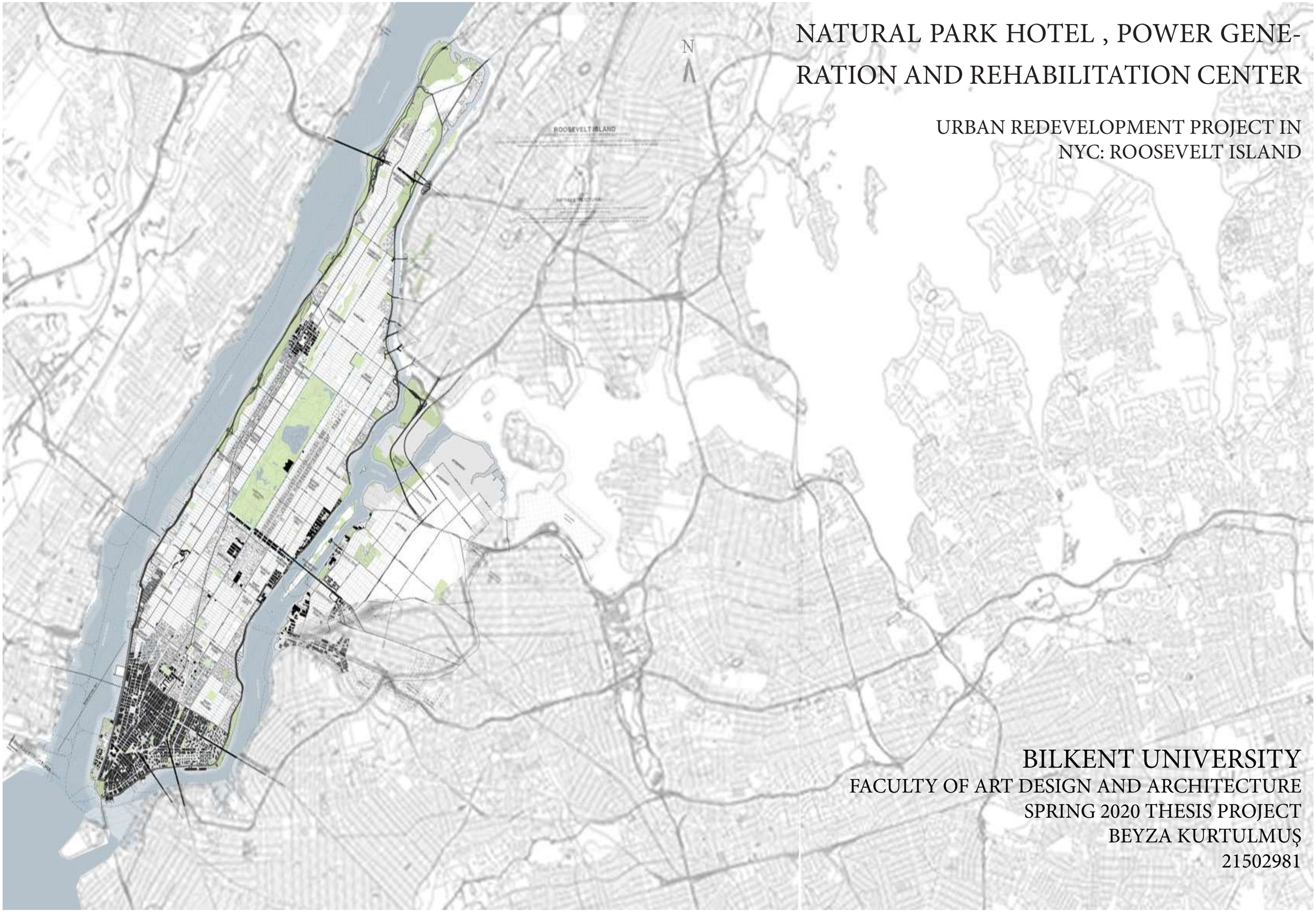
NYC

ROOSEVELT ISLAND

A SUSTAINABLE URBAN LIVING PROTOTYPE



NATURAL PARK HOTEL , POWER GENERATION AND REHABILITATION CENTER

URBAN REDEVELOPMENT PROJECT IN
NYC: ROOSEVELT ISLAND

BILKENT UNIVERSITY
FACULTY OF ART DESIGN AND ARCHITECTURE
SPRING 2020 THESIS PROJECT
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21502981

CONTENT

01 INTRODUCTION:

THIS CHAPTER COVERS A BRIEF OVERVIEW OF NEW YORK CITY WHICH IS ONE OF THE MOST POPULAR METROPOLITAN CITIES IN THE WORLD REGARDING A SUMMARY OF NYC URBANISM AND ARCHITECTURE, THE MAIN IDEOLOGY ABOUT USE OF SPACE : NATURE VERSUS MANKIND, SOCIOCULTURAL ASPECTS OF SUCH A MULTI-RATIONAL CITY AND A DESCRIPTION OF ROOSEVELT ISLAND REGION. THESE SUBTITLES OF STUDY ALL HAVE REMARKABLE ROLES IN THE DESIGN PROCESS AS THEY INEVITABLY INFLUENCE THE PROJECT AND LEND RELEVANCE AND UTILITY THROUGHOUT THE PLAN TO BE PROPOSED.

NYC URBANISM :
WHAT DOES NEW YORK NEED?

- Metropolitan City
- Dense Population
- One of the most important economies and harbours of the world
- Adopts a grid system as the urban character
- Hosts lots of different ethnic backgrounds
- Includes majority of skyscrapers and Concrete Mass in Compare to Green Areas
- NYC needs a freedom for nature!

ARCHITECTURE OF NYC:

- Des not reflect a specific group
- Contemporary Architecture
- Many cultures and different lifestyles
- Create NYS's own culture

USE OF SPACE:
NATURE VERSUS MANKIND:

- Declared as the dirtiest city of the USA in 2012.
- Yet currently one of the most energu efficient cities of the country
- Highest mass transit use in the USA
- Although over population NYC consumes less energy than other cities such as Chikago and Dallas
- Many attempts for green buildings (especially in the East River)
- However, New York faces growing demands and limited space.

SOCIOCULTURAL:

- Many cultures (Chineese, Afro-Americans, Italians, Jamaicans, etc.)
- Different religions and beliefs
- Many interactions on different fields between these groups
- Not so much interaction between nature and the NYC population (except Central Park)

ROOSEVELT ISLAND REGION:

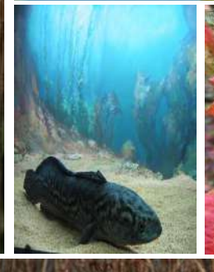
- It is a narrow island between Manhattan and Queens in the East River
- It is about 3.2 km long with a max width of 238 m and a total area of 0.59 km2
- 11,661 population (4,995 FEMALE, 4,525 MALE)
- Hosts mostly middle class and high class population like a small town
- 67% of the population is between 18 and 65
- The island has a distinguished architectural history
- It is nearly divided into two as green parks and concrete mass
- Includes mini schools, rentals and residentials
- Public transportation encouraged master plan
- Access is via Ferry, Bus, Subway, Cable Car (from Manhattan to the Island), Roosevelt Island Bridge (from Queens to the island) or Car from the bridge

02 INFLUENCES:

IN BEGINNING A NEW PROJECT, THE REVIEW OF EXISTING LITERATURE AND PRECEDENT STUDIES ARE AN IMPORTANT PART OF THE DESIGN PROCESS, AND CAN HELP INFORM THE DESIGNERS OF RELEVANT APPLICATIONS AND SOLUTIONS TO BE EMPLOYED ON A SITE. THIS PROCESS HELPS DELIVER INFORMED DESIGN THAT CAN BE RUN THROUGH AN ARRAY OF DESIGN AND PLANNING ORDERING SYSTEMS, THEREBY REVEALING THE OVERALL RELEVANCE OF THE PURPOSED INTERVENTIONS. THE FOLLOWING PAGES DISCUSS THE DESIGN IMPLICATIONS DISTILLED FROM APPLICABLE LITERATURE AND PRECEDENT STUDIES THAT IN TURN, INFORMED THE DESIGN OF VARIOUS FACETS OF ROOSEVELT ISLAND.

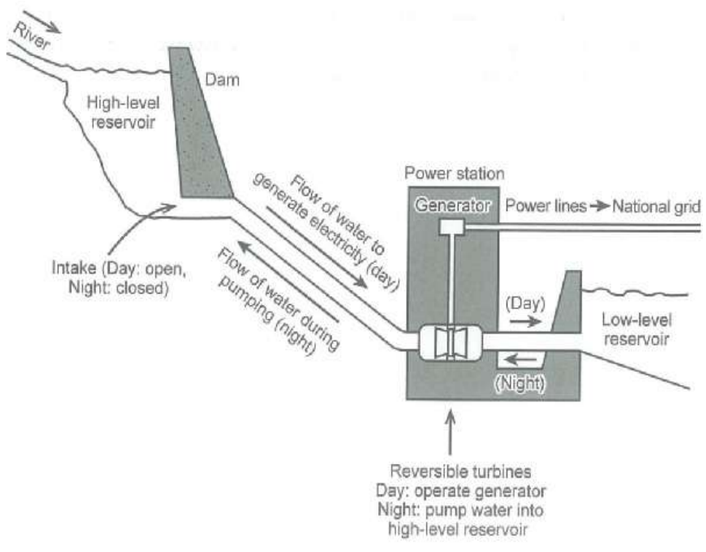
ECOLOGY OF NYC PARKS:

- 31 °F (0 °C) average temperature in winters
- 72 °F (22 °C) average temperature in summers
- Moderate Climate (the Harbour rarely freezes)
- Annual precipation is 1120 mm
- Urban settlement affects Flora and Fauna
- Rapid changes on wikd habitat
- Wide variety of animal species (80 species of fish, scores of birds from the Peregrine Falcon to the Pigeon, Mammals such as Raccoon, Rabbits, Mandarin ducks, Squirrels, Virginia Opossums, Berry trees, shrubs etc.)
- Over 235 species of Flora and Fauna in all the NYC Parks
- Reduced and destroyed vegetation by urban sprawl



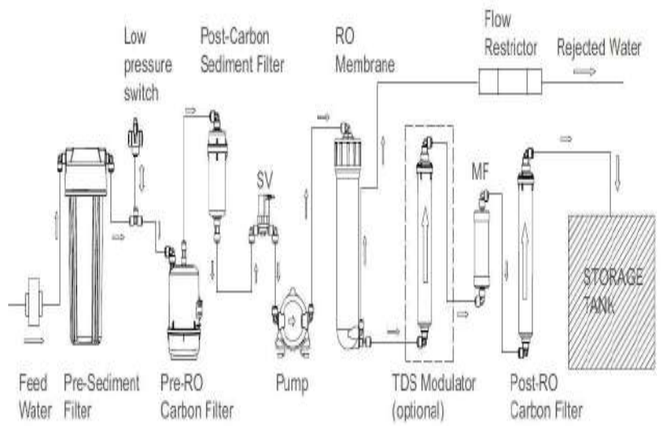
URBAN HYDROELECTRIC GENERATION IN RIVERS:

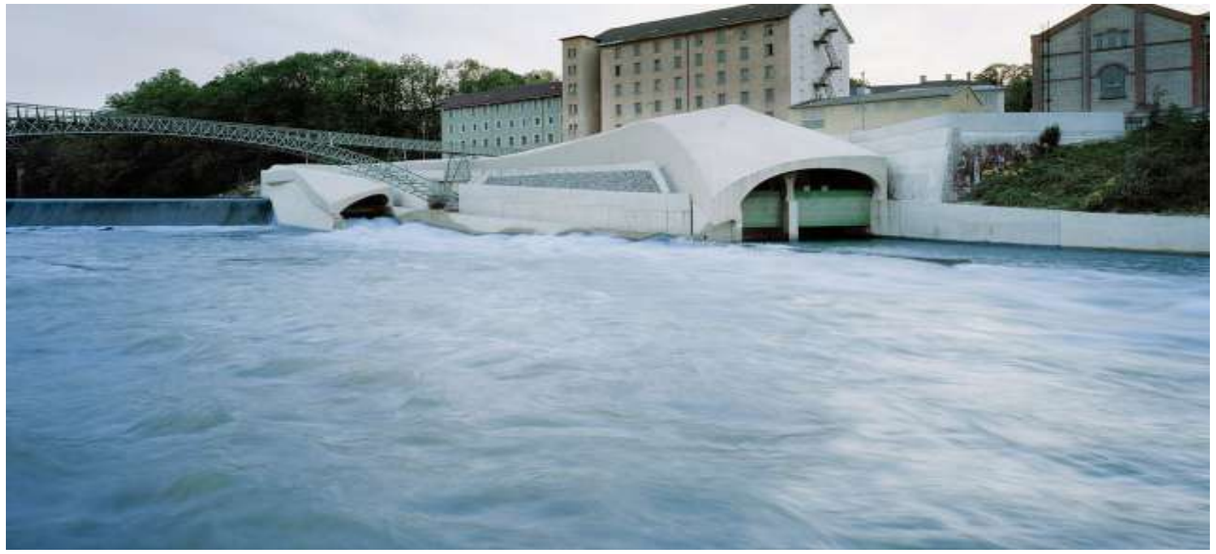
- Electricity from Hydropower 16.6% of the World's total energy to be increased
- Power comes from the potential energy of dammed water driving a water turbine and generator
- A flexible source of electricity
- Very low cost-High value power
- Reduced CO_2 emissions
- Suitable for industrial applications
- Yet to be careful about:
  Ecosystem damages
  Loss of land
  Water loss by evaporation
  Failure risks

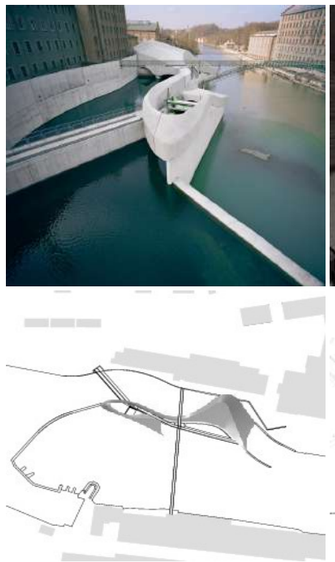


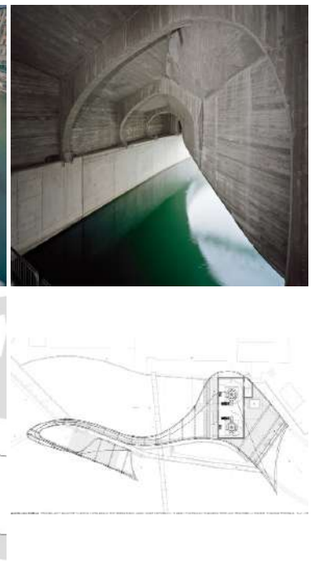
WASTE WATER PURIFICATION:

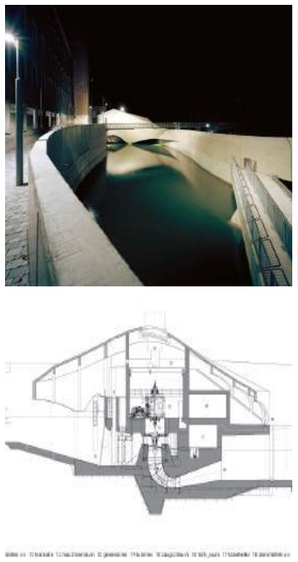
- Removal of unwanted constitutents from the water to make it safe
- Clean water
- Process
  Pretreatment
  Coagulation and Flocculation
  Sedimentation
  Filtration (UV Disinfection etc.)
  Portable Water Purification

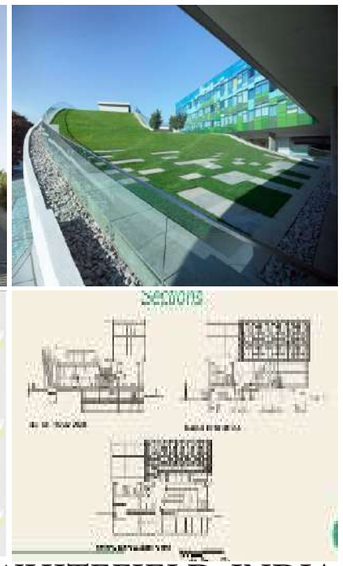










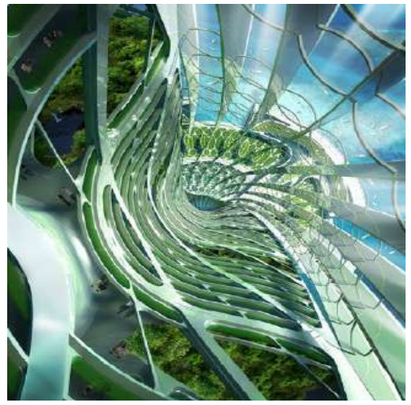


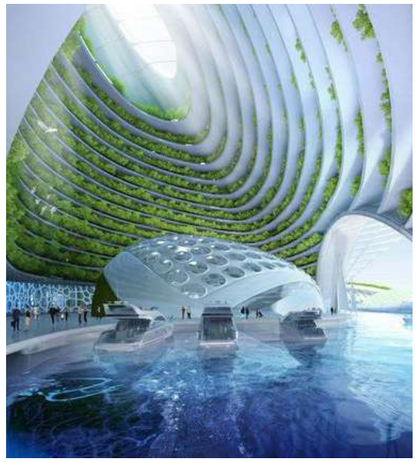
ILLER HYDROPLANT, GERMANY
by Becker Architects

Main design considerations was the symbolic representation of the water dynamics, which change from a calm state at the water inlet to the churning and pitching of the water near to the turbines, before subsequently returning to a calm state after the electricity generation. Further associations included the river-washed rock formations in close proximity to the location of the power plant. The concept intended to connect the limit points machine room including turbines/generators and retention bar weir/rack cleaning with a continuous wrapping that dives underneath a historical steel – framework of a former bridge for wires, in order to avoid its total demolition. The softly shaped wrapping nestles against the technical underground engineering parts and creates thus space for many connotations, among them a smoothed river stone, a frozen wave or a stranded whale and so on. In close continuance of the underground construction the reinforced concrete wrapping is fitted on selective plate bearings with a revolving gap (2 cm) in order to compensate longitudinal deformation. In crosswise direction ribs stabilise the construction similar to the ribs of a boat, that is turned around. The structure that is like a skeleton generates a fascinating sequence of interior rooms, which are changing between dome dimensions and intimate sizes. All notches, that are technical essentially, were reduced as much as possible in order to reach a homogeneous appearance. Even a (via truck – mounted crane) complete removable component (lightweight concrete) in case of log jam disappears almost.

HOTEL VIVANTA, WHITEFIELD, INDIA
by TAJ

India, the hotel is a gateway statement between the IT Park and the developing city around it. The brief inspired the team to question and push the boundaries of hotel design, not just to address the needs of the discerning business traveller coming to Whitefield, but also to redefine and intensify the hotel as a contemporary socio-cultural hub for both the IT Park and IT-based population in Whitefield. Besides, Hotel Vivanta is designed as a flowing land-scrapper that blends earth to sky. The building embraces Bangalore's culture and climate, adopting a site-specific landscape strategy that plays on relationships between interior and exterior spaces. Public and private spaces interweave in an endless promenade of spatial experiences with culturally distinctive cinematic qualities that allude to the circling and twisting of traditional Indian dance forms. Spaces flow and connect to each other encouraging exchange and interaction. By its concept and application the building offers a different and enjoyable sequence of space and quality of these spaces which are almost always interation with the nature. It covers a variety of gardens such as roof gardes, secret gardens, sloped gardens, exterior courtyards, interior courtyards-atriums. In addition large and spacious halls, galleries and relaxation spaces are always interaction with the direct daylight. The building offers room suites, spa centers, offices, business opprtunities, fitness centers, entertaintment places both for the visitors and locals as well.





AQUA-SCRAPER/UNDERWATER WORLD

BY BELGIAN ARCHITECT VINCENT CALLEBAUT

He has revealed ambitious plans for a series of underwater eco-villages that could house up to 20,000 people each in the future. Jellyfish-like in appearance, each oceanscraper would be constructed using recycled plastics from the misleadingly named “Seventh Continent”, or Great Pacific Garbage Patch (much of the debris here is believed to be in the form of microplastics, rather than a visible mass). As well as living space, the Aequorea would house science labs, offices, hotels, sports fields and farms across 250 floors and reach a depth of up to 1,000 meters (3,280 feet). Seawater would be desalinated for drinking, microalgae would recycle organic waste, and light would be provided through bioluminescence.

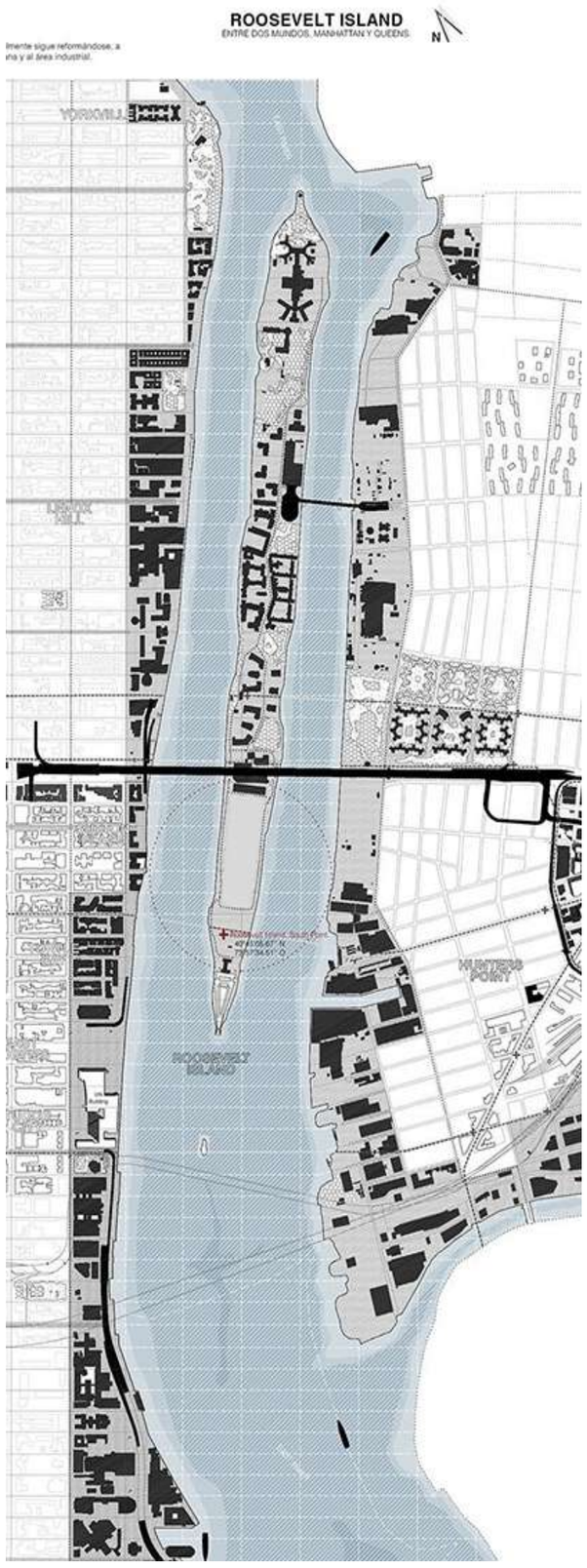
THEORIES:

- New Urbanism :
  promotes quality architecture and urban design to create a dense mixed use community that is: walkable, connected, sustainable, and has a high quality of life. New urbanism is a descriptive style of human habitat that is community focused and socially sensitive to human functions. The landscape is formed into the built human space.
- Landscape Urbanism:
  is an approach to the organization of the design of human habitat based upon the existing landscape form and not on architectural form. Landscape urbanism is an ecological approach to human habitat that is process focused and contextually sensitive to ecological functions. The human space is integrated into the landscape.
- Smart Growth :
  is an approach to controlling growth by concentrating growth at urban centers in order to minimize sprawl. Smart growth is a transit based infill built upon policy and relies on growth management tools to make decisions and encourages sustainable communities, combats sprawl, and strengthens urban centers through existing infrastructure.
- Smart Code :
  is a unified land development ordinance for planning and urban design. It considers: zoning code flexibility, subdivision regulations, urban design, and architectural standards. Smart code supports community vision, transit options, mixed use, and conservation of open lands while preventing sprawl and auto dominated streets.

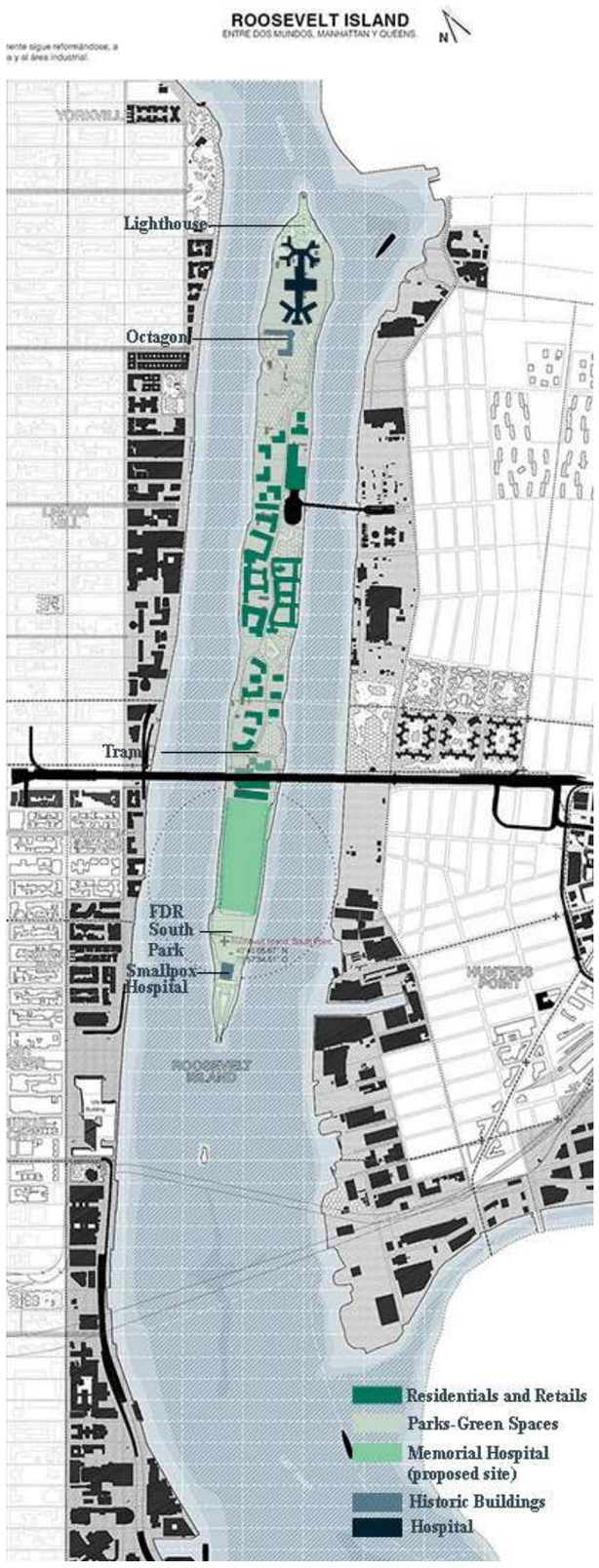
03 SITE ANALYSIS:

SITE ANALYSIS CHAPTER PROVIDES AN OVERVIEW OF ROOSEVELT ISLAND'S EXISTING CONDITIONS ON FUNCTION (CITY LAYOUT, LAND USE, CIRCULATION INCLUDING GREEN NETWORKS VEHICULAR AND PEDESTRIAN CIRCULATIONS), SOCIOCULTURAL (USER PROFILE), ECONOMICS (INCOME LEVELS AND FUNCTIONS), AESTHETICS (ROOSEVELT ISLAND VIEWS) AND ENVIRONMENTAL ASPECTS (ENERGY CONSUMPTION, FLOW OF THE RIVER AND WATER SUPPLY).

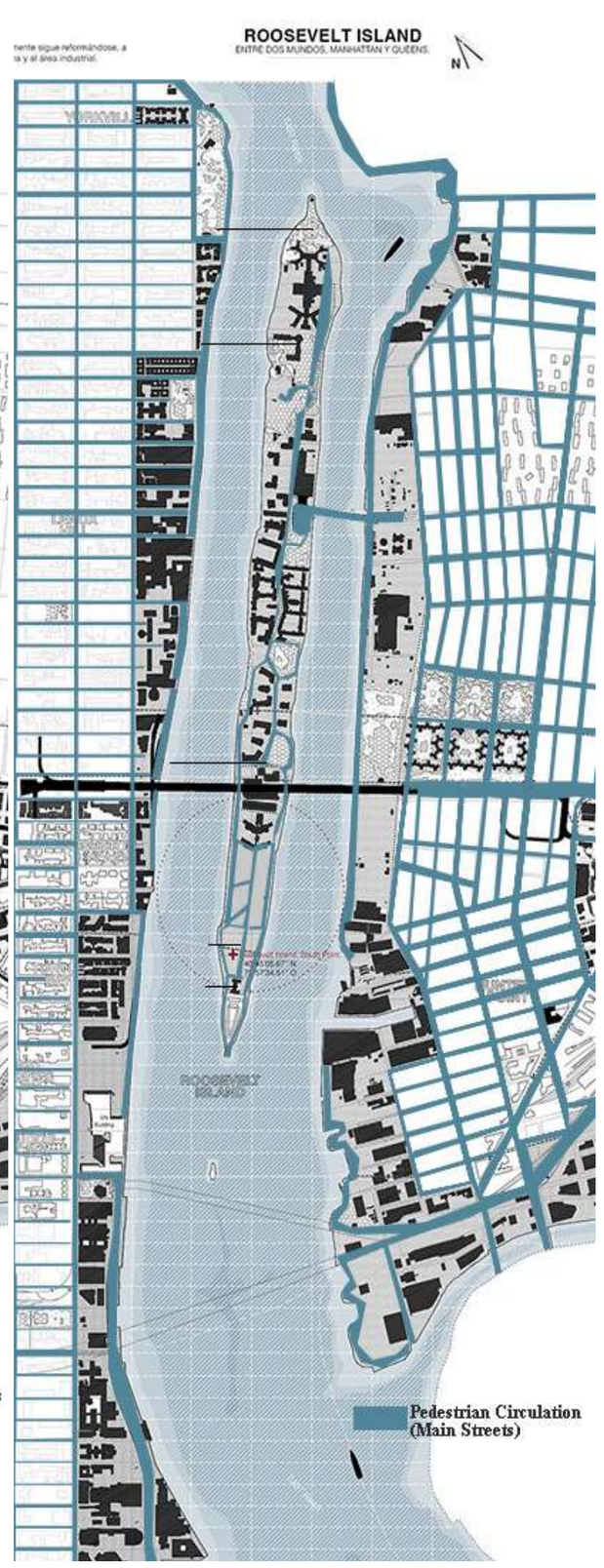
CITY LAYOUT AND OPEN SPACE:



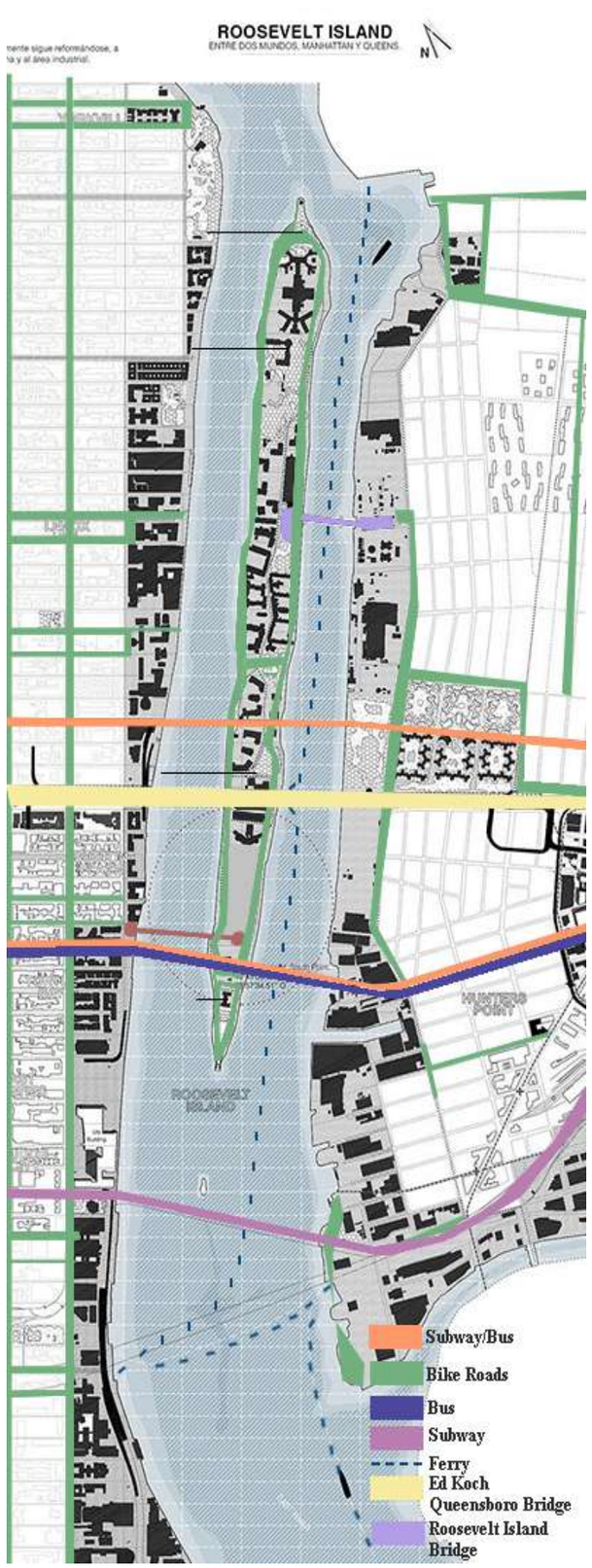
LAND USE:



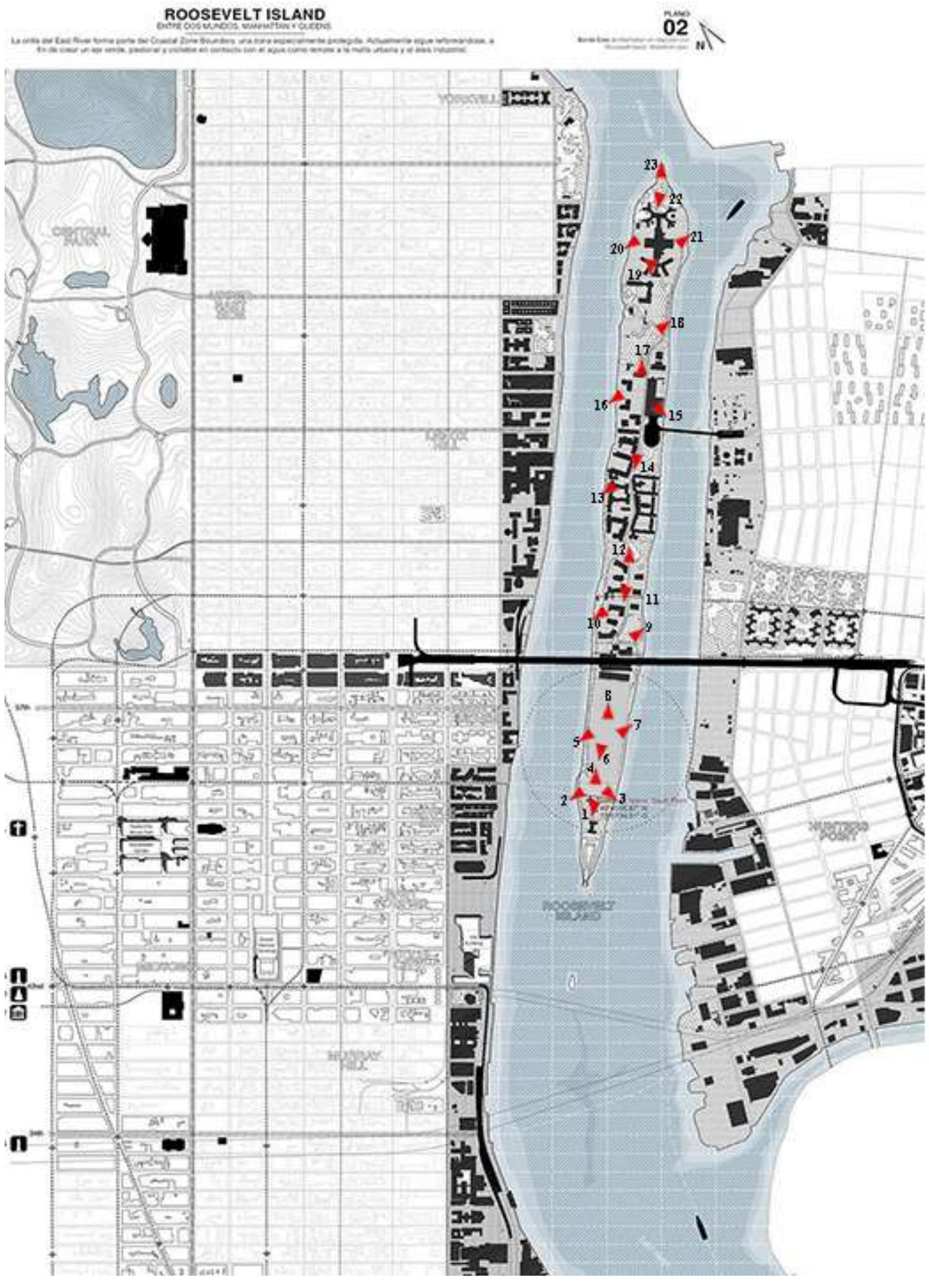
PEDESTRIAN CIRCULATION:



PUBLIC TRANSPORTATION:



AESTHETIC ASPECT:



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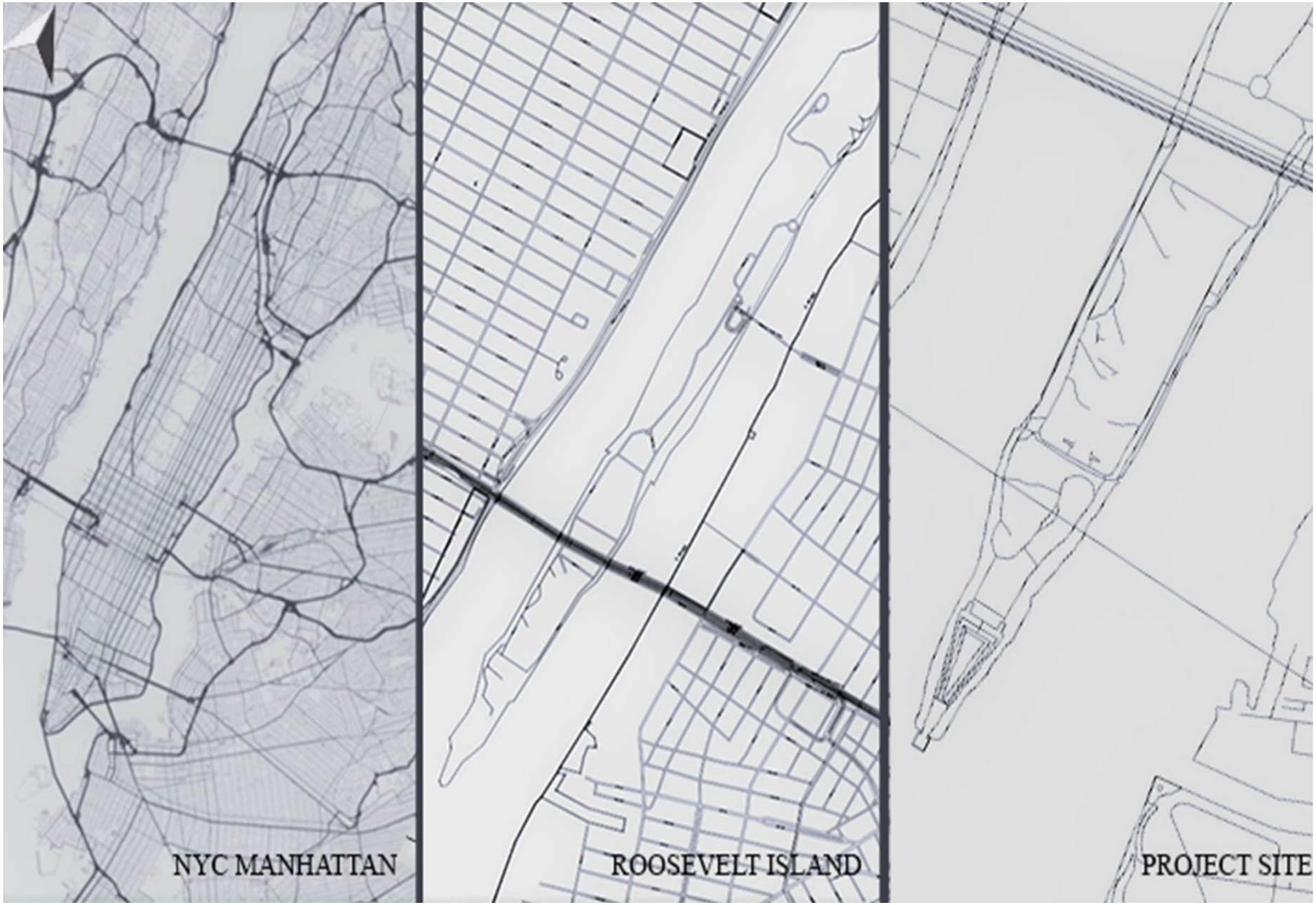
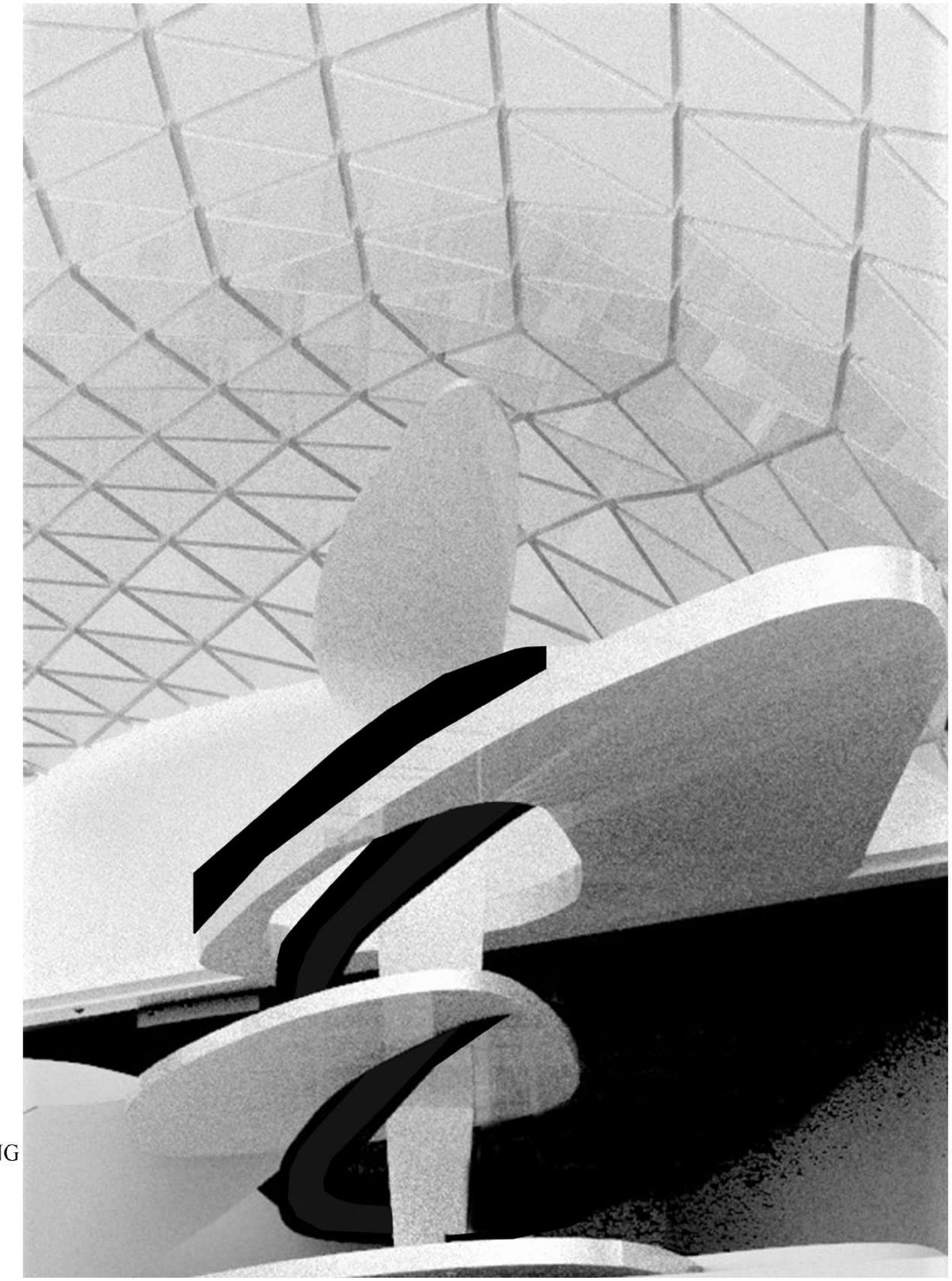
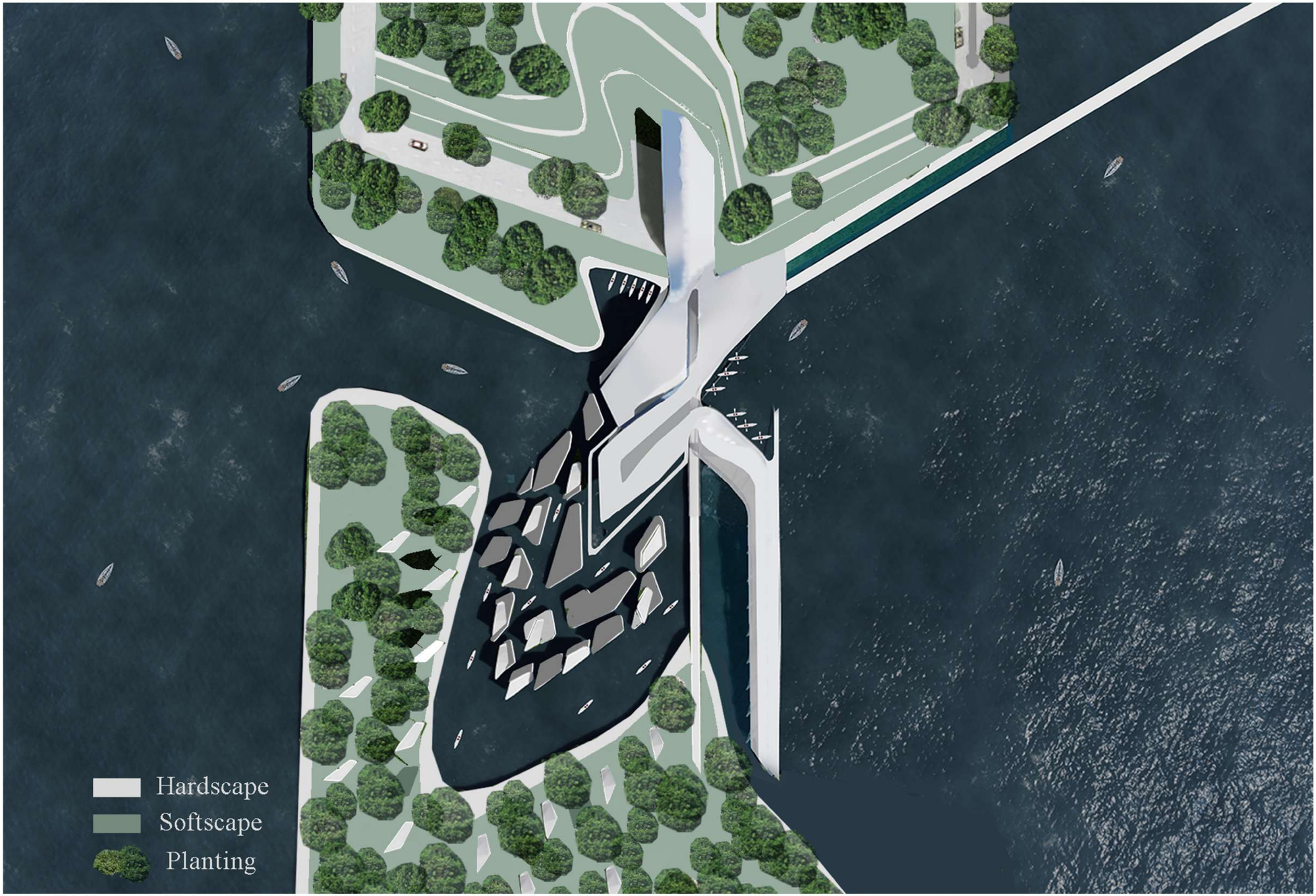

NYC MANHATTAN
ROOSEVELT ISLAND
PROJECT SITE

04 DESIGN :

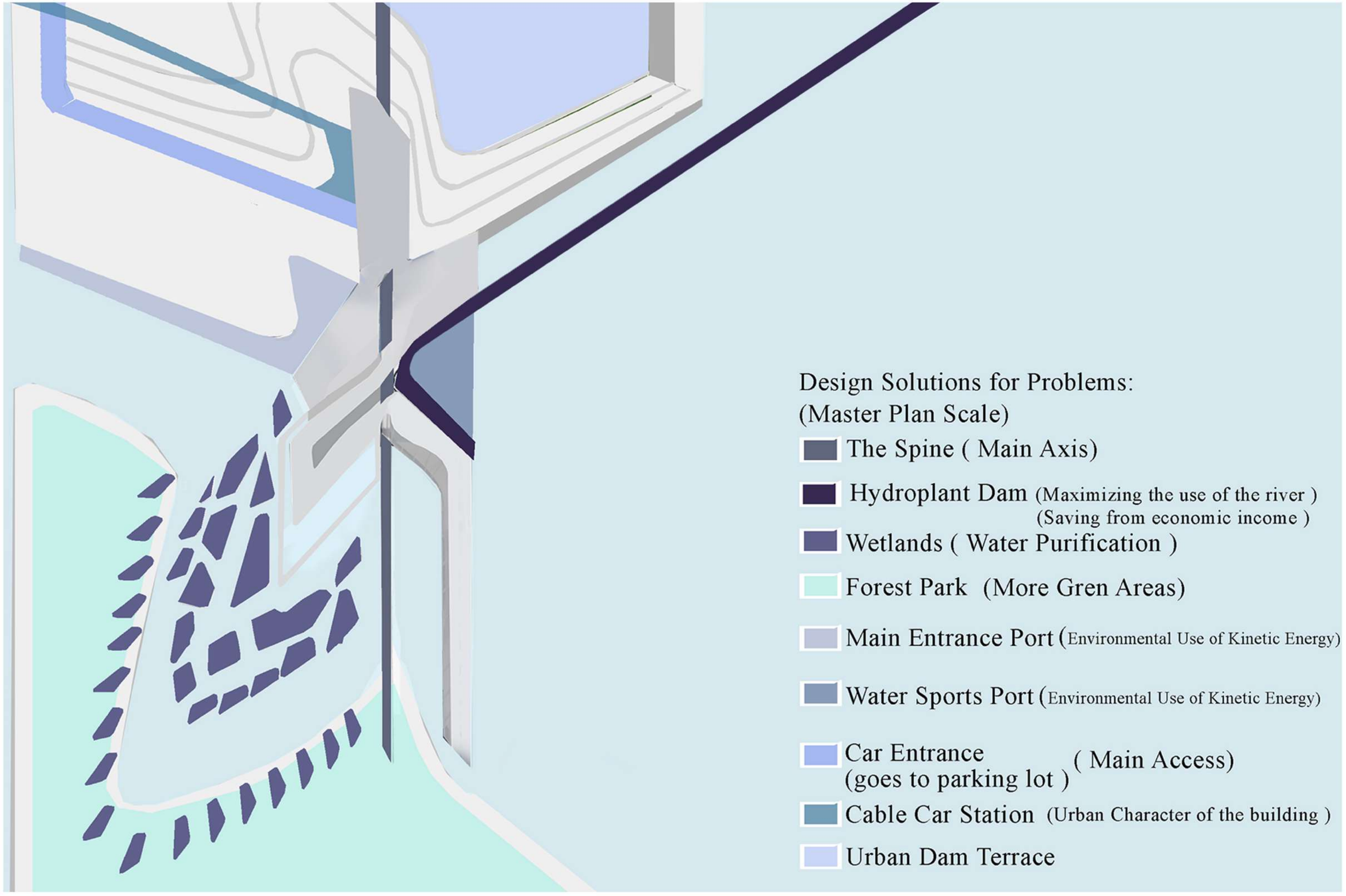
THIS CHAPTER COVERS THE DESIGN AND PLANNING PROGRESSION OF THE PROJECT, WHICH BEGAN IN NYC AND CONTINUED FOR 3 MONTHS. DIFFERENT CONCEPTS GENERATED WERE THEN SYNTHESIZED INTO ONE FINAL CONCEPT BASED OFF OF FEEDBACK RECEIVED FROM OUR INSTRUCTOR., AND CONTINUING IDEA GENERATION WITHIN THE TEAM. DESCRIPTIONS OF EACH CONCEPT, INCLUDING PLANS, CAN BE FOUND WITHIN THIS CHAPTER AND THE OVERALL MASTER PLAN, SECTIONS, AND PERSPECTIVES THAT WERE GENERATED BY THE TEAM, FORM THE CONCLUSION OF THIS BOOK.



MASTER PLAN DESIGN



DESIGN STRATEGIES :



DESIGN STRATEGIES:
ORDERING SYSTEMS

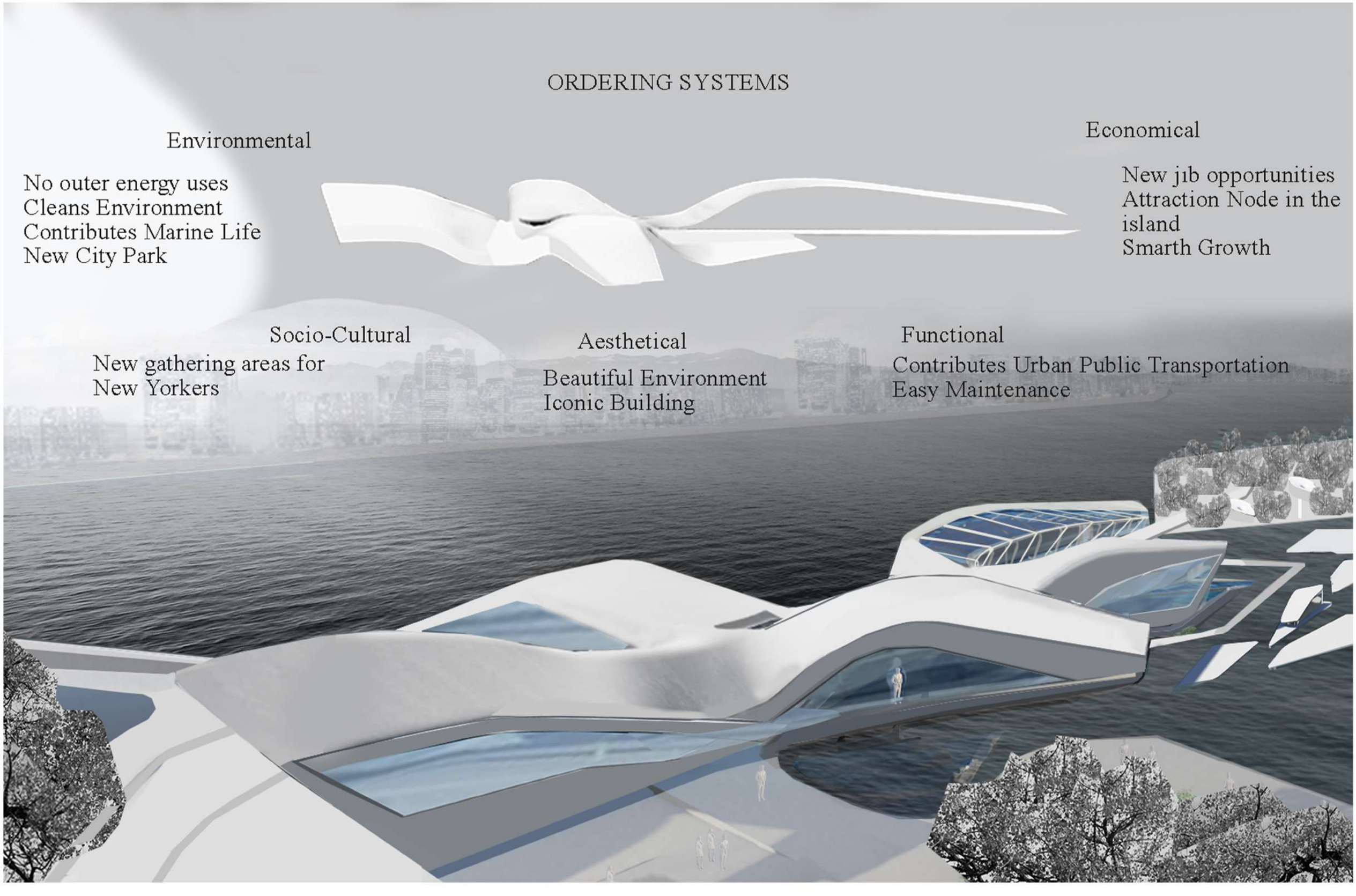
ENVIRONMENTAL STRATEGIES:
• Streetscape and shading strategies reduce urban heat island effect.
• Water purification, retreatment and storage by wetlands.
• Grey water reuse for landscape.
• Landscaped Pedestrian connections for comfort and walk-ability.
• Structural arrangement platform regarding the flooding data and problems that may occur because of the flood
• Produces electric energy by water power as a Hydroplant Dam Building
• Cleans environment by TiO2 building skin
• No outer energy use
• The design proposes a new city park
• It creates biodiversity
• LEED Candidate building

ECONOMIC STRATEGIES:
•Local labor and architectural and landscape architectural solutions create on-site employment for NYC citizens. New job opportunities
•Terraces create opportunities for urban agriculture which can be sold on the site.
•Dedicated revitalized/rebuilt spaces for start-up business and entrepreneurship.
•Huge amount of Energy production, improvement of existing construction material in the hotel area and water purification that meet the daily needs of Roosevelt residents and surroundings.

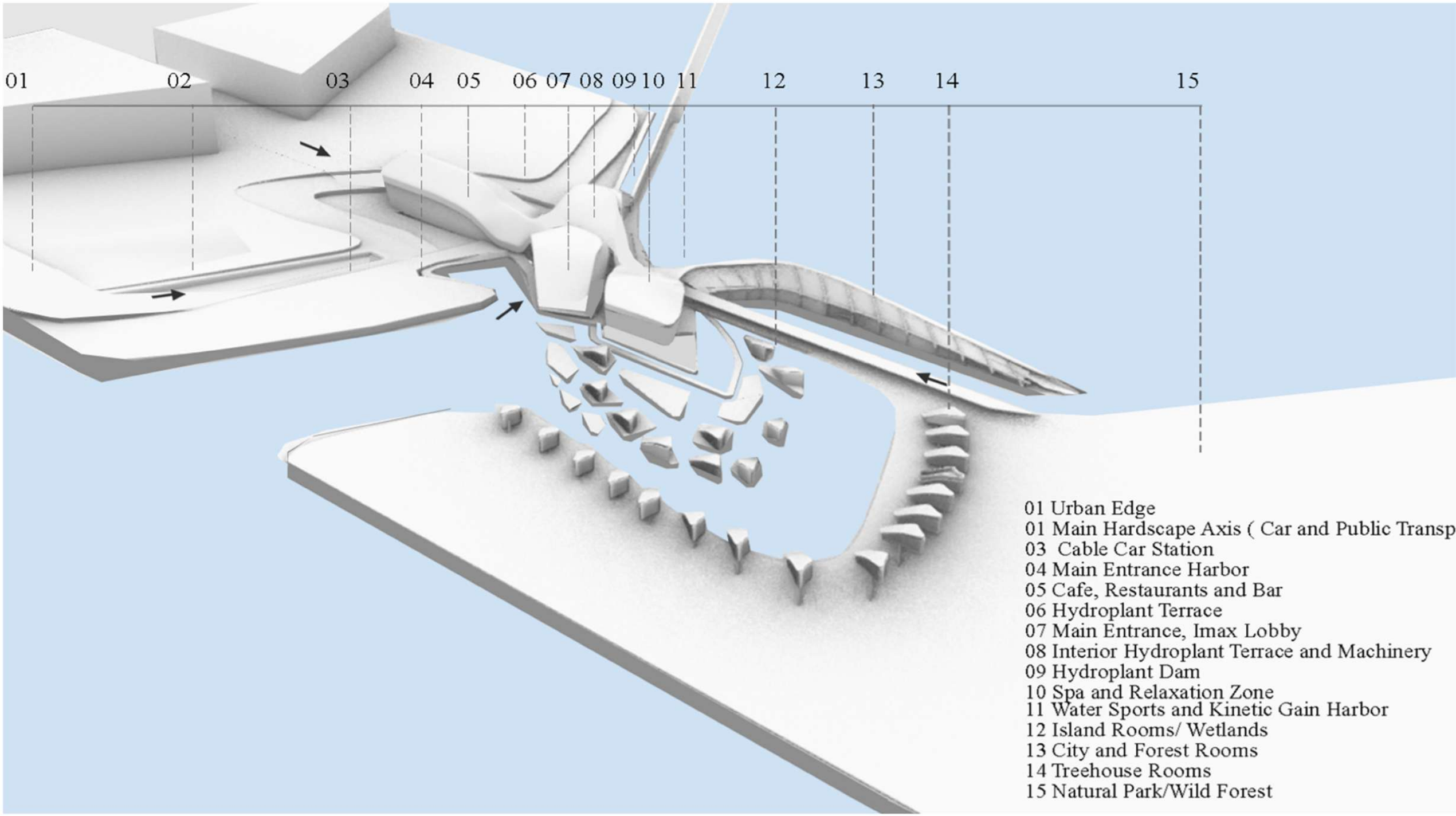
SOCIAL STRATEGIES:
• The design provides new open spaces
•Amenities such as a new city park as the second Central Park in NYC, water sports harbor fields targeted for young New Yorkers and families.
• Dedicated areas for women and parks for children.
• Dedicated areas for the ones who work and live on the site.
• Connections and space for local business start-ups.
• Vocational spaces for on site workers.

FUNCTIONAL STRATEGIES:
• Parking and Plazas along the edge.
• Service Terraces designated for commercial area.
• Proposed road along urban edge of Roosevelt Island for through traffic, and creating connections along the entire site, from urban city to the island by different transportation webs giving the building an urban characteristic.

DESIGN:


ORDERING SYSTEMS
Environmental
No outer energy uses
Cleans Environment
Contributes Marine Life
New City Park
Economical
New jıb opportunities
Attraction Node in the island
Smarth Growth
Socio-Cultural
New gathering areas for New Yorkers
Aesthetical
Beautiful Environment
Iconic Building
Functional
Contributes Urban Public Transportation
Easy Maintenance

AERIAL VIEW :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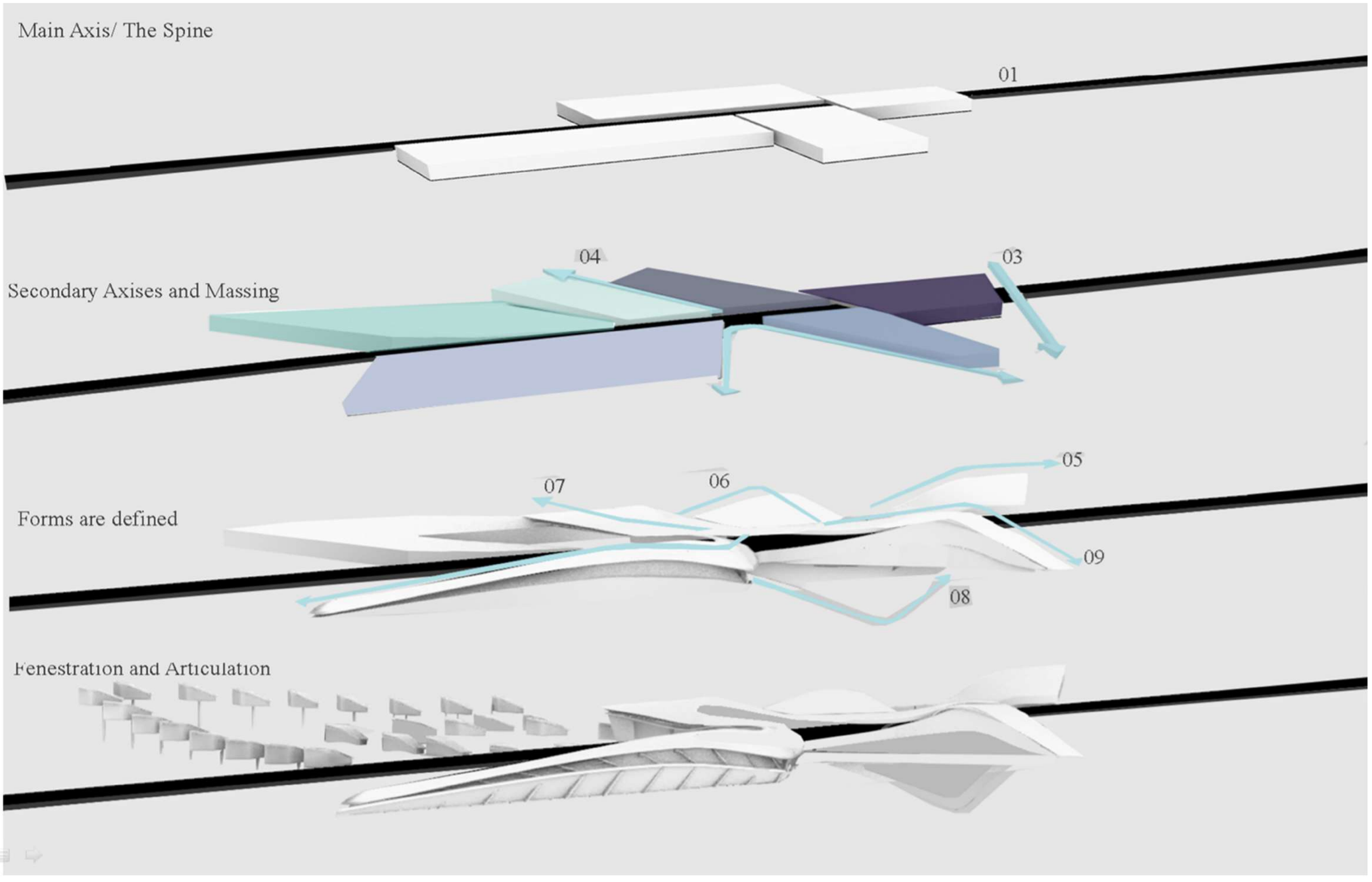
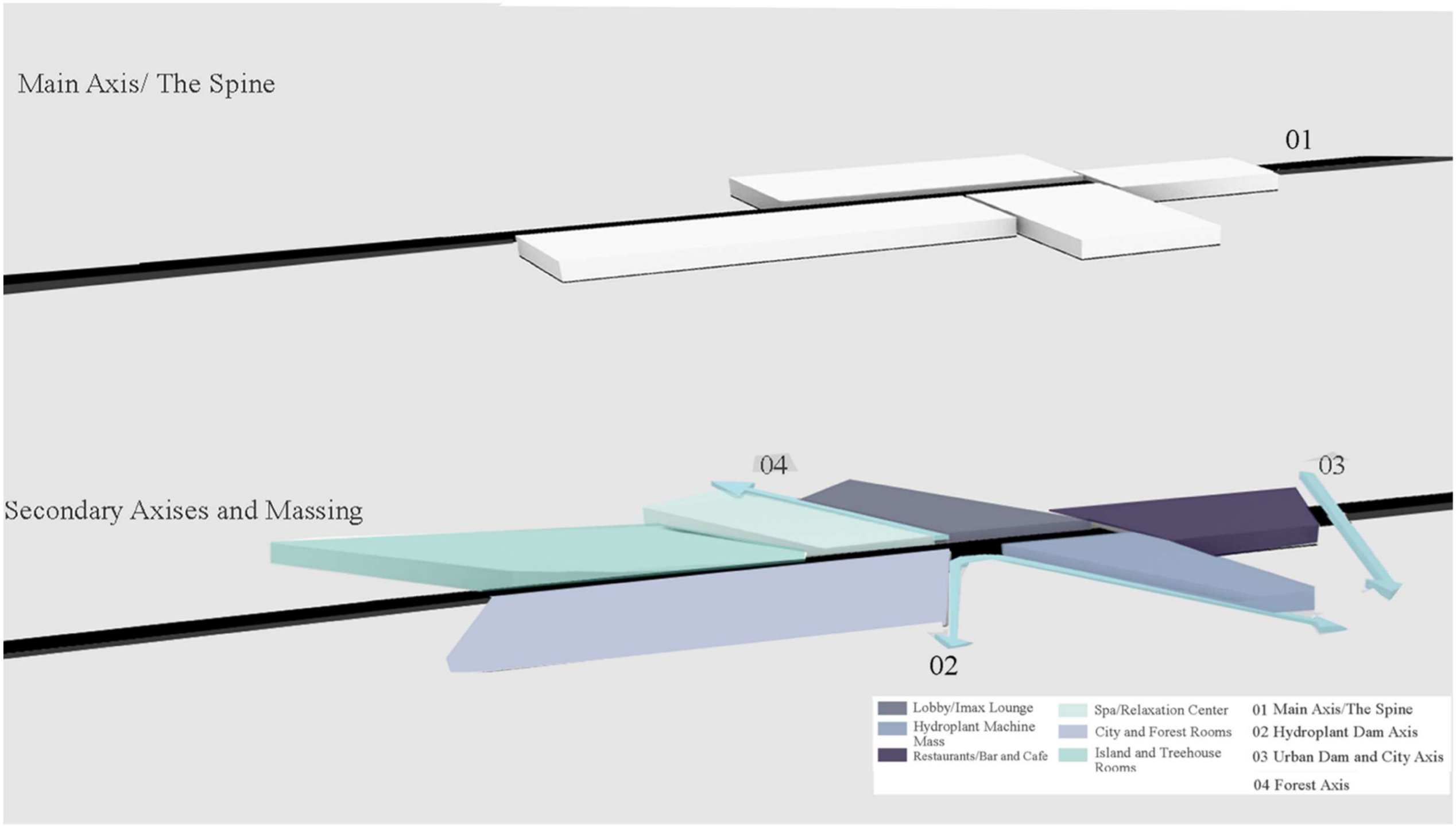
01 Urban Edge
01 Main Hardscape Axis (Car and Public Transp
03 Cable Car Station
04 Main Entrance Harbor
05 Cafe, Restaurants and Bar
06 Hydroplant Terrace
07 Main Entrance, Imax Lobby
08 Interior Hydroplant Terrace and Machinery
09 Hydroplant Dam
10 Spa and Relaxation Zone
11 Water Sports and Kinetic Gain Harbor
12 Island Rooms/ Wetlands
13 City and Forest Rooms
14 Treehouse Rooms
15 Natural Park/Wild Forest

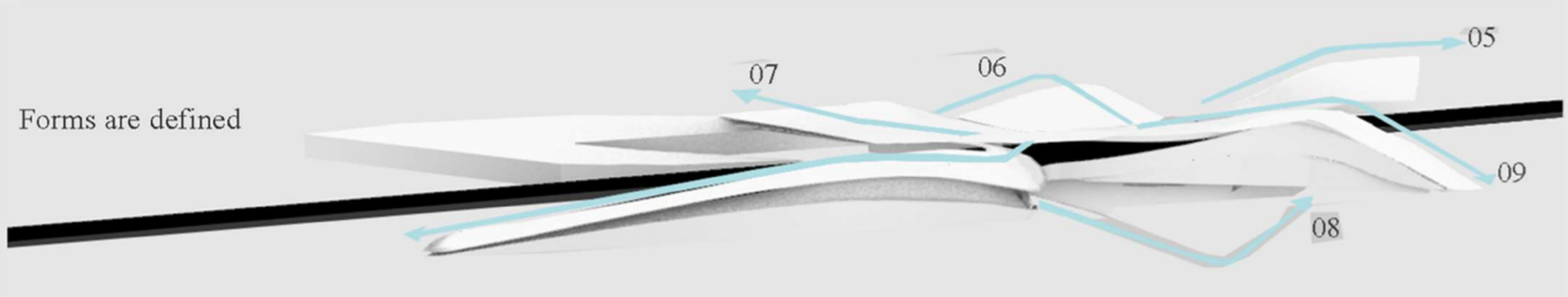
FORMATION DIAGRAMS :
MAIN STRATEGIES

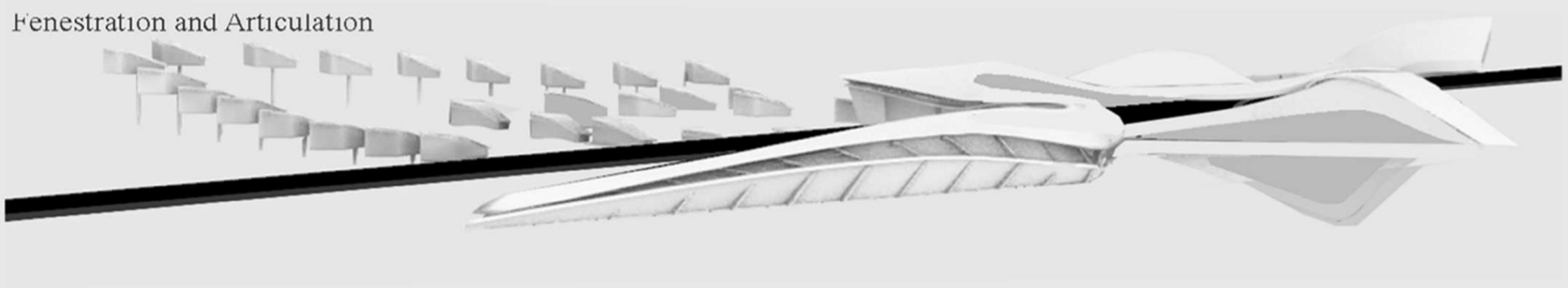


MASSING IN 2D AXISES:



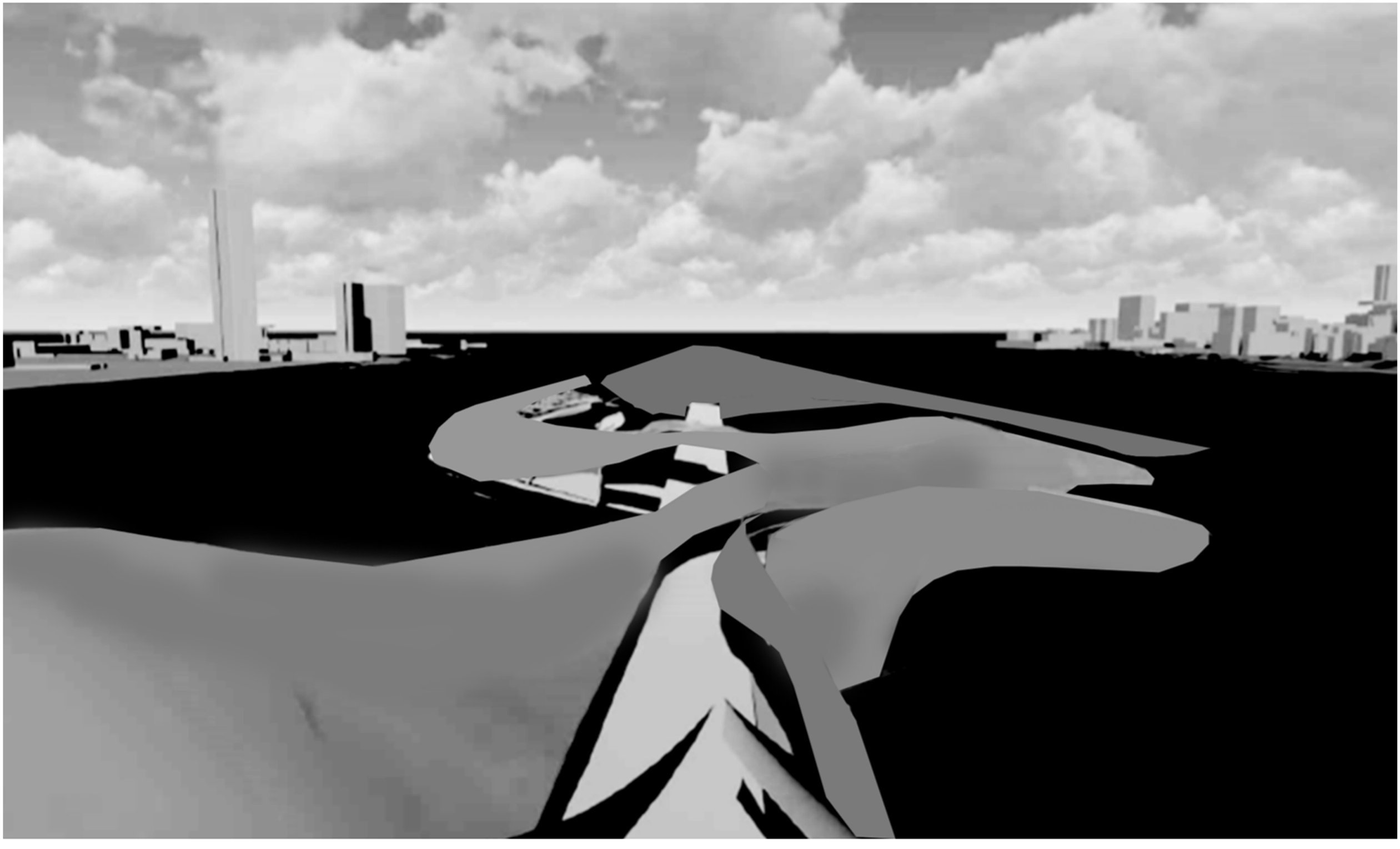
MASSING IN 3D AXISES:



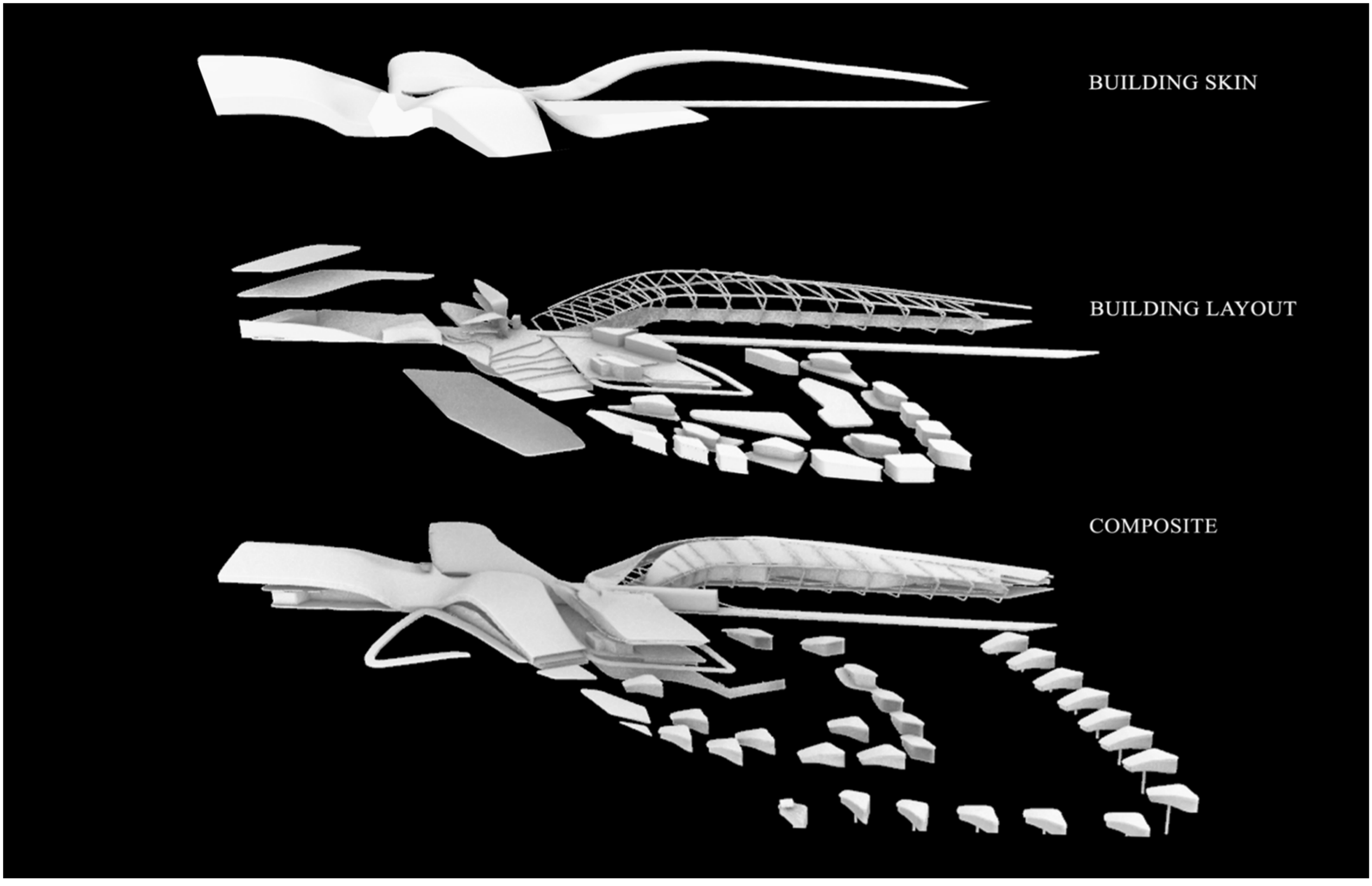


05 Encountering Urban Edge
06 Bowing for Imax
07 Raising to forest
08 Platform Structure of dam
09 Bowing for Dam

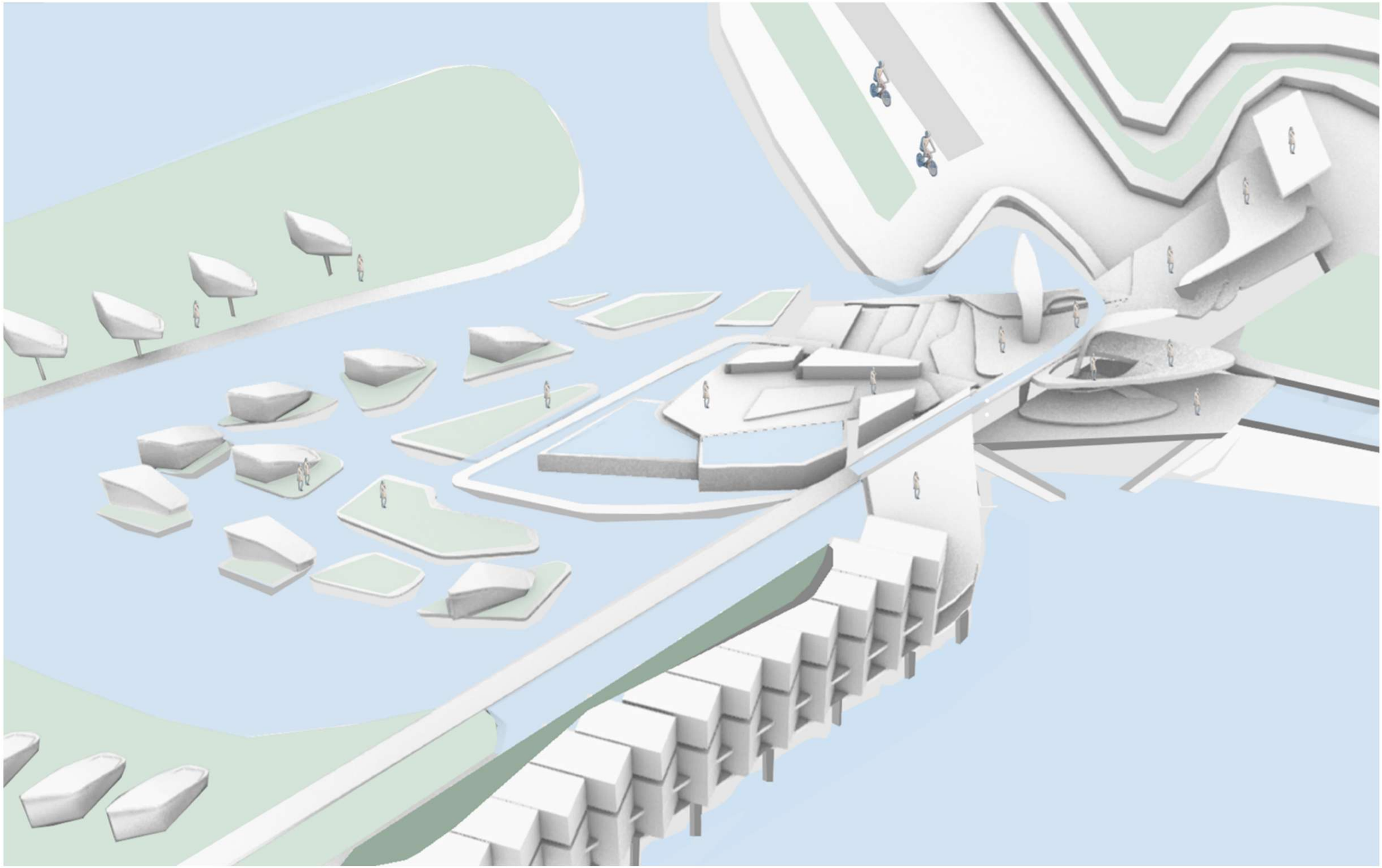
BUILDING STRATEGIES:



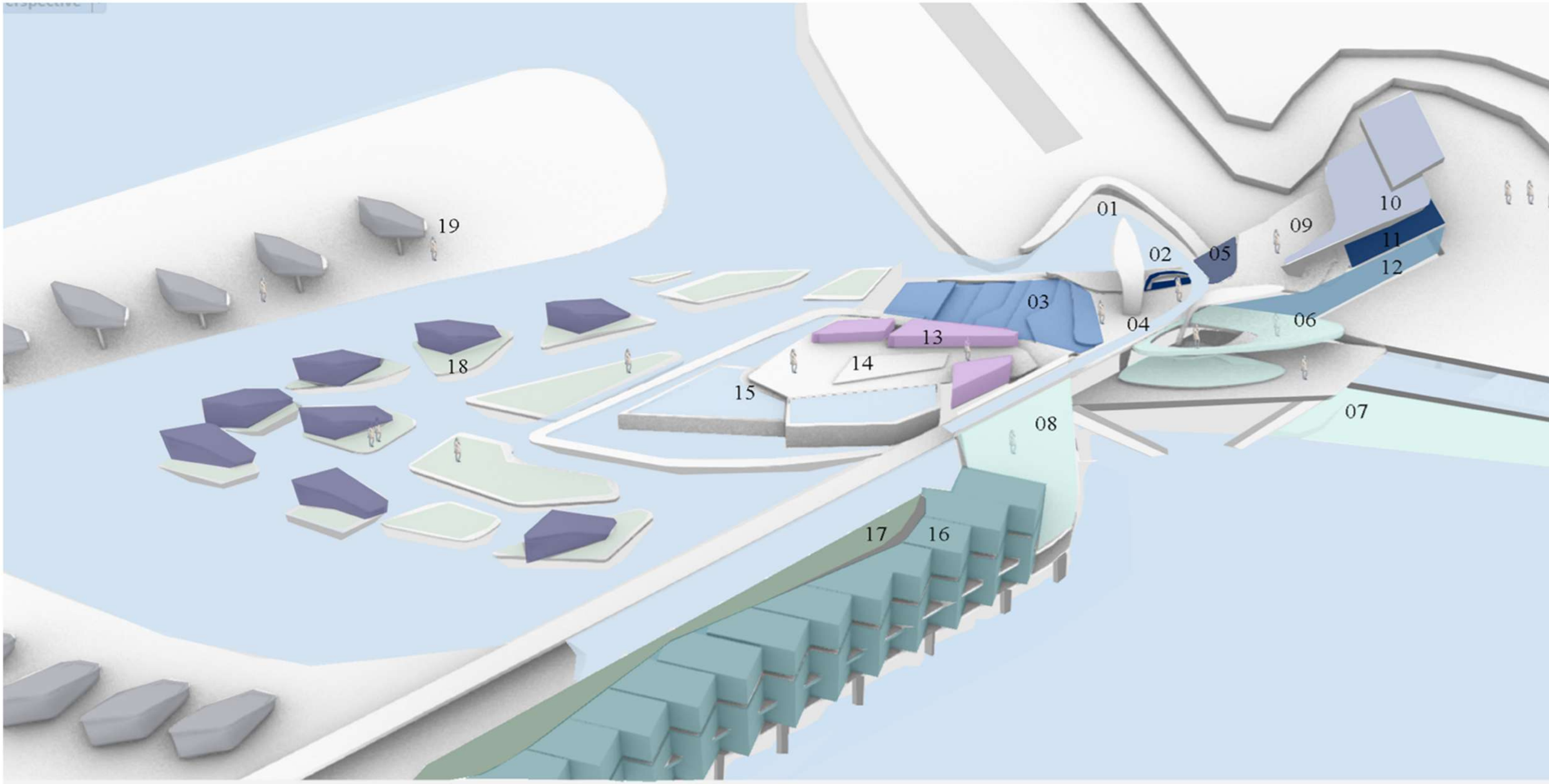
BUILDING LAYOUT STRATEGIES:



AXONOMETRIC VIEW:
BUILDING LAYOUT

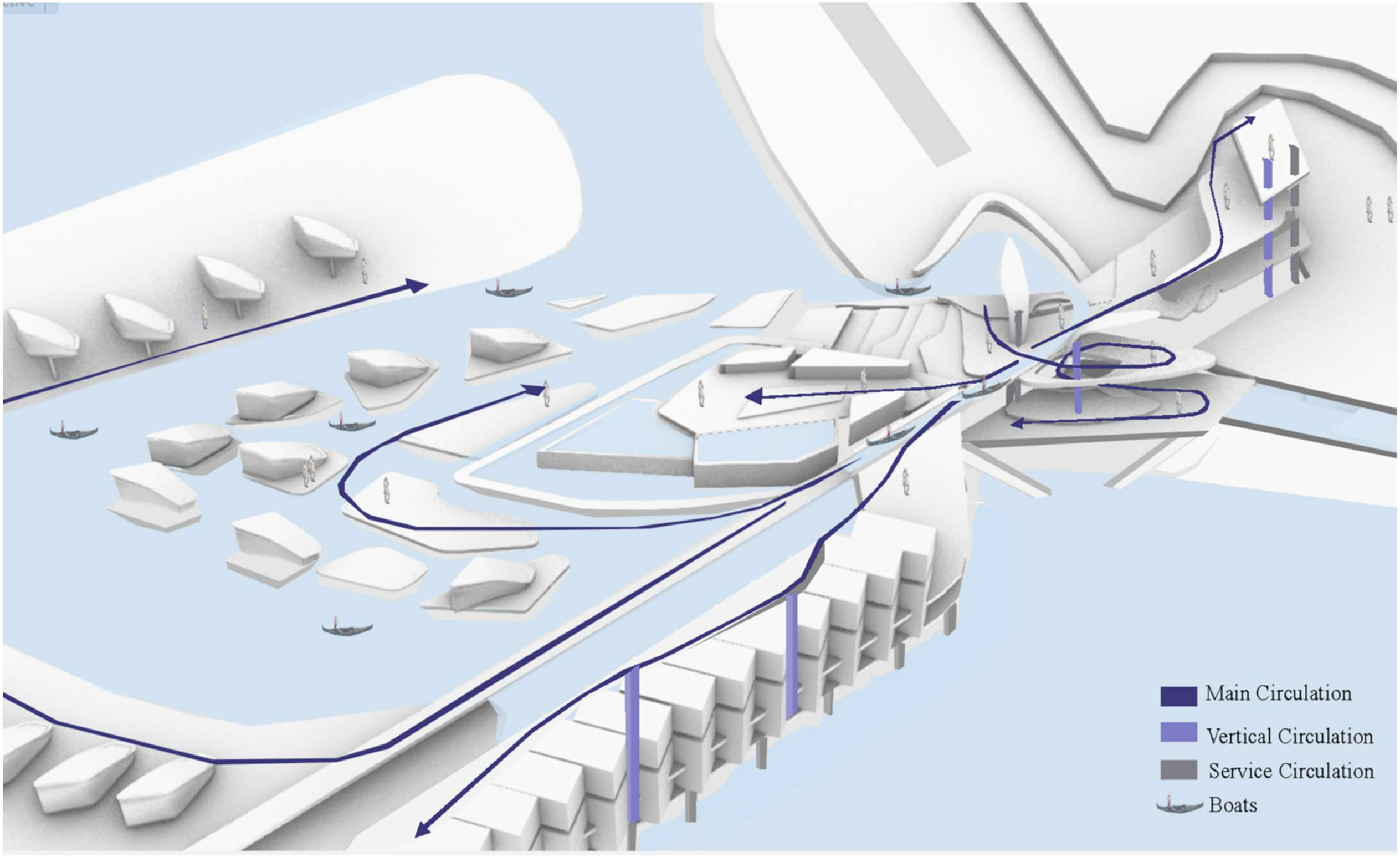


AXONOMETRIC INTERIOR PLAN DIAGRAM:
BUILDING LAYOUT

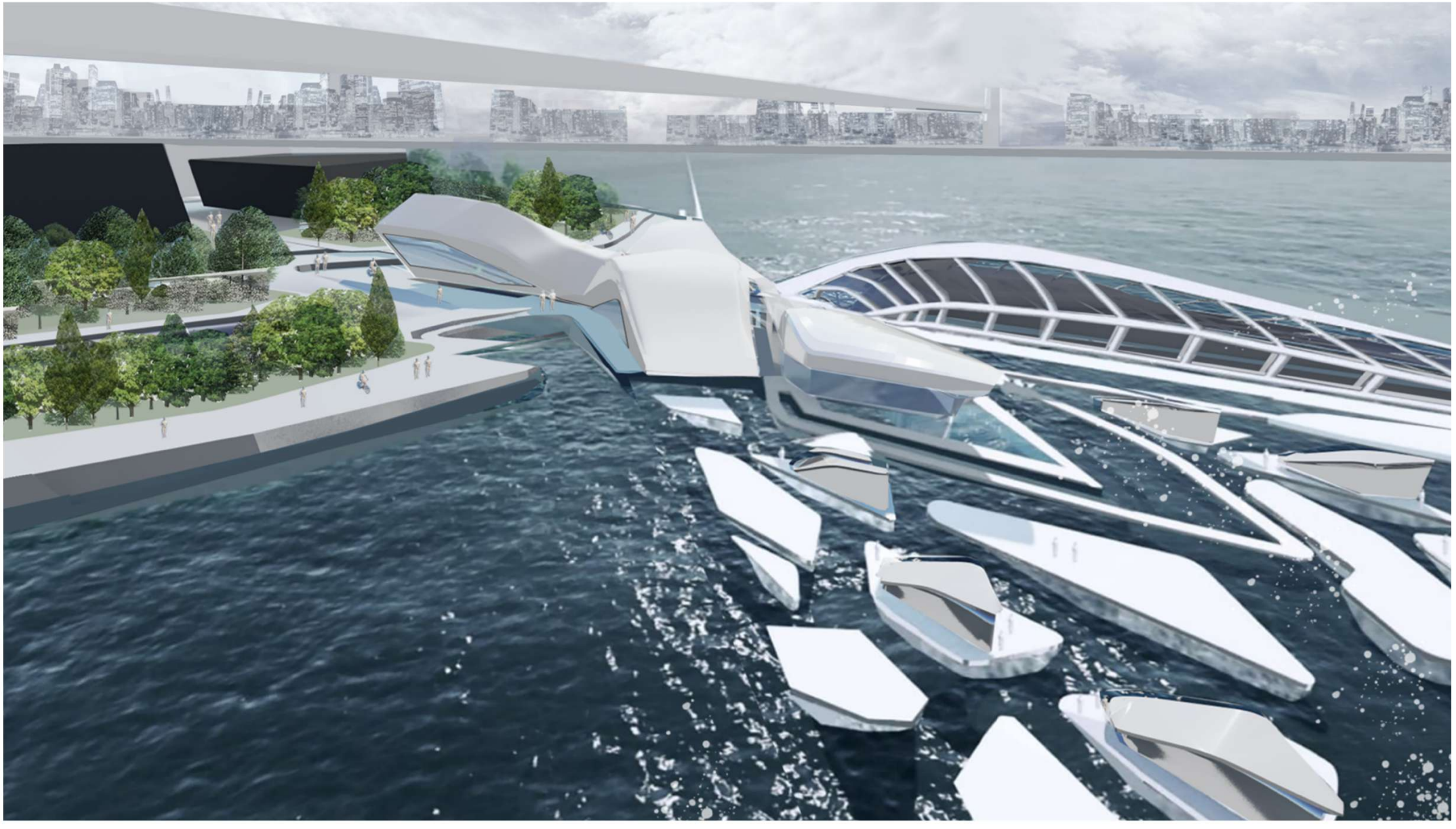


01 Entrance Harbor
02 Lobby Desk
03 Imax Lounge
04 Interior Canal
05 Administration
06 HydroplantTerrace/Machinery
07 Hydroplant Dam
08 Hydroplant Release Water
09 Atrium
10 Cafe/ Restaurant/Bar
11 Urban Entrance
12 Services
13 Gym, Hamam Relexation Units
14 Atrium
15 Pools
16 City and Forest Rooms
17 Private Gardens
18 Island Rooms
19 Treehouse Rooms

AXONOMETRIC INTERIOR CIRCULATION DIAGRAM:
BUILDING LAYOUT



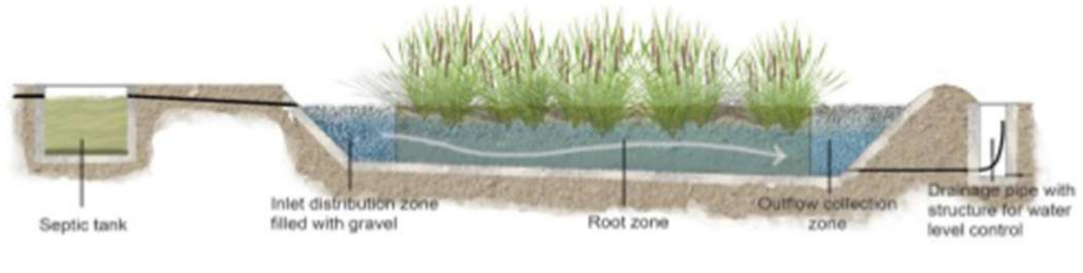
SOUTHERN ELEVATION :
BUILDING LAYOUT

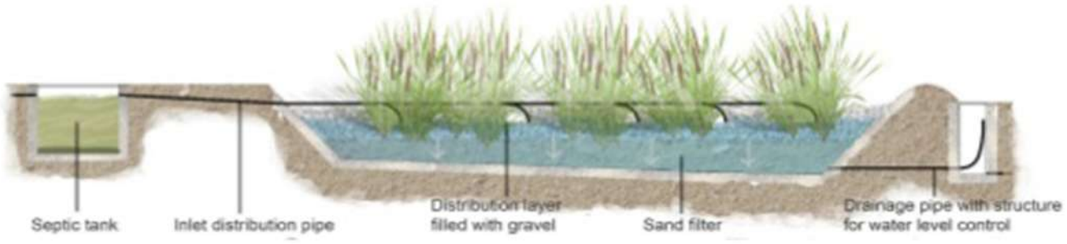


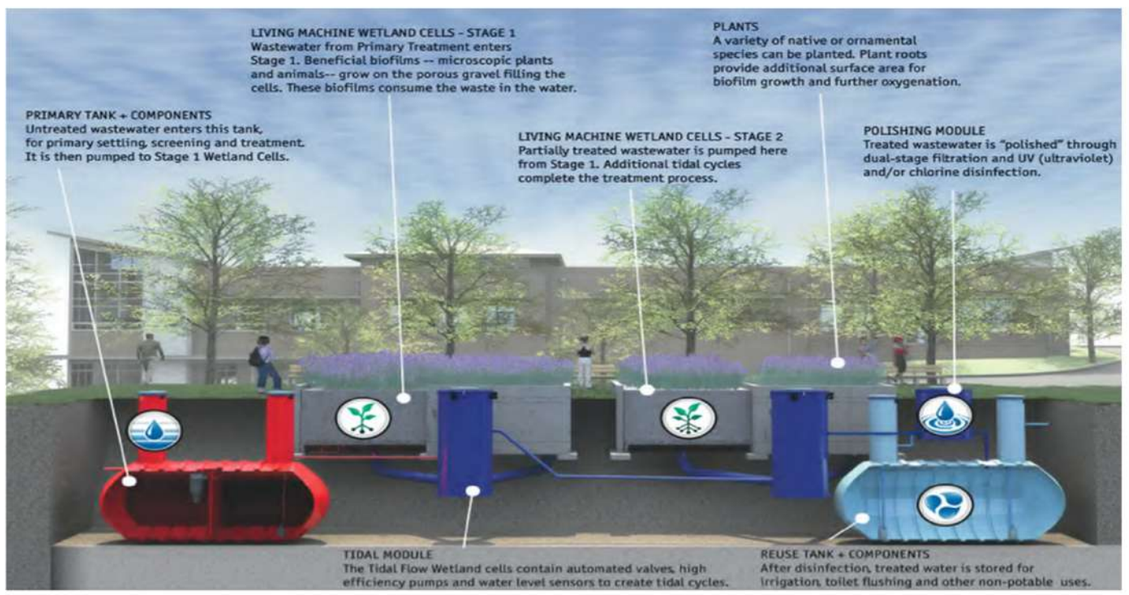
Southern Elevation showing the relationships between the building masses, the urban edge, the islands and hydroplant dam at the background. It narrates how the building has differently shaped in elevations according to different datas of the site.

WATER PURIFICATION AND WETLAND STRATEGIES:

LIVING MACHINES







The Living Machine System utilizes the latest technologies, and is engineered to mimic the ecology of natural wetlands. The system provides a lasting water solution by effectively treating and reusing wastewater through a series of wetland cells. These cells are filled with optimized gravel, which promotes the growth of a micro eco-system, resulting in a high quality reusable water. Living machines provide an opportunity for on-site water reuse and provides a living laboratory with on-site educational opportunities. It also utilizes all wastewater and produces high quality water that can be used to flush toilets, supply cooling towers, irrigation, and other non-drinkable situations. In addition, the living machine may save water in remote and drought prone areas. Attractive and effective foliage can be integrated in the interior and exterior of public spaces and the energy efficient design enables lower operation and maintenance costs. Overall,the technology has a smaller physical footprint and a lighter carbon footprint

How it works?

Water is pumped into a tank where debris settles and degrades as in the figure, then water flows into an equalization tank which determines the release into specially engineered gravel, sand, and plant boxes (wetland cells). Following this, different cells with different organisms eat and purify the black or grey water in order to remove the microscopic sediment. The water is then treated with ultraviolet light and is lightly chlorinated to meet suitable standards.

Why are wetlands valuable?

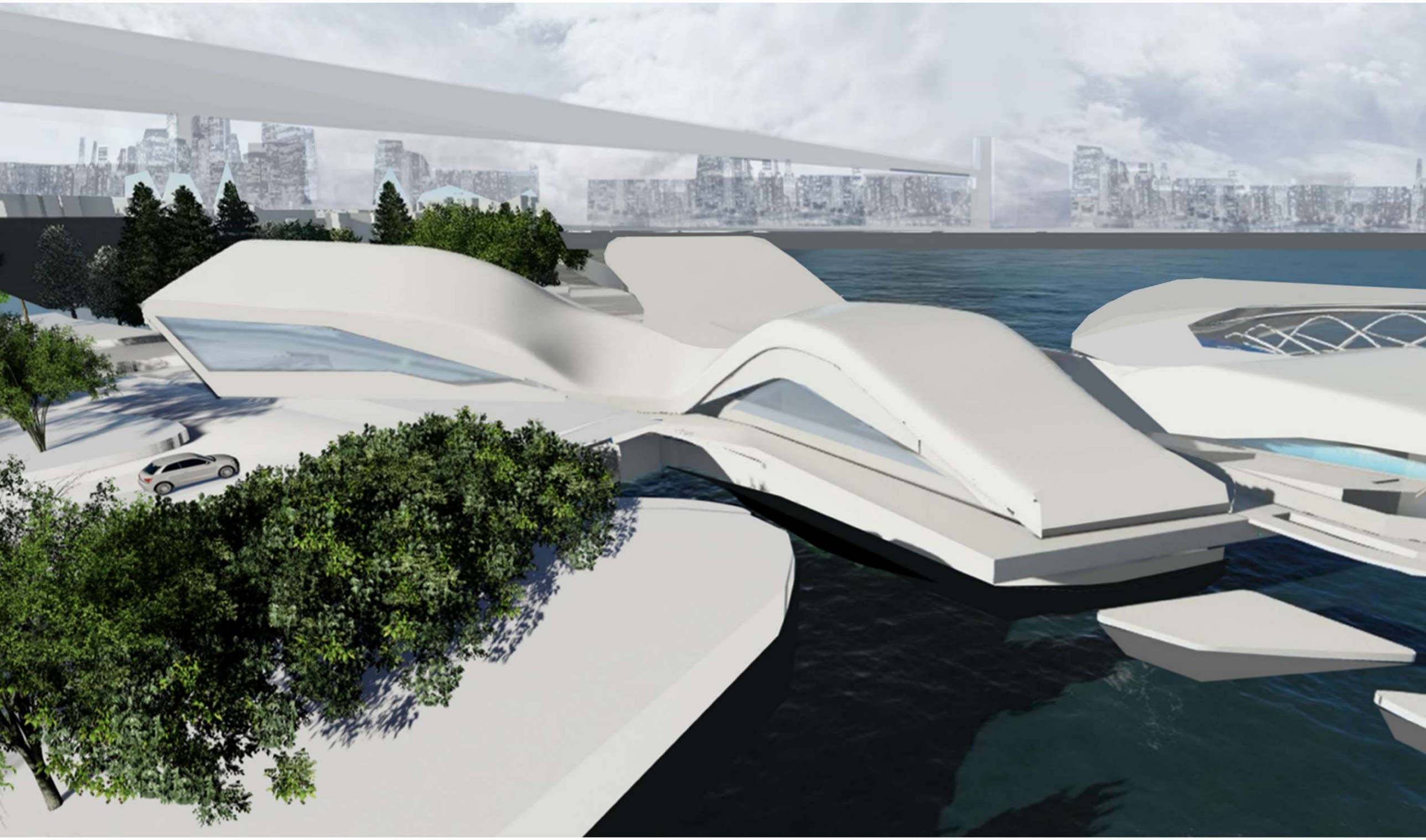
Economics :
A wide range of natural products are derived from wetlands such as fish and shellfish, blueberries and cranberries, timber, wild rice, and medicine and herbs from the soils and plants.

Aesthetics : Wetlands have recreational, historical, scientific, and cultural values. A total of $59.5 billion is spent annually in the U.S. towards hunting, fishing, bird watching and wildlife photography. People enjoy the fascination of being close to water, which results in hiking, boating, and other recreational activities.

Flood Protection: Flood is an important issue for the NYC and wetlands are a vital component in slowing down the speed of flood water in addition to the runoff from pavement and buildings. The sponge-like nature of the wetlands allows it to trap and slowly release surface water, rain, snow melt, groundwater and flood waters. Additionally, the roots of trees and other wetland vegetation absorb the water.Shoreline Erosion. The plants in wetlands hold the soil in place with their roots and help to slow down the flow of water from the currents. In coastal areas, wetlands are utilized to buffer the storm surges from hurricanes and tropical storms.

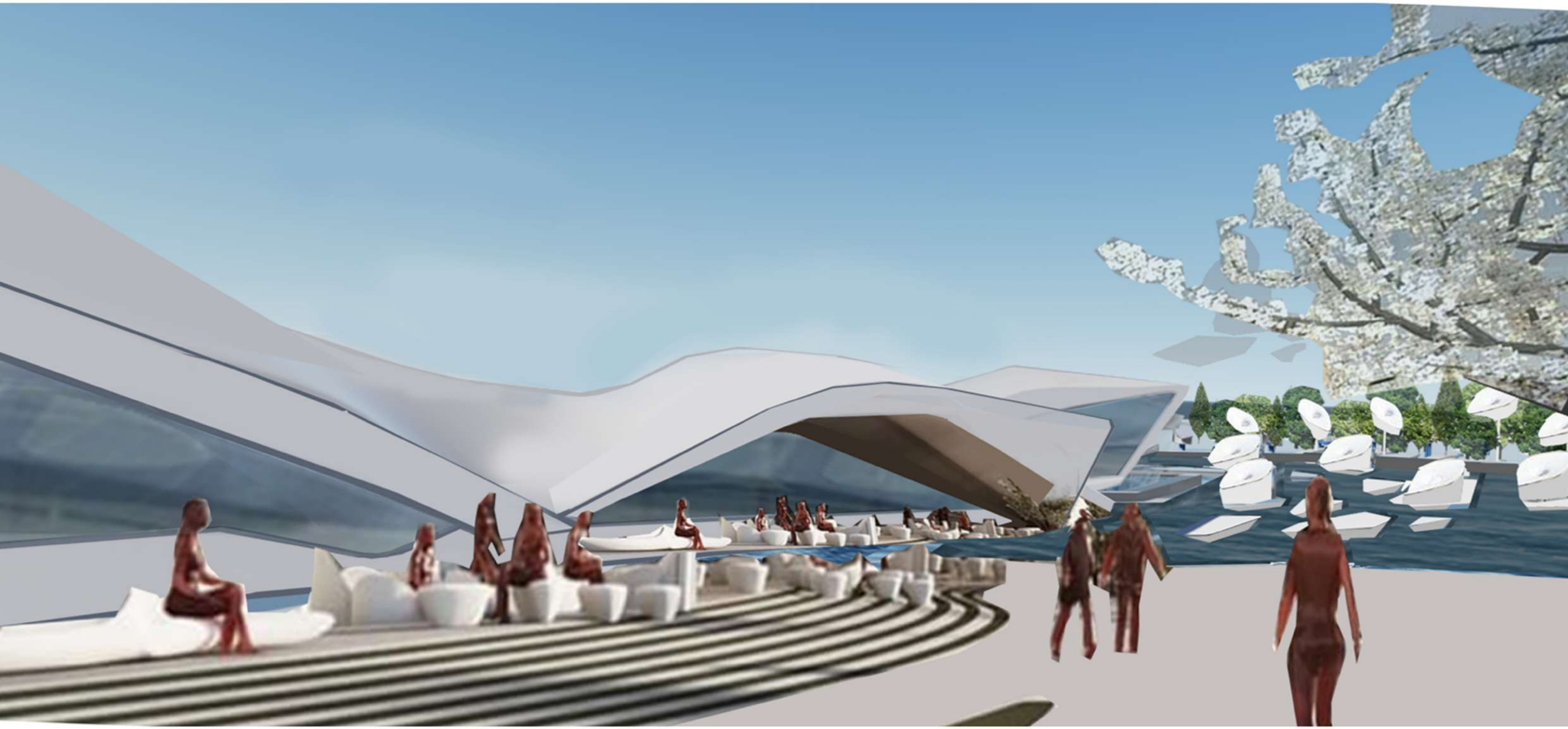
Water Quality: The filtering capabilities of wetlands enable the surface runoff to be cleaned and removed of contaminates before the water reaches open water. The wetlands retain excess nutrients and some pollutants, as well as reducing the sediment buildup that would clog the downstream waterways and harm the fish and egg development.

MAIN BUILDING ENTRANCE:
BUILDING LAYOUT



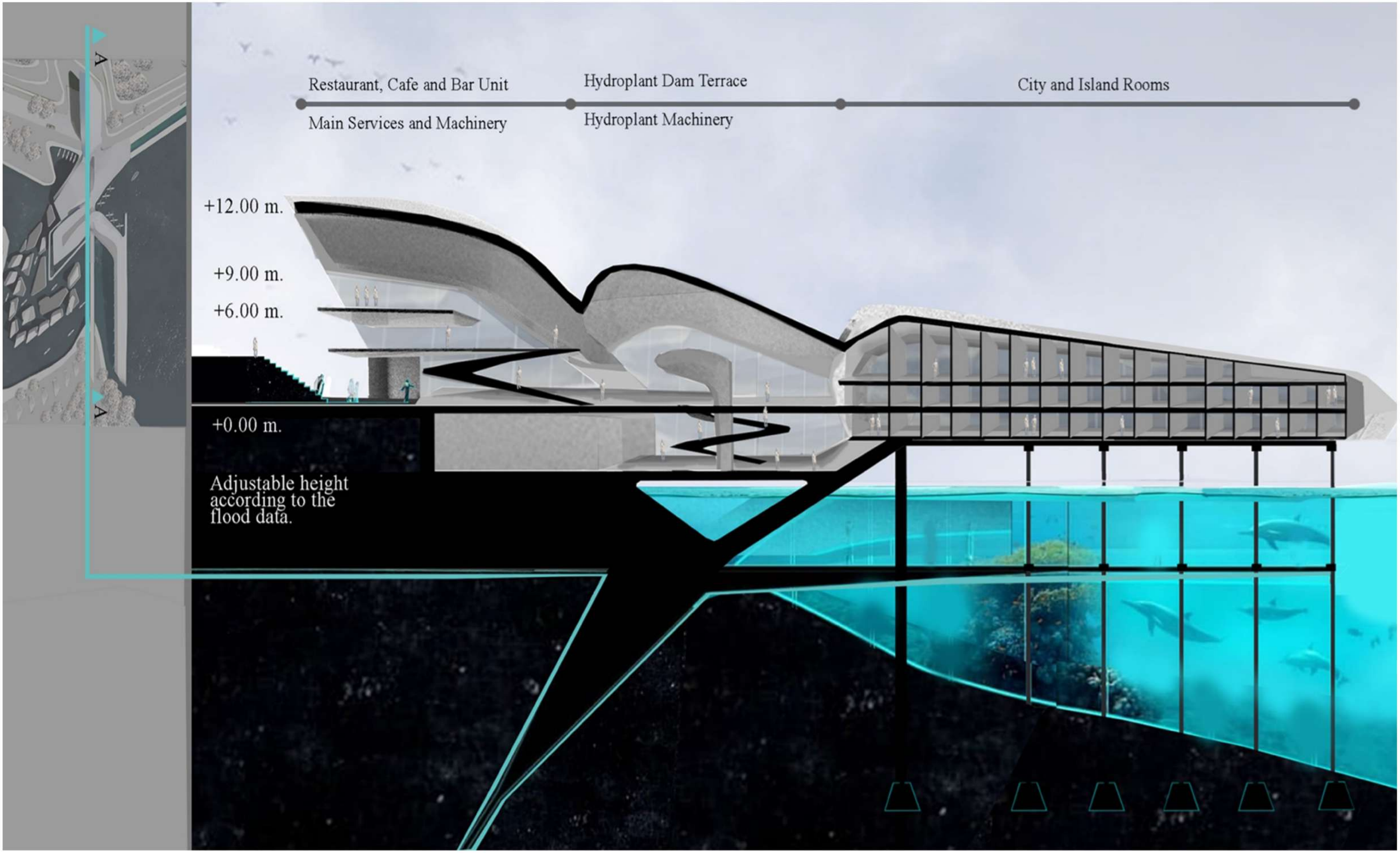
The closer elevation showing the building entrance and the building as a raised platform on the exterior look. How it is treated for the flood issues and water levels.

HUMAN EYE LEVEL BUILDING FRONT PLAZA:
BUILDING LAYOUT

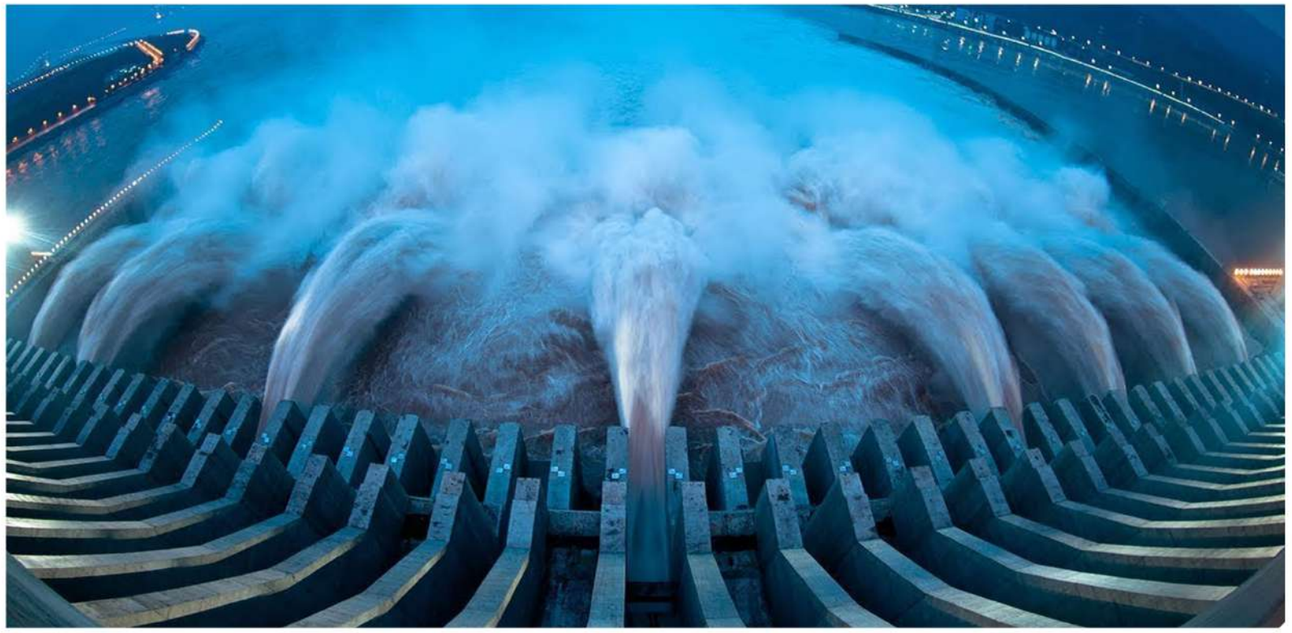


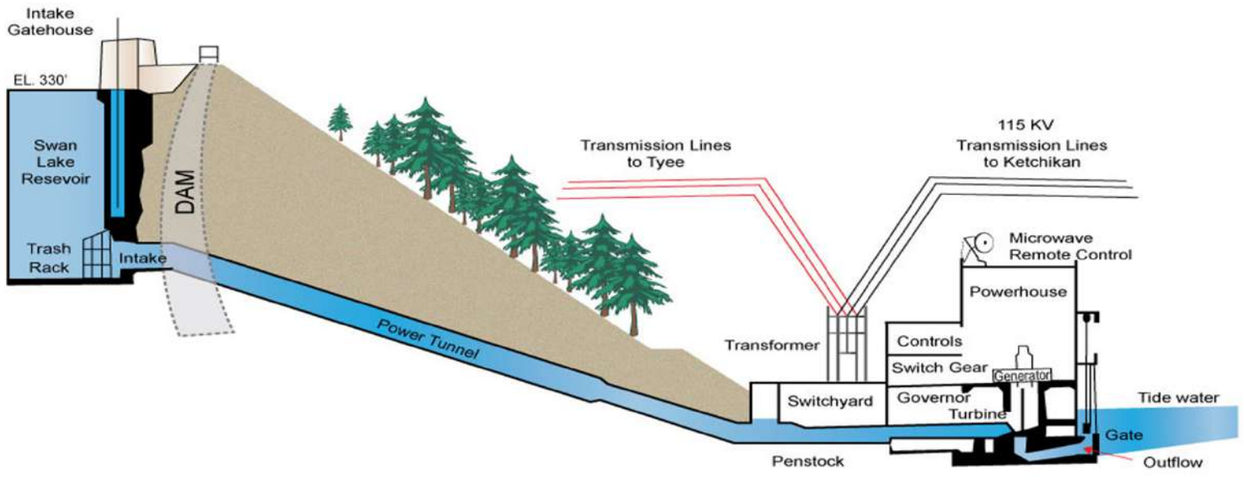
The closer elevation showing the building front plaza, urban furnitures, pavements, building skin, glazing systems, island-treehouse relationships and possible life in the entrance harbor.

LONGITUDINAL BUILDING SECTION :
DESIGN STRATEGIES



ENERGY PRODUCTION AND HYDROPLANT DAM STRATEGIES:
LIVING MACHINES





The starting point of the design considerations was the symbolic representation of the water dynamics, which change from a calm state at the water inlet to the churning and pitching of the water near to the turbines, before subsequently returning to a calm state after the electricity generation. Further associations included the river-washed rock formations in close proximity to the location of the power plant. The concept intended to connect the limit points machine room including turbines / generators and retention bar weir / rack cleaning with a continuous wrapping that dives underneath a historical steel framework of a former bridge for wires, in order to avoid its total demolition.

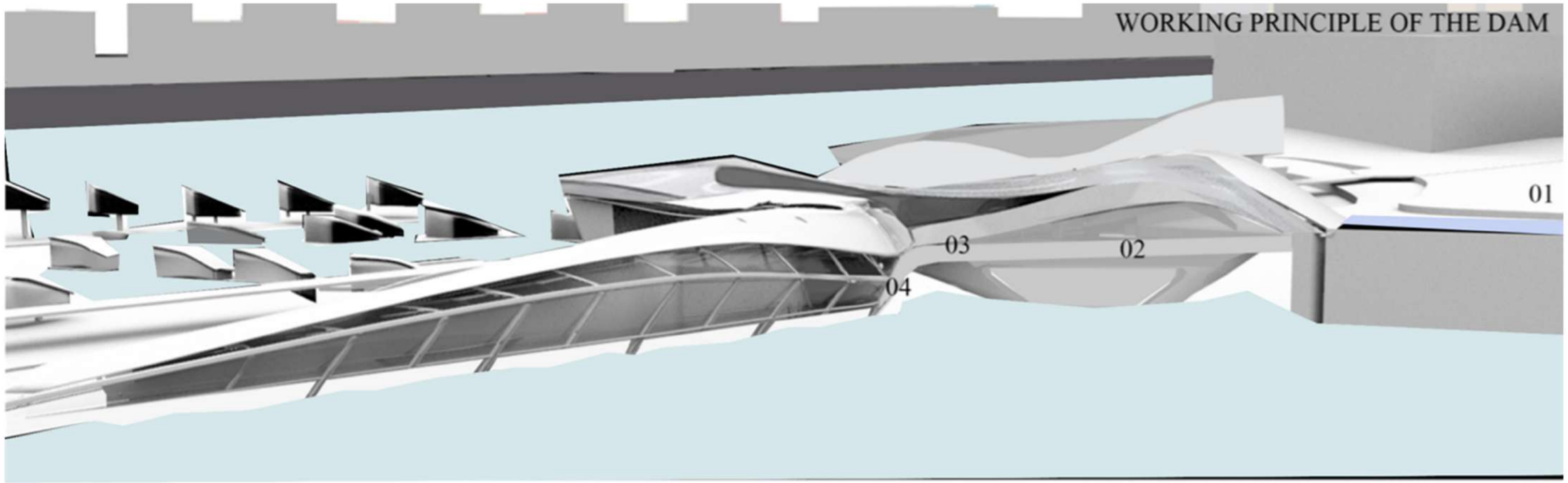
The softly shaped wrapping nestles against the technical underground engineering parts and creates thus space for many connotations, among them a smoothed river stone, a frozen wave or a stranded whale and so on. It`s quite interesting that each observer may be thinking about an own image for the building from different perspectives.

In close continuance of the underground construction the reinforced concrete wrapping is fitted on selective plate bearings with an adjustable flooding height from the water level in order to avoid deformation. In crosswise direction diagrid ribs stabilise the construction similar to the ribs of a boat, that is turned around. The structure that is like a skeleton generates a fascinating sequence of interior rooms, which are changing between dome dimensions and intimate sizes. All notches, that are technical essentially, were reduced as much as possible in order to reach a homogeneous appearance.

The three dimensional curved TiO2 skin was formed by rough planks in the interior and was protected by an economic spraying with gravel inlets on the exterior surfaces. Thus manifold reflections were generated, creating different appearances according to the changing weather and daylight. During the execution ecological issues like the integration of a fish ladder were considered and also things as for example airborne and structure.The interior lightning percolates through gaps and run in and run out jaws towards the exterior and provides an impressive orchestration for the flaneur.

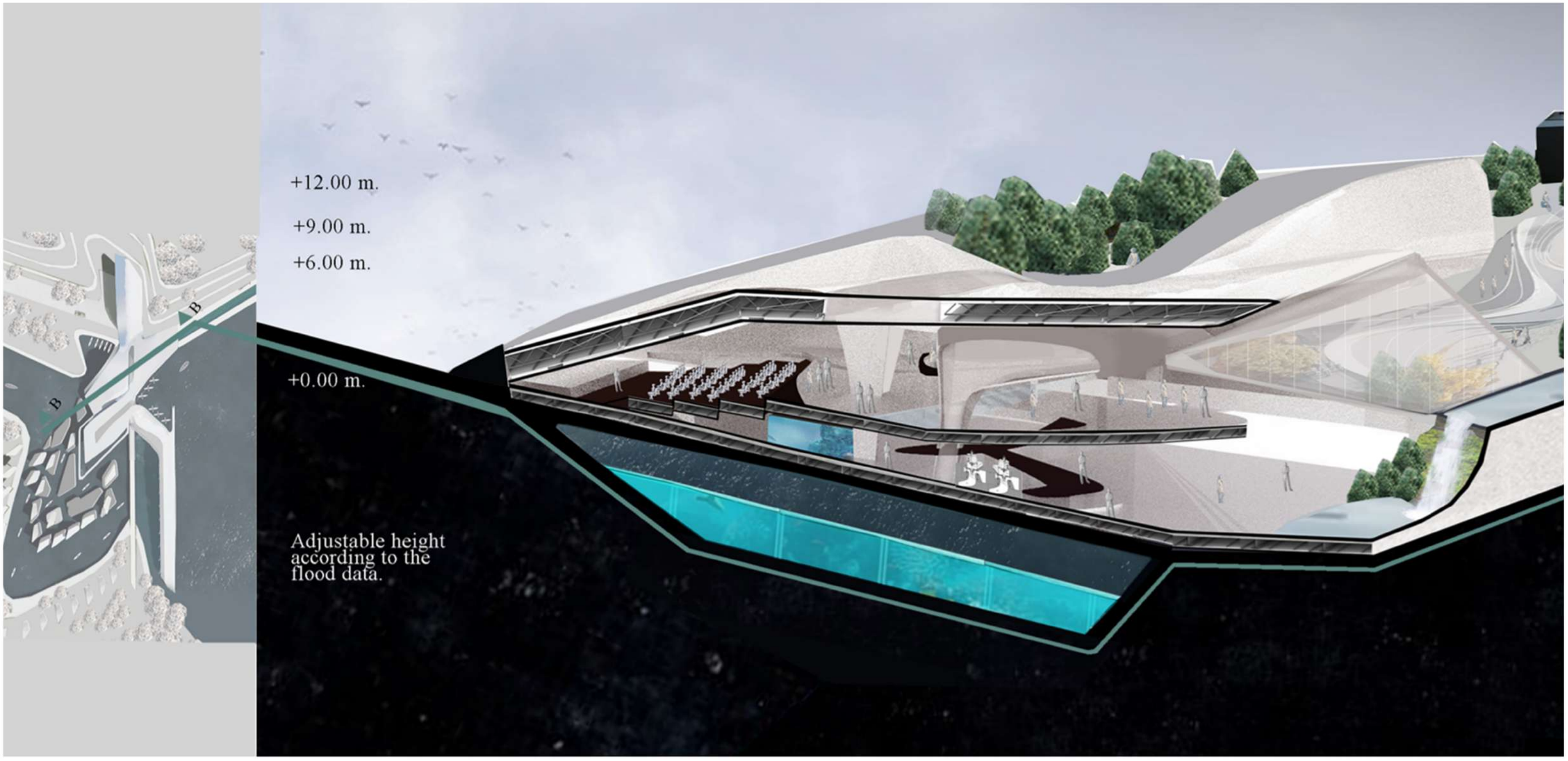
Despite the huge dimensions a very differentiated formation was created, that on the one hand assimilates the surroundings and on the other hand a self confident building is now existing, that will get part of a later public `hydro – power experience`. Public frequency is the consequence of a new continuous track for pedestrians and cyclists along the former weavery and provides an greater impulse for the further contribution of the city towards its river.

EASTERN ELEVATION AND HYDROPLANT DAM STRATEGIES:
LIVING MACHINES-WORKING PRINCIPLE OF THE DAM



Eastern Elevation showing how hydroplant dam works in comparison with the partial plan and elevation views.

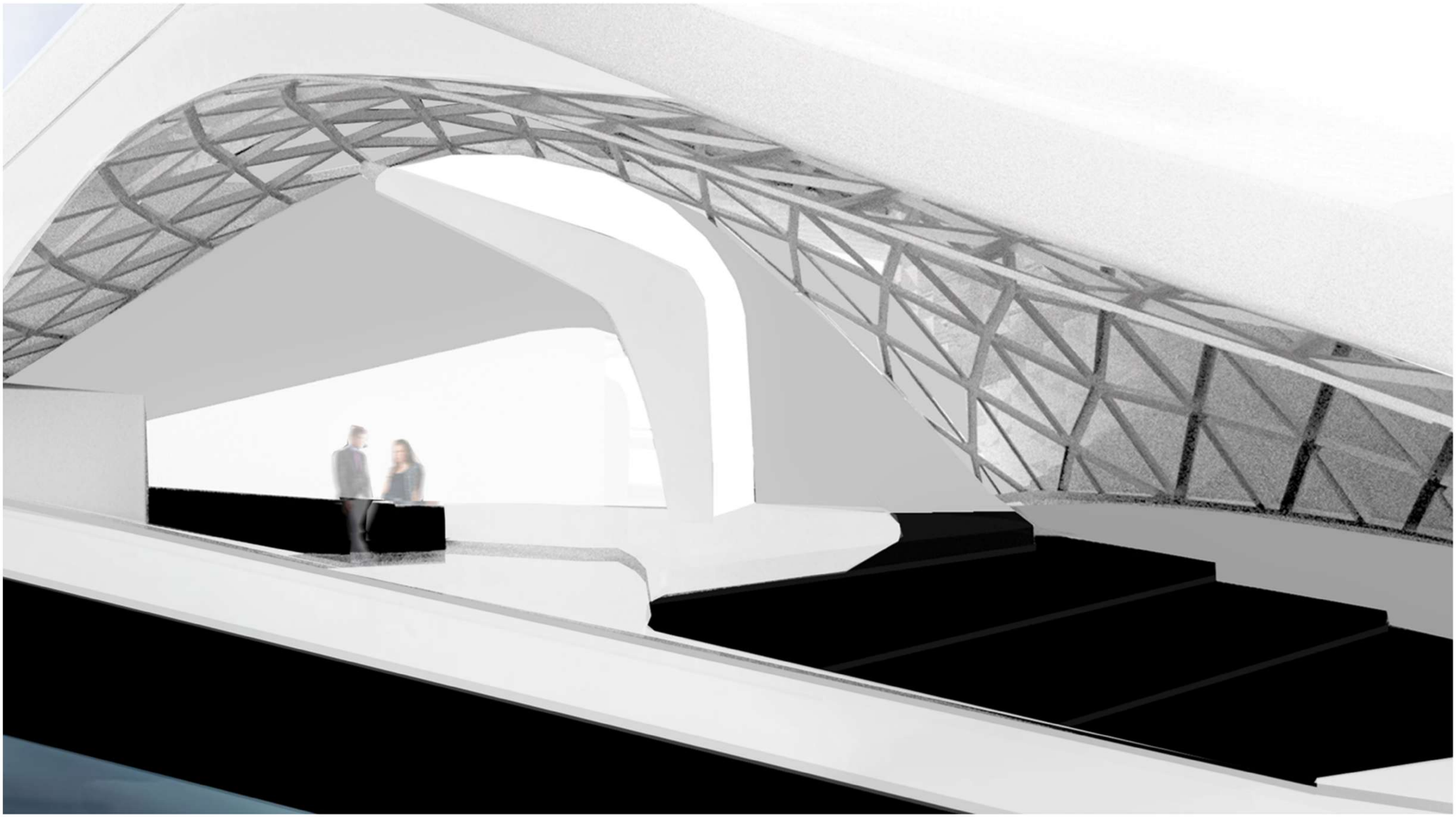
CROSS-SECTIONAL BUILDING SECTION :
DESIGN STRATEGIES



This section suggests another perspective by the introduction of the interior spaces and the relationship between these interior spaces. It narrates how the interior life cıntinues in the building showing the lobby, Imax theatre, Hydroplant Dam terrace, Hydroplant Dam, Aquarium unit, first part of the machinery place and the adjustable height accırding to the flooding data.

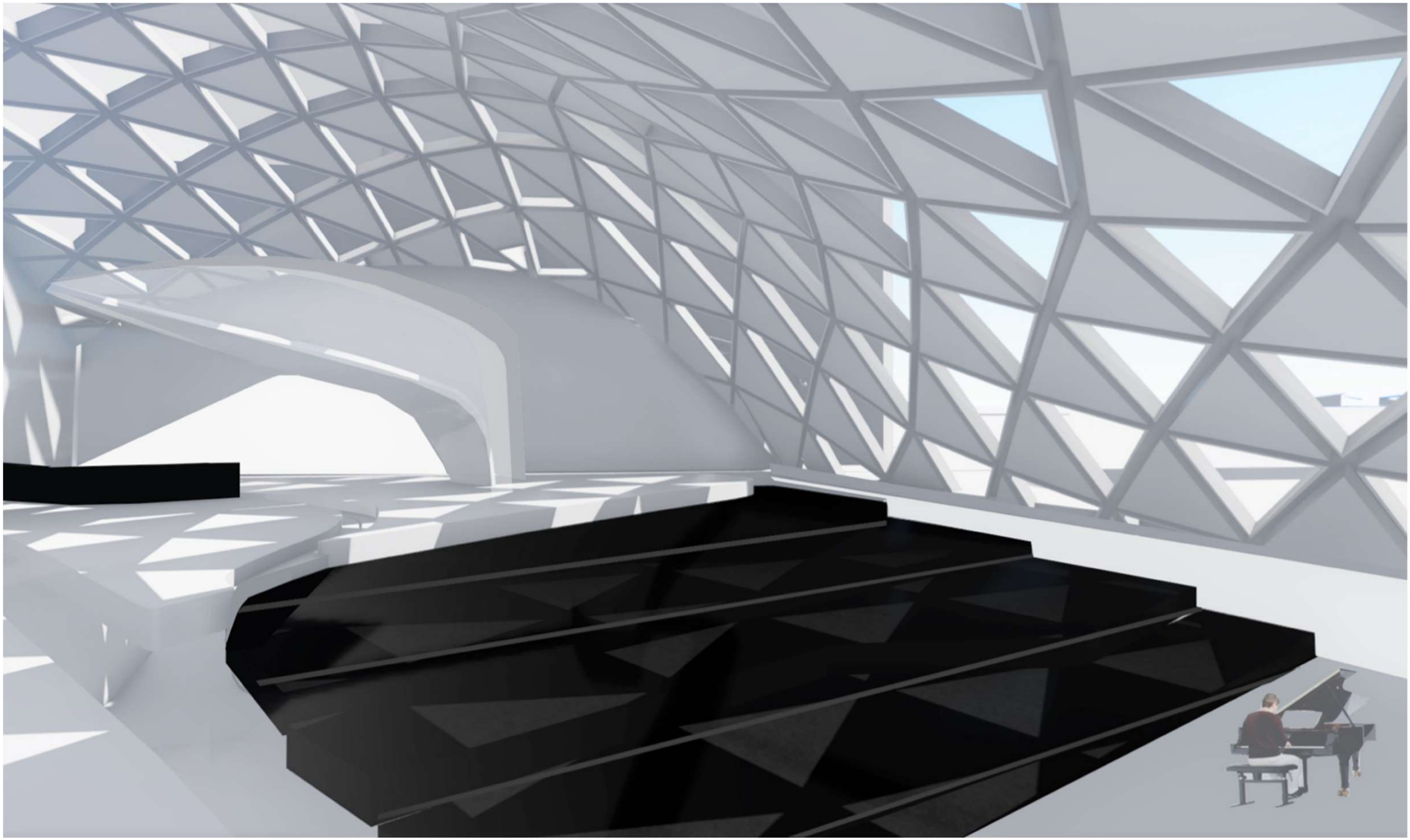
INTERIOR SPACE-MAIN BUILDING ENTRANCE

INTERIOR DESIGN STRATEGIES



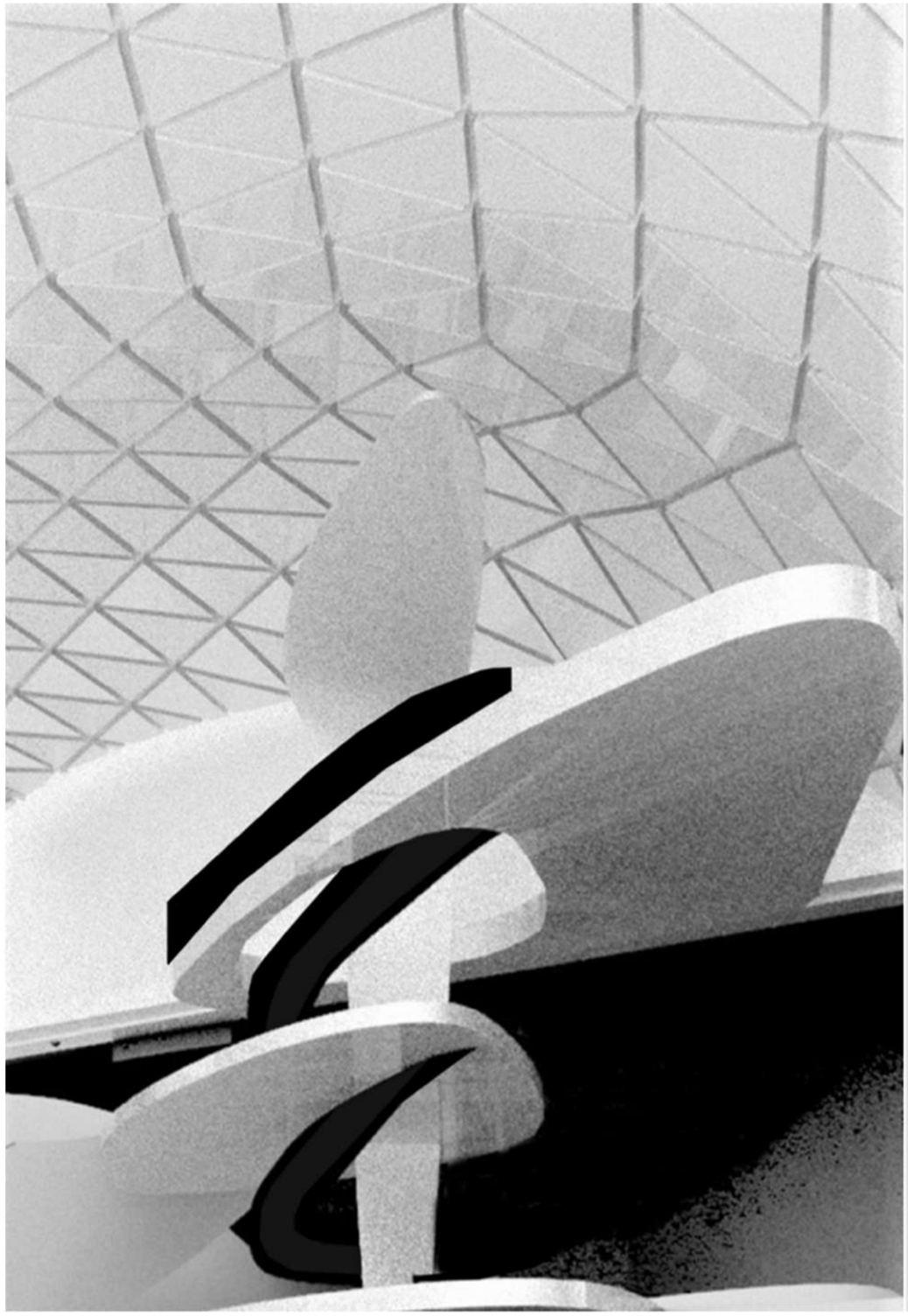
The Section render narrates how to approach to the building from exterior space, the double skin treatment in the building and how the interior design is directed under the double skined dome showing building structure web, lobby desk, stack effect tower, sitting steps and main scene.

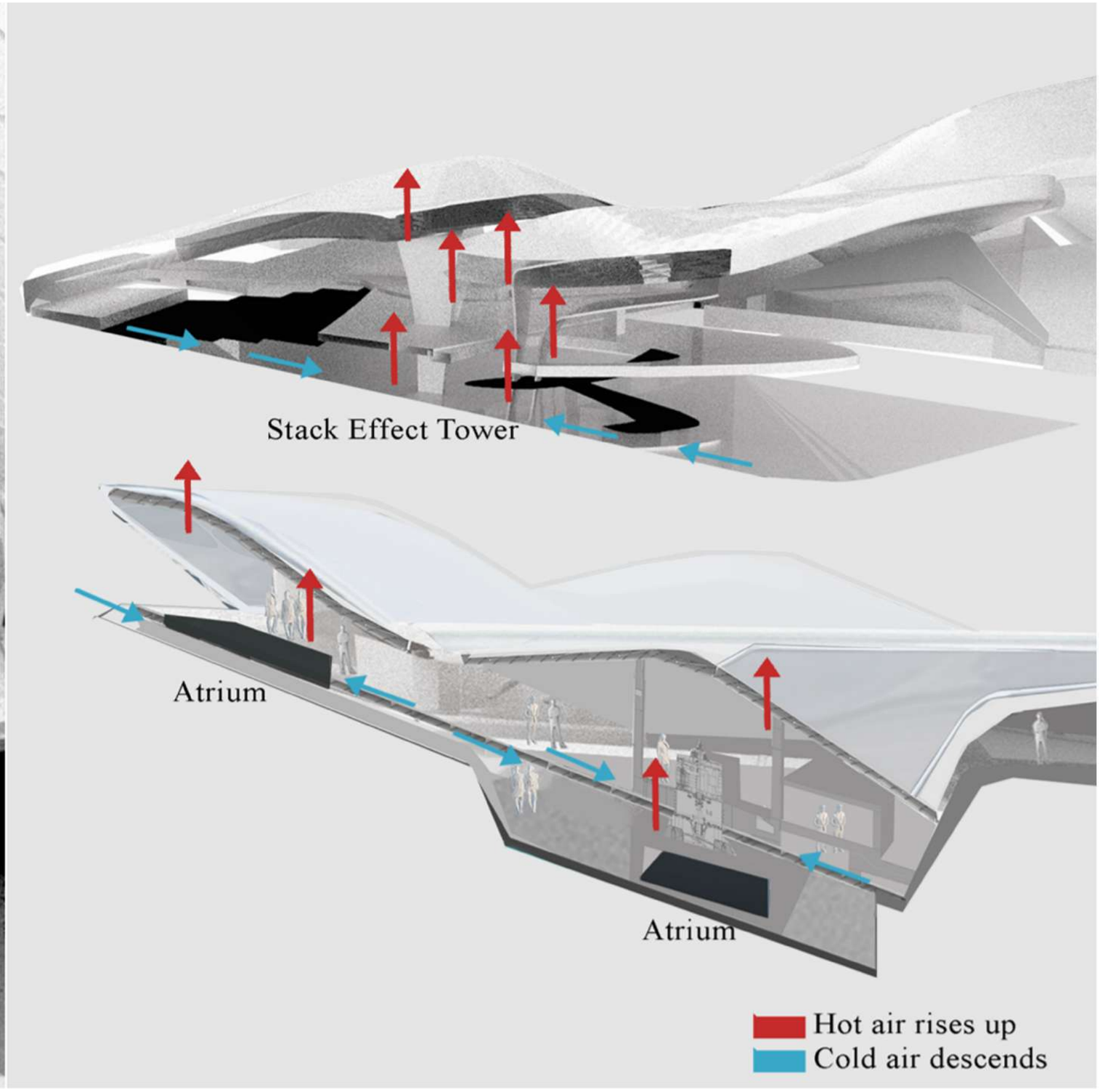
IMAX LOUNGE :
INTERIOR DESIGN AND LIGHTING STRATEGIES



The Imax Lounge renders narrates the double skin treatment in the building and how the interior design is directed under the double skined dome showing building structure web, lobby desk, stack effect tower, sitting steps and main scene. Although it is not revealed on the exterior, the building structure is revealed in interiors.

STACK EFFECT TOWER-HYDROPLANT DAM TERRACE
INTERIOR DESIGN STRATEGIES

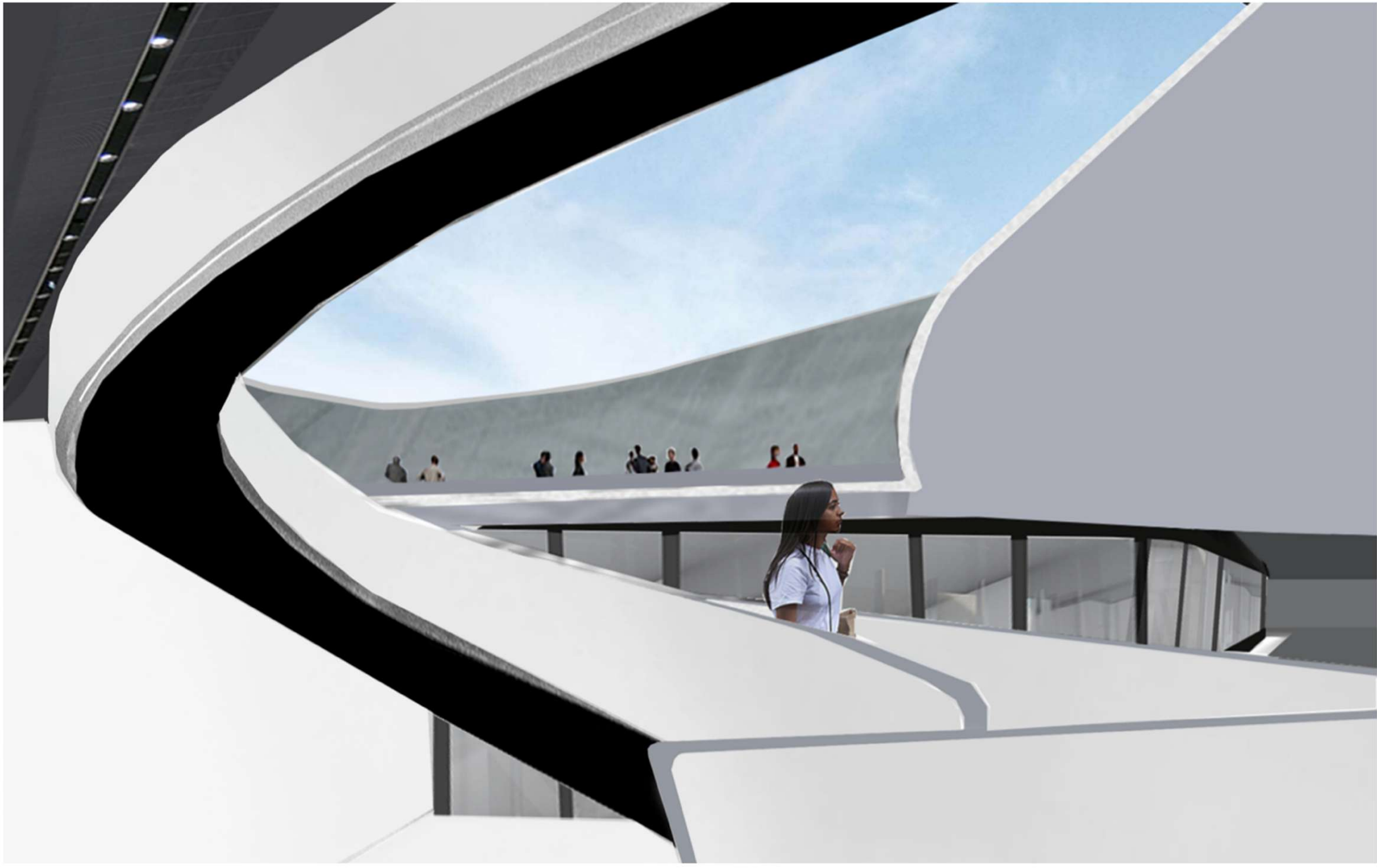




Stack Effect Tower render narrates one of the main elements of interior design-the stack effect towers also showing the hydroplant dam terraces, vertical circulation and building structure. Cold air descends and hot air rises up through the stack effect towers providing interior ventilation and sustainable building strategies.

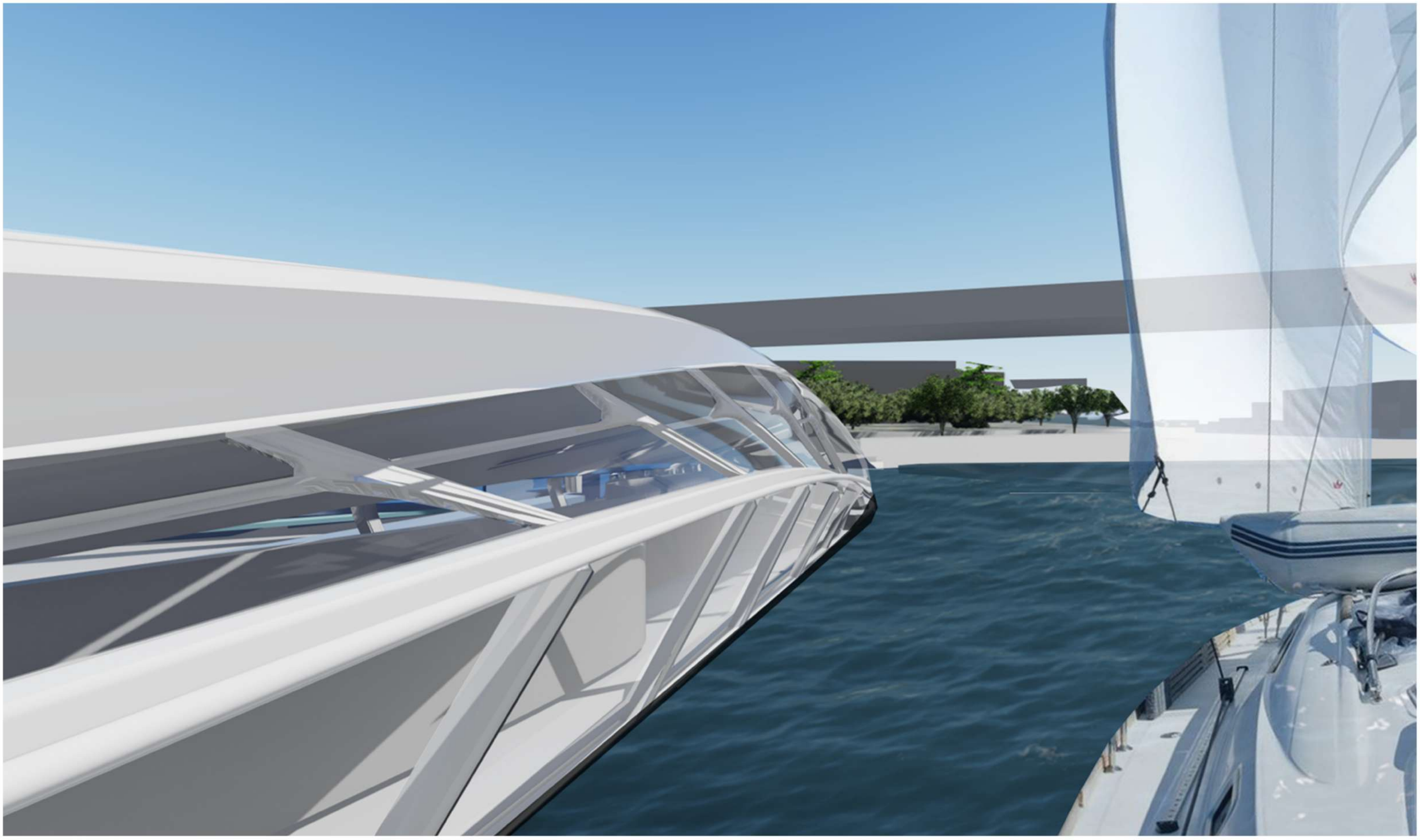
CAFE-RESTRAURANT-BAR PLACE VERTICAL RAMP

INTERIOR DESIGN STRATEGIES



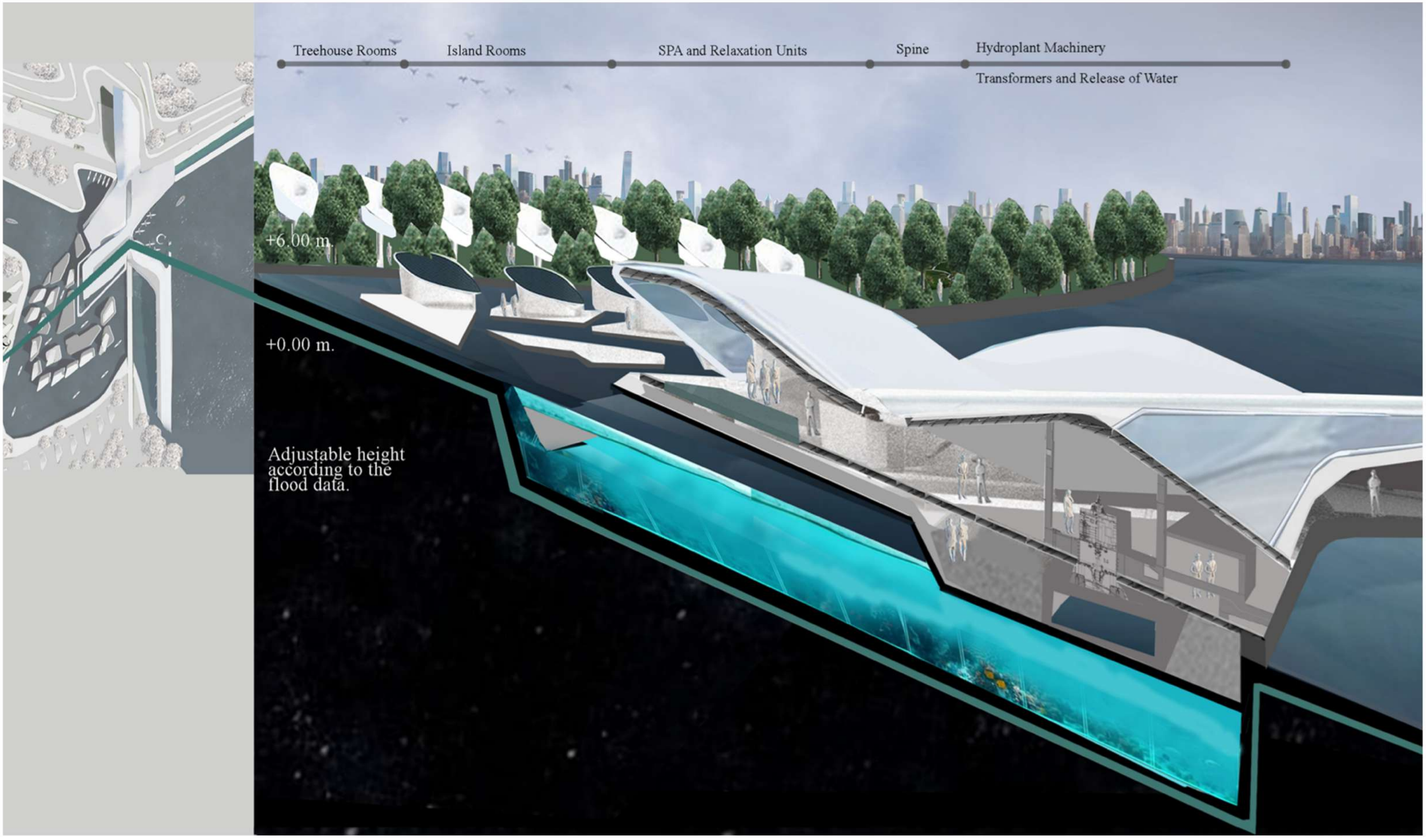
This render narrates one of the main elements of interior design-vertical ramps also showing a window to cafe-restaurant-bar place and administration pla
at the background.

CITY AND ISLAND ROOMS
DESIGN STRATEGIES



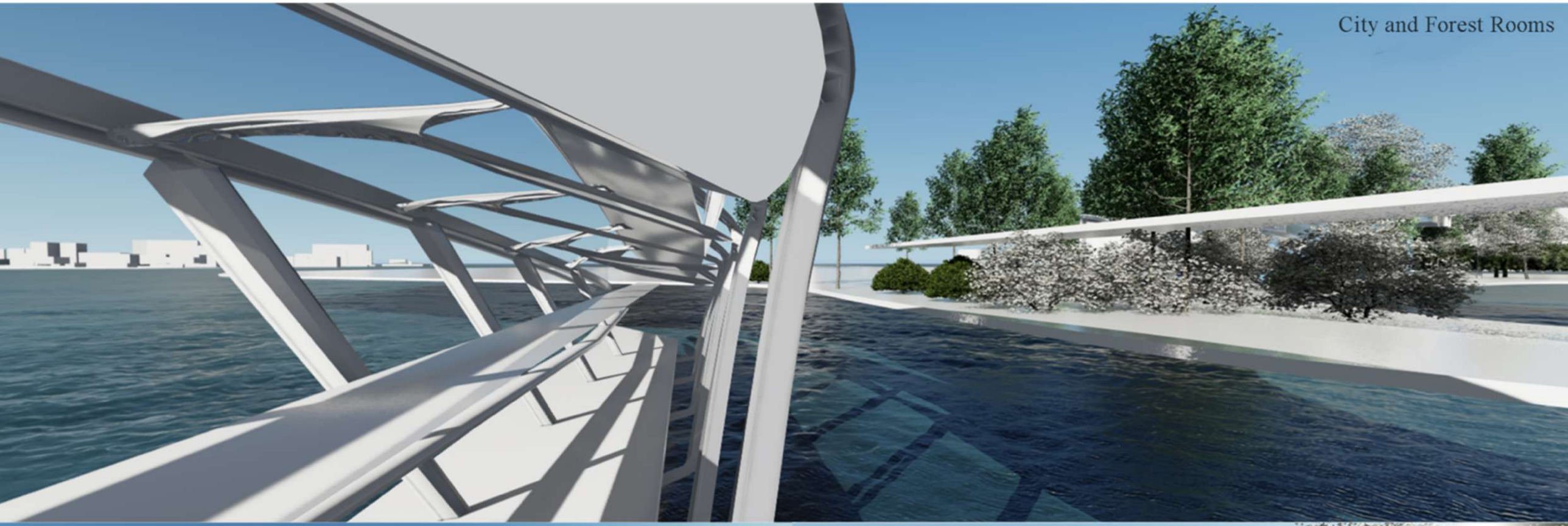
The render narrates a human eye view from the boat focusing on the exterior building structure of city and island room place.

CROSS-SECTIONAL BUILDING SECTION:
DESIGN STRATEGIES



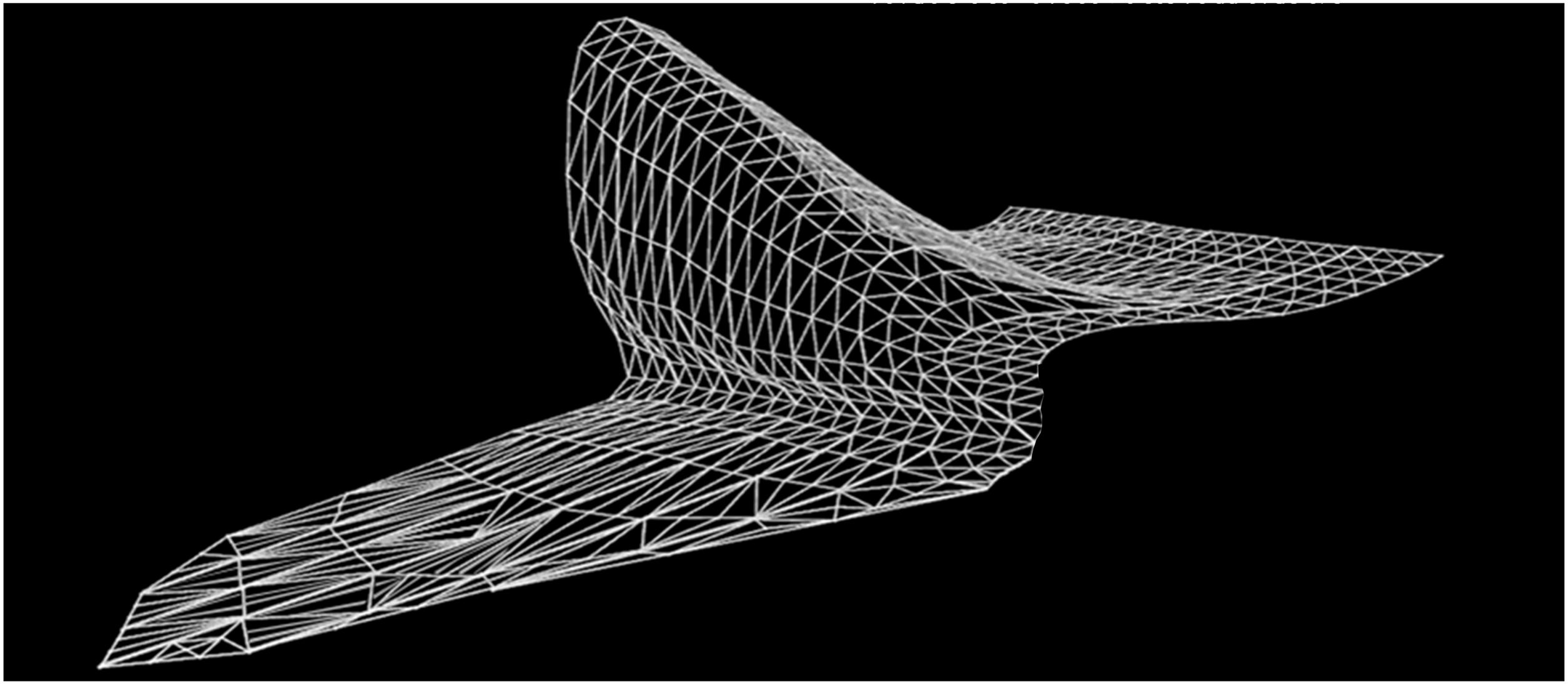
The cross-sectional section view showing the relationship between main spa-relaxation space and island-treehouse rooms in addition to the release of water at the right handside.

HOTEL ROOMS
INTERIOR DESIGN STRATEGIES



The rendering demonstrates the interior view of city and iskand rooms in addition to island room and treehouse rooms exterior

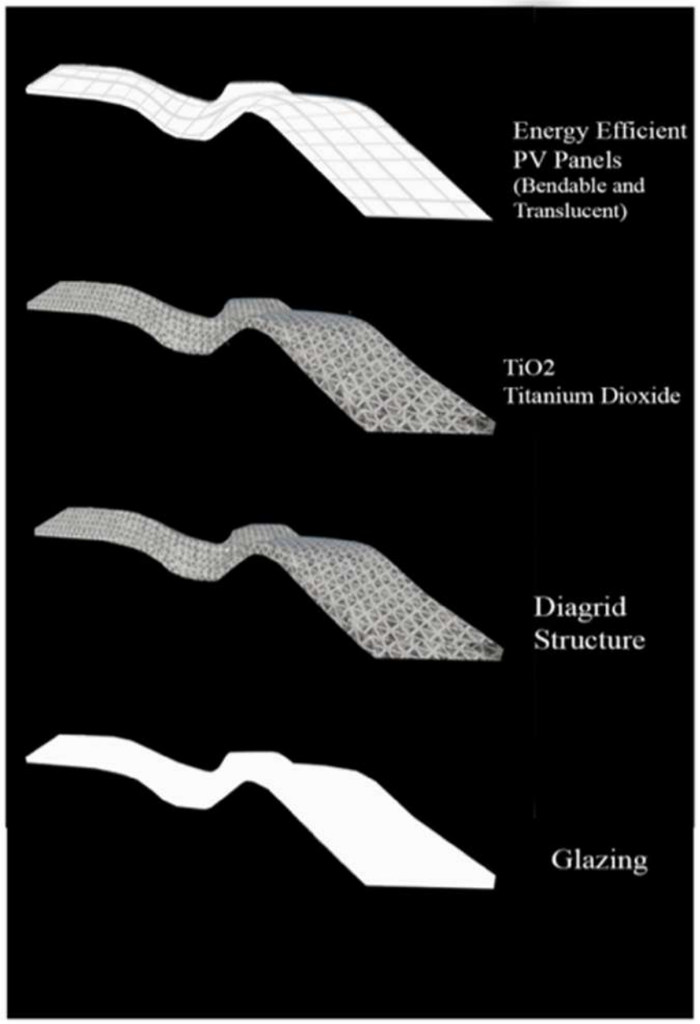
DIAGRID WEB SYSTEM AS THE MAIN BUILDING STRUCTURE
BUILDING STRUCTURE STRATEGIES

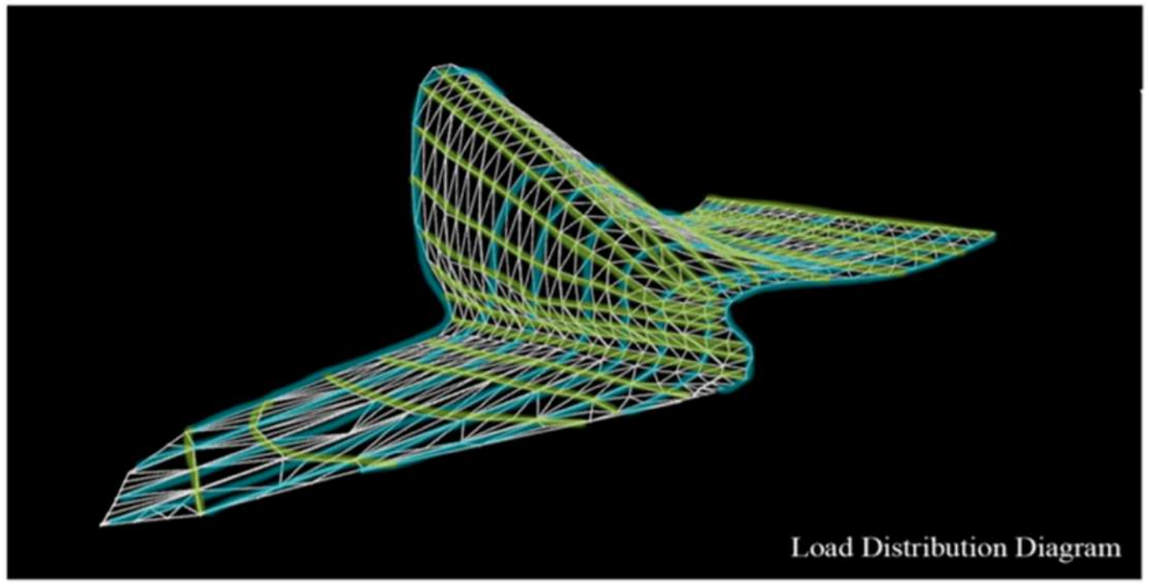


Diagrids are the system of triangulated beams, straight or curved, and horizontal rings that together make up a structural system. Similar in idea and execution to a typical moment frame just more evolved. The diagrid system offers several advantages in addition to eliminating perimeter columns. Most notably it optimizes each structural element. Diagonals or braces provide stability and resistance to large forces, such as wind and seismic loads. But Rahimian [structural engineer for the Hearst Tower] says that diagonals and braces ‘want’ to participate in the vertical load transfer, and their members work in both tension and compression to transfer the loads one another. In a diagrid system the two functions are married, he says. ‘The columns and diagonals and bracings are all one’. Furthermore, in addition to main structural system TiO2 environment cleaning building skin panels, building insulations, dropped ceiling systems, steel floor structure, open web floor systems, raised platform structure for flood data, and water based foundation system burried in the beneath concrete are also used as building systems in the hotel.

MATERIAL AND STRUCTURAL ANALYSIS
BUILDING STRUCTURE STRATEGIES

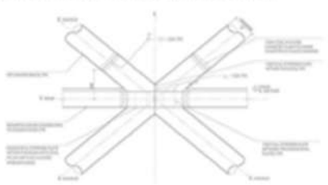
METAL DIAGRIDS AS THE MAIN STRUCTURAL SYSTEM

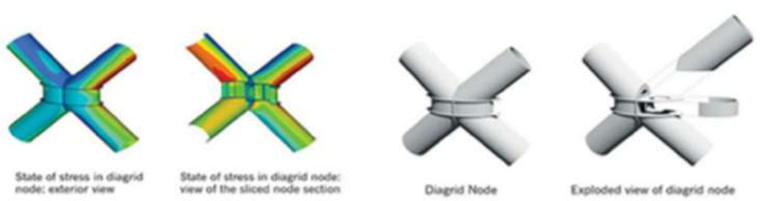




Load Distribution Diagram

SYSTEM DETAILS:





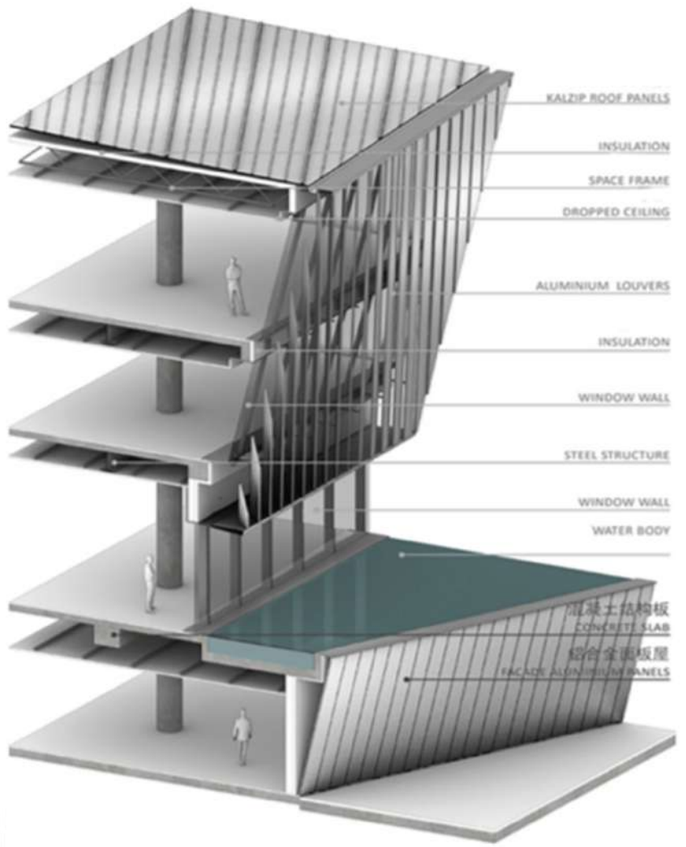
State of stress in diagrid node: exterior view

State of stress in diagrid node: view of the sliced node section

Diagrid Node

Exploded view of diagrid node

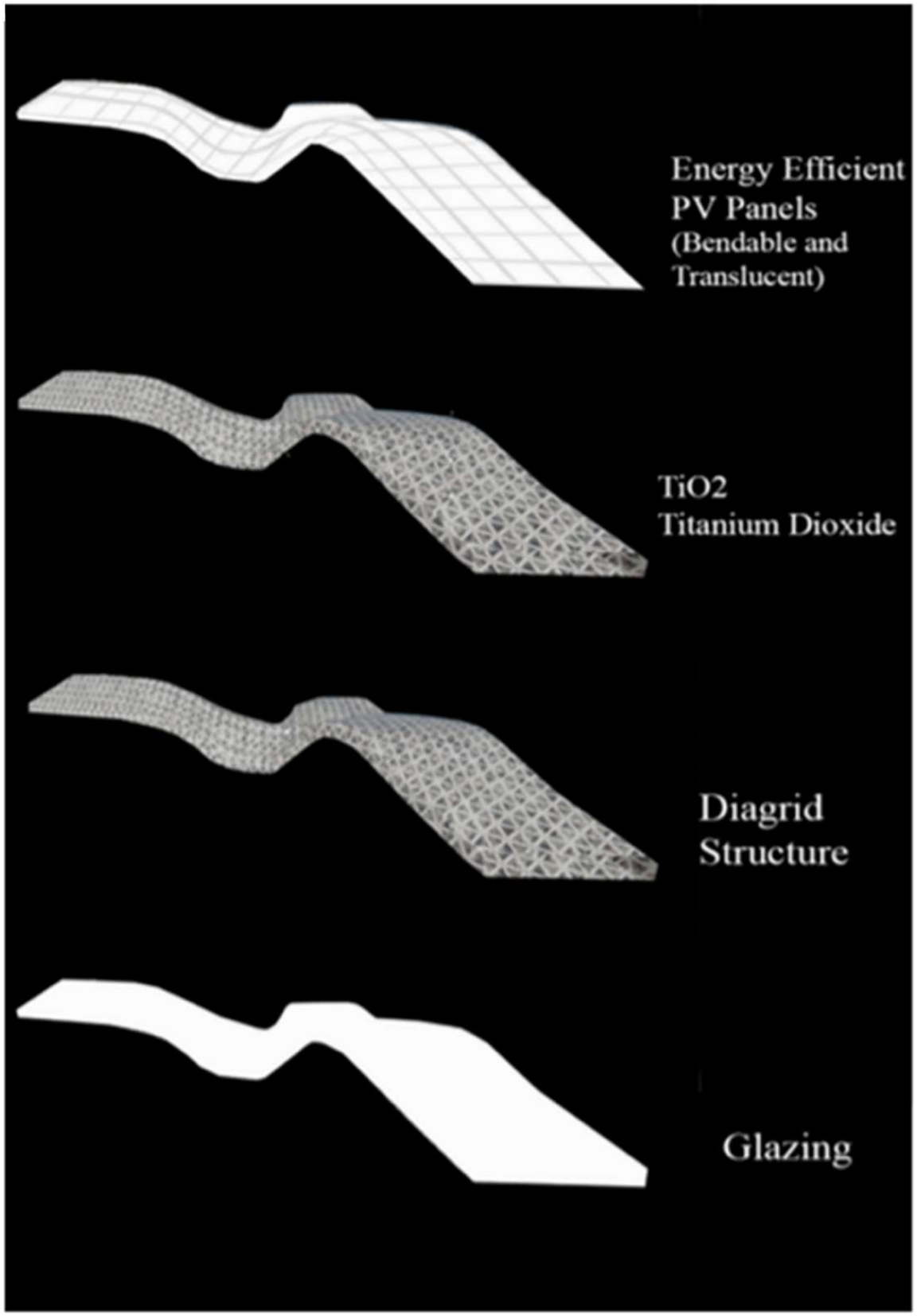
CASE STUDIES AND CONSTRUCTION METHODS

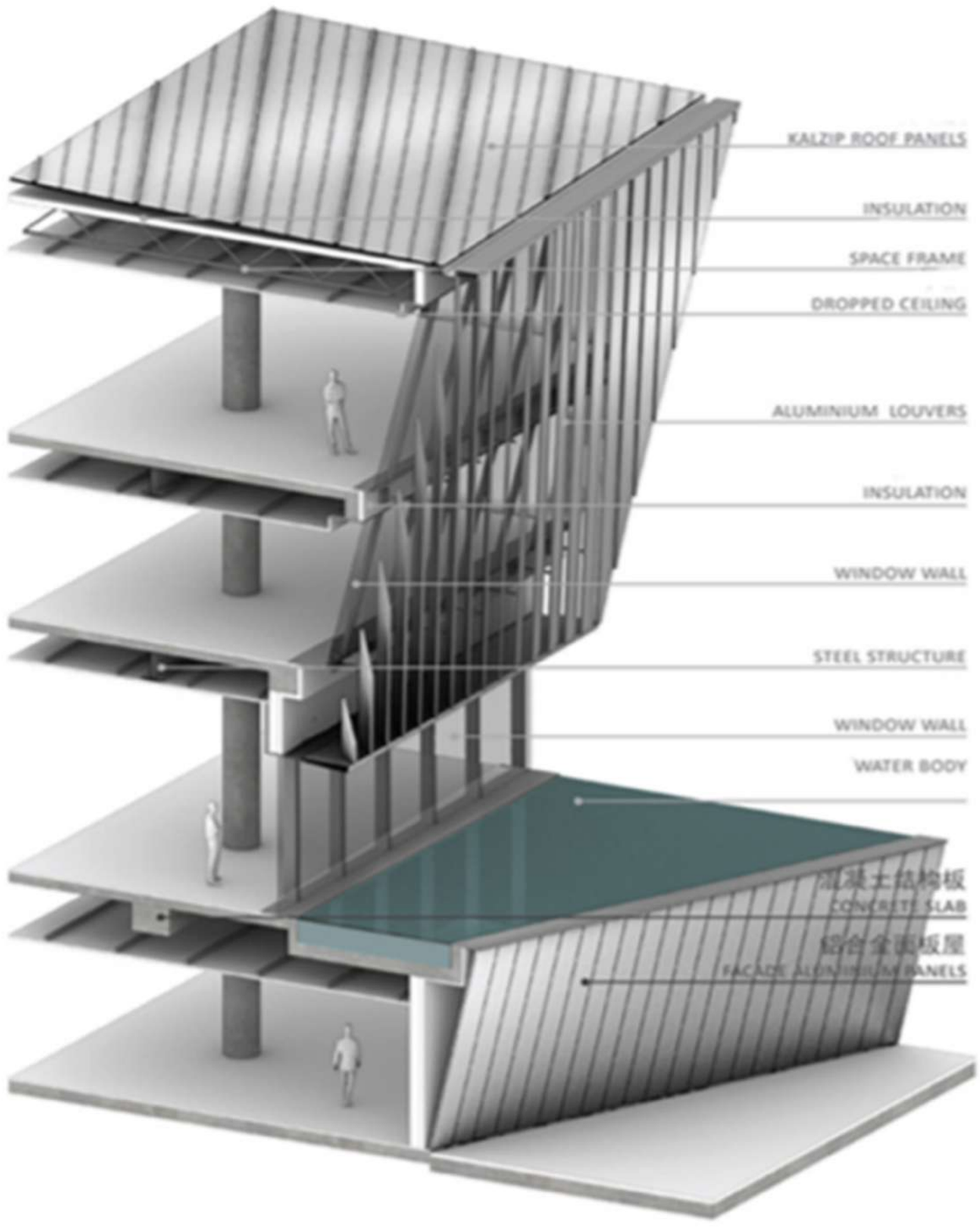


WALL SECTION

BUILDING SYSTEM DETAILS

BUILDING STRUCTURE STRATEGIES





WALL SECTION

APPENDICES

WORKS CITED:

1.livingmachines. (n.d.). Retrieved from http://www.livingmachines.com/Home.aspx
2. eco friend. (n.d.). Retrieved from http://www.ecofriend.com/living-machine-nature-helps-out-big-time-in-hydro-clean-up.html
3.Innovative Stormwater Management Practices, General Descriptions Source: CVC & TRCA Low Impact Development Stormwater Management Planning and Design Guide (2010) unless otherwise stated.http://www.iswm.ca/technologies.php
4.Katz, P. 1994. The new urbanism: towards an architecture of community. New York: McGraw-hill,inc.
5.Problem Organisms in Water: Identification and Treatment, 3rd Ed. (M7). Amewrican Waterworks Associan. 2004.
6. "Climate mitigation and adaptation - Wetlands International". Wetlands International. Retrieved 2018-08-09.
7.^ Renewables 2011 Global Status Report, page 25, Hydropower, REN21, published 2011, accessed 2016-02-19.
8."Hydroelectric Power". Water Encyclopedia.
9."Hydroelectric power - energy from falling water". Clara.net.
10."Renewable Energy Essentials: Hydropower" (PDF). IEA.org. International Energy Agency. Archived from the original (PDF) on 2017-03-29. Retrieved 2017-01-16.
11.https://www.archdaily.com/353707/hydro-electric-powerstation-becker-architekten
12. Delaware Wetlands. (n.d.). Retrieved from http://www.dnrec.delaware.gov/admin/delawarewetlands/pages/delawarewetlandsconservationstrategy.aspx
13.alansab wetlands. (n.d.). Retrieved from http://www.haya.com.om/AlAnsabWetland.aspx
14."Factsheet: Tidal Wetland Living Machine System -- Description and Scientific Basis." "Archived copy" (PDF). Archived from the original (PDF) on 2011-09-29. Retrieved 2011-08-18.. Retrieved 2011-8-18.
15.Water and Waste water Plant Directory. NEB Solar Aquatic System