

LIFE
WATER COOL



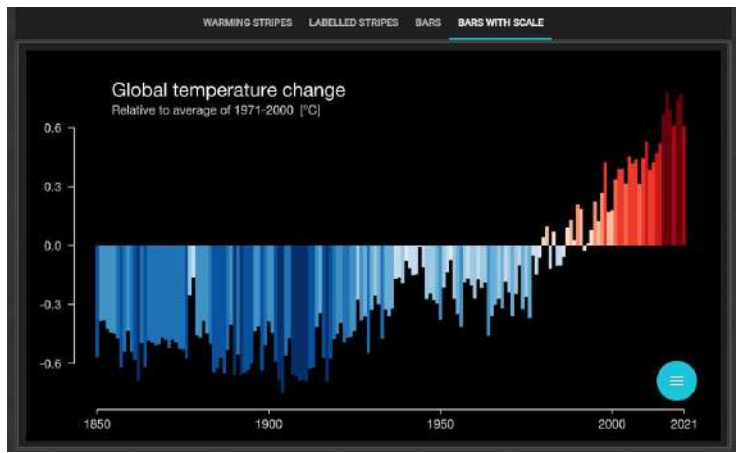
LIFE WATERCOOL

Water efficient systemic concept for the climate change adaptation in urban areas

LIFE18 CCA/ES/001122



The situation....



Source: <https://showyourstripes.inf>



Project



LIFE18 CCA/ES/001122

- **Project Title:** “WATER EFFICIENT SYSTEMIC CONCEPT FOR THE CLIMATE CHANGE ADAPTATION IN URBAN AREAS”(LIFEWATERCOOL)
- **Contract CE:** LIFEWATERCOOL (LIFE18 CCA/ES/001122)
- **Project Duration:** 48 months (1/09/2019 – 31/08/2023)
- **Total Budget:** 3.779.677 €
- **Grant (55% of eligible budget):** 2.078.602 €
- **Partners:**

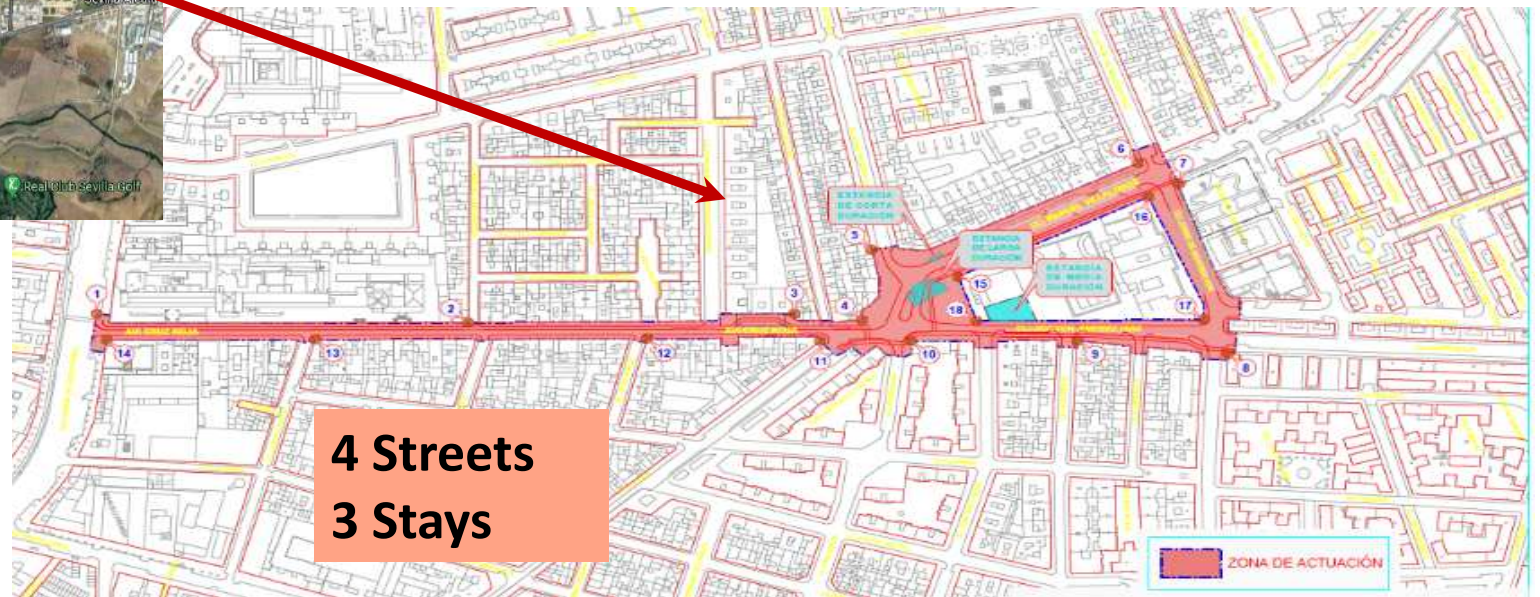
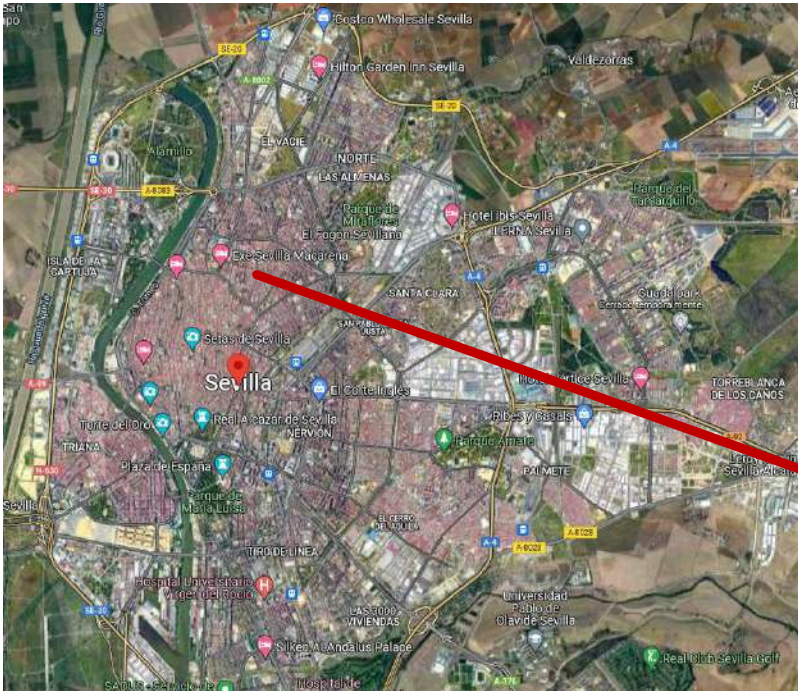


Objectives

- 1 Developing a grid-based water management system to soften the impact of water-related extreme effects linked to climate change
- 2 Improving the urban climate in the demo area (decreasing the temperature by 3-5C and generating 28C cold air) by implementing climate change adaptation measures in urban spaces
- 3 Developing new tools for collaborative management by public and private bodies
- 4 Engaging new cities and citizens in replication to increase the level of commitment and participation in sustainable management of resources
- 5 Creating a framework integrating all stakeholders so that problems can be solved actively and collaboratively



Intervention planning in the demo area



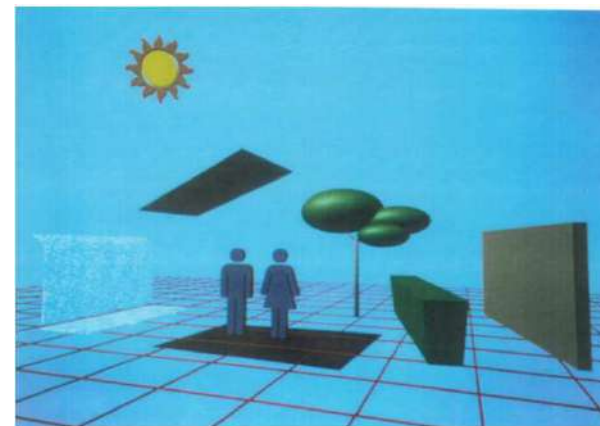
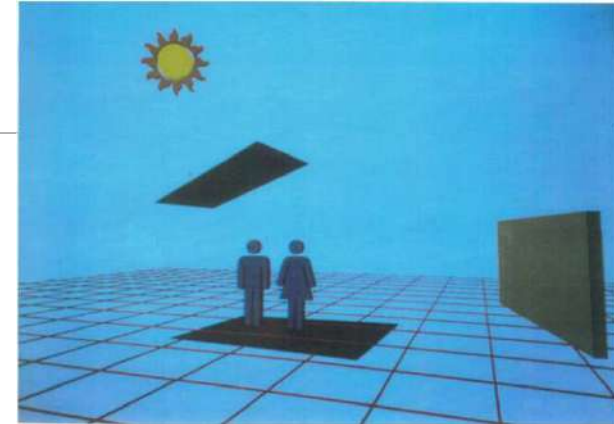
4 Streets
3 Stays

ZONA DE ACTUACIÓN

Urban heat sinks at WATERCOOL

Most of the thermal stress in the urban space during the summer comes from solar radiation. Getting conditions of comfort in the public space is based on:

1. Control of solar radiation through elements of shade that they do not overheat.
2. Reduced temperatures of surrounding surfaces occupants below body temperature.
3. Air temperature reduction (only when the other two strategies have been implemented).



Connectivity of water elements

Infiltration well

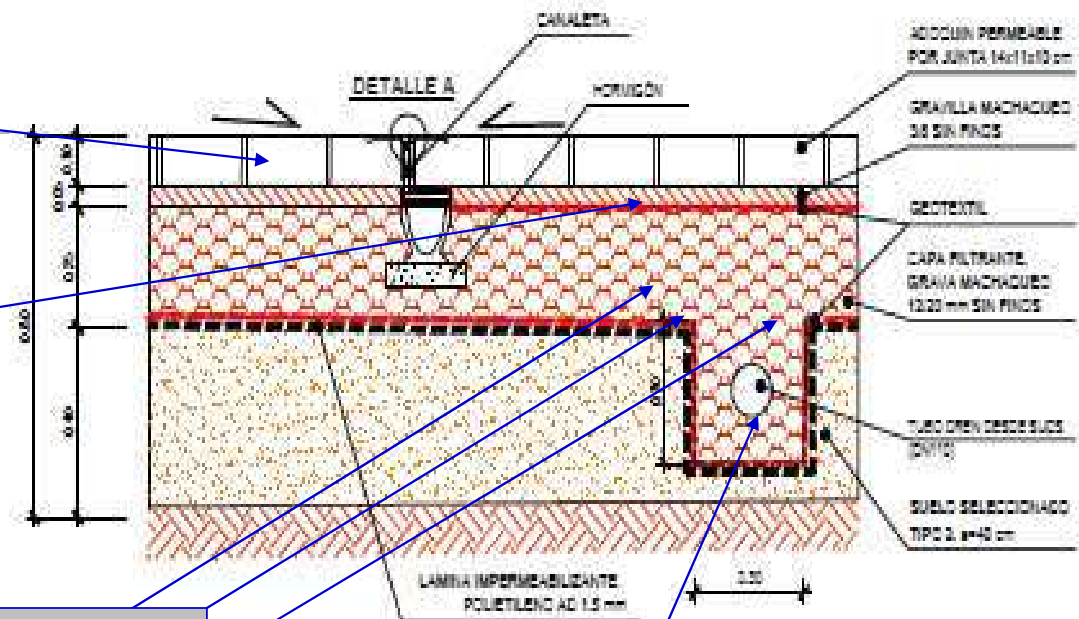


Pervious pavement

Geotextile. Filter function

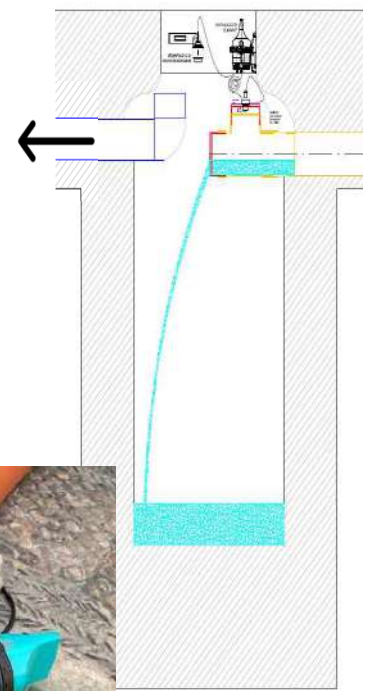
Layer of graded gravel. Filter and store function.

Drainage pipe. Use to transport the filtered water to the infiltration wells.



To sewerage well (drainage)

From drainage pipe



Connectivity of water elements



- New concept of the public space, a “green corridor”
- Decrease of maximum temperatures in the summer season.
- The implantation of a large number of new trees.
- Decrease of CO2 atmospheric level.

At the scale of the WATERCOOL project, cooling technologies are used associated with environmental sinks:

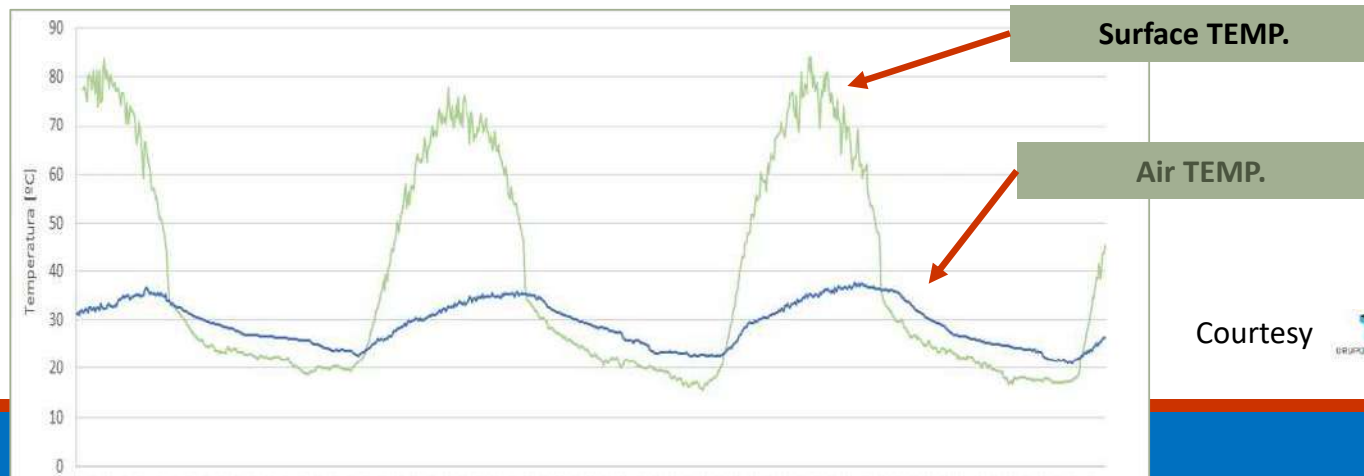
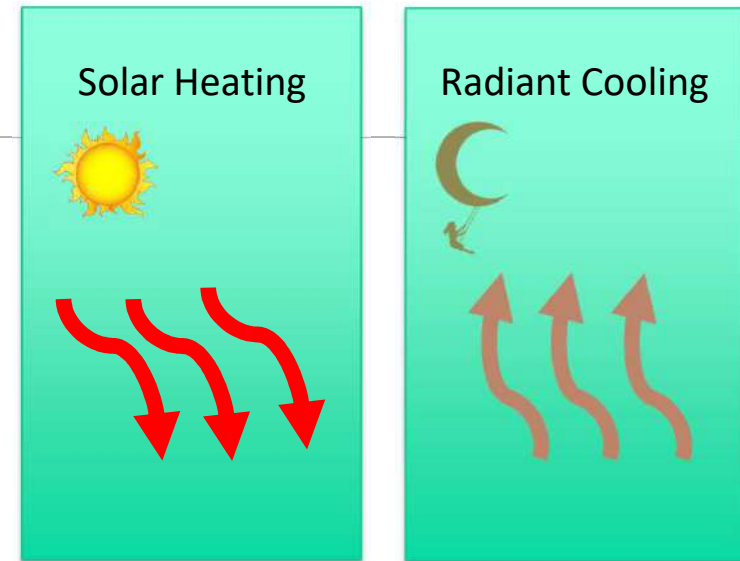
- The sky at night (radiation cooling)
- Outside air during the day (direct evaporative cooling)
- Outdoor air at night (cooling by convection / evaporation)
- Vegetation
- The terrain (conductive cooling)

Urban heat sinks at WATERCOOL

On an annual basis, the planet's radiant balance is neutral.

That is, all the short-length radiation of wave received from the sun is dissipated by radiation long wave-length into outer space.

Outer space (heaven) is therefore a heat sink the same way that the sun is a source of heat

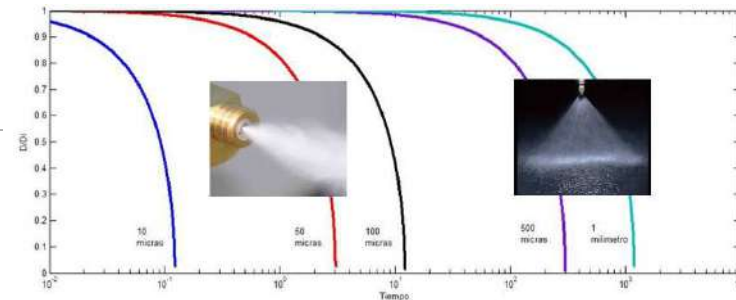


Courtesy GRUPA TERMOTECNIA

SMALL DROPS



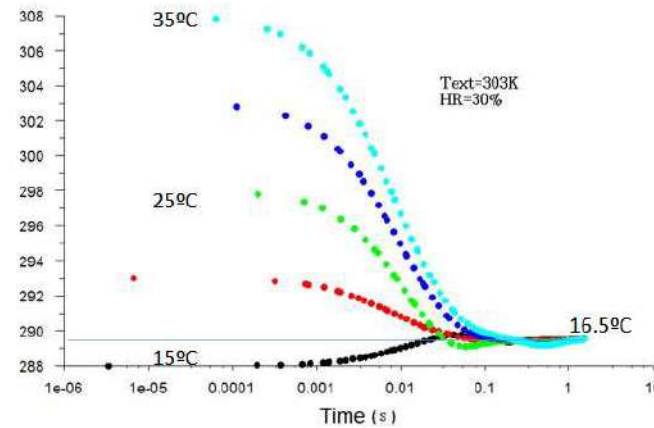
BIG" DROPS



EVAPORATION TIME FOR DROPS OF DIFFERENT

- particle-1 288K
- particle-2 293K
- particle-3 298K
- particle-4 303K
- particle-5 308K

Particle Temperature (Kelvin)

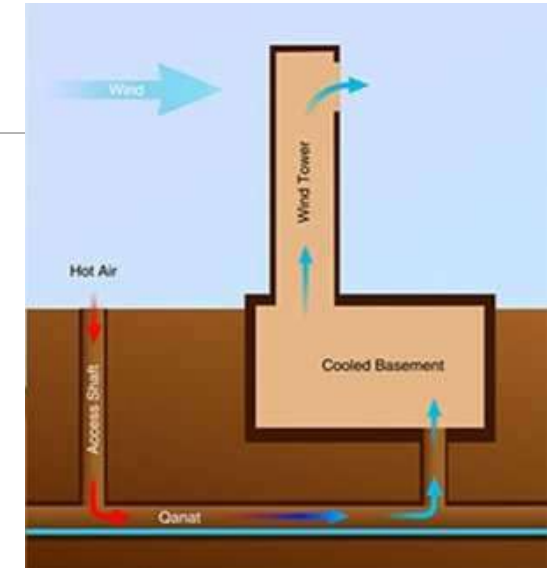
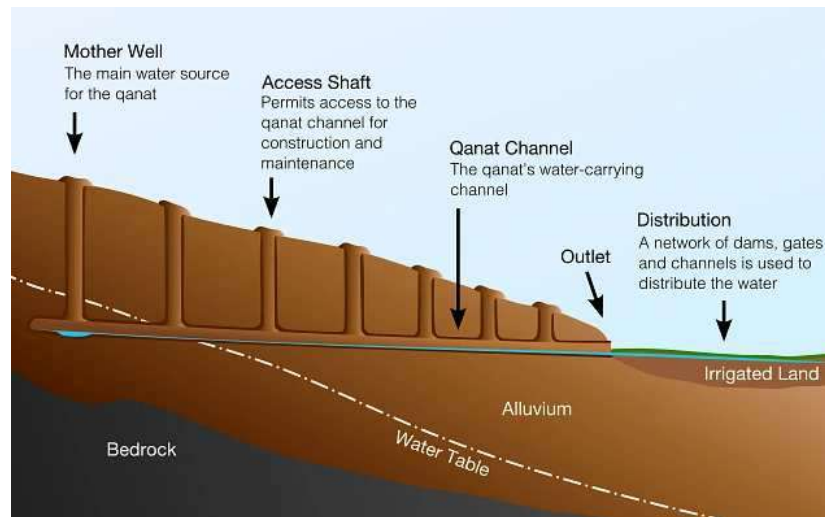


VARIATION OF THE TEMPERATURE OF THE DROP WHEN IT EVAPORATES

Urban heat sinks at WATERCOOL

Hydrogeological infrastructures of Persian origin dating back to 1 millennium BC.

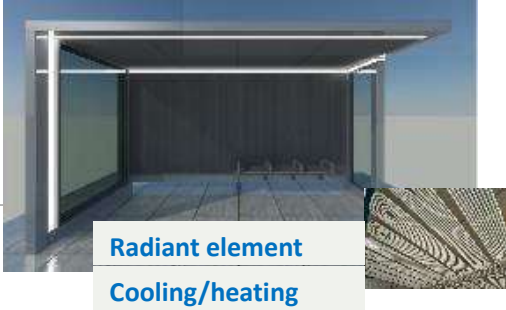
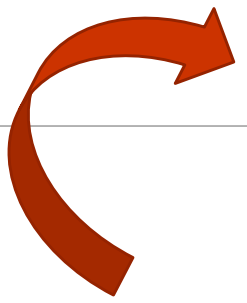
Based on the use of water and the conduction through drainage galleries to maintain naturally stable temperatures.



Development of the WATER-GRID



LIFE18 CCA/ES/001122

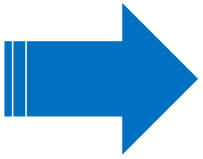


Radiant element
Cooling/heating

SHORT DURATION

Bus stop

Design and implementation of dissipation ponds and hybrid cold sinks



MEDIUM DURATION

School

Semitransparent cold-pergola + cold air

1. Solar control by movable louvres
2. Cool surfaces by means of a chilled ceiling
3. Cold air supply
4. Evaporative barrier

DUAL OPERATION

- Summer
 - ✓ Day: electricity production
 - ✓ Night: cold water – falling film
- Winter
 - ✓ Day: electricity production
 - ✓ Day: hot water



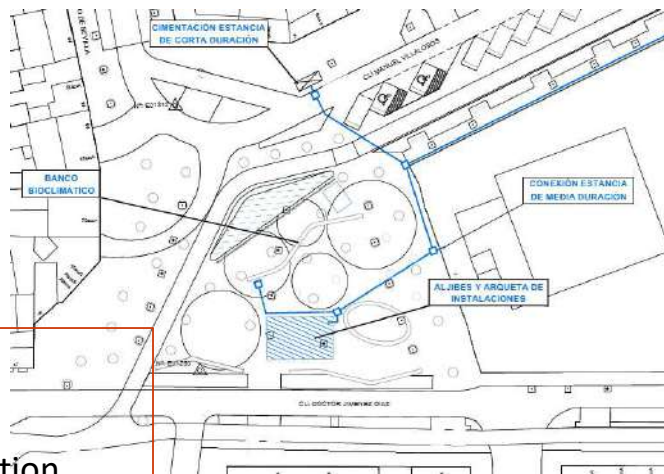
LONG DURATION

Square

Level 1: Temporary cover
Level 2: Barriers
Level 3: Active bank

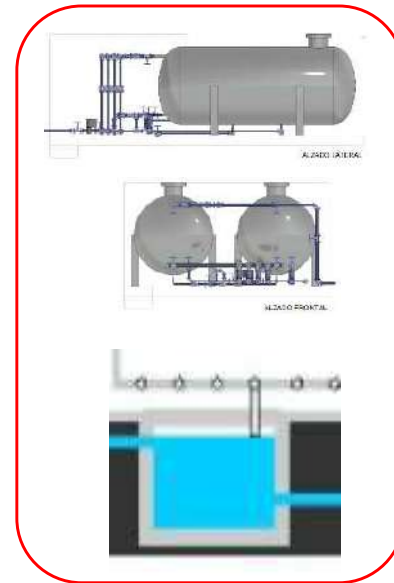
Development of the WATER-GRID

Two underground water tanks made of glass reinforced polyester provides cool water to the stays. The total capacity is 50.000 liters.

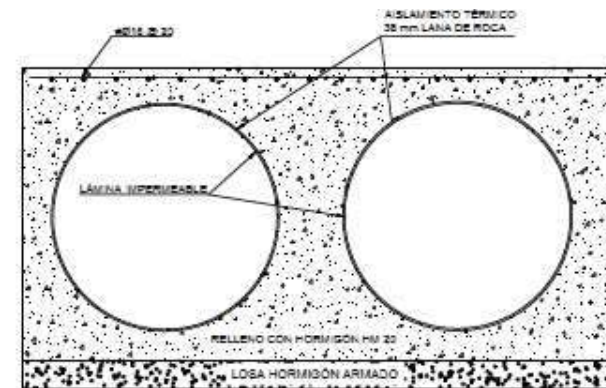


DUAL OPERATION

- Summer
 - ✓ Day: electricity production
 - ✓ Night: cold water – falling film
- Winter
 - ✓ Day: electricity production
 - ✓ Day: hot water



The tanks surface has a thermal insulation layer made of stone wool 38 mm thick to keep the water cool plus a cover of concrete.

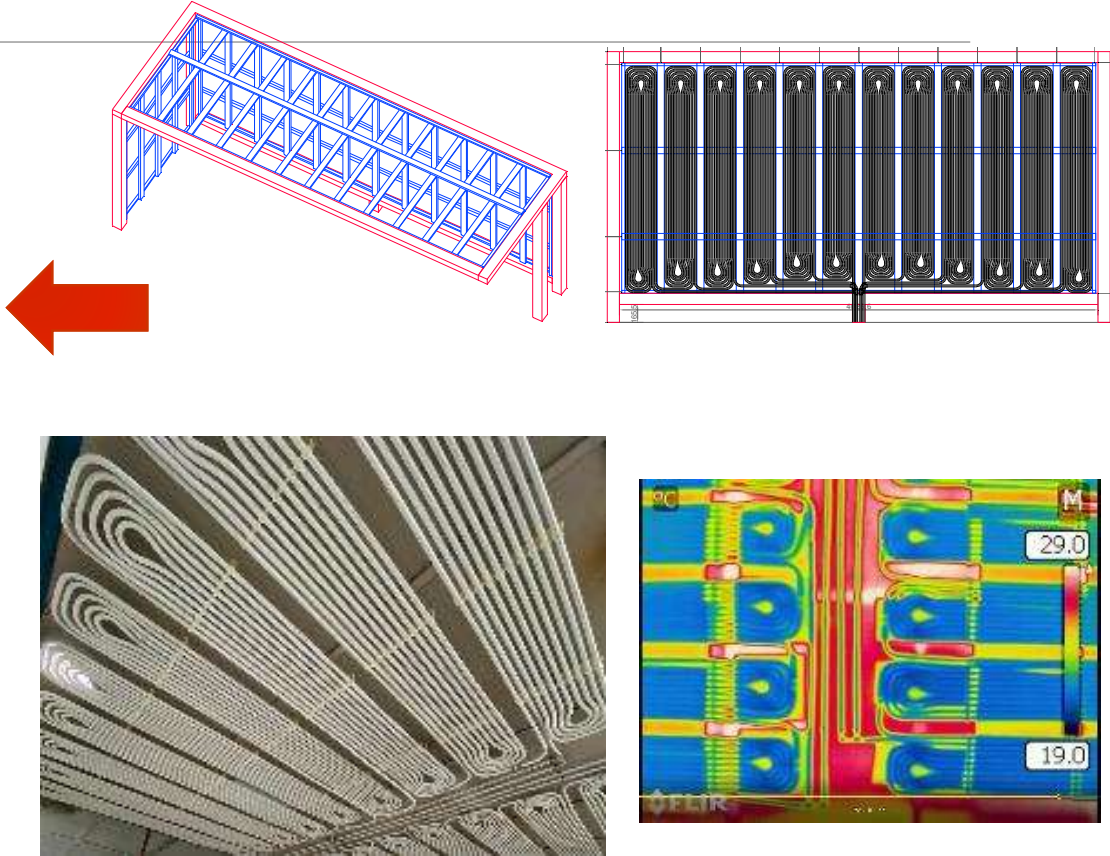


❖ SHORT DURATION

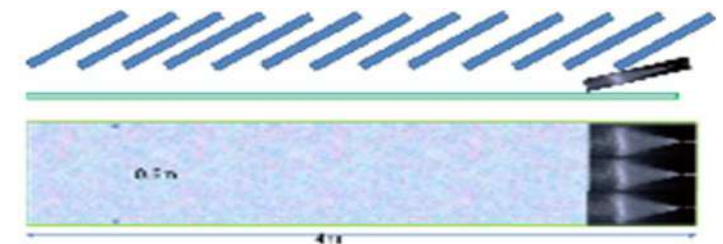
Radiant element (Cooling/heating)



Bus stop



❖ MEDIUM DURATION

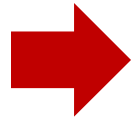


Semitransparent cold-pergola + cold air

Adaptative shadows with cold surface

Bioclimatic comfort stays on the streets

❖ LONG DURATION



Square

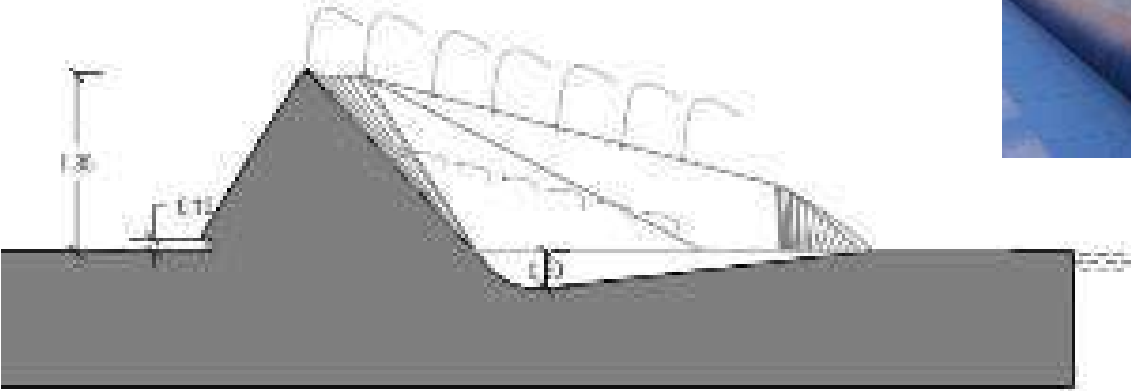
❖ LONG DURATION

Level 1 - Temporary cover



❖ LONG DURATION

Level 2: barriers

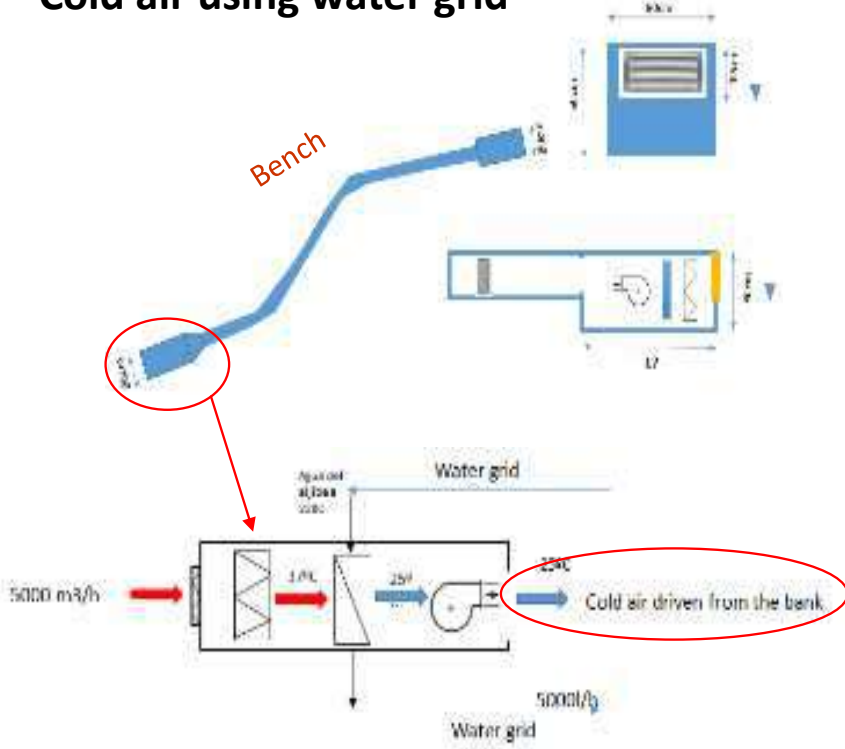


Conditioned area

❖ LONG DURATION

Level 3: active bank

Cold air using water grid



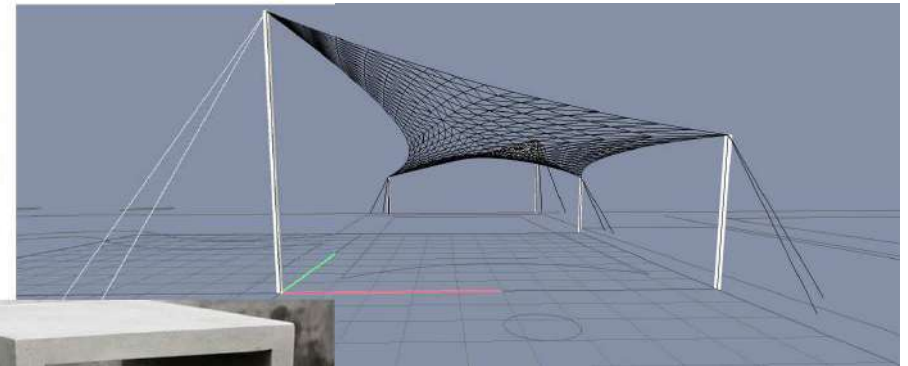
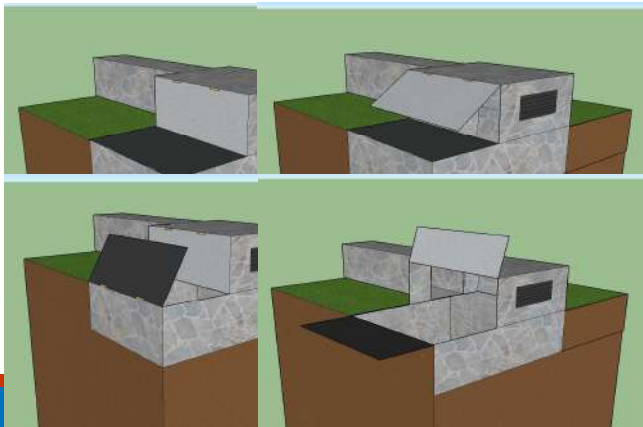
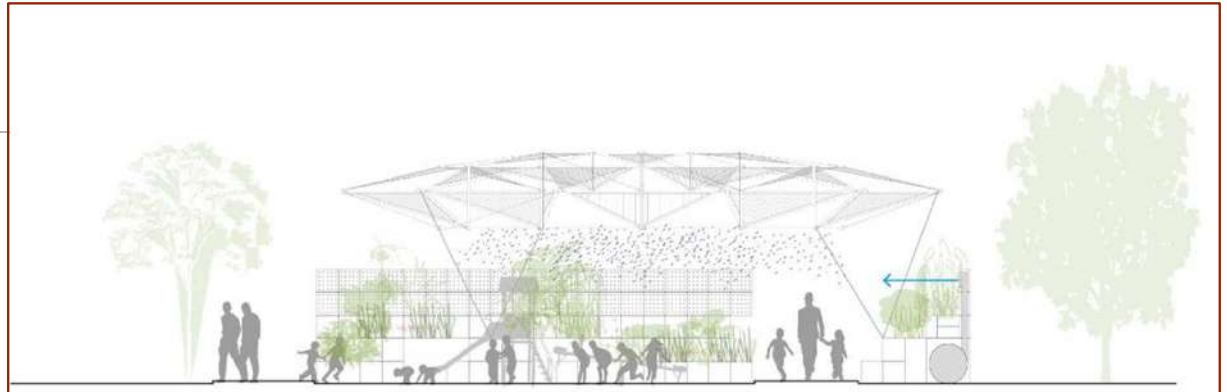
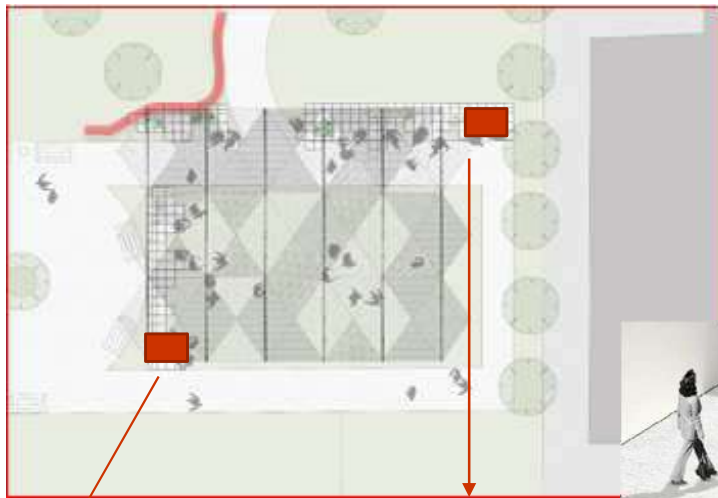
❑ LONG DURATION – Big spaces

Cartuja Qanat



Replicability and transferability strategy

LONG DURATION - Park





CATÁLOGO DE COMPONENTES

Life watercool



Introducción



Variables de diseño



caracterización



valoración



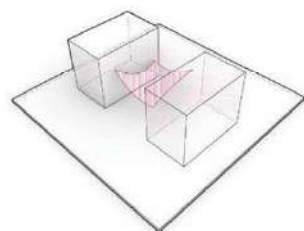
base de casos



ejemplos



fichas



Variables de diseño:

- Continuas
- Discontinuas
- Perforadas

Breve descripción de la categoría y dar paso a las características que se pueden medir y aparecen en el párrafo de la derecha con unidades, variables, rangos etc.

- 1 Acondicionamiento calle Unterhacing, Adeje (España)
- 2 Acondicionamiento plaza pública en Tenerife (España)
- 3 Anclaje de toldos para un grupo de comerciantes en Badajoz (España)
- 4 Peatonalización de calle Las Cabezas de S.Juan, Sevilla

- Protección sombra
- Resistencia al viento
- Color del textil
- Soporte
- Tipo de cobertura
- Transmitancia
- Reflectancia
- Clasificación



1-TEXTIL

Arquitectura textil
Paisaje
Estructura pórticos



2-TEXTIL

PVC
Membrana
Estructura tensada



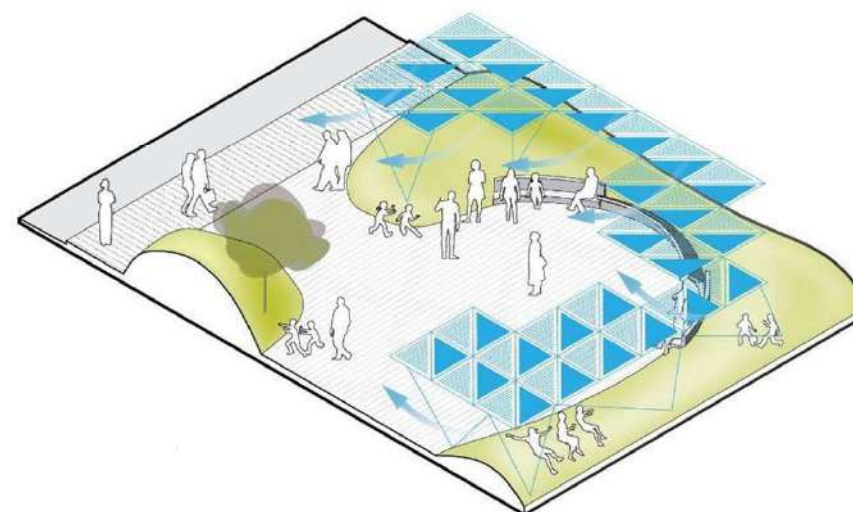
3-TEXTIL

Arquitectura textil
Paisaje
Estructura pórticos



4-TEXTIL

Arquitectura textil
Paisaje
Estructura porticos



Axonometría proyecto piloto

Collaborative and Green-management tools

Decision support planning tool



Work area definition

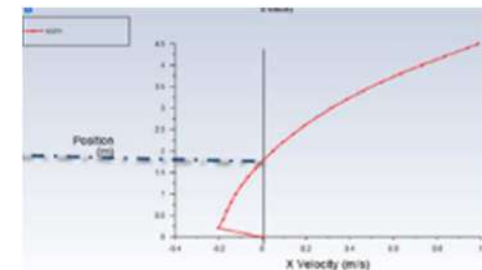
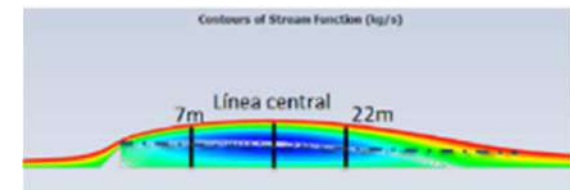
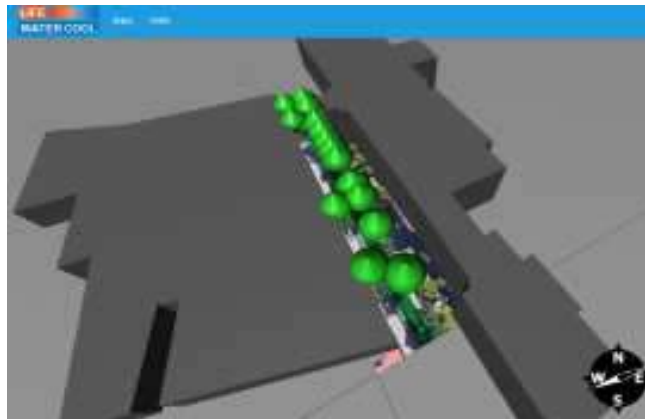
- 3D view of the selected street.
- Object edition

Software calculation tool

- Calculation engine data structure
- Air movement – Computational Fluid Dynamics

Objectives

- Analyzing the current state of energy efficiency in the city
- Plan improvements
- Evaluate impact of planned improvements



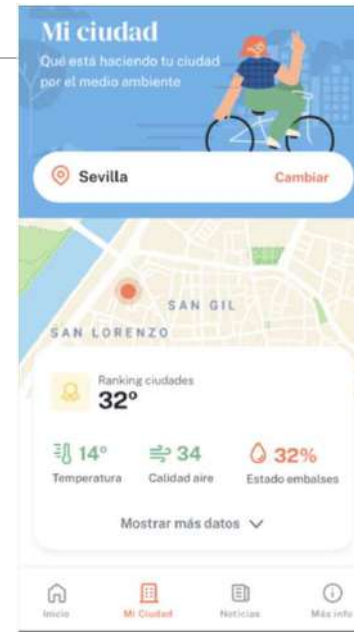
Collaborative and ecological management tools

- URBAN LAB
- Change Climate Adaptation Office

Mobile app



Encourage the use of responsible resources -
Gamification

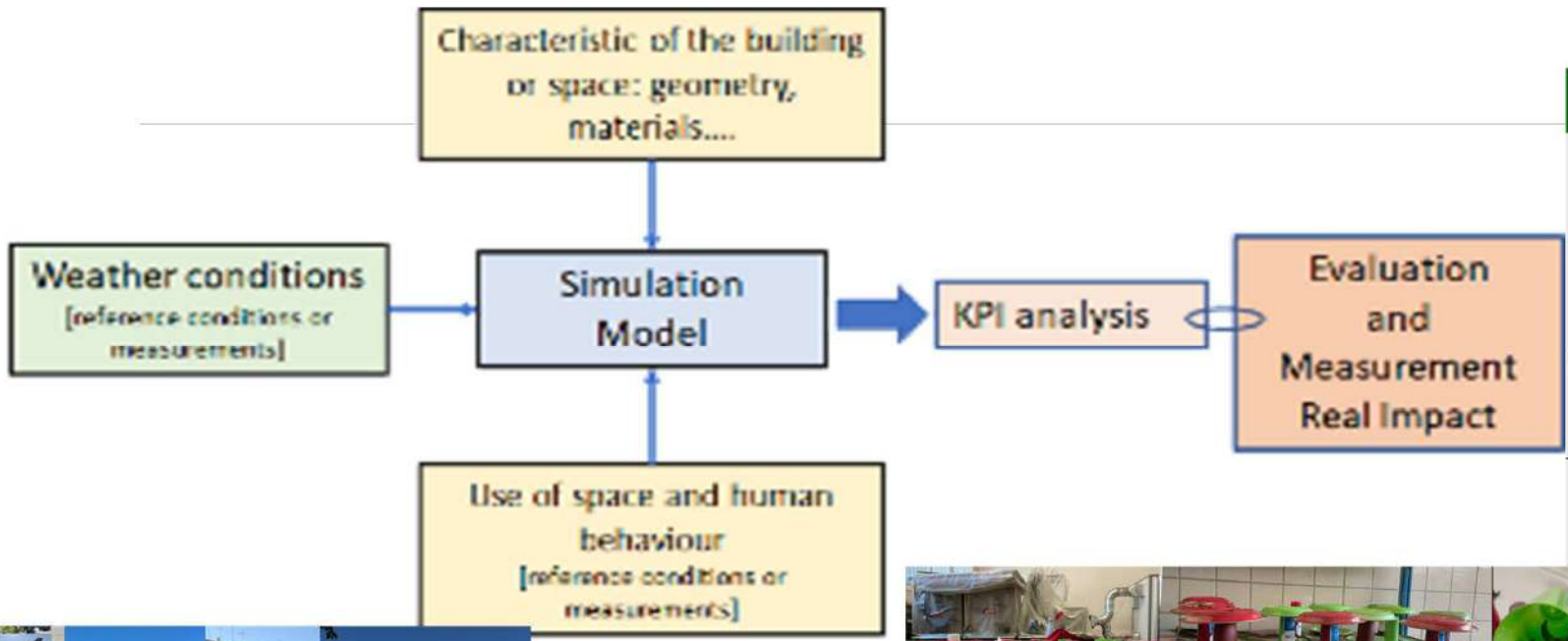


Communication portal Global



Communication portal, financial opportunities and citizen participation My city

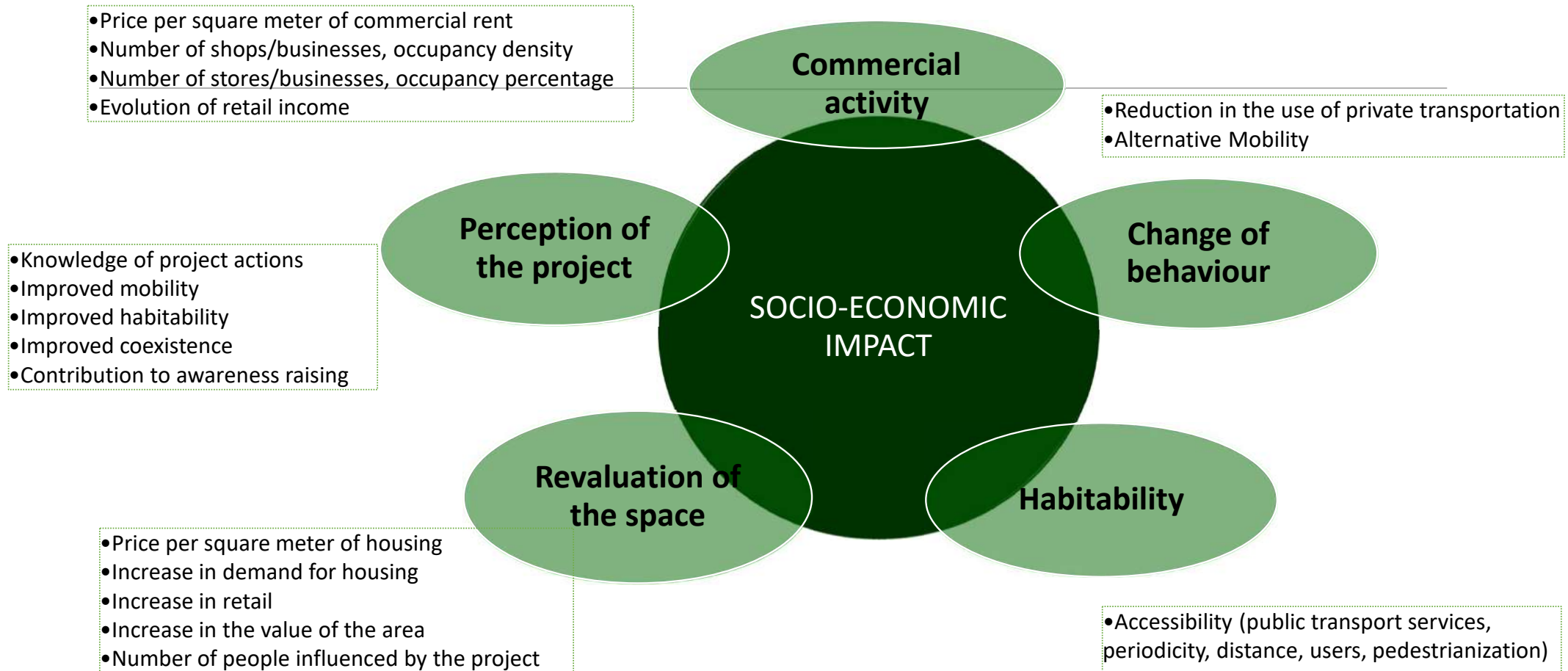
Monitoring the project impact on the environmental problem addressed



Objective	Indicators	Type	
Improved Environmental and Climate Performance (including resilience to climate change)	Reduction of greenhouse gas emissions (GHG)	CO2 Direct + Normalized	
	Air quality and emissions	Air Pollutants (NOx) Direct + Normalized	
	Waste management	Waste Reduction	Direct
		Improved resilience to flooding Improved Water Quality	
	Temperature	Surface temperature Indirect	
Better use of natural resources	Water	Reduced runoff Direct	
		Reduced water consumption Direct + Normalized	
	Street water reservoir	Direct	
Energy	Energy from Renewable Energy Sources	Direct	
	Reduced energy consumption directly	Indirect	
Sustainable lands, agriculture and forestry	Soil Surface improved		
	Permeable soil surface	Direct	
Other (please specify)	Urban surface adaptation	Public areas adapted (street, squares, etc)	Direct
		Surface of public buildings	Direct
		Surface of private buildings	Direct
		Reduced energy consumption indirectly by hours out of comfort	Indirect



Monitoring of the socio-economic impact



www.lifewatercool.com

Twitter: @lifewatercool

Facebook: LIFE Watercool



LIFE18 CCA/ES/001122

Lucas Perea Gil

Head of Cooperation and Funds
Department

lperea@emasesa.com

Tlf.: +34 955 477 519

Movil: +34 654301290