

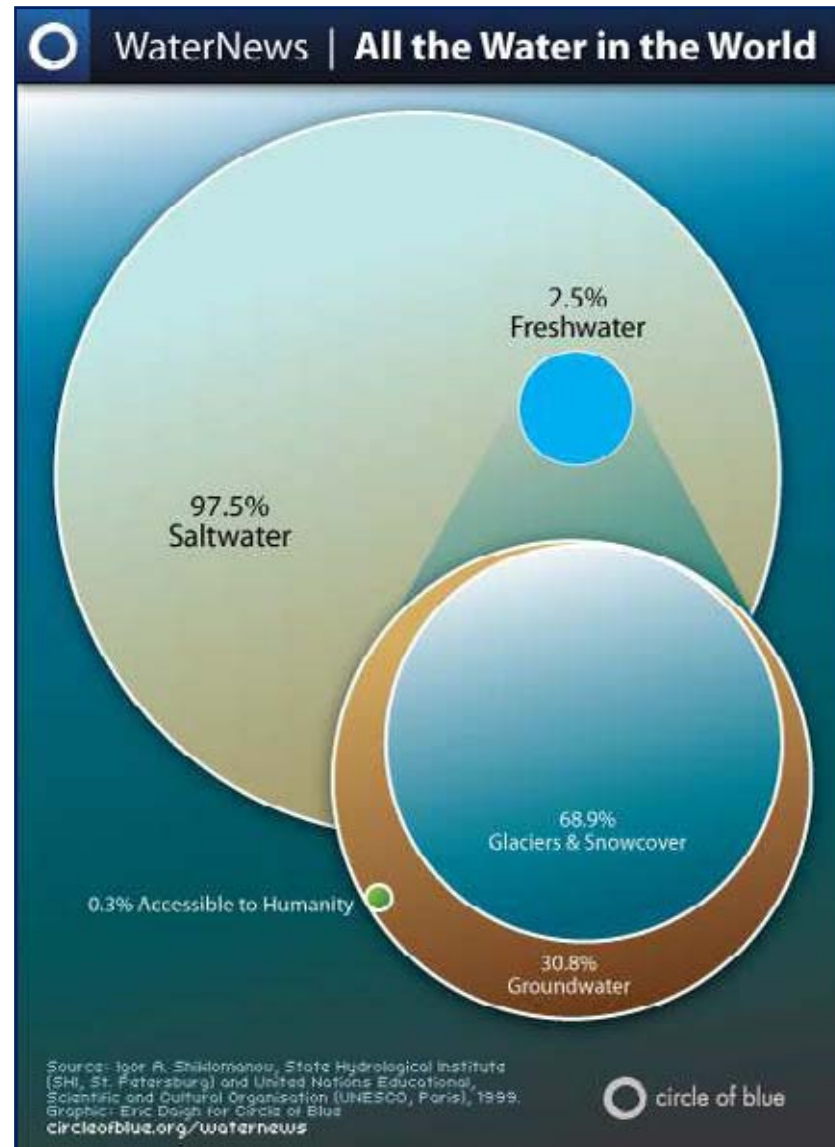


# **EFFECTIVE USE OF WATER AND ENERGY**

## **IN ARCHITECTURE AND URBAN PLANNING APPLICATIONS**

**CENTRE FOR SCIENCE & ENVIRONMENT  
SEPTEMBER 2013**

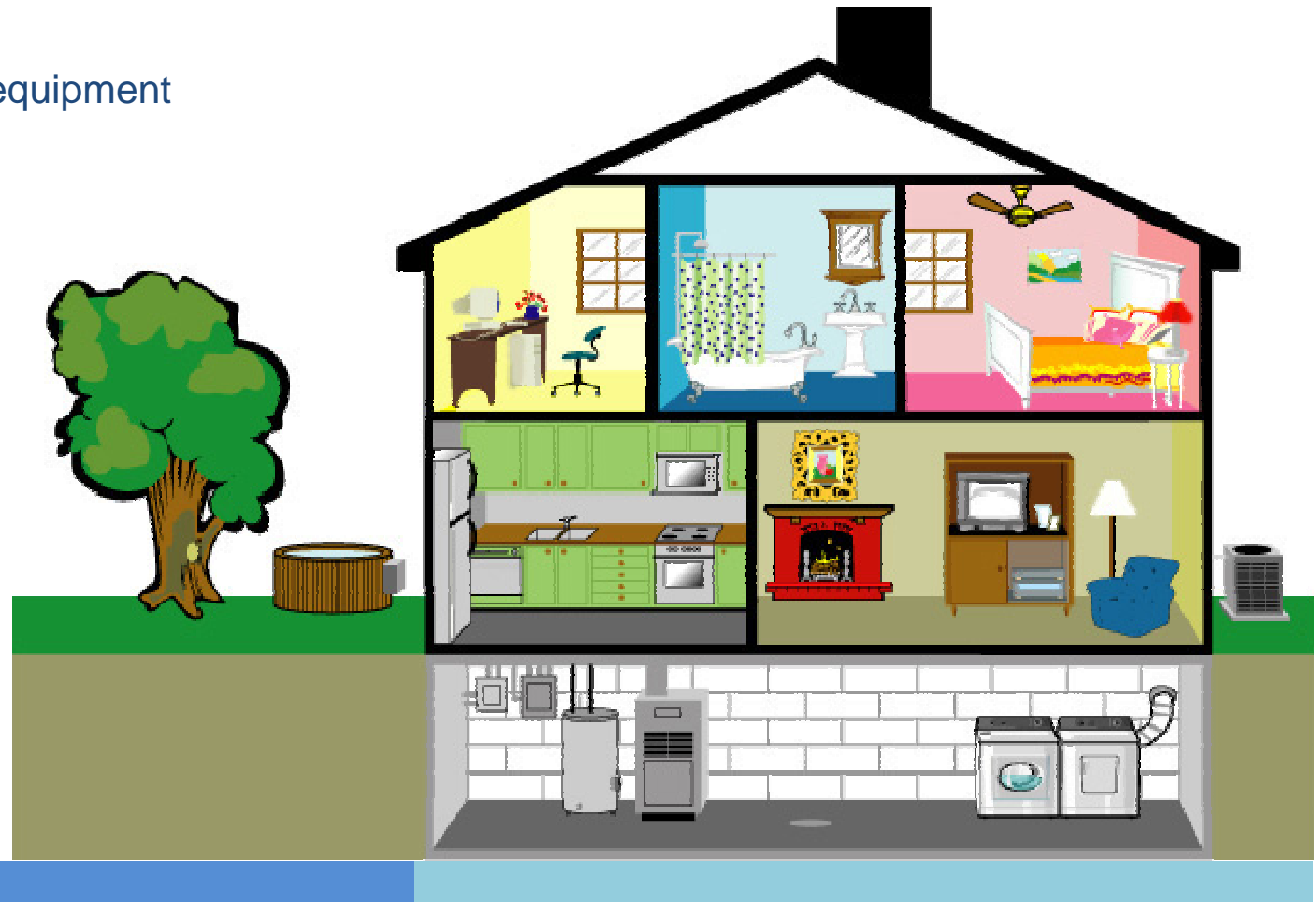
# HOW MUCH FRESH WATER IS AVAILABLE ON THE EARTH?



# TYPICAL HOME ENERGY CONSUMPTION

## COULD IT BE REDUCED THROUGH USING WATER?

- ⌘ Air conditioning/Heating
- ⌘ Lighting
- ⌘ Miscellaneous equipment

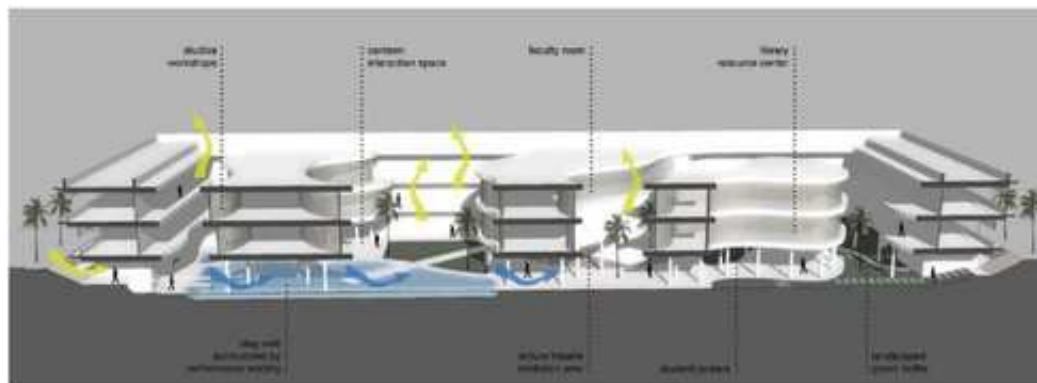


# WATER EFFICIENCY

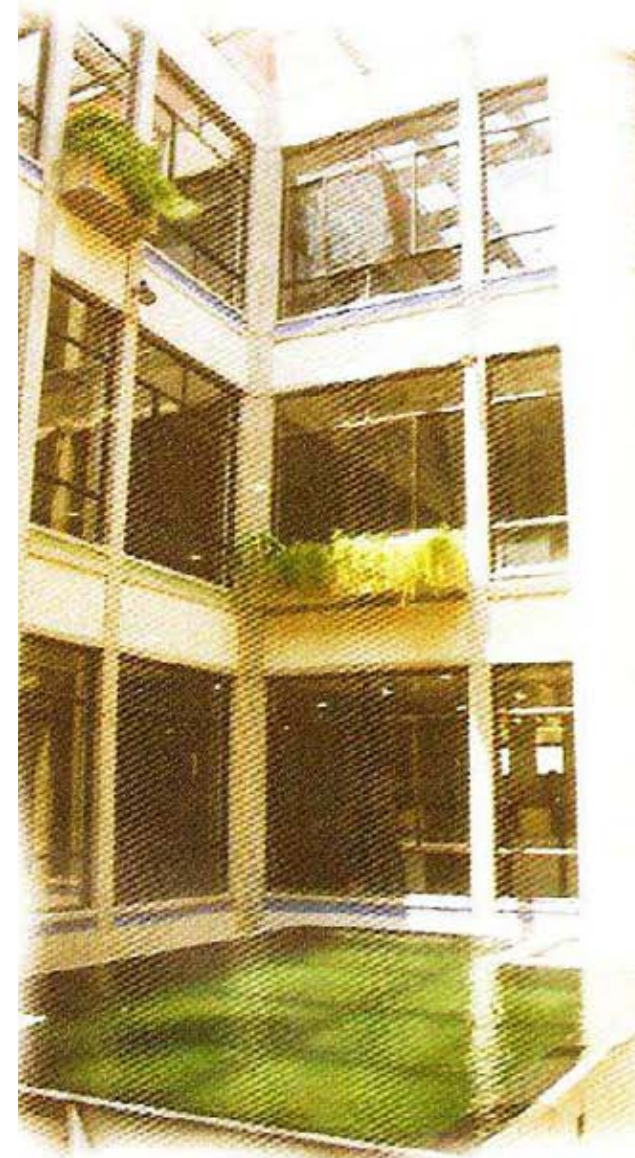
- ❧ Freshwater availability
- ❧ Water consumption pattern in buildings
- ❧ Approach in design
- ❧ Water-efficient landscaping
- ❧ Innovative wastewater technologies



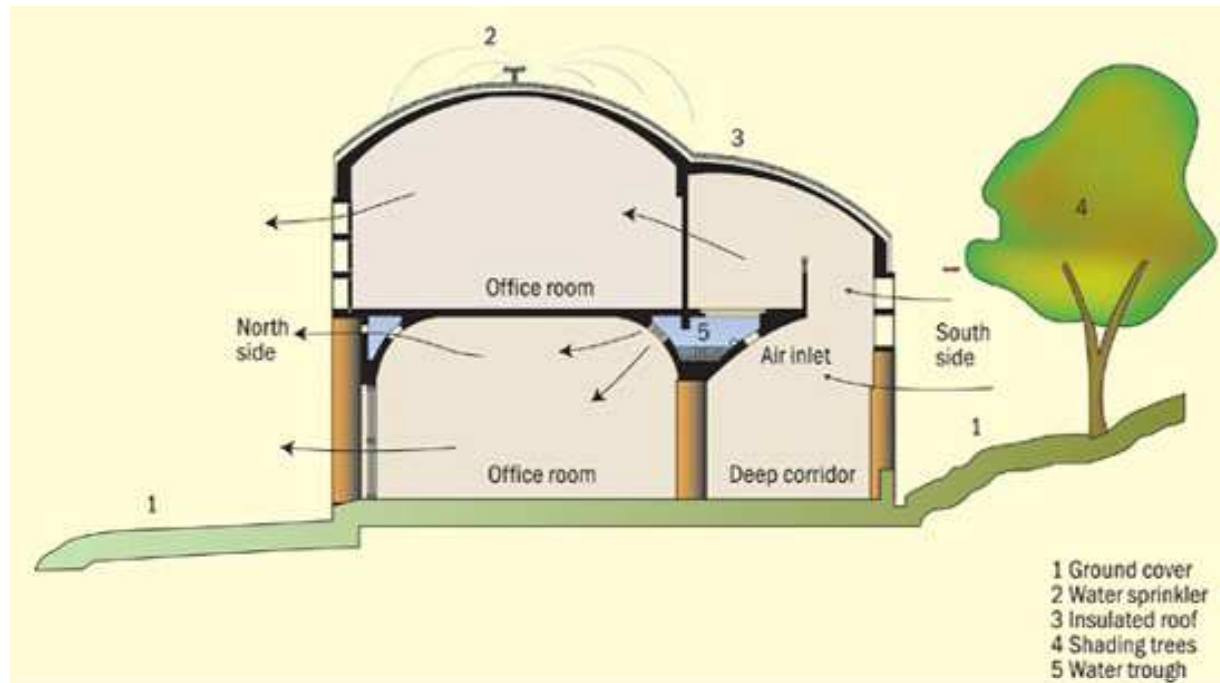




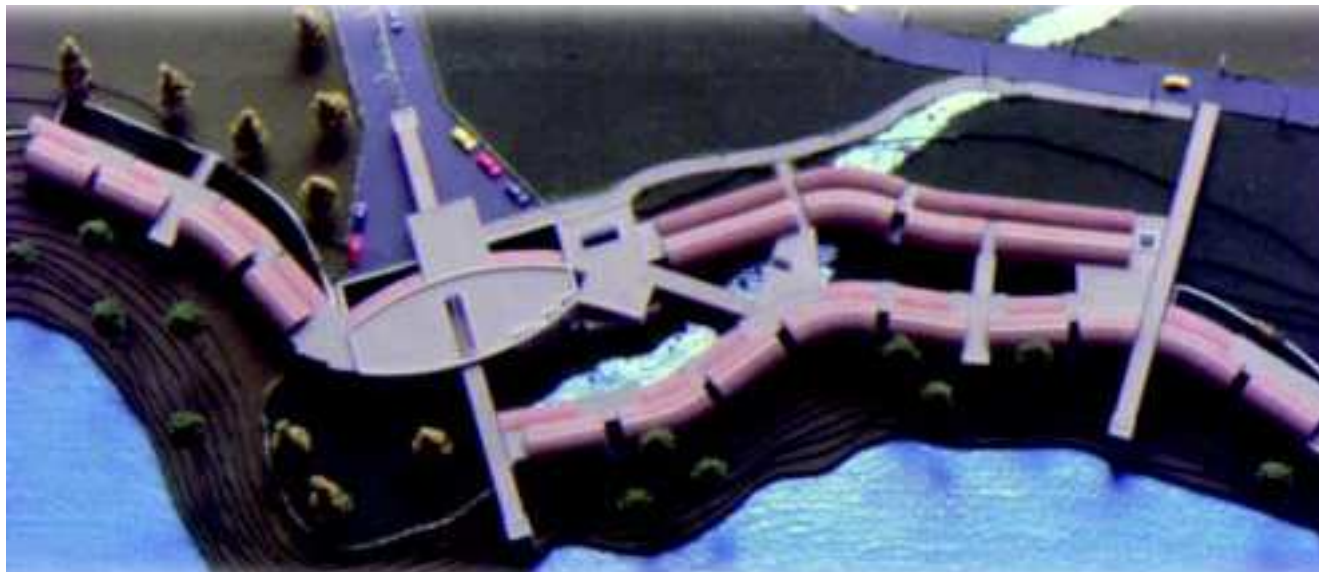
Micro- Climates and temperature regulation through water bodies

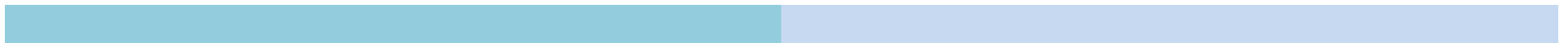






A typical section showing passive solar features of WALMI buildings













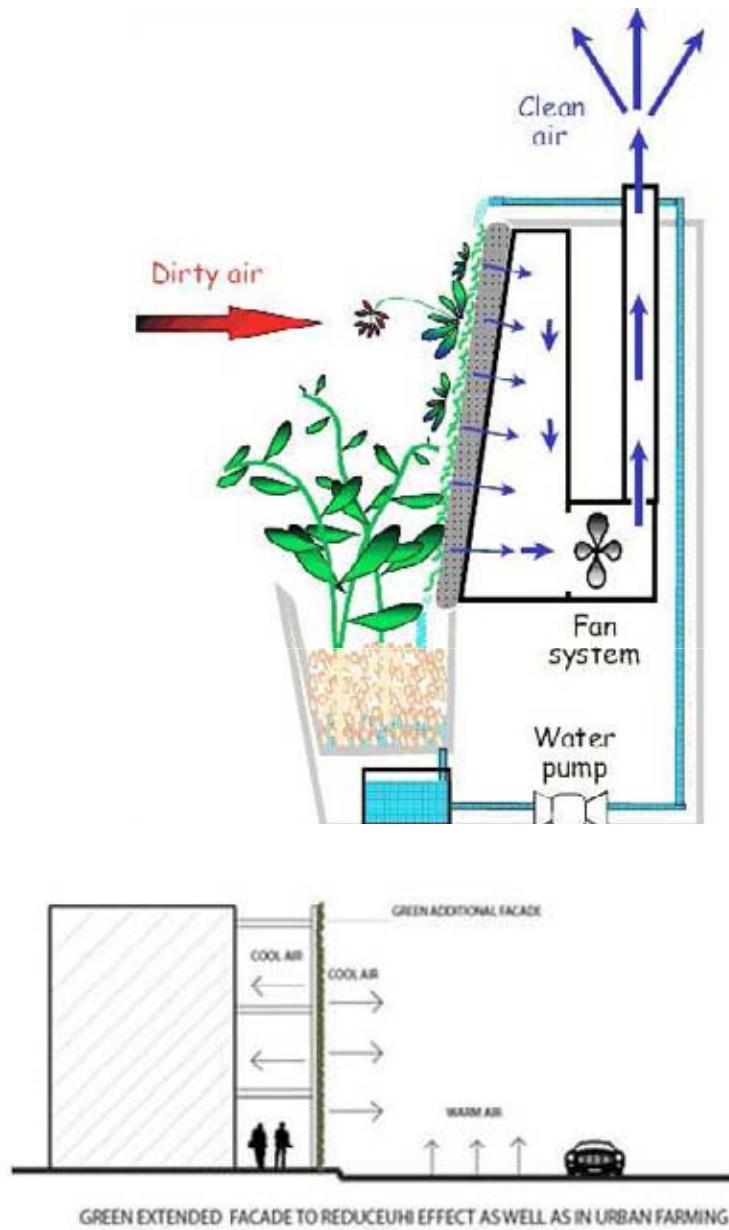
STRUCTURAL COOLING Through green walls, facades & roofs





Mozaic reference projects: Green roof Utilization





## GREEN WALLS AND BIOFILTERS





## TENSILE GRID SYSTEM

Powder coated wire hanging structure — designed to take the elements and provide structural integrity to the system

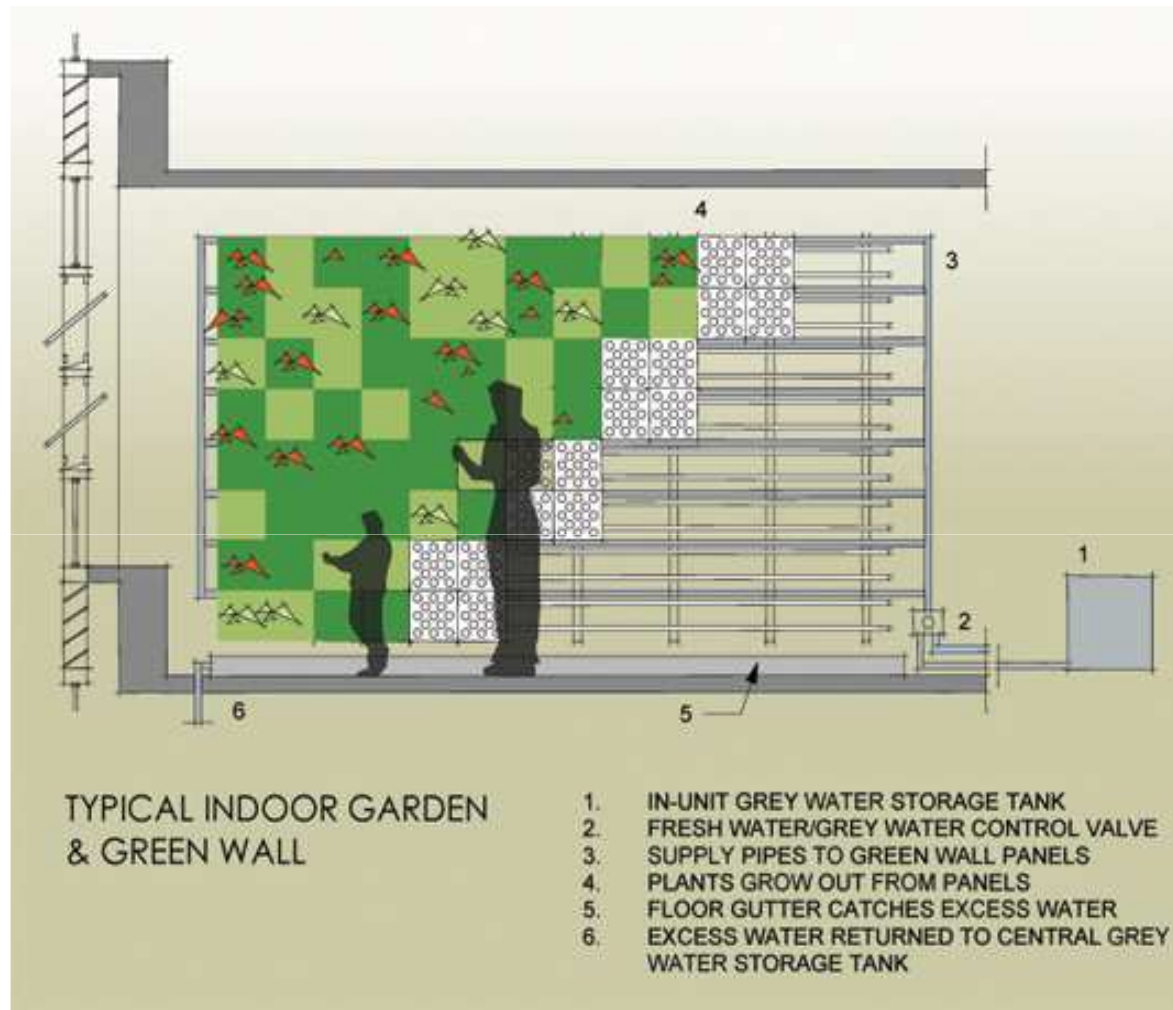
Drip Irrigation channel — allows for easy installation of irrigation system. (Irrigation line not included with the panel)

Easy planting — just cut a slit into the foam panel and insert stage IV liners or 3" starter plants. They adapt quickly to their new environment. No need to pre-grow panels



## GREEN WALL SYSTEMS

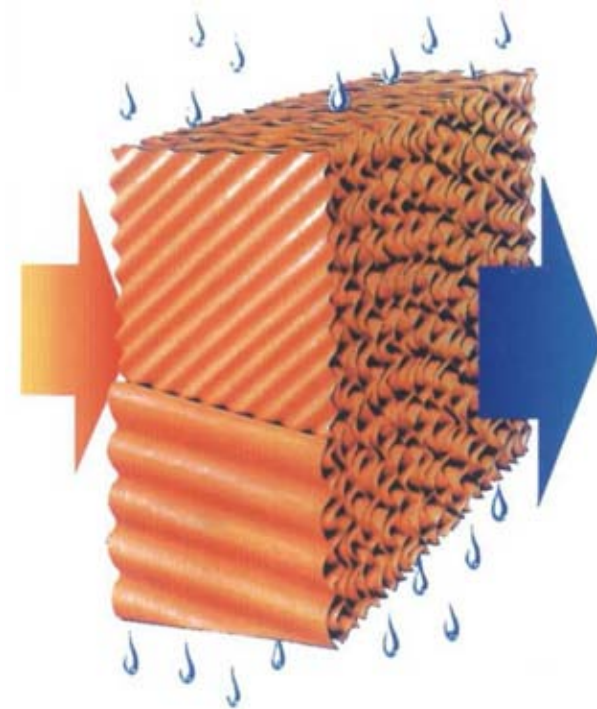
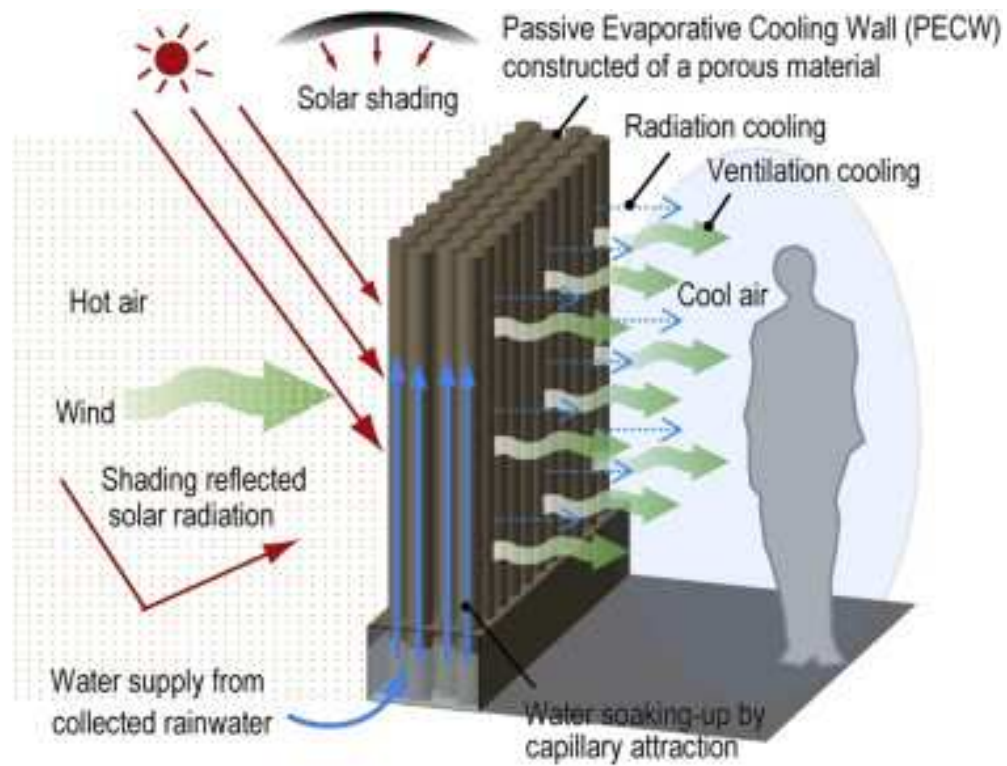




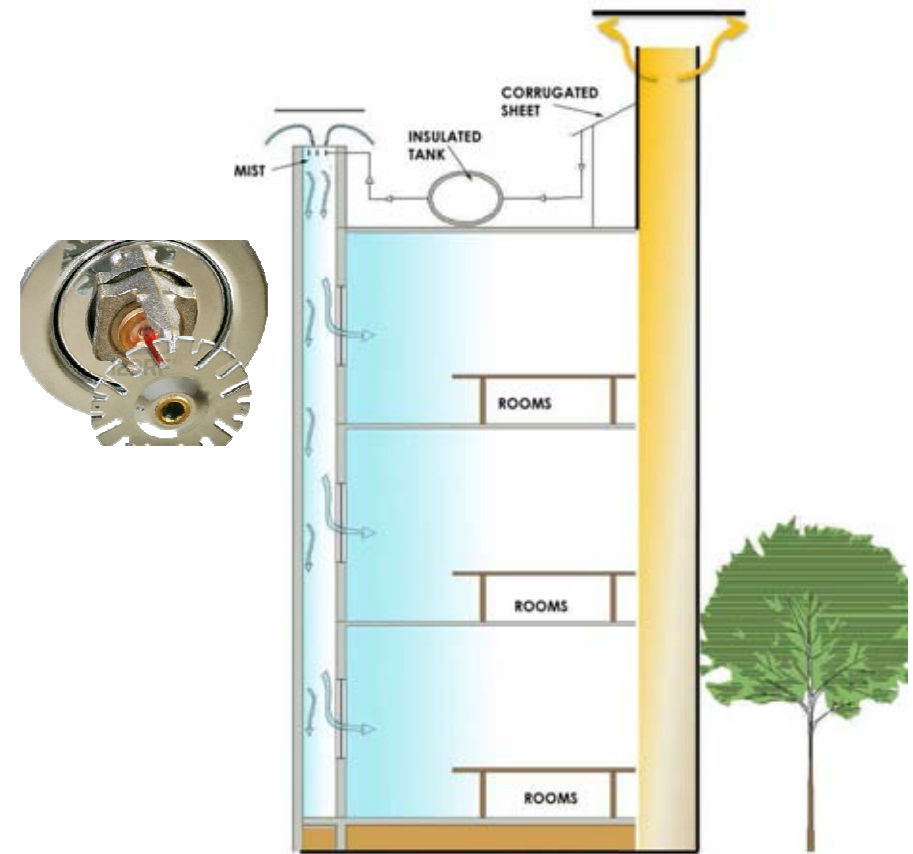




Mozaic reference project

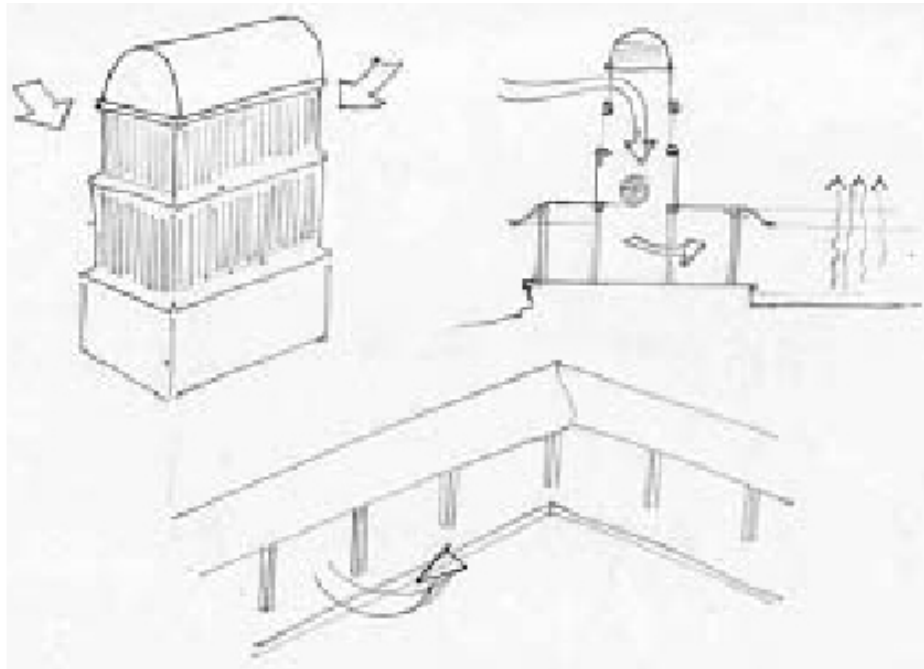


EVAPORATIVE COOLING



STACK EFFECT AND PASSIVE EVAPORATIVE DOWNDRAUGHT COOLING





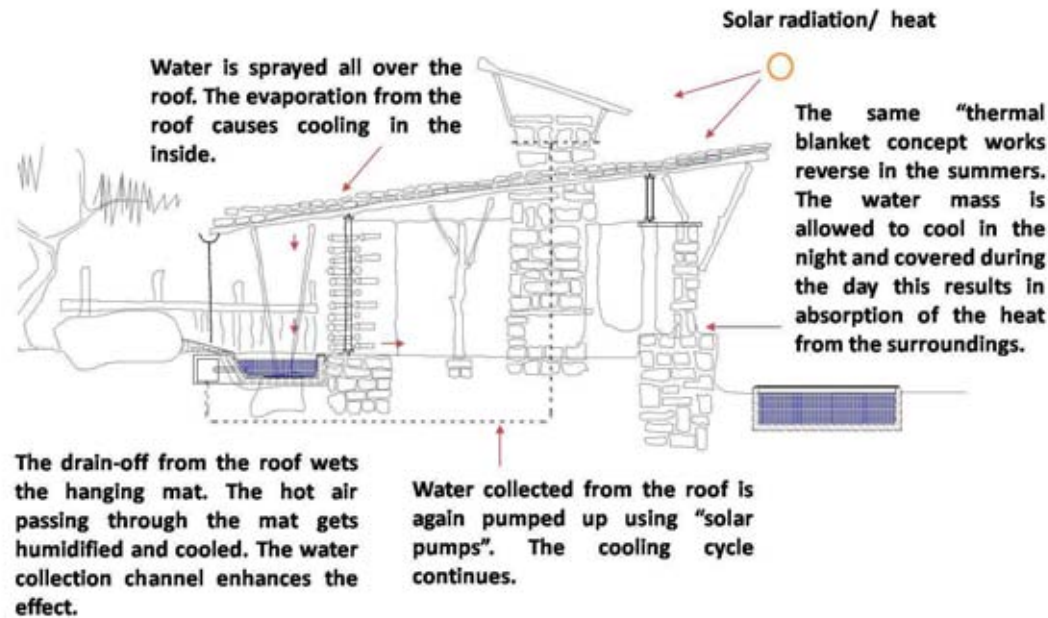
Mozaic reference project: Kannada University



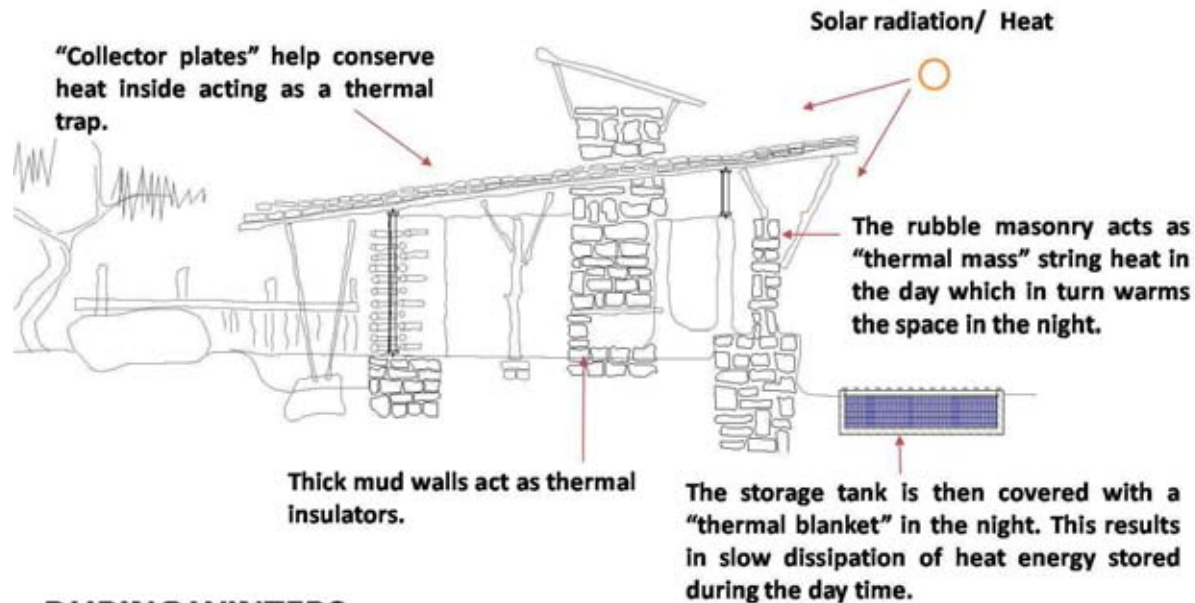
Mozaic reference project: Jungle lodge







### DURING SUMMERS...



### DURING WINTERS...



Mozaic reference project: Office building



*Terraces and the shells allows the day-light to enter the whole building.*

*Solar panels used to generate electricity.*

*Plants growing in boxes on terraces act as living wall bio filters.*

*Plants on the façade as shading devices.*



*Industrial waste used as insulation between walls.*

*Air-conditioned air pumped closer to work level instead of ceiling level.*

*Water cascade on building front to cool it down, water hyacinths clean the water at the same time as part of the Rain Water Harvesting system.*

*Recycled water used for flushing and irrigation .*

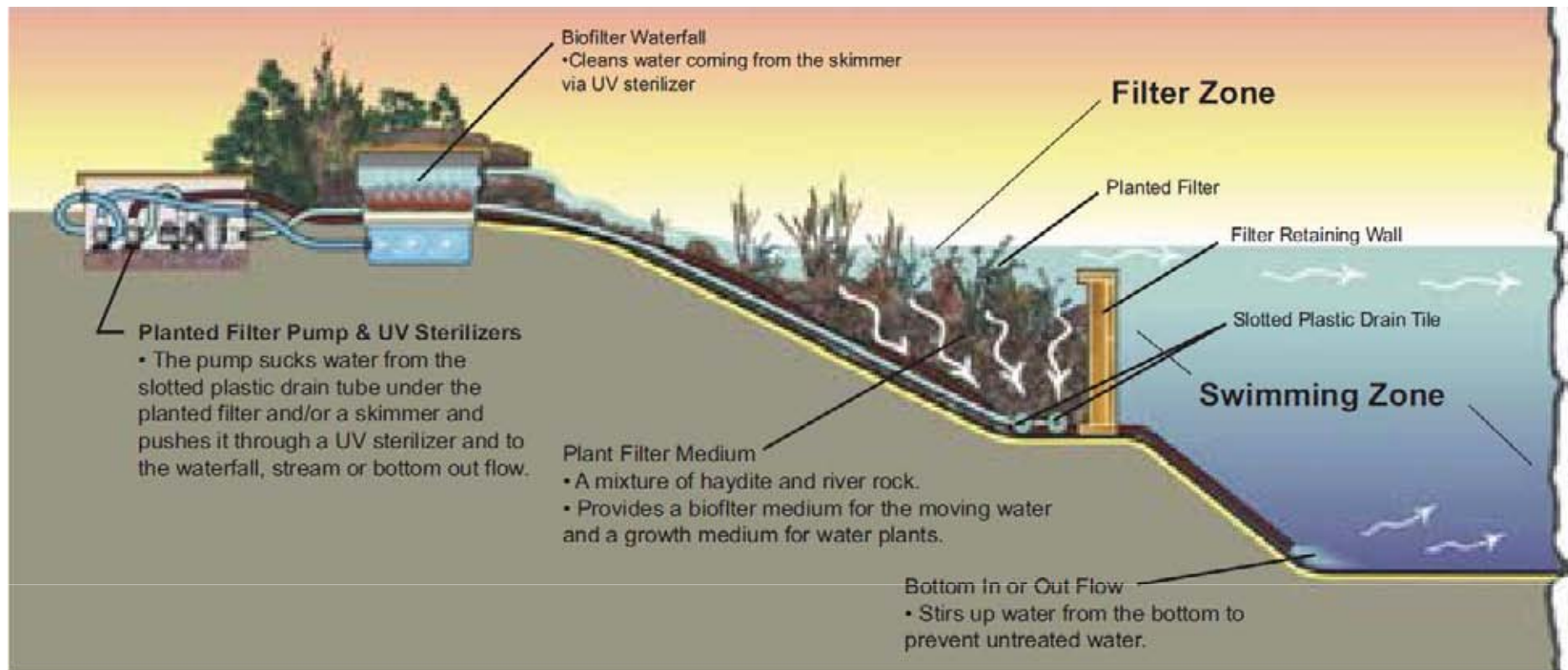
*Building mass cooled by peripheral water channel .*





## STORMWATER PLANTERS

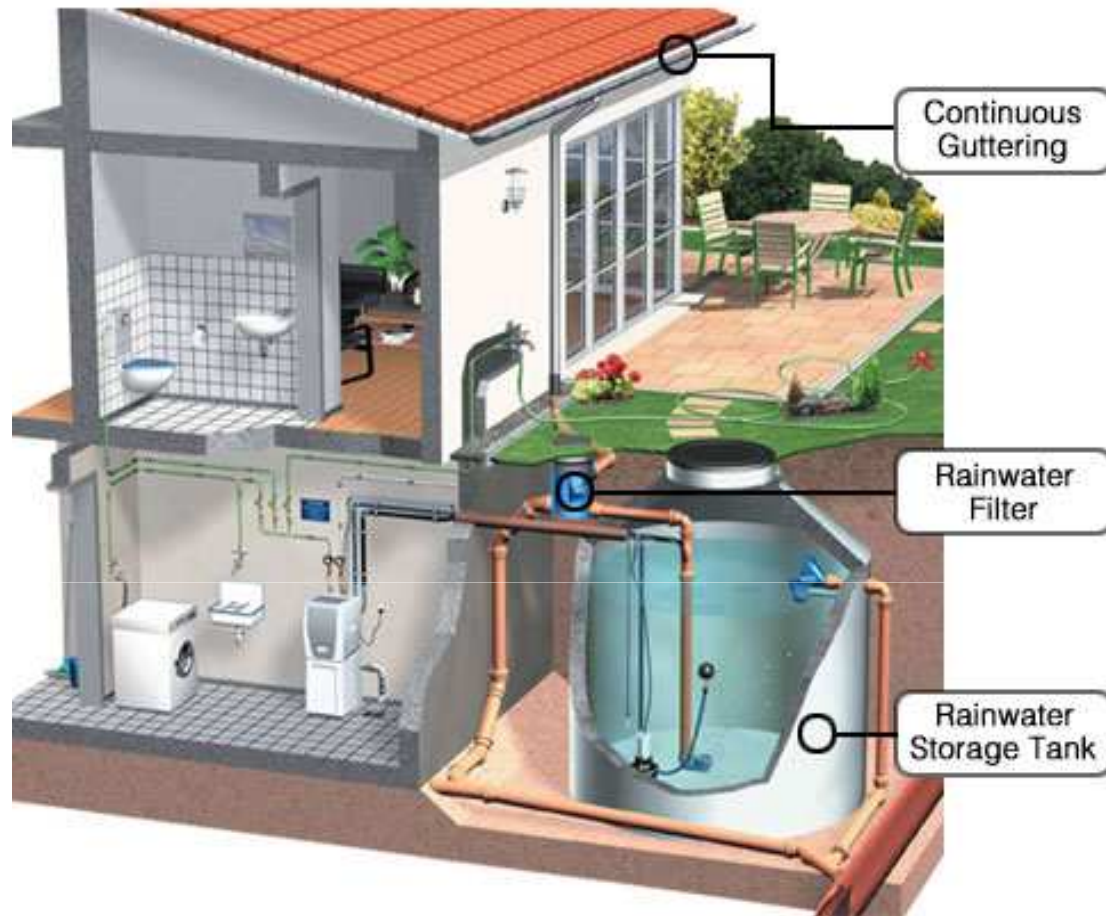




Natural pools

Semi-pervious pathways

RAIN WATER HARVESTED IN A NATURAL POOL THROUGH ROOF RUNOFF & PAVED SURFACES



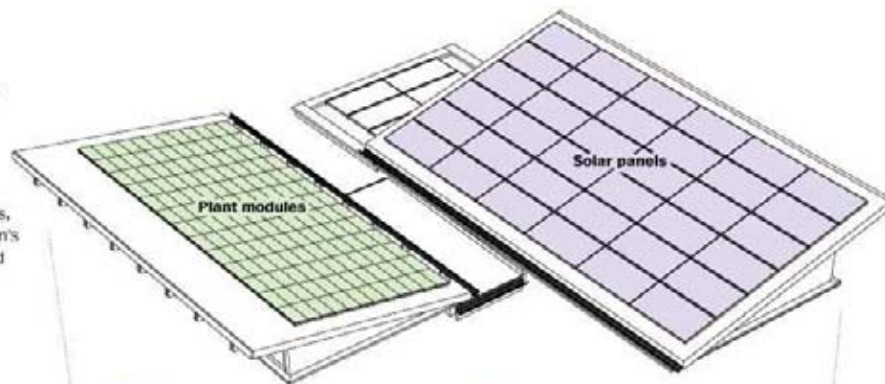
Rainwater Harvesting for 2400 sq.ft. of surface area  
can harvest 700 ltr/day



## WaterShed's main features:

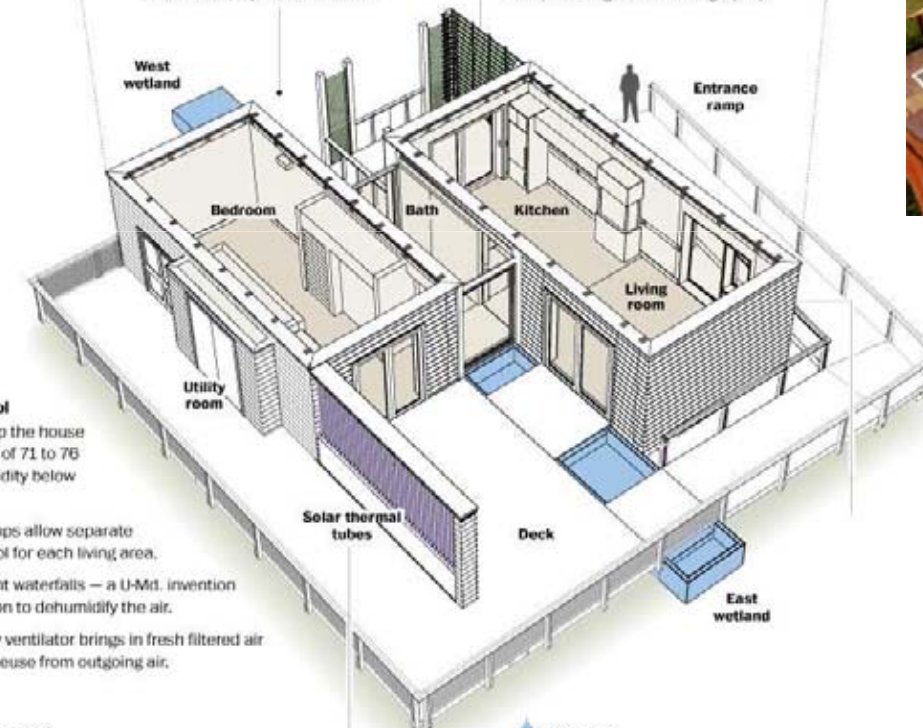
### Green roof

Modules contain soil and six types of sedums, which block the sun's heat and catch and filter rainwater.



A garden next to the kitchen grows tomatoes, beans, peppers, cucumbers, squash and herbs.

Vines form a 12-foot wall that provides shade, privacy and edible fruit (including two kinds of grapes).



### Climate control

Three systems keep the house at the goal climate of 71 to 76 degrees, with humidity below 60 percent.

Mini-split heat pumps allow separate temperature control for each living area.

Two liquid desiccant waterfalls — a U-Md. invention — use a salt solution to dehumidify the air.

An energy recovery ventilator brings in fresh filtered air and pulls heat for reuse from outgoing air.

### Solar water heater

A wall of solar thermal tubes heats the house's water. A conventional water heater serves as backup.

### Wetlands

The east wetland catches and filters rainwater from the solar roof. The west wetland treats "gray water" — water from the washing machine, shower and bathroom sink — and rainwater from the green roof. This water can be reused for irrigation.





Mozaic reference project: Housing project





Area : 3,702 Sq. KM

Average Rainfall : 3005 mm

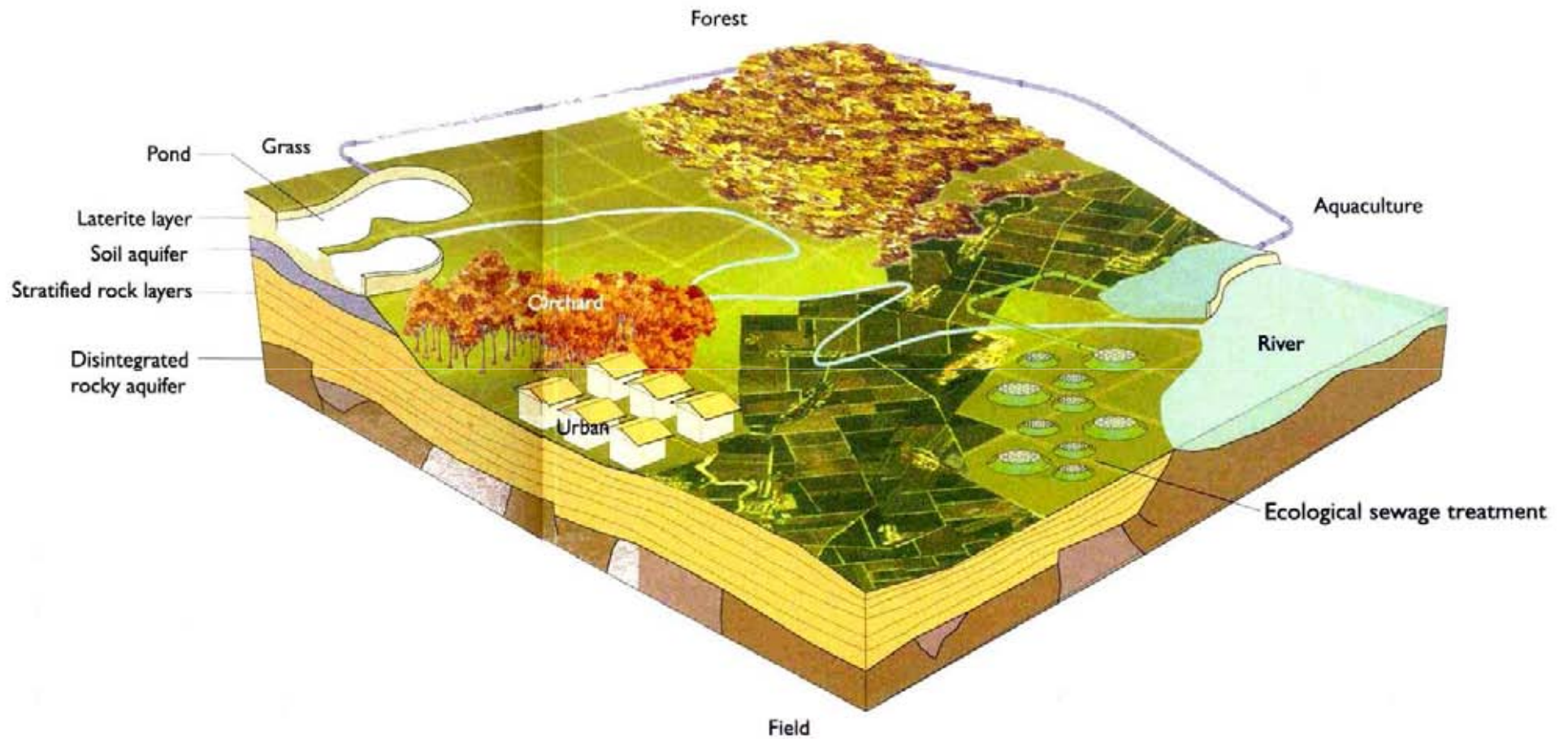
Rainfall Volume : 12957000000000 L per year

Water for the Indian population : 9970 L per person per year

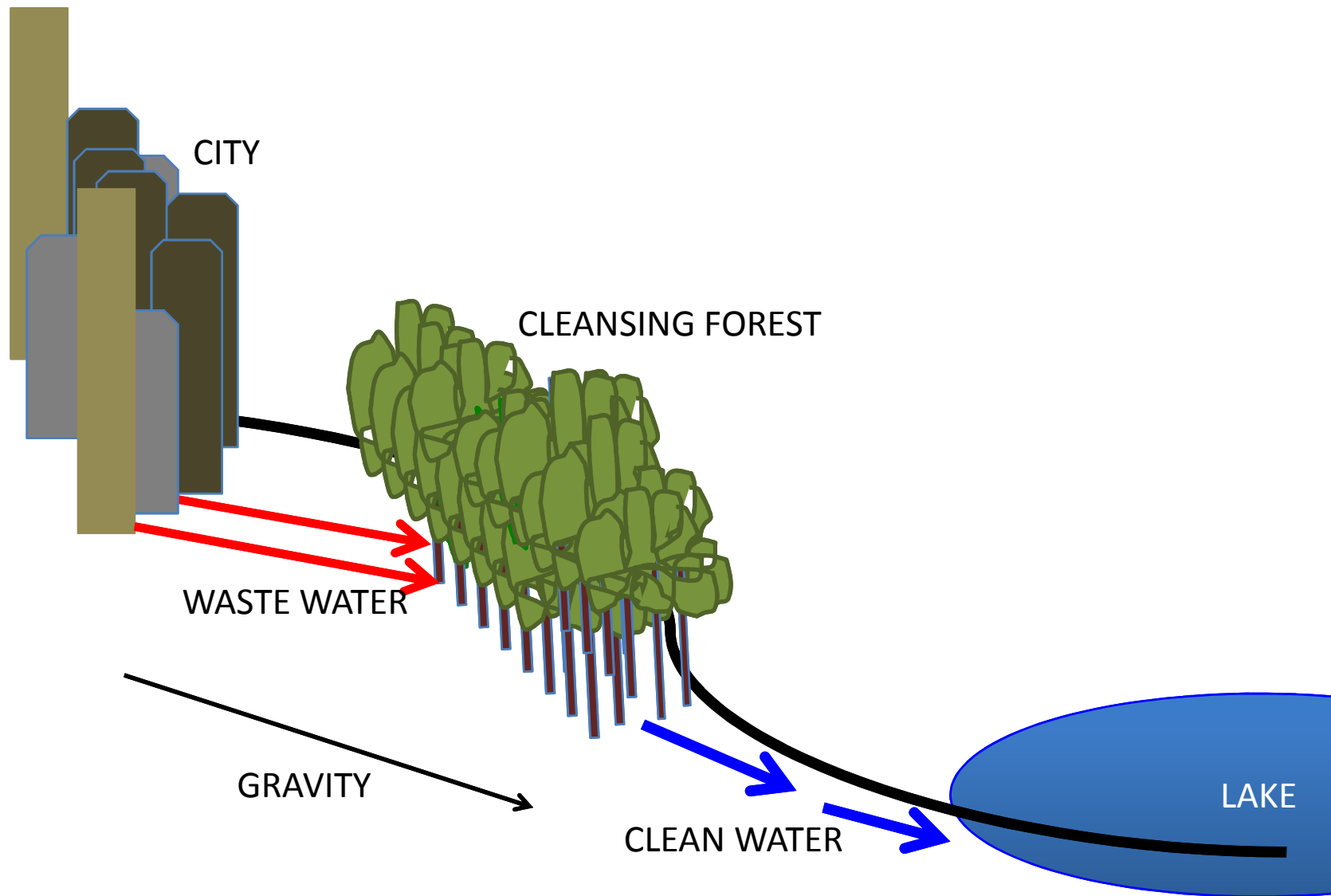
Daily Water provision for the Indian population : 27 L per person daily



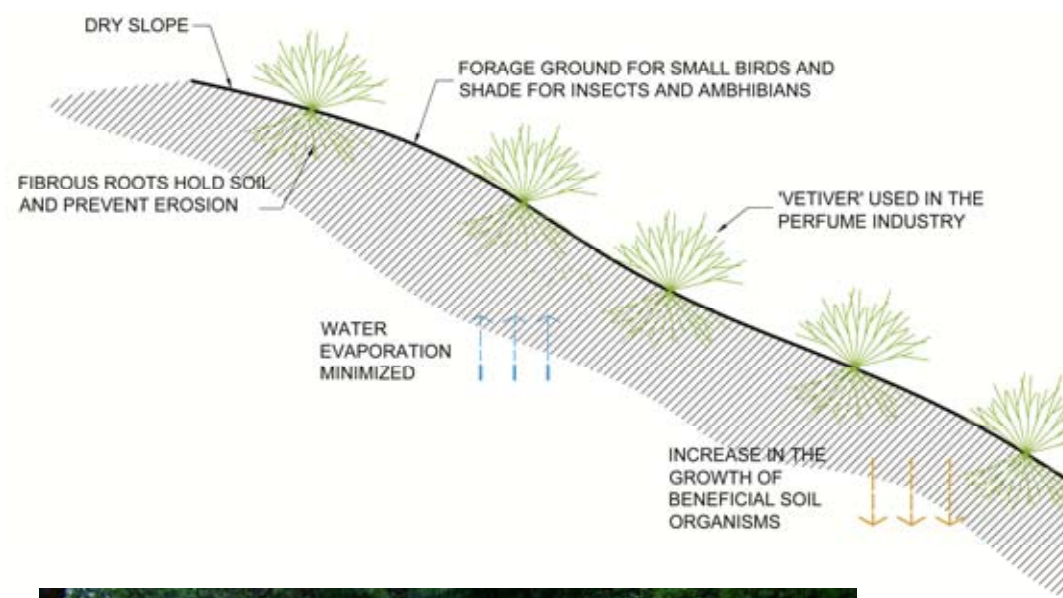




Natural processes in the eco-system

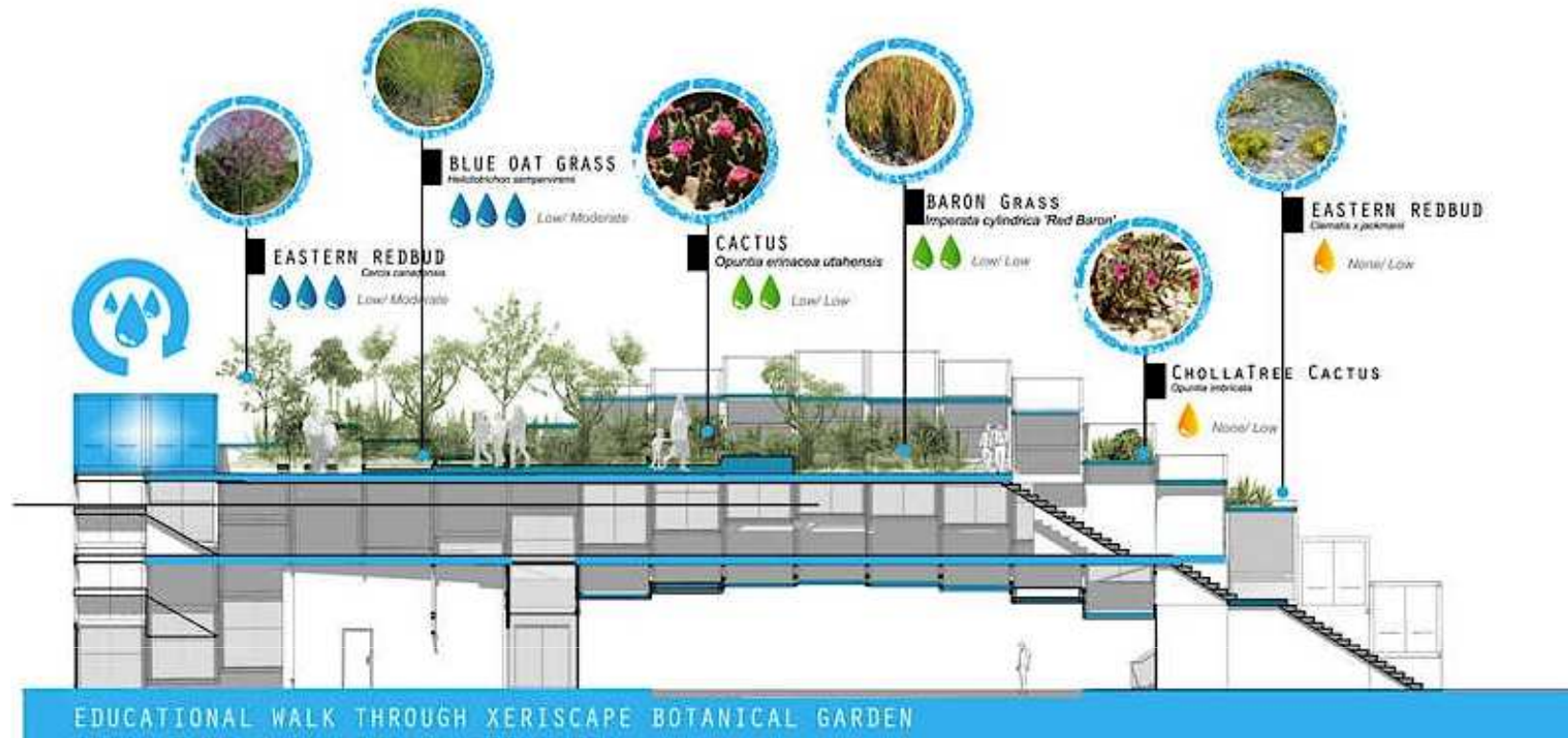






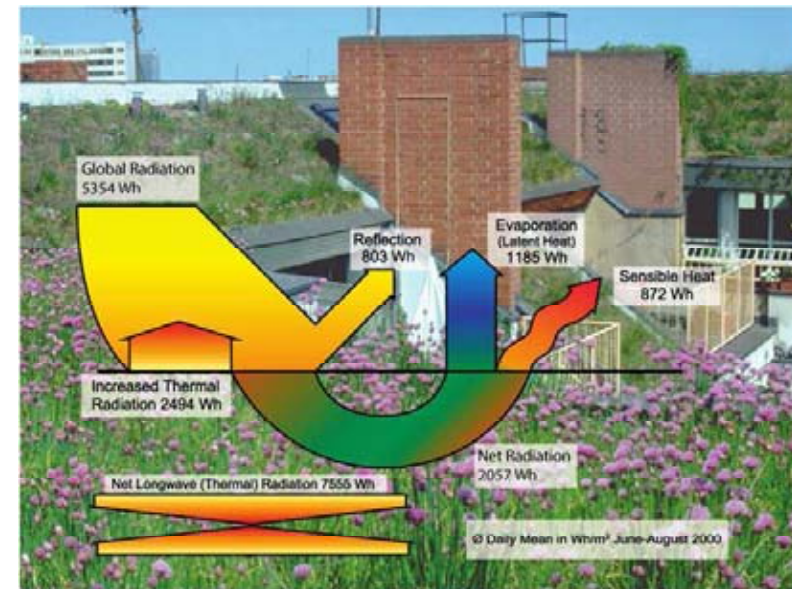
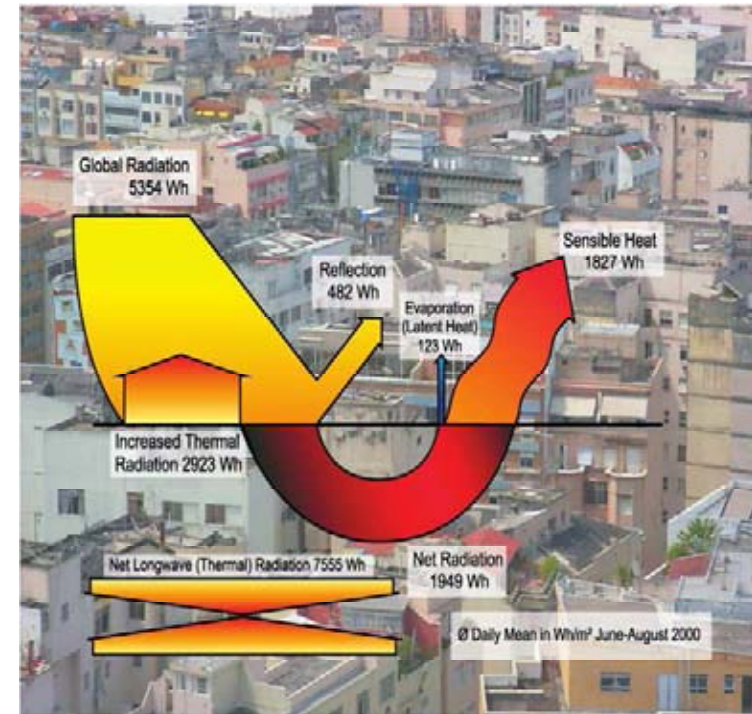
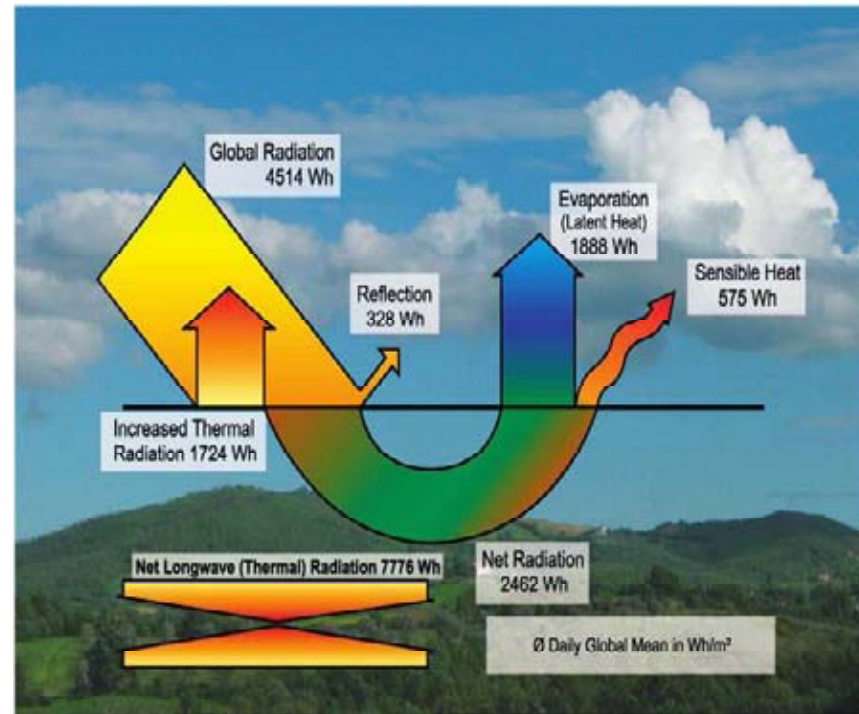
Grass swale to help water retention along slopes thus keeping them green





XERISCAPING



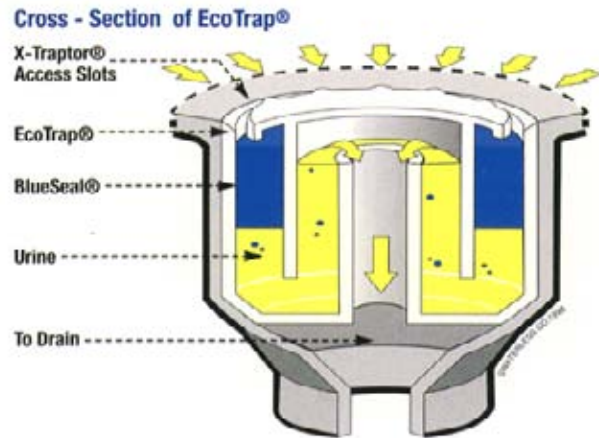


Water used for landscaping improves factors such as radiation, reflection, and evaporation on a large scale



Encouraging bio-diversity in urban areas

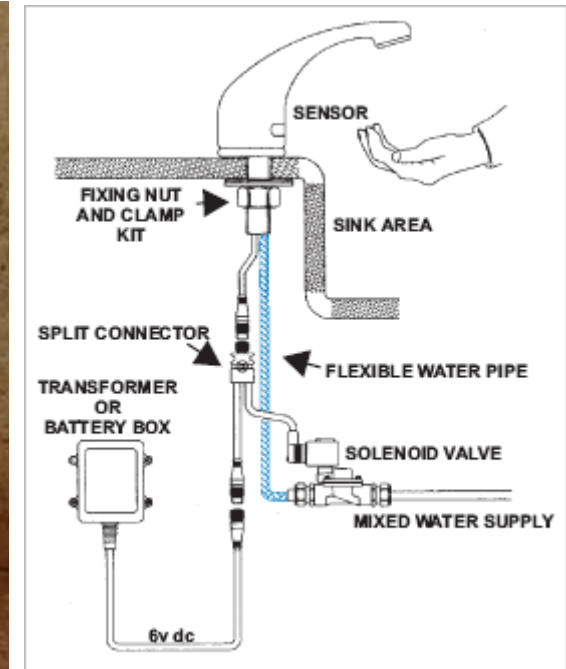




Innovative waterless urinals



Water-saving washing machines



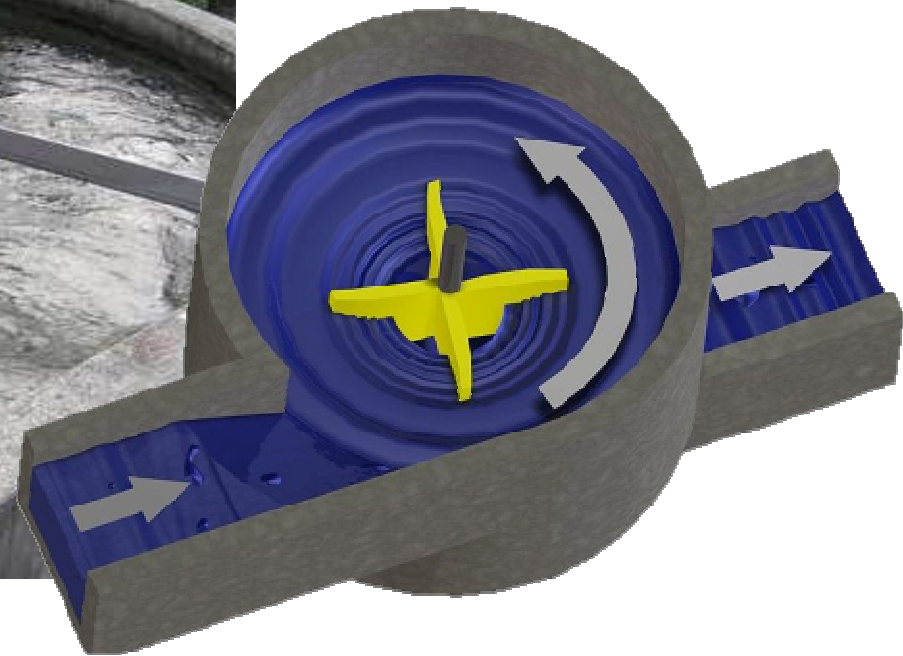
Infrared sensor taps



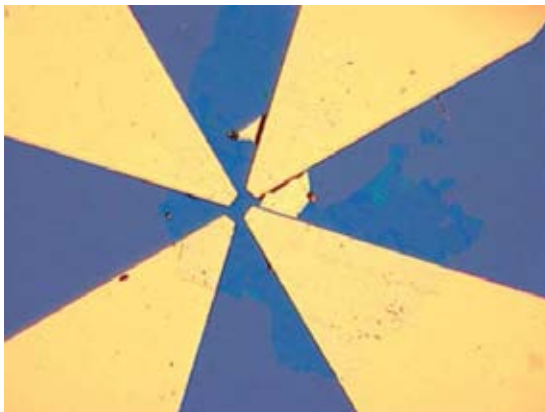
Commode with attached sink



Shower timer



Gravitation water vortex power plant

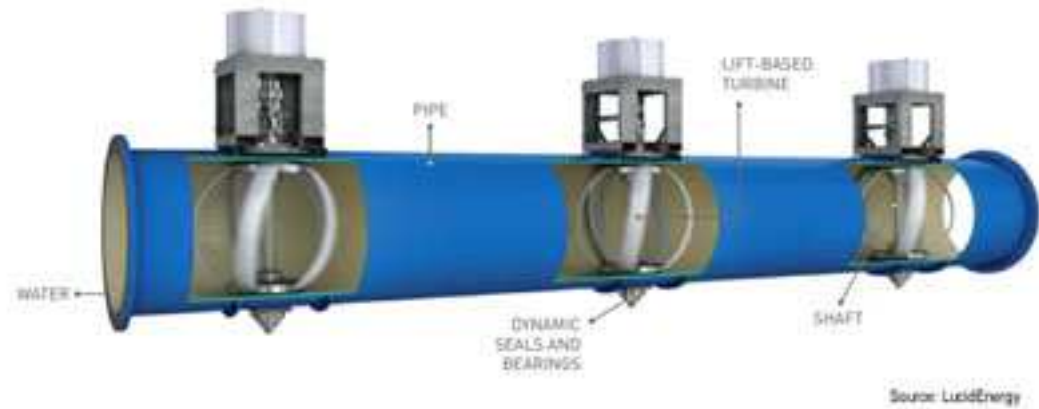


Now researchers at the Rensselaer Polytechnic Institute have developed a new method to harvest energy from flowing water using a **nanoengineered graphene** coating.





Waterhelix project



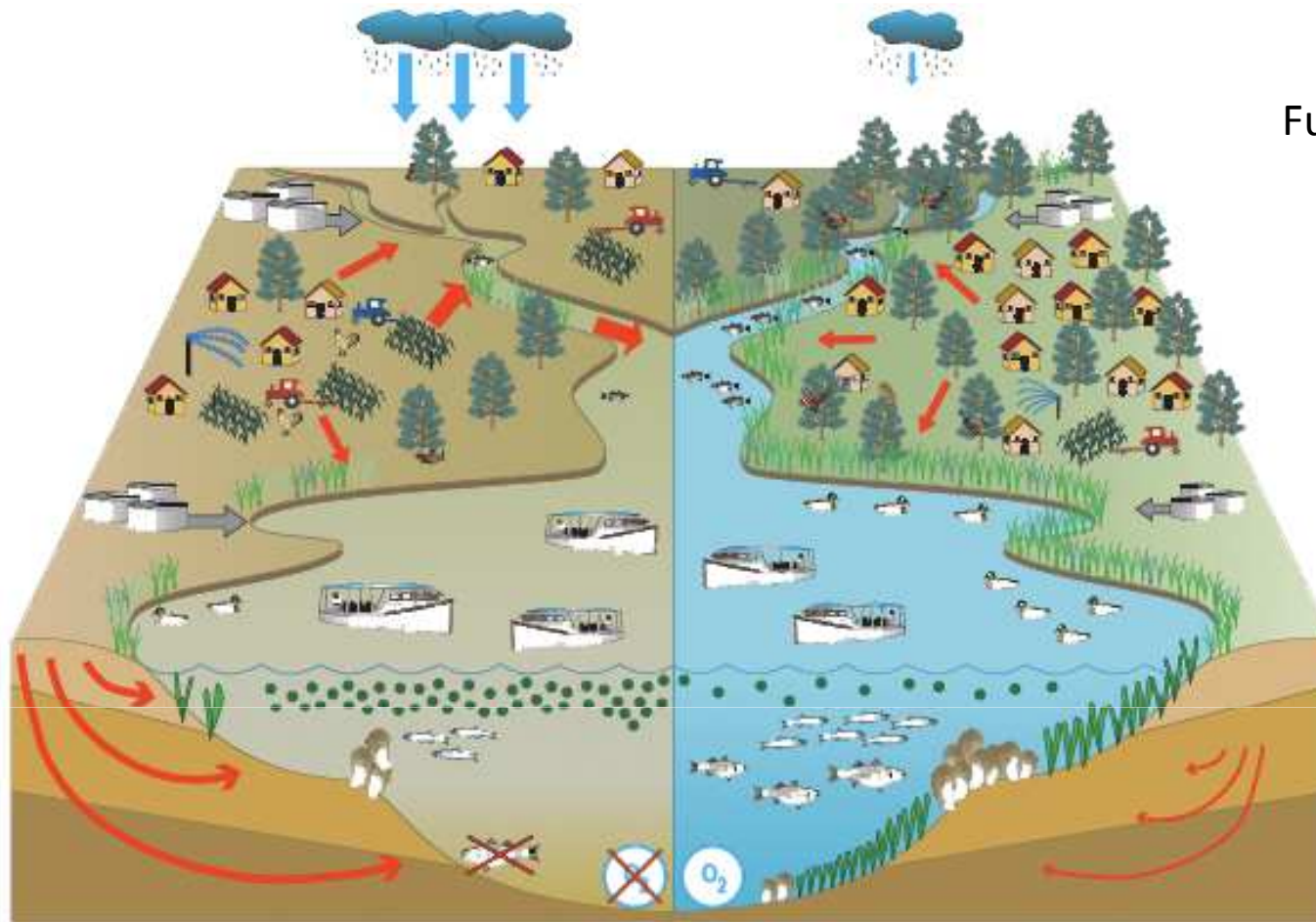
LucidPipe Power System



IN PIPE HYDROPOWER

Present

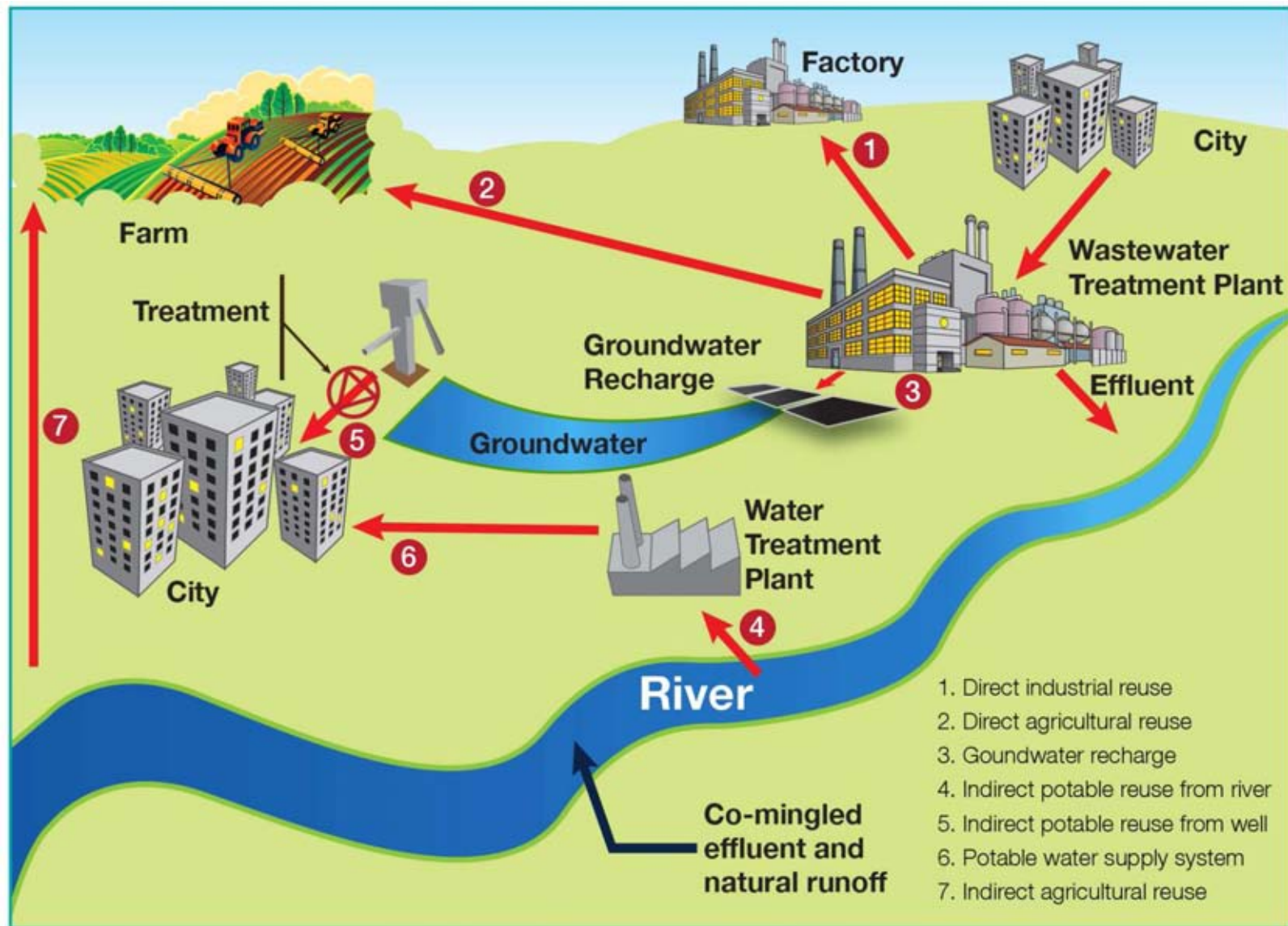
Future



- Water conservation
- Distributed stormwater management
  - Rainwater harvesting
  - Mostly surface drainage
- Distributed water treatment
- Water reclamation and reuse in buildings, irrigation and for ecological stream flow
- Heat and energy recovery from wastewater and potentially from stormwater
- Organic management for energy recovery
- Source separation
- Nutrient recovery

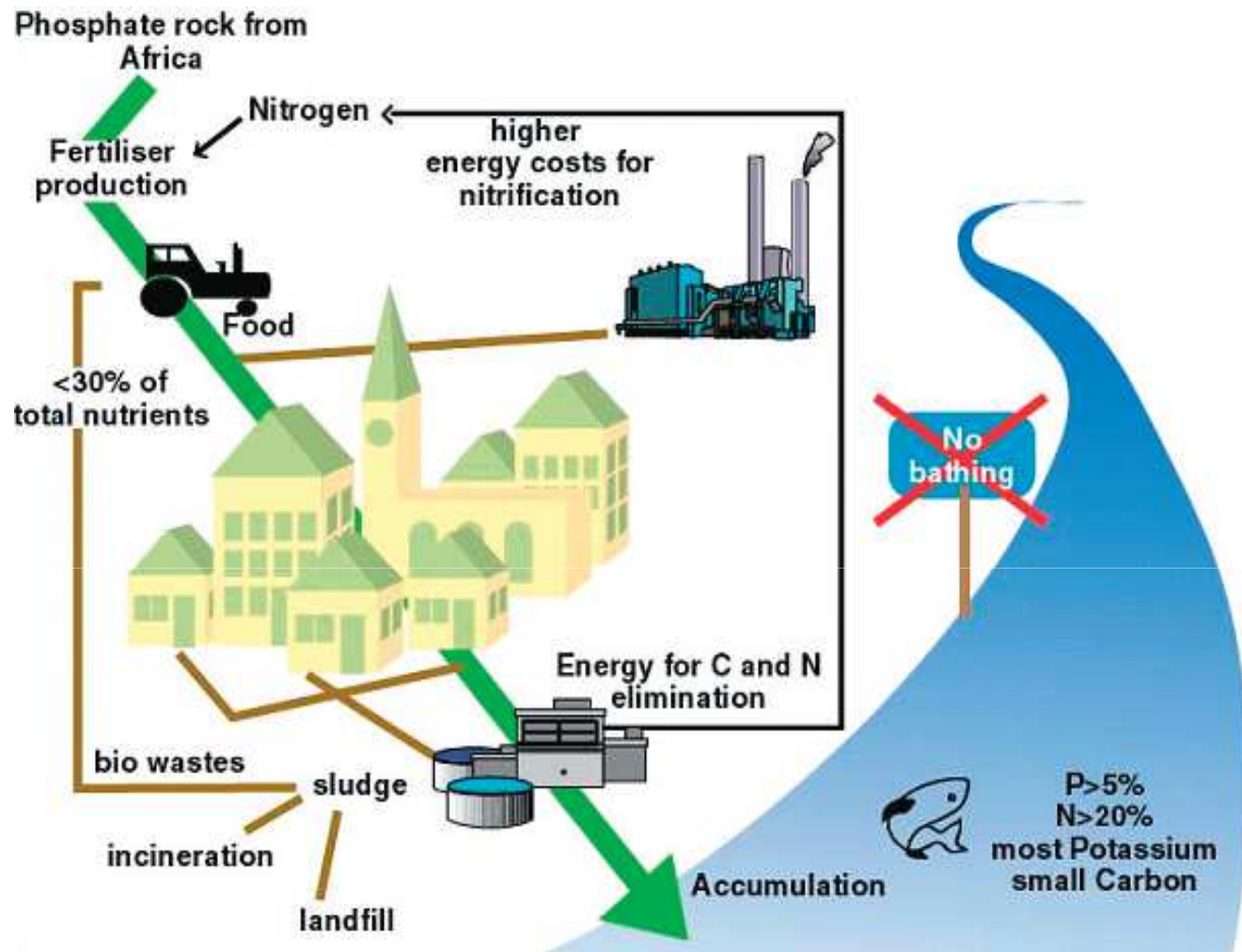
THE ROLE OF WATER SYSTEMS IN THE FUTURE





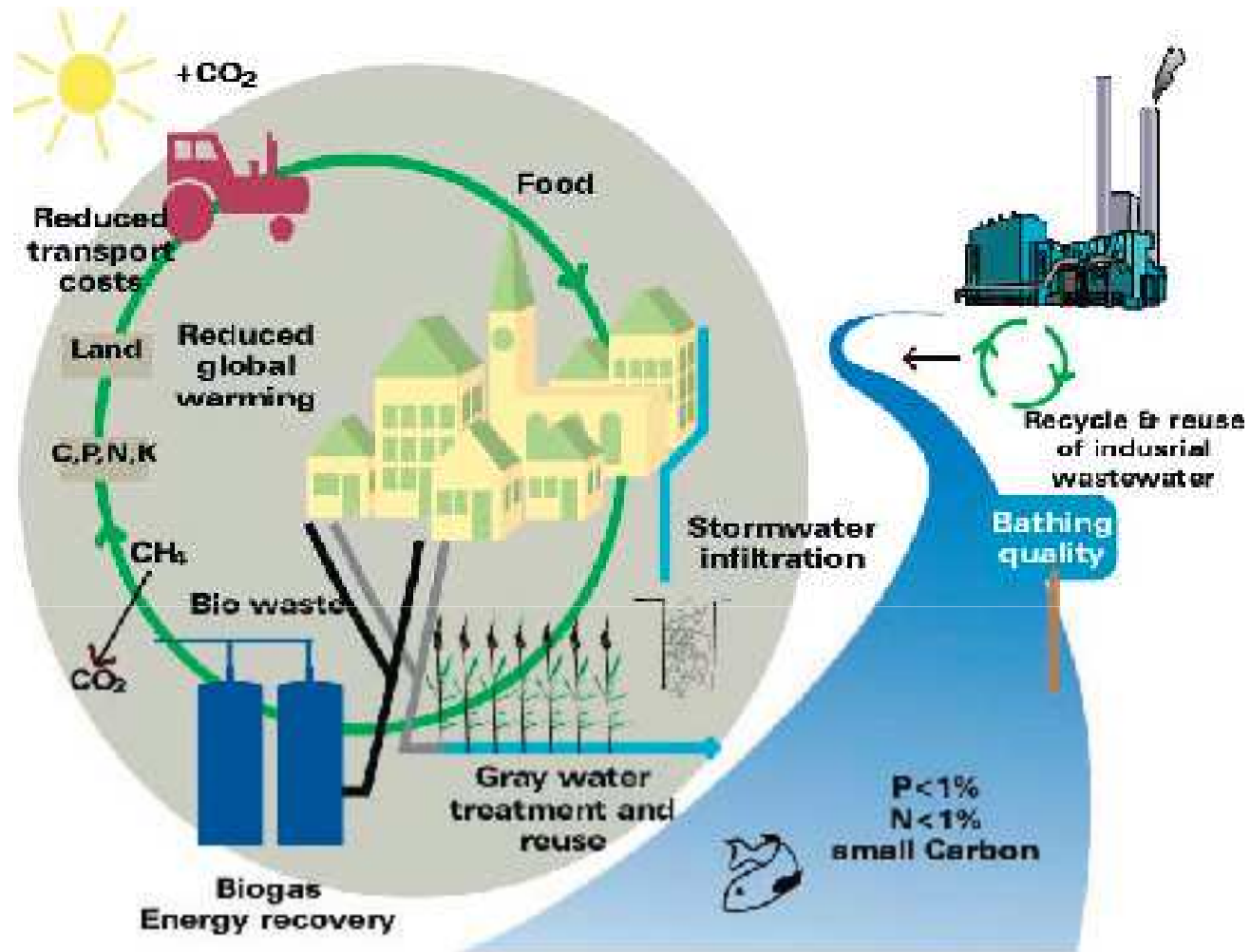
## APPLICATIONS OF WASTE WATER REUSE





CENTRALIZED

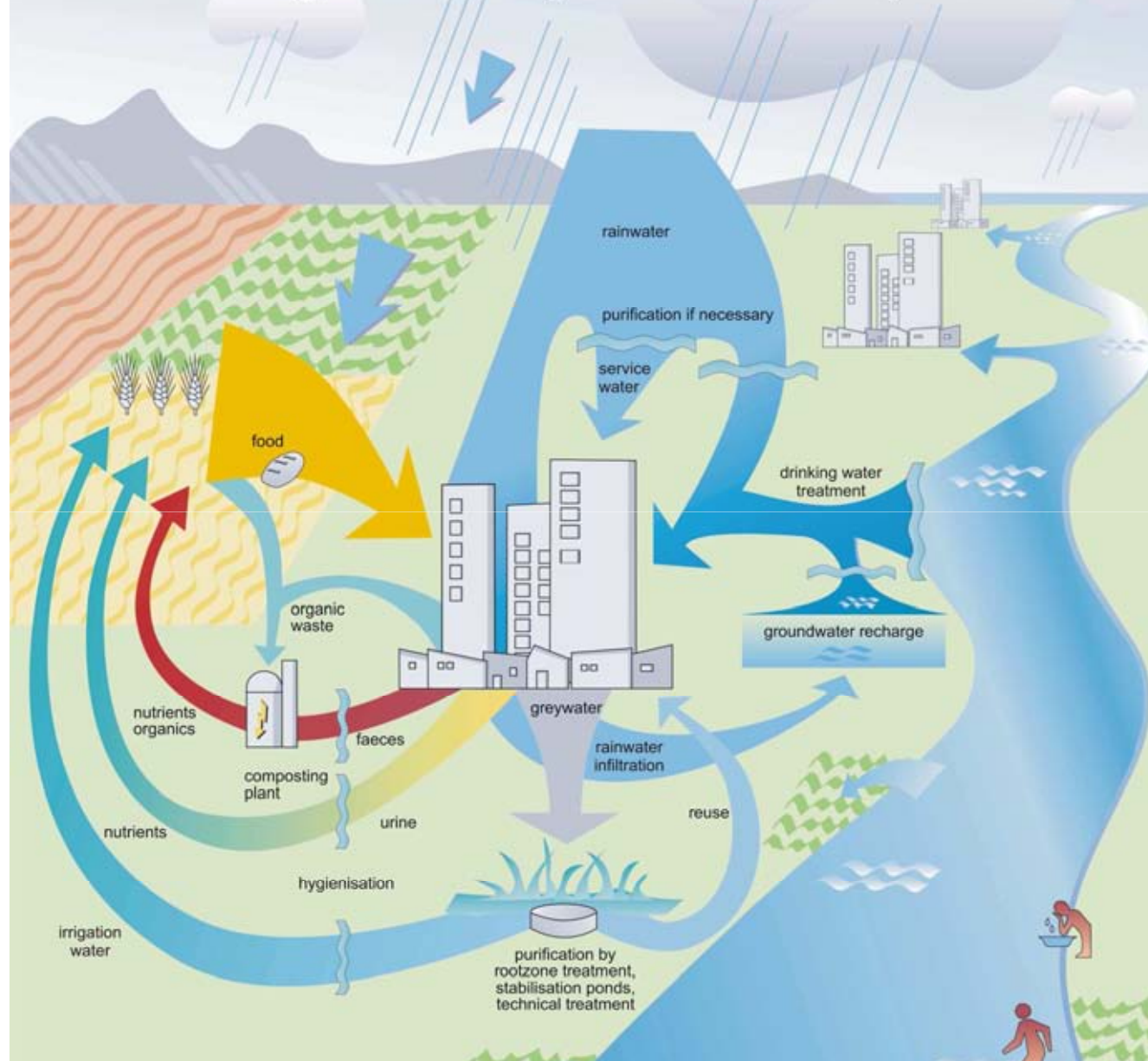
CENTRALIZED VS. DECENTRALIZED WATER SYSTEMS



DE- CENTRALIZED



## advantages of ecological sanitation systems





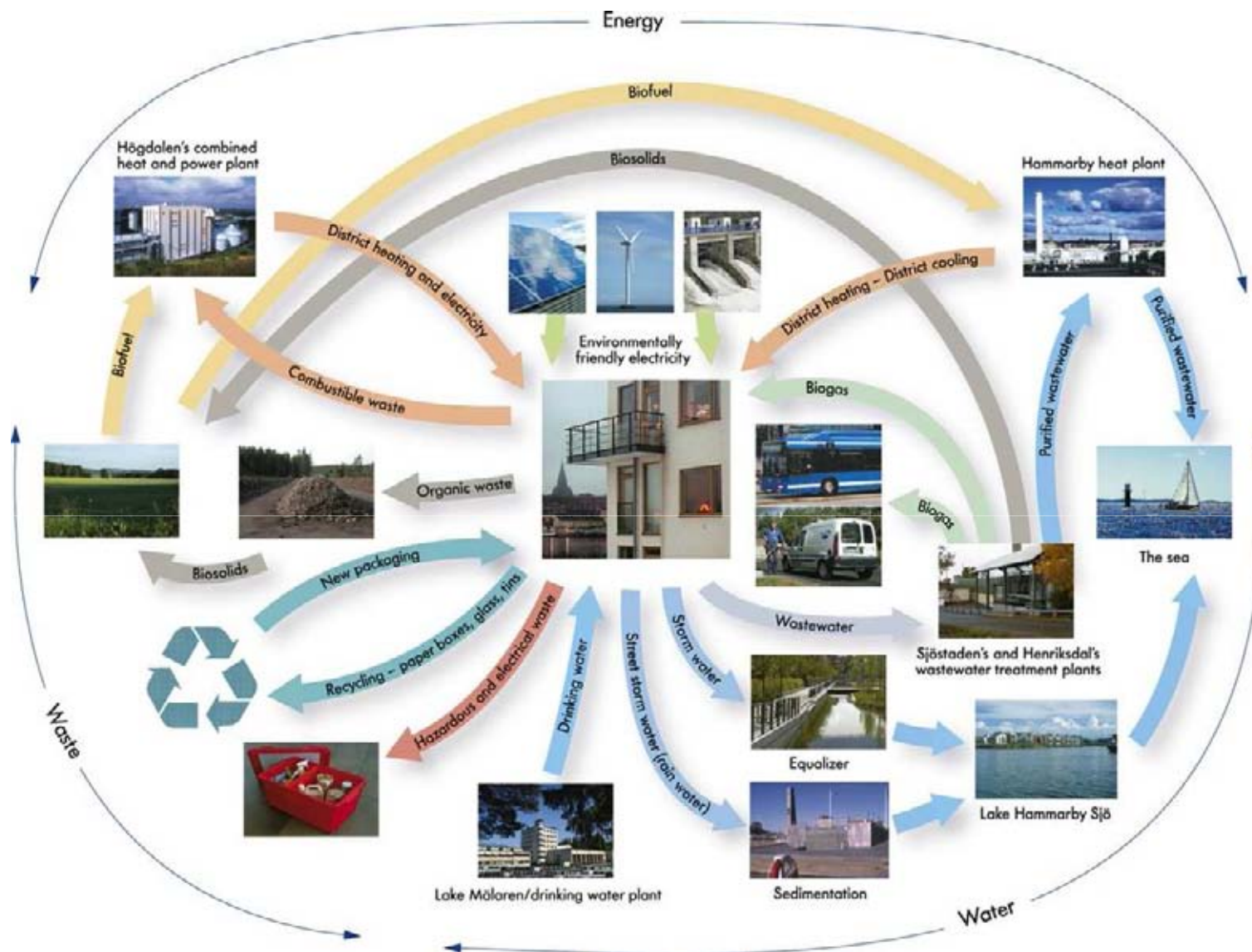
Safe drinking water Act





Eco-cities: Hammarby Sjöstad









Water and recreation



The End