



LABIRINTO
D'ACQUE
2018

21-24 marzo 2018

Scienza, cultura e storie d'acqua
al Labirinto della Masone

***The virtuous path
from water scarcity to water efficiency
International conference and exhibit
March 21, 2018***



***Sustainable actions and behaviors in water management:
Politecnico di Milano case study***

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Everyone talks about water

«Chiare, fresche et dolci acque, ove le belle membra pose colei che sola a me par donna...».

«Clear, cool, sweet, running waters, where she, for me the only woman, would rest her lovely body... ».



Francesco Petrarca



« Water does not resist. Water flows. When you plunge your hand into it, all you feel is a caress. Water is not a solid wall, it will not stop you. But water always goes where it wants to go, and nothing in the end can stand against it. Water is patient. Dripping water wears away a stone. Remember that, my child. Remember you are half water. If you can't go through an obstacle, go around it. Water does».

Margaret Atwood

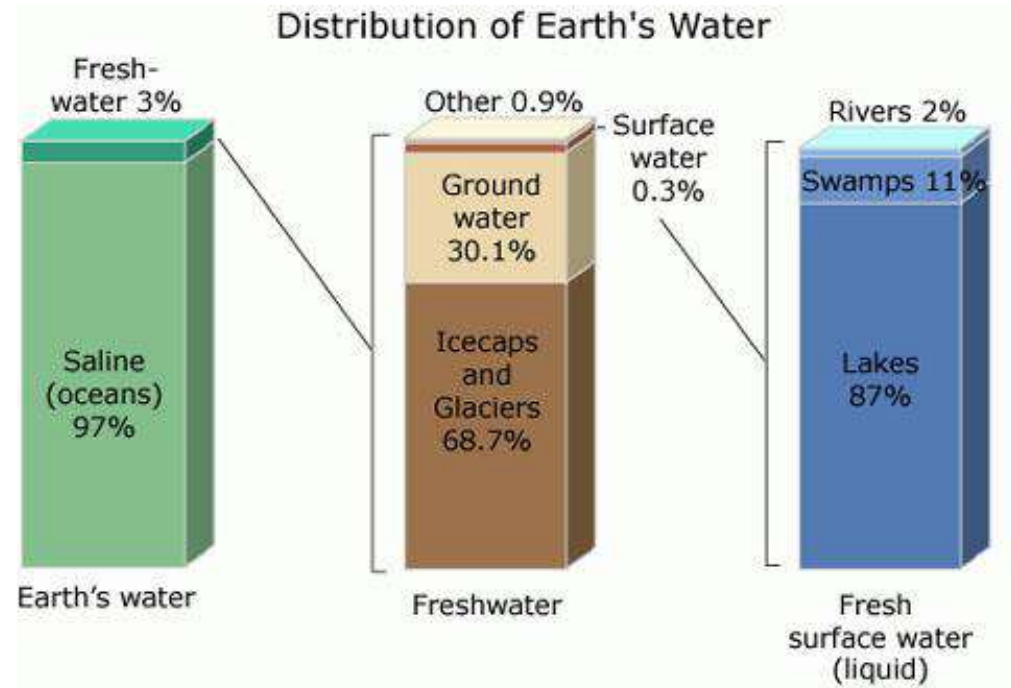
«Water is life's matter and matrix, mother and medium. There is no life without water».

Albert Szent-Gyorgyi



Why is water so important?

- We need it to live
- It is a renewable natural resource
- Only the 3% of the world water is fresh-water
- Not only quantitative but also qualitative problem
- Water demand already exceeds supply in many parts of the world
- In few years there is not going to be enough water for all the population



Gleik, 1996

How much water do we use per day?

- Bath → 120 l – 160 l
- Five minutes shower → 75 l – 90 l
- WC → 10 l
- Hand wash → 1,4 l
- Teeth brushing (without tap close) → 30 l
- Teeth brushing (with tap close) → 2 l

403.000 l per year in Italy

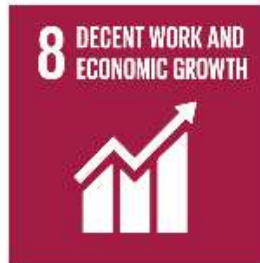
Grafton et al. 2011



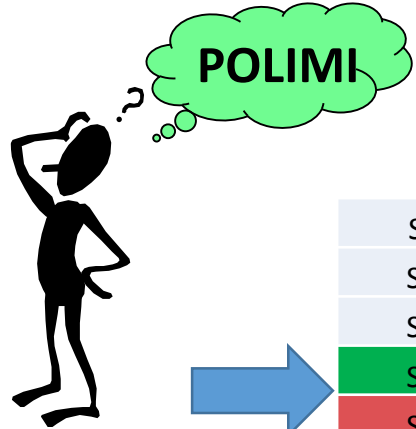
Source: Metropolitana Milanese (MM)

Sustainable Development Goals - SDGs

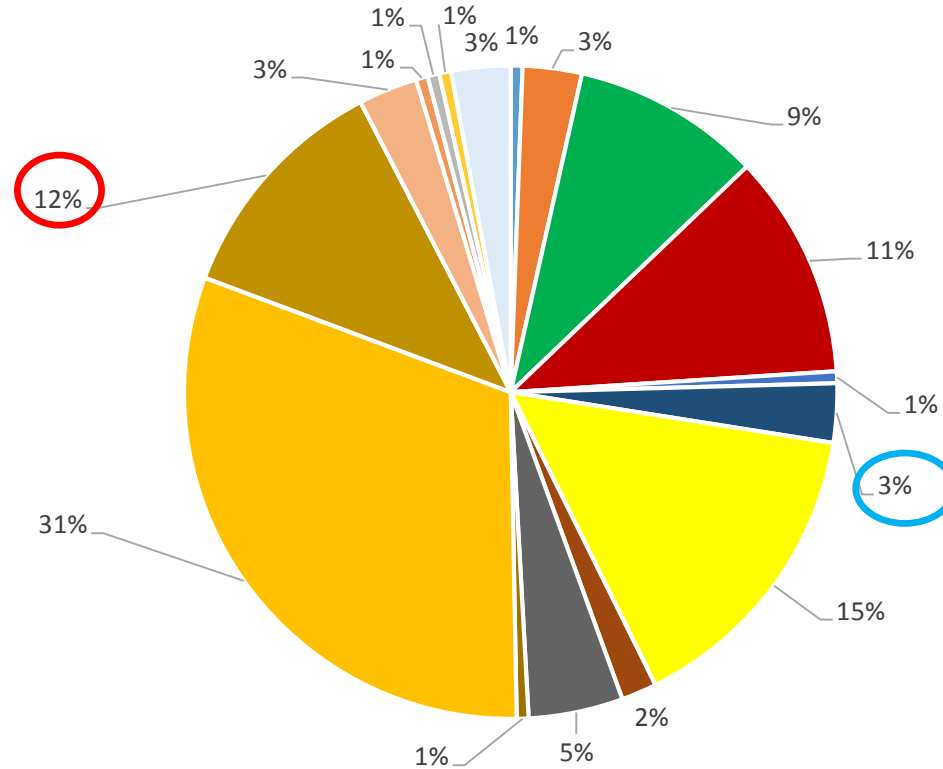
<https://sustainabledevelopment.un.org/?menu=1300>



Mapping Sustainable Development Goals - SDGs



SDGs	%
SDG1	0,6
SDG2	2,9
SDG3	9,4
SDG4	11,1
SDG5	0,6
SDG6	2,9
SDG7	15,2
SDG8	1,8
SDG9	4,7
SDG10	0,6
SDG11	31,0
SDG12	11,7
SDG13	2,9
SDG14	0,6
SDG15	0,6
SDG16	0,6
SDG17	2,9



Results from survey POLIMI 2017



Politecnico di Milano

- Scientific-technological university
- 7 Campuses located in 5 cities:
Milano (campus Leonardo e Bovisa); Como; Lecco; Cremona; Mantova;
Piacenza.
- 12 departments with 239 laboratories
- 41.600 enrolled students*
- Milano Bovisa and Città Studi → serving about 40.000 students in total
- 1.200 administrative staff*
- 900 full professors*
- 430 researchers*
- 1.200 untenured professors*
- 1.170 PhD students*
- Networking: RUS and ISCN

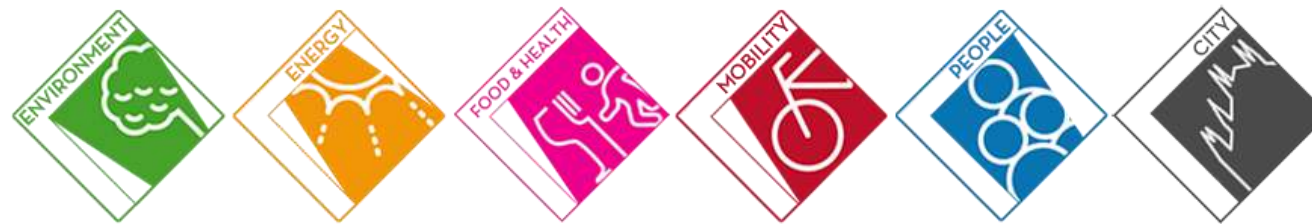


* 2017

Città Studi Sustainable Campus project and Sustainable Office of Politecnico

- The "**Città Studi Sustainable Campus**" (CSCS) project was launched in 2011 and is promoted by the Politecnico of Milan and by the University of Milan. The aim of the project is to transform the university district into a Campus and a part of the city aiming at becoming a model for the quality of life and the environment through the active contribution of the university population and citizen.

The project is made up of six working groups, open to all!



- From the CSCS project to **University Sustainability Office**, which:
 - represents the institutional leadership of sustainability issues
 - works with the aim of improving, from a sustainable development perspective, the environmental performance of the activities carried out by the University Areas and Departments;
 - promoting Sustainable Development Goals

Sustainability Office

Main goals and activities:

- ❖ support for the University policies and objectives definition
- ❖ improving the University environmental performance
- ❖ monitoring and management of the University environmental aspects
- ❖ definition of guidelines for all the activities related to environmental aspects
- ❖ **support water management**
- ❖ waste management
- ❖ supports air emission management
- ❖ mobility management
- ❖ information and awareness raising



Information, dissemination and awareness raising



Main goals and projects



Projects and actions

The wiki code of conduct

- Energy saving
- Waste management
- Mobility
- **Resources use reduction → water**

ii. What the administration can do

- Apply air mixers in the taps
- Install WC with double-button waste that allow two different ways of rinsing with different quantities of water
- Install tanks and plants for the collection and recycling of rainwater for irrigation of green areas or, possibly, reuse in a gray water network
- Perform periodic checks on the status of the water systems to check for any leaks in the network that represent a waste of resources, even economic, as well as reveal the possible risk of damage
- Have the internal system leaks promptly repaired



IL PROGETTO / CODICE DI COMPORTAMENTO



FrontPage

Dettagli Stampa

CODICE DI COMPORTAMENTO PER UN CAMPUS SOSTENIBILE

1. INTRODUZIONE

Molte delle minacce alla sostenibilità ambientale (cambiamento climatico, perdita di biodiversità) hanno origine nel comportamento dei cittadini. Per questo sono necessari poiché anche l'efficienza energetica dipende dai consumi.

Numerose azioni che compiamo ogni giorno a casa...

i. What can we do

- Drink tap water
- Avoid letting water run unnecessarily, checking the water jet, closing it when soaping or brushing your teeth and not leaving it open or dripping
- Use the toilet drain correctly
- Promptly report any failure of faucets, drains or external pipes to those responsible

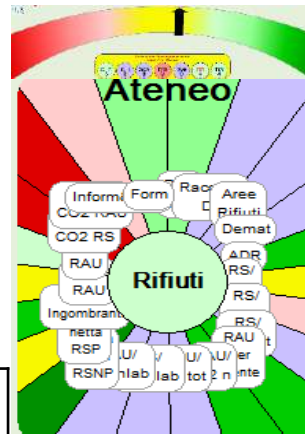
<http://www.campus-sostenibile.polimi.it/codice-di-comportamento/-/wiki/Main/FrontPage>

Projects and actions

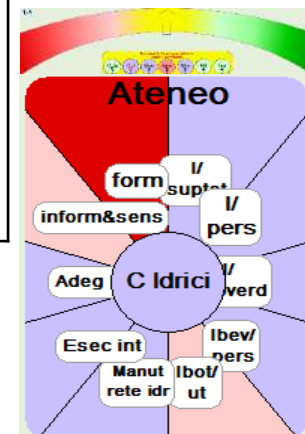
Dashboard of sustainability

- "Water consumption" in an environmental aspect to be managed
- Data researching is essential for consumption monitoring
- Monitoring is essential to evaluate the effectiveness of interventions (technical or concerning behavior)

Environmental aspect	Data	Unit of measure	Data	Unit of measure	Indicators / Indices to be developed by SSA
Water consumption	Annual total water consumption	m ³	Annual total water consumption	m ³ /year	Total water consumption per net area Consume bottled water per user Maintenance and adjustment of the water network Adjustment level for water saving systems Level of information / awareness Level of training of University staff
			Annual water bottle consumption	m ³ /year	
	Annual water bottle consumption	m ³	Buildings total net surfaces	m ²	
			Campuses green areas surfaces	m ²	
	Buildings total net surfaces		University population	n°	
			Campuses green areas surfaces	Annual number of maintenance and / or adjustment of the water network	
	University population		Percentage of water systems in University buildings equipped with water saving systems	%	
			Annual number of maintenance and / or adjustment of the water network	n°	
	Annual number of maintenance and / or adjustment of the water network	n°	Annual number of information and awareness events	n°/year	
			Percentage of water systems in University buildings equipped with water saving systems		
Annual number of hours of training courses for internal		n° hours/year			
Data			Unit of measure	ARUO/SSA	Yes
Annual total water consumption			m ³ /year	Indicators:5 Indices:1	



Dashboard software outcomes



Projects and actions

Water counters

- 26 water tax counters have been used for data collection
- The data have been registered at our institution in order to start the baseline for collecting data on water consumption
- In the future we will install detailed counters

Examples of water consumption at Politecnico di Milano (data from water bills)

LETTURE E CONSUMI

data	contatore	lettura	consumo	tipo lettura
08/05/2015	0003282521	503550		EFFETTIVA
21/10/2015	0003282521	512381	8831	EFFETTIVA
31/12/2015	0003282521	512381	4263	A CALCOLO

Consumo effettivo del periodo mc 13094

Consumo a calcolo dal 21/10/2015 al 31/12/2015 mc 4263

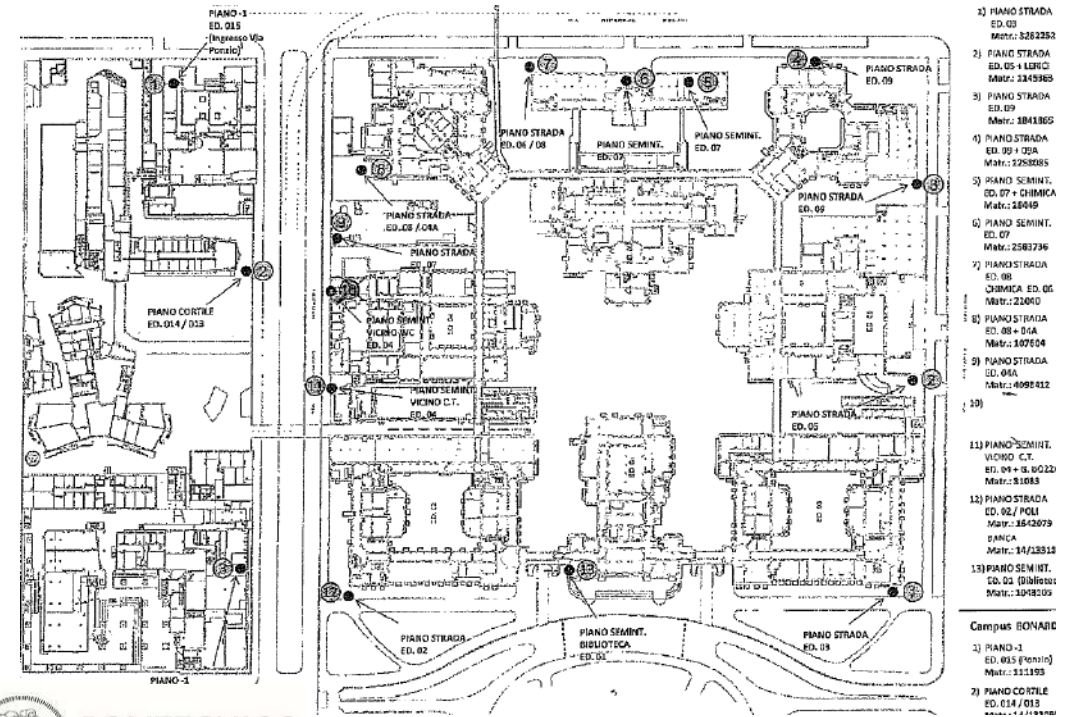
Consumo a calcolo già fatturato nelle bollette precedenti dal 08/05/2015 al 30/09/2015 mc 9587

Totale consumo fatturato mc 3507

Consumo annuo mc 23284



Distribution Water counters in Città Studi Campus



Projects and actions

Retrofitting of toilets

- installation of photocells, push systems, air mixers and dual flush toilets for water saving



Retrofitting of canteens

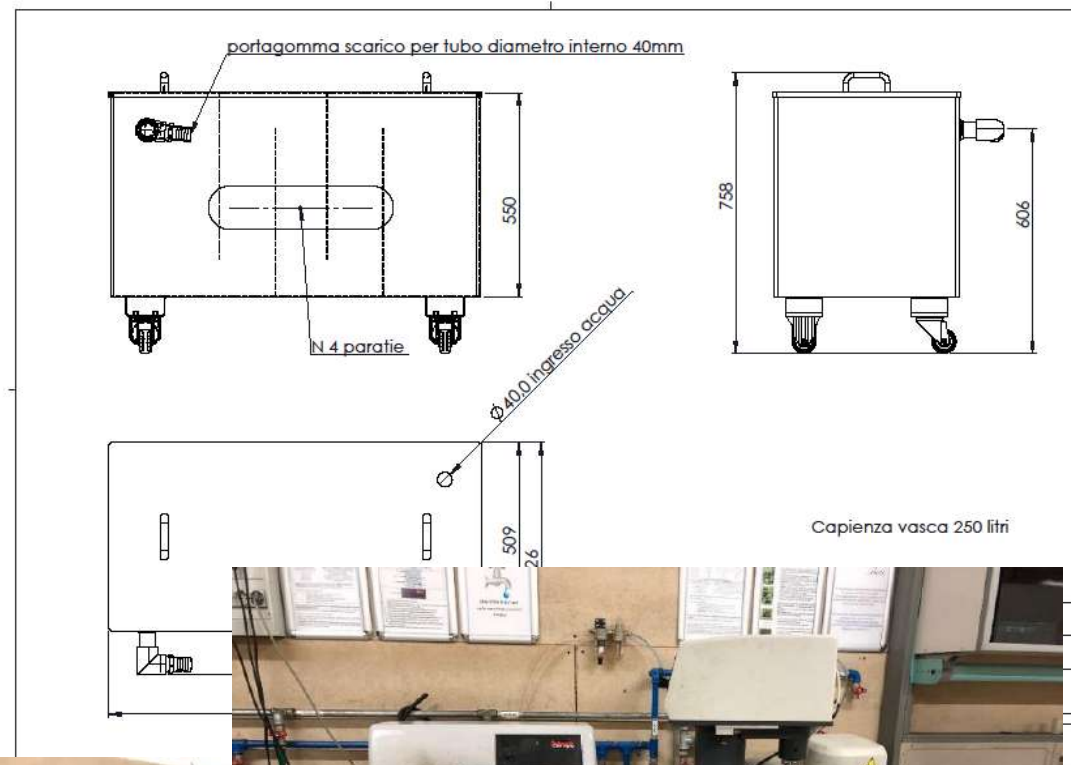
- push systems, air mixers



Projects and actions

Water decantation tanks

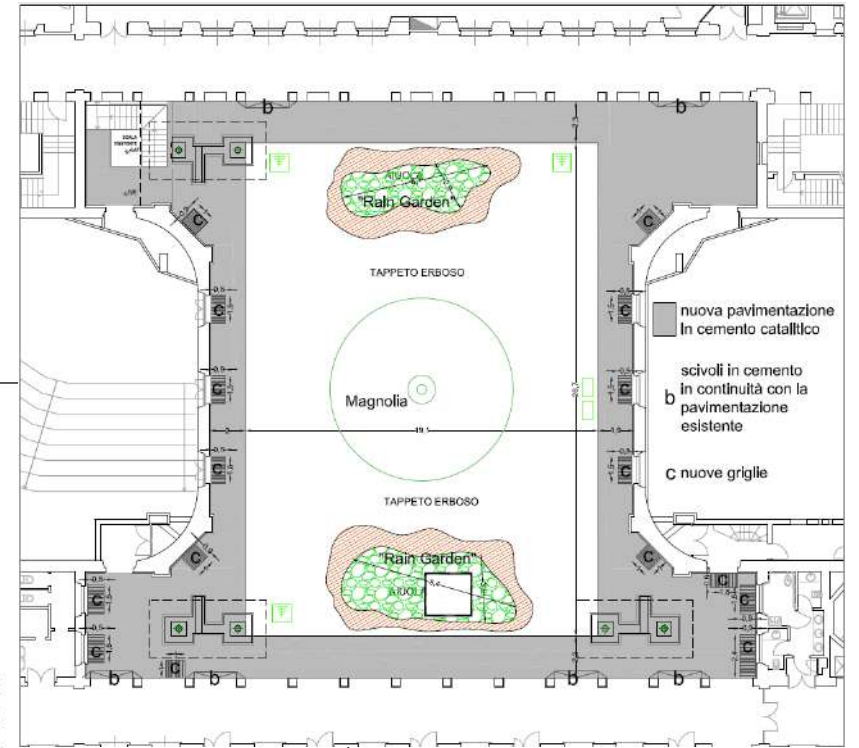
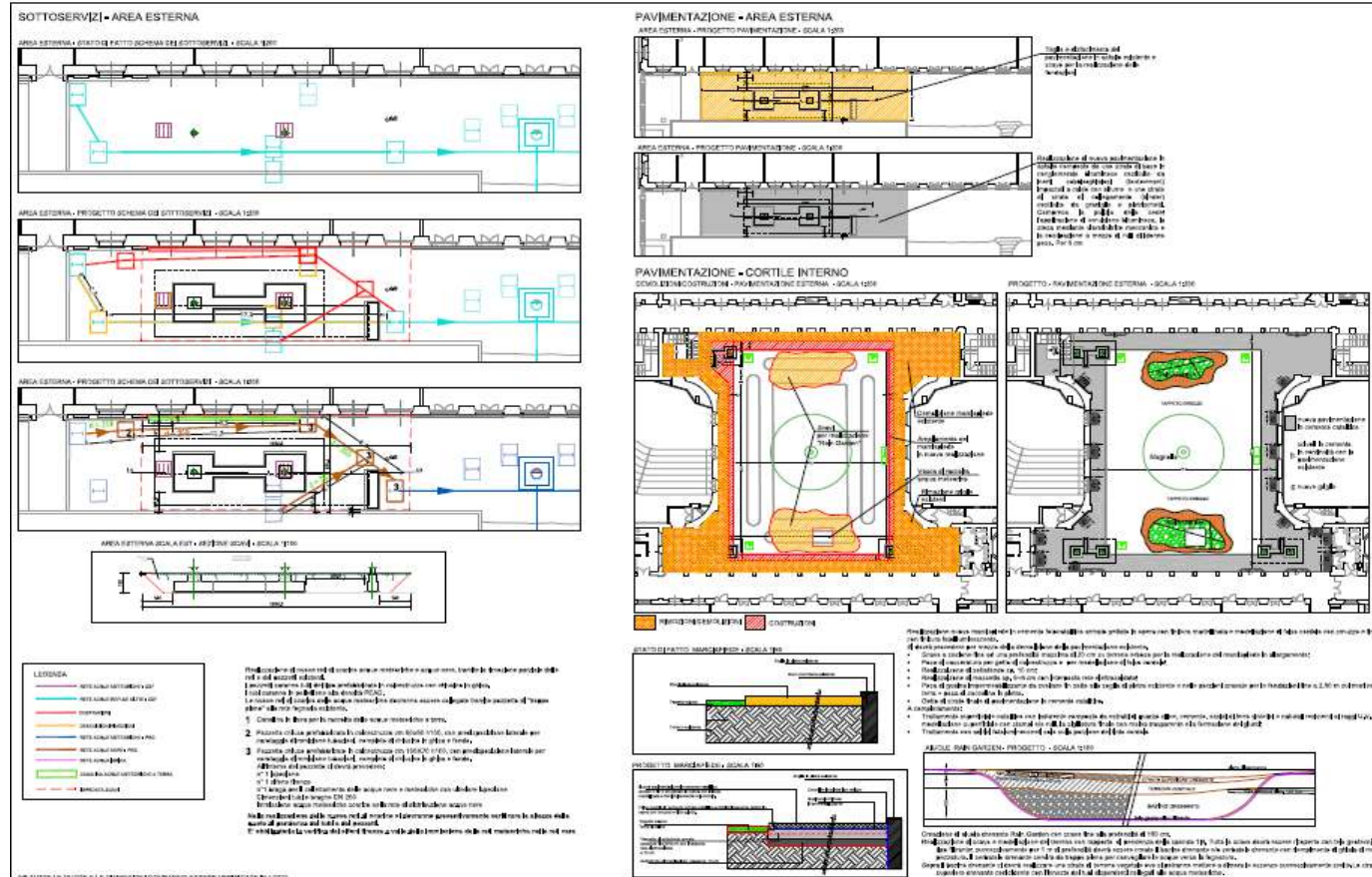
- CLASD - Specimen preparation laboratory project (Mechanics department)
- Decantation tanks for water depuration from polishing and metal compounds
- Water recycle
- Water pollution and pipes plug reduction



Projects and actions

Rain garden Campus Leonardo

- Technical building area project
- Recovery, collection and discharge system of rain water, rain-garden and underground tank for the reuse of water in the irrigation system

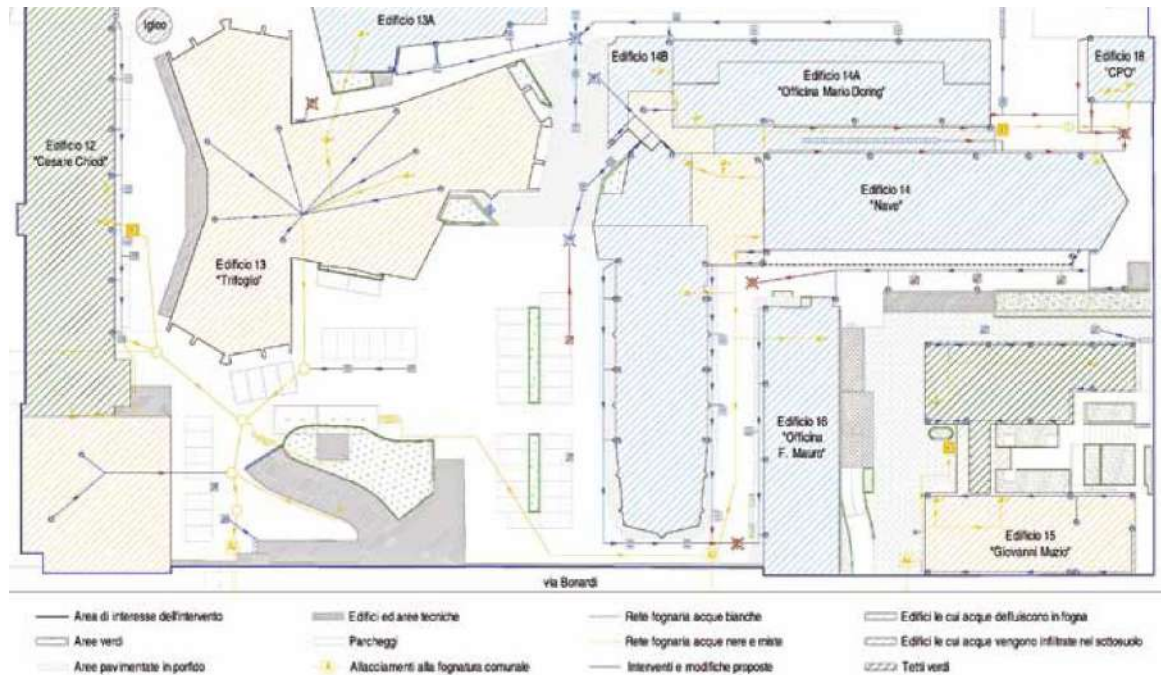


Projects and actions

Sustainable drainage of Campus Bonardi

- POLIMI project for Campus Bonardi area (Campus Città Studi), involving students (thesis)
- Run-off reducing and improve infiltration through:
 - Green roofs
 - Draining floors
 - Absorbing well
 - New collection and disposal line

Città Studi Campus - Bonardi



Tedeschi et al, 2013

Projects and actions

“Renzo Piano” Project 2015

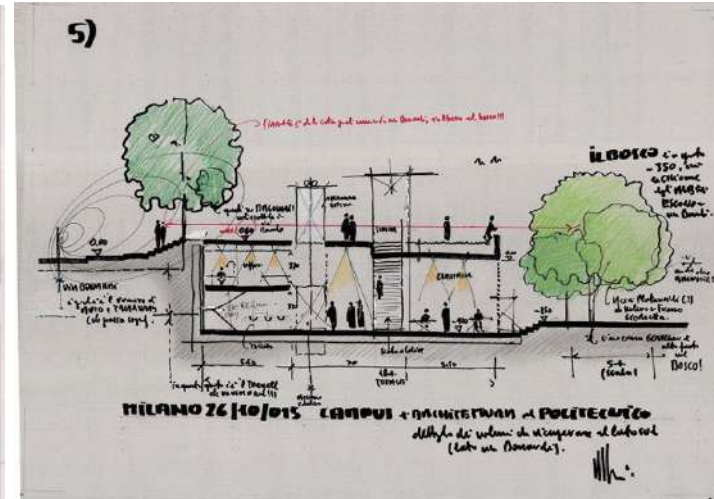
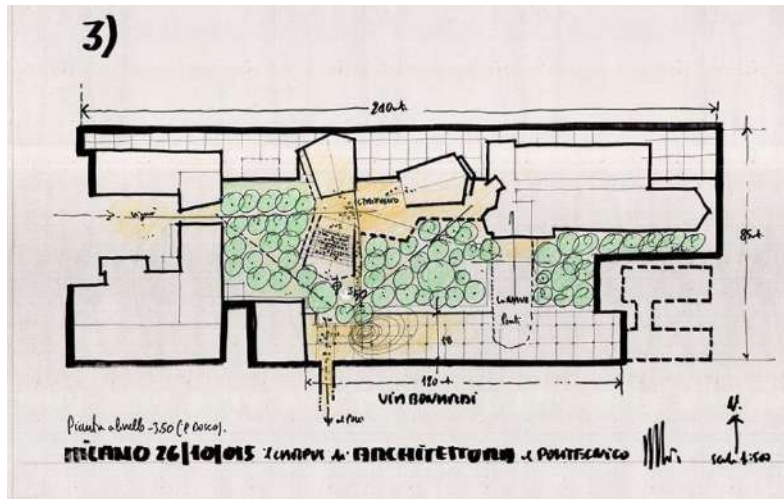
The design project by Renzo Piano will be constructed starting in April 2018 in the area of Campus Bonardi (Città Studi). The major objectives are:

- improve the access not only for University community but also for the citizens, improvement of the energy system, improvement of buildings insulation, more open spaces to live the University
- **FOCUS Water:**
 - increase of permeable surfaces, trees planting, rain water recovery...

Today



Tomorrow



Projects and actions

Vivipolimi Project 2018

- Redesign our campus spaces, according to better quality of life and sustainability principles (energy saving, more efficient energy production (installation of a new trigeneration plant) access improvement, reduction of resources consumption...

→ **FOCUS Water:** greening of existing pavements that will happen after the removal of parking lots

Today

Tomorrow

Citta Studi Campus



Bovisa Campus

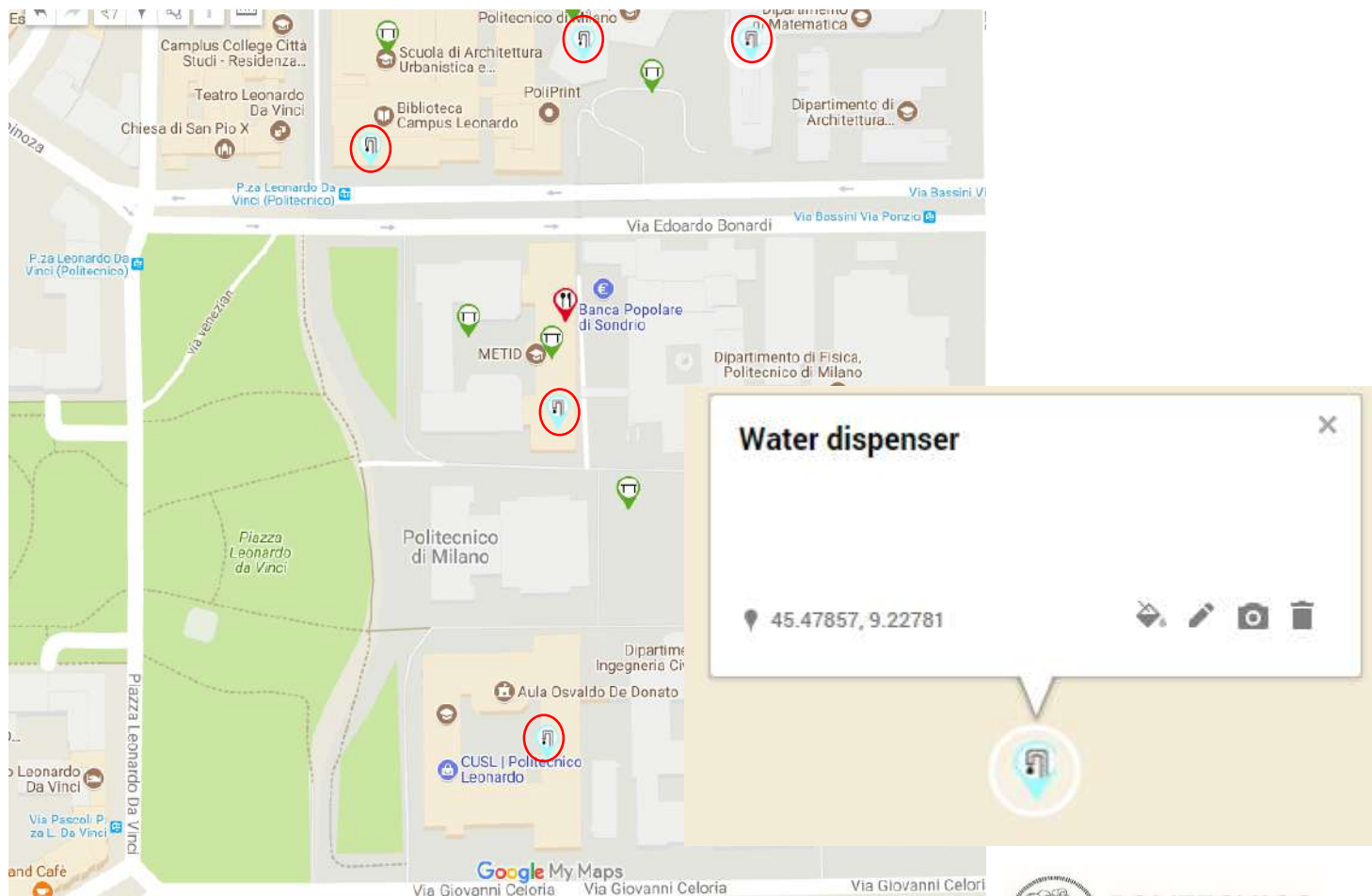


Projects and actions

Water dispensers

- 15 water dispensers have been installed in the buildings of the two main campuses of Politecnico, Bovisa and Città Studi

Map extraction



Projects and actions

Water house project

- The **water house** of Metropolitana Milanese (MM), will be inaugurated during the World Water Day (22/03/2018), in the garden near Campus Bassini – Città Studi.
- Available also to the University community and not only to all the citizens
- Will supply fresh, still or sparkling water
- Educational purpose and sustainable path
- Case study → research project, multiparametric optical and electrochemical probe which allows real-time control of some water parameters



GIORNATE DELLA SOSTENIBILITÀ

22 marzo 2018

Politecnico di Milano e MM Spa insieme per la Giornata Mondiale dell'Acqua

La celebrazione della Giornata Mondiale dell'Acqua viene inaugurata la Casa dell'Acqua ubicata presso i Giardinetti di Via 16, alla presenza delle autorità cittadine, di MM Spa e del Politecnico di Milano. La Casa dell'Acqua, dotata di strumenti di analisi della qualità dell'acqua in tempo reale, è un punto di sensibilizzazione e informazione sull'acqua di Milano con pannelli esplicativi e un luogo privilegiato di attività di studio/ricerca, che coinvolge docenti e ricercatori del Dipartimento di Ingegneria Civile e Ambientale del Politecnico. L'evento rappresenta un'opportunità per conoscere meglio un elemento che sta diventando sempre più prezioso sia a livello locale che globale, per capire come funziona il Servizio Idrico Integrato e per sfatare alcuni falsi miti.

Programma

Ore 15.30 – **Inaugurazione Casa dell'Acqua**

Saluti istituzionali

Marco Granelli, Assessore a Mobilità e Ambiente, Comune di Milano
Pierfrancesco Maran, Assessore a Urbanistica, Verde e Agricoltura, Comune di Milano
Caterina Antola, Presidente, Municipio 3
Antonella Bruzzone, Assessore Urbanistica Verde e Ambiente, Municipio 3
Davide Corritore, Presidente MM Spa
Eugenio Morello, Delegato al Progetto Sostenibilità di Ateneo, Politecnico di Milano
Graziano Dragoni, Direttore Generale, Politecnico di Milano

Interventi

Eleonora Perotto, Responsabile Servizio Sostenibilità, Politecnico di Milano
Fabio Marelli, Direttore Acquadotto, MM Spa
Manuela Antonelli, Referente progetti di ricerca «acqua potabile», Dipartimento Ingegneria Civile e Ambientale, Politecnico di Milano

Ore 16.30-18.30 – **Gli esperti sono a tua disposizione: dimostrazioni pratiche e informazioni in pillole sull'acqua potabile e sul Servizio Idrico Integrato**

Angela Manenti, Laboratorio e Qualità Prodotto, MM Spa
Manuela Antonelli e **Andrea Turolla**, Dipartimento Ingegneria Civile e Ambientale, Politecnico di Milano
Francesca Malpei e **Elena Ficari**, Dipartimento Ingegneria Civile e Ambientale, Politecnico di Milano

Vi aspettiamo numerosi!

L'iniziativa è aperta a tutti gli interessati. Per ragioni organizzative si prega di compilare il form presente sul sito: www.campus-sostenibile.polimi.it
 Ai presunti all'inaugurazione, registrati online, sarà distribuita una bottiglina.

servizio.sostenibilita@polimi.it
www.campus-sostenibile.polimi.it
www.facebook.com/cittastudi/CampusSostenibile
twitter.com/CampusSos

- Distribution of Aluminum water bottles
- Demonstrations and experiments conducted by experts (POLIMI)

Projects and actions

Environmental Modelling and Software

- EU Research project – SMARTH2O
- ICT platform
- Improving the management of urban and peri-urban water demand
- Involve consumers and promote water savings by increasing their awareness, using a social computing approach, and also exploring their sensitivity to water prices
- Creating a virtuous feedback cycle between water users and the utilities

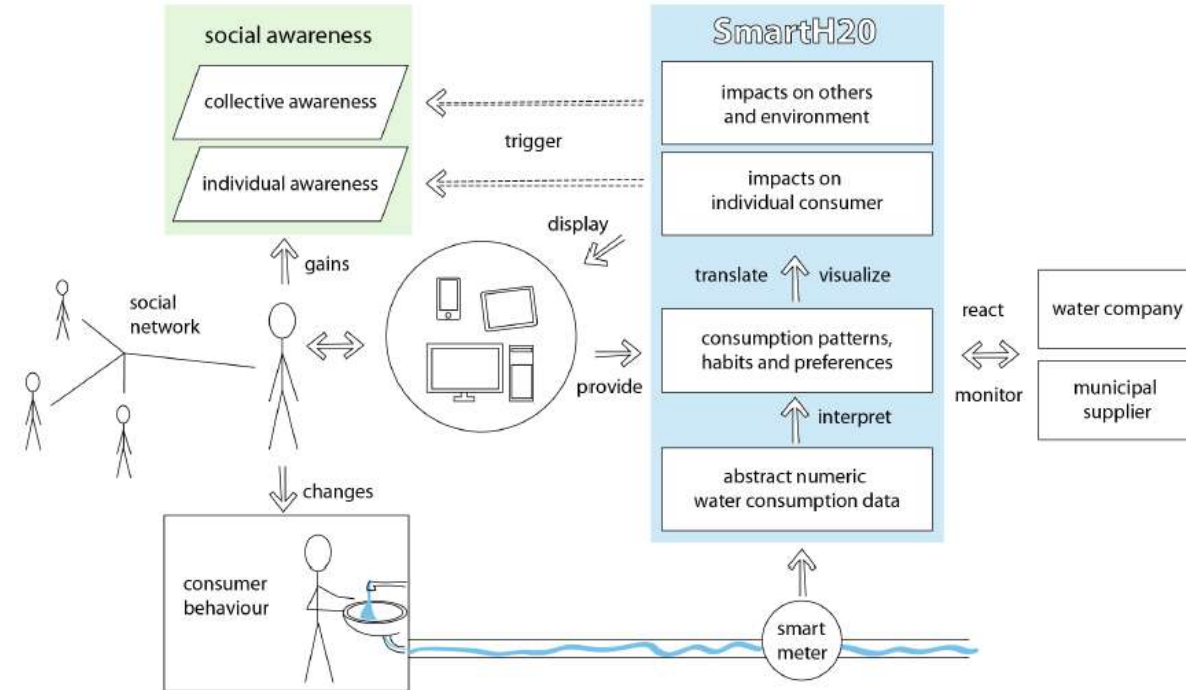


Figure 1. The flow of information and control in the SmartH2O system

Rizzoli et al, 2014

- Social participation is pursued with an online social game that will allow consumers to monitor their water usage
- Paper reports the overall project structure → outcomes coming soon

International Environmental Modelling and Software Society (iEMSS)
7th International Congress on Environmental Modelling and Software, San Diego, CA, USA
Daniel P. Ames, Nigel W. T. Quinn, Andrea E. Rizzoli (Eds.)
<http://www.iemss.org/society/index.php/iemss-2014-proceedings>

The SmartH2O project and the role of social computing in promoting efficient residential water use: a first analysis

A.E. Rizzoli^a, A. Castelletti^b, A. Cominola^b, P. Fraternali^b, A. Diniz dos Santos^c, B. Storni^d, R. Wissmann-Alves^e, M. Bertocchi^f, J. Novak^g, I. Micheel^h

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^gEuropean Institute for Participatory Media Berlin, Germany (i.micheel@eipcm.org)

Conclusions

In order to improve water efficiency and consumptions in the future, the possible ecofriendly paths that University should take are relate to two areas of action:

- Structural interventions



- Behavioral change



Structural interventions are necessary, but in order to ensure the effectiveness of investment, the cooperation of the University community, and also the citizens that live around the POLIMI campuses, is essential. For this reason, we should continue working on a deep cultural change, towards more sustainable behaviors.

... but first of all, data retrieval for monitoring!

Thanks for your attention

Contacts

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Eleonora Perotto: eleonora.perotto@polimi.it

- **E-mail Servizio Sostenibilità di Ateneo:** *serviziosostenibilita@polimi.it*

- **Web site Progetto “Città Studi Campus Sostenibile”:** *www.campus-sostenibile.polimi.it*

- **Canali Social:** *Facebook: <https://www.facebook.com/CittaStudiCampusSostenibile>*

Twitter: <https://twitter.com/CampusSos>



Lago di Gelt, Val Malgina

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Gleik, P. H., 1996. Water resources. In Encyclopedia of Climate and Weather, ed. by S. H. Schneider, Oxford University Press, New York, vol. 2, pp.817-823.

R. Quentin Grafton, Michael B. Ward, Hang To, Tom Kompas, 2011. Determinants of residential water consumption: Evidence and analysis from a 10-country household survey Water resources research, vol. 47, pages 1 -14

Rizzoli A.E., Castelletti A., Cominola A., Fraternali P., Diniz dos Santos A., Storni B., Wissmann-Alves R., Bertocchi M., Novak J., Micheel I., 2014. The SmarH2O project and the role of social computing in promoting efficient residential water use: a first analysis

http://www.iemss.org/sites/iemss2014/papers/iemss2014_submission_294.pdf

Ames, D.P., Quinn, N.W.T., Rizzoli, A.E. (Eds.), 2014. Proceedings of the 7th International Congress on Environmental Modelling and Software, June 15-19, San Diego, California, USA;

<http://www.iemss.org/society/index.php/iemss-2014-proceedings>

Tedeschi E., Raimondi A., Perotto E., Becciu G., 2013. Drenaggio sostenibile nelle aree urbane. Un caso di studio presso il Politecnico di Milano.

SDGs <https://sustainabledevelopment.un.org/?menu=1300>

Metropolitana Milanese: <http://www.metropolitanamilanese.it/pub/page/MM>