

## Smart pavers to refresh from rainwater

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**Year of commitment :** 2018

**Address 1 - street :** PLACE DE TOULOUSE MONTAUDRAN AÉROSPACE, France

**Diameter :** 20

**CO2 Impact :** Drop in long-term emissions under quantification

**Green energies :** Photovoltaic solar

**Digital services :** Smart metering

**Water cycle :** Collection, Containment

**Circular economy and waste management :** Optimization of ressources, Bio-based materials

**Biodiversity & Ecosystems :** / Green and blue corridor /



**250 000 €**

**Builder**

2EI Veolia Innove, Eco Engineering Design Office  
(Consulting and Sustainable City Innovation)

**Manager / Dealer**

Toulouse Métropole

### GENERAL INFORMATION

The rise in temperatures in the city centers, mainly because of their high mineralization, causes in summer the phenomenon of urban heat islands (ICU), with health consequences often heavy, as the magnitude of the excess mortality observed in Europe during the heat wave of 2003. You should know that in the second half of the twenty-first century, episodes of heat waves and heat waves will occur every other year, amplifying this phenomenon of ICU.

The processes to refresh the city are now part of the fight against climate change. In recent years, there has been a growing demand from municipalities, urban planners and developers for the implementation of resilience solutions to mitigate the "urban heat island" effect in renovation or renovation projects extension of urban neighborhoods.

**The "island of urban freshness " solution developed by 2EI Veolia and installed in 2018 in Toulouse aims to reduce the temperature of public spaces and improve outdoor comfort and the well-being of residents with a low-carbon impact solution through the circular use of water (non-drinking water - rain, dewatering (infiltration)). This is the first solution to cool public places with rainwater.**

The first step in a typical study is usually to work at the city level on the ICU risk map that crosses an exposure map with the sensitivity map (eg vulnerable populations). Then, it is necessary to work at the scale of a district to identify the "heat island" to refresh: this is the purpose of the innovation described below.

Innovation consists of:

1. A bioclimatic design approach (using the Envimet software) and an EVA (Water, Vegetation, Albedo) decision-making methodology to compare different feasible scenarios of public spaces on a neighborhood scale with the aim of mitigating impacts (discomfort and heat stress, low attractiveness, morbidity, mortality, energy consumption of buildings).

2. Intelligent technology using rainwater (or non-potable recycled) to remotely control the cooling of a space from the "evaporative pavers", which are water retention pavers; The evaporative paving method reduces the UTCI ("the felt temperature") from 5 to 7 ° C.

*"A general diagram of the approach and the principle of" smart pavers ", some photos of the installation, illustrate the operation of the Toulouse Montaudran Aerospace facility that we were able to build and maintain thanks to the collaboration with the Oppidea and Toulouse Metropolis " (2EI Veolia)*

## Progress Status

Delivered

## Data Reliability

Self-declared

## Funding Type

Public/Private Partnership

## Infrastructure Video

## Website Enterprise / Infrastructure

[↗ 2EI VEOLIA \(Veolia Innove\)](#)

## Sustainable Development

Attractiveness :

This type of project can contribute to increasing the attractiveness of an urban infrastructure, such as a place or zones of passage for the transit of travelers.

Well Being :

It is a complementary and integrable way in different types of contexts and neighborhoods to improve the quality of life of users, especially for sensitive populations (elderly, children ...).

It is an extra comfort for workers and travelers to cool off during transit periods.

Applied to the school environment or to a school site, it helps to serve the well being of young people by creating oases of this type with several combined solutions (Water, Vegetation, Playhouses ...), and in some cases to be able to open these sites outside school period.

Social Cohesion :

It is a means that helps social cohesion and conviviality; users of different generations and social backgrounds can go there to cool off at different times and interact with people in the neighborhood or passing through.

Preservation / Environmental Improvement :

This approach makes it possible to recover rainwater for cooling use, and to develop water and vegetation solutions for the purpose of saving and sustaining.

Resilience :

The fact that these places are designed on the basis of studies characterising the situation upstream with the social link and the rational use of resources is a real asset for developing resilience to climate change

Responsible use of resources :

This type of approach will help to raise awareness of the need for the rational use of resources, the amount of rainwater recovered for use being regulated and limited by operating instructions and remote control.

## Testimony / Feedback

<https://www.20minutes.fr/toulouse/2533087-20190606-toulouse-lutter-contre-chaueur-voici-premiers-paves-rafraichissantes-testes-europe>

<https://www.ladepeche.fr/amp/2019/05/29/a-toulouse-on-teste-les-premiers-paves-rafraichissants-deurope-en-cas-de-canicule,8228303.php>

<https://www.toulouse-metropole.fr/-/quand-la-fraicheur-vient-de-la-terre-?redirect=%2F>

[↗ https://www.toulouse-metropole.fr/-/quand-la-fraicheur-vient-de-la-terre-?redirect=%2F](https://www.toulouse-metropole.fr/-/quand-la-fraicheur-vient-de-la-terre-?redirect=%2F)

## Governance

VEOLIA INNOVE

Holder Type : Private Company

2EI Veolia Innove, Eco Engineering Design Office (Consulting and Sustainable City Innovation)

Toulouse Métropole

Manager / Dealer Type : Public

In response to the call for projects Ecocité 2015, and in coordination with Veolia Water, which had prepared a demonstrator project on the management of the water cycle at the Toulouse Montaudran Aerospace (TMA) district, the Innovation Department of 2EI (Veolia Innove) has developed a proposal for testing Urban Refreshment Systems based on the use of rainwater. Urban Refreshment Systems are intended to mitigate the impacts of urban heat islands and to improve the comfort and attractiveness of public spaces.

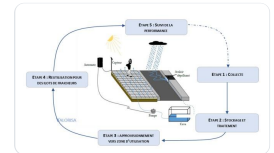
Business Model :

The economic model of the project will be based on economy and rainwater harvesting to limit the use of energy for cooling.

## Sustainable Solutions

"Smart pavers to refresh from rainwater"

Description : A system of intelligent paving stones to cool users of an urban space in Toulouse Montaudran Aerospace using rainwater (2EI Veolia installation for the Oppidea developer and the Toulouse Metropolis)  
Innovation is made up of:



1. A bioclimatic design approach (using Envmet software) and an EVA (Water, Vegetation, Albedo) decision-making methodology to compare different feasible development scenarios for public spaces at the scale of a district with the objective of mitigating impacts (discomfort and thermal stress, low attractiveness, morbidity, mortality, building energy consumption). EVA is able to compare different development scenarios over the long term according to six indicators: external comfort, building energy consumption, water consumption, investment and operating costs, CO2 emissions and contribution to biodiversity.

Through quantitative and meaningful indicators, EVA therefore proposes the best solution or combination of solutions to mitigate UHI (use of non-potable water-based technologies, use of vegetation, and modification of public spaces with the use of high albedo materials).

This EVA decision-making methodology, applicable to all types of contexts and technologies, was developed by Veolia and IRSTV as part of an R&D project funded by the French Environment and Energy Management Agency (ADEME). The results of the EVA project are freely accessible, excluding the tools used to calculate the indicators.

2. A patented intelligent technology using rainwater (or recycled non-potable rainwater) to remotely control the cooling of a space from "evaporative paving stones", which are water-retaining paving stones; it is precisely a question of injecting water into the bed where the paving stones are laid through drip feed pipes. This water rises through the paving stones by capillarity, evaporates when it reaches the surface of the paving stone. The evaporation of water significantly lowers the local temperature (from 15 to 20°C on the ground), and increases the relative humidity of the air, which generates the cooling phenomenon. The effectiveness of this device has been proven during summer heat peaks, with the advantage of being very water efficient. A solution that is also useful in winter to fight against snowfall since the water retained in the paving stones remains at a temperature of 10 to 15°C, which prevents the flakes from settling.

Beyond the ground temperature, the efficiency of the cooling process is measured using the UTCI (Universal Thermal Climate Index), an indicator of thermal comfort, which can be assimilated to the perceived temperature. This indicator takes into account air temperature, wind speed and direction, and relative air humidity). The evaporative paving stone process reduces the UTCI ("perceived temperature") from 5 to 7°C.

The request to lower the temperature of the treated area and the use of water reused in quantity and quality is automatically carried out locally according to meteorological parameters (ground temperature, air temperature, wind speed and direction).

The reused water is filtered (UV treated if necessary) and stored underground. The meteorological measurement system, which consumes very little energy, is autonomous and powered by a solar panel.

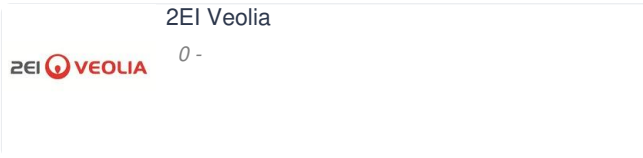
A schematic diagram and some photos of the installation (refreshed plot view, weather station) illustrate the functioning of the Toulouse Montaudran Aerospace installation that we were able to build and maintain thanks to the collaboration with Oppidea and the Toulouse Metropolis, and with the help of the financing (Caisse des Dépôts, Investissements d'Avenir) of the Ecocité 2015 project, the involvement of the local VEOLIA Eau France Agency, and the collaboration of local architects and design offices that facilitated the project (SEURA, NALDEO).

Translated with [www.DeepL.com/Translator](http://www.DeepL.com/Translator)

- Resources :
- Energy/climate :
- Urban project governance
- Citizen participation
- Circular economy

- Water management
- Climate adaptation

Company (es) Website :



Company (es) Website :



## Contest

### Reasons for participating in the competition(s)

This solution allows rainwater to be reused for non-potable use: urban cooling.

The innovation also lies in rainwater treatment: runoff water is collected and treated through depolluting drains (developed by Veolia) before being stored.

It is an autonomous, fully automated solution: the cooling demand is controlled by meteorological sensors. The materials and equipment used are available on the market. The innovation lies in the management and monitoring of the system's performance through these UTCI measures.

The system can be remotely controlled by the user (to change the setpoints or parameters) and requires very little maintenance.

This solution is intended to be combined with other types of cooling solutions (vegetation,...) to create outdoor spaces.

It can be integrated into a new space of conviviality at the service of resilience.

### Building candidate in the category



Grand Prix Infrastructure Durable



Prix du public



