The Urban Lab of Europe!

JOURNAL

PROJECT

CartujaQanat - Recovering the street life in a climate changing world

Sevilla, Spain

TOPIC

Climate adaptation

EDIT 08 JUNE 2023
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CartujaQanat - Journal 3: A 10°C reduction with ZeroNet energy consumption in open spaces is possible. Sevilla made it.

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The Sevilla CartujaQanat program is by design, an ambitious and particularly relevant program for regions facing extreme heat phenomena and for urban authorities looking to re-develop large and unused public spaces such as Expo Spaces or old infrastructure sites adhering to the zero-energy consumption target.

The program is pioneering new management approaches for such unused public spaces that can render them economically and socially viable. It is also seeking to transform the artisanal trade of ceramic-making into a 21st C technological arsenal to be used for climatic space conversions.
The Thomas Alva Edison Avenue, in the Cartuja Technology Park, has now been renovated and transformed through the combination of historic climate control technologies (the qanat) with cotemporary technologies targeting NetZero energy consumption. Innovative components and strategies such as variable solar control, nocturnal dissipation towards the sky, dissipation towards the ground with nocturnal evaporative regeneration, thermal storage in qanats (underground galleries) and solar electricity production are used throughout this area. The result is a pioneering zero-energy and zero-emission installation.

1) Summary of key project developments

CartujaQanat provides a tangible answer to the triple problem of (i) rising heat in Sevilla with expected 50 degrees Celsius for more consecutive days over the next 5 to ten years while (ii) adhering to the EU NetZero energy target and (iii) maintaining an active outdoors public life in the recognition that access to liveable public spaces is a matter of social equity.

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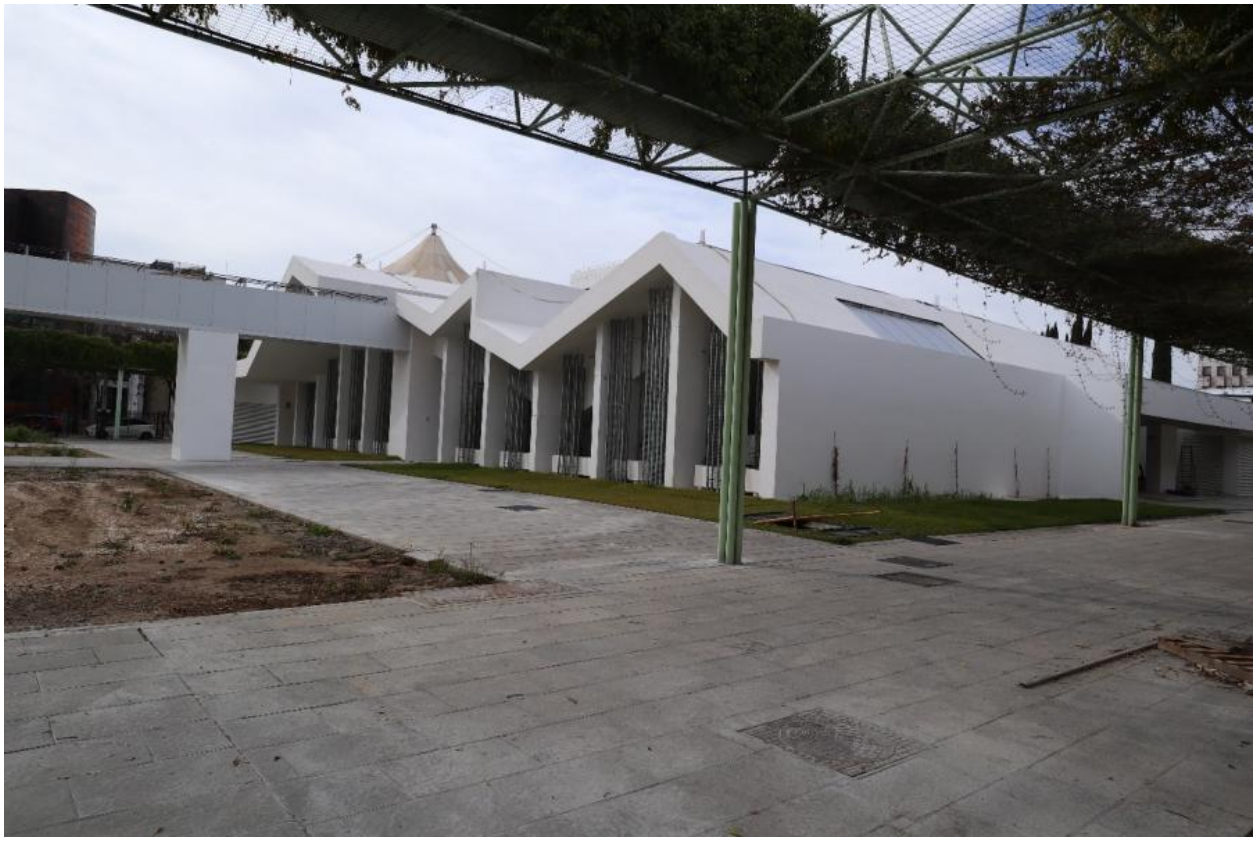
The renovation has also incorporated technologies such as remote sensing and artificial intelligence for optimal

management of the facilities using presence control, user preferences and climate prediction.

In this way, the project objectives are met:

- A 10°C reduction of the temperature in open spaces. For example, in conditions of 45 degrees Celsius under the sun, the open-air amphitheatre will record a 35 degrees consistent temperature rendering it liveable without using any energy consumption
- The delivery to the people in Sevilla of a new fully accessible public space based on the legacy of Roman, Arab, Persian and Jewish cultures.
- The exploration and development of a new model of public-private-social partnerships to accelerate and improve the process of resilience building and adaptation of the city to climate change
- The creation of new/old materials based on traditional techniques such as classic ceramic products which can now be used as functioning 21st C material capable of retaining a large amount of water inside due to their porous structure, whose fundamental mission is to act as energy exchangers to condition the environment and new multifunctional concrete products.



Throughout 2022, Sevilla through the UIA project CARTUJA QANAT:

- Completed the renovated space available for daily public use through a formal inauguration ceremony organised in Autumn 2022 delivering to the public three large bioclimatic spaces. A renovated covered open-air amphitheatre, un underground Souk with compartmentalised spaces that can be used as a multifunctional event space amongst others and a temperate island, which is designed as an open space with a certain linearity that incorporates a series of vertical, horizontal and furniture elements which links in an ambient way the square and the Amphitheatre. Using the diversity of new technologies which have emerged from the project the space creates a temperate micro-climate without consuming energy.
- Formalised a new partnership between Seville City Council, the PCT Cartuja, the University of Seville and EMASESA designating them as co-managers of the new space responsible for its maintenance and activation through 2026. This is an innovative collaboration departing from classic public-private models offered for the management of public spaces aiming to build a flexible scheme for maximum usability, safety and renewal.
- Hosted in April 2022 the EU-wide conference 'EU cities Acting for Just Transitions and Climate Adaptation' in partnership with the UIA secretariat, a 2-day event to discuss how EU cities can contribute to green and just transitions and showcase concrete experiments to make resilient cities from around the world.
- Developed new partnerships with private companies and other stakeholders interested to apply the new cooling model to additional spaces such as outdoor gym areas or playgrounds.

Overview of the UIA management innovation challenges for CartujaQanat, Sevilla

Challenge	Observation
Leadership for Urban Innovation: Challenge level	CartujaQanat is essentially an innovative urban climate governance project that can effectively be described as a co-creational leadership project for urban climate transformation. This forward- looking approach calls for the implementation of ambitious purpose-driven policies (in this case maintaining city liveability through the reduction of heat in outdoor spaces with zero energy consumption) by a multitude of actors who are otherwise not formally connected through any kind of organisational format. This silo-bursting approach brings with it several challenges often nested in the existing organisational format of administrations. One of these challenge areas throughout the project lifecycle has been the financial management of the project. The rigid audit procedures foreseen within the Spanish Administration system have repeatedly clashed with the intention and the signed and approved agreements stemming from the budget approved by the UIA within the context of the grant. The problem has persisted throughout the project lifecycle creating repeated delays in the execution of payments and the progress of the project impeding to an extent some of the foreseen innovative aspirations. For example, in the question of the management of the new space. In other words, a narrow interpretation of regulatory standards contradicts urban innovation projects which may call for broader interpretations or even new regulations to be applied, requiring and demanding a combination of political and technical leadership and coordination as well as additional time which may go beyond the foreseen timeline of a project.
Smart Public Procurement:	

Challenge level

The success of the project was in fact closely linked to the public procurement processes. Liaising once again to the issue of regulatory interpretation, the successful development of the tender documents was directly liaised to:

- successful construction and development of the pilot area
- successful deployment of the novel materials that have been developed
- scalability and replication potential of the project itself

Part of the obstacles which emerged was the tender specifications which required innovative procurement processes aiming to the development of tender documents that would succeed in driving the optimal technical result. For example, the consortium needed to procure a diversity of materials under one tender, materials which had just been produced as pilots in the context of the project. To solve for this situation several meetings had to take place between the partners and the procurement department of the City of Sevilla.

An additional implementation space 'a demonstration island' was included in the delivered and implemented area, partly as a result of the procurement and innovative tender requirements. The 'pilot' approach for the demonstration of new materials has been used as a way to by-pass some of the obstacles presented in the context of the procurement process.

Cross-departmental working (or the organisational arrangements within the public authority)

Challenge level

Sevilla has high maturity and prior experience in the management of complicated multistakeholder projects. As such they are implementing a flexible cross-departmental management approach with the core management team at the centre with the flexibility to expand or overlap to include representatives of other departments and/or other relevant actors at various points over the project time-frame. Nevertheless, the project also presented a difficulty stemming from the fact that the key implementor (EMASESA) was not the project owner (which in this case was the City of Sevilla). As such and despite the long-standing experience of the city, it was more difficult in several instances to ensure complete project ownership and thus endorsement by the diversity of the involved departments of the city administration. To resolve similar scenarios, it is critical to ensure that an invested high-level representative of the project-owner is part of the central management team providing consistency and support where necessary.

Participative approach for implementation (or the role of project delivery partners)

Challenge level

Delivery Partners have had a key and very well defined role in the project's implementation ranging between management, technical implementation, stakeholder engagement and public space governance and revitalisation. The participatory model for implementation is in fact continuing formally beyond the formal ending of the project which is a very significant step towards the long-term success of the project goals. Defining the appropriate governance structure for the new space is today a key legacy of the project.

Monitoring & Evaluation (Measurability)

Challenge level

As described in Journal #2, a number of indicators and parameters have been identified during the project lifecycle to enable an appropriate evaluation as well as ensure appropriate monitoring even beyond the end of the official project life. These indicators correspond to the variety of the expected project outcomes and some of these have already delivered strong results.

Technological innovations monitoring and evaluation:

- Successful temperature lowering and creation of an ambient atmosphere in conditions of extreme heat: The target set has been met as conditions withing the renovated spaces have proven to be ambient with an average 10 degrees Celsius difference recorded repeatedly
- New materials and techniques developed: At least three new solutions have been tested and now released towards market replication including bioclimatic lattices based on ceramic elements; Evaporative surface with ceramic tiles and new evaporative surface with ceramic slats
- Energy-savings and in the mid-term the reduction in non-renewable energy consumption: As a result of the scientific monitoring process followed in the project, it is constantly followed that water cooling and space cooling is successful with near zero net energy consumption.

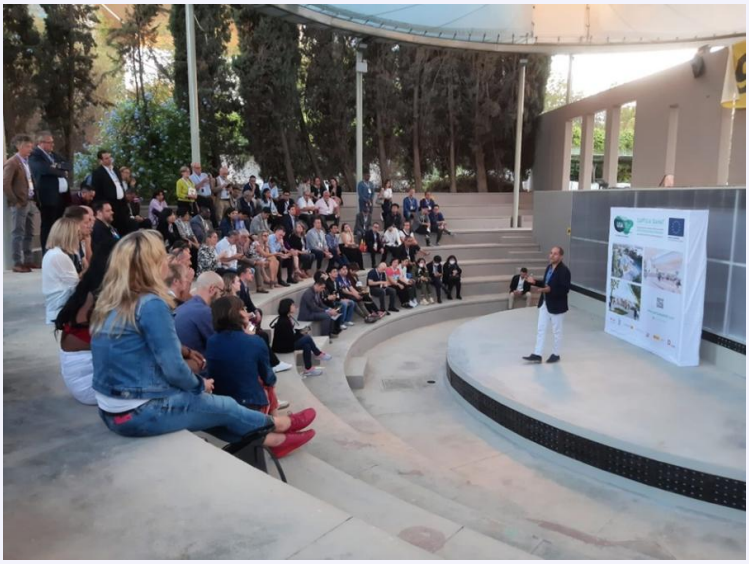
Space activation, management and liveability

- Number of new visitors in the area and/or number of new events: This indicator enables the new management partnership formed to map the success in the space usability with a baseline set near zero, considering the space was underused prior to the CartujaQanat program.

- Successful management of the space (which can be translated to variables such as costs, energy production/consumption, number of citizens of entities involved in the management of the space, security and others

Program Scalability:

- Number of public spaces where the new cooling techniques will be scaled: Already during the project lifecycle, there have been indications that the solution will be replicated to at least two new locations in the city, including bus-stops and open-air gyms.



Through the combined use of old (the qanat) and 21st C technologies the renovated open air amphitheatre has 10 degrees less heat with netzero energy consumption

Communication with target beneficiaries (end users)

Challenge level

The project had a diversity of target beneficiaries, each requiring a different approach. Following the end of the COVID-19 restrictions the program was truly able to deliver in this respect recording several successes:

Ceramics industry: Technical innovations have been consistently communicated to the industry through a diversity of methods including targeted participation in industry events and the involvement of a key ceramics industry actor

PCT Cartuja Park institutional users: This target audience is a central beneficiary as companies present in the Cartuja Park as well as the university are now primary users of the new space. Both abovementioned entities are also directly involved in the pilot stage of the management of the space.

Start up and sustainability entrepreneurs: This particular set of end-users is directly linked to the follow-up actions stemming from this innovation project with compagnies and actors being supported into the demonstration of prototypes related to energy, water management and mobility amongst others.

Residents and visitors of Sevilla: While a critical end-user this is the least developed audience to this date given that the space has only formally opened four months ago. Provisions such as the citizens lab, the planning of public entertainment events such as concerts and exhibitions are due to make this new public space more known and gradually incorporate it to the fabric of the city.

Upscaling and next steps

Challenge level

The entire UIA project of CartujaQanat is deeply entwined to the city's strategic goals for 2030 as well as operationally linked to EMASESA's role as a driver of urban change in the metropolitan area of Sevilla. As such, various elements of the project started upscaling already during the project lifecycle

- **Re-invention of a traditional market such as the ceramics industry and identification of novel ceramic products.** Innovarcilla, has already started a communication process with key industry stakeholders to inform of the process goals and expected outputs.

- **Space usage and business development**. CartujaQanat has kickstarted a new incubation program for start-ups in the sustainability domain. The space is used as a demonstration area for the development of new prototypes and to this date at least nine-projects have been integrated in the framework of CartujaQanat focusing on energy efficiency, mobility, water and air quality.
- **Innovative Space Management and Citizens' Lab for Mobility and Resilience**
- **International collaborations and demonstrability**: Throughout the past year several entities and urban representations have shown interest in the project, including private companies, cities representatives of EUROCITIES, new building designers such as a new European Bauhaus Building to be developed in Sevilla by the European Commission and several city representations including a representation study visit from South Korea. Moreso, enquiries from tourism offices in Switzerland and Germany have been made to the city looking to promote CartujaQanat as a sustainability tourism attraction.

Concluding remarks

Sevilla will be a battleground in Europe for extreme urban heat. As the warmest city in continental Europe

based on annual average temperatures, Sevilla will be dealing over the next five to ten years with longer periods of heatwaves, and extreme temperatures. Left untreated such climatic phenomena will have multi-faceted consequences in the urban life from energy consumption, to tourism to public health and street-life. Among others the city made headlines as part of the Arsht-Rock Resilience Centre led pilot for a new classification system of heatwaves becoming the first city in the world to name and categorize severe heat waves under the program proMETEO Sevilla.

The UIA project CartujaQanat, is exemplary when it comes to the combination of technical and public space development innovation in the new era of urban resilience and risks. In its final year of implementation a new inclusive space is been made available to citizens and targeted end-users and new technical approaches are scaled in the city and beyond.

In the forthcoming period it is expected that the new space will deliver further results at the intersection of social equity and technical innovations offering a holistic paradigm for multi-dividend transformational programs.

Climate adaptation

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