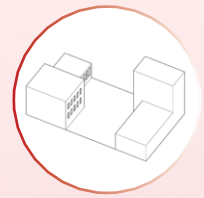


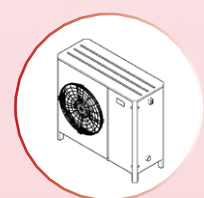
Unprotected façades

Interior heat generated by lack of shading on building façades: buildings without shading can absorb more heat from the sun, leading to higher indoor temperatures and contributing to the urban heat island effect.



Sun exposure

Direct sun exposure increases surrounding area temperatures, contributing to the urban heat island effect. The lack of solar radiation protection elements in open spaces and the absence of vegetation allow high solar radiation to pass through. Urban furniture, especially when it is dark-coloured, can also affect the amount of heat that absorbed and radiated.



AC systems

Air conditioning systems can generate a significant amount of heat as they remove heat from the indoor environment and expel it outside. This can contribute to urban heat islands, particularly in areas with high concentrations of air conditioning units.



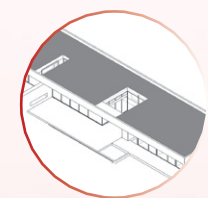
Impervious pavements

Surfaces such as driveways, parking lots, paved sidewalks can retain heat during the day and re-radiate it at night, leading to higher temperatures in urban areas. Other retaining-heat surfaces are compacted soils, which favours surface water runoff.

Heat sources

Dark-coloured roofs

Dark-coloured roofs tend to absorb more radiation than lighter-coloured surfaces and heat up quickly contributing to the urban heat island effect. Heat absorbed can also increase the temperature inside the buildings causing thermal discomfort to the occupants.



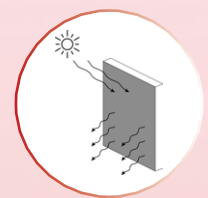
Water misuse

The city has numerous ways of collecting water, which is usually drained and evacuated from urban environments. However, water harvesting can help with cooling purposes by having that resource available in times of drought for use in vegetation maintenance.



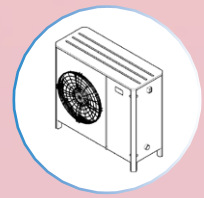
Reirradiation

When sunlight hits a building's facade, it can be absorbed and then re-irradiated as heat. This effect can be reduced by using materials with high reflectivity, such as light-colored paints or reflective coatings, which reflect more sunlight and reduce the amount of heat absorbed and re-radiated. External Thermal Insulation Composite Systems (ETICS), very common in building renovations, can also reduce the heat absorption and re-irradiation.



Old bulbs

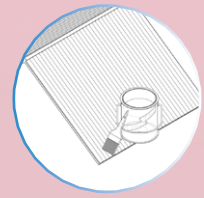
Artificial lighting, particularly from outdoor sources such as streetlights, can also contribute to urban heat islands. This is because light bulbs generate heat, and this heat is released into the surrounding environment. To minimize this effect, it is recommended to use energy-efficient lighting sources that generate less heat, and to reduce outdoor lighting during periods of high temperature.



Location of AC Systems

i.1

To minimize the accumulation of heat removed by the AC system, it is recommended to: 1) Limit the use of air conditioning during periods of high temperature 2) Find a better location for the outdoor units, placing them in very well ventilated areas (e.g. rooftops instead of façades).



Painting roofs

i.2

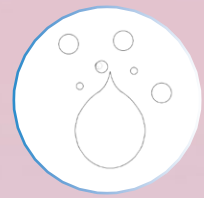
By painting roofs white, the albedo (reflectivity) of the surface is increased, which can help to reflect solar radiation and reduce the amount of heat absorbed by the building.



Irrigation

i.3

Keeping the soil moist can help to create a cooling effect by evaporating water from the surface, which can help to lower temperatures in the surrounding area.



Water misting

i.2

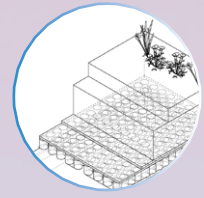
Water misting systems can be used to create a cooling effect by evaporating water into the air, which can help to lower temperatures in the surrounding area. This is highly recommended in dry climates but it should be avoided in humid climates.



Tree planting

i.3

Planting trees can help to provide shade and also create a cooling effect through evaporative cooling, as the leaves release moisture into the air.



Permeable soil

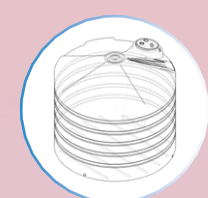
i.4

Using permeable and low-density surfaces can help to reduce heat buildup and release it slowly during the night, which can help to reduce temperatures in the surrounding area. If moistened, it can also help reduce the temperatures by its evaporation.

Adaptive measures

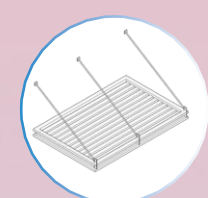
Rainwater recycling

Storing rainwater for later use in irrigation, fountains, and other non-potable applications can reduce water consumption and benefit the surrounding vegetation.



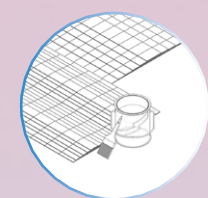
Awnings

Installing shading devices on the building facade can prevent direct solar radiation from entering the interior spaces, reducing heat gain and improving comfort.



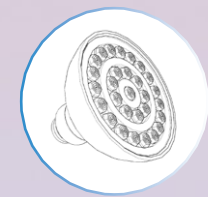
Ground painting

Painting paved surfaces with light-colored, high-albedo coatings can reduce the amount of solar energy absorbed, lowering surface temperatures and mitigating urban heat island effects. Care should be taken to avoid light reflection towards living areas.



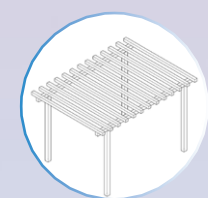
LED bulbs

Use of low-heat emitting lighting can reduce heat gain and improve energy efficiency. LED bulbs use up to 80% less energy than traditional incandescent bulbs. They also last much longer, reducing the need for frequent replacements.



Shading

Outdoor shading devices such as canopies, pergolas, or shade sails can improve microclimatic comfort in outdoor areas and protect vegetation from excessive heat.



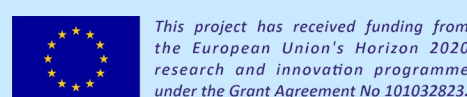
Ideas to cool your courtyard

Deliverable 3.2



Raising summer energy poverty awareness to reduce cooling needs

Coordination and support action
Call H2020-LC-SC3-EC-2-2020: Mitigating household energy poverty



This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Grant Agreement No 101053263

Installation recommendations

- i.1** - Avoid placing the AC towards livable outdoor spaces, especially if they are not very well-ventilated (e.g. interior courtyards, narrow streets, first floors, ...).
- Locate the AC equipment in well-ventilated areas to prevent the accumulation of heat due to other units or from other heat sources. This will increase their energy performance.
- i.2** - The water supply to the water misting should always be connected to the public system supply.
- The materials of the nozzles should resist the action of disinfectants.
- A drainage system should be provided at the lowest point to empty the water when not in use, avoiding stagnation and microbiological proliferation.
- i.3** - Consider the structure of the trees, with special attention to the size of the canopy and its leafiness.
- Mind the solar and water needs of the selected vegetation.
- Choose deciduous species that allow solar gains in winter and provide solar shading in summer.
- It is recommended to plant the trees in autumn and until the beginning of winter to ensure the establishment of the tree.
- Mind the heat and pollution resistance of the tree. Recommended: <https://bellochforestal.com>
- i.4** - Choose pavements with high albedo index to reflect a greater amount of solar radiation.
- The use of permeable surfaces is highly encouraged. Recommended not to use it near façades to prevent dampening issues or structural problems with the foundations.
- i.5** - In case of using awnings to shade the outdoor space, place them perpendicular to the ground, taking into account the orientation of the space to be shaded, ideally through a solar shading analysis.
- Verify that the selected product can withstand the climatic conditions of the location (e.g. Wind, gusts, precipitation, UV protection, or if noise dampening is desired).
- Depending on the use of the space, a flexible element that can be opened and closed as needed may be appropriate.
- If the shading element uses fabric, check its characteristics of the fabric: whether it resists fading, abrasion, rotting, shrinking or fraying, as well as its air permeability to avoid overheating underneath.
- i.6** - Conduct a study of those spaces that require artificial lighting, identifying those elements that may obstruct and affect it.
- The use of lighting points whose electrical supply comes from photovoltaic panels provides flexibility when choosing where to install them.
- Led bulbs are energy-efficient and emit little heat.

Limitations

Requires property approval	Level of skills needed	Costs of the solution
No Yes	Less More	Low Medium High