

THE RAIN GARDEN OF VIA PACINI: the first SUDS of the City of Milan

Paola Viganò
Public Sector Executive
Green and Environment Department | City of Milan

Milano



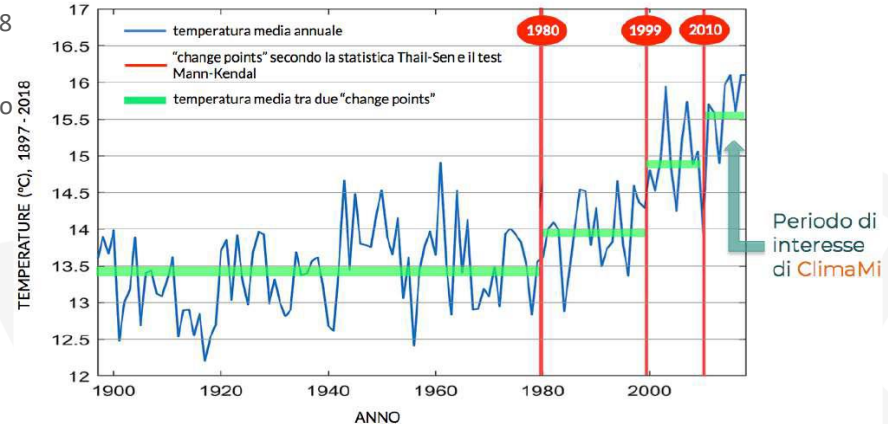
Flood risk in municipal territory



Evolution of the water cycle with climate change

Milano Central Station from 1898 to 2018

Fondazione Osservatorio Meteorologico Milano Duomo

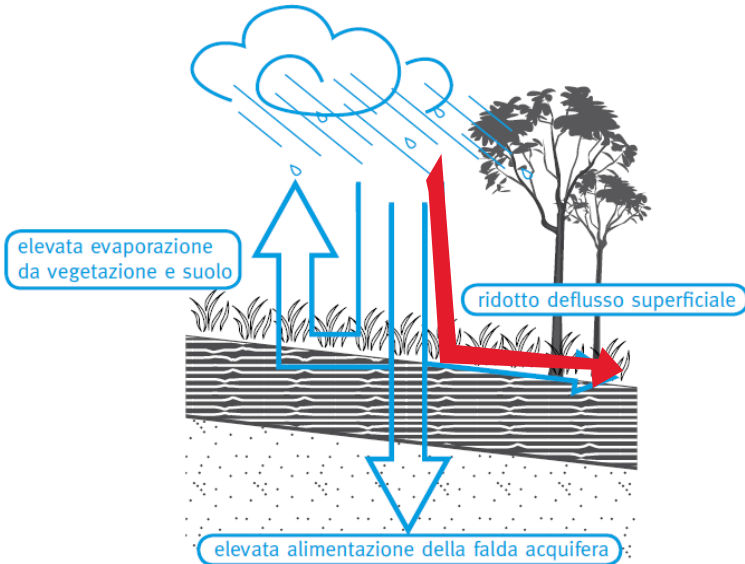


- constant amount of rain falling over the years;
- reduction in the number of rainy days per year;

- increase in rainfall intensity;
downpours

Evolution of the water cycle with urbanisation

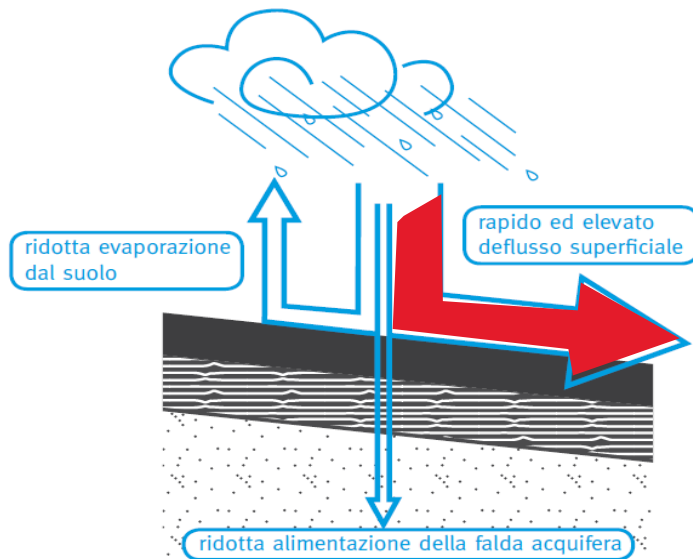
Meteoric water outflows in the natural environment



Evolution of the water cycle with urbanisation



Meteoric water outflow
in an urban environment



Evolution of the water cycle with urbanisation



Evolution of the water cycle with urbanisation

Soil sealing (arid/paved) tends to:

- reduce rainwater runoff times by intensifying flooding phenomena; reduce the time of concentration for the watershed outlet (secondo me più corretto);
- reduce the amount of infiltration water recharging aquifers and groundwater; increase surface runoff, leading to increased soil erosion, solids transportation and water pollution;
- requires the construction of drainage networks that, to be sustainable, need a high level of complexity, often in contrast to the ease of management and its cost;
- reduces the ecosystem and landscape services provided by vacant land.

Effects of urbanisation - Is this inevitable?

Is it inevitable that urban spatial development will increase stormwater runoff and hydraulic criticality?

In the past:

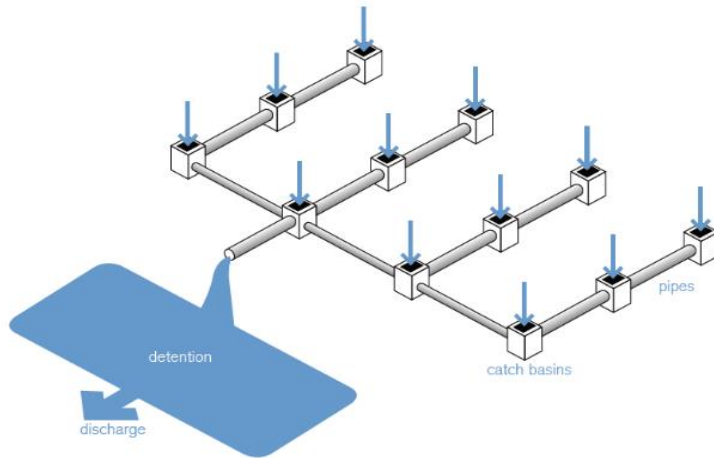
- the increase in flow rates and volumes of meteoric runoff was perceived and "endured" as a direct and inevitable consequence of urbanisation;
- meteoric outflows were controlled 'downstream' of their formation, by strengthening drainage networks and/or with spillways, rolling basins and raising embankments.

However nowadays, politicians, administrators and technicians are aware that:

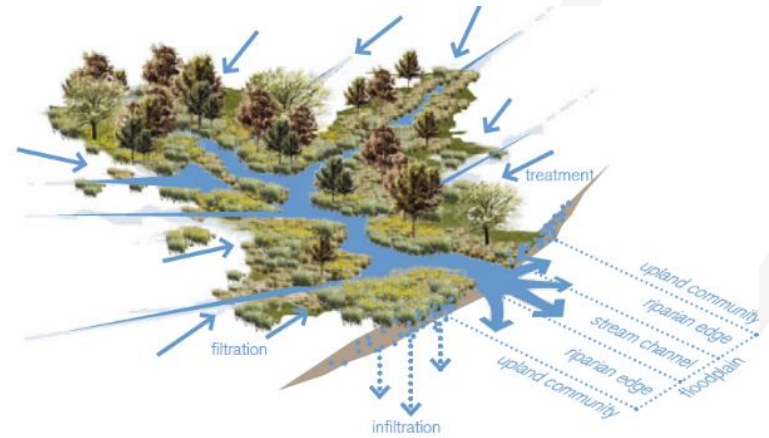
- the increase in flows and volumes is avoidable and must be avoided;
- in fact, with hydraulic and urban planning strategies based on the "upstream" reduction of outflows (Sustainable

Effects of urbanisation - Towards sustainable management

Traditional hydraulic engineering engineering



Integrated hydraulic



Effects of urbanisation - Towards sustainable management

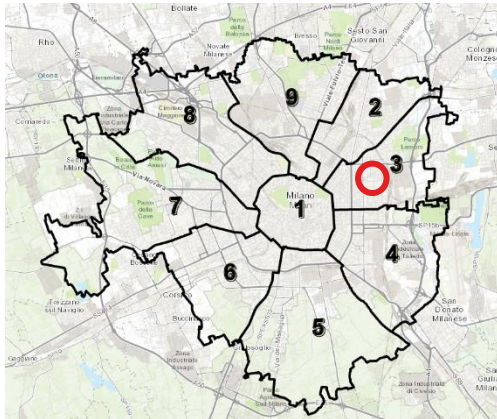
The aim is to alter the natural circulation of water as little as possible.

HYDRAULIC AND HYDROLOGICAL INVARIANCE:

Principle according to which the runoff volumes and the flow rate at the flood elevation resulting from the drainage of an area should remain unchanged before and after the land use transformation that took place in the area, referring to the pre-urbanisation condition.

THE 'RAIN GARDEN' IN VIA PACINI – Il Giardino della pioggia

TRANSFORMATION OF THE AREA:
FROM GREY TO GREEN INFRASTRUCTURE



THE 'RAIN GARDEN' IN VIA PACINI – Il Giardino della pioggia

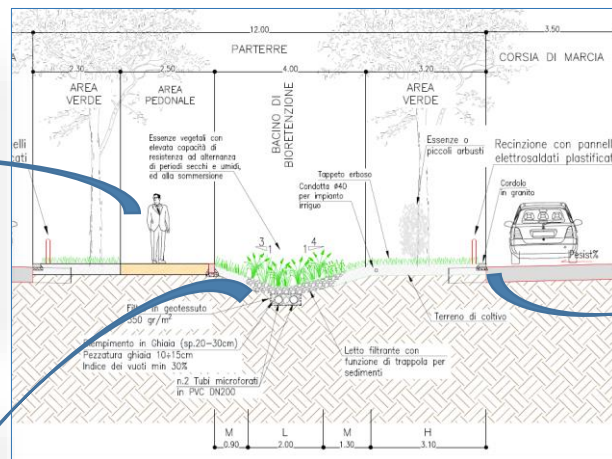


Main Elements of the Intervention

SHADED AND PROTECTED CYCLE AND PEDESTRIAN PATHS



BIORETENTION AREAS FOR RAIN INFILTRATION AND BIODIVERSITY ENHANCEMENT



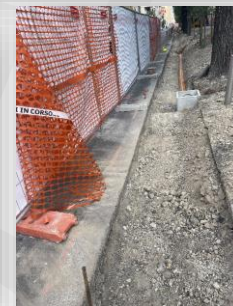
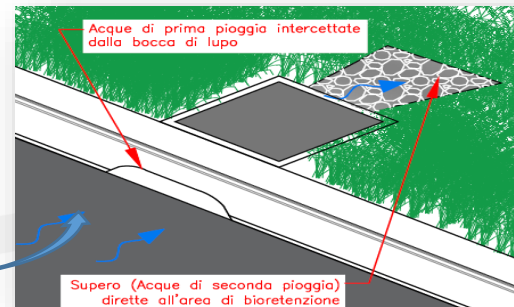
BICYCLE RACKS



BENCHES FOR COOLING OFF AND RESTING



ROAD DRAINAGE SYSTEM WITH CONNECTION TO THE SEWER AND OVERFLOW THRESHOLD TO GREEN AREAS



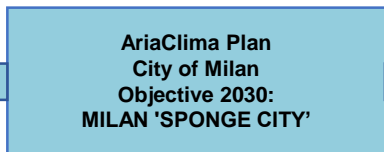
The Building Site



The Building Site



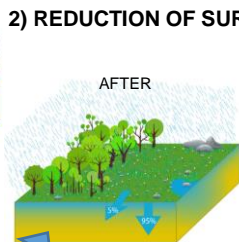
Benefits of the Intervention



1) INCREASE IN BIODIVERSITY:
PRESERVATION OF EXISTING GREENERY AND CREATION OF 3 ECOLOGICAL ZONES, WITH DIFFERENT PLANT SPECIES ACCORDING TO DIFFERENT LEVELS OF WATER AVAILABILITY



BEFORE



AFTER



2) REDUCTION OF SURFACE RUNOFF



3) INCREASED EVAPOTRANSPIRATION

4) GROUNDWATER RECHARGE THROUGH SOIL INFILTRATION

6) HYDRAULIC RISK MITIGATION:
REDUCTION OF FLOODING
REDUCED STORMWATER DISCHARGE TO TREATMENT PLANTS
REDUCTION OF FLOW RATES IN THE DRAINAGE NETWORK

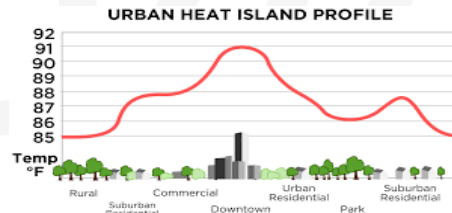


5) PURIFICATION:
REMOVAL OF SIMPLE POLLUTANTS THROUGH PHYTO-PURIFICATION BY APPROPRIATE PLANT SPECIES AND FILTRATION THROUGH THE SOIL.

7) CREATION OF GREEN SPACES FOR CITIZENS' USE



8) HEAT ISLAND MITIGATION:
TEMPERATURE REDUCTION THROUGH THE PRESENCE OF GREENERY



THANK YOU!

paola.vigano@comune.milano.it

Milano

