



THE MANAGEMENT OF AQUIFER RECHARGE IN URBAN HYDROGEOLOGY.

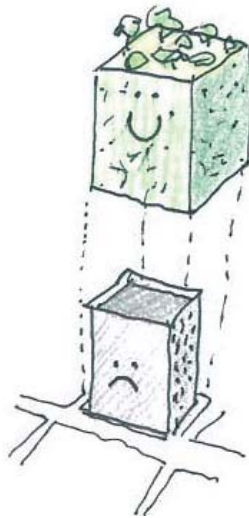
SUDS: SUSTAINABLE URBAN DRAINAGE SYSTEMS

Definition

Sustainable Urban Drainage Systems are systems that recuperate the natural cycle of water in cities.

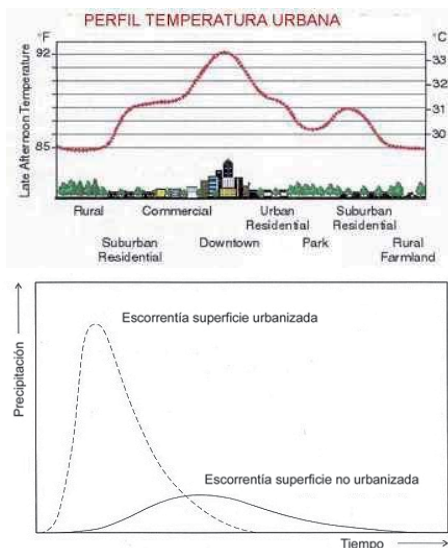


Impermeable city.

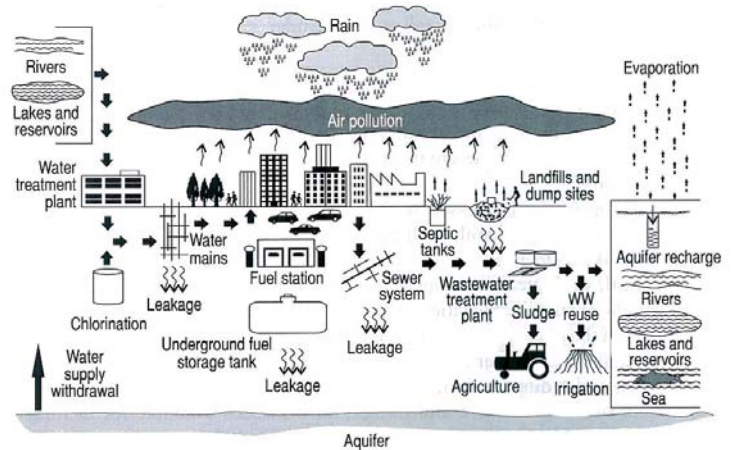


Problems

The introduction of buildings and urban development entail a negative effect on the territory. The progressive impermeabilisation of the terrain causes great hydrological changes and means large investment in infrastructures to channel and treat the water collected.



The natural cycle of water consists of various phases: evaporation, condensation, precipitation and infiltration. All of these are of vital importance for the water to maintain stable levels of life and to enable the development of a healthy territory. The urban water cycle, on the other hand, has abandoned the original paths of the place and this causes economic and environmental problems that are difficult to solve:



Urban water cycle.

Heat Island effect

The impermeabilisation of urban surfaces: roads, pavements, car parks, roofs and so on cause a temperature rise of up to 6 °C in city centres.

Runoff build-up

Impermeable urban surfaces cause a quick build-up of water from precipitation in short spaces of time, resulting in highly pollutant floods that are difficult for the urban sanitary and sewer network to absorb.



Classification

Sustainable urban drainage systems must be understood to be components in a management chain and not isolated features capable of treating the water individually.

This chain of management includes preventative action, management at the origin, management of transport, and management in the treatment prior to the definitive infiltration, and this leads to the following classification:

MANAGEMENT AT THE ORIGIN

Provides attenuation for the runoff , returning the water to the natural drainage system.

Permeable surfaces: Devices that have a volume of permeable material below ground to store surface water

Filter strips and swales: Vegetated surface or long shallow channels features that drain water evenly off impermeable areas.

Infiltration devices: drain water directly into the ground

Green Roof: The vegetated surface provides a degree of retention, attenuation and treatment of rainwater, and promotes evapotranspiration.



Permeable surface.



Filter ditch.



Green roof.



Infiltration tank.

PERMEABLE TRANSPORT SYSTEMS

These transport runoff water slowly, enabling filtration, storage, infiltration, and even evaporation and oxygenation.

Filtering drains: ditches covered with geotextile material and filled with gravel.

Green swales: channels with grass planted, which guide the runoff water from the drainage surfaces to a storage system or to a connection with the existing sewer system.



Filter drainage.



Green swale.

PASSIVE TREATMENT SYSTEMS

Eliminating and decomposing water pollutants at the end of the treatment process:

Filtering strips: sections of terrain with vegetation and a slight slope designed to receive and filter the layer of runoff by trapping solids and oils.

Detention tanks: depressions designed to slow up the

runoff from storms for a few hours and allow for sedimentation of the suspended solids

Retention pools: depressions in the land with a permanent volume of water

Artificial wetlands: extensive areas of shallow water with typical marsh or natural wetland vegetation.



Filter strip.



Artificial wetland.



Detention tank.



Retention pool.

PREVENTATIVE MEASURES

Aimed at achieving good practices in cities:

Minimising surface runoff in cities.

Draining towards green areas instead of diverting the water to the sewers.

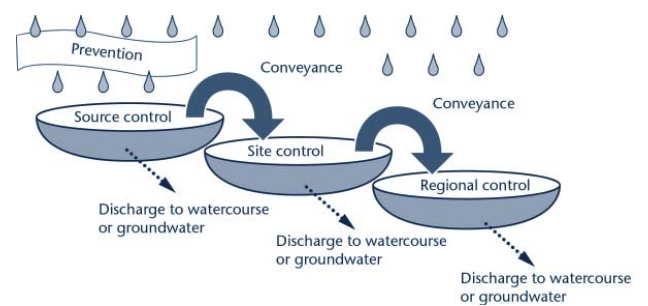
Collecting rainwater for later use: irrigation, cisterns, washing machines...

Keeping the city clean regularly.

Creating awareness about sources of pollution: workshops, hospitals, etc.

Minimising the use of herbicides and fungicides in parks.

Education about the agents involved in designing and maintaining Cities.



Applications

The Tragsa group has begun to introduce these techniques in projects being carried out, thereby improving the environmental quality of cities.



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