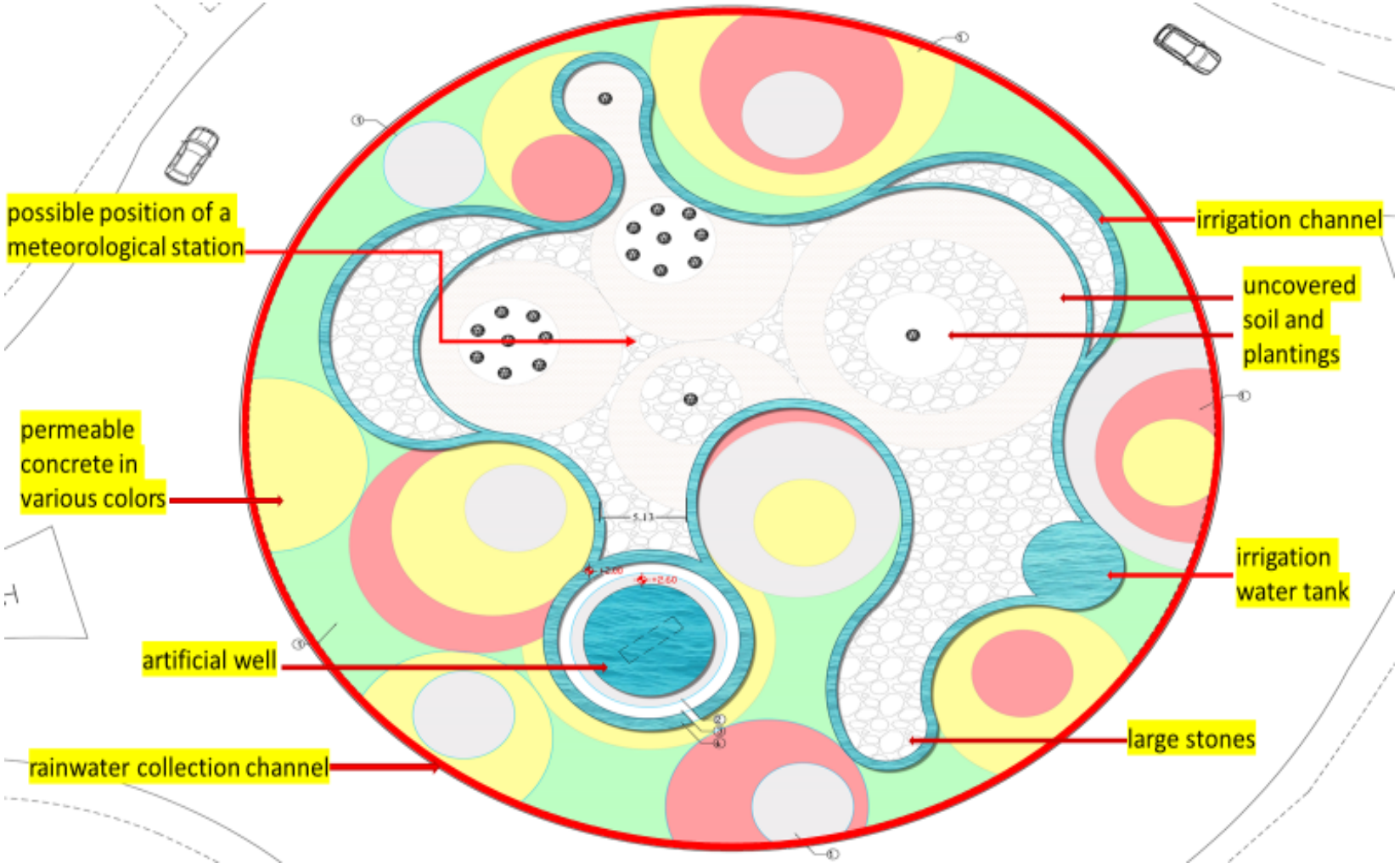
Reconstruction of Melina Merkouri Avenue roundabout





IMPLEMENTATION OF GREEN INFRASTRUCTURE PROJECTS: MUNICIPALITY OF STROVOLOS

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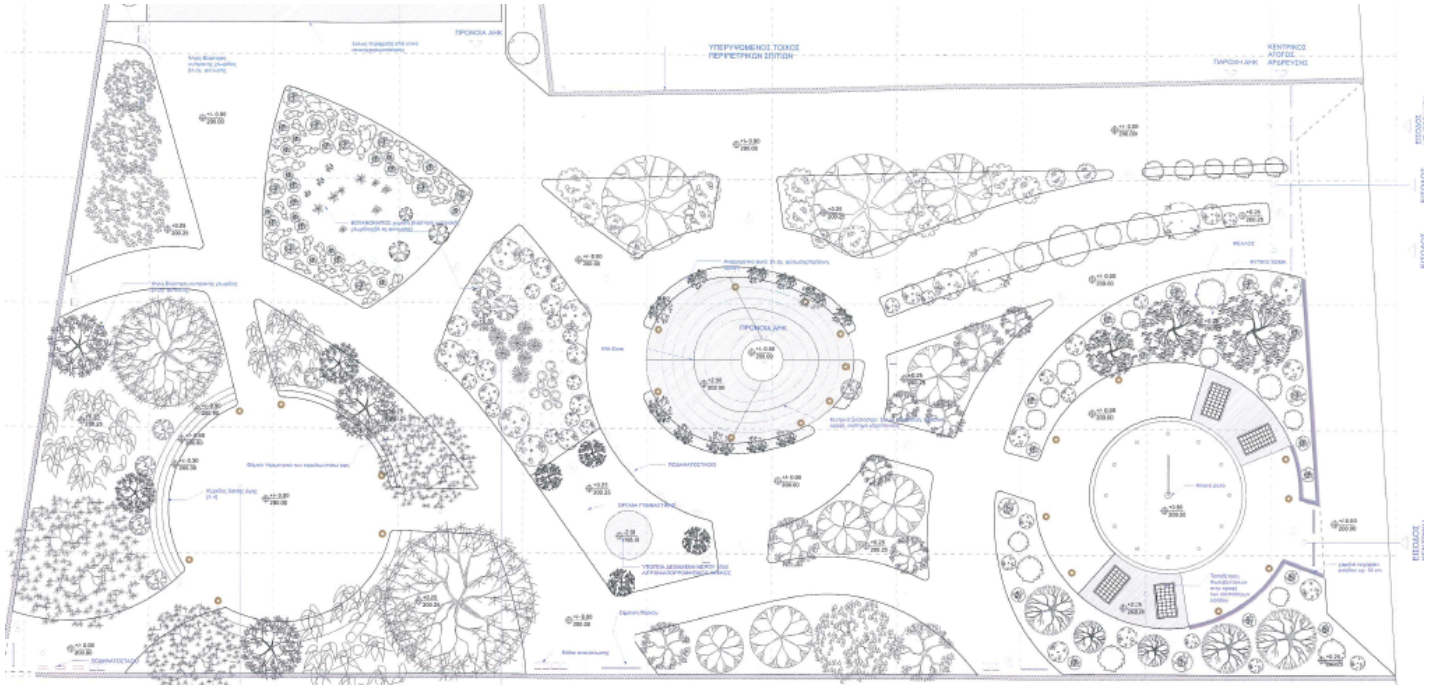
Area reformation into sustainable urban park (2000m²)



IMPLEMENTATION OF GREEN INFRASTRUCTURE PROJECTS: MUNICIPALITY OF STROVOLOS

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- Botanical garden with drought resistant plants
- Plant techniques for enhancing water retention
- Rainwater collection system
- Use of advanced irrigation systems
- Use of permeable materials
- Fitness equipment producing energy

IMPLEMENTATION OF GREEN INFRASTRUCTURE PROJECTS: MUNICIPALITY OF PERISTERI

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- Installation of temperature and relative humidity sensors in strategic places throughout the municipality and in buses
- Real-time geospatial presentation of climatic indicators relevant to human discomfort
- Provision of information through electronic billboards installed at central municipality points
- Provision of advice to citizens (e.g. airconditioned public facilities)

	Θερμοκρασία	Σχετ. Υγρασία	Αίσθηση
Κέντρο	31°C	30%	31°C
Τσαλαβούτα	30°C	30%	30°C
Μπουρνάζι	30°C	30%	30°C
Λόφος	30°C	30%	30°C
Νέα Ζωή	29°C	28%	29°C
Κηπούπολη	28°C	28%	28°C
Χρυσούπολη	28°C	28%	28°C
Λεωφορ. γραμμή	30°C	30%	30°C

MONITORING PILOT ADAPTATION PROJECT RESULTS

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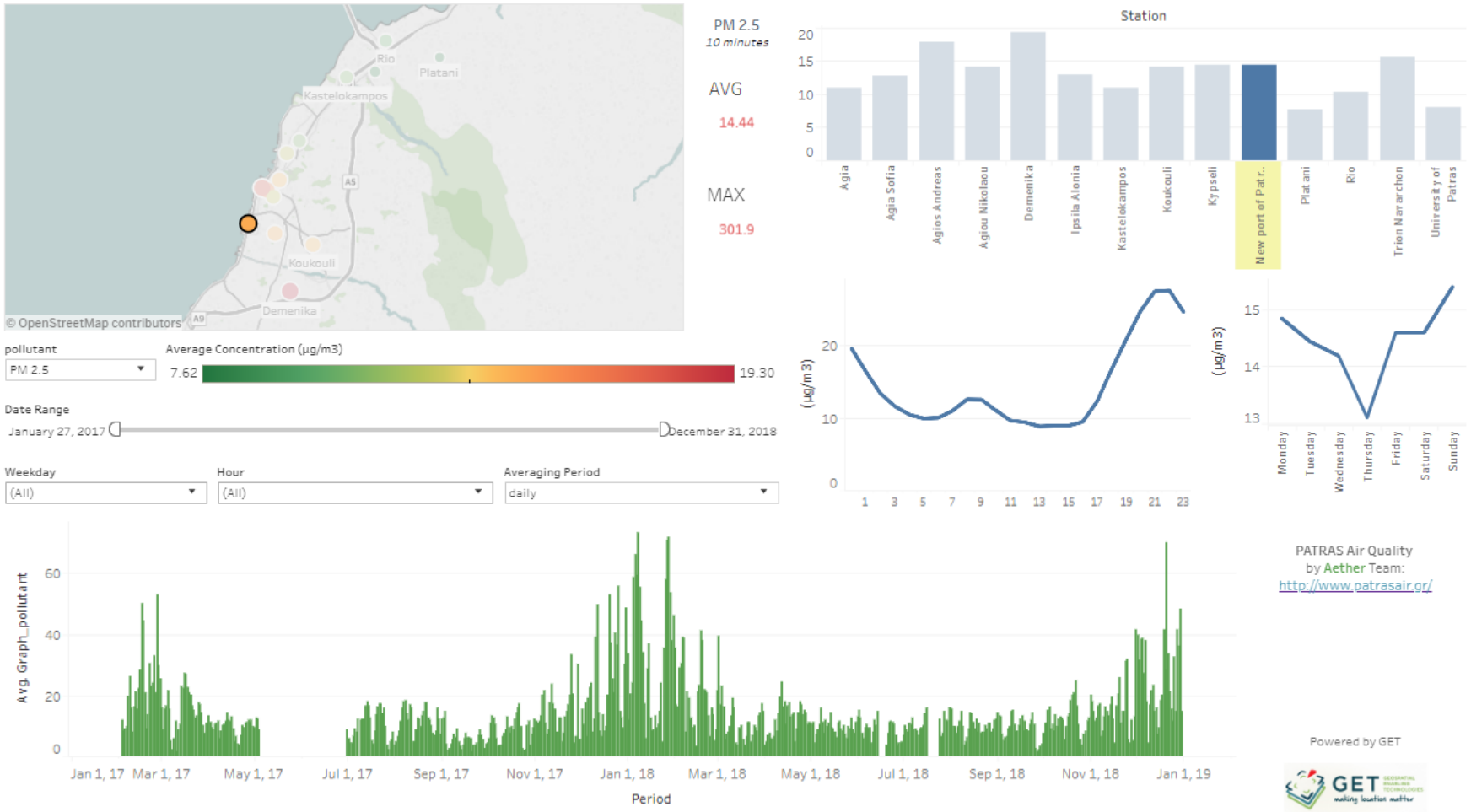
- Installation of sensors where the adaptation projects are implemented as well as to reference areas
- Telemetry for the continuous supply of data
- Presentation of real-time data and of historical time series through the URBAPROOF tool platform



Thank you for your attention!

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