



URBAN DESIGN PROPOSAL FOR BIOCLIMATIC SHELTERS

REFUGI DEL BARRI | Plaza de Nicolás Ferrer Julve, Valencia

Roland Polczer

INTERVENTION AREA | Plaza de Nicolás Ferrer Julve

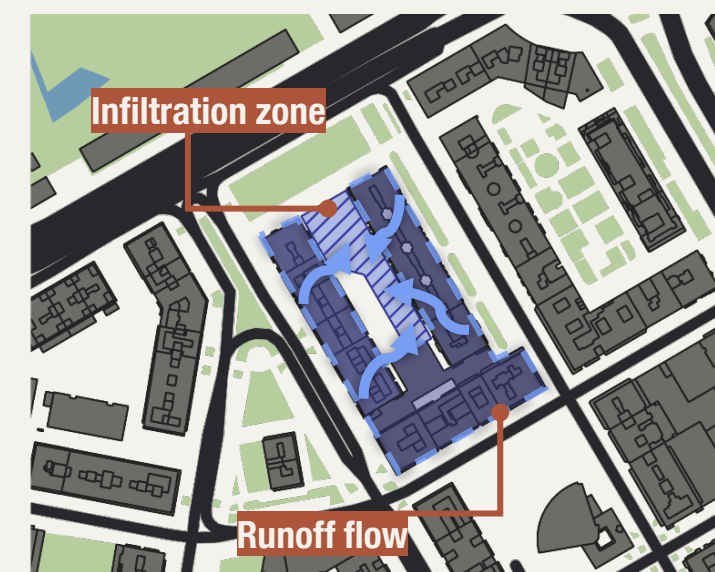


URBAN DENSITY: HEAT MAP



LOW HIGH

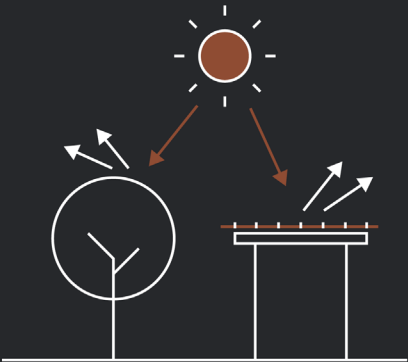
WATER MANAGEMENT: HARVESTING



Urban density intensifies the heat island effect and prevents water infiltration. The project proposes a paradigm shift: replacing conventional drainage with an active-retention 'sponge city' model.

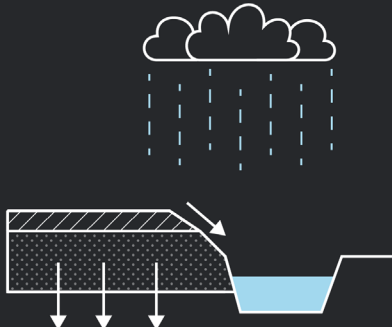
Water harvesting restores the ground's regulating role, turning moisture into a resource for cooling the microclimate and improving thermal comfort.

MICROCLIMATE AND SHADE MANAGEMENT



Reduction of the Urban Heat Island (UHI) through vegetation shade and lightweight structures.

SUSTAINABLE WATER MANAGEMENT



Use of permeable paving and biofilters to absorb and retain excess rainfall, preventing flash floods (DANA).

FROM THE CITY TO THE REFUGE

The Masterplan guides the user from the urban bustle toward a calm core, creating a fluid transition between community and nature.

The space is structured around three adaptive nodes: the Casal Urbà as neighbourhood engine; the Bioclimatic Centre for environmental regulation; and the Intimate Refuge, a dense tree mass offering acoustic protection and disconnection.

SOCIAL: CASAL URBÀ

Setting: Bioclimatic timber pavilion with integrated pergolas in the square.

Use: Social engine and circular economy. Houses a "Library of Things", "Repair Café" and neighbourhood workshops.

ECOSYSTEM: BIOCLIMATIC OASIS

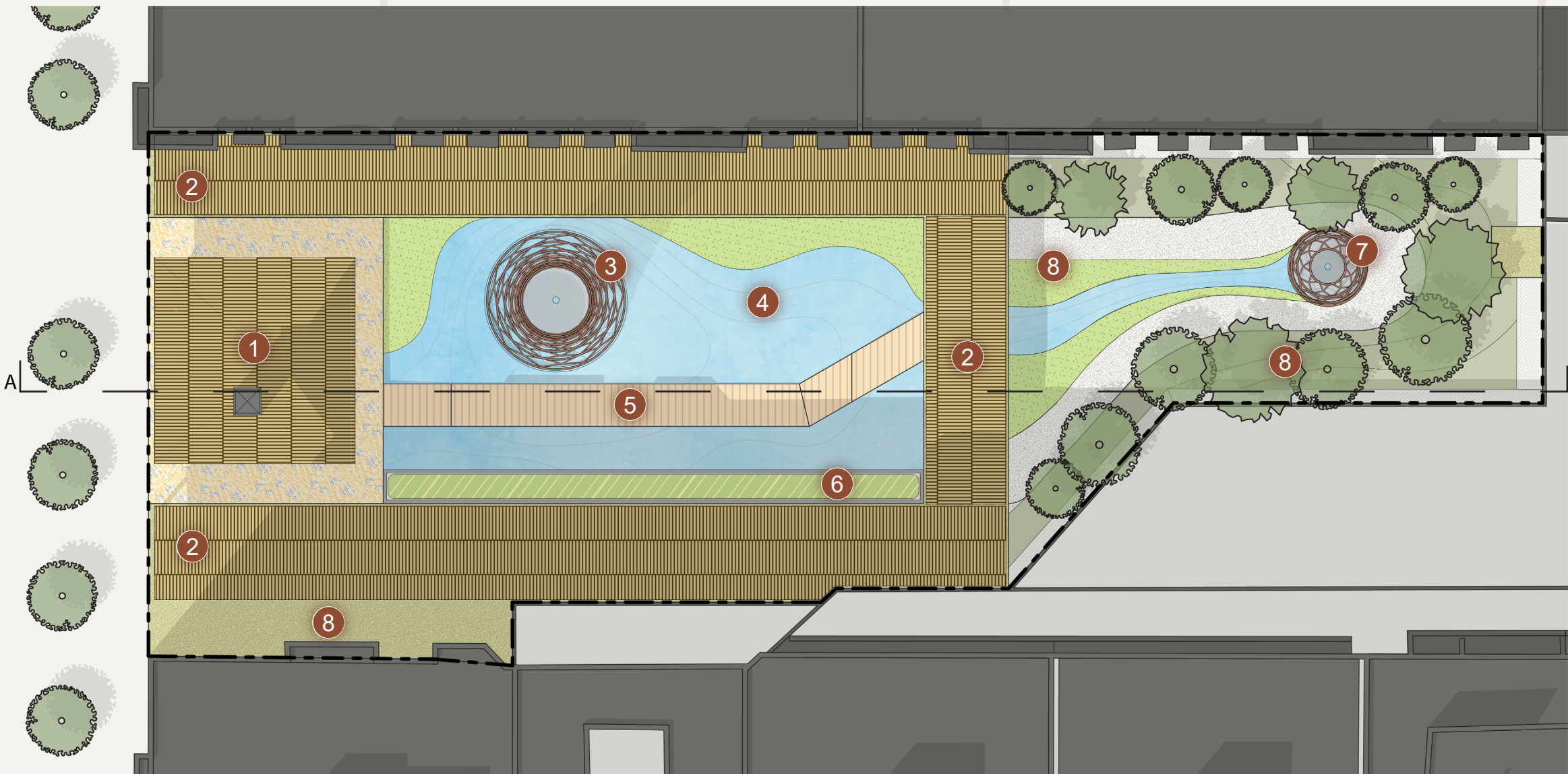
Setting: Infiltration basin with central pond, natural phytoremediation biofilter and the main Warka Tower.

Use: Circular water management and climate regulation. Flash flood mitigation (DANA), atmospheric moisture harvesting, grey water reuse and passive cooling.

HABITAT: INTIMATE REFUGE

Setting: Dense urban forest with native flora, permeable ground and flexible growing spaces.

Use: Maximum thermal comfort and acoustic barrier. An environment promoting biodiversity, rest and urban agriculture.



LEGEND

- 1 Casal Urbà
- 2 Pergola walkways
- 3 Warka Tower
- 4 Evaporative pond
- 5 Timber boardwalk
- 6 Phytoremediation filter
- 7 Micro-Warka
- 8 Flexible growing areas

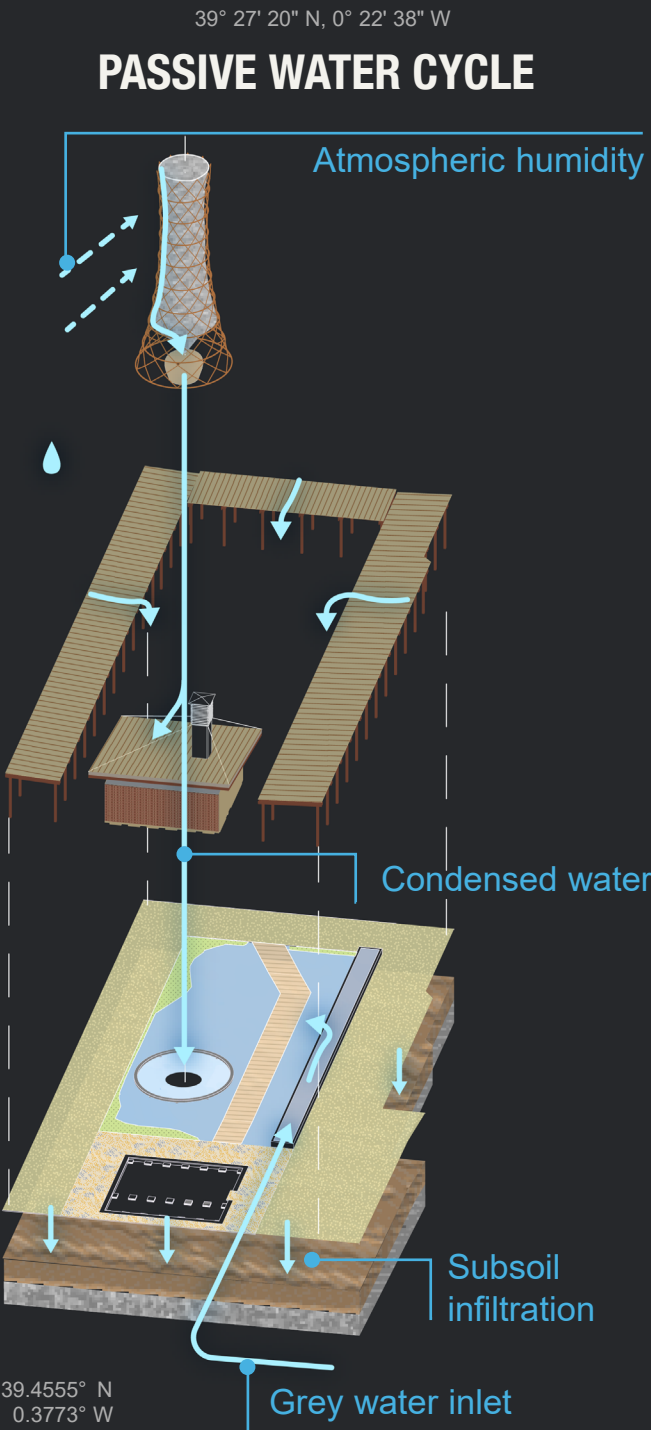
- Permeable paving
- Vegetation and urban forest



1:300

SPACIAL SYSTEM AND SCALE | Longitudinal Section

The blue-green infrastructure operates across three strata. The Warka Towers harvest atmospheric humidity while the surface directs runoff. Simultaneously, grey water is treated in the adjacent biofilter before flowing into the central pond, while the subsoil acts as an active reservoir that filters and stores water through the Stockholm Method.



The section reveals the three-dimensional functioning of the square. It demonstrates how the excavated relief and lightweight infrastructures transform the space into an active system that passively manages water and temperature.

SOCIAL: COMMUNITY SPACE AND COMFORT

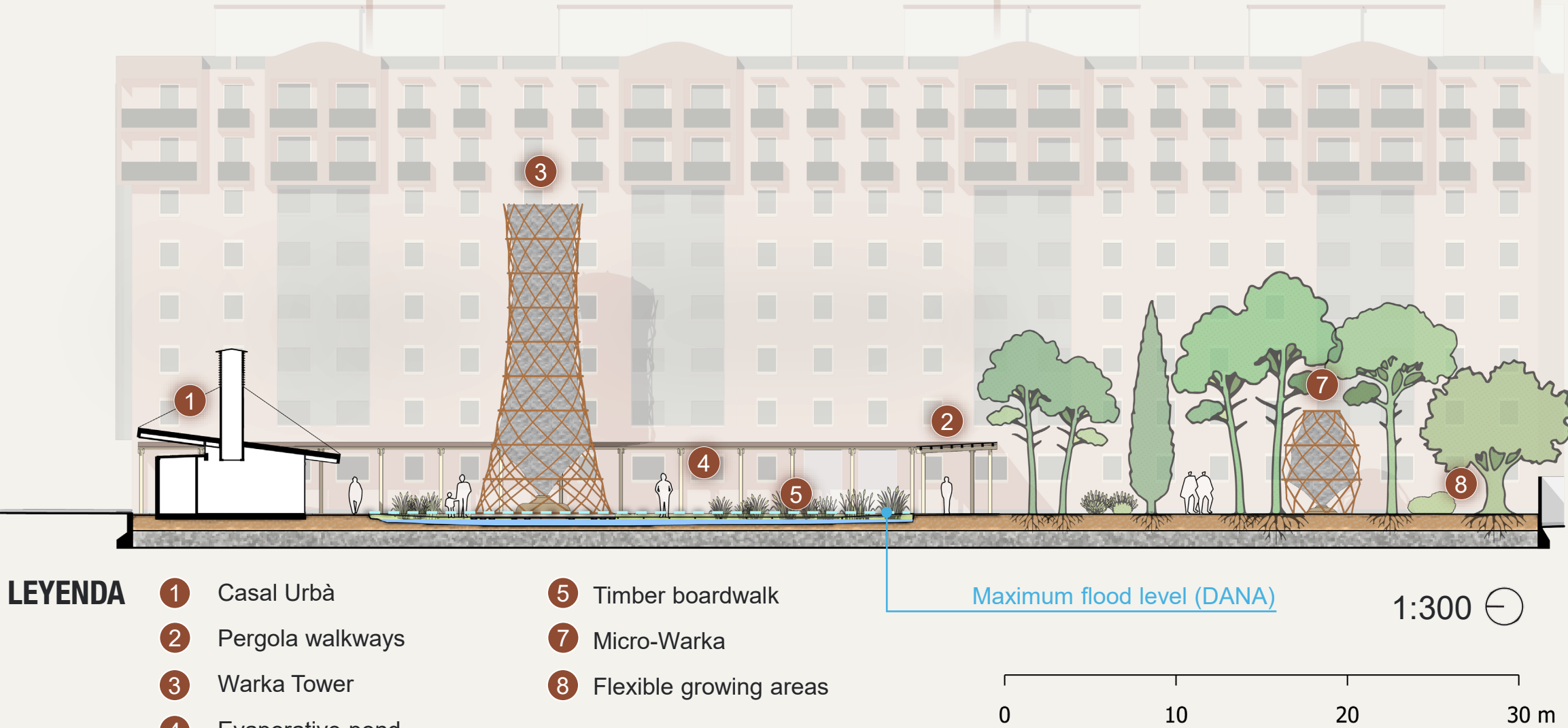
The Casal Urbà is the neighbourhood engine of the project. Its passive tower extracts hot air while the pergolas extend shade onto the square, creating a protected and accessible space for workshops and social support.

ECOSYSTEM: WATER INFRASTRUCTURE

The central topographic depression forms an infiltration basin against DANA flash flood events, supported by the underground Stockholm Method acting as a storm tank. Simultaneously, the biofilter treats neighbouring grey water to feed the water surface, whose evaporation passively cools the surroundings.

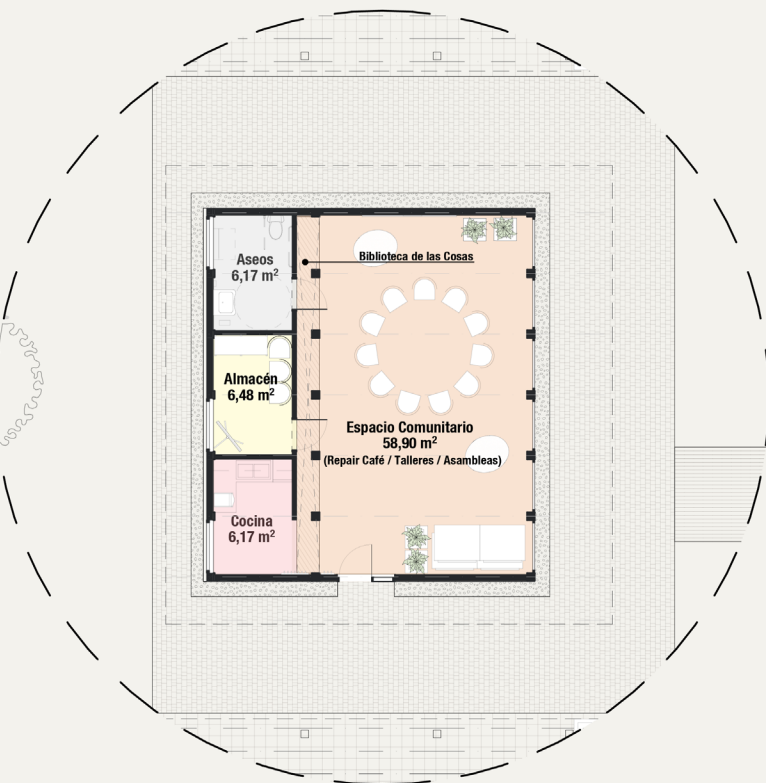
HABITAT: CLIMATE AND ACOUSTIC BARRIER

The dense tree mass at the rear acts as an essential acoustic buffer against urban noise. The vegetation is structured vertically, from riparian species to the forest canopy, filtering sunlight to create deep shade and the point of greatest thermal comfort in the park.



SPATIAL FLEXIBILITY

The Casal Urbà is the engine of the local community and a shield against gentrification. Its interior offers absolute flexibility: modular furniture allows the space to be reconfigured in minutes for assemblies, workshops or yoga classes. The environment evolves according to needs, empowering residents through self-management and shared learning.

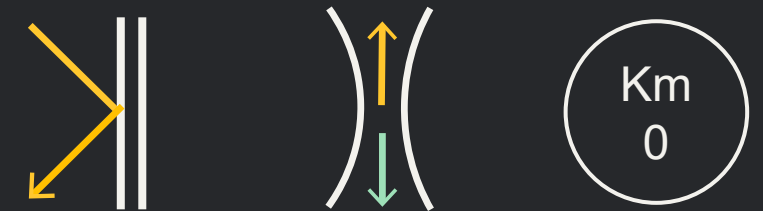
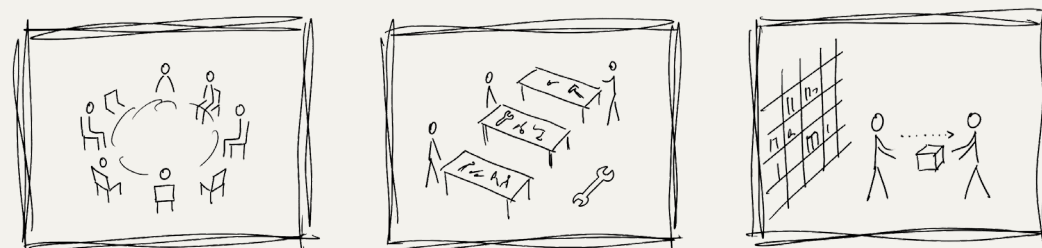


FLOOR PLAN: CASAL URBÀ | 1:200



CIRCULAR ECONOMY

Promoting the circular economy, the pavilion integrates a "Library of Things" with smart lockers for tool lending, alongside a neighbourhood "Repair Café" to combat obsolescence. This same philosophy is applied to the building itself: its ventilated façade uses lightweight modules (such as reed panels) designed for accessible maintenance and quick part replacement.



PASSIVE SYSTEMS

THERMAL MASS: Walls that regulate daytime heat.

PDEC TOWER: Evaporative cooling without electricity.

LOCAL MATERIALS (KM 0): Sustainability and low impact.

FRESH AIR  **HOT AIR** 

Cooling tower (PDEC)

Glued laminated timber structure

Library of Things

Ceramic lattice (solar filter)

EXPLODED AXONOMETRY | No scale

WARKA TOWER AND ATMOSPHERIC HARVESTING:

An 18-metre monumental structure in glued laminated timber, designed to withstand urban wind loads. Through a fog-catching mesh, it condenses air humidity without energy consumption. The pure water is stored in a structural vitrified stoneware cistern at the base, used exclusively for evaporative cooling (PDEC) and drip irrigation.

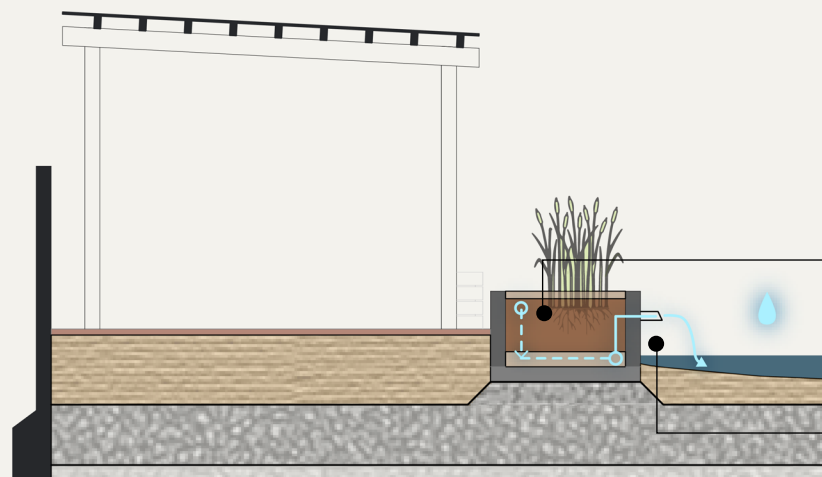


WARKA PROTOTYPE (2015)

The original prototype by Arturo Vittori for passive water harvesting has been adapted to the urban context of Valencia.

PHYTOREMEDIATION BIOFILTER:

A living system that optimises the local water cycle. It partially captures grey water and rainfall runoff from neighbouring buildings, treating them biologically through beds of reeds and gravel. The treated water feeds the central pond, maintaining its level to ensure continuous evaporative cooling.



SECTION: BIOFILTER | 1:100

ESTANQUE EVAPORATIVO:

The water surface cools through evaporation and acts as water retention. During DANA flash flood events, excess water infiltrates the underground Stockholm Method. The result is a serene landscape that reflects the monumentality of the Warka Tower.

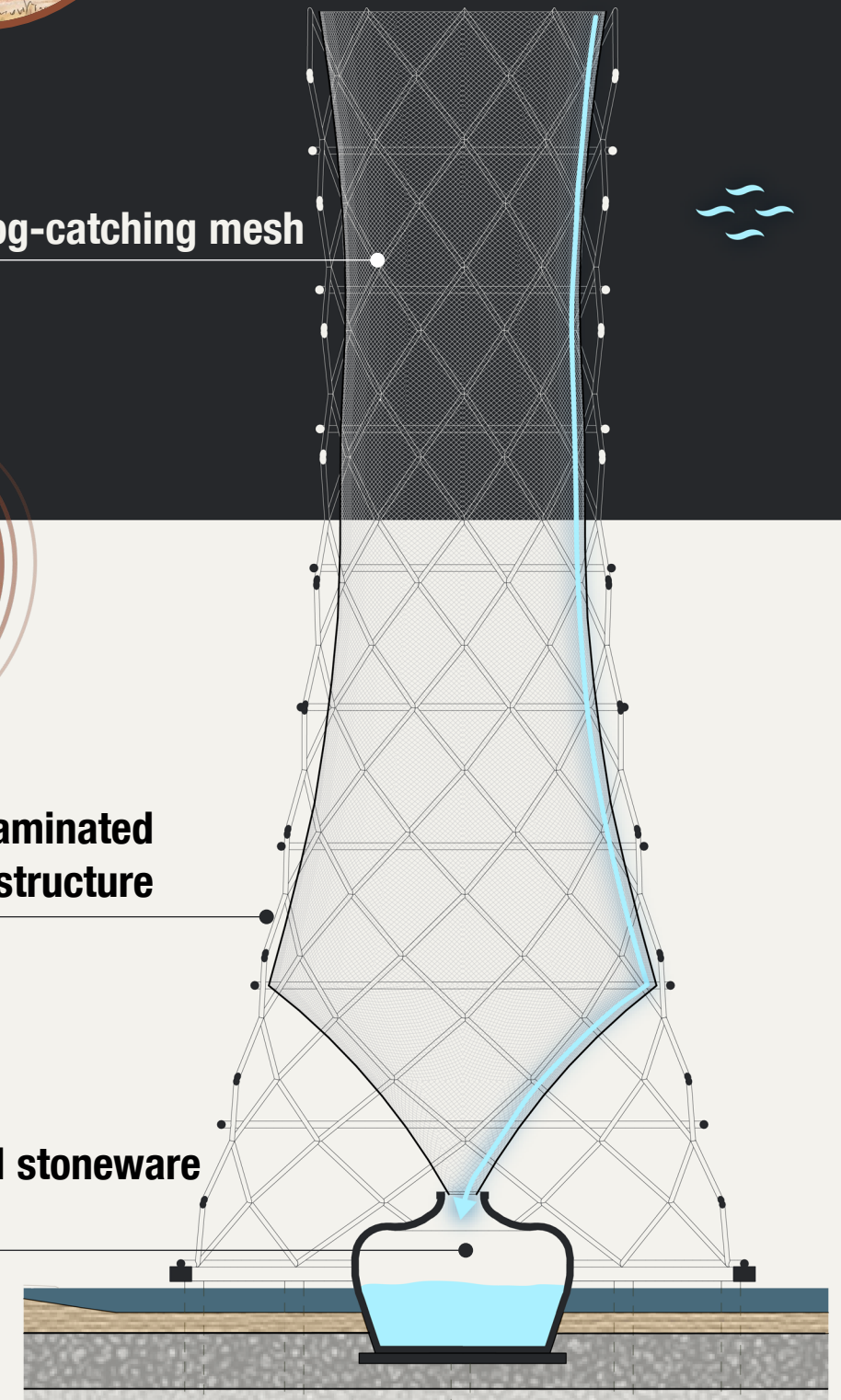
Grey water inlet

Filtration to the pond

HDPE fog-catching mesh

Glued laminated timber structure

Vitrified stoneware cistern



SECTION: WARKA TOWER | 1:100

HABITAT: CANOPY AND SERENITY

The dense tree canopy acts as a natural parasol that maximises shading and passive cooling of the square. At its core, surrounded by vegetation, a Micro-Warka structure creates a space of absolute rest and calm, where filtered sunlight generates a microclimate of maximum disconnection.

STOCKHOLM METHOD: STRUCTURAL SOIL

The subsoil uses a matrix of crushed stone and biochar. This system prevents compaction, creating an optimal volume for forest root development and acting as a moisture reservoir that nourishes vegetation during dry months.



BIODIVERSITY AND COMMUNITY GROWING

The botanical palette prioritises Mediterranean species and integrates urban agriculture through raised beds. These spaces allow the collective cultivation of traditional produce such as tiger nuts (chufa), turning self-growing and landscape maintenance into a shared educational and social activity.



Lavandula dentata



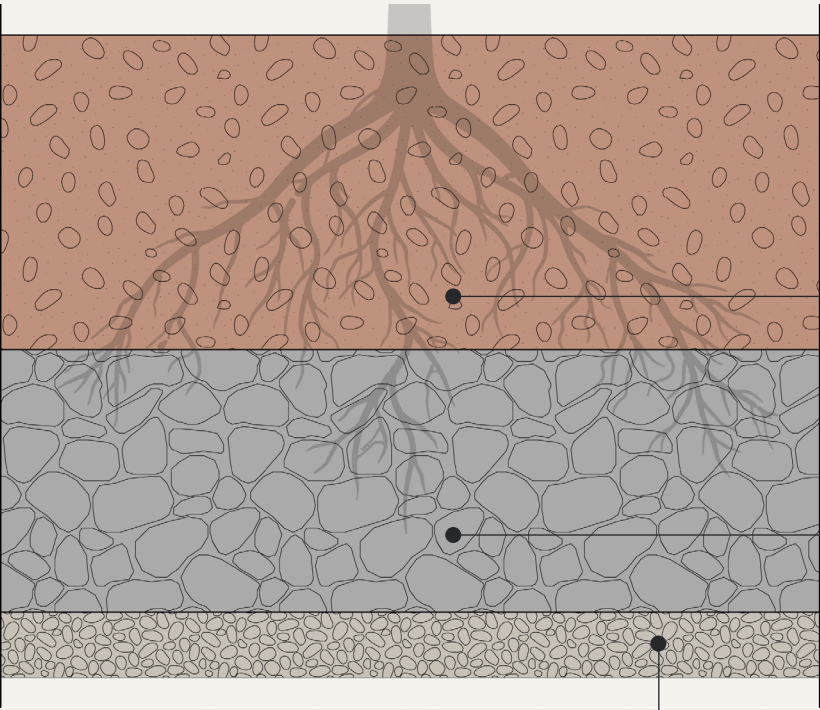
Rosmarinus officinalis



Pinus halepensis



Cyperus esculentus



Organic Substrate

Acts as a passive storm tank against DANA flash flood events, preventing surface flooding and filtering pollutants.

Structural Layer (Gravel and Biochar)

Base layer of gravel enriched with biochar. Enables healthy tree growth beneath the square. Retains excess rainfall and stores moisture for dry months.

Drainage Layer

Drainage gravel that regulates deep water flow. Facilitates slow, natural infiltration into the subsoil.

BOTANICAL CATALOGUE: NATIVE FLORA

The landscaping prioritises native low-water species. The tree stratum (pines, olive trees) provides deep shade and thermoacoustic control, while the shrub level (lavender, rosemary) promotes pollination and ecological resilience.

VERNACULAR INNOVATION

The project reinterprets the ancestral building materials of the Mediterranean region and integrates them into a contemporary bioclimatic engineering system. It is a low-tech approach that promotes maximum urban resilience through the use of the most basic and primary materials.



GLUED LAMINATED TIMBER

Main structure and envelope. Ensures construction lightness, thermal insulation and a biophilic interior environment.



COMPRESSED EARTH BLOCKS (CEB)

Interior partition walls. Provide passive thermal mass, absorbing daytime heat to release it at night.



CERAMICS AND STONEWARE

Cistern and finishes. A material of deep Valencian tradition that guarantees the purity of harvested water.



LOCAL REED

Pergolas and lattices. Fibres extracted from ecological cleaning works that offer natural and biodegradable shading.



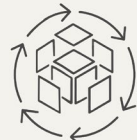
GRAVEL AND BIOCHAR

Structural soil (Stockholm Method). Acts as a storm tank and permanent carbon sink.

A LOW-IMPACT METABOLISM

The project rejects high-energy-impact materials. The palette is entirely based on local resources (Km 0), minimising transport costs and emissions. This strategy not only reduces the Material Execution Budget (MEB), but also enables a circular architecture model.

LIFE CYCLE ASSESSMENT (LCA)



1. LOCAL ORIGIN
2. DRY ASSEMBLY
3. PASSIVE EFFICIENCY
4. DISASSEMBLY

- | Sustainable extraction of Valencian resources.
- | Modular construction without wet waste.
- | Materials age naturally.
- | 100% recyclable or biodegradable elements.

ECONOMIC FEASIBILITY | BIM Extraction and Cost Analysis



The Material Execution Budget (MEB) is based on precise quantities extracted directly from the 3D BIM model. The implementation of green infrastructure and local low-tech systems not only promotes ecological resilience but also represents an economically competitive alternative.

BUDGET CHAPTERS (MEB)	SUMMARY DESCRIPTION (BIM QUANTITIES)	ESTIMATED COST
01. Site Preparation	General excavation and topographic relief preparation (~3,600 m³).	60.000 €
02. Water Infrastructure and SUDS	Stockholm drainage matrix (2,030 m³), evaporative pond and phytoremediation biofilter (EPDM and gravel).	120.000 €
03. Bioclimatic Architecture	Glued laminated timber structures (~42.6 m³), CEB thermal mass walls, reed shade structures and Warka Tower.	180.000 €
04. Landscaping and Paving	Permeable paving (1,093 m²), timber deck, organic substrate (1,524 m³) and native planting.	90.000 €
05. Equipment and Miscellaneous	Passive PDEC Tower system, flexible furniture (Library of Things) and solar lighting.	25.000 €
TOTAL MATERIAL EXECUTION BUDGET		475.000 €

ECONOMIC SUMMARY

Official intervention area: 2.011,76 m²
Project cost ratio: 236,11 €/m²