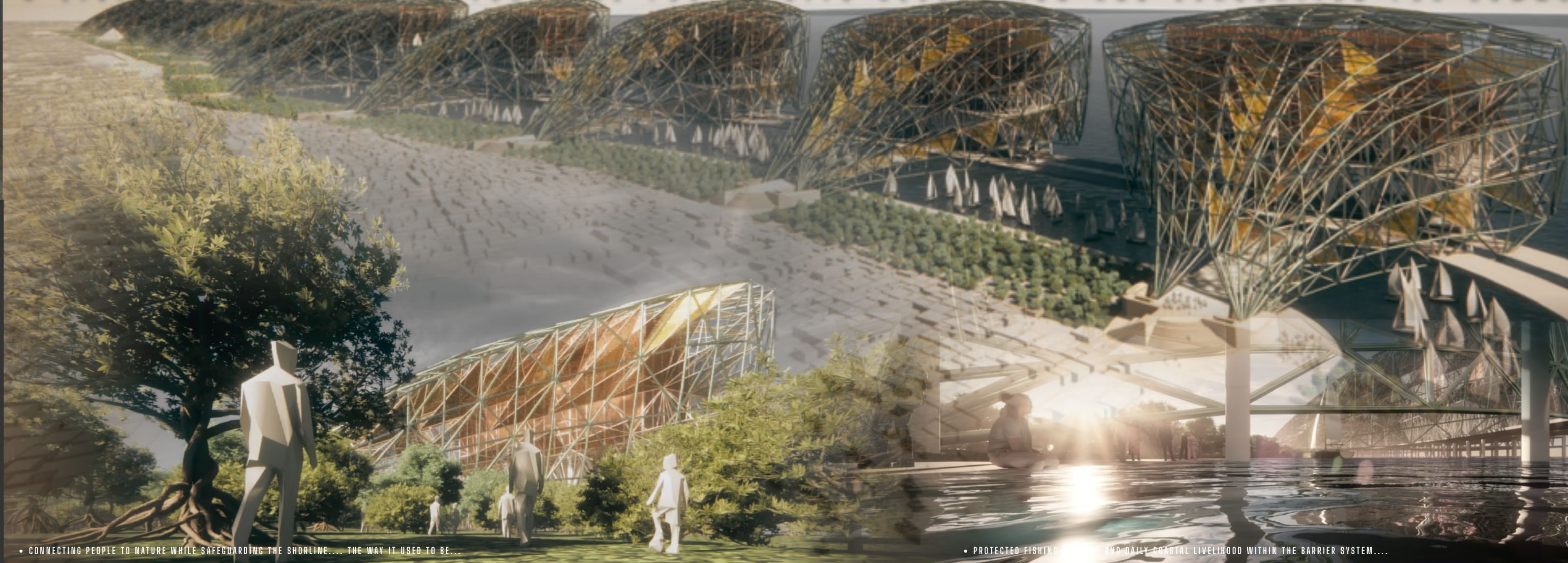


# "EARTHQUAKE-PROOF TSUNAMI BARRIER"

A LIVING COASTAL INFRASTRUCTURE FOR IN-SITU RELOCATION AND EVACUATION FOR COMMUNITY SURVIVAL

## MACCAN GROVE

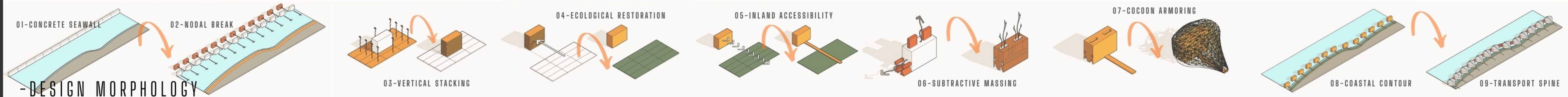
RESILIENT URBAN TYPOLOGY



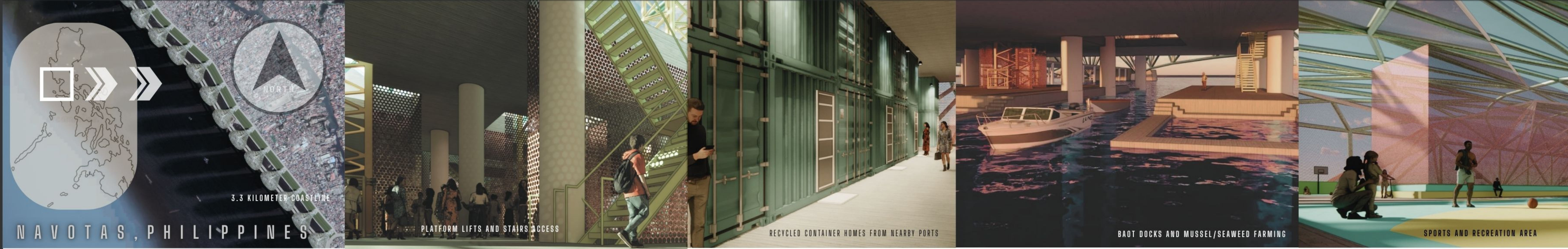
AS RISING TIDES AND SEISMIC VOLATILITY THREATEN OVER 40% OF THE GLOBAL POPULATION, ARCHITECTURE CAN NO LONGER BE STATIC. MACCAN GROVE IS A BIOTECHNIC SHIELD DESIGNED AS AN IN-SITU RELOCATION PROTOTYPE FOR NAVOTAS CITY, PHILIPPINES—ONE OF THE MOST TSUNAMI-VULNERABLE URBAN AREAS IN THE WORLD. GROUNDED IN THE NAVOTAS COMPREHENSIVE LAND USE PLAN (CLUP) AND PHIVOLCS HAZARD DATA, THIS PROJECT DIRECTLY ADDRESSES THE CITY'S 6-METER INUNDATION THREAT AND EXTREME LIQUEFACTION RISK. BY INTEGRATING A DUAL-LAYERED ADAPTIVE SHIELD WITH A COMMUNAL HABITABLE COCOON, THE DESIGN REJECTS THE TRAUMA OF MASS DISPLACEMENT, ALLOWING INFORMAL COASTAL COMMUNITIES TO REMAIN ANCHORED TO THEIR LIVELIHOODS. THIS MODULAR URBANISM BREATHES WITH THE TIDE WHILE STANDING FIRM AGAINST THE 60-MINUTE 'MANILA TRENCH' TSUNAMI ARRIVAL WINDOW. ALIGNED WITH THE SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION, MACCAN GROVE ACHIEVES THE GOAL OF 'BUILDING BACK BETTER' BY TRANSFORMING VULNERABLE COASTLINES INTO RESILIENT, LIFE-SAVING INFRASTRUCTURES. IT IS A RADICAL TRANSITION FROM MERELY LIVING NEAR THE WATER TO THRIVING WITH THE WAVES THROUGH STRUCTURAL PERMANENCE AND ECOLOGICAL RESTORATION.

• CONNECTING PEOPLE TO NATURE WHILE SAFEGUARDING THE SHORLINE... THE WAY IT USED TO BE...

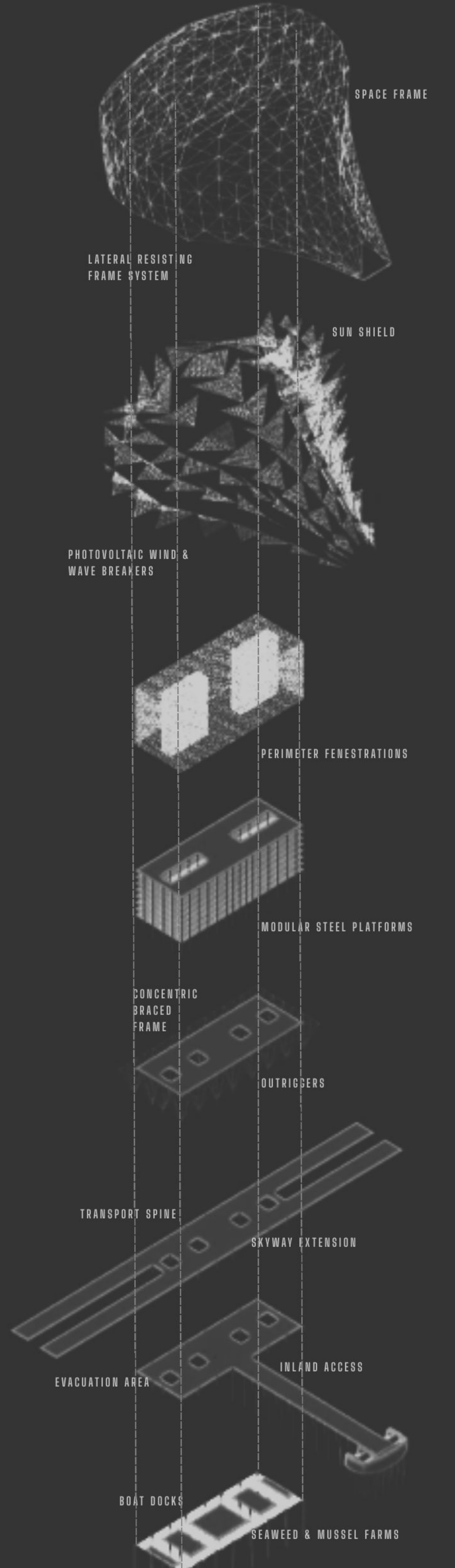
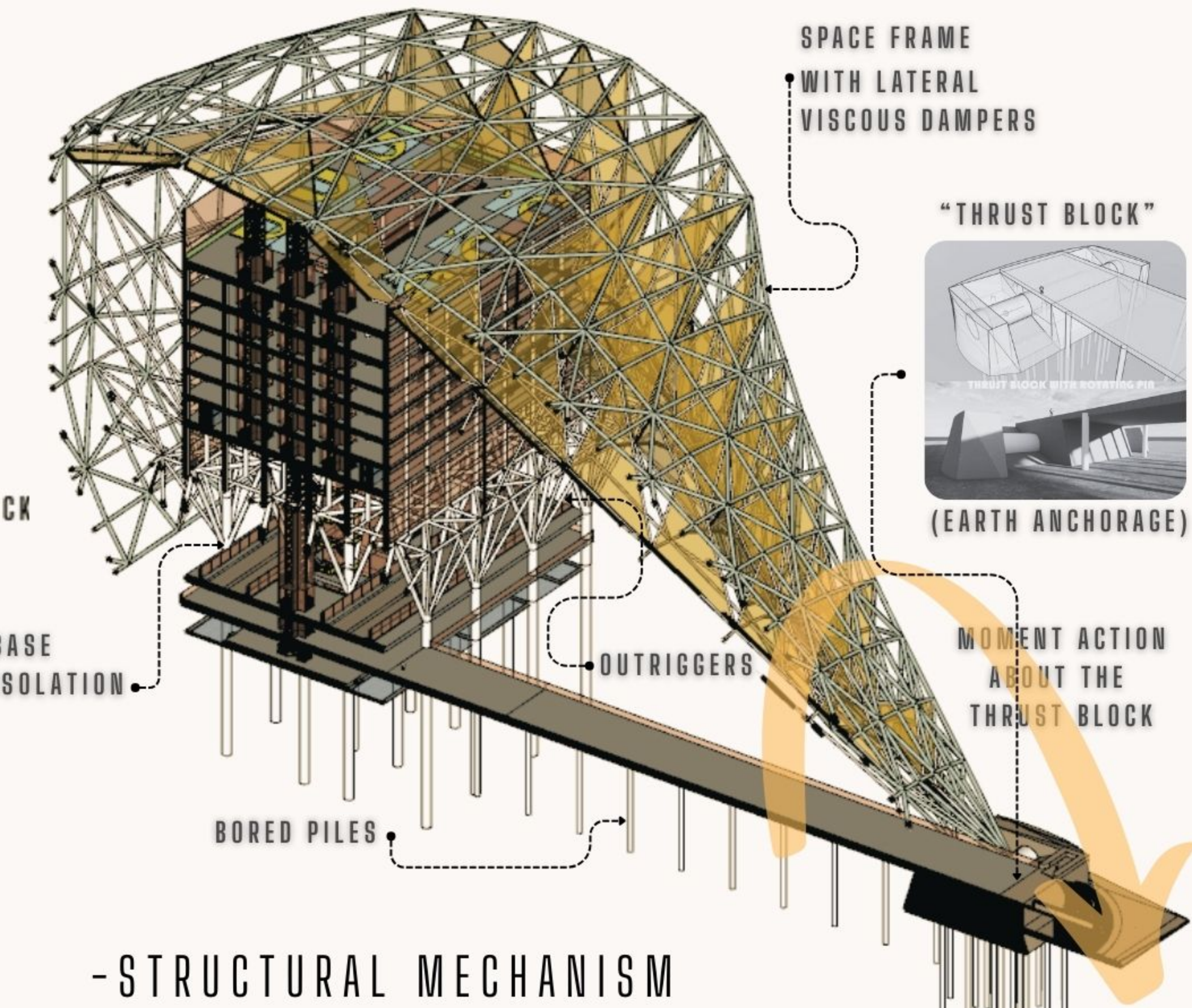
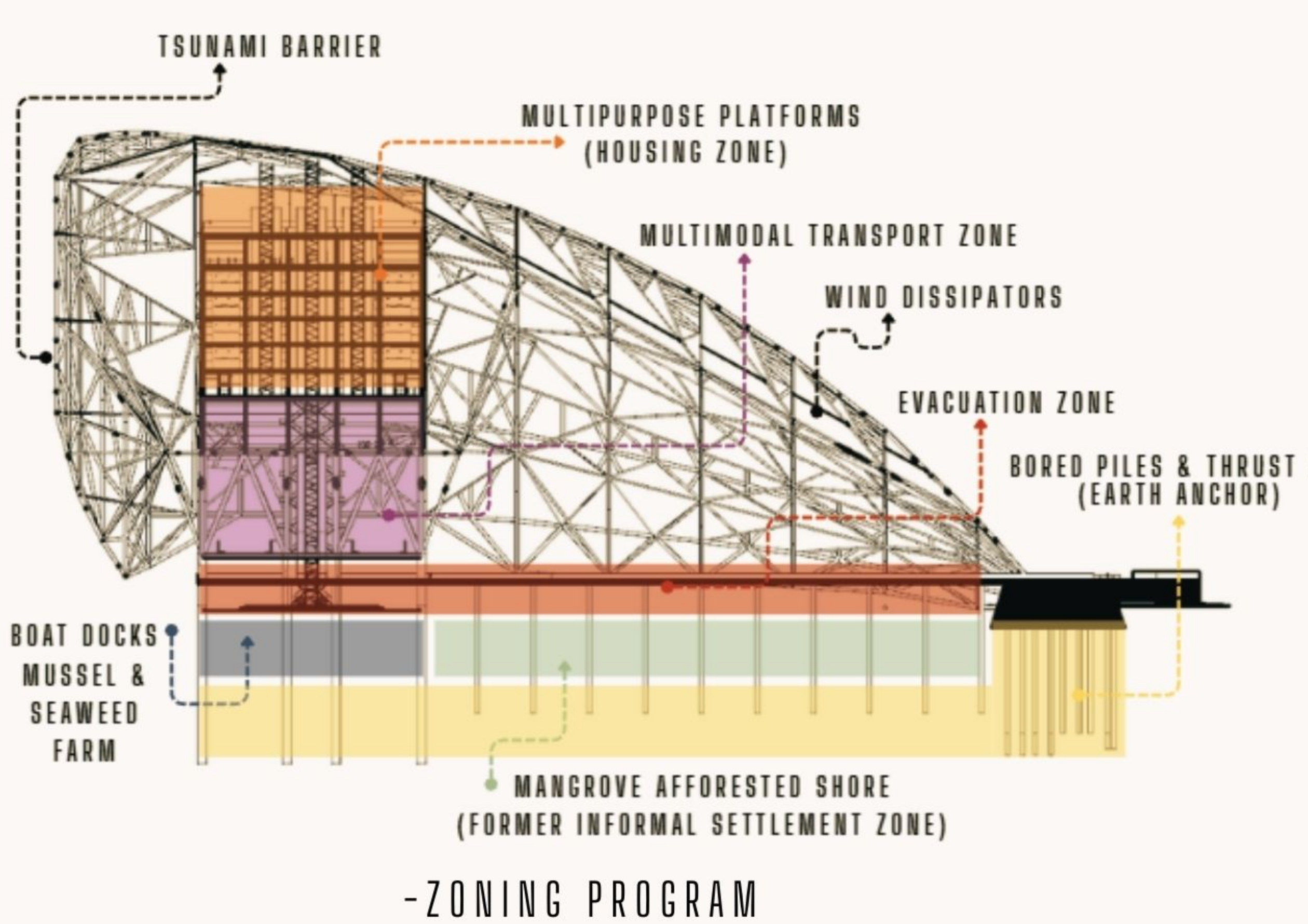
• PROTECTED FISHING AND DAILY COASTAL LIVELIHOOD WITHIN THE BARRIER SYSTEM....



## ADAPTATION - RESTORATION - INCLUSION - RESILIENCE



### HAZARD MITIGATION STRATEGIES



AXONOMETRIC DIAGRAM

THIS PROPOSAL REPRESENTS A SCALABLE FRAGMENT OF A BROADER GLOBAL URBAN TYPOLOGY FOR PLANETARY SURVIVAL

# MACCAN GROVE



RESILIENT URBAN TYPOLOGY

# RESEARCH & CONCEPTS



THE FEARFUL THOUGHT OF A WORST-CASE SCENARIO; AN EARTHQUAKE TRIGGERING LIQUEFACTION AND A TSUNAMI NO LONGER LIES IN THE REALM OF SPECULATION BUT IN THE STARK REALITY THAT IT COULD ERASE NAVOTAS AND ITS NEIGHBORS FROM THE MAP. DESPITE BEING THE FISHING CAPITAL OF METRO MANILA AND A HUB OF MARITIME TRADE, NAVOTAS IS GRIPPED BY MULTIPLE, OVERLAPPING HAZARDS, MOST CRITICALLY, A MAGNITUDE 8.5-9.0 MEGATHRUST RUPTURE ON THE MANILA TRENCH WOULD UNLEASH CATASTROPHIC LIQUEFACTION AND A 10-12 M TSUNAMI WITHIN 30 MINUTES OF THE INITIAL SHAKING, RENDERING LOW-LYING COMMUNITIES UNINHABITABLE. COMPOUNDING THIS THREAT IS THE FAR MORE IMMINENT 'BIG ONE' ON THE WEST VALLEY FAULT-AN MW 7+ STRIKE-SLIP QUAKE THAT CAN PRODUCE PGA'S OF 0.4-0.6 G AND WIDESPREAD SOIL FAILURE UNDER OUR SOFT ALLUVIAL PLAINS, EVEN SHORT OF THOSE EXTREMES, NAVOTAS ENDURES CHRONIC FLOODING FROM STORM SURGES AND HEAVY RAINFALL, AND MUCH OF THE CITY LIES BELOW SEA LEVEL SO THAT A SINGLE BREACH OF SANDBAGS OR RIVER WALLS, AS SEEN IN JUNE 2026, CAN BECOME A DISASTER IN MINUTES.

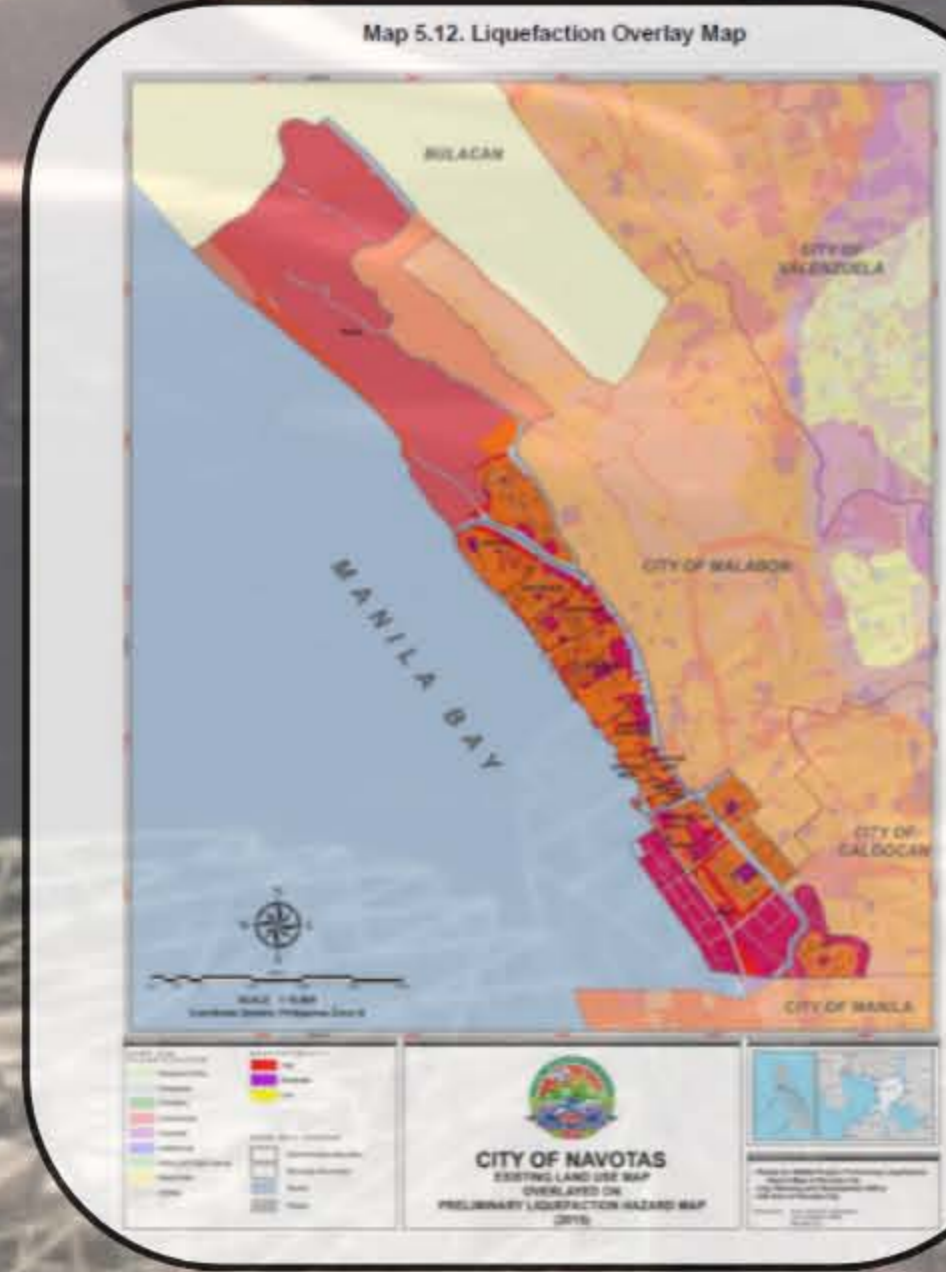
SENDAI ARCHITECTURE

"THE ARCHITECTURAL LANGUAGE OF MACCAN GROVE OPERATIONALIZES THE SENDAI FRAMEWORK BY TRANSITIONING FROM 'FAIL-SAFE' STRUCTURES TO 'SAFE-TO-FAIL' SYSTEMS, MOVING BEYOND THE 'FORTRESS MENTALITY' OF STATIC DIKS. THIS TYPOLOGY ADOPTS PRIORITY 4: BUILD BACK BETTER BY INTEGRATING DISASTER-RESILIENT INFRASTRUCTURE INTO THE VERY FABRIC OF URBAN DEVELOPMENT. THE DESIGN ACKNOWLEDGES THE INEVITABILITY OF THE 'BLACK SWAN' EVENT-SPECIFICALLY THE EXTREME SEISMIC AND HYDRAULIC PRESSURES OF THE MANILA TRENCH-SHIFTING THE OBJECTIVE FROM STOPPING NATURE TO ABSORBING ITS IMPACT. THROUGH A STRATEGY OF MULTI-HAZARD MITIGATION, THE URBAN FABRIC IS NO LONGER A VICTIM OF DISPLACEMENT BUT A STRUCTURAL ANCHOR. BY PRIORITIZING IN-SITU ADAPTATION, MACCAN GROVE ENSURES THAT EVEN DURING A CATASTROPHIC EVENT, THE COMMUNITY REMAINS ANCHORED IN PLACE, FULFILLING THE SENDAI MANDATE TO REDUCE GLOBAL DISASTER MORTALITY AND LIVELIHOOD LOSS."

## ENVIRONMENTAL HAZARDS: NAVOTAS C.L.U.P. ( REFERENCE )



NAVOTAS IS HIGHLY SUSCEPTIBLE TO TSUNAMIS. YET CURRENT DEFENSES RELY ON A 3.6KM STATIC DIKE AND 20M 'NO-BUILD' EASEMENTS. THESE TRADITIONAL BARRIERS ARE VULNERABLE TO EXTREME HYDRAULIC PRESSURE SCOURING AND OVERTOPPING RELIANCE ON RIGID RESISTANCE RISKS TOTAL STRUCTURAL FAILURE AND THE DESTRUCTION OF THE URBAN FABRIC DURING MAGNITUDE 8.0+ EVENTS.



THE LOOSE ALLUVIAL SOILS OF THE MANILA BAY COASTLINE ARE PRONE TO SEISMIC LIQUEFACTION. DURING AN EARTHQUAKE THESE SOILS LOSE SHEAR STRENGTH LEADING TO LATERAL SPREADING AND SHORELINE SLUMPING. STANDARD BUILDING FOUNDATIONS LACK THE DEEP-STRATA ANCHORAGE REQUIRED TO PREVENT STRUCTURES FROM TILTING OR SINKING WHEN THE GROUND TURNS TO A SEMI-LIQUID STATE.



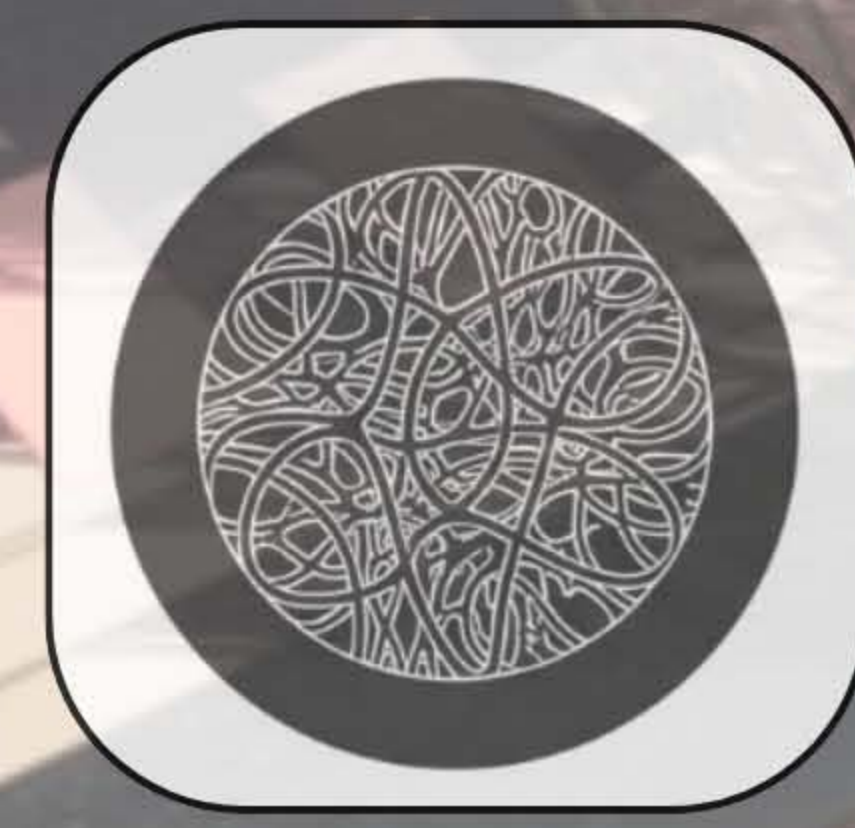
SEVERE WINDS DURING TYPHOONS PRIMARILY AFFECT 'EXPOSED' ELEMENTS OF THE COMMUNITY. HORIZONTAL URBAN DEVELOPMENT LEAVES RESIDENTIAL UNITS AND CRITICAL TRANSPORT UTILITIES DIRECTLY VULNERABLE TO HIGH-VELOCITY GUSTS. WITHOUT AN AERODYNAMIC STRATEGY, WIND DAMAGE CONTINUES TO THREATEN THE CITY'S ECONOMIC CONTINUITY AND HUMANITARIAN SAFETY.



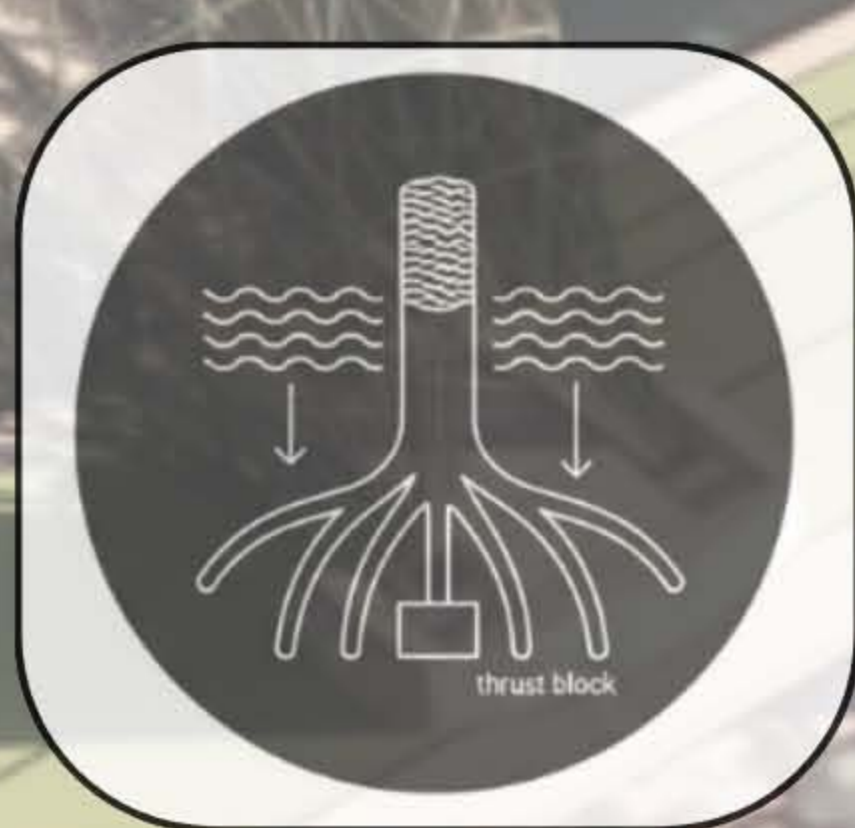
CURRENT STORM SURGE RESPONSES OFTEN RESULT IN THE MASS DISPLACEMENT OF 'THOUSANDS OF FAMILIES. ENFORCING 'NO-BUILD ZONES' SEVERS THE VITAL SOCIO-ECONOMIC LINK BETWEEN THE COMMUNITY AND THE SEA WHILE DIKS REDUCE FLOODING. THEY FAIL TO PROVIDE A TYPOLOGY THAT HOUSES THE MARITIME WORKFORCE SAFELY IN-SITU, HINDERING THE CITY'S TRUE ADAPTIVE CAPACITY.

## TSUNAMI THREAT LIQUEFACTION SEVERE WIND STORM SURGE

## CONCEPTUAL FRAMEWORK: MANGROVE (BIO-STRUCTURAL SYNTHESIS)



INSPIRED BY THE COMPLEX ROOTS OF THE MANGROVE, THE TSUNAMI BARRIER EXOSKELETON ACTS AS A PERMEABLE ARMOR. UNLIKE SOLID DIKS THAT REFLECT ENERGY, THIS PERFORATED MATRIX FRAGMENTS HYDRAULIC FORCE FROM TSUNAMIS AND STORM SURGES, ALLOWING THE STRUCTURE TO DISSIPATE ENERGY WHILE MAINTAINING STABILITY.



TO ADDRESS THE HIGH RISK OF LIQUEFACTION IDENTIFIED IN THE CLUP, THE PROJECT UTILIZES A BORED PILE AND THRUST BLOCK SYSTEM INSPIRED BY THE DEEP ANCHORING ROOTS OF THE MANGROVE. THIS 'EARTH ANCHOR' BYPASSES UNSTABLE LIQUEFIED TOPSOIL TO GRIP THE DEEP-STRATA ENSURING THE ENTIRE 3.6KM DEVELOPMENT REMAINS UPRIGHT DURING MAJOR SEISMIC EVENTS.



THE INTERIOR OF THE COCON FRUNCTIONS AS A STRUCTURAL 'NURSERY' FOR THE COMMUNITY, MIRRORING THE SAFE HAVENS WITHIN MANGROVE ROOTS. THESE MULTIPURPOSE PLATFORMS PROVIDE A SHELTERED ENVIRONMENT FOR IN-SITU HOUSING, PROTECTING RESIDENTS FROM EXTREME WIND AND WATER WHILE PRESERVING THE SOCIAL FABRIC OF THE 6 BARANGAYS.

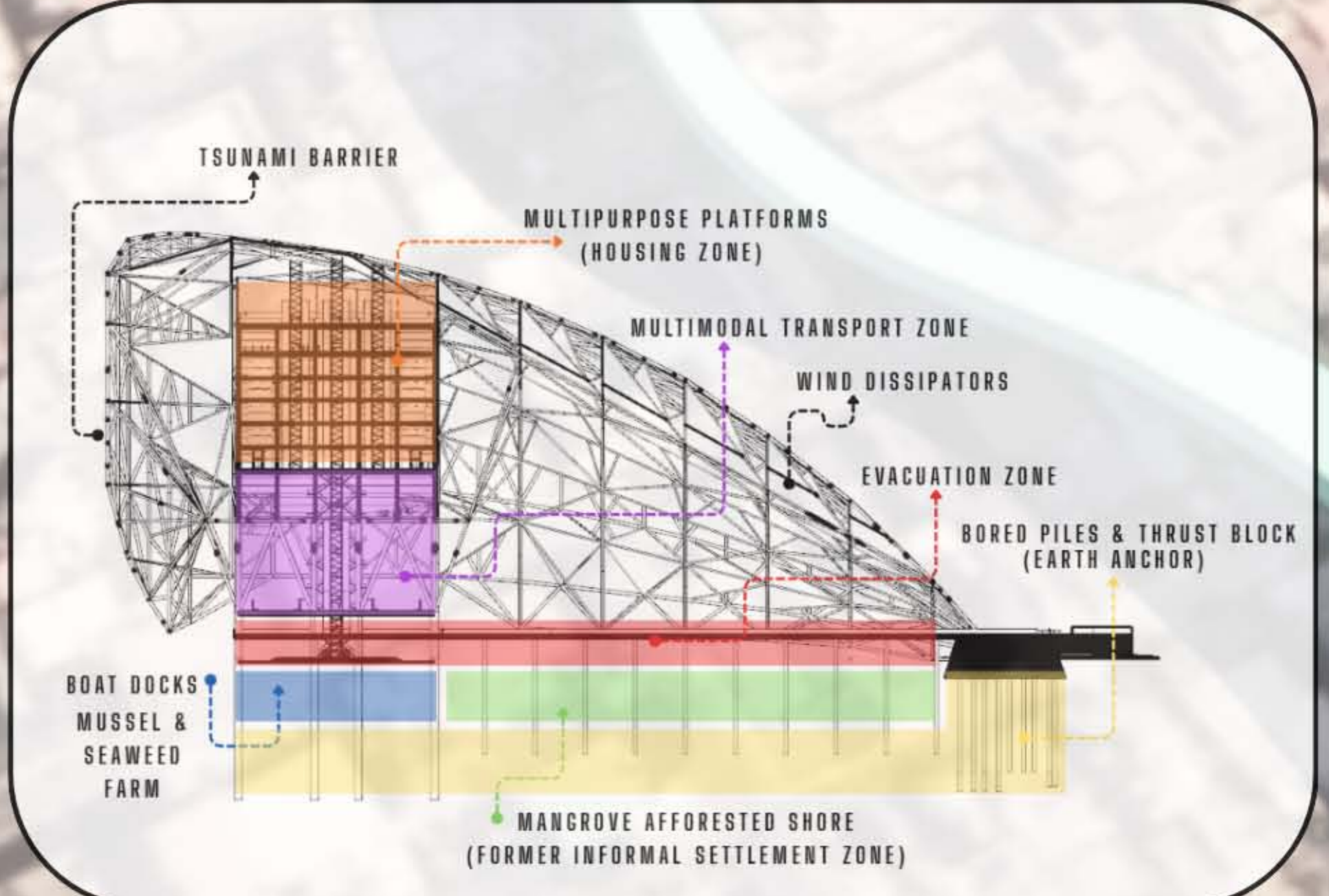


MIMICKING THE GAS EXCHANGE OF A MANGROVE ECOSYSTEM, THIS VERTICAL SYSTEM UTILIZES AIRWELLS AND WIND DISSIPATORS FOR PASSIVE VENTILATION. THIS 'RESPIRATORY' CYCLE IS SUPPORTED BY MUSSEL AND SEAWEED FARMING AT THE BASE, WHICH GENERATES OXYGEN AND CARBON-SINKING VALUE, ENSURING A HEALTHY BIO-CLIMATE THROUGHOUT THE HOUSING NODES.

## ATTENUATION ANCHORAGE NURSERY RESPIRATION

## MITIGATING STRATEGIES: LOCAL POLICY VS. MACCAN GROVE (THESIS)

Hazard / Factor	LGU Mitigating Measure	Shore Adaptations (Maccan Grove)	Impact of Adaptation
Tsunami	3.5km Coastal Dike & 20m No-Build Zone.	13 Resilient Nodes & Cocoon Framing: Perforated exoskeleton designed to fragment wave energy.	Survival over Resistance: Prevents the "pancake" collapse and catastrophic scouring associated with solid walls.
Liquefaction	Strict observance of the Building Code.	Thrust Block Foundations: Deep-strata structural anchors engineered to bypass liquefied topsoil.	Structural Anchorage: Ensures the nodes remain upright and operational even during lateral soil spreading.
Severe Wind	Wind-resistant designs & Green Linear Parks.	Aerodynamic Cocoon Geometry: A lattice structure that reduces wind load and acts as a massive windbreak.	Infrastructure Shield: Protects internal housing units and the elevated transport spine from high-velocity gusts.
Storm Surge	Mangrove planting & 3.5km Coastal Dike.	3,300m Ecological Bio-Shield: Integrated mangroves paired with water-permeable massing gaps.	Energy Attenuation: Mangroves act as a pre-filter, while massing gaps allow water to bypass without building pressure.
Social Cost	Mass Displacement: Forced relocation of families due to "No-Build Zone" mandate.	In-Situ Relocation: Verticalizing the community safely within the permanent armor of the nodes.	Livelihood Continuity: Keeps the 6 barangays connected to the "Blue Economy" and their social fabric intact.



THE CURRENT NAVOTAS DISASTER RISK REDUCTION (DRR) FRAMEWORK CORRECTLY IDENTIFIES LOCAL HAZARDS BUT LACKS A SPECIALIZED ARCHITECTURAL TYPOLOGY CAPABLE OF HOUSING A MARITIME COMMUNITY WHILE ACTIVELY DEFENDING THE LAND.

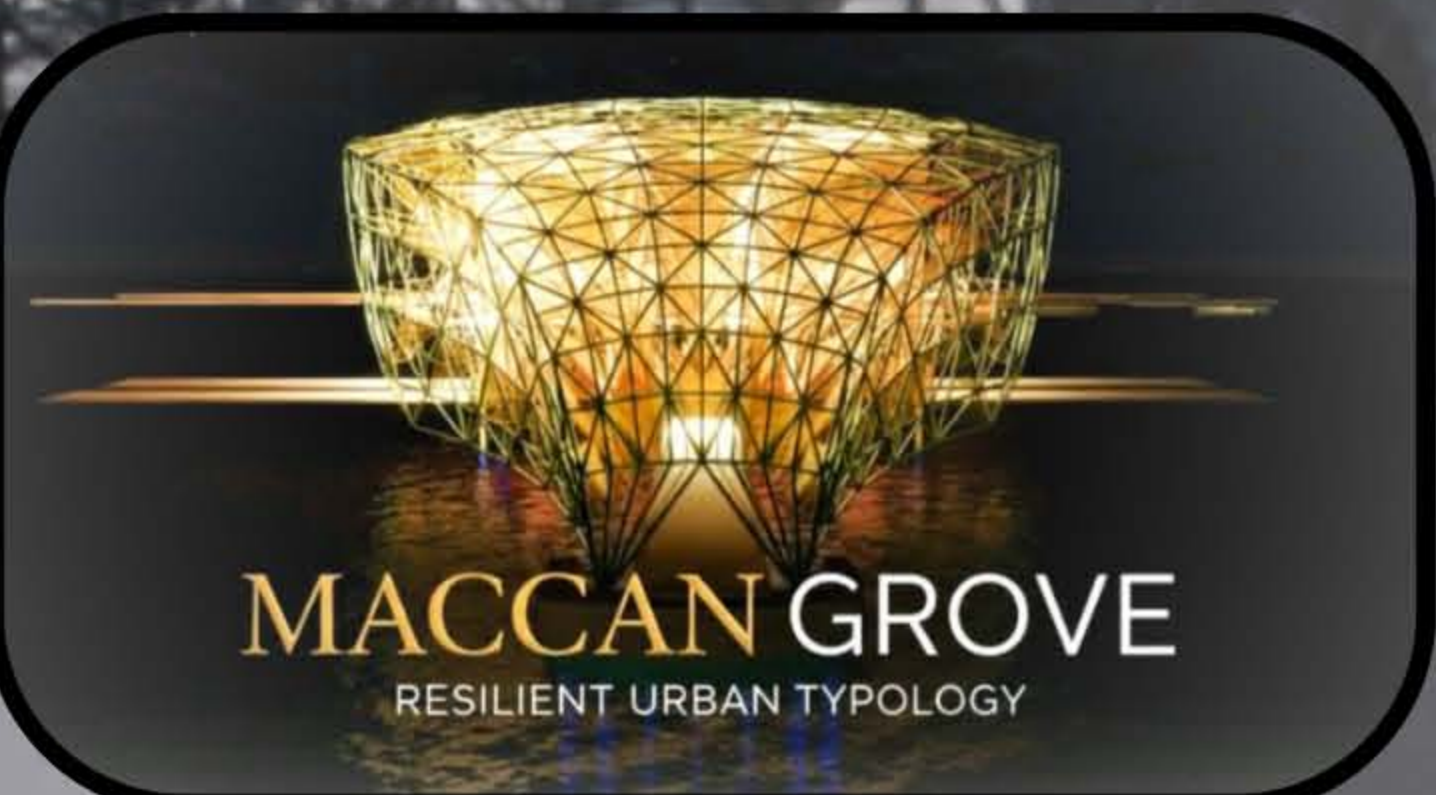
BY REPLACING THE STATIC DIKE-A SYSTEM OF EXCLUSION-WITH A KINETIC PERFORATED SHIELD, MACCAN GROVE FULFILLS EVERY INSTITUTIONAL SAFETY REQUIREMENT WHILE ELIMINATING THE HUMANITARIAN CRISIS OF DISPLACEMENT.

THIS PROJECT OPERATIONALIZES THE SENDAI FRAMEWORK BY SHIFTING THE URBAN STRATEGY FROM HORIZONTAL RETREAT TO VERTICAL ADAPTATION, THROUGH THE BIOMIMETIC LOGIC OF ATTENUATION, ANCHORAGE, NURSERY, AND RESPIRATION.

THE DESIGN ENSURES THAT CRITICAL INFRASTRUCTURE AND RESIDENTIAL DUPLICATIONS REMAIN OPERATIONAL EVEN UNDER EXTREME SEISMIC AND HYDRAULIC PRESSURES. MACCAN GROVE IS MORE THAN A HOUSING PROJECT: IT IS A SOCIO-TECHNICAL BRIDGE THAT ALLOWS NAVOTAS TO GROW VERTICALLY WHERE IT CURRENTLY CANNOT SURVIVE HORIZONTALLY."

## COMPARATIVE ANALYSIS ZONING DIAGRAM RESEARCH CONCLUSION

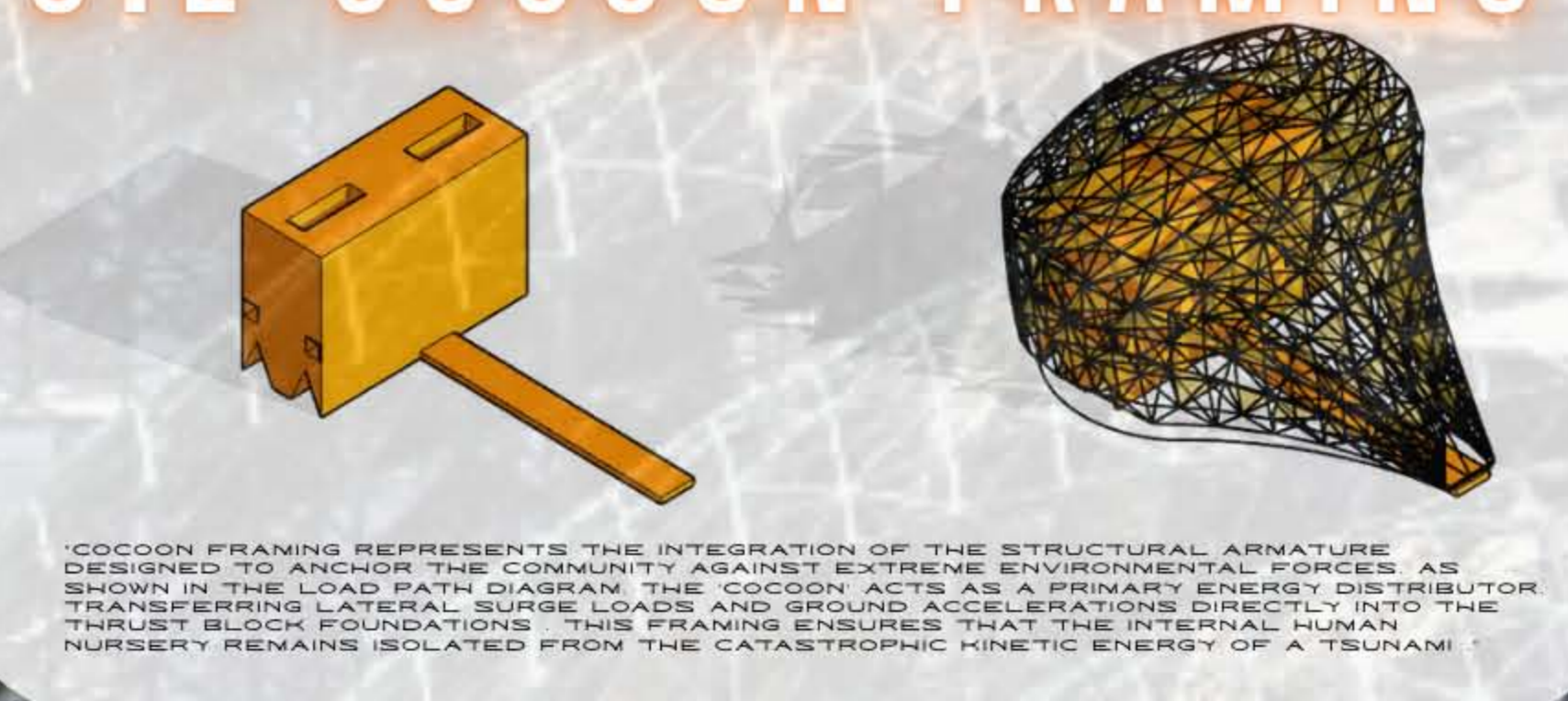
KINETIC MORPHOGENESIS: THE DYNAMICS OF ADAPTATION. THE DESIGN EVOLUTION OF MACCAN GROVE REJECTS THE STATIC RIGIDITY OF CONVENTIONAL COASTAL BARRIERS IN FAVOR OF KINETIC MORPHOGENESIS-A FORM-FINDING PROCESS WHERE THE ARCHITECTURAL ENVELOPE IS SHAPED BY THE VERY FORCES IT AIMS TO MITIGATE. BY TRANSLATING THE BIOLOGICAL LOGIC OF THE RHIZOPHORA MANGROVE INTO A DIGITAL STRUCTURAL MATRIX, THE MORPHOLOGY OF THE 13 NODES EVOLVED TO FRAGMENT HYDRAULIC ENERGY WHILE MAINTAINING STRUCTURAL STABILITY UNDER SEISMIC STRESS. THIS IS NOT A FORMAL GESTURE, BUT A PERFORMANCE-DRIVEN GEOMETRY THAT 'BREATHES' AND 'FLEXES' IN RESPONSE TO THE MANILA TRENCH'S EXTREME PRESSURES. THROUGH THIS MORPHOGENETIC LENS, THE 'FORTRESS' IS REPLACED BY A RHIZOMORPHIC EXOSKELETON. THE CURVATURE OF THE COCOON IS MATHEMATICALLY OPTIMIZED TO REDIRECT SEVERE WIND LOADS AND ATTENUATE STORM SURGES, WHILE THE INTERIOR 'NURSERY' VOIDS PROVIDE A STABLE, PROTECTED ENVIRONMENT FOR THE COMMUNITY TO REMAIN IN-SITU. EVERY FACET OF THE NODE'S GEOMETRY IS A DIRECT RESULT OF ENVIRONMENTAL DATA, ENSURING THAT THE FINAL FORM IS A GLOBAL PROTOTYPE FOR COASTAL RESILIENCE-A SYSTEMIC BRIDGE BETWEEN BIOLOGICAL SURVIVAL AND TECTONIC PERMANENCE."



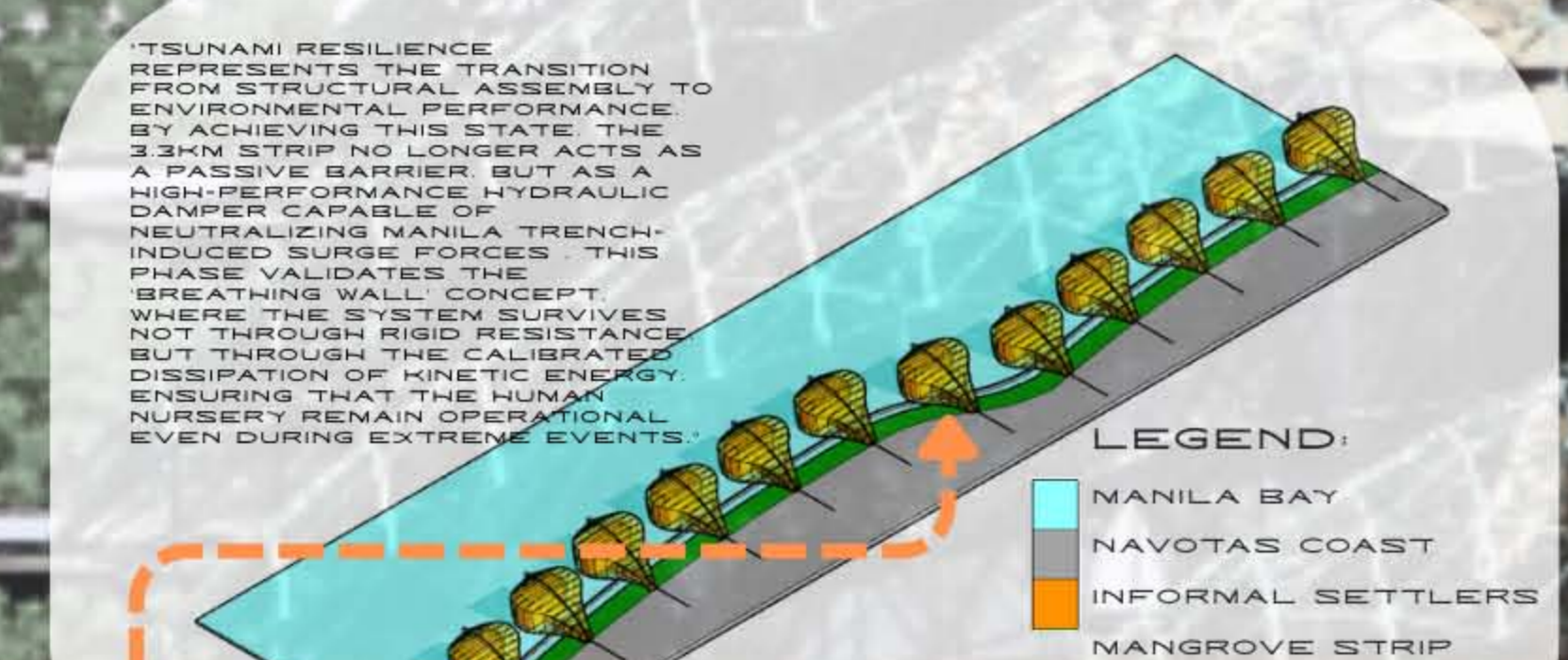
### 3.1-SUBTRACTIVE MASSING



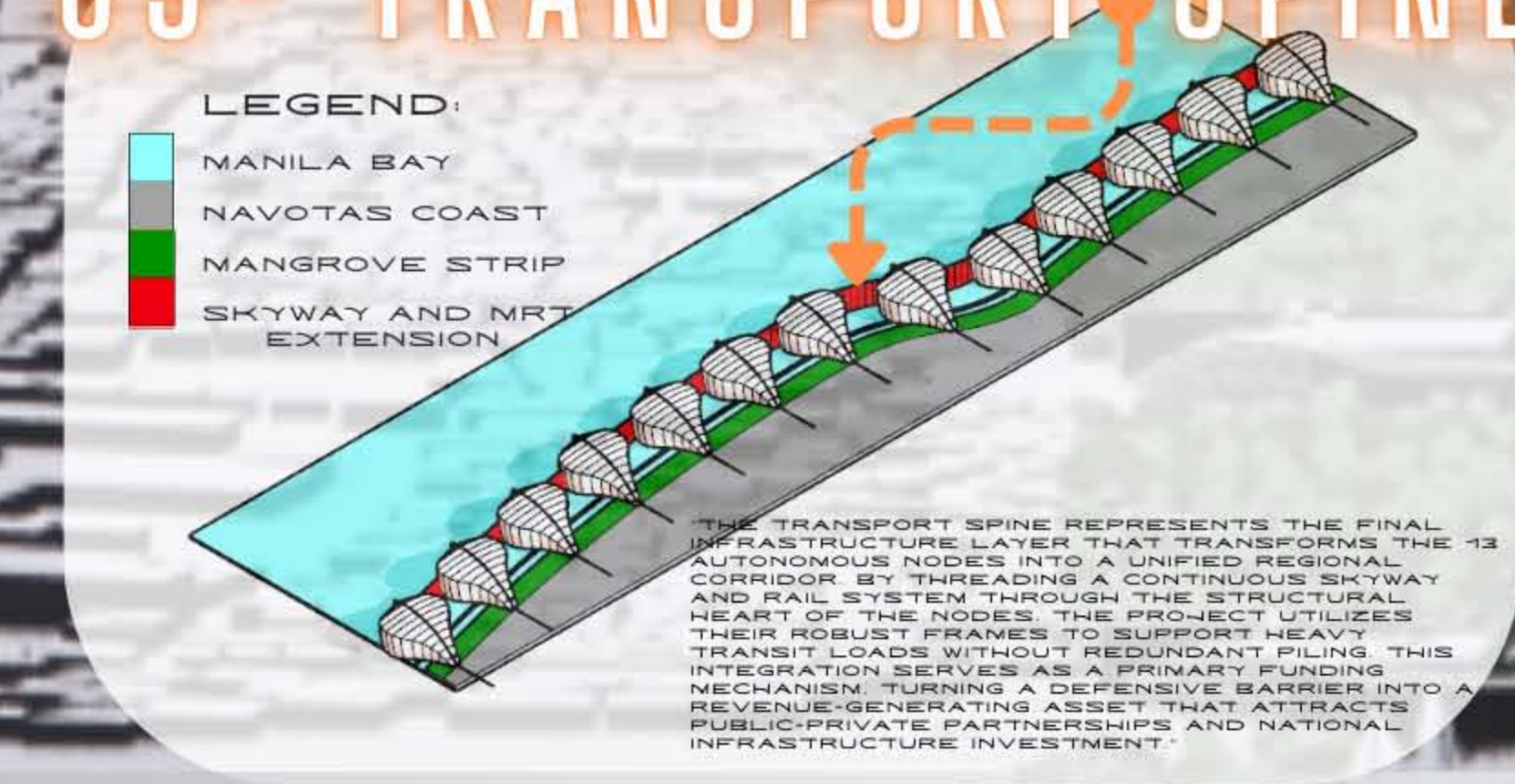
### 3.2 COCOON FRAMING



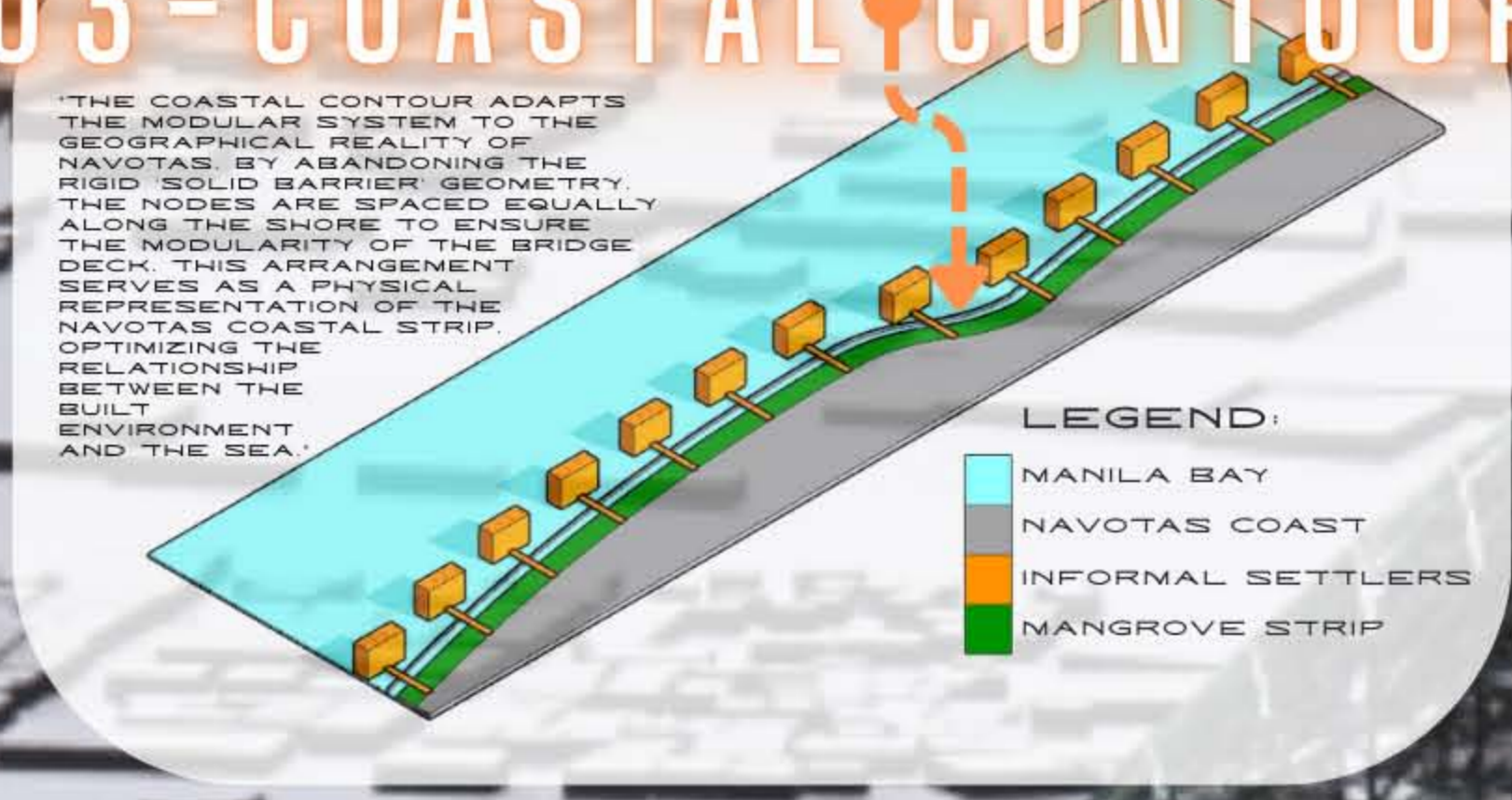
### 04-TSUNAMI RESILIENCE



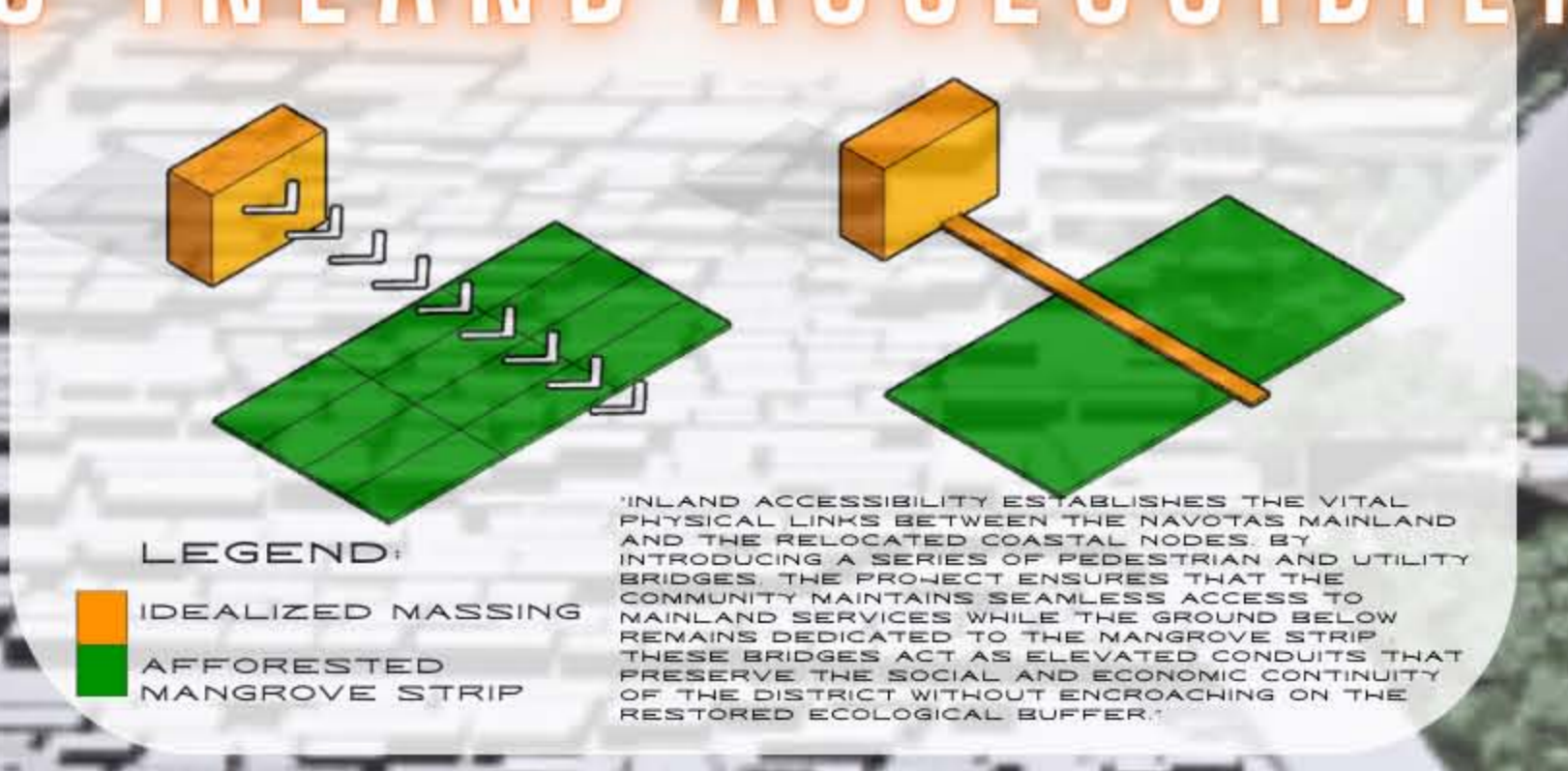
### 05- TRANSPORT SPINE



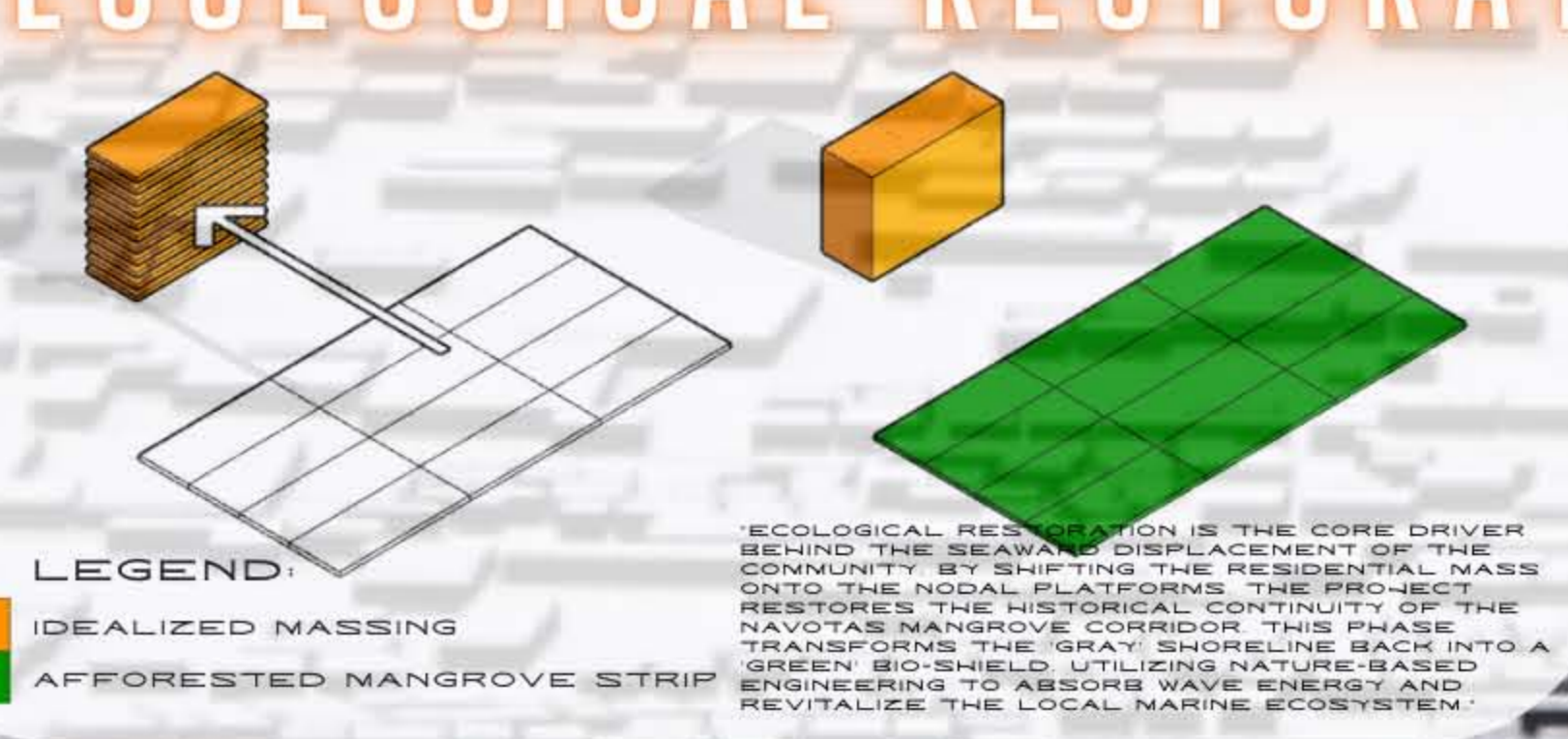
### 03-COASTAL CONTOUR



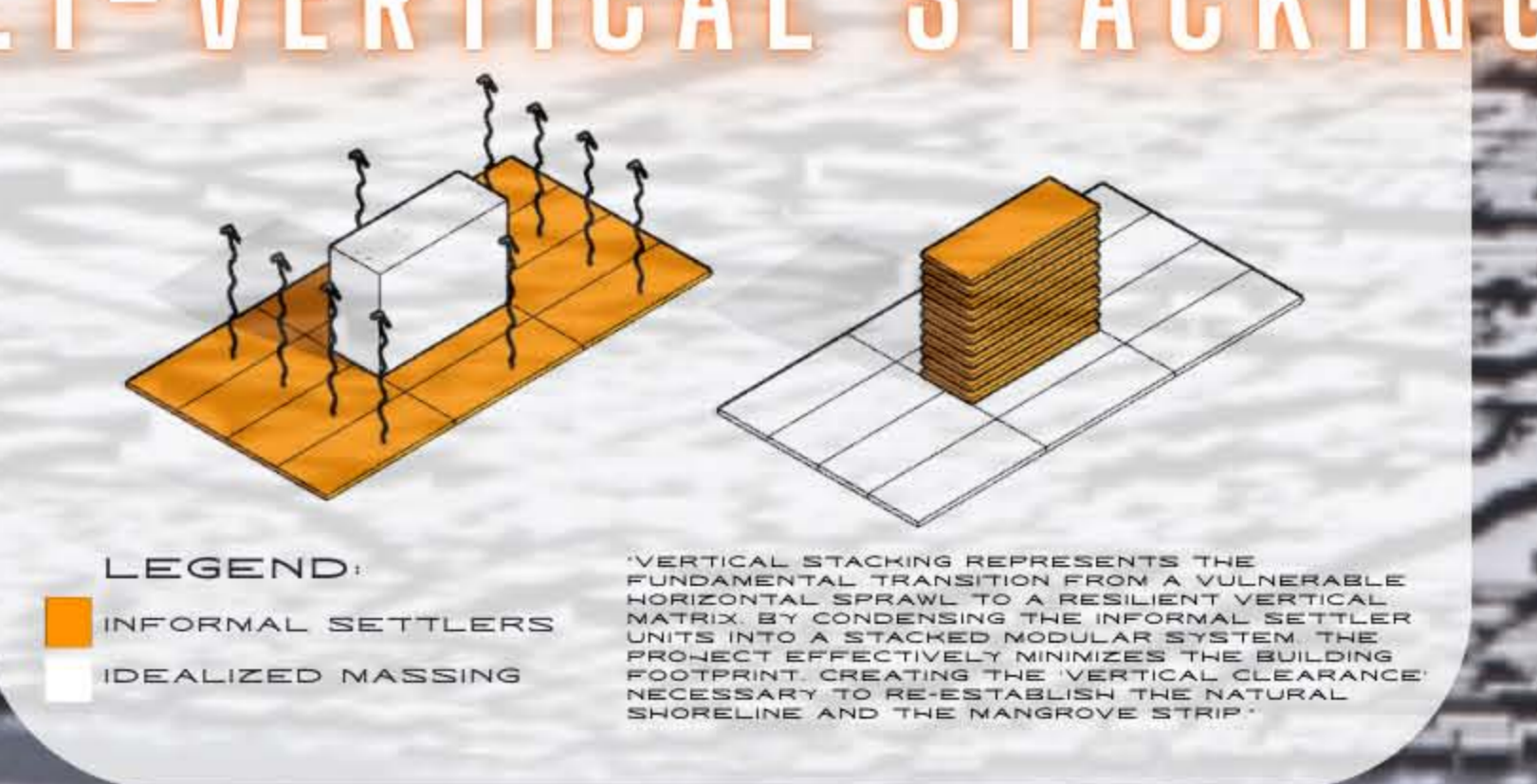
### 2.3 INLAND ACCESSIBILITY



### 2.2- ECOLOGICAL RESTORATION

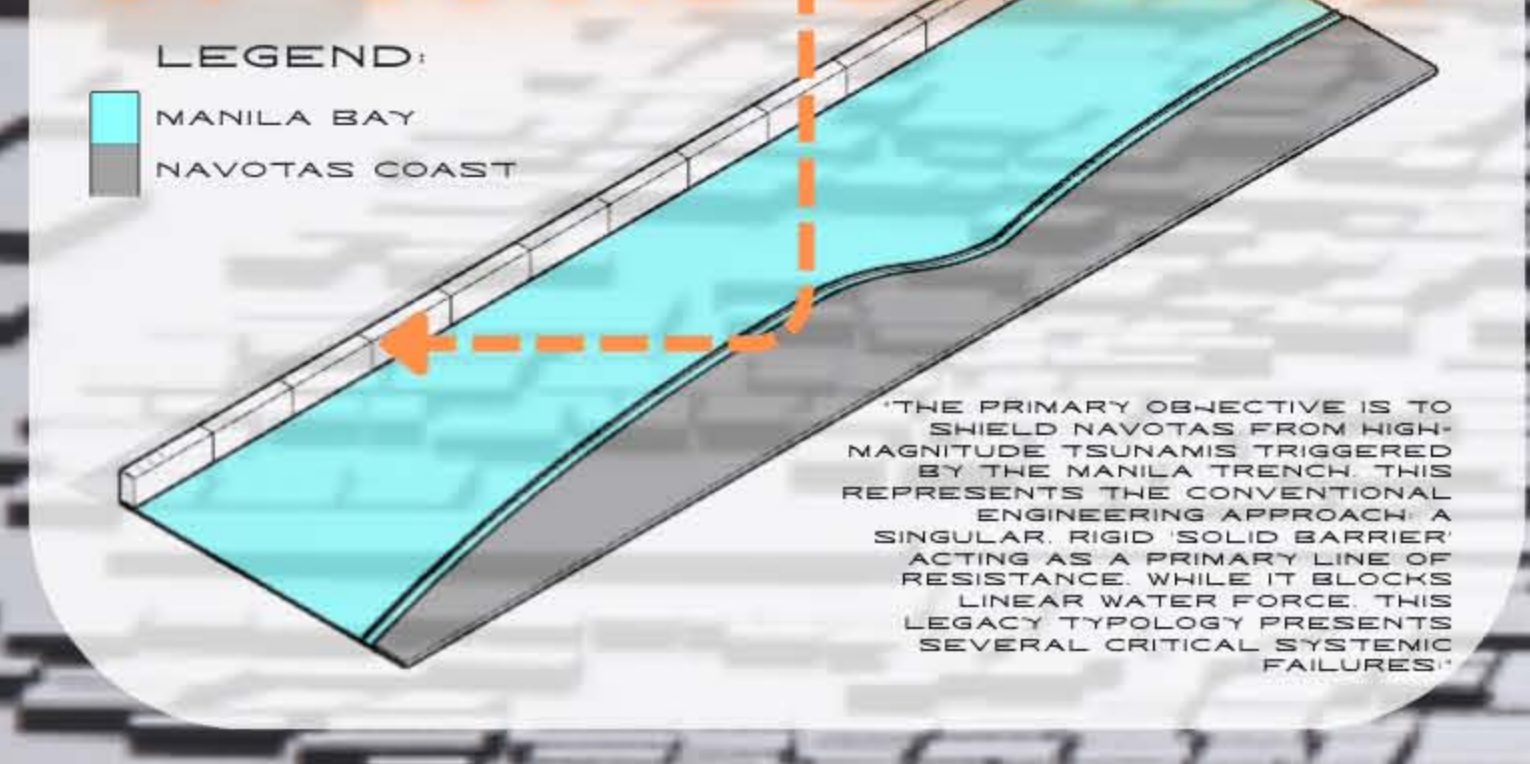


### 2.1- VERTICAL STACKING

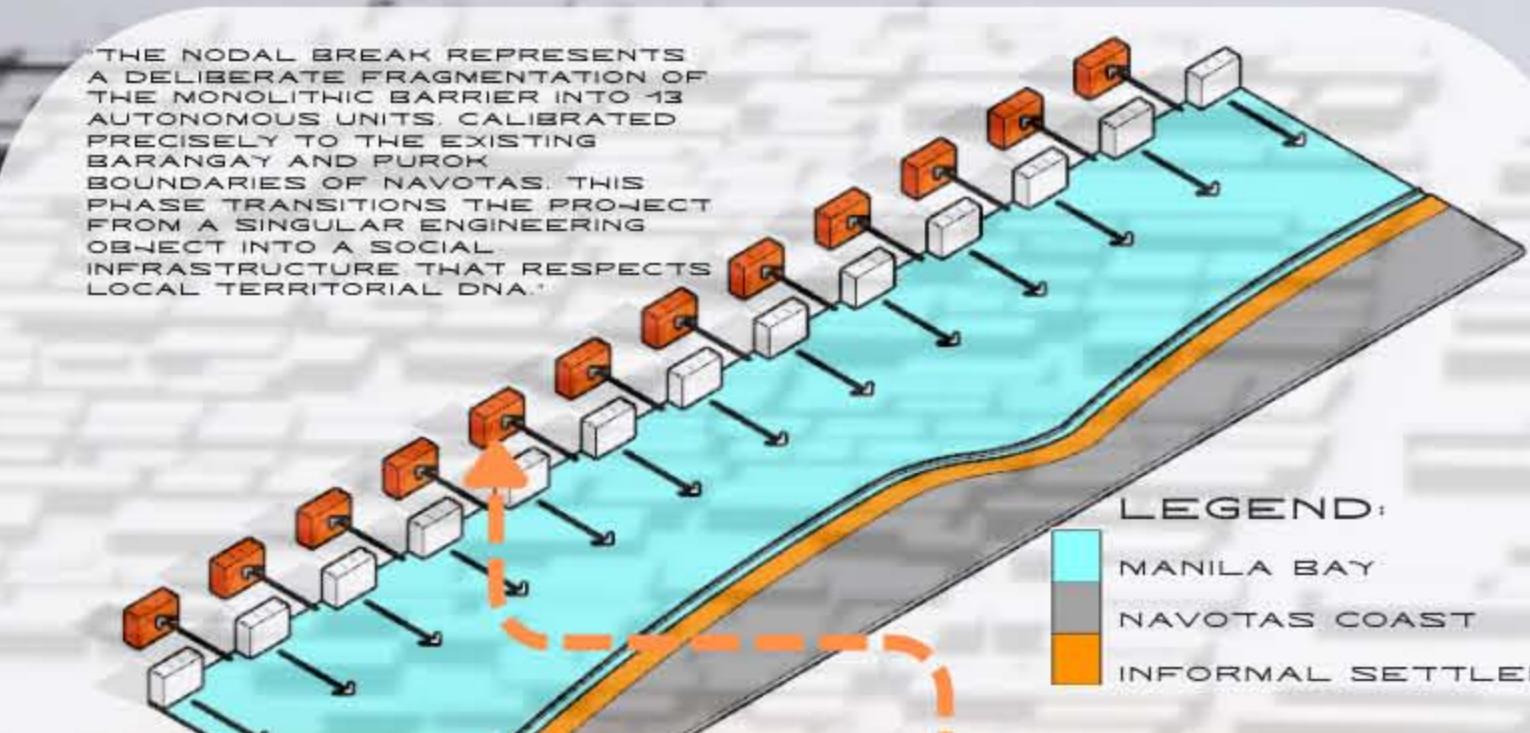


### URBAN MACRO MORPHOLOGY

### 01-SOLID BARRIER



### 02-NODAL BREAK

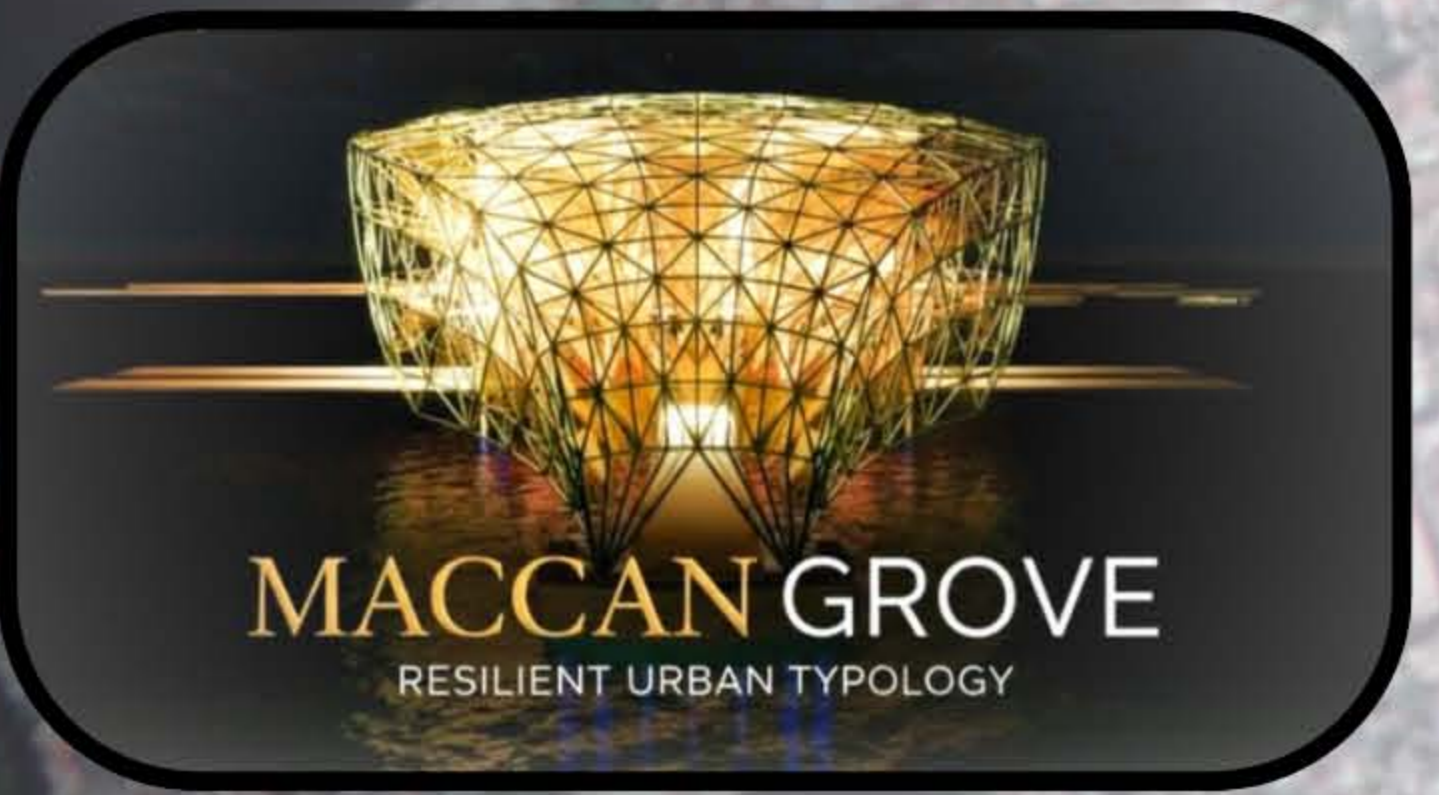


### NODAL MICRO MORPHOLOGY

# SITE DEVELOPMENT

( NAVOTAS WEST TO TANGOS NORTH )

THE MACCAN GROVE DESIGN MORPHOLOGY IS A MASTERCLASS IN RESILIENT URBANISM. TRANSFORMING THE VULNERABLE NAVOTAS COASTLINE FROM A "PASSIVE VICTIM" OF THE SEA INTO AN "ACTIVE PARTICIPANT" IN COASTAL ECOLOGY. BY EVOLVING FROM A STATIC, SOLID BARRIER INTO A SERIES OF 13 AUTONOMOUS MODULAR NODES, THE PROJECT ACHIEVES A RARE SYNTHESIS: HIGH-DENSITY IN-SITU RESETTLEMENT PAIRED WITH AGGRESSIVE TSUNAMI DEFENSE. "



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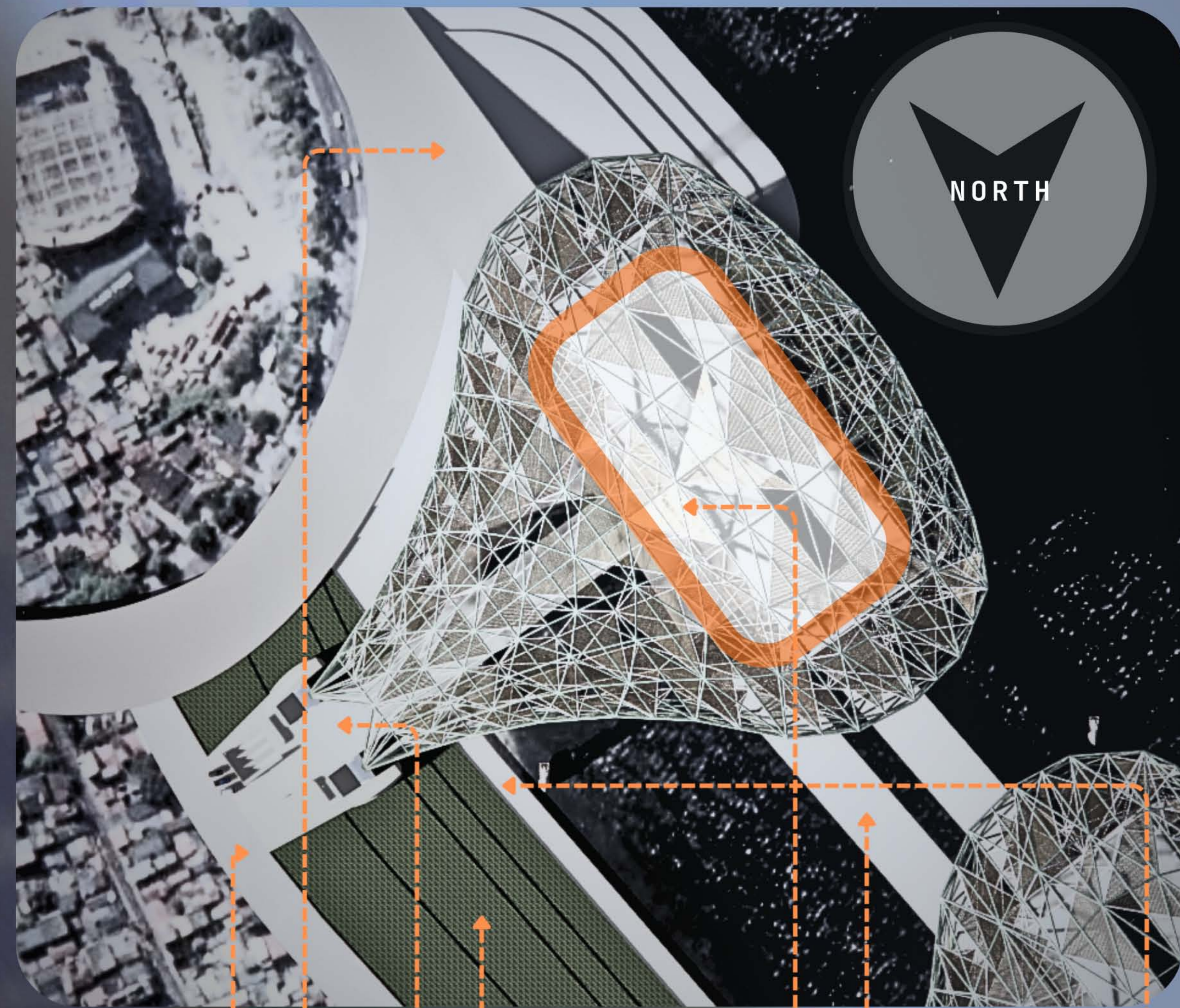
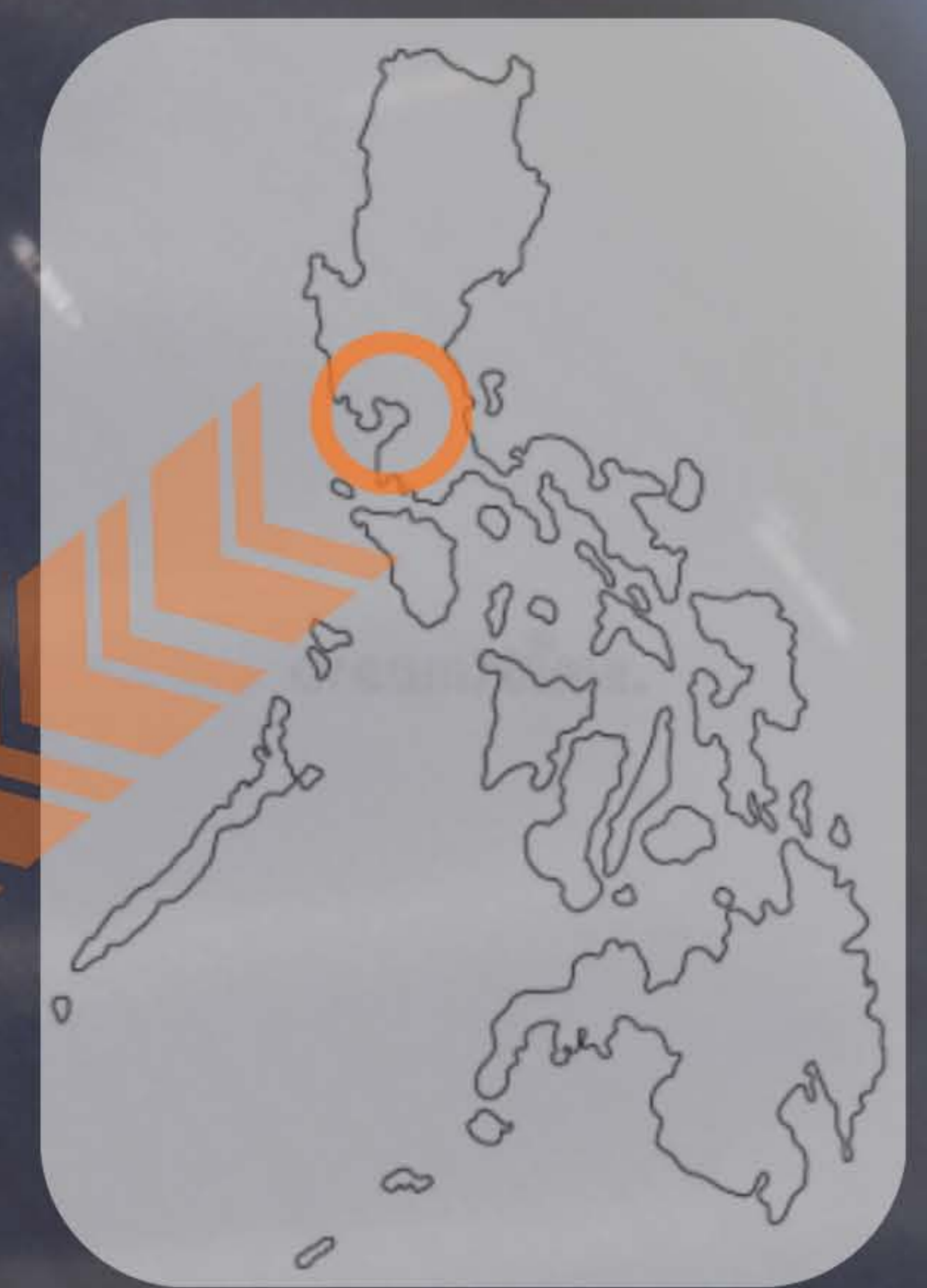
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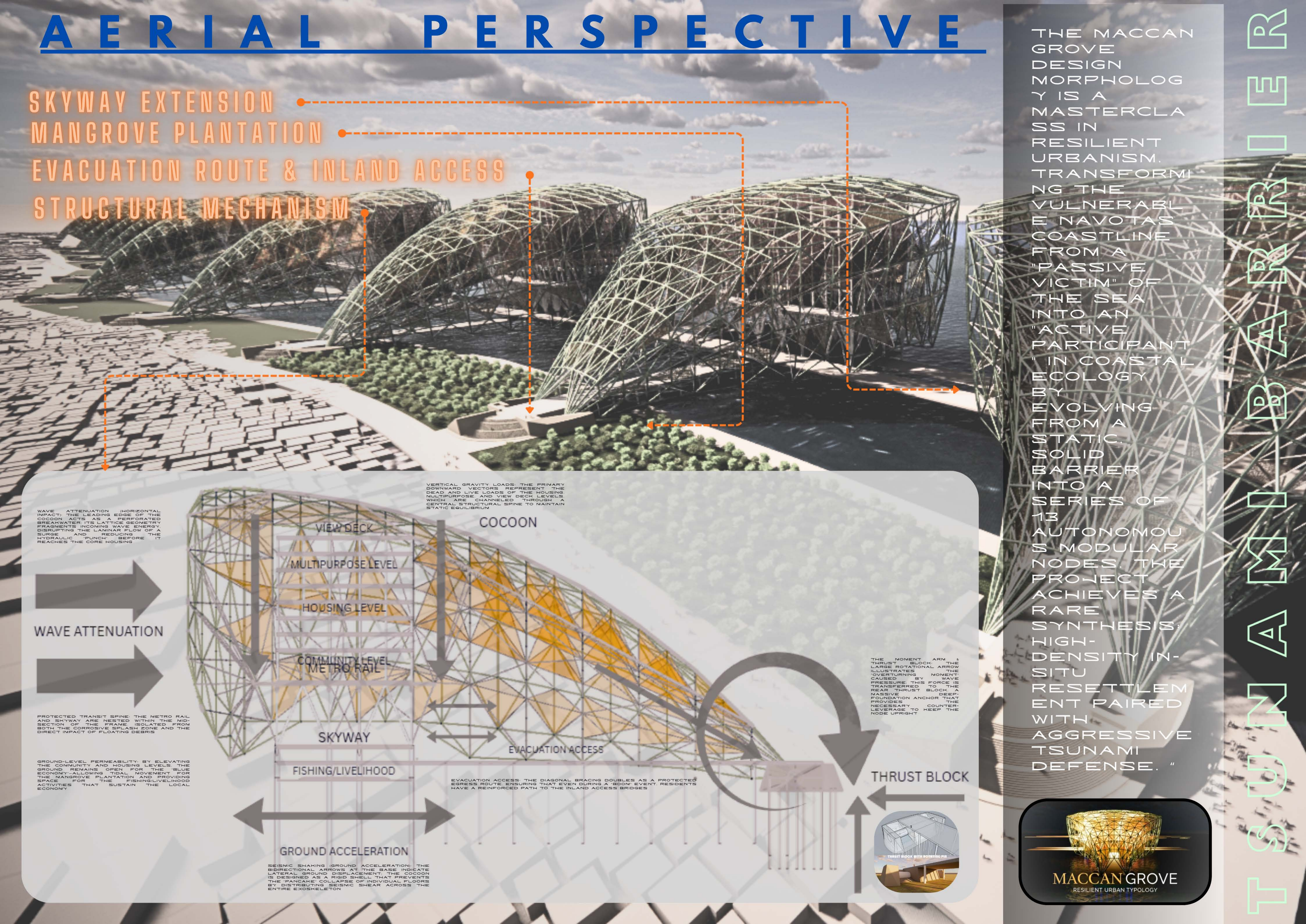
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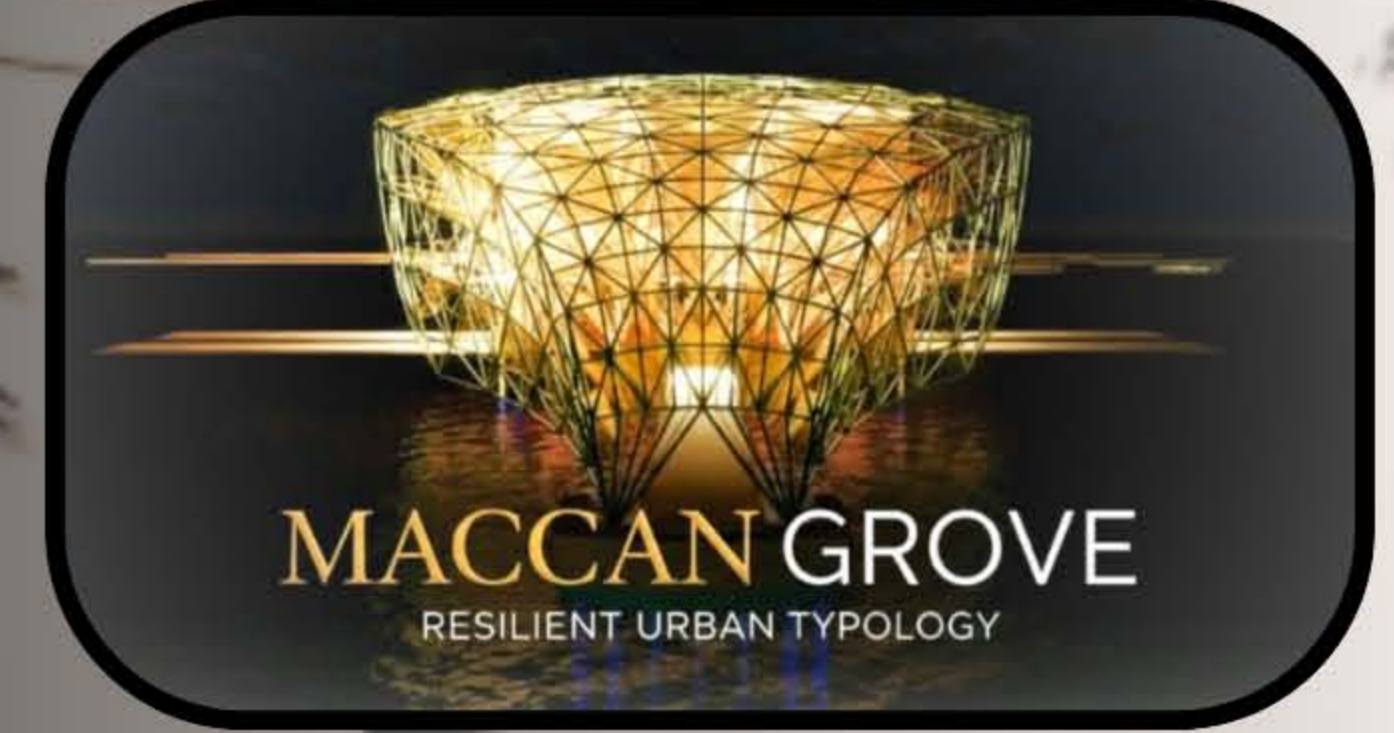
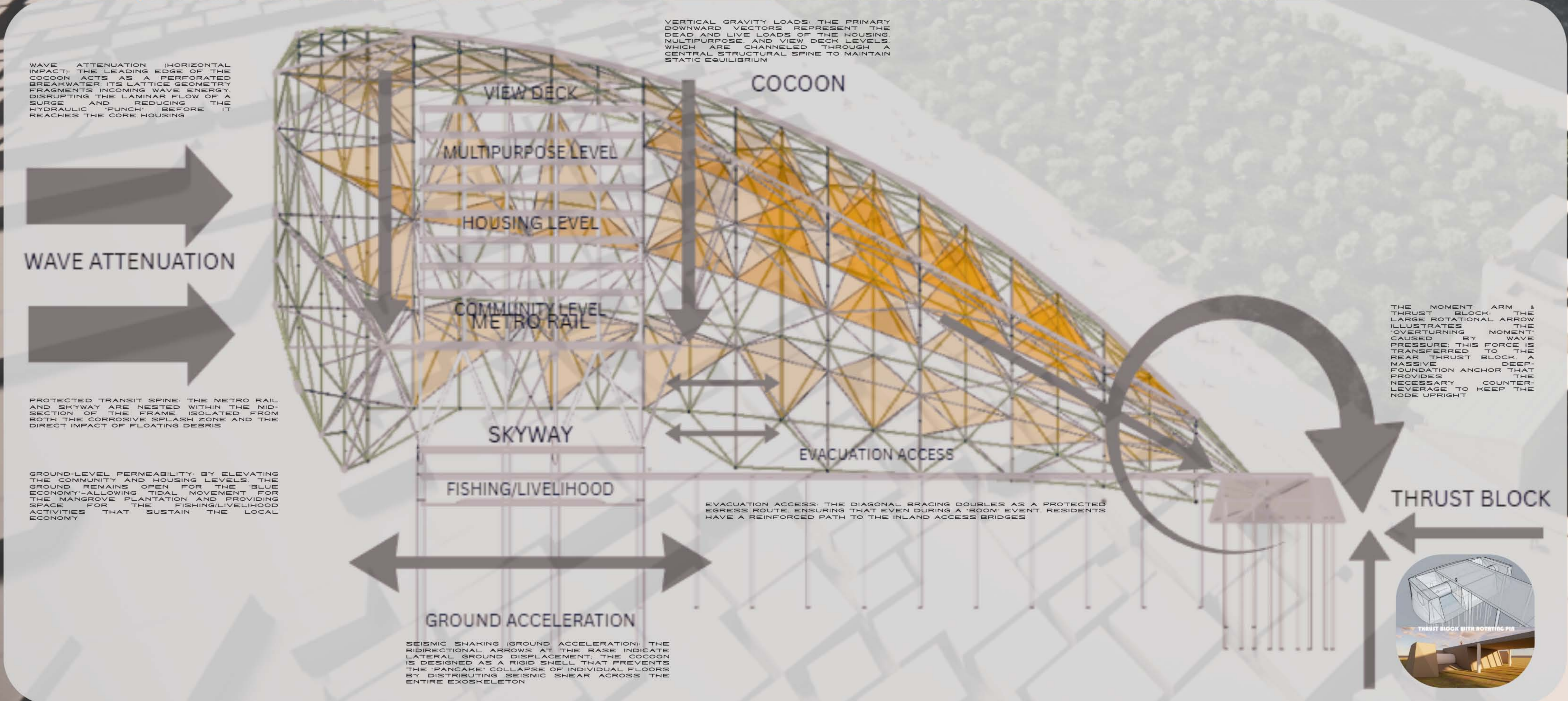
# AERIAL PERSPECTIVE

- SKYWAY EXTENSION
- MANGROVE PLANTATION
- EVACUATION ROUTE & INLAND ACCESS
- STRUCTURAL MECHANISM



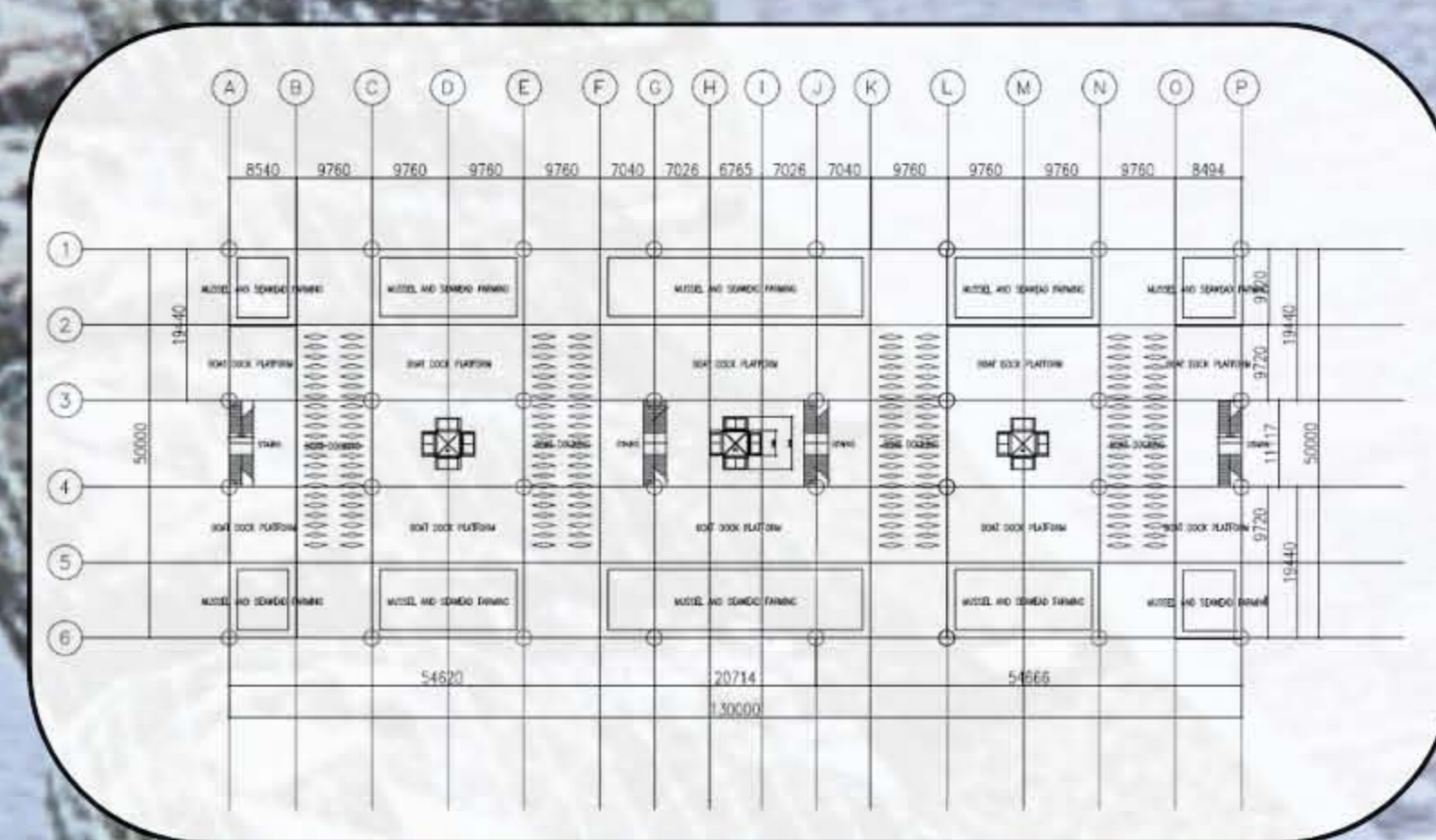
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RESILIENT URBANISM

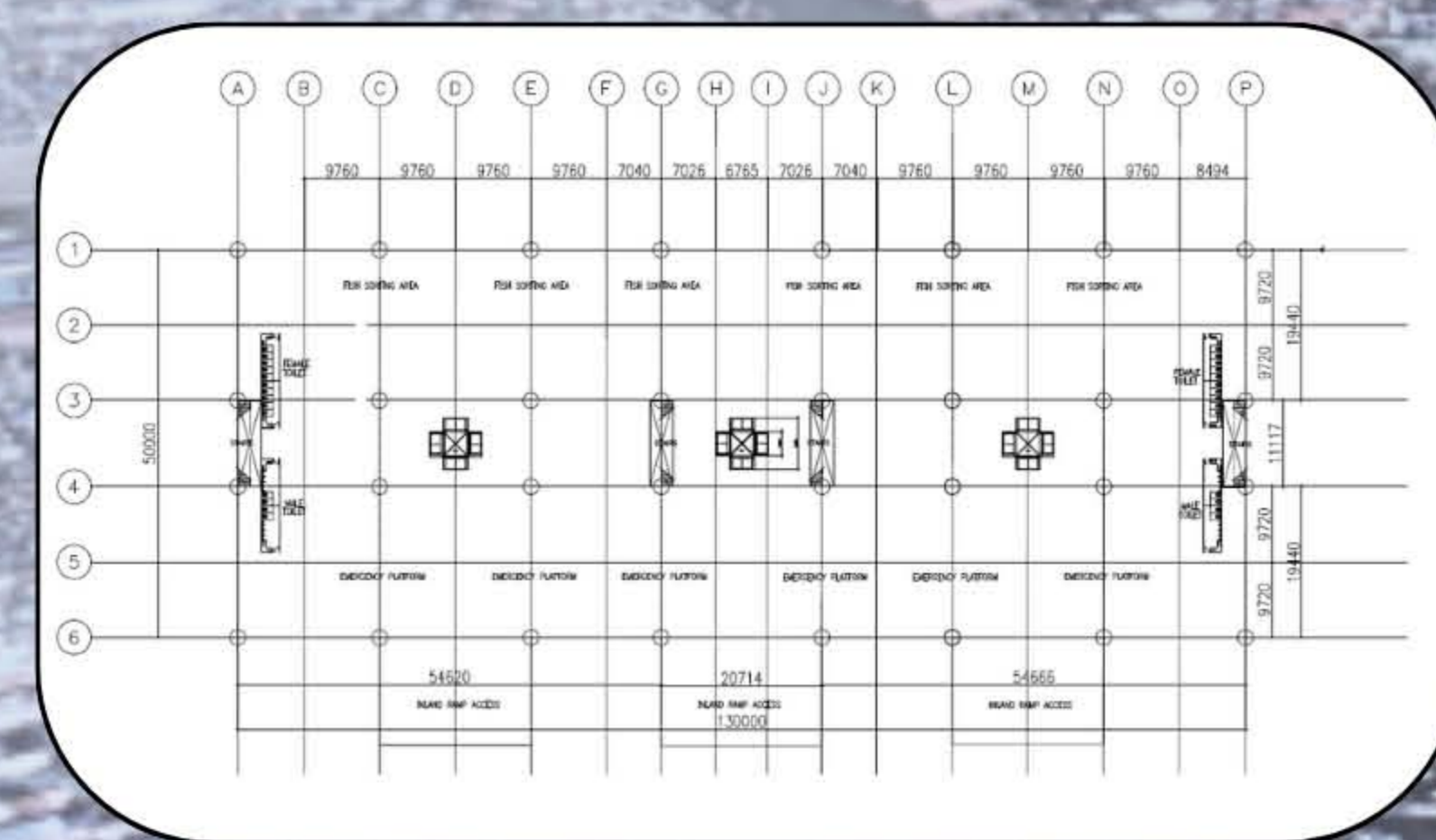


THE MACCAN GROVE SERVES AS A POWERFUL SOCIO-ECONOMIC CATALYST BY TRANSFORMING A VULNERABLE, MARGINALIZED FRINGE INTO A HIGH-PERFORMANCE, PRODUCTIVE URBAN ENGINE. BEYOND ITS PRIMARY ROLE IN DISASTER MITIGATION, THE PROJECT IS A STRATEGIC INTERVENTION DESIGNED TO DISMANTLE THE CYCLE OF POVERTY AND DISPLACEMENT THAT PLAGUES THE NAVOTAS COASTLINE. EACH OF THE 13 AUTONOMOUS NODES ACTS AS A CENTER OF GRAVITY, DESIGNED TO STIMULATE LOCAL WEALTH, PRESERVE THE DEEP-ROOTED CULTURAL HERITAGE OF THE MARITIME COMMUNITY, AND SYSTEMATICALLY INTEGRATE THE INFORMAL SECTOR INTO THE FORMAL NATIONAL ECONOMY.

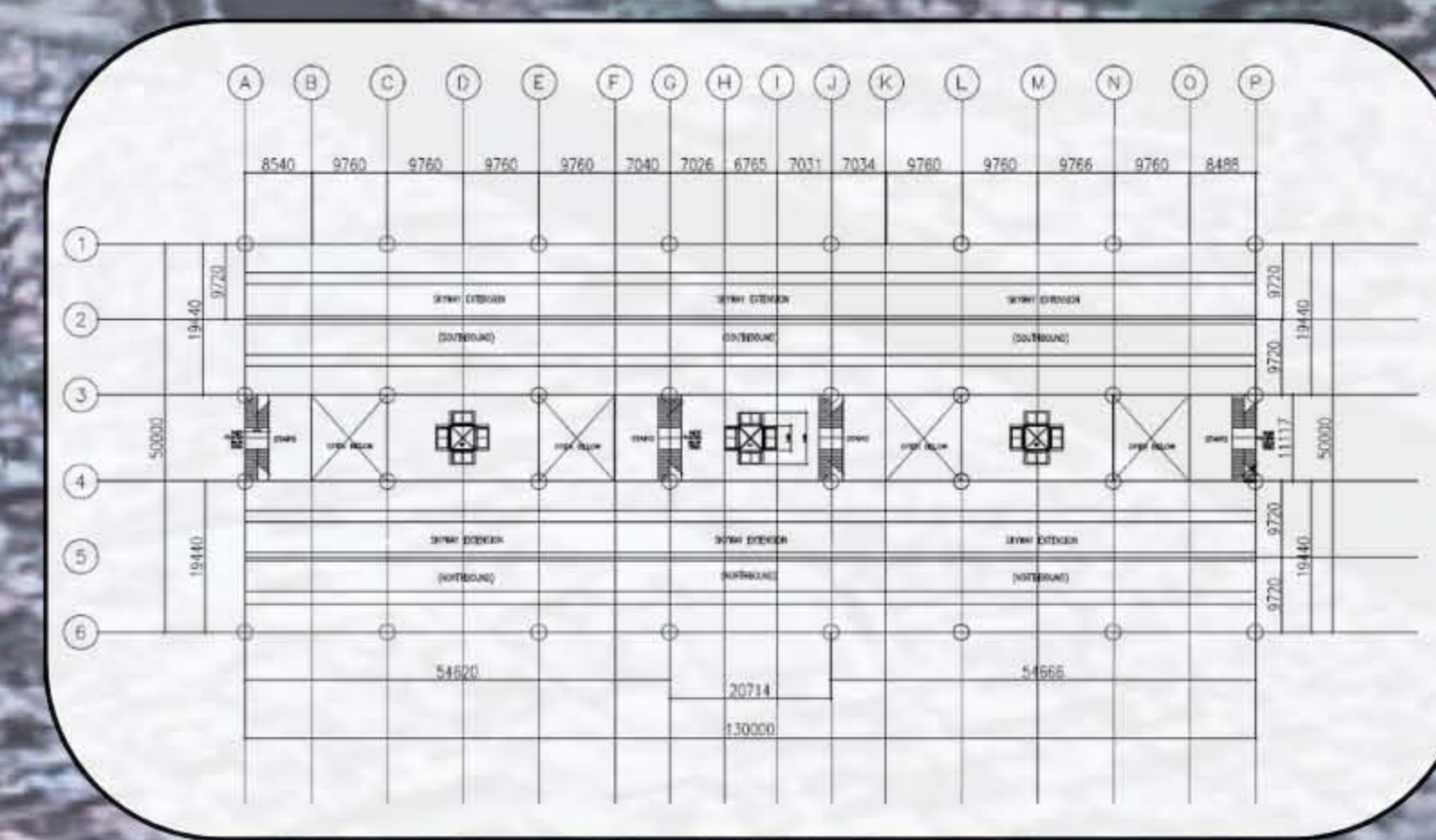
# FLOOR PLANS



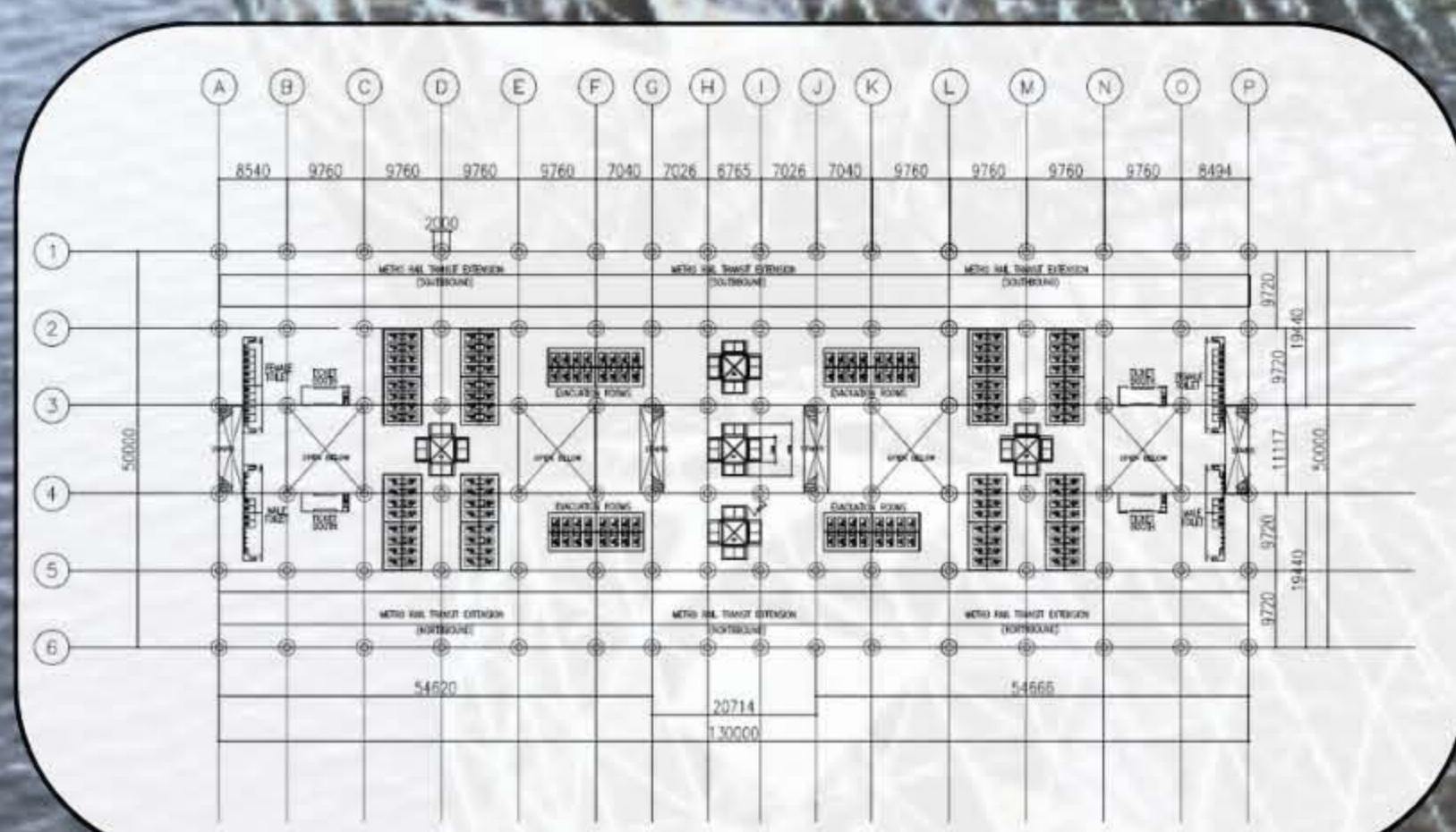
**01-FISHING LEVEL**



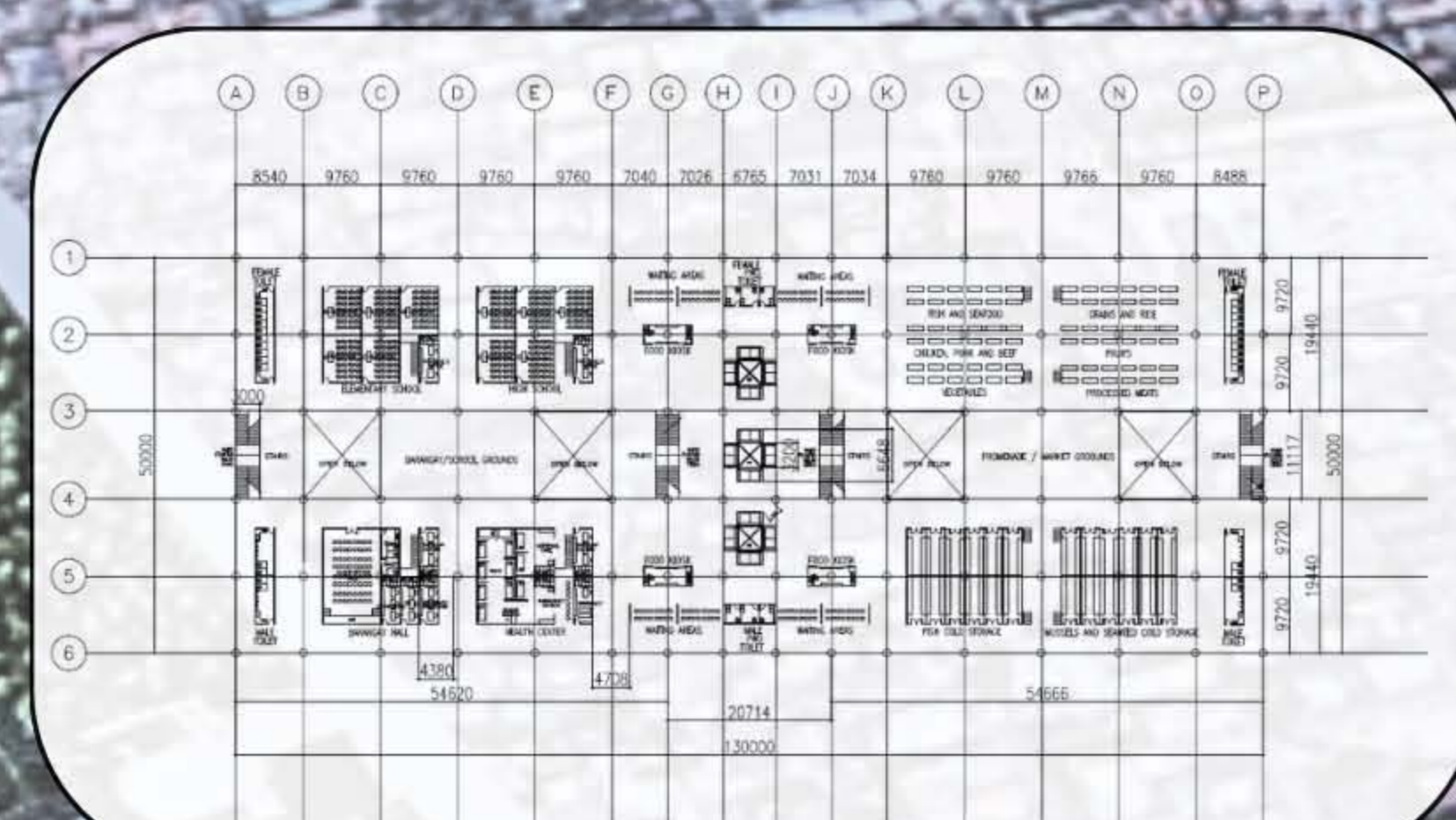
**02-EVACUATION LEVEL**



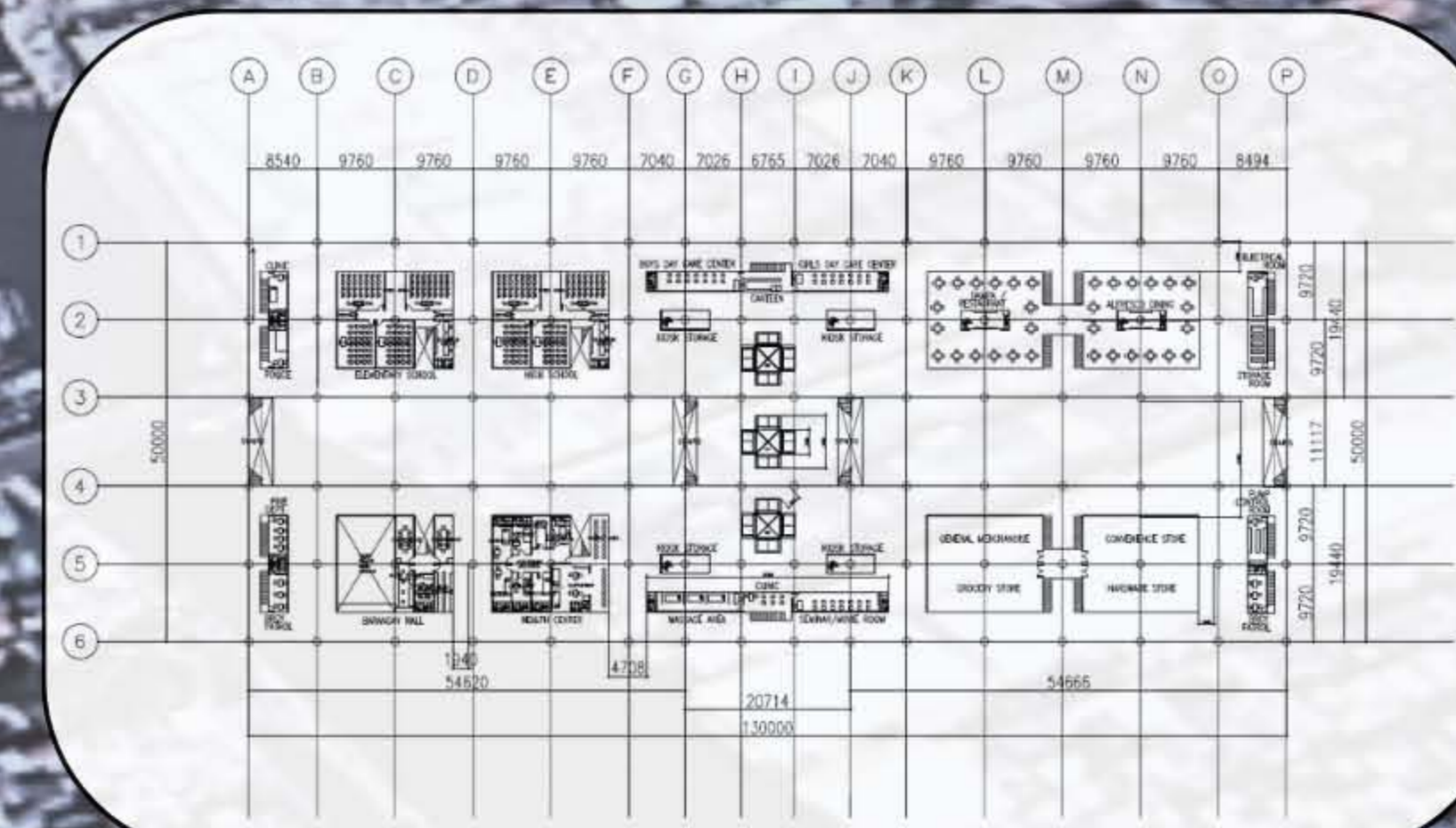
**03-SKYWAY LEVEL**



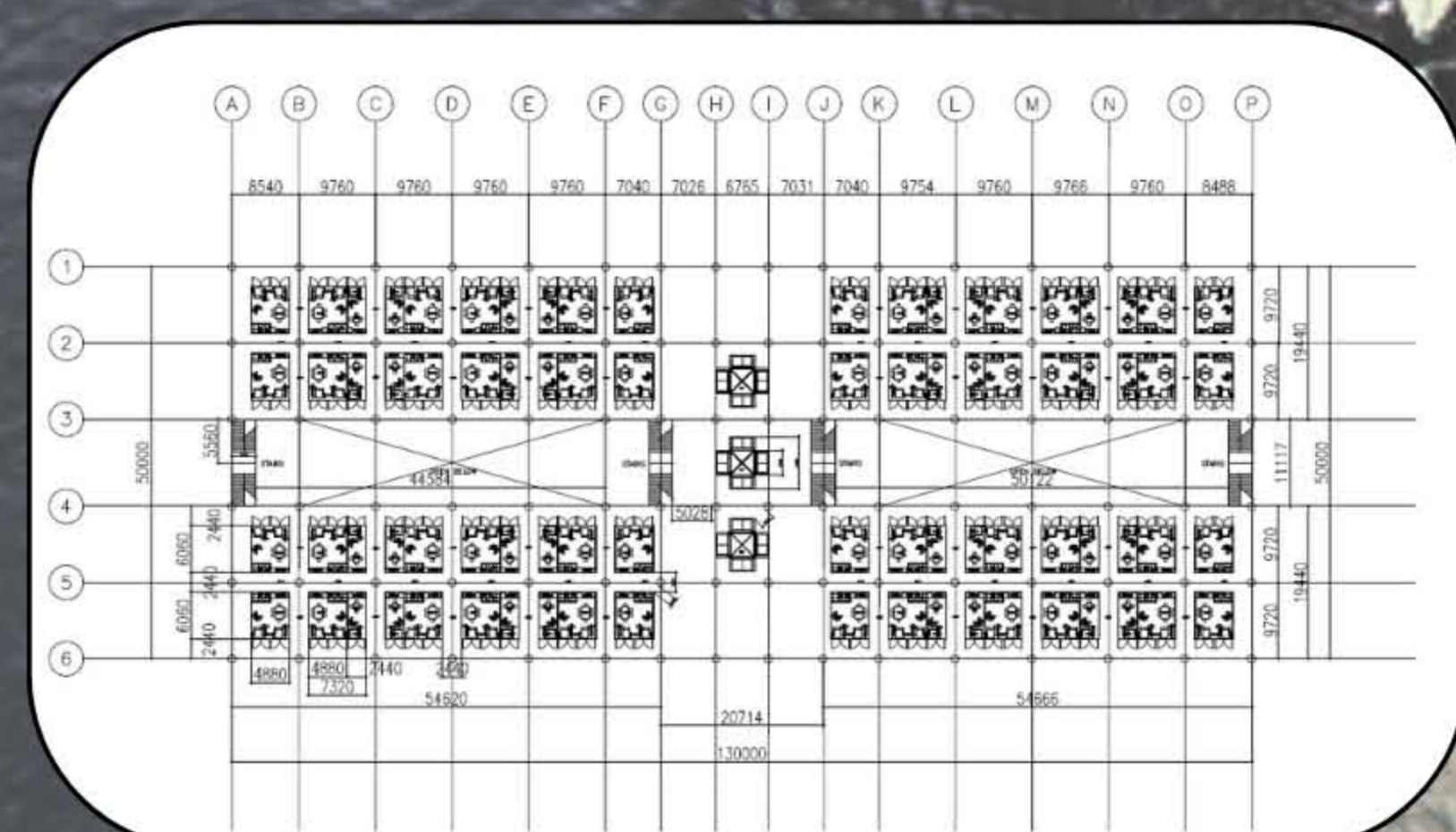
**04-MRT LEVEL**



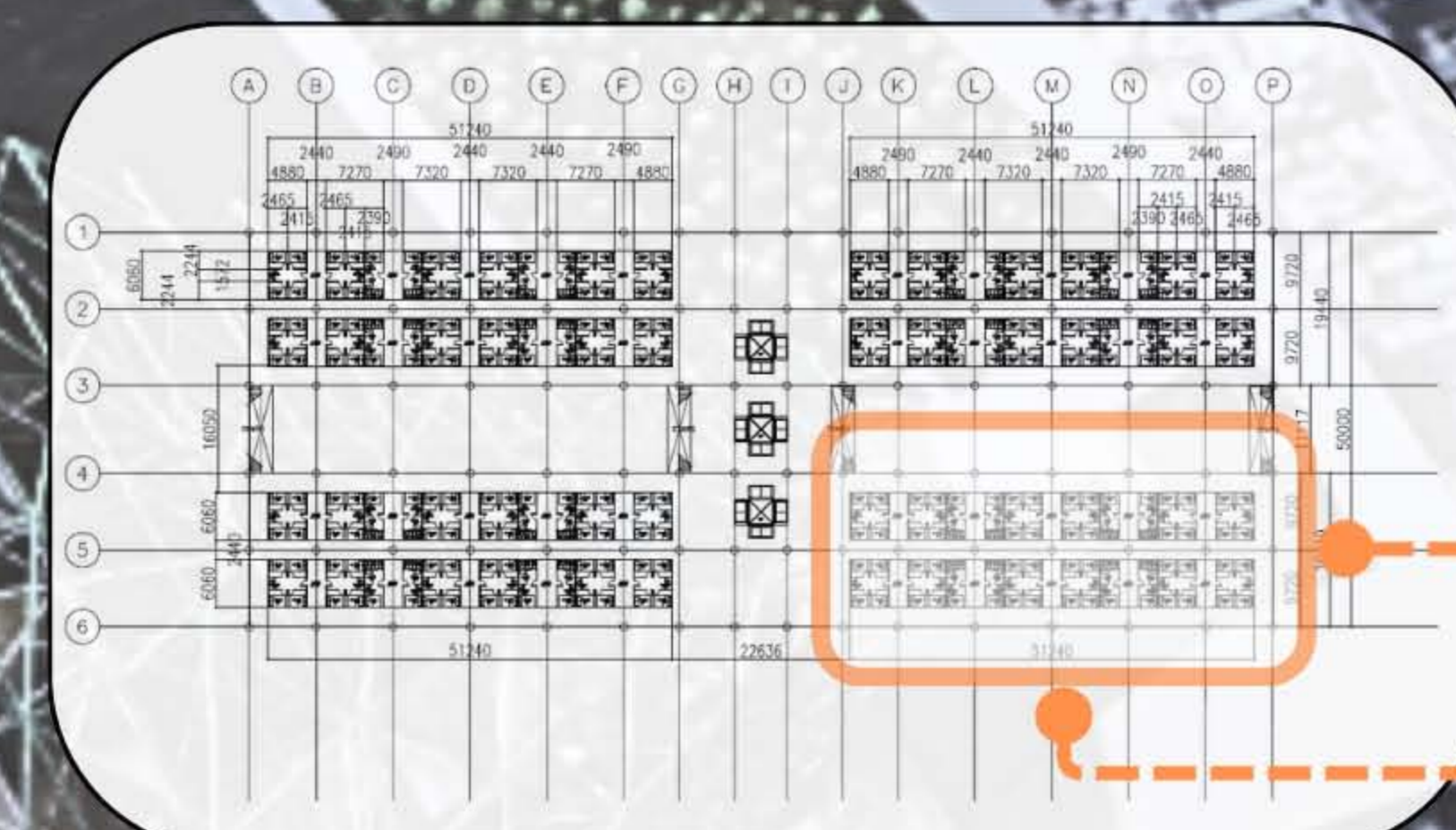
**05A-LOWER COMMUNITY LEVEL**



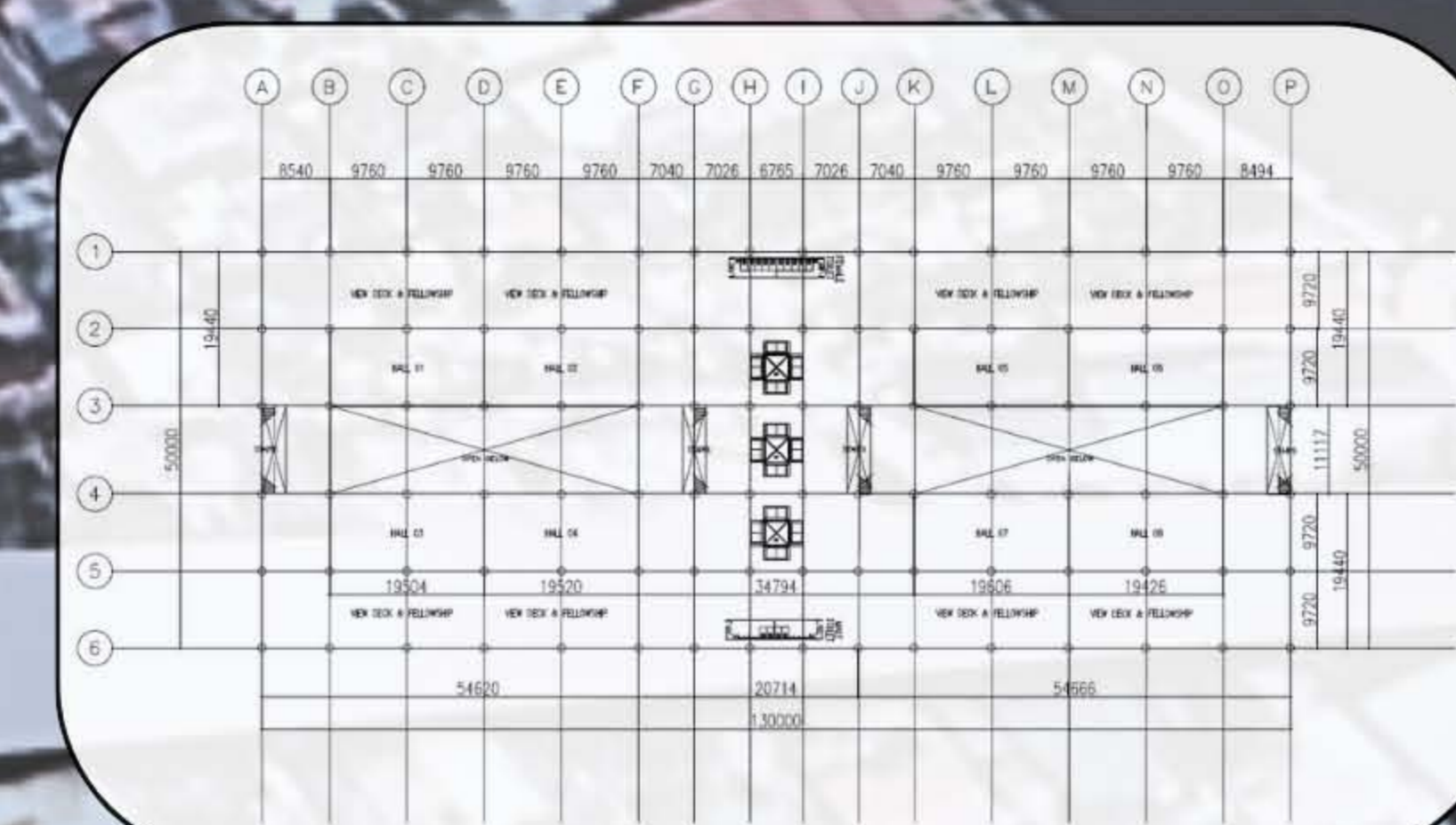
**05B-UPPER COMMUNITY LEVEL**



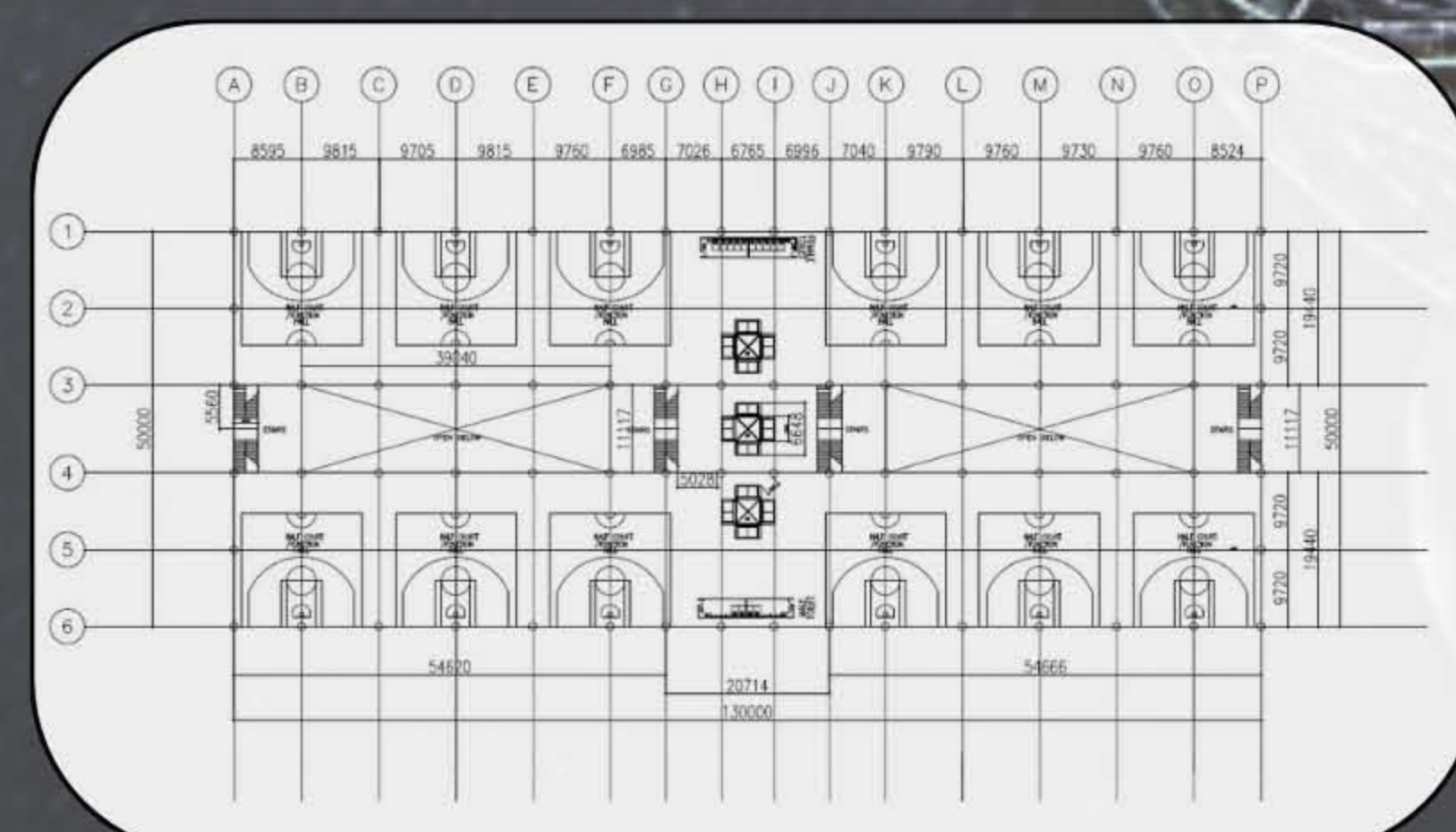
**06A-LOWER HOUSING LEVEL**



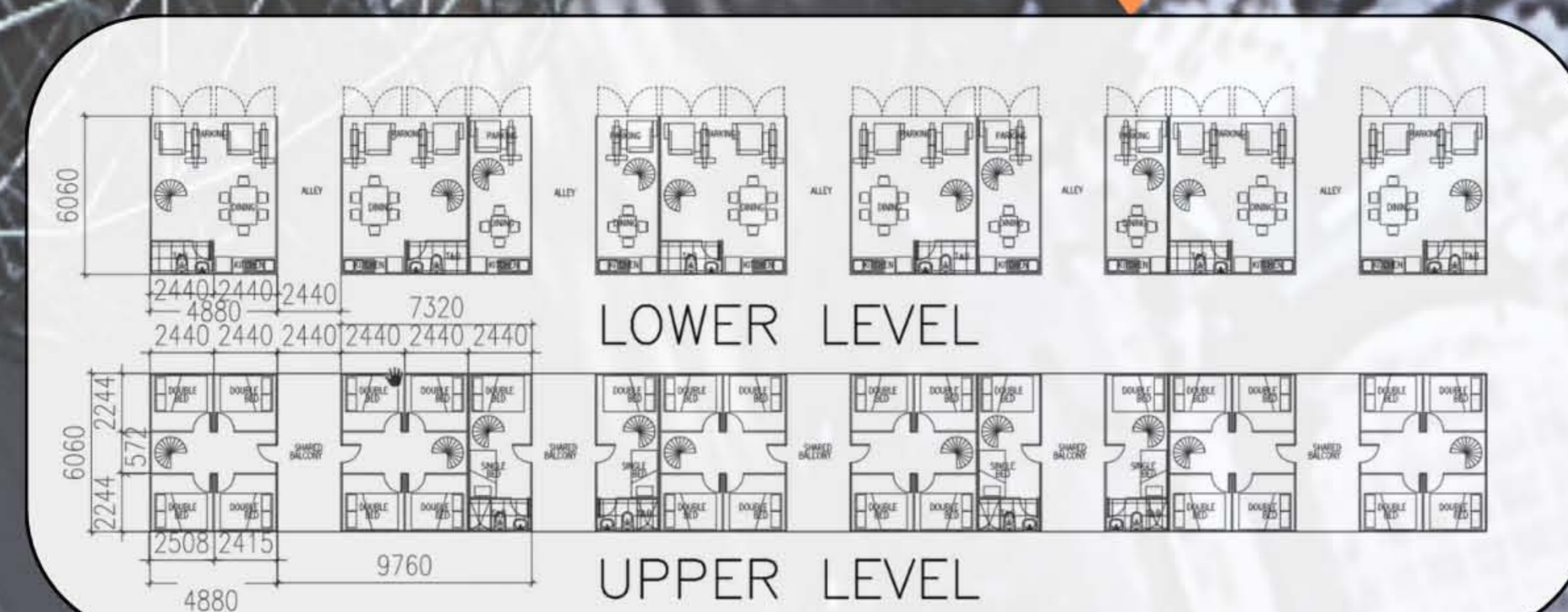
**06B-UPPER HOUSING LEVEL**



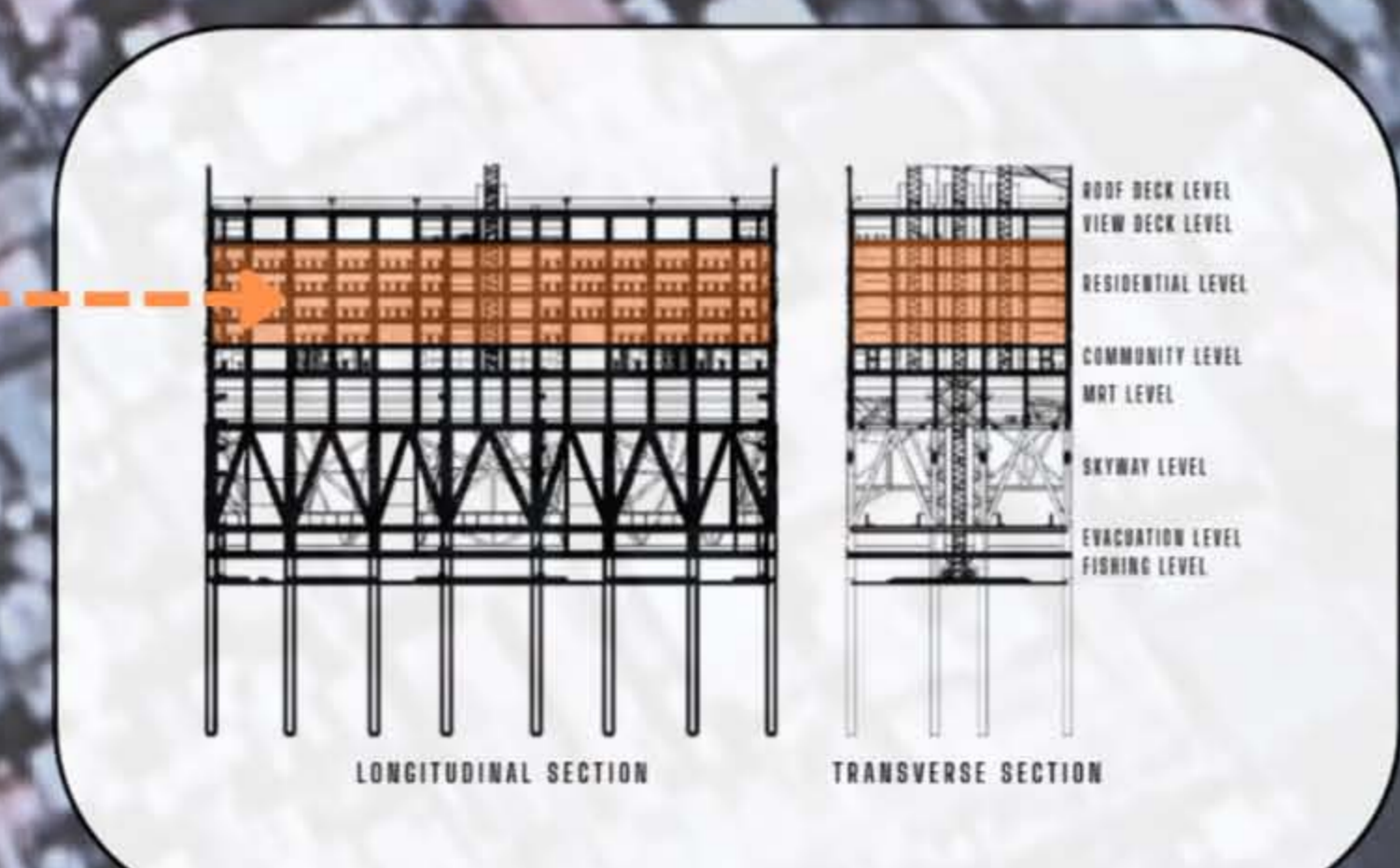
**07-VIEWDECK LEVEL**



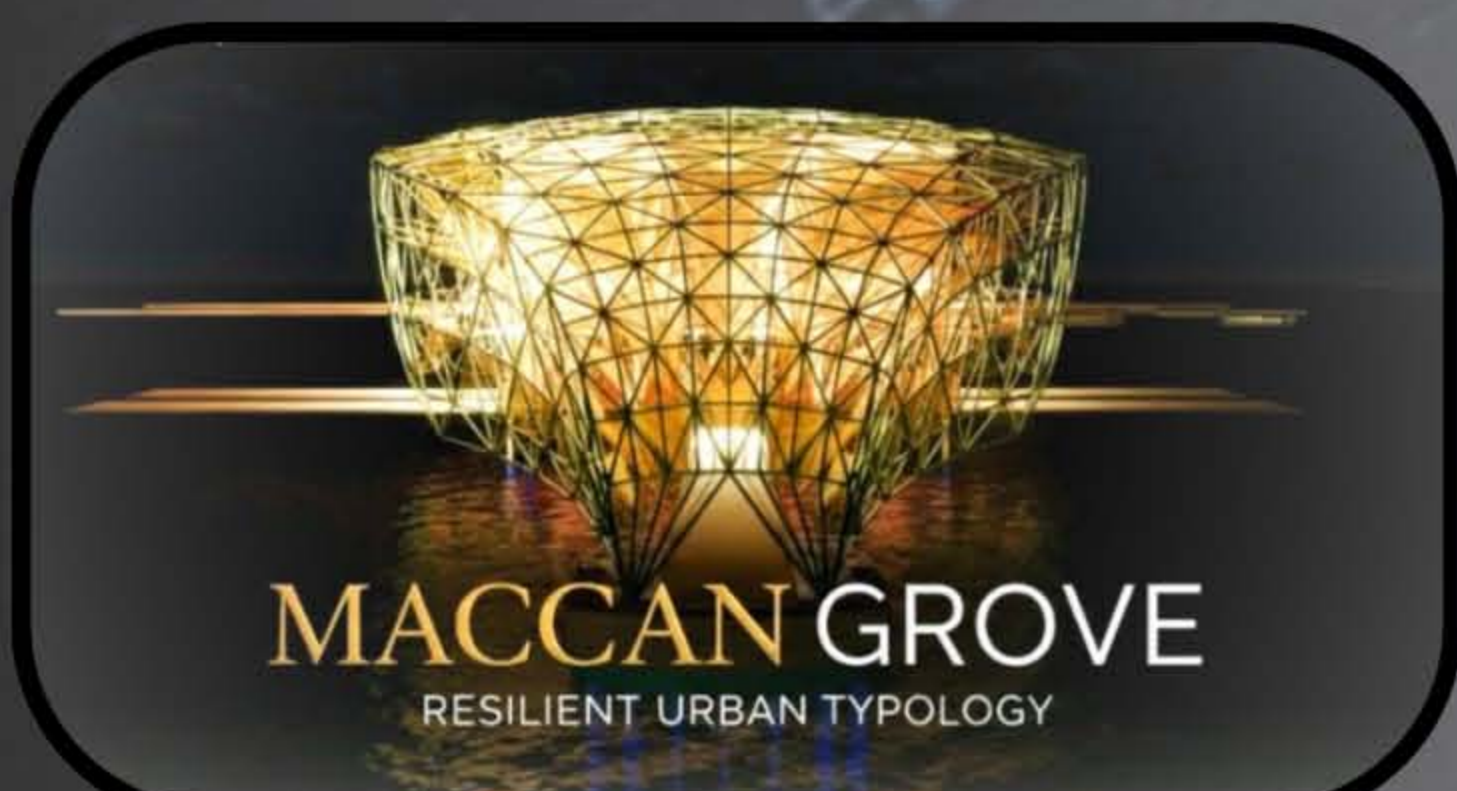
**08-ROOFDECK LEVEL**



**MODULAR CONTAINER HOUSING CLUSTER**



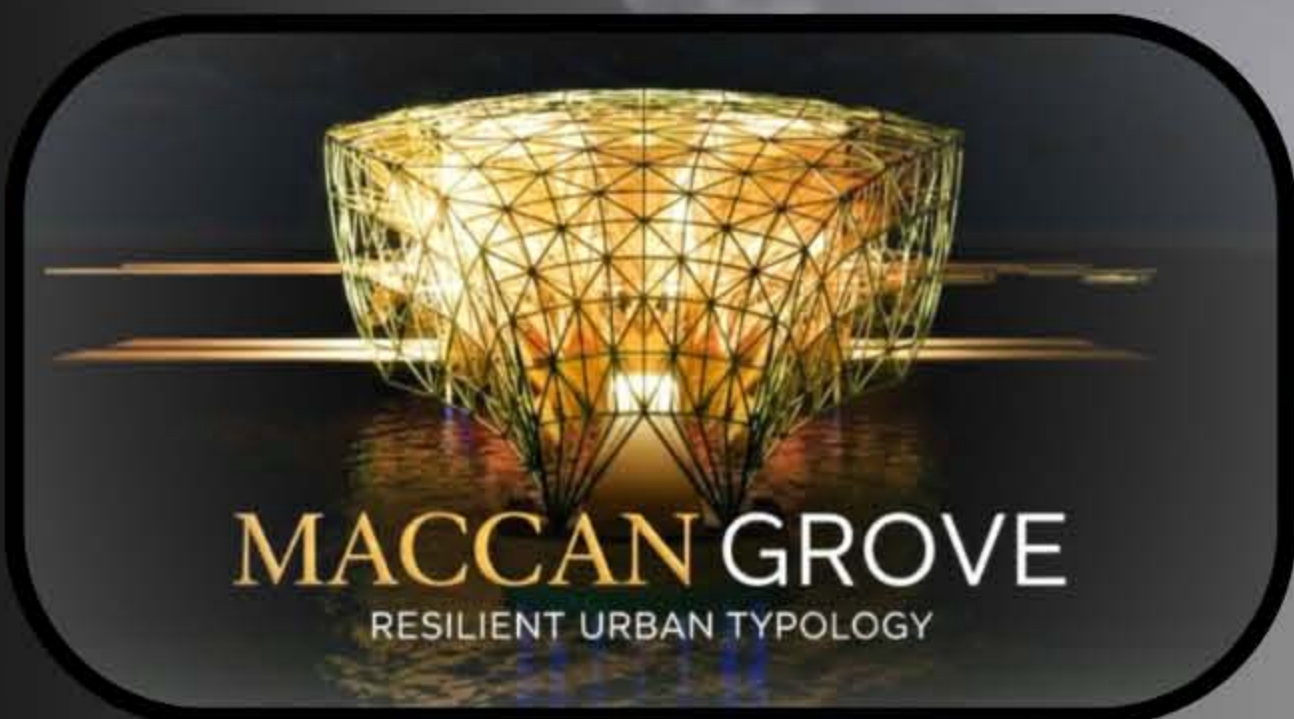
**HOUSING LEVELS**



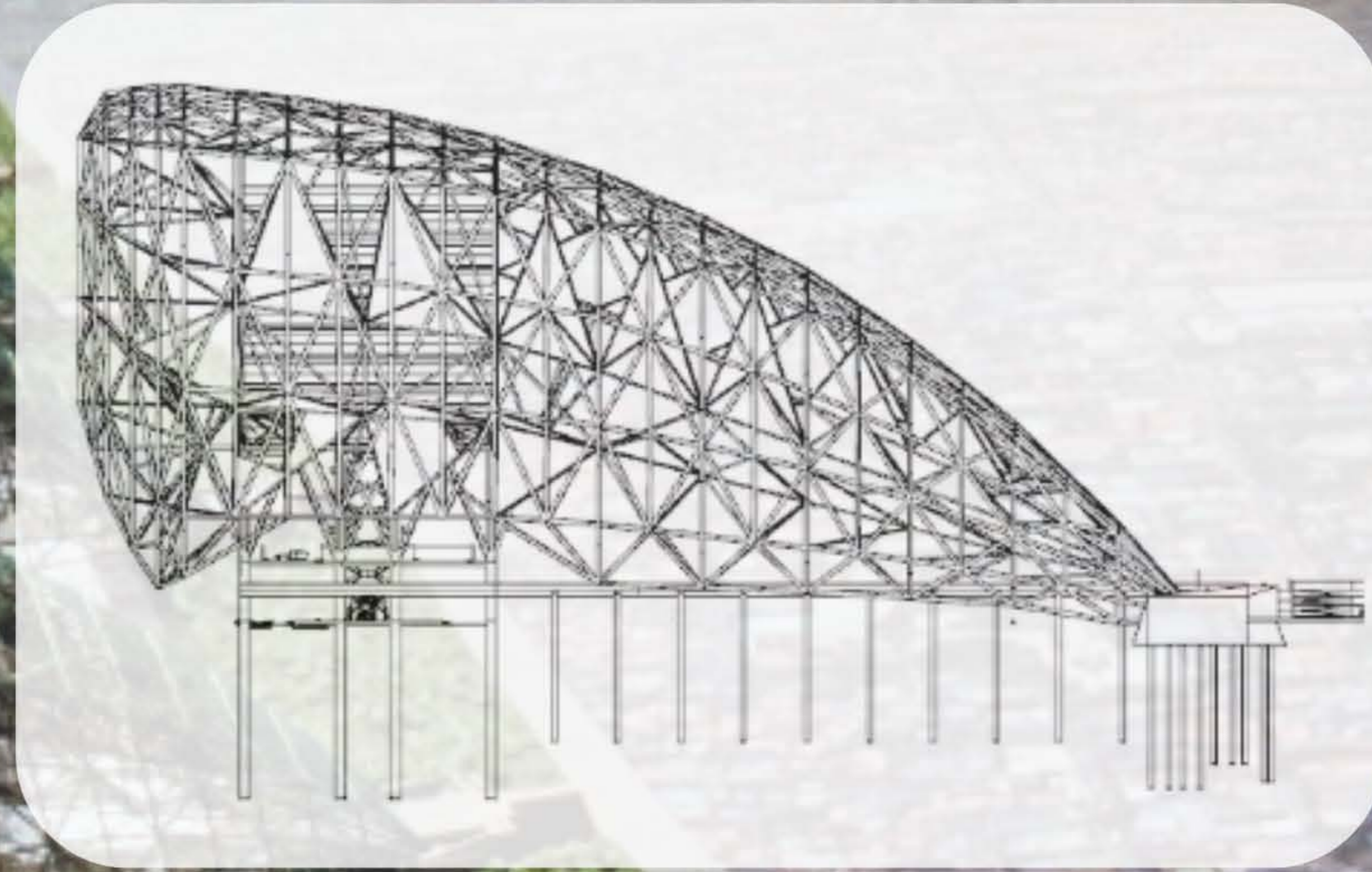
**MACCAN GROVE**  
RESILIENT URBAN TYPOLOGY

# ECOLOGICAL BUFFER

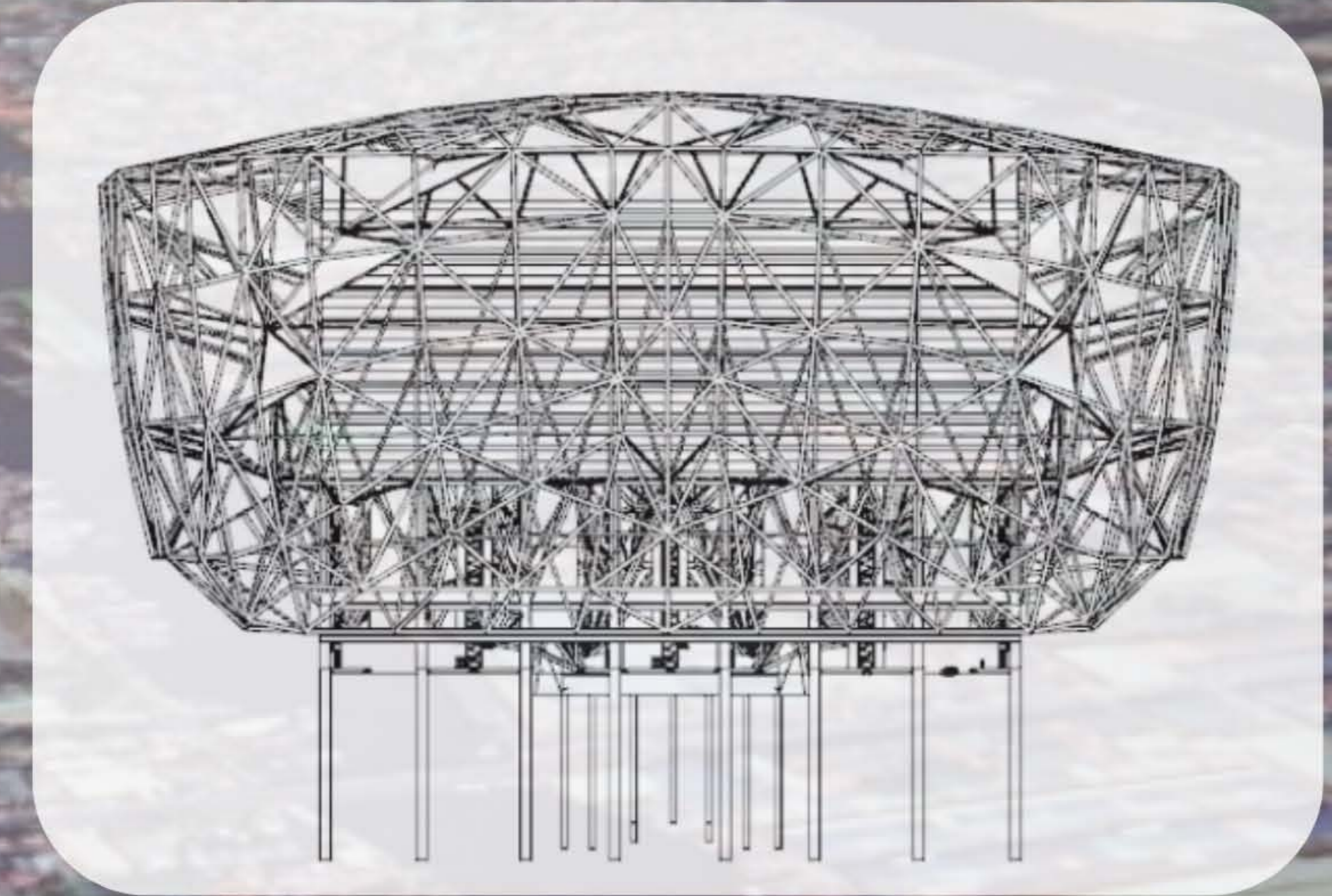
"THE ECOLOGICAL BUFFER IS A 3,300-METER RESTORED MANGROVE PLANTATION THAT SERVES AS THE PROJECT'S PRIMARY BIO-SHIELD. BY SHIFTING THE RESIDENTIAL MASSING SEAWARD INTO MODULAR NODES, WE RECLAIM THE COASTLINE TO REINTRODUCE INDIGENOUS MANGROVE SPECIES, CREATING A NATURAL WAVE ATTENUATION ZONE THAT REDUCES THE INITIAL KINETIC ENERGY OF STORM SURGES AND TSUNAMIS BEFORE THEY REACH THE BUILT ENVIRONMENT."



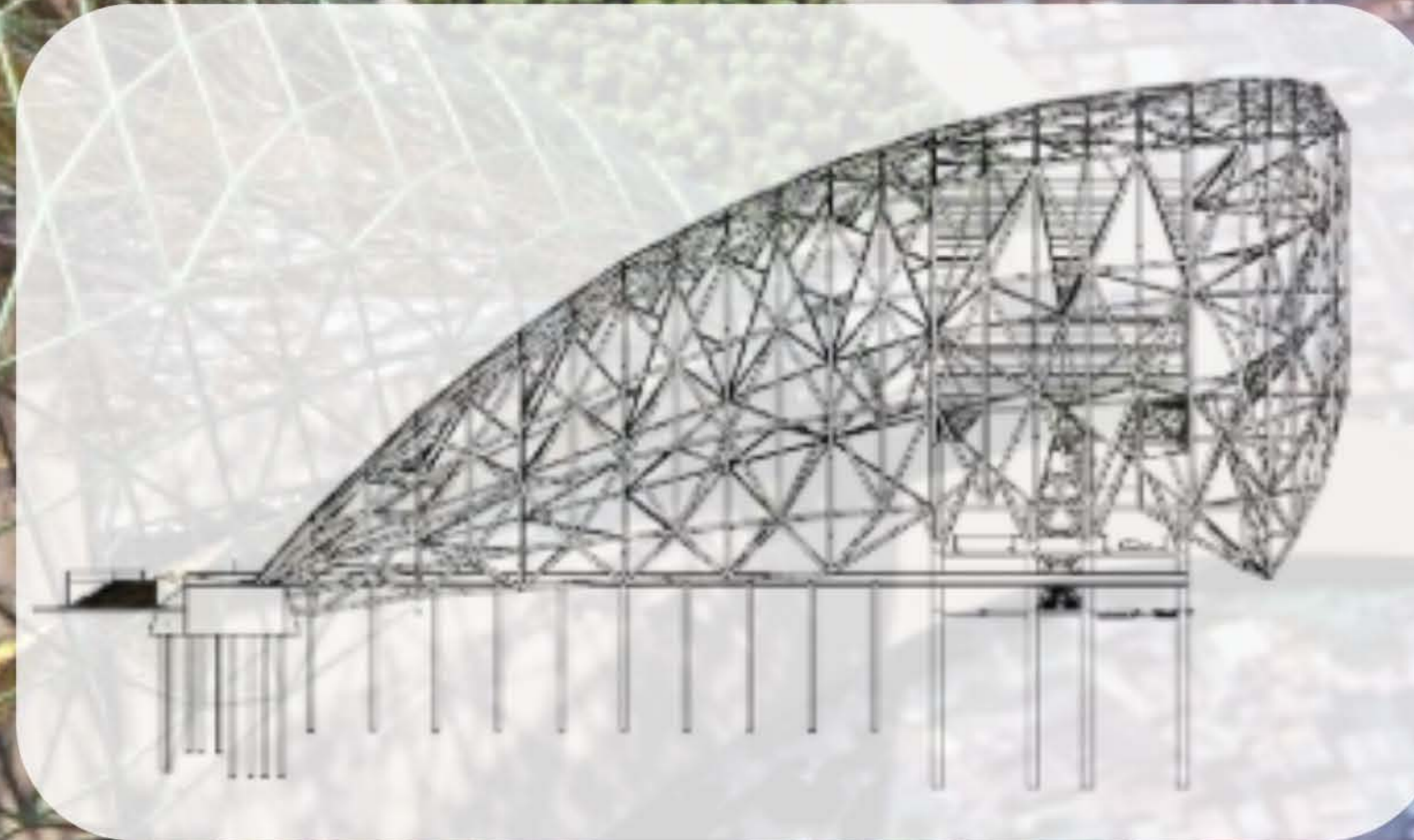
## SECTIONS & ELEVATIONS



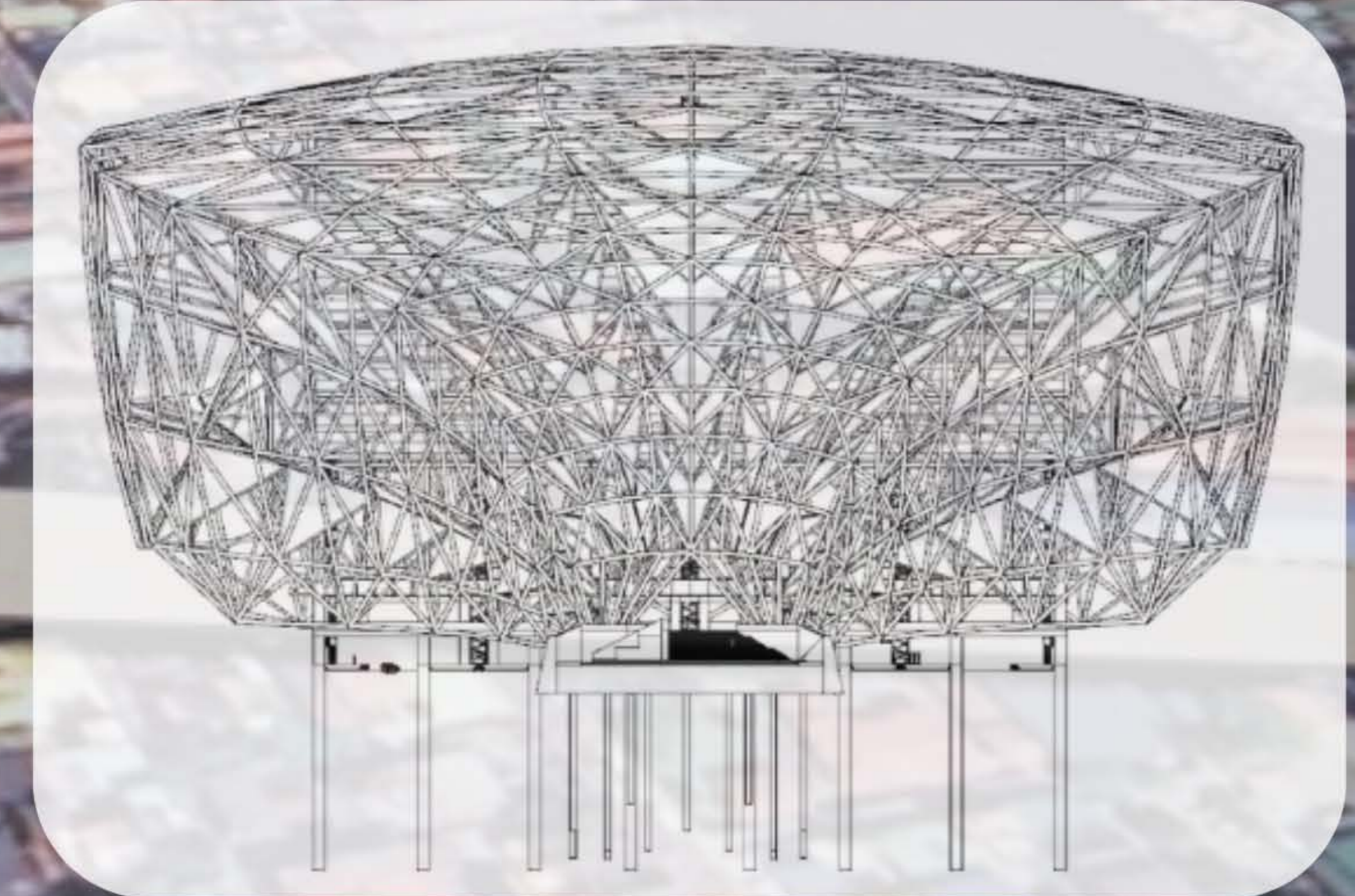
LEFT SIDE ELEVATION



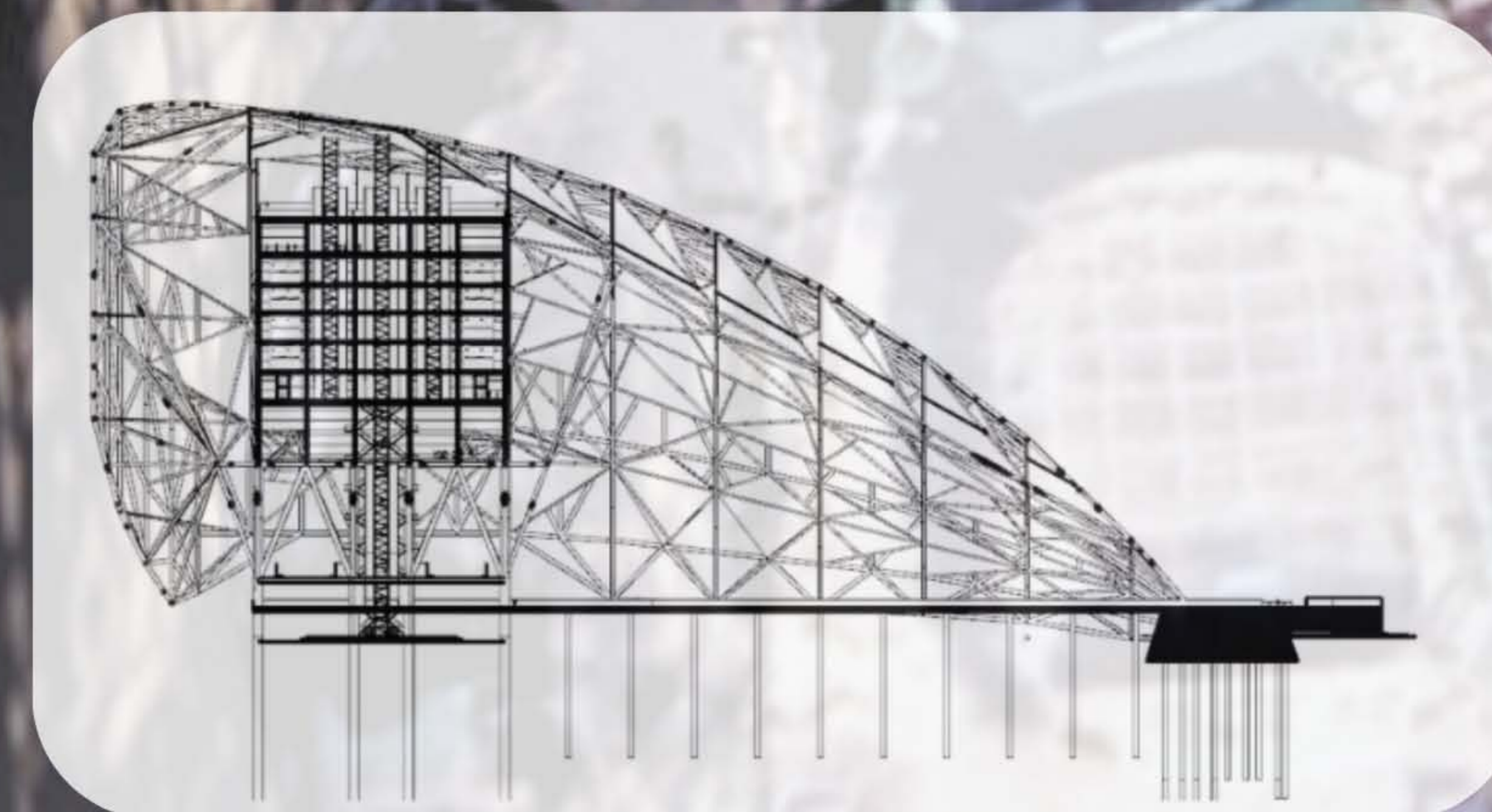
FRONT ELEVATION



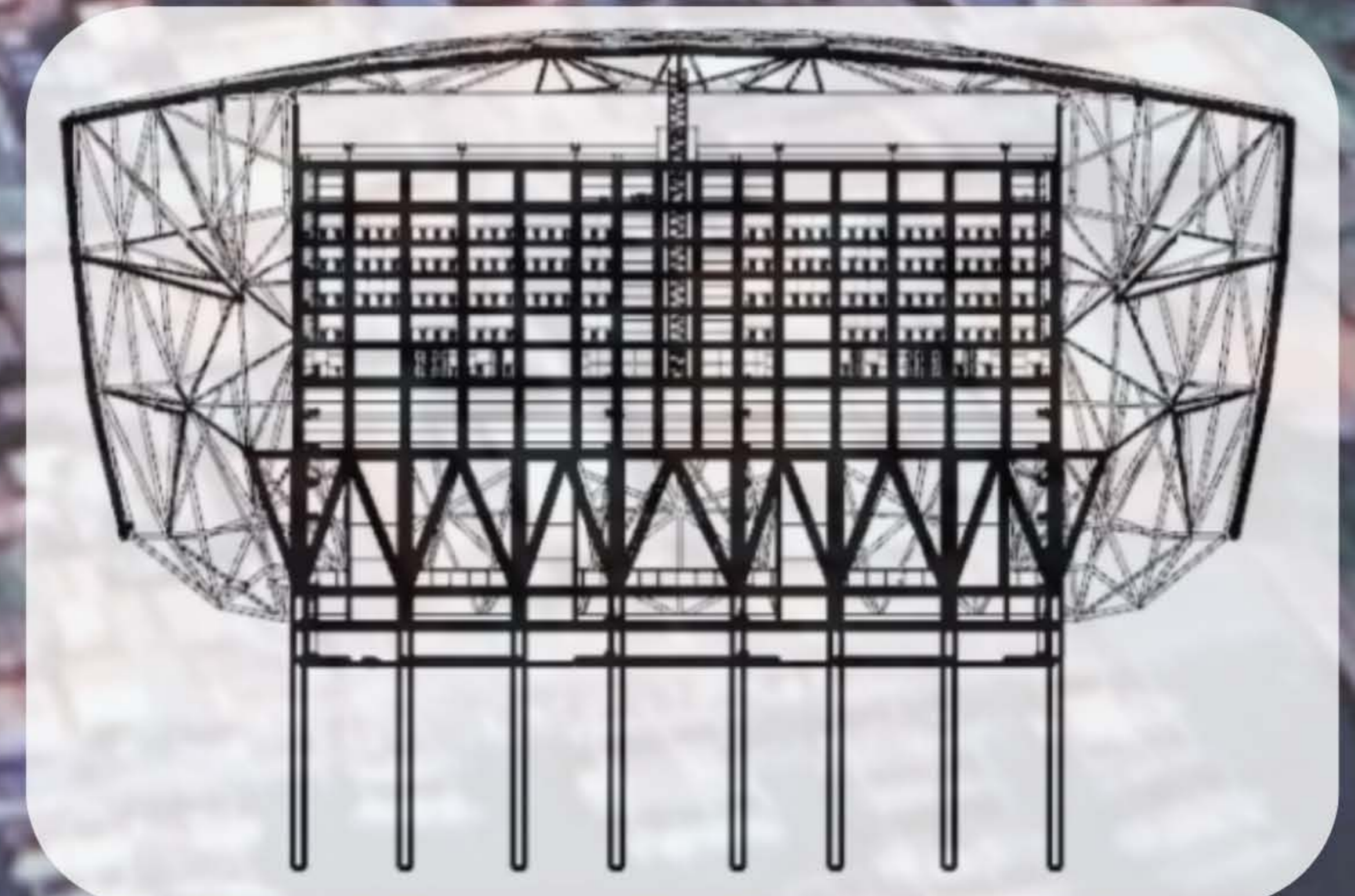
RIGHT SIDE ELEVATION



REAR ELEVATION

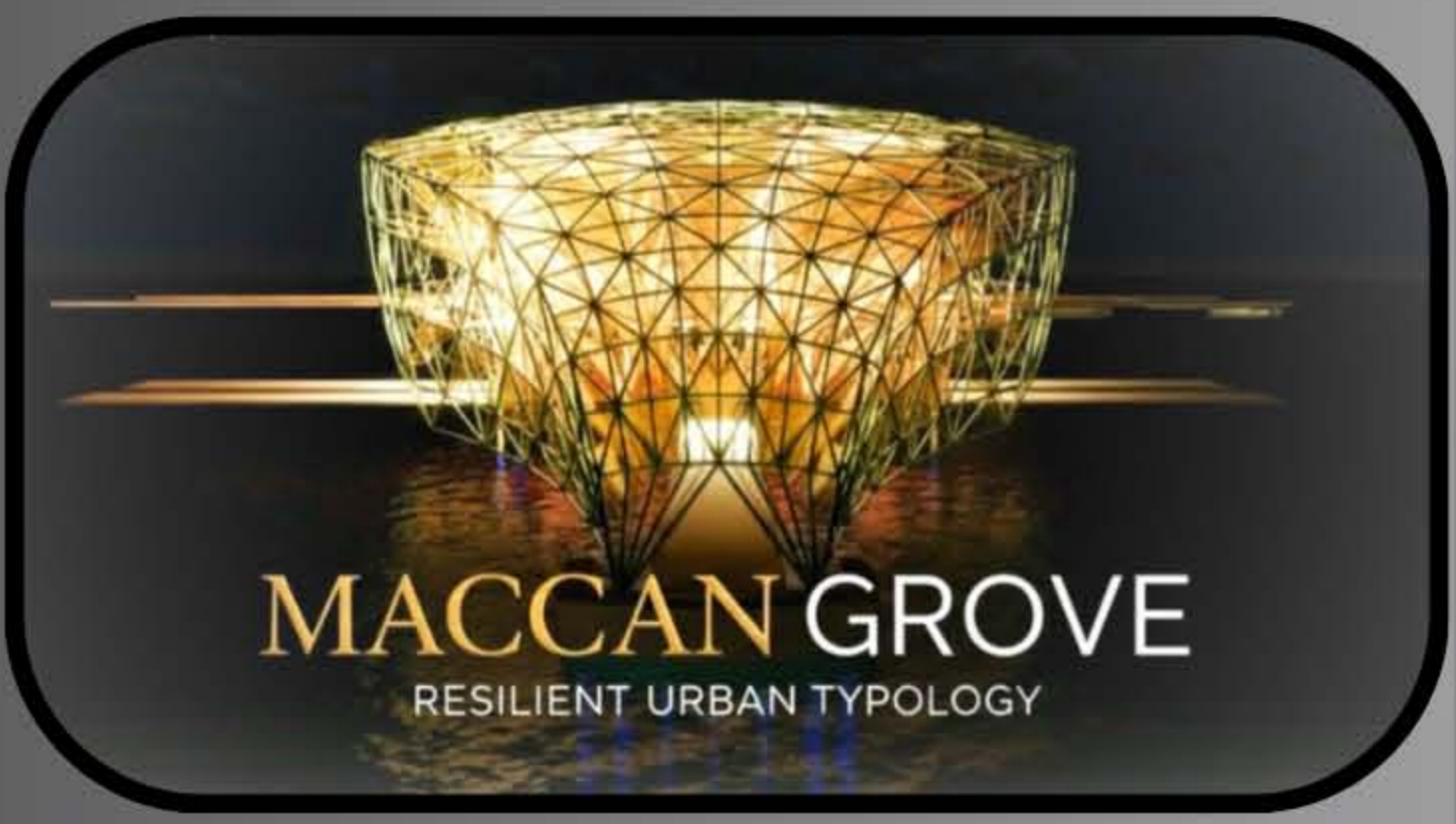


LONGITUDINAL SECTION



TRANSVERSE SECTION

IN-SITU RELOCATION



"MACCAN GROVE REJECTS THE TRADITIONAL MODEL OF DISPLACEMENT. PROPOSING INSTEAD A STRATEGY OF IN-SITU RELOCATION THAT ANCHORS THE URBAN POOR WITHIN THEIR OWN SOCIO-ECONOMIC ECOSYSTEM. BY VERTICALIZING THE SETTLEMENT INTO 13 RESILIENT NODES, THE PROJECT PRESERVES THE CRITICAL PROXIMITY TO THE NAVOTAS FISHERIES AND PORT INDUSTRIES, ENSURING THAT THE LABOR FORCE REMAINS CONNECTED TO THEIR PRIMARY LIVELIHOODS. THIS MODEL RECOGNIZES THAT TRUE RESILIENCE IS NOT JUST STRUCTURAL-IT IS THE PRESERVATION OF THE SOCIAL FABRIC AND INFORMAL NETWORKS THAT HAVE SUSTAINED THESE 6 BARANGAYS FOR DECADES. THE PROJECT SERVES AS A 'SAFETY VALVE' FOR THE DISTRICT, PROVIDING IMMEDIATE, HIGH-PERFORMANCE HOUSING FOR THOSE IN THE HIGH-RISK 'DANGER ZONES' WHILE OFFERING VOLUNTARY, ASPIRATIONAL GROWTH FOR THE INLAND COMMUNITY."

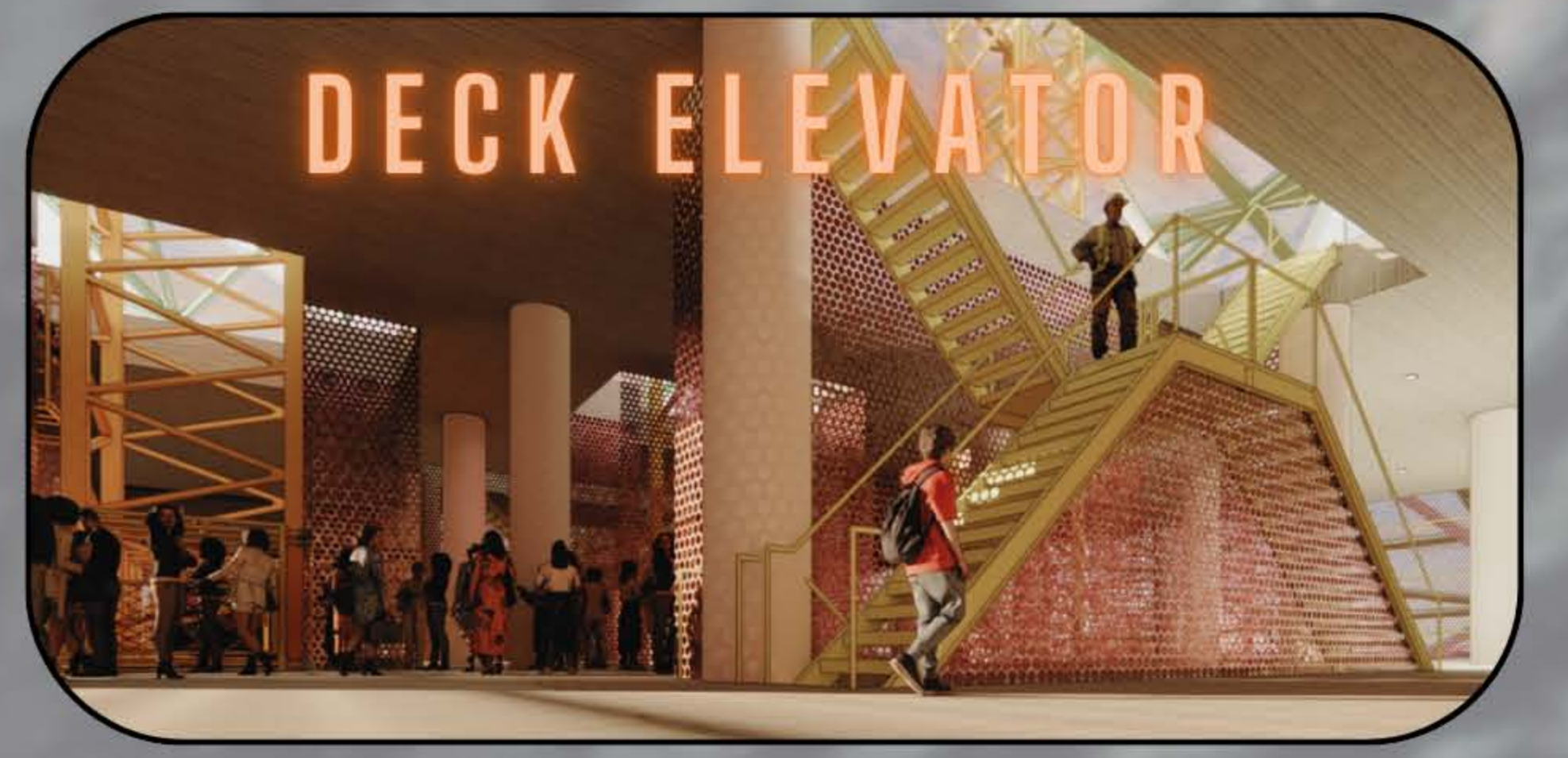
INTERIOR PERSPECTIVES



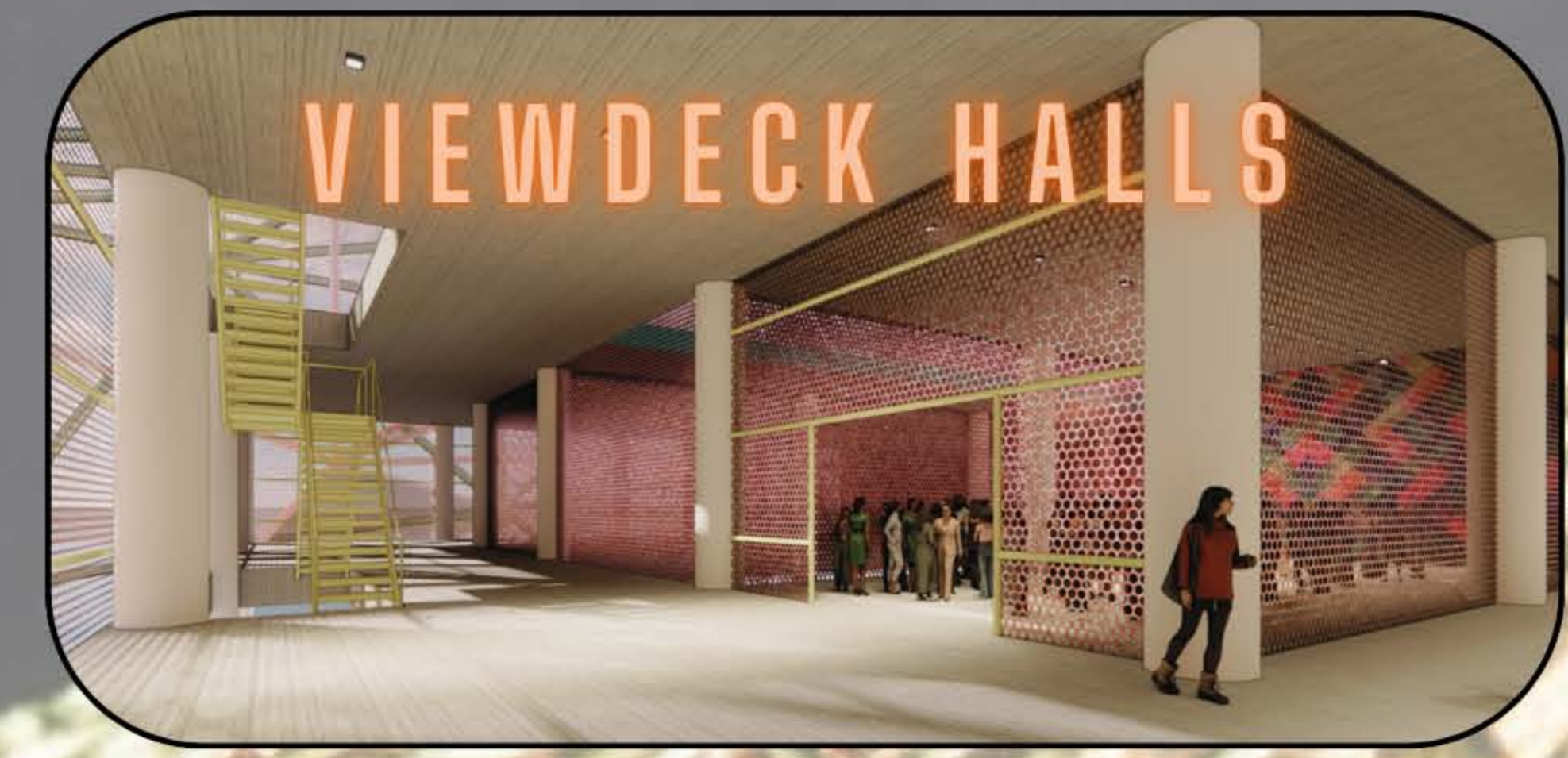
BASKETBALL COURTS



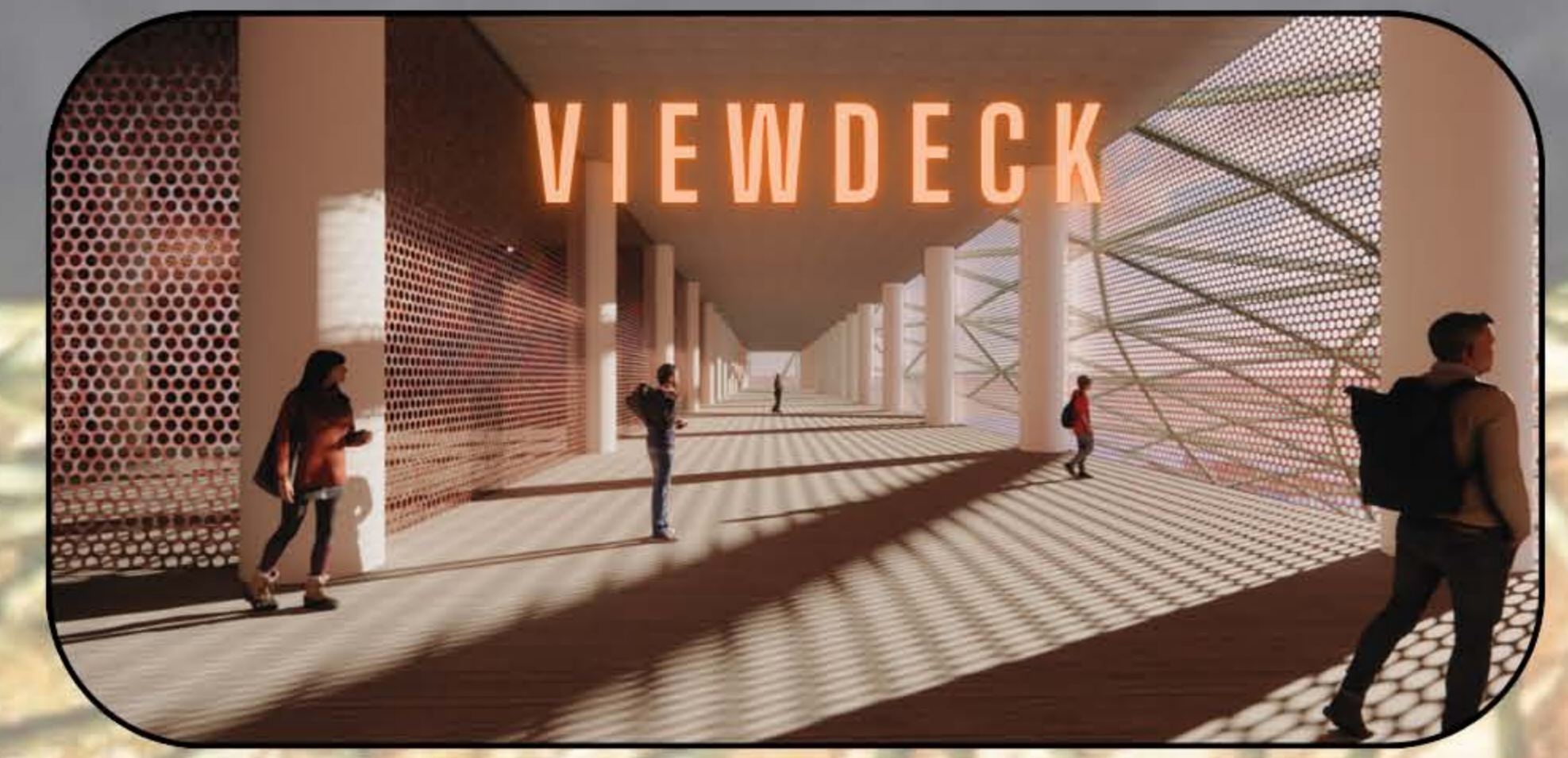
ROOF DECK



DECK ELEVATOR



VIEWDECK HALLS



VIEWDECK



VIEWDECK STAIRS



RESIDENTIAL



RESIDENTIAL STAIRS



ATRIUM



FENESTRATIONS



BUILDING ENVELOPE



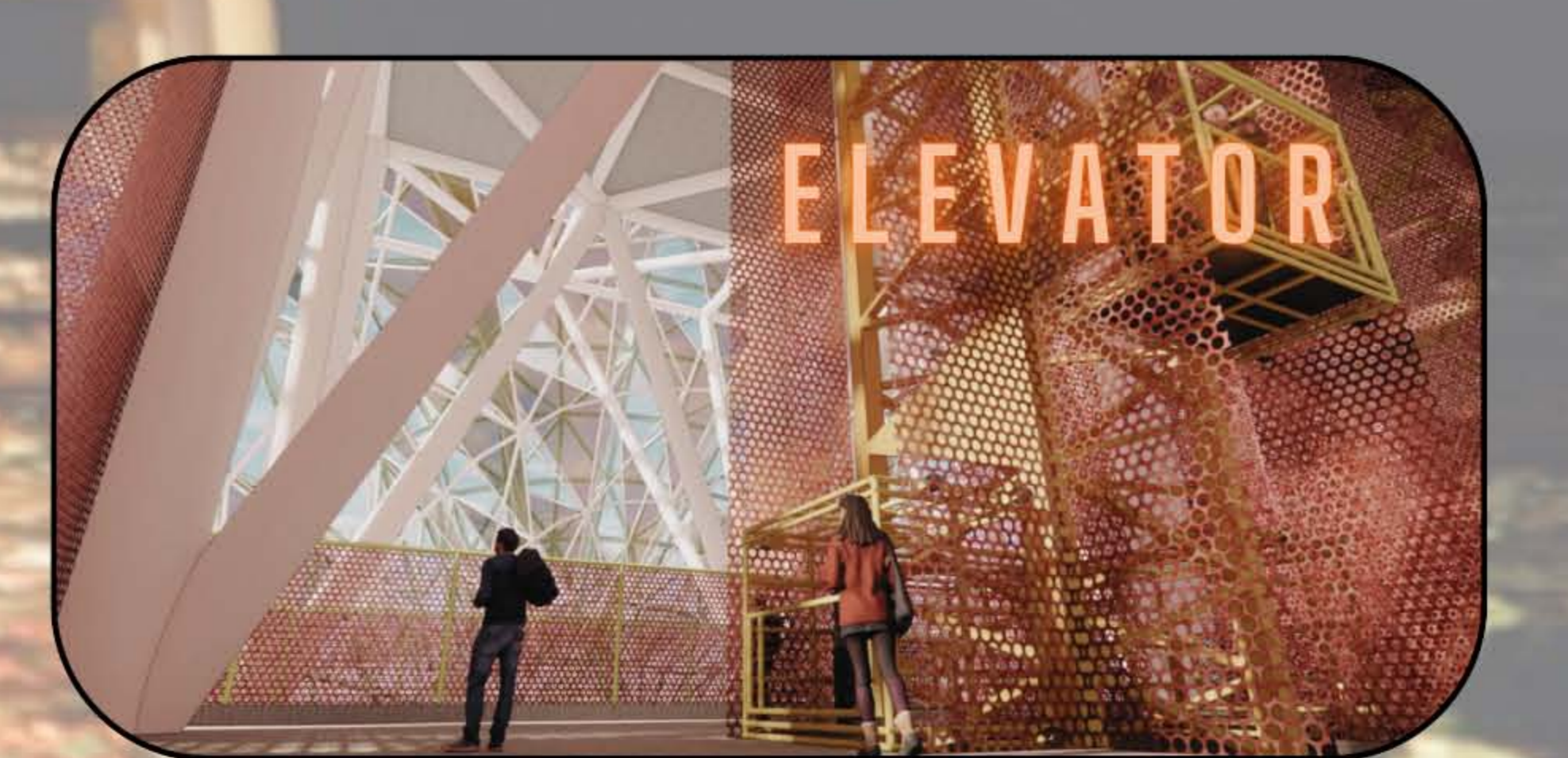
SKYWAY



MUSSELS FARM



MRT LEVEL



ELEVATOR