

An innovative technological platform to improve management of green areas for better climate adaptation

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Green areas and quality of life in urban areas

Healthy green spaces are crucial for the quality of life in cities



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Mitigation

Storage of carbon in trees and green spaces in general

Adaptation

Cooling of temperature in summer due to evaporation and shading

Protection against erosion during heavy rainfall

Adsorption of pollutants



Source: https://www.bbc.com/news/science-environment-37813709





The importance of maintenance

Municipalities spend a lot of money to maintain their green areas (Vienna 95M €/y, Berlin 150M €/y, Milano 20M €/y)

Maintenance of urban green areas is complex and requires many people, machines and material. A correct maintenance is important to maximise the positive contribution of trees and extend the life cycle (Hauer, 2015)



Maintenance tools are needed to help cities to organise and monitor their activities and at the same time maximise ecosystem services











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Project partners



R3 GIS srl – Bolzano (IT) - Lead Partner

Progea 4D – Krakow (PL)



University of Milano (IT)



Anthea srl - Rimini (IT)

Zarząd Zieleni Miejskiej w Krakowie Zarzad Zieleni Miejskiej - Krakow (PL)

External Partner



Mational Central University of Taiwan







Project cities (and pilot areas)







	DEVELOPMENT PHASE					TEST PHASE				
07/2018	2018 01/2019		07/2019 01/		2020 07/20		2020 01/2		2021 06	
Pilot ar	eas charact	erisation								
Measu	urement of	fecosystem	services							
Integra	ationand	use of meteo	, satellite a	nd sensor d	ata					
Softwa	are develo	pment								
		Public Port	al and App							
			(Test on pil	ot areas	and adju	stments			
Baseli	Baseline measurement					Impact measurement				
		NC								





Pilot area characterization

OBJECTIVE: Selection of Pilot and Control areas in Krakow and Rimini to develop, test and demonstrate the LIFE URBANGREEN innovative management approach



Paved areas: tree lanes, parkings, trees located in defined planting holes with strong interaction between tree and built environment.



Unpaved areas: trees in parks and gardens, located on free soil, with few interaction with constructions.





Pilot area characterization

SELECTION OF PROJECT AREAS AND TREES









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Pilot area in Taipei



Activities in Taipei are funded by the Taiwan Ministry of Science and Technology.





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Efficient programming of jobs and control activities







Efficient programming of jobs and control activities

OBJECTIVE: Determine the sequence of daily scheduled works to make maintenance activities more efficient and reduce their carbon footprint.











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OBJECTIVE: improvement of water resource delivery and management through the identification of critical thresholds based on climatic models, plant water requirements and meteo forecasts



ALERT ON TREES REQUIRING WATER

		1-		1 -	1	Lauran Laur		Í
Open map	Site	Tree nr.	Tag Nr.	Taxonomy	Calculated tr	Date TRA Risk	:lass Height	Wate
Weather Data	BIM1 - Centro Direzionale Piazza del Popoloparco	5	4680	Populus nigra Italica (Pioppo cipressino)	55		13,50	•
Sites	BIM1 - Centro Direzionale Piazza del Popoloparco	15	4671	Quercus ilex (Leccio)	63		11,00	
Objects	BIM1 - Centro Direzionale Piazza del Popoloparco	23	4125	Tilia x europaea (Tiglio)	71		11,00	
Statistics	BIM1 - Centro Direzionale Piazza del Popoloparco	53	4175	Pinus pinea (Pino domes	68		12,50	٠
Communications (0)	BIM1 - Centro Direzionale Piazza del Popoloparco	44	4002	Populus alba (Pioppo bia	68		12,00	
	BIM33 - Parco del Gelso	6	1339	Tilia x europaea (Tiglio)	70		10,50	
Trees	BIM33 - Parco del Gelso	10	1439	Pinus pinea (Pino domes	-		12,50	
Plant with planned TRA	BIM33 - Parco del Gelso	50	2160	Celtis australis (Bagolaro)	-		10,00	•
	BIM33 - Parco del Gelso	50	2160	Celtis australis (Bagolaro)	44		10,00	
TRA	BIM33 - Parco del Gelso	33	2462	Quercus robur (Farnia)	50		13,05	۲
Shrubs, shrubs areas,	BIM33 - Parco del Gelso	42	2552	Pinus pinea (Pino domes	50		13,05	
hedges	BIM33 - Parco del Gelso	88	3476	Tilia x europaea (Tiglio)	35		9,00	
Playground/Sporting Area	BIM33 - Parco del Gelso	89	3477	Tilia x europaea (Tiglio)	36		9,50	







Taking into account the efficiency of different irrigation methods when planning interventions













OBJECTIVE: estimation of benefits of green areas for a sustainable and healthy urban environment

DESCRIPTION: Understand environmental benefits provided by selected tree species in the two cities

- 1- Carbon storage
- 2- Carbon assimilation
- 3- Pollution adsorption on leaves
- 4- Thermoregulation





Measurements on the leaves determine the contribution of the plants in terms of CO_2 stored and absorbed, pollutants captured by the leaves, microclimatic mitigation.







How many benefits would my 40-year-old tree provide, if it was...

Species	ecies DBH (cm)			Day _	
	Both strata	Paved	Unpaved	M. W. M. St.	The Park all
Aesculus	38,8	161	518	1 Acres For	ALCON ANY
Acer negundo	33,8	211	444 🕐	Strain CENT	201 10 13
Ligustrum japonicum	18,5	20	59	CO	5.000
Prunus laurocerasus*	21	239	239		No. A MAR
Platanus x acerifolia	46,8	270	608 🕐		
Populus nigra	56,6	133	119		ON AN ANY
Quercus ilex	33,8	160	470		12420112321
Quercus robur	38,5	192	334	- The state	
Tilia x europaea	42,1	261	368	F182	L P Anto
LIFE URBANGRE (LIFE17 CCA/IT	EN A/000079) * F	ree form, unpru	ined		A PARK











Use weather, remote sensing and sensors data to improve green area management and maximise ecosystem services:





IOT sensors to collect environmental and tree physiology data













Severe Weather Warnings

PRECISE WARNINGS TO PREVENT DAMAGE

Features & Benefits

- Hyperlocal severe weather warnings via SMS/F-Mail
- Helps customers in preventing or reducing damage
- Warnings are sent out in advance (48 hours to 15 minutes prior to the event)
- 24x7 manned Severe Weather Centrale

UBIMET - SWC

- 100 Mio. alerts in the last years
- 1 Mio. recipients in Europe



WARNING LEVEL II

Acute warning: Extremely severe weather is forecast. Time and place can be clearly defined

WARNING LEVEL II

Acute warning: Very severe weather is forecast. Time and place can be clearly defined.

WARNING LEVEI

Acute warning: Severe weather is forecast. Time and place can be clearly defined.

ADVISORY

Severe weather is forecast for the next 48 hours

ALL CLEAR

No severe weather is expected.





THE WARNING SYSTEM

Wind

Radar

Rain

Weather stations

data

UBIMET

Severe weather warnings

Thunder- Hurricane

Text message communication system

e-mail interface

Customers

storm

Satellite

data

Snow

External

data

Freezing

rain

SENSORS MEASURING AIR POLLUTION (PM10, PM2,5, T, RH)









SENSORS MONITORING TREES

- Water transport in the tree
- Growth through diameter changes
- quantity and quality of foliage (light transmission in four spectral bands)
- Climate and soil parameters
- Tree stability with motion sensor
- Air temperature and humidity
- Data is transmitted to the cloud by radio







USE OF SATELLITE IMAGES

Through a weekly comparison of the pixels where the same tree species occur, health problems in trees should be detected early.

In addition, the satellite data will be used to determine further indicators for the entire vegetation of the urban area.







Weekly Planet satellite data to monitor health of trees in urban green areas







Solicit social involvement of citizens in urban green area management. Two tools will be developed:



a web portal for the public, georeferenced visualization of data on green areas, such as:

- inventory of public green areas, trees and playgrounds,
- data monitored by the IoT networks
- ecosystem services of green areas



a mobile app allowing access to the same information in the field and feedback from citizens





Testing and demonstration of LIFE URBANGREEN

From October 2019 all tools developed during the previous months will be tested in daily management activities on pilot areas:

Best practices according to the LIFE URBANGREEN Platform to be applied in the pilot areas:

- Smart Irrigation
- Target pruning
- Mulching
- Efficient programming of maintenance activities
- Monitoring through sensors and RS

Traditional practices normally used in most cities, to be applied in the control areas:

- No irrigation or irrigation based on traditional practice
- Topping
- No mulching





LIFE URBANGREEN Results

The final result is a tested, innovative technological platform to efficiently manage urban green areas, maximising ecosystem services.



SMART IRRIGATION



EFFICIENT PROGRAMMING OF JOBS AND CONTROL ACTIVITIES



EVALUATION OF ECOSYSTEM SERVICES



MONITORING OF GREEN AREAS THROUGH IoT, RS AND METEO DATA



PUBLIC PORTAL AND APP







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