



INFRAVISION 2026 • STUDENT COMPETITION

THE URBAN MYCELIUM NETWORK (UMN)

An intervention that cools itself, block by block.

Location: King Khalid Street, Al Khubar Ash Shamaliyah · Eastern Province, Saudi Arabia



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ABSTRACT

Urban Mycelium Network

In the Gulf, heat and humidity have made the outdoors unusable for much of the year, and the people with the least shelter carry the cost: outdoor workers, delivery riders, the elderly, children, and lower-income households. Along our 28-block pilot corridor, 4,245 residents live under an average summer land-surface temperature of 51.7 °C, with severe heat-stress days rising by 15 to 18 per decade. Shade is treated as amenity. We treat it as infrastructure. The Urban Mycelium Network cools a street the way a mycelium colonises a forest, block by block, each cluster helping fund the next. Three layers do the work. **Nodes** are the physical intervention, made of biomimetic solar canopies, cool roofs, cool paving and native Ghaf planting irrigated with treated wastewater. **Threads** are sensors and a routing app that verify performance and guide people to cool refuges. **Roots** are the Cool-Share Fund, a revolving vehicle in which verified energy savings repay capital through a charge on the utility bill that is capped below the savings itself, then seed the next block. We do not forecast one world. We test the network against three. In the **first**, replication demand outruns our capacity to build. In the **second**, reform arrives in a shape our financing cannot use. In the **third**, heat accelerates while capital and input costs rise. Every vulnerability, from subsidy dependency and affordability to supply-chain shock, water throughput, verification integrity and disintermediation, is answered by a design choice already made: bolted modules that unbolt, procurement in 28 tranches rather than one order, a phase gate before any scaling, and auditors who sit off the board. The block, not the corridor, is the unit of risk. We chose financial resilience over maximum yield, proof over speed, inclusion over simplicity, and credibility over big claims. Each choice costs something, and we boldly say what. The corridor links six systems- energy, water, mobility, urban heritage, public health, and finance into one street-scale operating architecture aligned with Saudi Arabia Vision 2030 targets for wastewater reuse and energy-subsidy reform. Delivery runs in four phases, from a regulatory sandbox cluster to a full 28-block corridor costing about USD 10.7 million, split between a public purse and a private account repaid from verified savings. Our single indicator of success is felt-temperature relief on the street, with a target of -6 °C for the people who need it, at no net cost to the public purse. The corridor delivers 15.2 GWh of clean power a year, avoids roughly 9,040 tonnes of carbon annually, and builds the next block. It's the mechanism itself that replicates, not the canopy.

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THE WHOLE IDEA, IN BRIEF

Urban Mycelium Network

01

THE PROBLEM

The heat and humidity have made the outdoors unlivable for much of the year, and the people with the least shelter bear the brunt: outdoor workers, gig and delivery riders, the elderly, children, and lower-income households.

02

THE IDEA

To cool the city the way a mycelium colonises a forest: block by block, each cluster helping fund the next. Three layers: cooling nodes, sensing threads, financing roots.

03

HOW IT CREATES VALUE

A revolving Cool-Share fund builds each block. Sensors verify the impact. A capped charge on the electricity bill repays the fund.

H

E

The Gulf streets are prone to heat in prolonged summer hours, which causes empty streets

The street gets worse between towers, where narrow canyons trap the heat with nowhere to go

Constant glare and radiative heat cause immense discomfort in walking

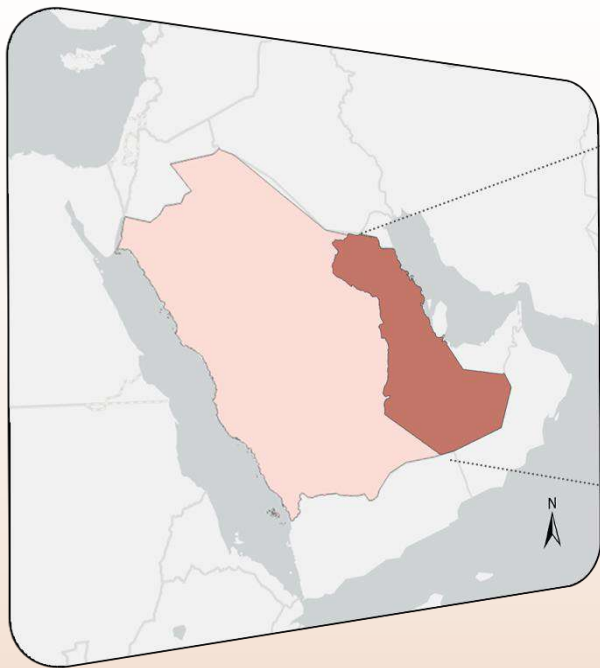
A

Occasional dust storms envelop the streets, contributing to loss of visibility

T

Unshaded rooftops absorb heat all day and keep releasing it long after sunset.

FROM SAUDI ARABIA TO KING KHALID STREET, AL KHOBAR



01 SAUDI ARABIA

The model is built to scale block by block across the Kingdom



02 EASTERN PROVINCE

Northern Al Khobar's municipal upgrade anchors the pilot corridor

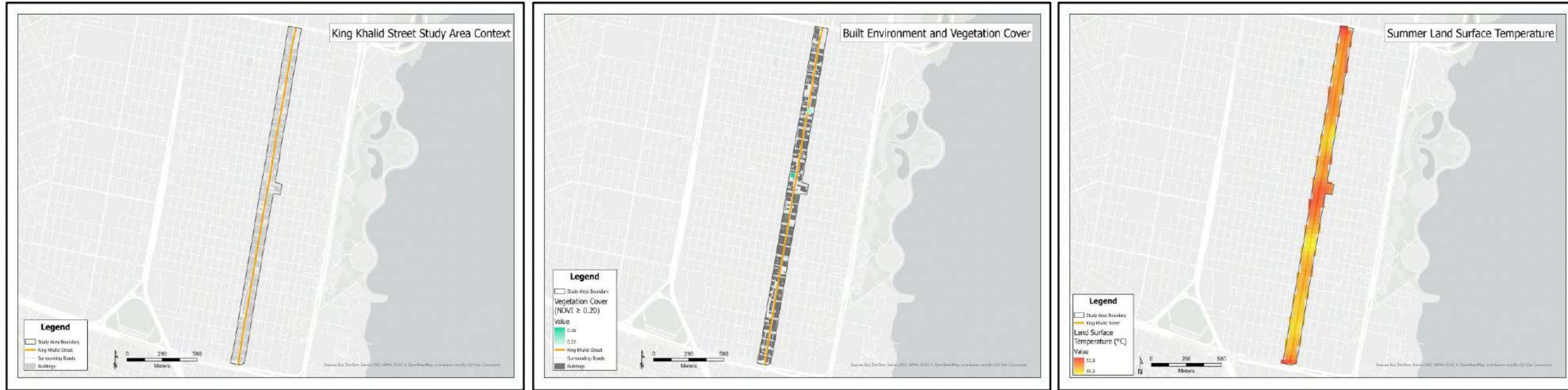


03 AL KHOBAR

Al Khobar Al Shamaliya was selected as the demonstration area, and King Khaled Street was selected as the pilot Corridor

ABOUT THE SELECTED STREET

King Khaled Street - Al Khobar Al Shamalia (Northern Khobar)



King Khalid Street of Al Khobar Al Shamaliya

Built-up and Vegetation Cover

Land Surface Temperature (Summer)

Our pilot location is King Khalid Street in Northern Al Khobar, Saudi Arabia

These GIS maps explain the scenario of the Street



SITE IMAGES

WHY KING KHALID STREET IS THE RIGHT PILOT

01

Socio-Historic Value



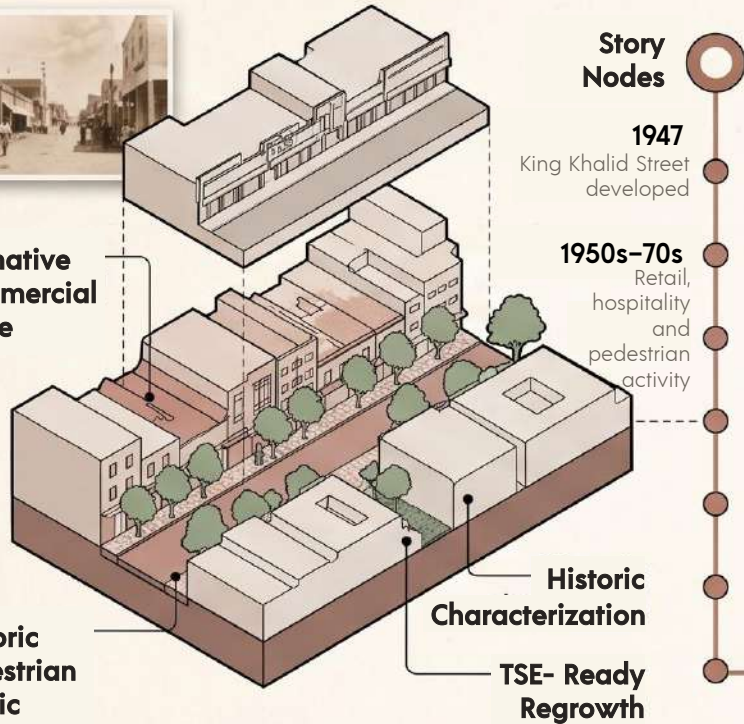
HERITAGE CHARACTER & PEDESTRIAN FABRICATION

A formative commercial street in Al Khobar's modern urban identity. Earlier tree shaded, pedestrian character and urban regeneration



Formative
Commercial
Spine

Historic
Pedestrian
Fabric



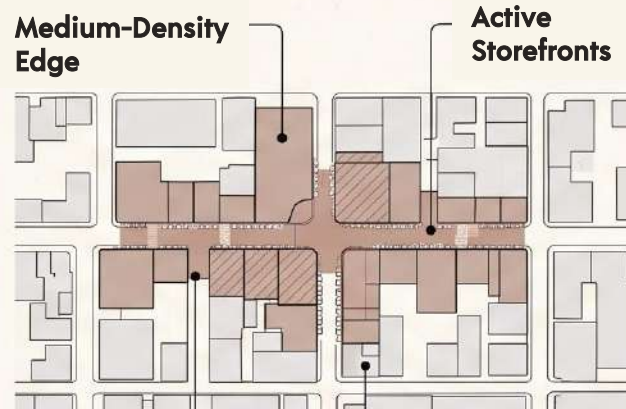
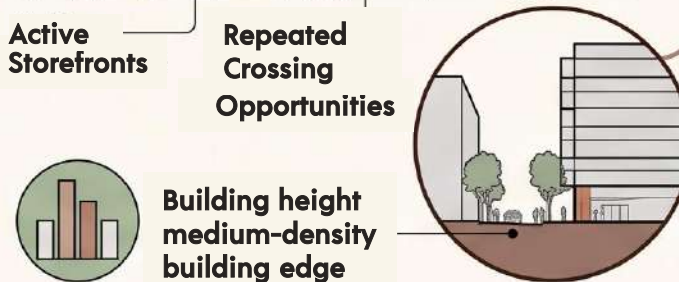
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Urban Morphology



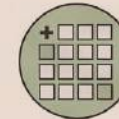
TECHNICAL URBAN FORM

A continuous mixed-use corridor with short blocks, frequent intersections, and consistent street geometry



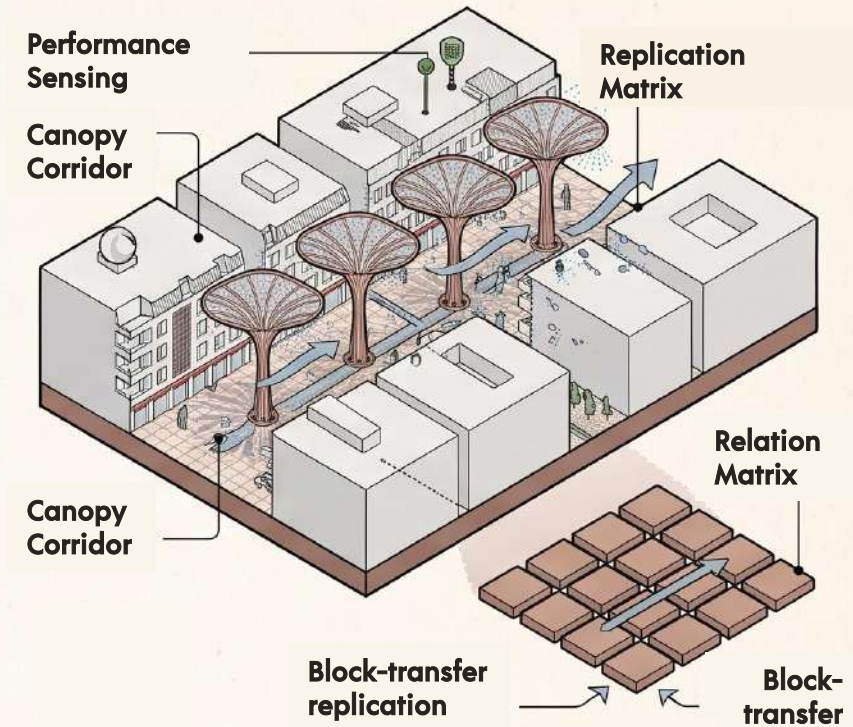
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Pilot + Replication Value



PERFORMANCE TESTBED AND REPLICATION MATRIX

28 blocks provide enough variation to test different intervention mixes, and a visible whole-street corridor makes before-and-after performance legible to users and decision-makers, resulting in rules that can transfer to comparable hot, humid Gulf streets.



PLACE VALUE × DELIVERABLE URBAN FORM × MEASURABLE REPLICATION = A CREDIBLE PILOT

King Khalid Street can prove an integrated cooling network at the scale of everyday urban life.

KING KHALED STREET SPANS 29 INTERSECTIONS, MAKING 28 BLOCKS

A regional 500m x 500m remote sensing grid comparison of Al Khobar's wider heat field versus the focused King Khalid Street area corridor to understand the how many people are at risk

AL KHOBAR WIDER CONTEXT



46.86°C

average summer land-surface temperature



197,895

residents represented with 6,482 Elderly people



679

500 m x 500 m study grid cells



ZOOM TO AREA

KING KHALID STREET AREA



51.7 °C

average summer land-surface temperature



4245

residents



0.30 km²

of study area



359 ELDERLY

Within the **4245 residents** living in Al Khobar Al Shamaliya (northern district)



52.1 °C Mean Summer

for Al Khobar Al Shamaliya (the district our corridor sits in)



+15 TO +18 DAYS

severe heat-stress days per **decade**, with the trend still rising



Heat risk is spatial and social: the corridor has a clearly defined population whose relief should be prioritized

OUR VISION

A City where cooling spreads faster than the heat

OUR MISSION

We plan cooling nodes block by block, for the people the heat hits hardest, funded by the value they create, verified by data anyone can audit, and built to spread to any hot-humid city

OUR OBJECTIVES

01

Cool the outdoors for the hours and for the people that matter

02

Make it self-financing through a fair public-private model

03

Prove it with credible, independently-checkable measurement

04

Make it genuinely replicable across the hot-humid Gulf

Biomimicry Reference Of Mycelium Fungus

The main, living body of the fungus. It is composed of a network of microscopic, thread-like structures called hyphae

When environmental conditions (such as moisture and temperature) are optimal, the mycelium produces a mushroom which further propagates and expands the fungus through spores

The mycelium lives underground, in soil, actively absorbing nutrients, breaking down organic matter, and even sharing resources between plants

The Urban Mycelium Network

An underground electrical power feedback grid, smart sensor threads, and TSE-treated water supply lines connect canopy structures, trees, and building meters

Capital investment generates physical cooling nodes (biomimetic PV canopies, cool roofs, tree rows). These reduce heat, create solar power, and significantly improve the pedestrian appeal and microclimate of streets

Verified energy savings and exported solar power repay the invested capital through Cool-Share Fund. The returned money goes to neighboring blocks to grow new canopies, creating an organic propagation block-by-block

The Mycelium Fungus Concept Adopted as UMN

The network architecture mirrors the most successful decentralized infrastructure on Earth

Nodes. Threads. Roots.

01 Nodes

What physically participates in providing shade or energy

INTEGRATED DESIGN

Bolted structural frame
Solar canopies
Roof-top Solar Panels
Cool roofs
Cool paving,
Native Ghaf trees and Plants

BIOMIMICRY

The canopy's modular framing mimics the branching growth structure of the mycelium fungus. The superhydrophobic TiO_2 skin mimics the lotus leaf (lotus effect) to shed dust using morning dew

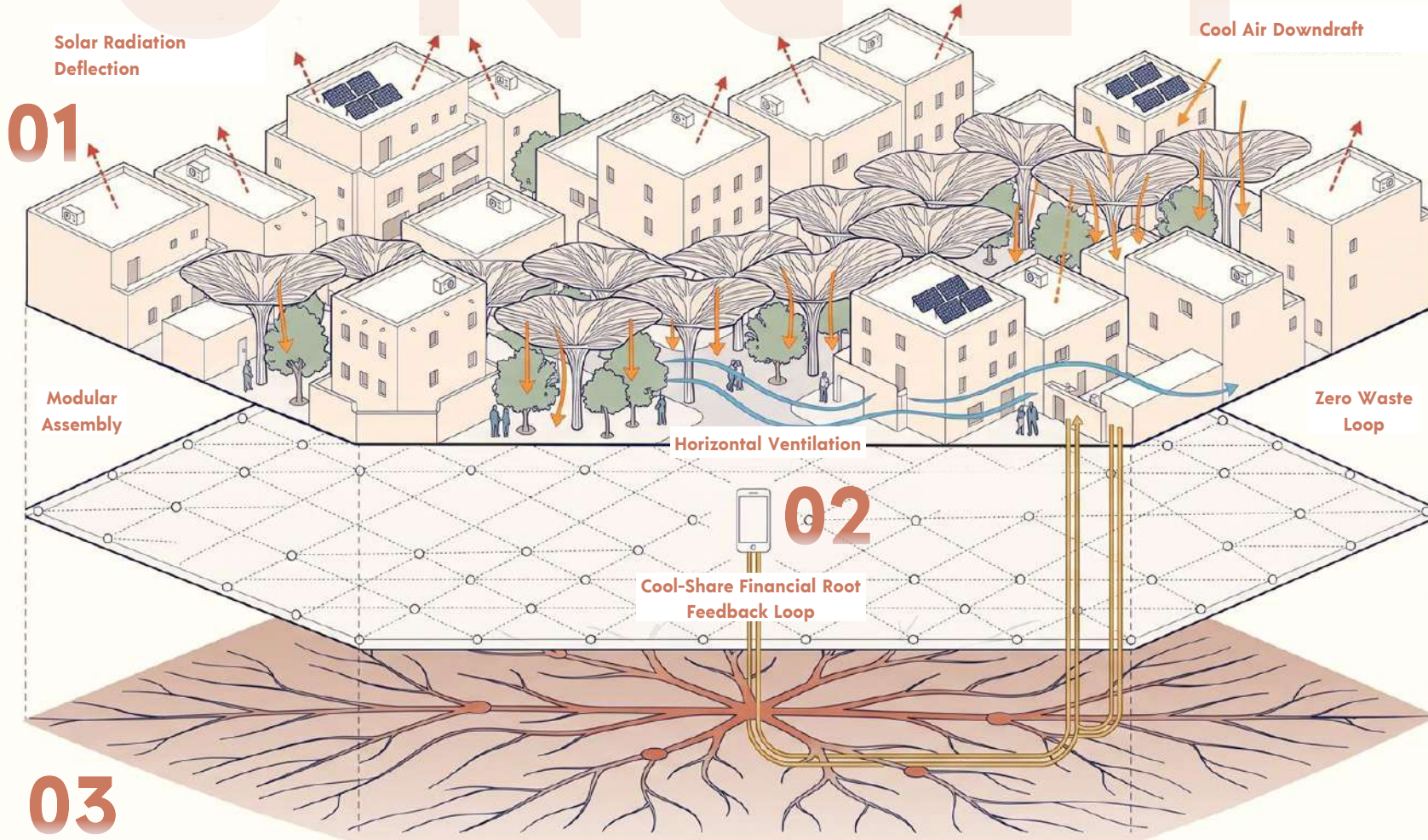
Cradle-to-Cradle (C2C)

Bolted (not welded) structural joints allow the modules to be easily disassembled, relocated, and fully recovered at the end of their lifecycle

REGENERATIVE DESIGN

Energy-Positive: Solar canopies and rooftop solar generates clean power and feed surplus back to the utility grid.

Water-Positive: Permeable paving and native tree soils absorb rainfall and runoff to recharge local groundwater aquifers.



02 Threads

Sensors and apps that prove the nodes work and guide people to safety

DESIGN COMPONENTS

Solar-powered micro-sensor
Real-time pedestrian navigation app

PERFORMANCE & COOLING AS A SERVICE (CAAS)

Implements the Performance Economy by applying CAAS. Sensors verify actual building energy savings, which are used to repay the revolving Cool-Share fund through a capped utility bill charge

03 Roots

The underground components and the invisible financing tool that funds each block and lets the network spread

INTEGRATED DESIGN

Cool Share Fund
Treated Sewage Effluent (TSE) water network
Utility grid connections.

INDUSTRIAL SYMBIOSIS

Diverts industrial wastewater (municipal TSE) to irrigate native street plantings and misting, turning a waste stream into a cooling asset

One system, grown like biological mycelium, linking urban elements, sharing resources, and spreading block by block.

Every element weighs on every other

Five small systems working as one bigger system, making everything feasible

Primary Node: Canopy

The Canopy Structure

This self-sustaining smart canopy integrates an exterior self-cleaning, NASA electrodynamic translucent PV core, power while a sub-surface passively dehumidifies

canopy integrates an dust-repelling TiO_2 and envelope over a generating its own chitosan-sea salt skin the microclimate below.

Components of Canopy Skin



Biomimicry

01-NASA electrodynamic dust shields

It consists of optically transparent, embedded electrodes that generate a high-voltage alternating electric field across the surface that repels and clears fine particulate dust

02-Superhydrophobic TiO_2 coating

It prevents dust from cementing by forcing morning dew to bead and slide off the canopy instantly. This prevents moisture from binding loose particulate matter into a hard crust.

03- Chitosan-Sea Salt Skin for Dehumidification

Positioned below the canopy surface, it serves as an eco-friendly sorption barrier against ambient humidity. The porous biopolymer captures localized water vapor via the embedded marine salts and regenerates passively using ambient thermal energy.

04-TSE Water Supply

Treated municipal sewage effluent is delivered underground to root zones for irrigation and misting instead of drinking water. Turns a municipal waste stream into a cooling resource for the street

Industrial Symbiosis

05-Bolted Joints

Structural connections are fastened with bolts rather than welded, so canopy modules can be fully disassembled. Lets a component retired from one block become material for the next.

Cradle to Cradle

Threads Layer (Smart)

01-Navigation app

Streams live sensor data to route pedestrians and outdoor workers along shaded paths. Directs the most vulnerable people to the nearest verified cool refuge during dangerous heat spikes



01

Performance Economy

02-Sensor node

Solar-powered units mounted across canopies, roofs, and paving continuously measure real cooling performance. Every reading is checked against untreated control blocks so no claimed saving goes unverified.

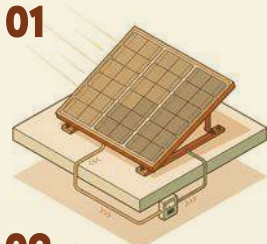


02

Roof Top Nodes

01-Rooftop solar panel

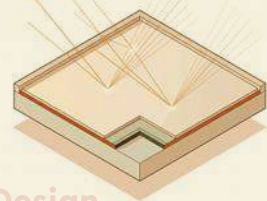
Mounted directly on building rooftops to generate electricity at the exact point of peak summer cooling demand.



02

02-Cool roof

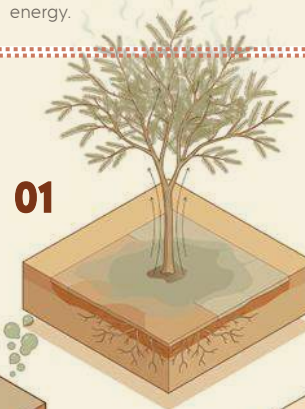
A reflective coating that bounces solar radiation away instead of absorbing it, cutting indoor air-conditioning load. Saudi studies show savings of roughly 12-22 kWh/m² a year, though it does not cool the street below it



Regenerative Design

01-Green corridor

Native Ghaf, Vitex, and Plumbago planting that shades and cools through transpiration while rebuilding pollinator habitat. Irrigated entirely on treated wastewater, never on precious desalinated supply



01

02

03

Primary Green Nodes

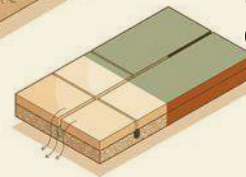
Decarbonization

02-Carbonate building block

The structure incorporates carbon-negative concrete blocks synthesized from mineralized desalination brine and captured CO₂, utilizing the eco-material both as dense structural canopy supports and as high-porosity permeable pavers for the pedestrian footpaths.

03-Cool Pathways

Light, non-glaring, permeable paving used only underneath shade, and permeable paving outside to reduce the glare and recharge the groundwater



Roots Layer (Finance)

01-Cool-Share fund

Community and investor capital pays for the cooling upfront, so residents pay nothing to start.



02



Performance Economy

02-Bill Linked Payment

The Fund is repaid only from verified savings, through a bill charge always smaller than the saving itself, tied to the meter and ending at payback

The Canopy Structure

How It Works

Daylight-Positive Shade: Blocks heating infrared solar rays while letting pleasant daylight filter through to prevent dark street gloom

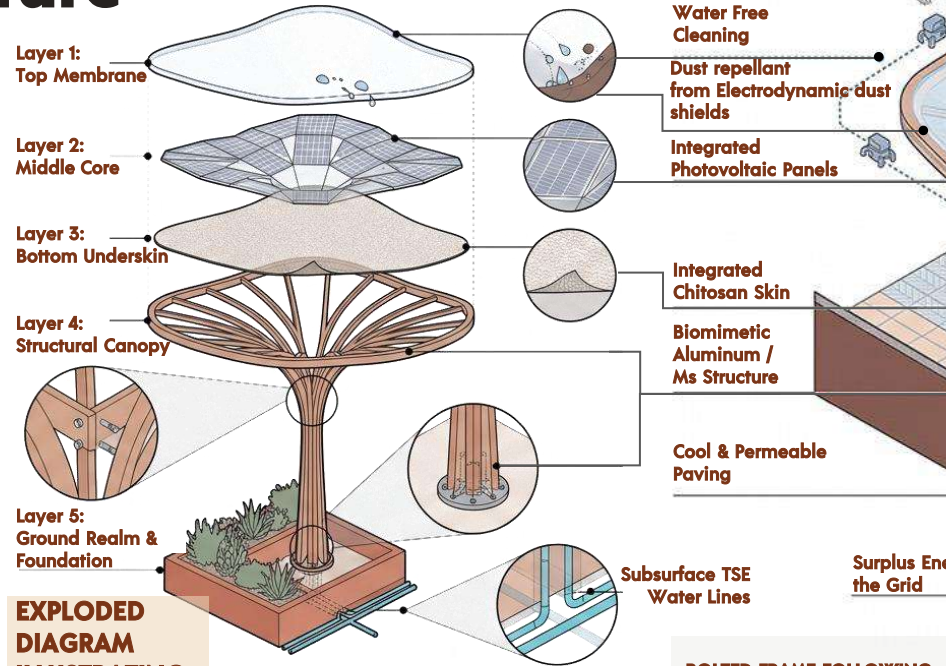
Anti-Soiling Technology: Panels feature a superhydrophobic TiO₂ coating. Morning dew beads and slides off, carrying dust with it before it can crust

Water-Free Cleaning: Powered by the canopy's own energy; includes a NASA-derived Electrodynamic Dust Shield (EDS) research pathway

Innovative Design

Bolted Frame: Built of recycled aluminum / MS Frame and coated steel. Bolted (not welded) so modules can be relocated and reused without waste

Functional Zoning: Strictly dry-top PV zone, load-bearing core, and modular underside (tracking a chitosan-salt composite skin for future evaporative cooling)



TiO₂ Coating
Superhydrophobic Skin

Dew Droplets over
Hydrophobic Skin

Water Free
Cleaning

Dust repellent
from Electrodynamic
dust shields

Integrated
Photovoltaic Panels

Integrated
Chitosan Skin

Biomimetic
Aluminum /
MS Structure

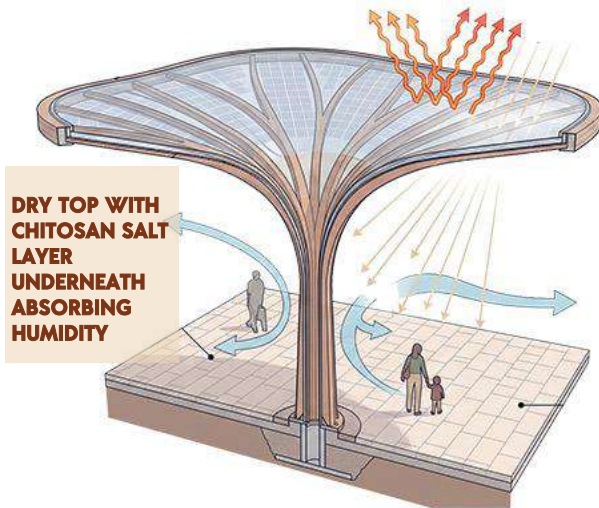
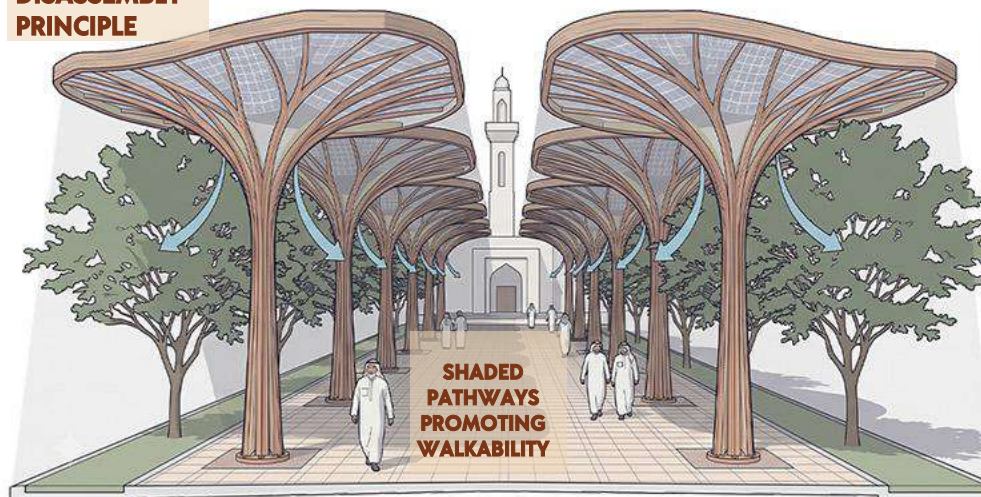
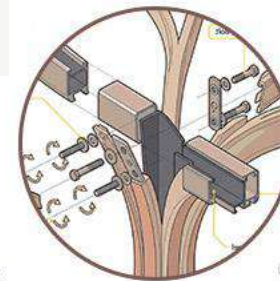
Cool & Permeable
Paving

Subsurface TSE
Water Lines

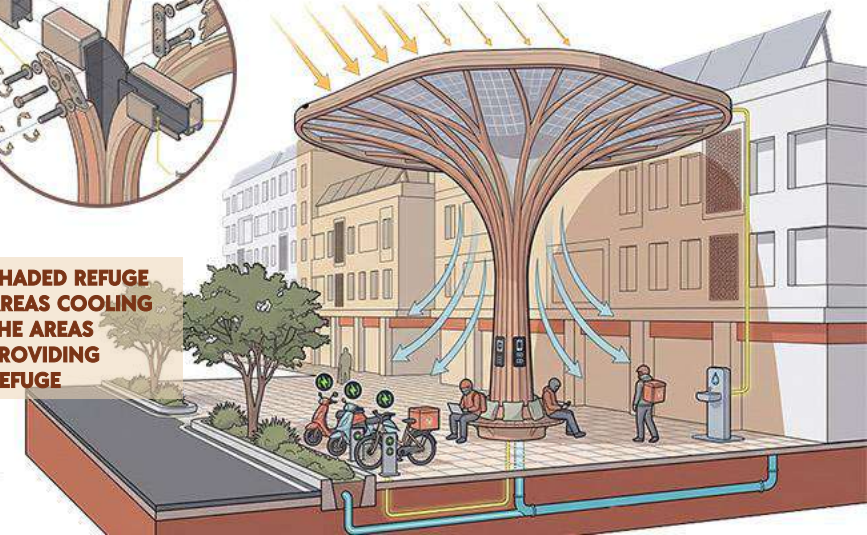
Surplus Energy back to
the Grid

**BOLTED FRAME FOLLOWING
CRADLE TO CRADLE PRINCIPLE**

**COMPONENTS
OF CANOPY
STRUCTURE**

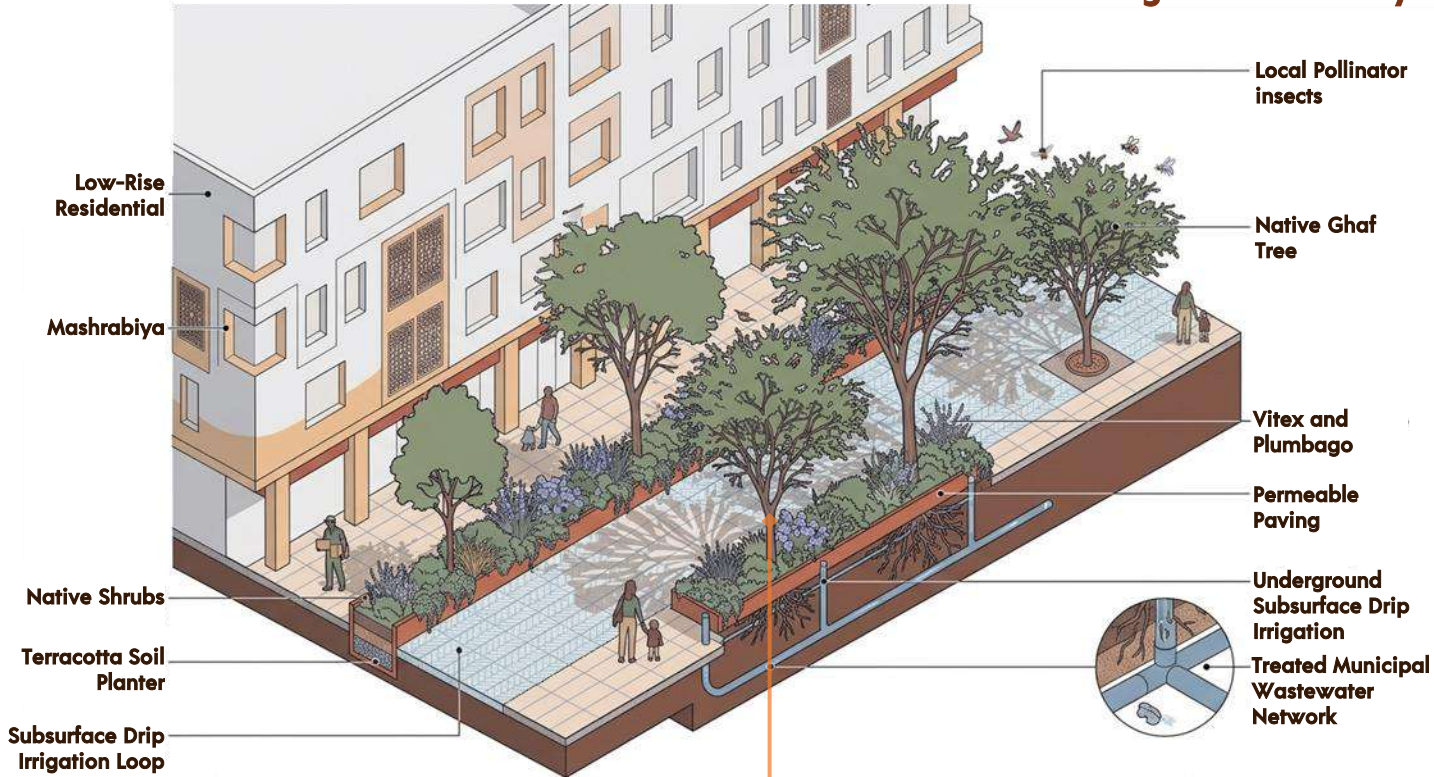


**SHADED REFUGE
AREAS COOLING
THE AREAS
PROVIDING
REFUGE**



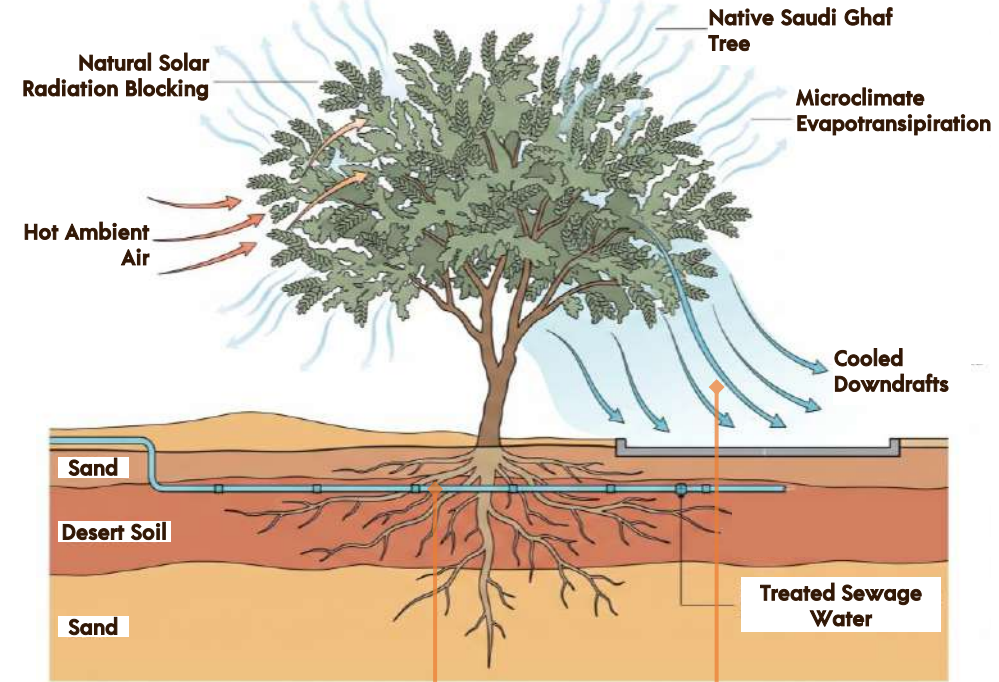
The Green Corridors are more than a shade

Ecological & Social Symbiosis



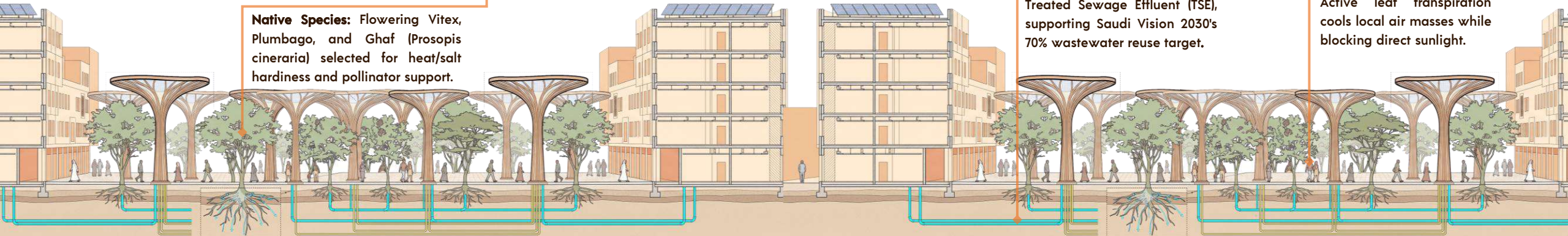
Native Species: Flowering Vitex, Plumbago, and Ghaf (*Prosopis cineraria*) selected for heat/salt hardness and pollinator support.

How It Works:



TSE Integration: Irrigated with Treated Sewage Effluent (TSE), supporting Saudi Vision 2030's 70% wastewater reuse target.

Evapotranspirative Cooling: Active leaf transpiration cools local air masses while blocking direct sunlight.



WHAT WE BUILD: SHADE

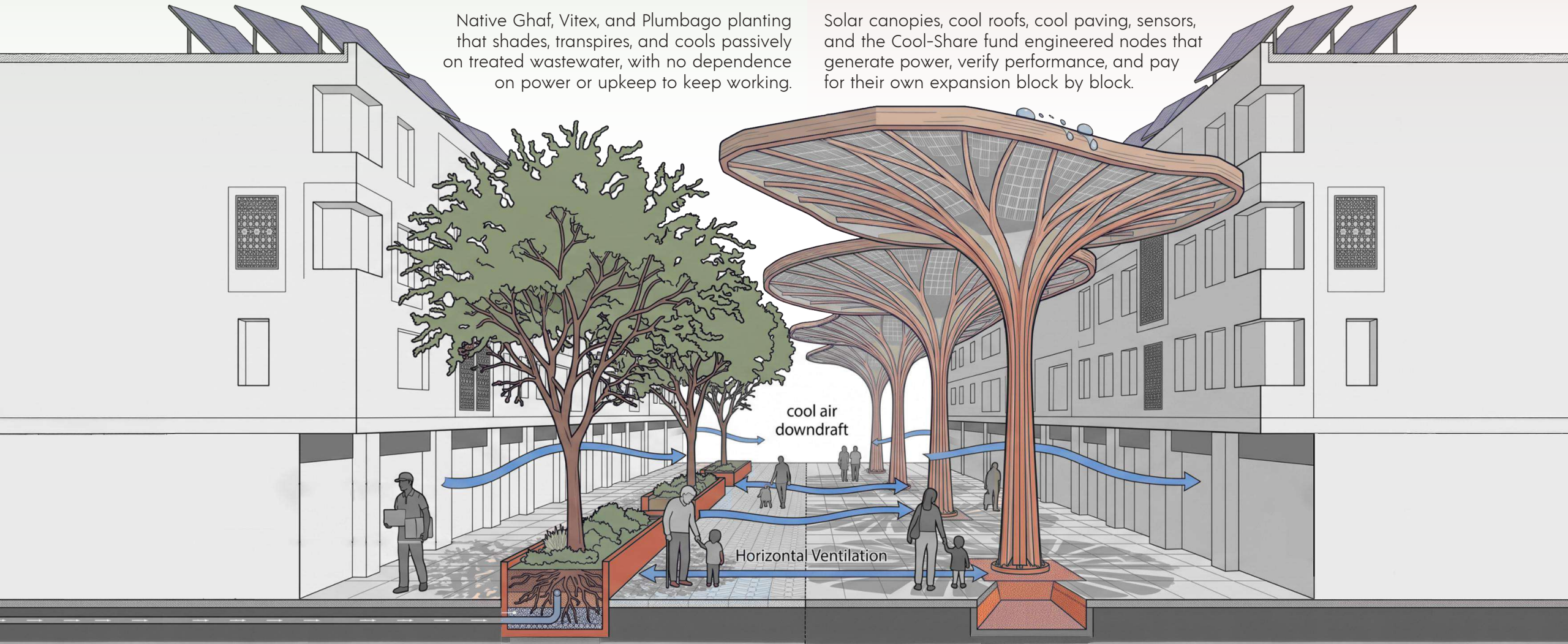
Shade the hero in two forms

NATURE-Based Solutions

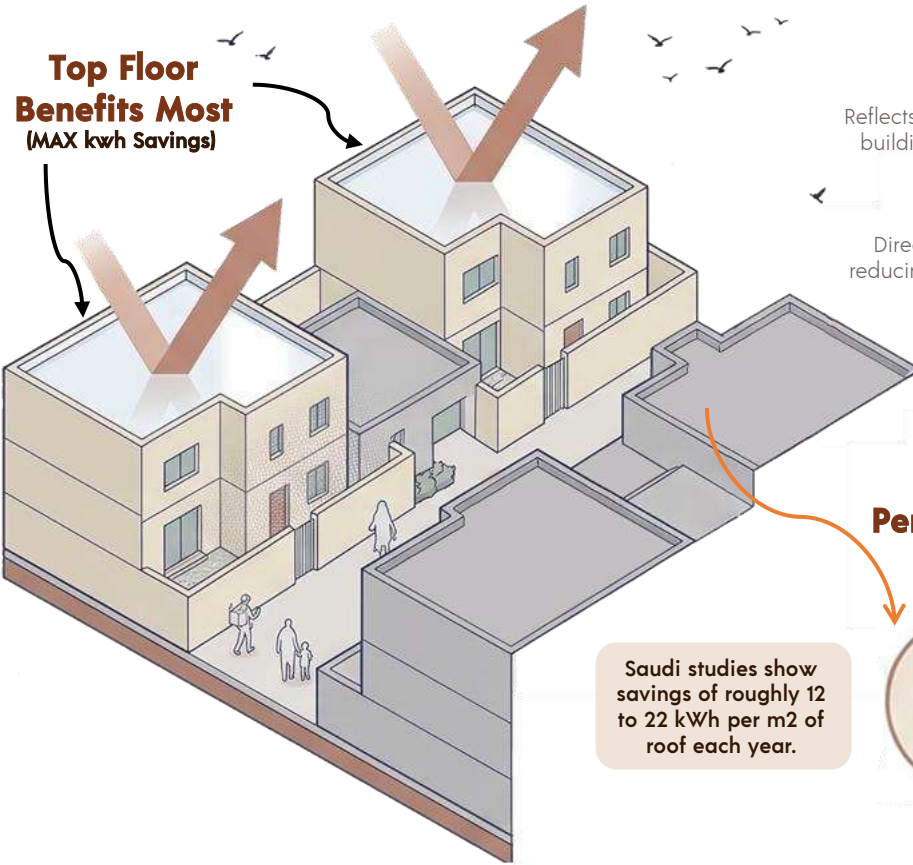
HUMAN-Made Solutions

Native Ghaf, Vitex, and Plumbago planting that shades, transpires, and cools passively on treated wastewater, with no dependence on power or upkeep to keep working.

Solar canopies, cool roofs, cool paving, sensors, and the Cool-Share fund engineered nodes that generate power, verify performance, and pay for their own expansion block by block.



The Cool Roofs Are The Quiet Engine



How It Works

High-Albedo Coating:

Reflects solar radiation before it enters the building envelope, slashing interior air-conditioning load

Peak Demand Shaving:

Directly targets afternoon A/C peaks, reducing grid strain and freeing crude oil for export

Performance & Savings

Saudi studies show savings of roughly 12 to 22 kWh per m² of roof each year.



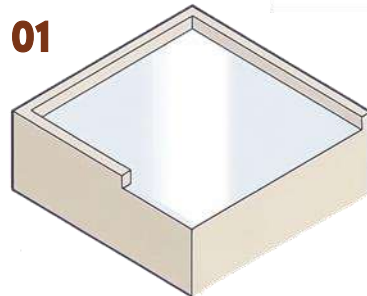
An intervention that most clearly pays for itself by cooling the building in the long run



Maintenance Cost Cycle

- 01** Initial Application (Year 0)
- 02** Performance Degradation (Year 3)
- 03** Re-Coating cycle (Year 5-7)

01

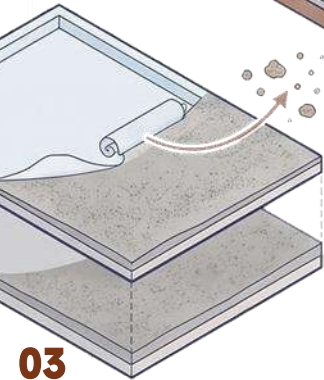


02



A white roof greys with dust

03



Initial Application Gives High Reflectance

Re-Coating keeps the reflectance alive

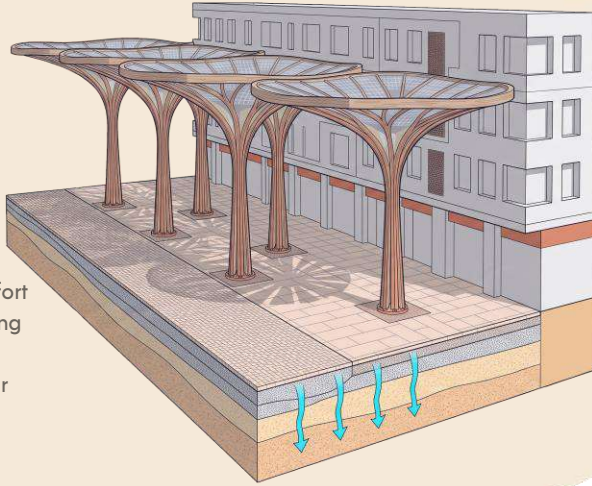
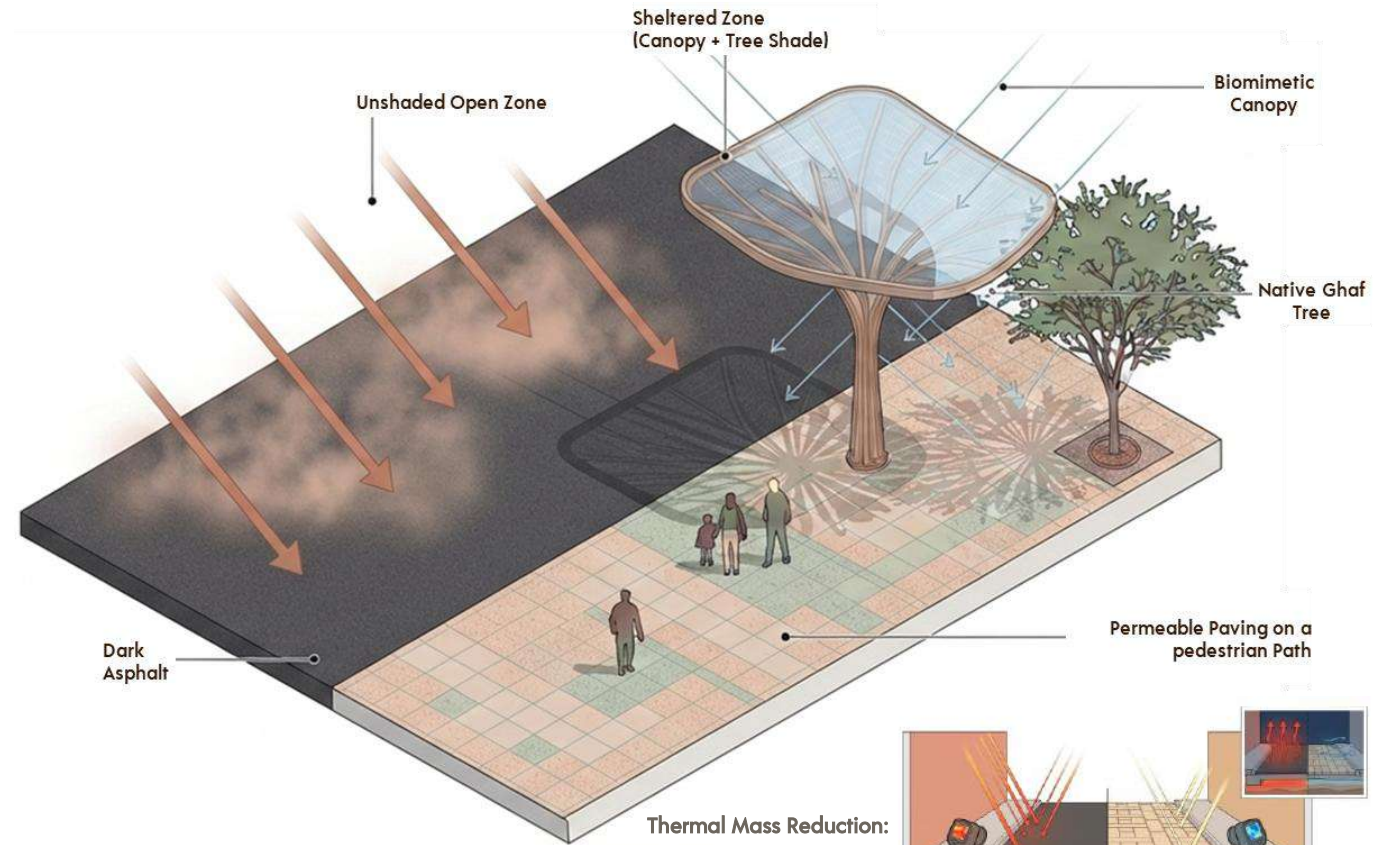
The Cool Pathways

How It Works:

Stormwater Permeability: Reclaims rainfall and irrigation runoff, feeding local green aquifers rather than pooling

The Open-Sun Trap: Highly reflective paving in open sun bounces solar radiation and glare directly up at pedestrians, worsening thermal comfort

Our Solution: UMN restricts cool paving strictly to shaded zones (under solar canopies and trees). We would rather design with evidence than chase unshaded albedo metrics



Innovative Design

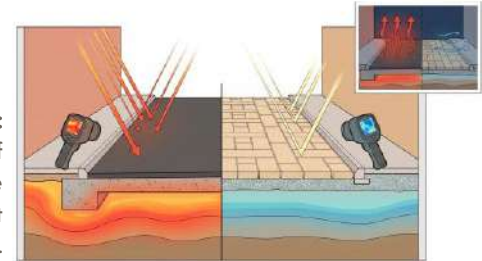
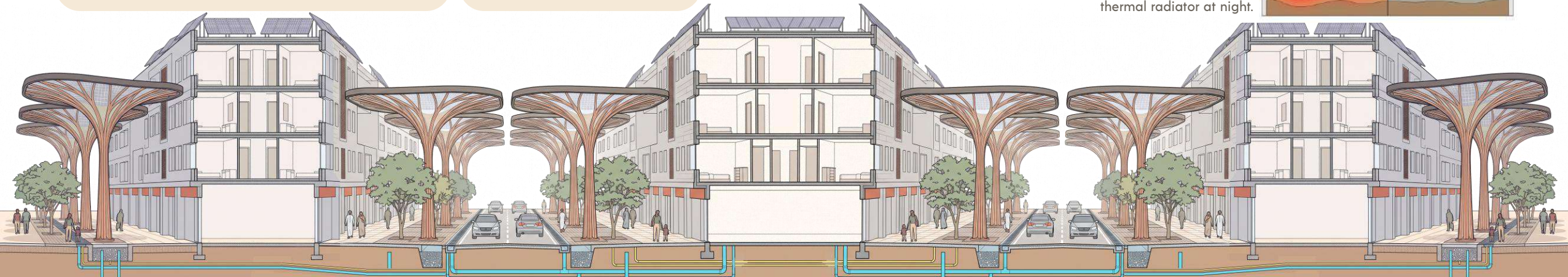
Shade-Gated Albedo: Reflectivity only under shade, so no glare reaches the pedestrian

Sponge Section: Permeable paving feeds runoff back to the trees, not the drain

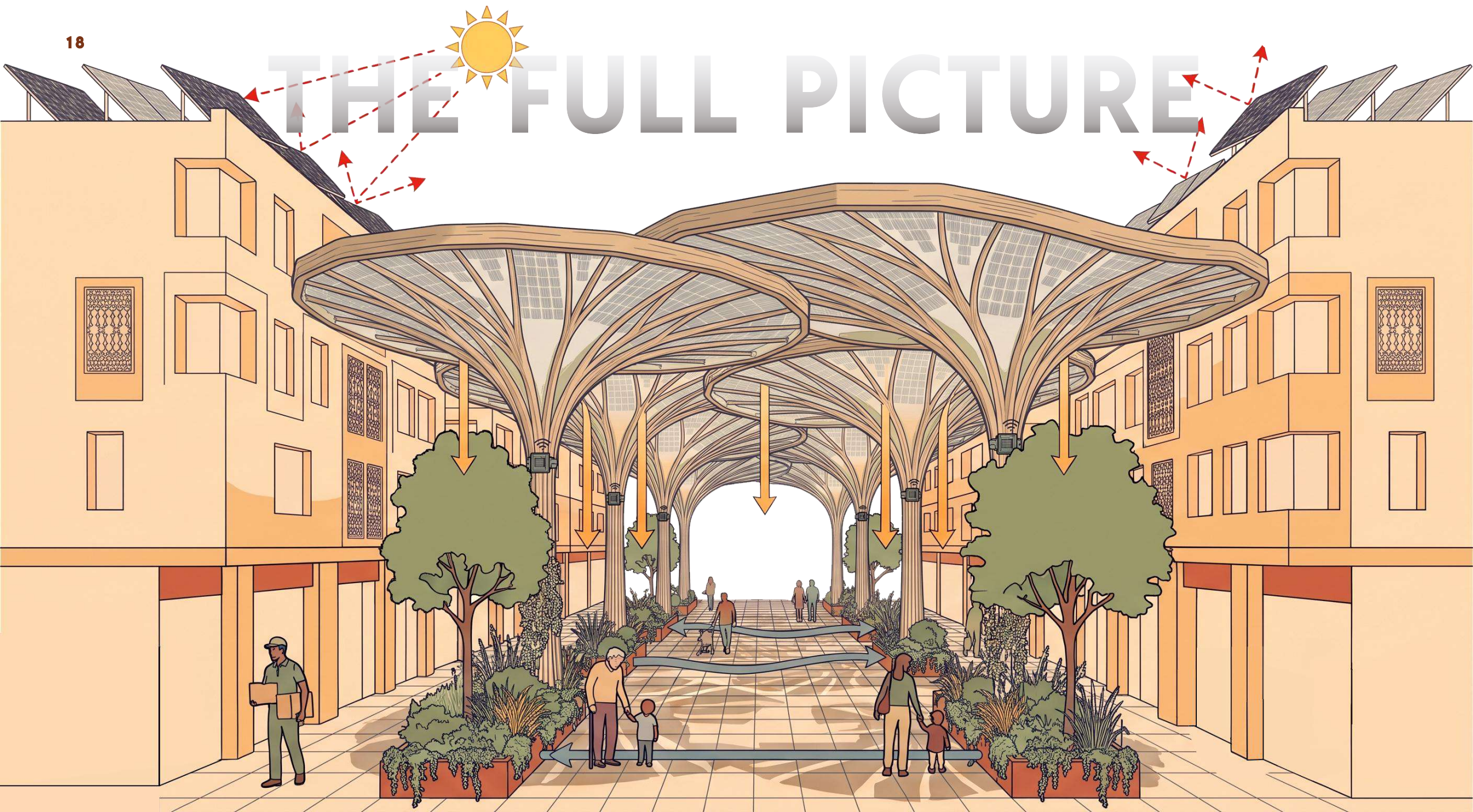
Key Characteristics:

Materiality:
Light, non-glaring, permeable paving

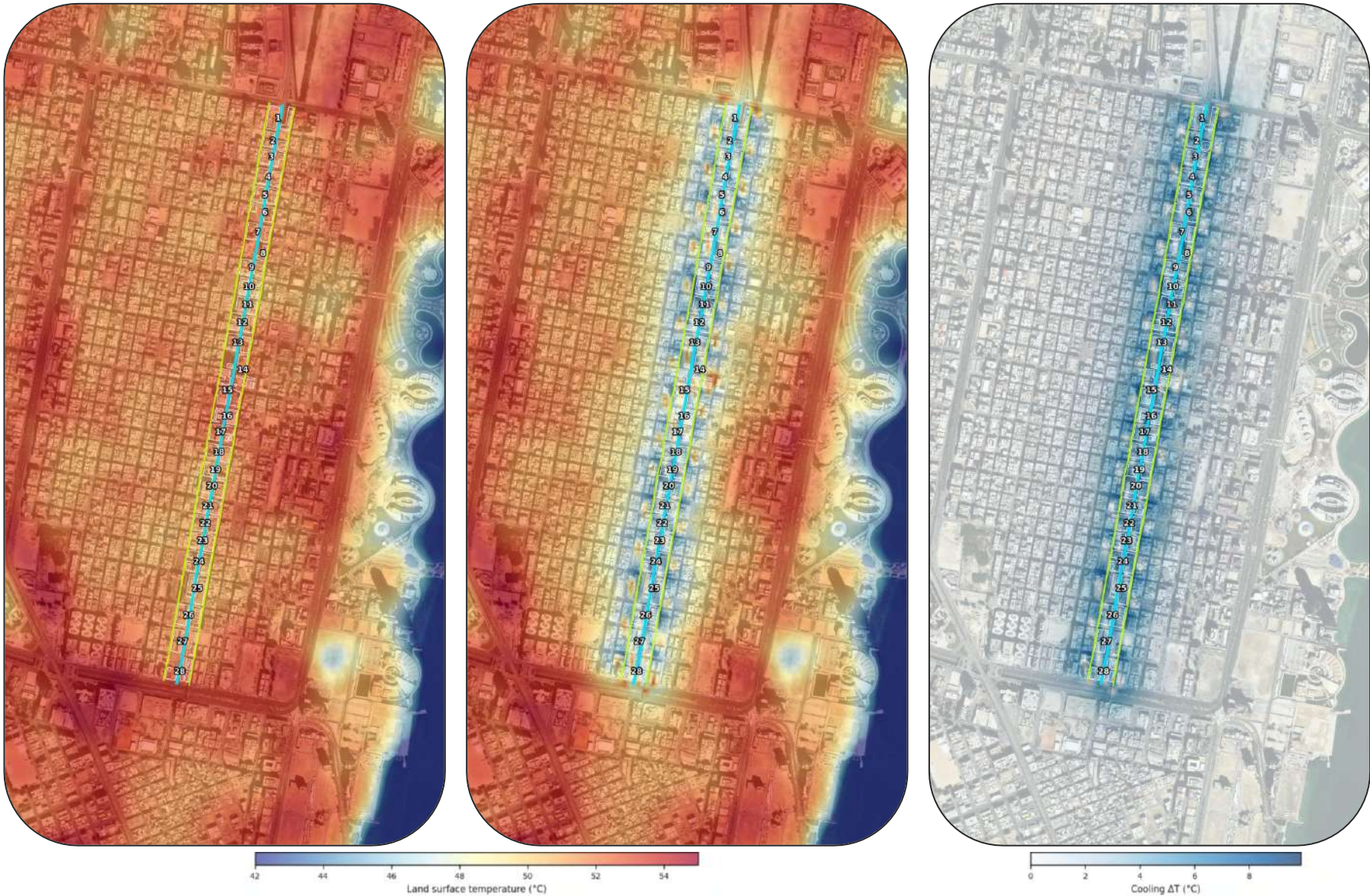
Thermal Mass Reduction:
Lowers heat absorption of paved surfaces, preventing the street from acting as a giant thermal radiator at night.



THE FULL PICTURE



Each Intervention is measured for Impact



To prove the efficiency of the design, we made a digital twin at street scale for the whole corridor of 28 blocks at about 52 °C in summer. We applied all six interventions, using the city's own coefficients. The maps turn a red-hot district into a cool blue ribbon, and treated surfaces drop by roughly 6 °C on average (up to nearly 10 °C), and the felt temperature falls from 53 °C to 41 °C. The cooling spreads beyond the kerb into a -284-hectare area, reaching around 3,580 residents in the neighborhoods beside this commercial street

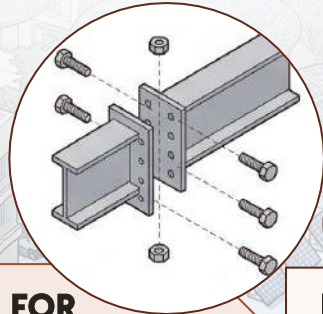
INTERVENTIONS	SURFACE ΔT PEAK	SURFACE ΔT MEAN	FEELS- LIKE Δ
Cool pavement	-7.2 °C	-3.5 °C	-0*
Cool roofs	-3.0 °C	-1.4 °C	-0*
Street trees	-1.2 °C	-0.6 °C	-2.5 °C*
Green corridor	-1.2 °C	-0.6 °C	-2.5 °C*
Solar Shade canopies	— (comfort only)	—	-8.0 °C
Dehumidification	0 °C	0 °C	-6.3 °C
All six combined	-9.9 °C	-5.3 °C	-12.0 °C (capped)

L I F E - C Y C L E A P P R O A C H

THE UMN IS DESIGNED AS A LIFE-CYCLE APPROACH

The System Is Planned To Deliver Service, Learn From Performance, Renew Critical Layers And Recover Components For The Next Block.

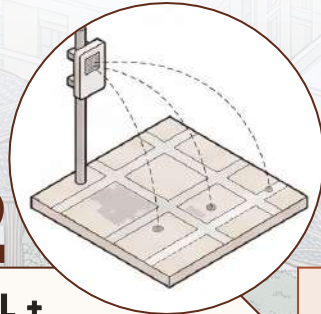
01



DESIGN FOR DISASSEMBLY

Bolted modules, native planting and TSE-ready components.

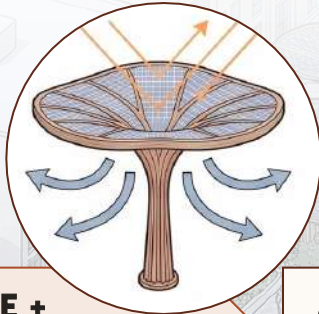
02



INSTALL + BASELINE

Block geometry plus treated and control sensor readings.

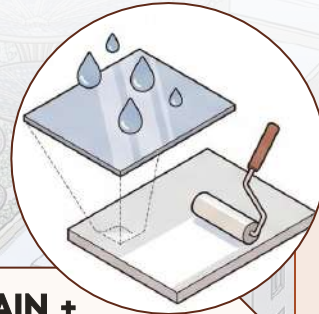
03



OPERATE + SERVE

Shade, cooling, PV, irrigation and verified safe routes.

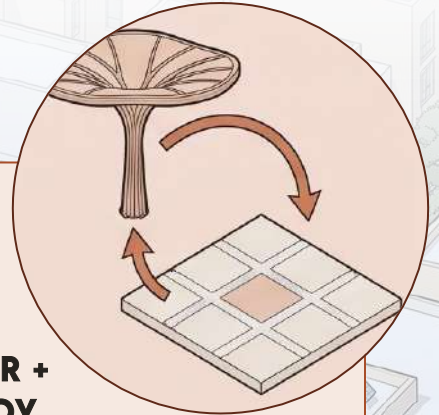
04



MAINTAIN + RENEW

Clean surfaces, tune water and recoat roofs in Years 5–7.

05



RECOVER + REDEPLOY

Unbolt, repair and relocate usable parts into the next block.

THREE CLOSED LOOPS KEEP VALUE IN CIRCULATION

LOOP	INPUT	PROCESS	RETURN
MATERIAL	Bolted modules	Disassemble / repair	Redeploy in the next block
WATER	Municipal TSE	Trees + misting	Soil infiltration and groundwater recharge
ENERGY	Canopy + rooftop PV	Node operation / peak shaving	Utility grid

Lifecycle success means continued service, verified performance and recoverable value

ONE STREET, SIX SYSTEMS: ONE OPERATING ARCHITECTURE

The Street links infrastructure, digital verification and revolving finance so each block can cool, learn and fund the next

01 ENERGY

1. PV canopies & rooftop solar capture peak summer demand
2. Replaces blanket power discounts with capital retrofits
3. Drives **06 FINANCE** via verified kWh savings

02 WATER

1. TSE municipal wastewater directed to root zones & misting
2. Permeable paving recharges groundwater, zero desalinated water used
3. Feeds **04 URBAN** green corridors & **05 PUBLIC HEALTH** Cooling

03 MOBILITY

1. Continuous shaded pathways & delivery rider refuges
2. Live app guides pedestrians along the lowest Hot routes
3. Powered by **01 ENERGY** safeguards **05 PUBLIC HEALTH**

04 URBAN DESIGN

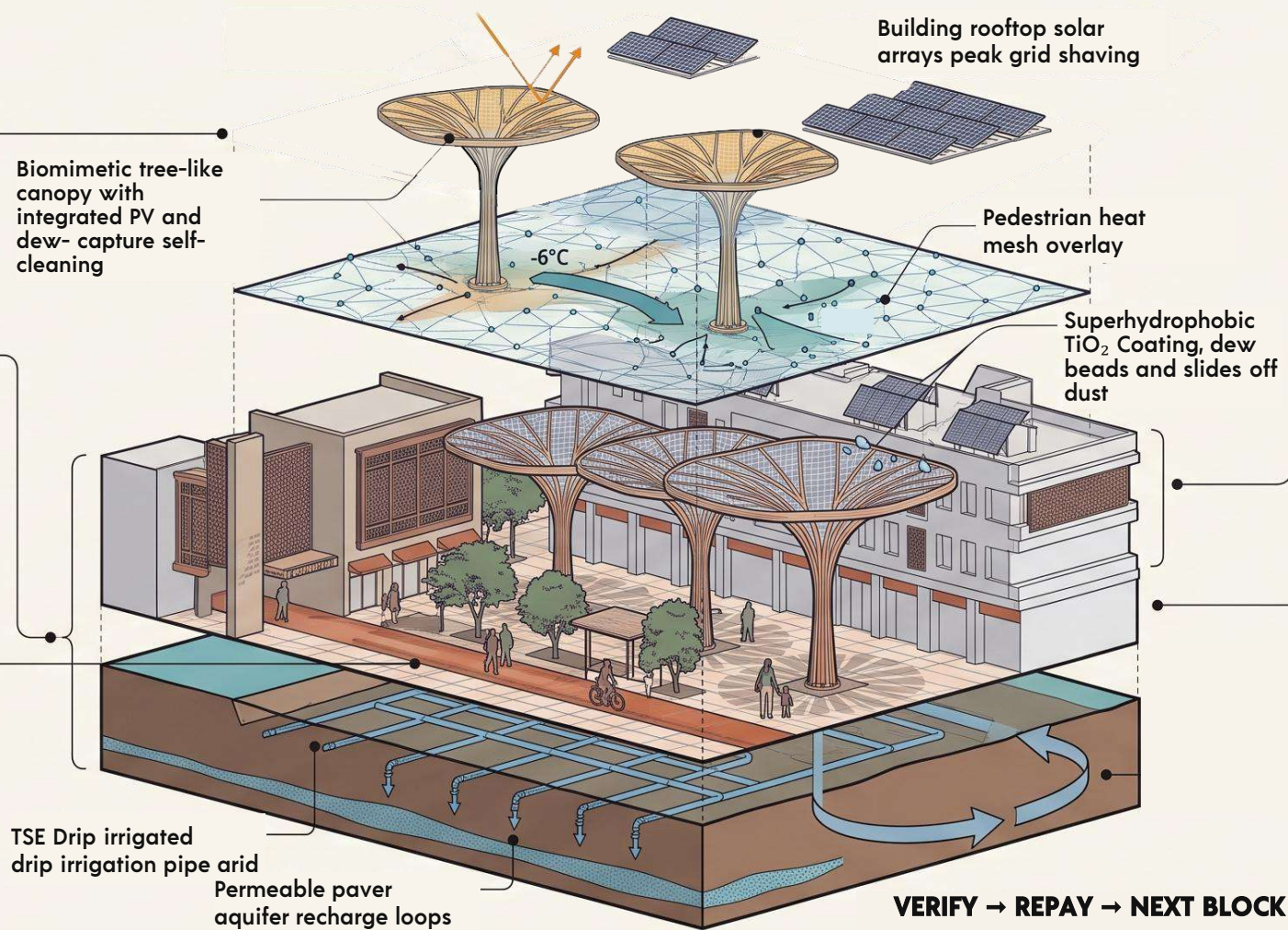
1. Upgrades King Khalid Street's identity with comfortable shaded walking areas and recreational spaces
2. Lifts property values to secure **06 FINANCE**

05 PUBLIC HEALTH

1. Targeted relief for outdoor workers, elders, and children
2. Sensor-linked emergency routing to cool refuges
3. Sustained by **01 ENERGY** & **02 WATER** transpiration

06 FINANCE

1. Revolving Cool-Share fund: Separated Public & Private purses
2. Bill-linked repayments capped below verified monthly savings
3. Reinvests returned capital into the next block flywheel



01 ENERGY

+

02 WATER

→

04 URBAN

+

03 MOBILITY

→

05 PUBLIC HEALTH

→

06 FINANCE REINVESTMENT

→

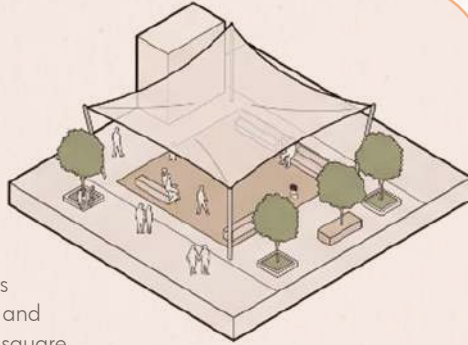
NEXT BLOCK

UMN links resources, public comfort, verified performance and revolving finance into one street-scale operating architecture

PRECEDENTS

Every Layer Of Our Idea Already Exists Somewhere In The World

Al Nouq, Doha



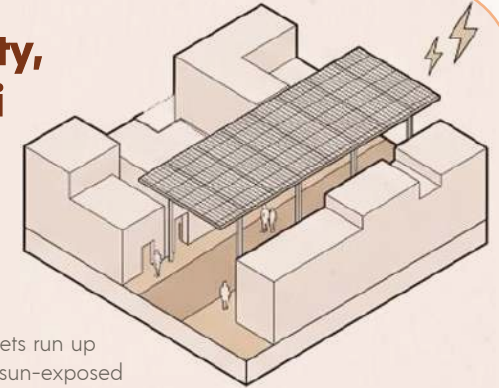
Daytime temperatures in Doha reach 50°C, and the Barahat Al Nouq square design limits perceived temperature to below 32°C using a retractable membrane roof combined with floor-level radiant cooling.

Medellín, Colombia



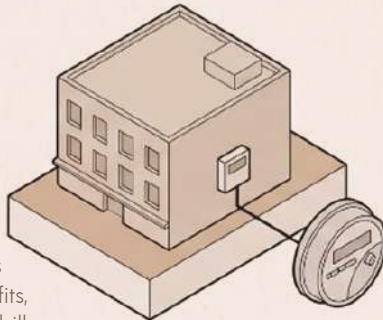
Medellín cut average temperatures by 2°C through its Green Corridors program, planting trees and vegetation along roads and waterways for \$16.3 million to establish and \$625,000 annually to maintain.

Masdar City, Abu Dhabi



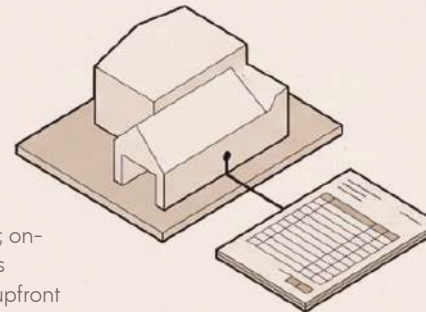
Depending on the source, the shaded, wind-tower-fed streets run up to 10°C cooler than sun-exposed areas, with some estimates as high as 15–20°C below the surrounding desert.

Tarshid, Saudi Arabia



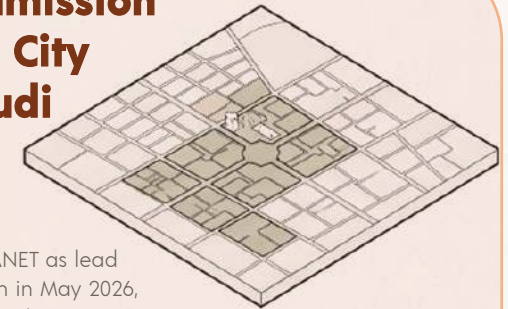
Tarshid contracts with ESCOs to execute and finance retrofits, sharing the resulting energy-bill savings as its financial return, letting building owners upgrade without raising capital.

Bill Linked Finance, Canada



This model is widespread; on-bill repayment lets owners install upgrades with no upfront cost, with the utility adding the repayment charge to the monthly bill.

Royal Commission for Riyadh City (RCRC), Saudi Arabia



RCRC appointed PLANET as lead consultant for Riyadh in May 2026, targeting an 8–15°C reduction in surface temperatures across roads, walls, and other urban surfaces via five pilot zones testing innovative cooling solutions.

THE SENSING THREADS LAYERS

Screen 1: Cool-Route Microclimate Navigation (Public Realm)

Real-Time Microclimate Navigation & Energy Tracking (UI/UX Case Study)

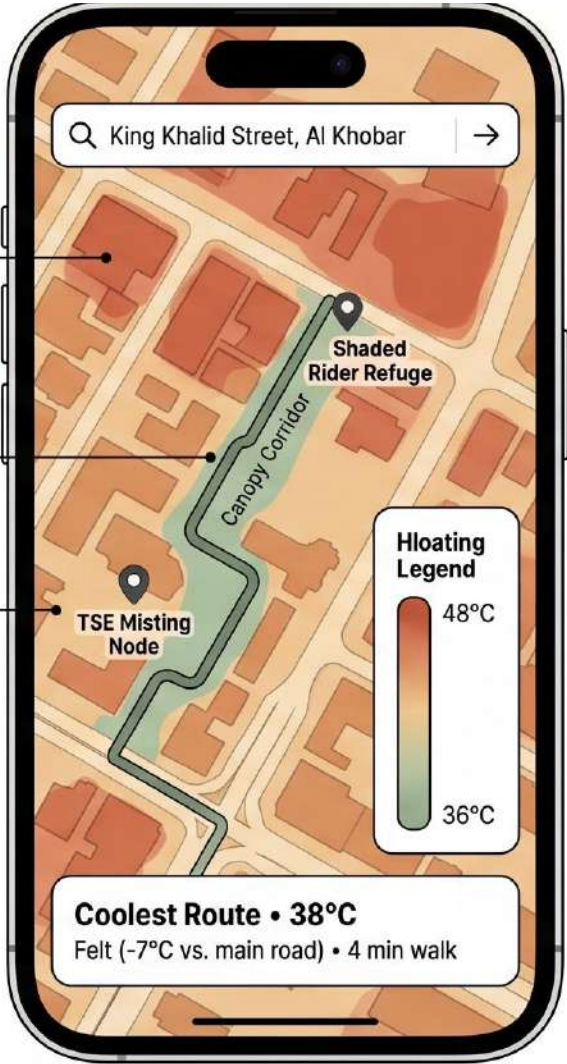
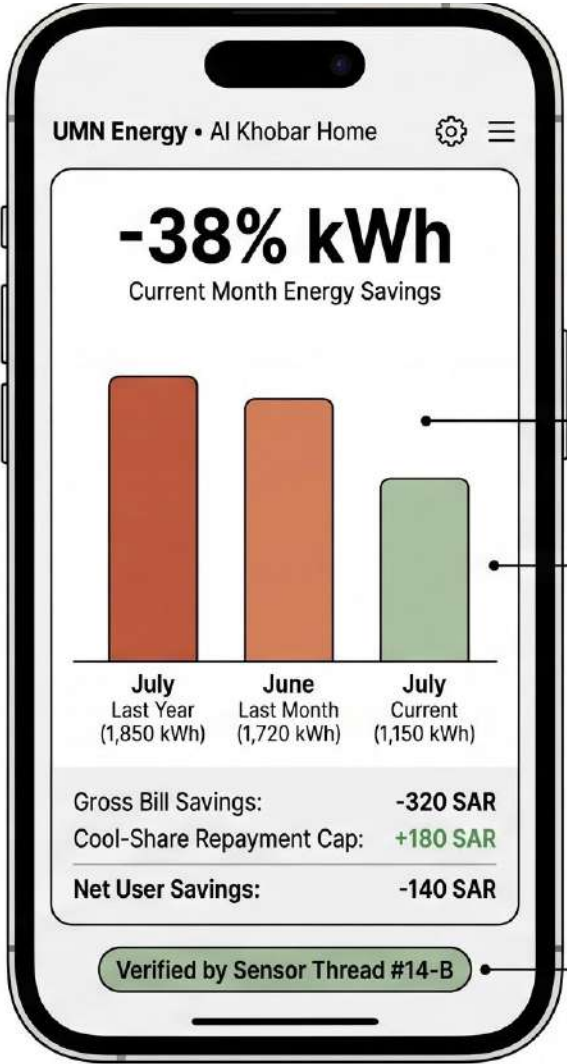
Screen 2: Home Energy & Performance Dashboard (Private Realm)

- High-contrast thermal GIS layer
- Glanceable route optimization (-7°C felt)
- Micro-climate POI pins

UX RESEARCH & USABILITY RATIONALE

User Persona: Outdoor Delivery Workers & Vulnerable Pedestrians

Key Insight: Users under severe heat stress require zero-friction glanceable navigation. Route algorithm defaults to lowest wet-bulb globe temperature rather than shortest distance, reducing unshaded exposure by >60%.



Seasonal baseline comparison bar graph

Transparent financial ledger strip

IoT telemetry verification badge

UX RESEARCH & USABILITY RATIONALE

User Persona: Homeowners & Residential Tenants

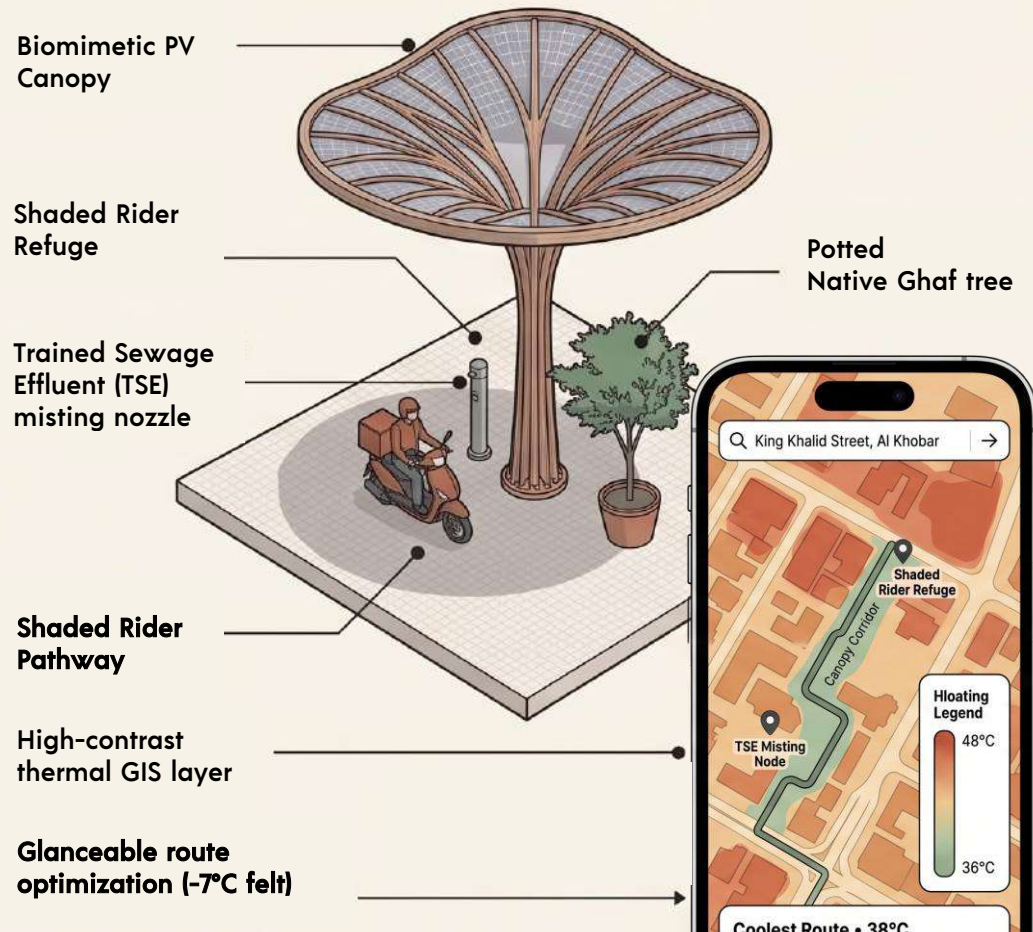
Key Insight: Establishes financial trust through transparent data-ledger patterns. Comparing current consumption directly against same-month-last-year baselines proves seasonal energy reduction and validates the bill-linked repayment cap.

THREADS LAYER: LIVE IOT MICRO-SENSOR TELEMETRY CONNECTS OUTDOOR PEDESTRIAN SAFETY WITH INDOOR ENERGY VERIFICATION.

THE SENSING THREADS LAYERS

Real-Time Microclimate Navigation & Energy Tracking (UI/UX Case Study)

PUBLIC REALM - GIG Worker & Pedestrian Benefit



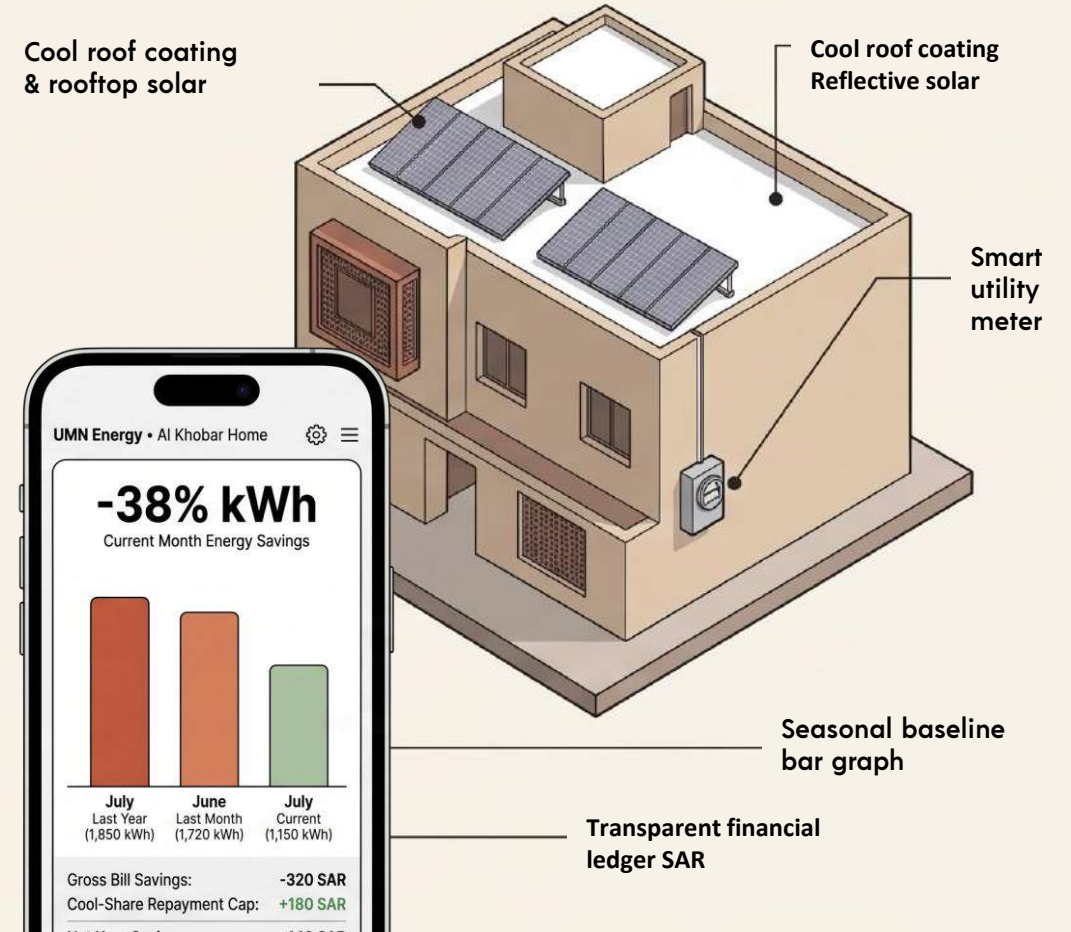
Outdoor Delivery Workers & Vulnerable Pedestrians

Key Insight: Route algorithm defaults to lowest WBGT rather than Shortest distance, reducing unshaded exposure by >60%

CENTER AXIS



PRIVATE REALM - Stakeholder & Homeowner Trust



Homeowners, Residential Tenants & Green Bond Investors

Key Insight: Establishes trust through transparent data ledgers. Comparing against baseline proves seasonal energy reduction and guarantees bill savings

HOW THE FUND IS BUILT

The Cool-Share Fund as a revolving engine

Public Inputs:

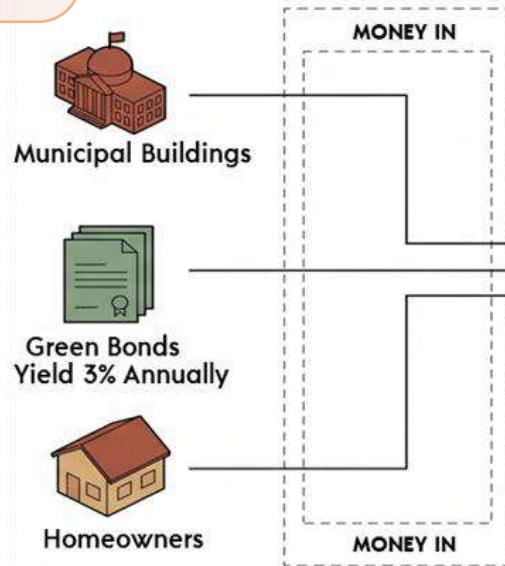
The municipal government and green grants supply initial equity into the Public Account. This treats outdoor shade and public thermal comfort as essential civic infrastructure.

Private Inputs:

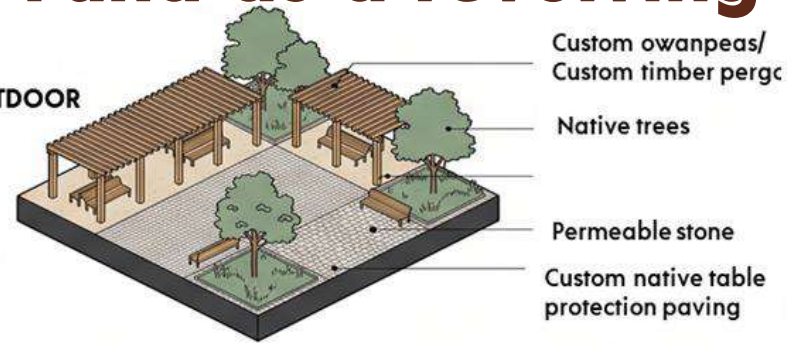
Institutional investors purchase 3% Green Bonds, providing low-interest debt capital into the Private Account.

Property Owner Co-Investment:

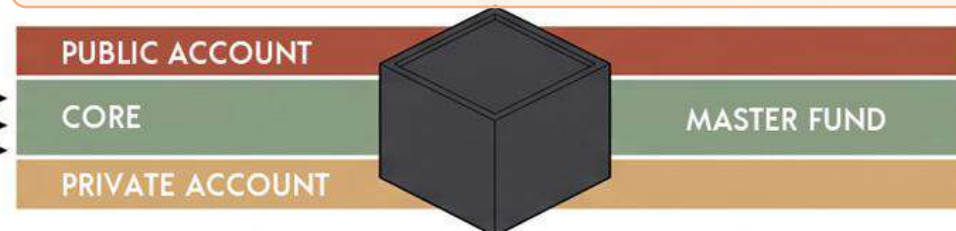
Homeowners who choose to own rooftop solar co-fund their share, locking in long-term energy savings.



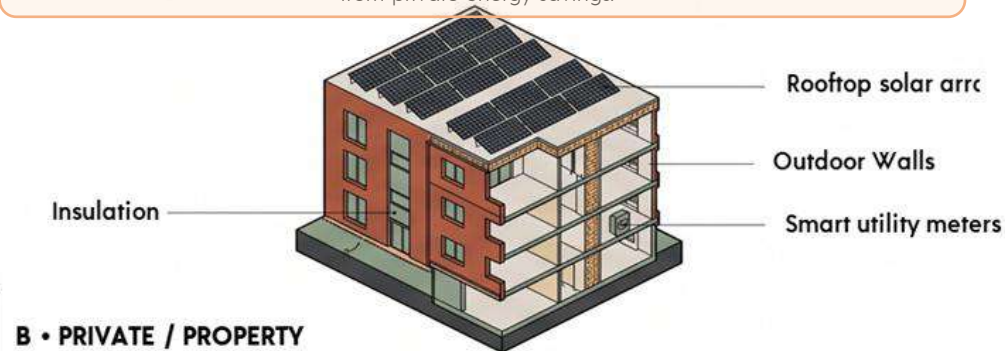
A • PUBLIC / OUTDOOR



THE MASTER FUND USES TWO STRICTLY SEPARATED PURSES (PUBLIC VS. PRIVATE)



This prevents cross-contamination: public funds meant for trees and shaded walkways are never diverted to service private financial debt, and investor yields are repaid exclusively from private energy savings.



B • PRIVATE / PROPERTY

PUBLIC FUND PAYS EACH BLOCK

100% funded upfront with zero repayment required from residents. Because walkability and outdoor cooling benefit the whole community,

CAPITAL RETURN ON BILL CHARGES BASED ON PERFORMANCE

IoT sensor threads continuously log actual kWh energy savings. A modest repayment fee is added to the property's utility bill, but it is strictly capped below the monthly savings amount. 100% of returned capital flows back into the master fund to build the next block.

Investors receive a return plus an impact certificate toward their Corporate Social Responsibility (CSR) efforts

THE REFORM AT THE CENTRE

From Subsidizing Power to Co-Funding Action

TODAY

A discount on every unit of power, for everyone, forever. Rewarding nothing.

\$0.05 to \$0.085 per kw/h depending on type and consumption tier. Actual cost is \$0.07 – \$0.1 per kw/h



UNDER THE PILOT

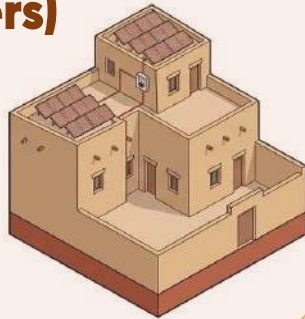
The same money follows the people who invest in the fix. Put solar up, the help follows you

A one-time capital cost that ends the forever-subsidy.

1 OWN IT (Homeowners)

Mechanism: 50% fund grant + 50% bill-linked repayment.

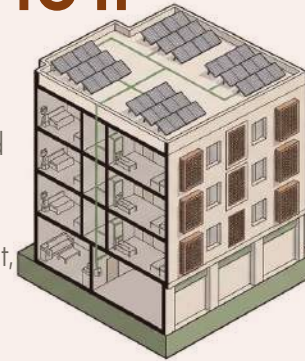
Benefit: Zero money down, guaranteed bill cap, full asset ownership. F



2 SUBSCRIBE TO IT (Renters)

Mechanism: Fund installs and retains solar panels.

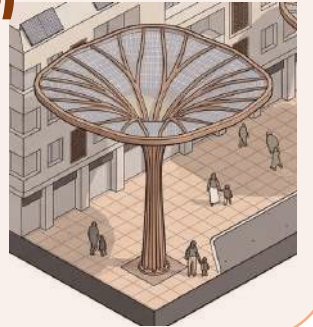
Benefit: Instant discounted solar power, zero upfront cost, zero commitment



3 OPT OUT (Status Quo)

Mechanism: Retain the standard utility tariff.

Benefit: Enjoy the shaded, cooled street outside with zero obligation.



A protected baseline rate remains subsidized for all, ensuring no resident is forced onto higher rates against their choice.

TWO PURSES, NOT ONE

Split the money and let it grow sustainably Block by Block

PUBLIC • OUTDOOR

\$2.18M**Shade, pavement, trees, irrigation**

The city already budgets to improve a street. No repayment, more public comfort.

ONE BLOCK**\$382k**

total cost

323 †

CO2 saved/yr

~59

homes & shops

0.54 GWh

clean power/yr

PRIVATE • PROPERTY

\$8.52M**Cool roofs, rooftop solar, sensors**

Sits on private property and lowers a bill. That saving repays the investment.

28 BLOCKS
THE PILOT CORRIDOR
15.2 GWh

clean power/yr

~1,650

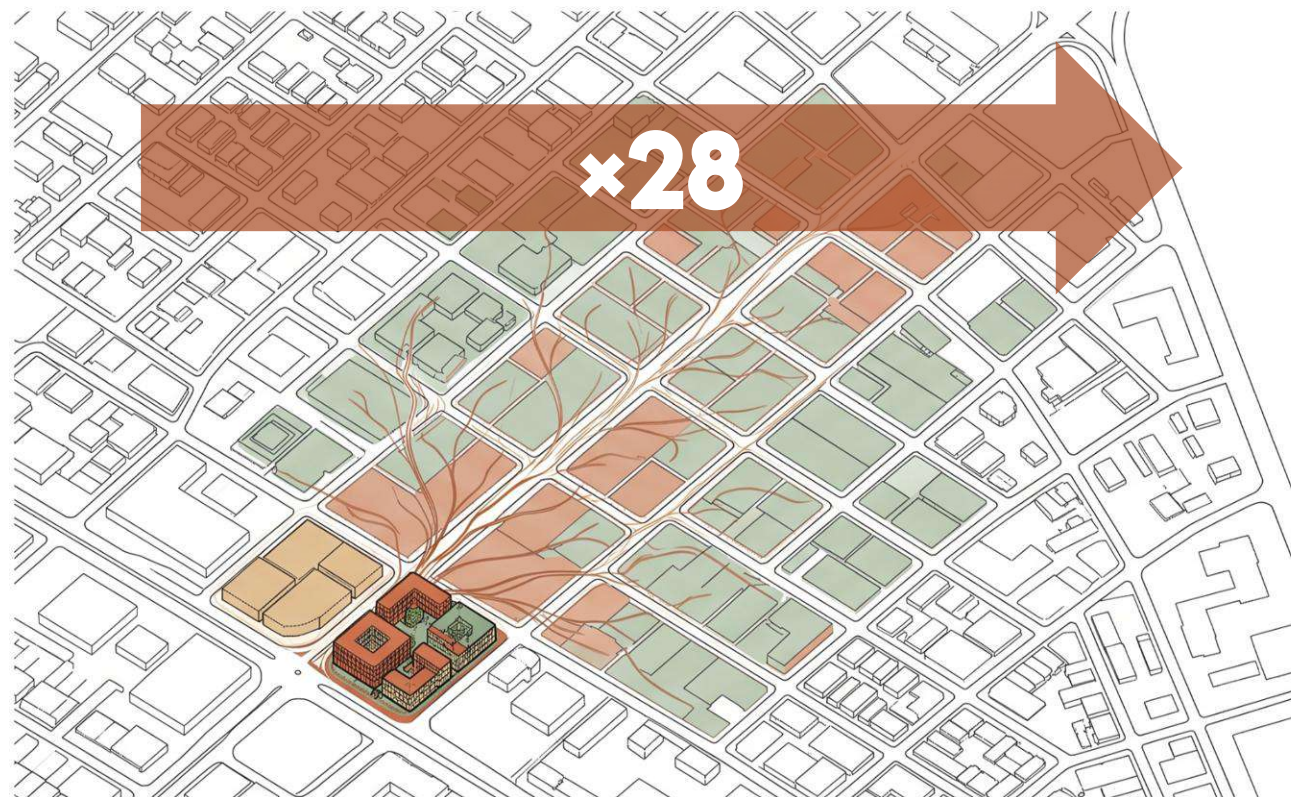
homes & shops

\$10.7M

total cost

9,040 †

CO2 saved/yr



DOES IT PAY FOR ITSELF?

Self-funding on one rail

Subsidy Inflow



+ \$315k

Money in redirected
subsidy

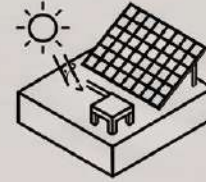
Bond Cost



- \$141k

Investors + admin
green bond at 3%

Maintenance



- \$151k

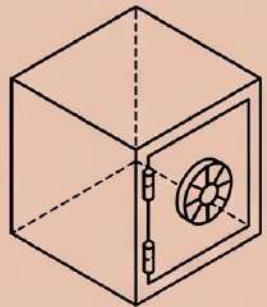
Maintenance
mostly dust cleaning

Net Return



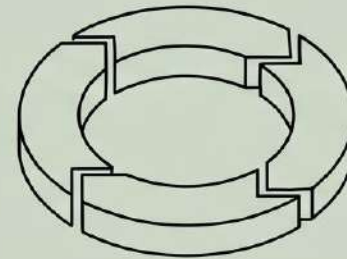
+ \$24k

net each year



Reserve for a bad year

About \$278k, which is roughly twelve months of costs is held back so one poor season is absorbed, not fatal.



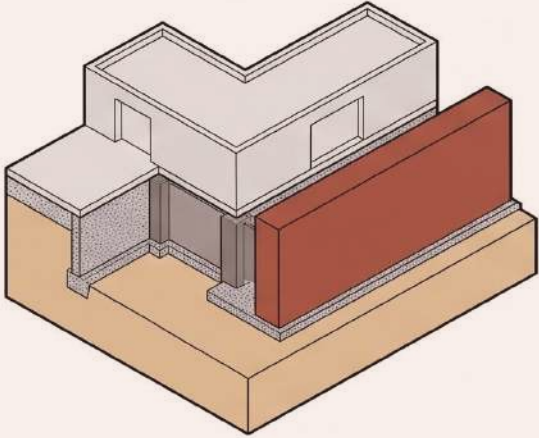
Growth runs on repaid capital

As homeowners repay their half, the money returns and seeds the next block, about one new block a year.

The whole result hinges on one number: the rate the subsidy is redirected to make the real impact

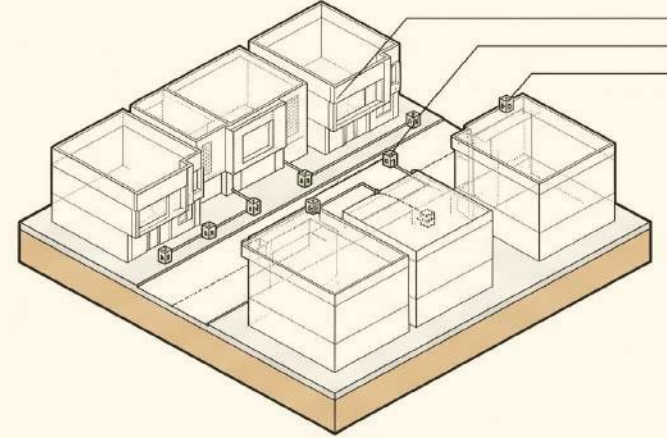
TRADE-OFFS WE MADE ON PURPOSE

Every Choice Costs Something



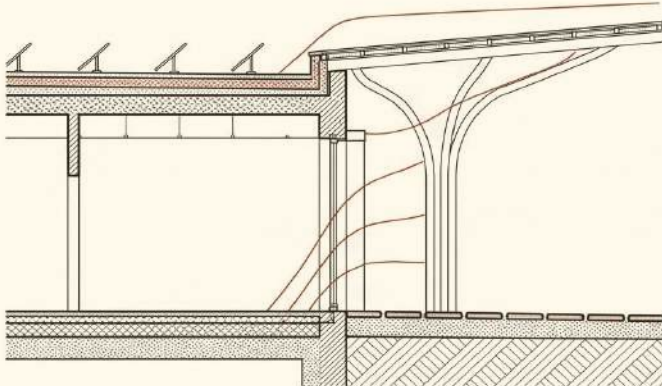
FINANCIAL RESILIENCE OVER MAXIMUM YIELD

We hold a reserve and count only one conservative revenue rail, a thinner surplus, but it survives a bad year.



PROOF OVER SPEED

A sandbox pilot on one cluster first; we scale only what the sensors validate. Slower start, far lower risk.



CREDIBILITY OVER BIG CLAIMS

Cool roofs and paving are marked as 0°C felt cooling for walkers.



INCLUSION OVER SIMPLICITY

Three ways to join, including a no-cost option more moving parts, but nobody is shut out.

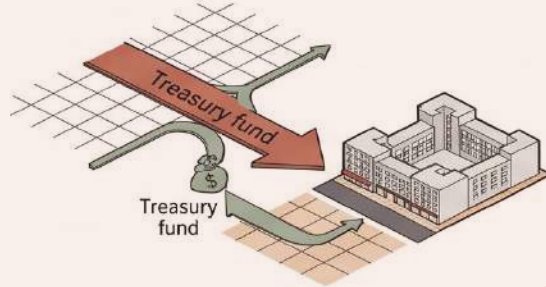
BOLD BETS AND QUICK WINS

Play The Long Game And The Short One

BOLD BETS (Systemic Long-Term Transformations)

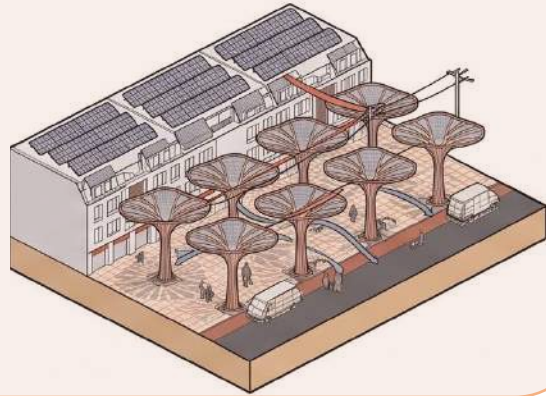
Redirect The Energy Subsidy

from cheap power for all to backing those who invest, a national reform, proven on one street first.



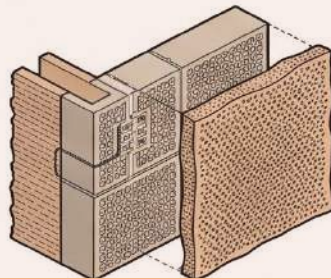
Block-scale power community

pooled rooftop and canopy solar run as one virtual plant that nets down the whole block.



Circular desert materials

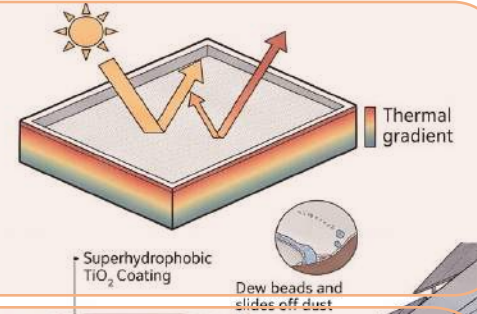
Brine-and-CO₂ building blocks and an evaporative skin, tracked as 2030+ research.



QUICK WINS (Immediate Actionable Interventions)

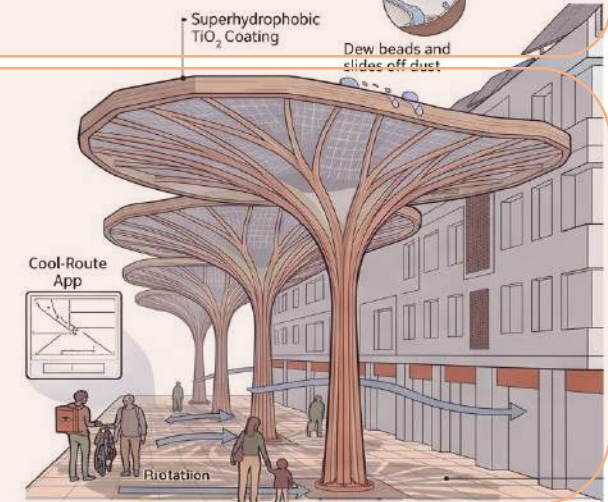
Cool-roof coating first

the cheapest layer, fastest payback, deployable today with no new technology.



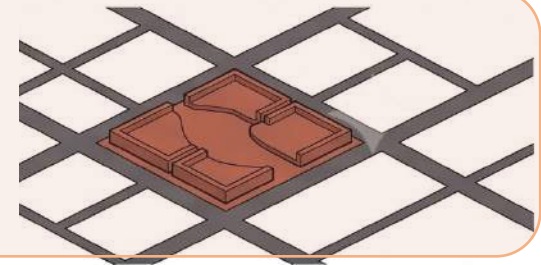
Shaded rider refuges + cool-route app

visible relief for delivery riders and elders within the first season.

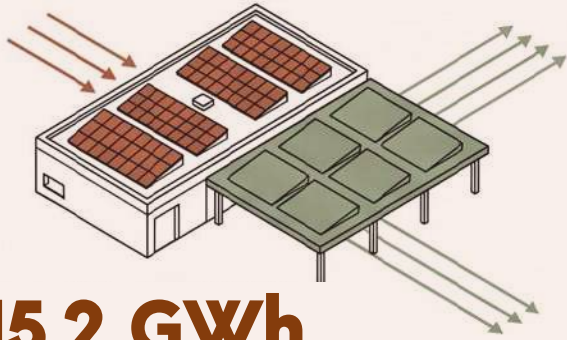


One sandbox cluster

a bounded pilot that proves the savings and the subsidy mechanism at low cost.



Annual Clean Power

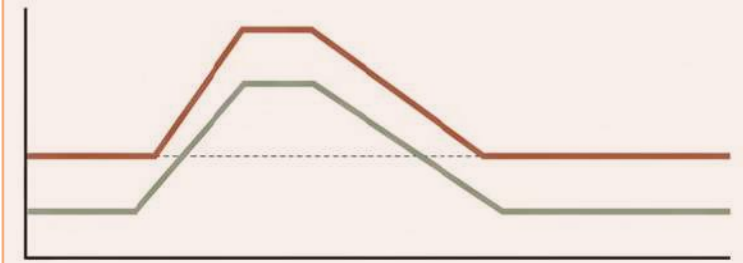


15.2 GWh
clean power a year

WHAT THE STREET GETS
BACK IN THE LONG RUN?

Impact?

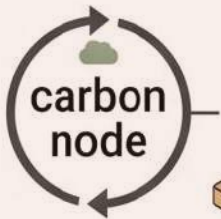
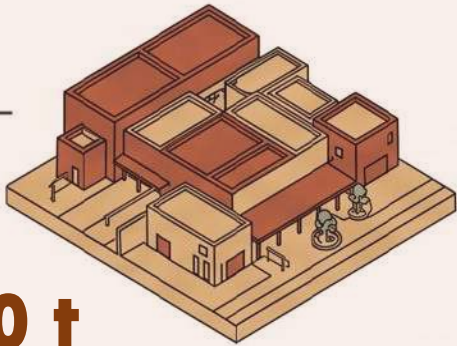
Grid Demand Offset



-26%

of grid demand offset

Annual Carbon Avoided

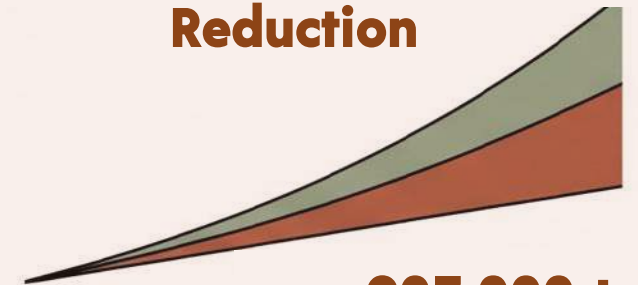


9,040 t
carbon avoided a year

SINGLE MOST IMPORTANT INDICATOR

Felt-temperature relief on the
street, target -6°C , at no net cost
to the public purse.

Long-Term Carbon Reduction

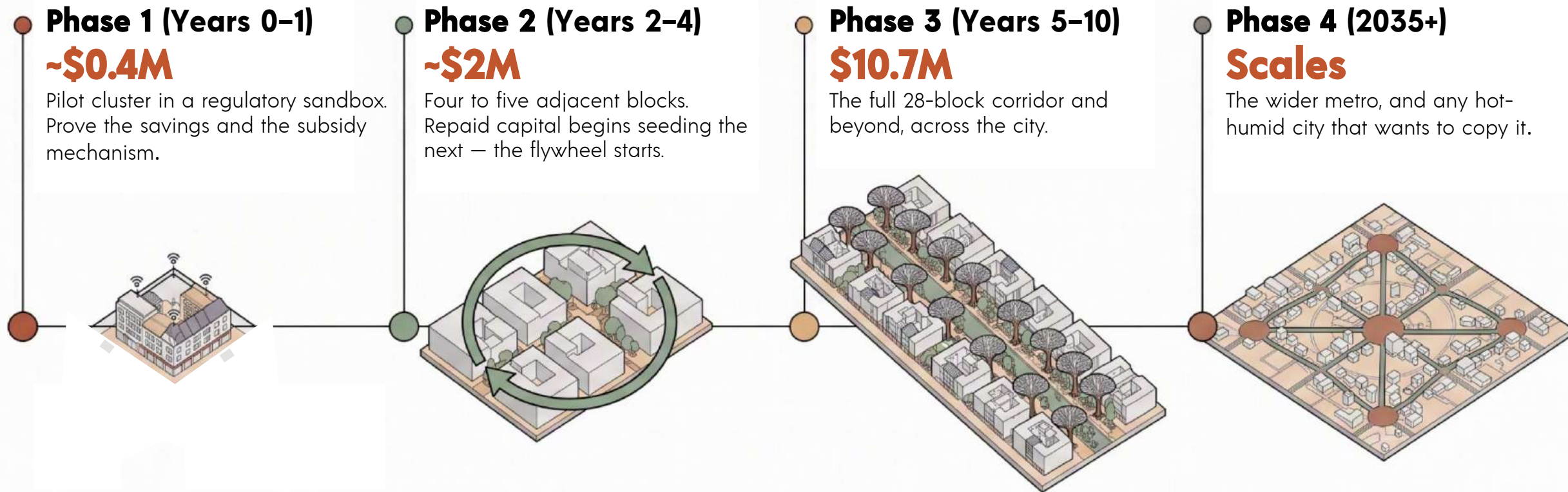


203,000 t
carbon over 25
years

Cost-benefit in a line: about \$10.7M cools 28 blocks for ~1,650 households and shops, avoids 9,040 tonnes of carbon a year, and returns its private half to build the next block – all while the public purse stays whole.

A Phased, Fundable Plan

Enabling condition for every phase: the energy-reform authority confirms the redirected-subsidy rate in the sandbox.



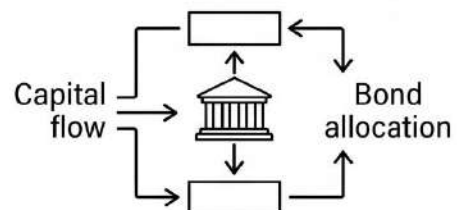
WHO RUNS IT

Decided fast, captured by no one



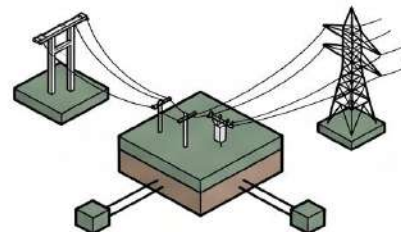
Board of 5–7 • independent chair
 city • energy-reform • investors • operator • resident

The referees are tariff regulator and auditors that stay off the board. Subsidy terms need a super-majority plus outside sign-off.



Finance

(investors, treasury, compliance)



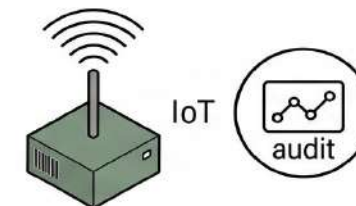
Technical

(operator, utility, certifier)



Community & equity

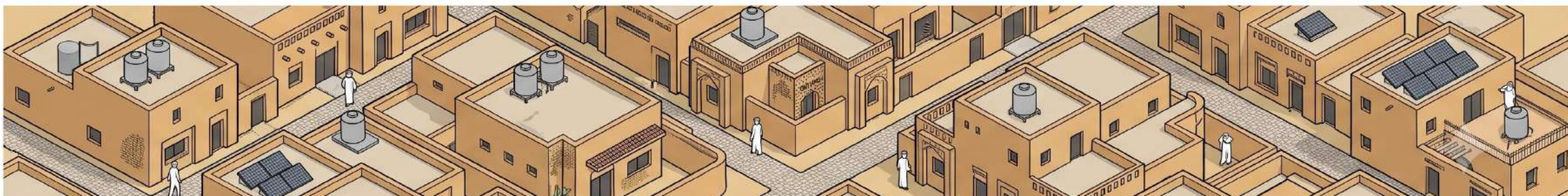
(residents, protection)



Impact & measurement

(sensors, audit)

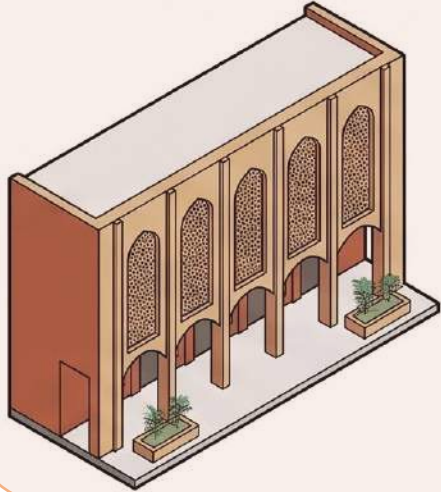
Advisory sub-committees , every interest heard, none holding a veto



Block councils : each block elects its own committee, in constant contact with the fund

STAKEHOLDER ENGAGEMENT

Aligning the interests, securing the buy-in

**City government****What they want:**

Cooler streets, a Vision-2030 win

How we align them:

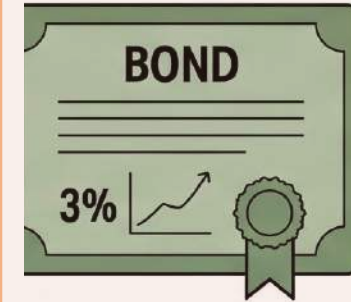
Fund pays for public cooling it already budgets; a visible landmark revived

**Energy-reform authority****What they want:**

Proof that subsidy reform works

How we align them:

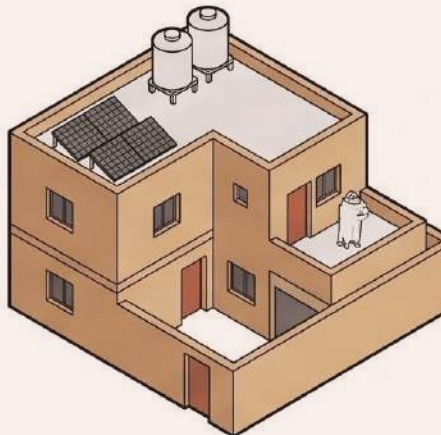
A low-risk sandbox that tests it on one street before any national move

**Investors****What they want:**

A fair return, ESG credentials

How we align them:

A 3% green bond plus a reportable impact certificate

**Homeowners & renters****What they want:**

Lower bills, no risk

How we align them:

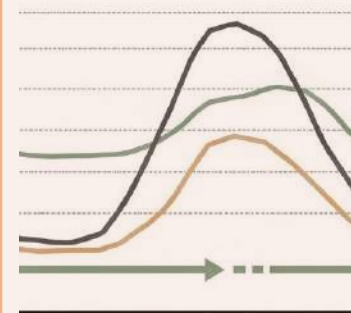
Capped bills, half-price or no-cost solar, protection for the vulnerable

**Merchants****What they want:**

More footfall

How we align them:

A shaded, walkable street that brings shoppers back; option to co-invest

**Utility & the vulnerable****What they want:**

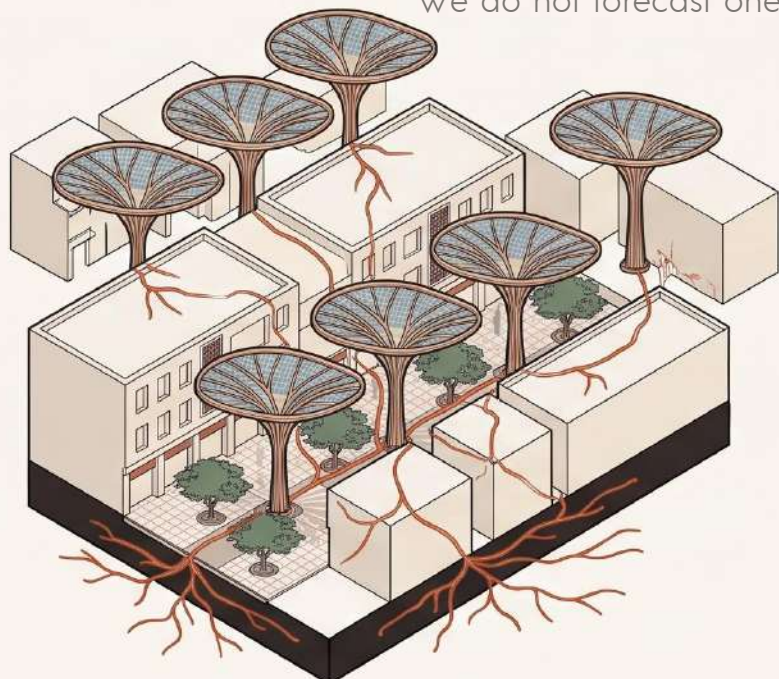
Grid relief, real comfort

How we align them:

Peak demand shaved, shade, cool routes and refuges where they are needed

Designed For Three Futures, Not One

We do not forecast one world. We name three plausible ones and build a network that can survive



1. THE ROOTS SPREAD FASTER

It works, and the demand is for the model.

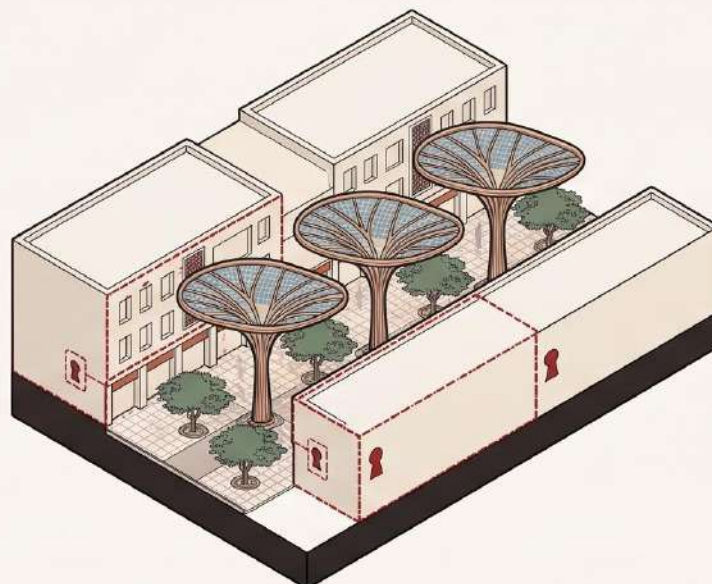
The sandbox rate is confirmed, and savings are held.
Other cities ask for the model, not the canopies.
Capital recycles faster than one block a year.

Reform confirmed · Repayment ahead of plan · Replication requests

WHAT IT STRESSES

Capacity, not capital, and rents on the street we cooled

WIN TOO FAST



2. THE SANDBOX NEVER OPENS

Reform arrives, but not in a shape we can use.

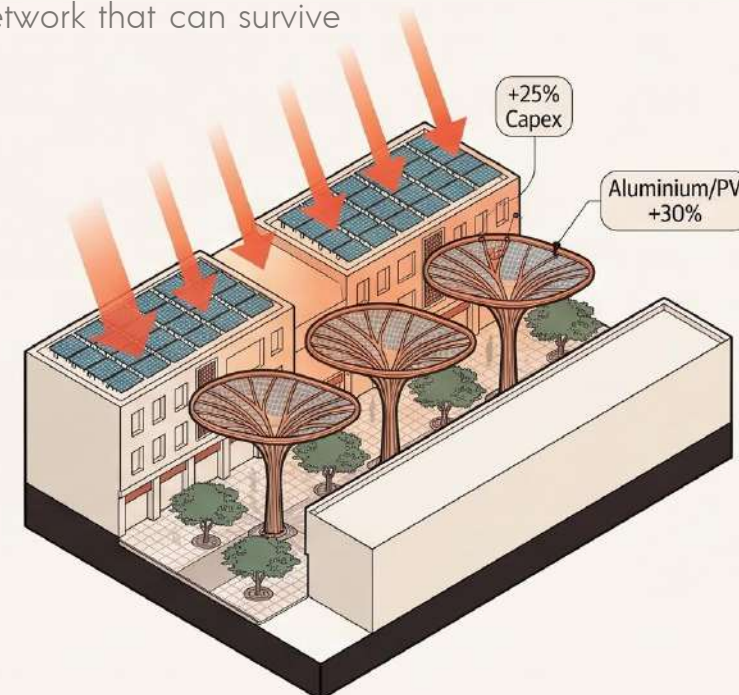
Bill-linked repayment is barred to a non-utility entity,
right-of-way rules block third-party assets, or a state
program simply builds the shade.

Sandbox deferred past Year 1 · Licensing ruling ·
Municipal program announced

WHAT IT STRESSES

The financing mechanism, not the engineering.

NOT ALLOWED TO PLAY



3. HOTTER, COSTLIER, CONSTRAINED

The need rises as the economics turn.

Severe heat days run past the trend.
Aluminium, PV and coatings spike 25–35%, and
the bond reprices.

Capex above +25% · Bond above 5% · Heat above trend

WHAT IT STRESSES

Demand climbs as unit economics turn.

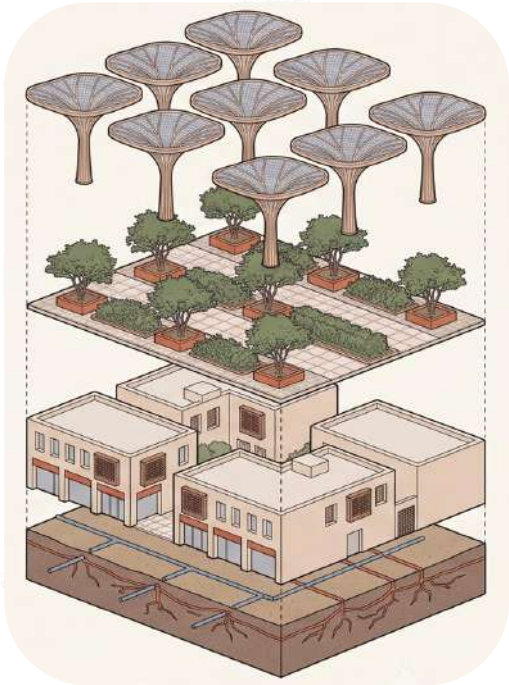
PHYSICS AND PRICES TURN

RESILIENCE AND ADAPTIVENESS

Stress-Tested Against All Three

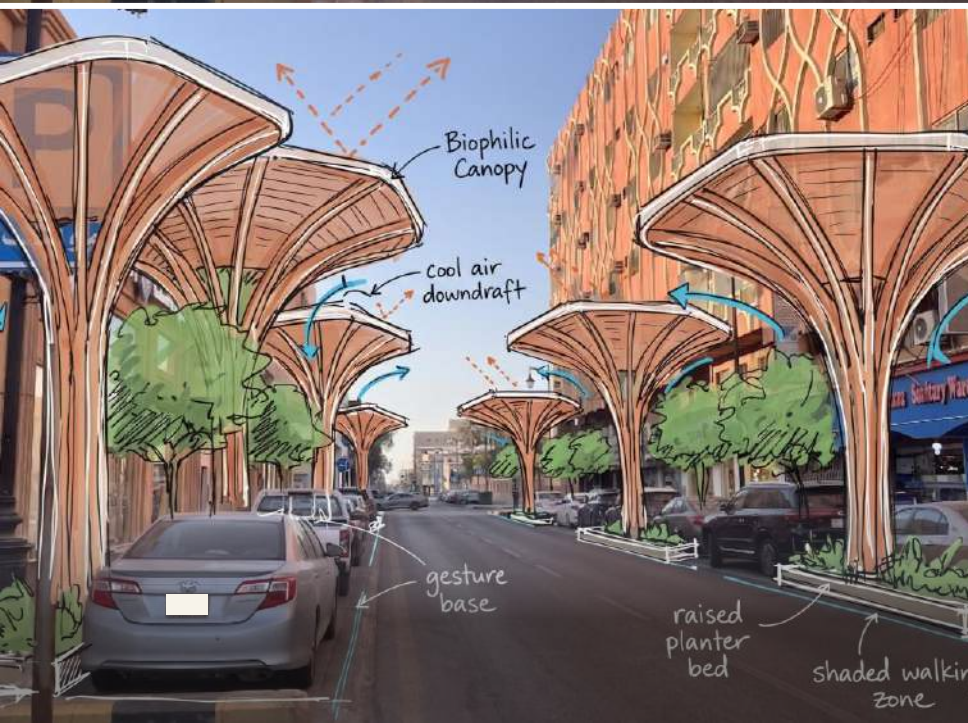
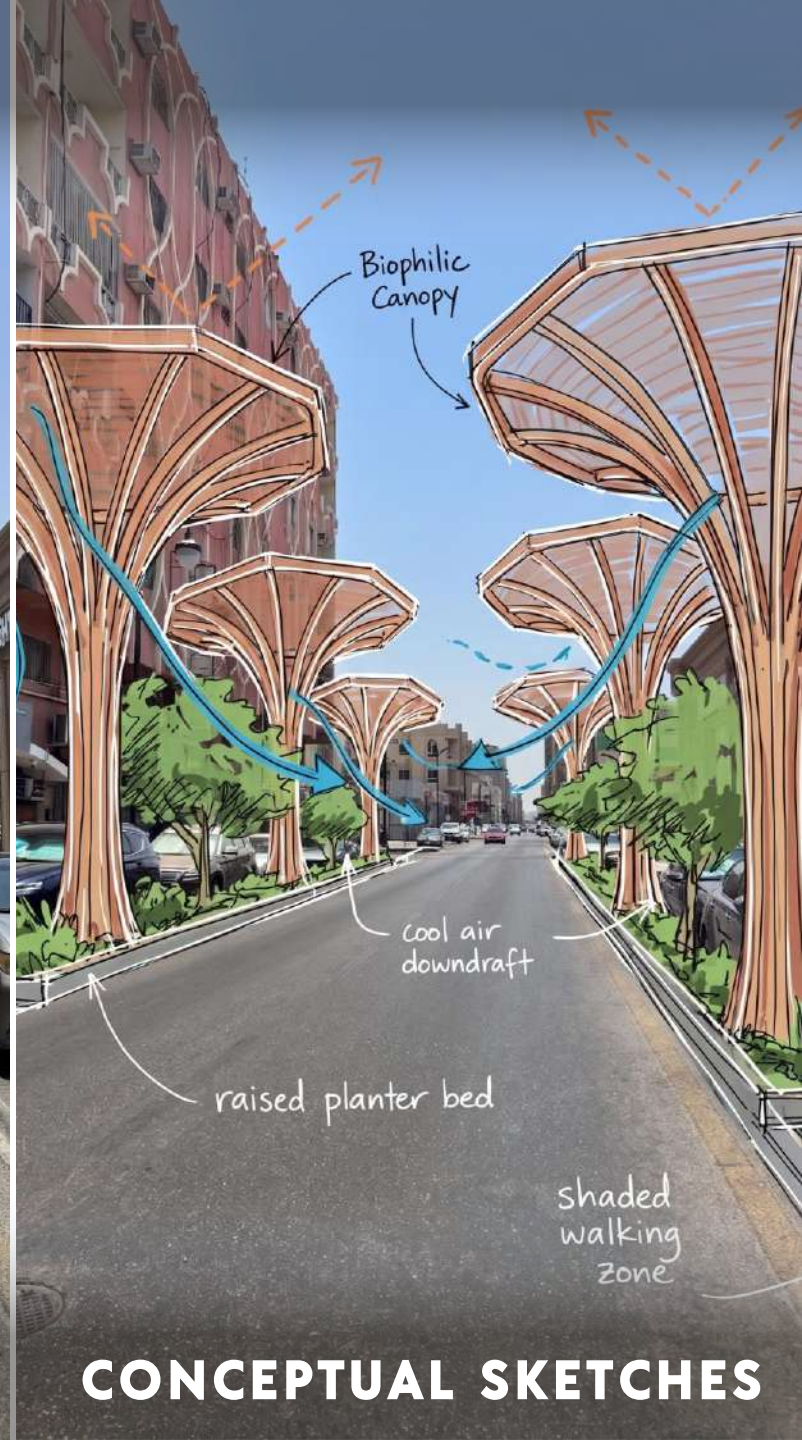
Every vulnerability is named, tied to the future that triggers it, and answered by a design choice we already made.

VULNERABILITY	EXPOSED IN	OUR RESPONSE, BY DESIGN	LEVER
SINGLE-RAIL SUBSIDY DEPENDENCY	Scenario 2 Scenario 3	Phase gate: nothing scales until the rate is confirmed. The public purse never repays, and bolted modules are recoverable. A stalled pilot is redeployable.	REVERSIBILITY
AFFORDABILITY, EQUITY AND DISPLACEMENT	Scenario 1 Scenario 3	Repayment capped below verified savings, a protected baseline tariff and a zero-cost way to join. An anti-displacement covenant protects the residents we built it for.	FLEXIBILITY
CAPEX AND SUPPLY-CHAIN SHOCK	Scenario 3	Procured block by block, not in one order. Coated steel substitutes for recycled aluminium. Circular materials stay in research: they can improve performance and cost, but they are never the critical path.	MODULARITY
WATER THROUGHPUT, NOT WATER SUPPLY	Scenario 3	Saudi already irrigates from TSE and runs a surplus, so the constraint is treatment throughput against demand. Phased block-by-block uptake keeps demand inside supply, with subsurface drip before misting and heat- and salt-hardy natives.	FLEXIBILITY
VERIFICATION INTEGRITY	All Scenarios	Untreated control blocks on every claim. Auditor and tariff regulator sit off the board. Subsidy terms need a super-majority plus outside sign-off.	GOVERNANCE
DISINTERMEDIATION AND THE PRICE OF MONEY	Scenario 1 Scenario 2	The fund pivots from financier to aggregator: the block-scale virtual plant. A blended concessional tranche and phase-gated drawdown absorb the repricing.	FLEXIBILITY



THE UNIT OF RISK

We fund, build and prove one block at a time. A block can be paused, repriced, re-sited or unbolted and moved. So a bad future costs one block, not the corridor.



CONCEPTUAL SKETCHES

38 King Khalid Street

