HYBRID EDGE

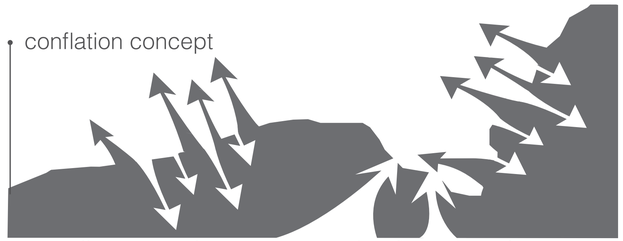
INTRO_
Conventional coastal urban development eliminates protective landscape features, exposing large communities to wave impact, flooding and degraded resources. Regenerating urban edges with protective living shorelines requires that both systems be accommodated...

This research studies the urban- coastline condition and proposes the re-invention of the coastline edge of Downtown Miami. Examines the expansion and dissipation of the coastline edge by conflating urban and wetland ecologies. Explores how natural ecosystems in this exchange zone, like the coral reef, and mangrove, regenerate, expand, and adapt to coastal changes, recognizing them, rather than challenging them.

CONCEPT_
The design concept came from the wetland's (mangroves and coral reefs) fractal regenerative network system, whose redundant structural form helps buffer and break strong water currents. This turned turn into one subdivided mesh or strata that redefines the city's coastal edge as a series of cellular spaces, subdivisions, and transitions. It implements methods like Biorock Technology, which enhances the growth of aquatic organism.

This promotes and helps the generation of coral reefs. Coral reefs also allow and stimulate the reproduction of other wetland ecosystems like mangrove forests, which are also known to buffer strong wave action. Just like coral fractals and mangrove's structural redundancy, these urban strata canalizes, breaks and buffers storm surges and wave action, while it keeps growing and reconfiguring the expansion of the city outland.

conflation concept



coastline as exchange zone, adapting coastal ecosystem's properties

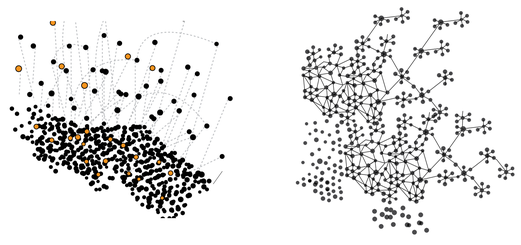
coastal ecosystems
wetland ecosystems

adaptation of wetland's structural concepts:

interconnected network — distributed footprint — adaptable configurations

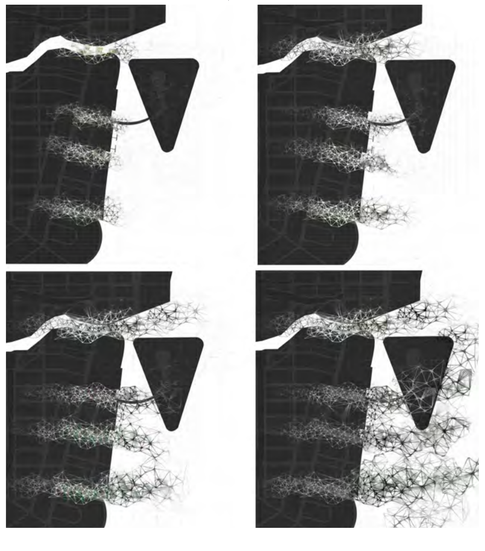
Mangrove forests, coral polyps, and their rhyzomatic growth were studied and adapted as methods for the coastline expansion, since they show properties of networked growth, interconnection and resilience.

representative of a resilient rhizomatic network



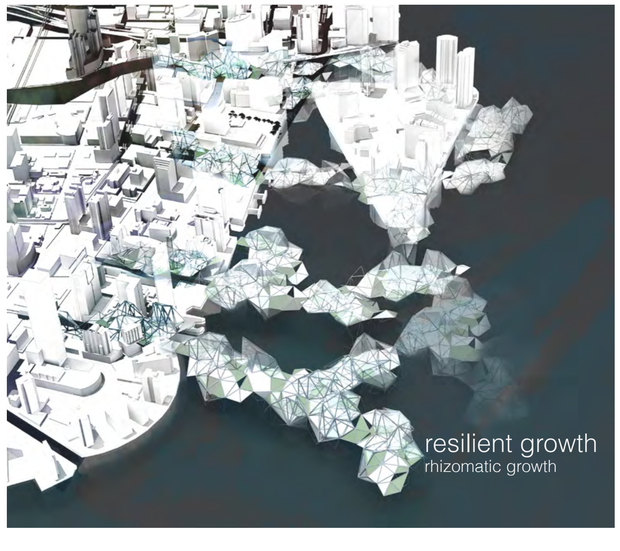
Miami is subjective to various urban and environmental pressures, and it's ranked number one coastal city most vulnerable to climate changes. In addition, it has more property at risk from storm surges and wave action than any other City in the world. It represents a clear hotspot of human and economic exposure.

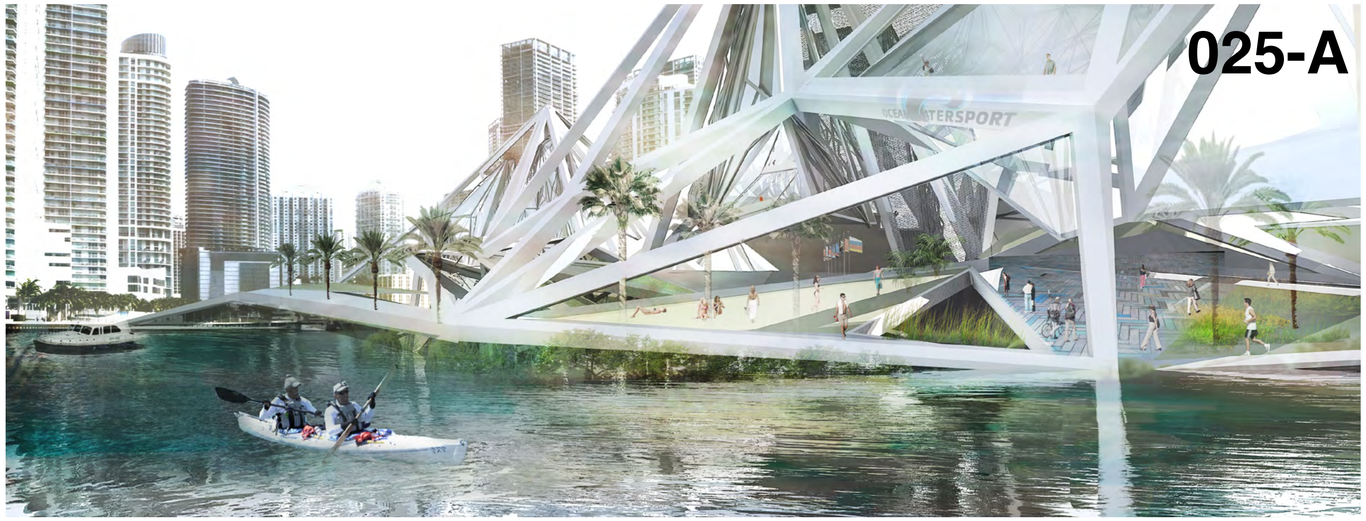
DOWNTOWN MIAMI, FL.



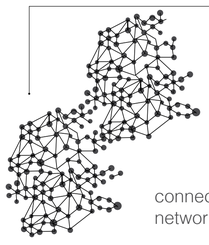
expansion
urban growth outland

conflation
urban + wetland ecologies

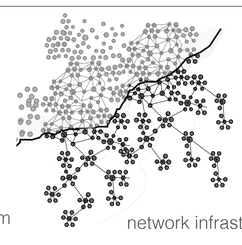




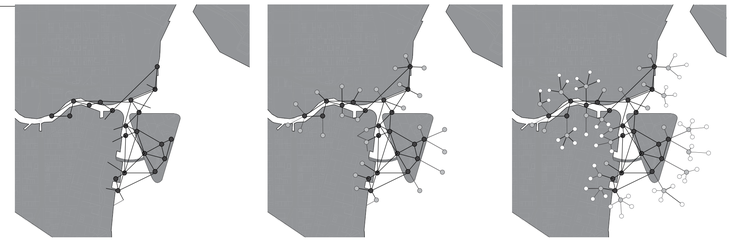
025-A

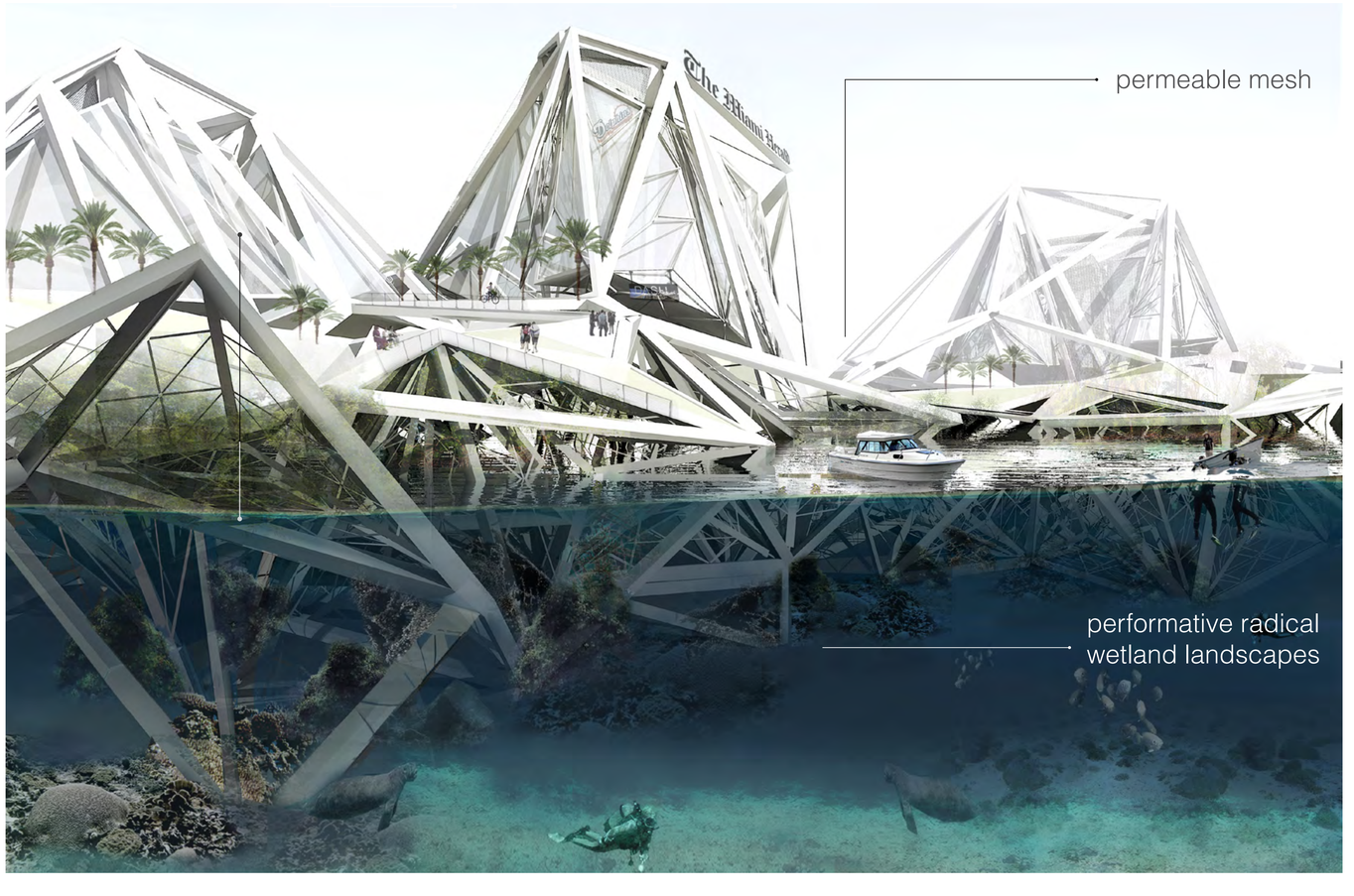


connectivity network system



network infrastructure

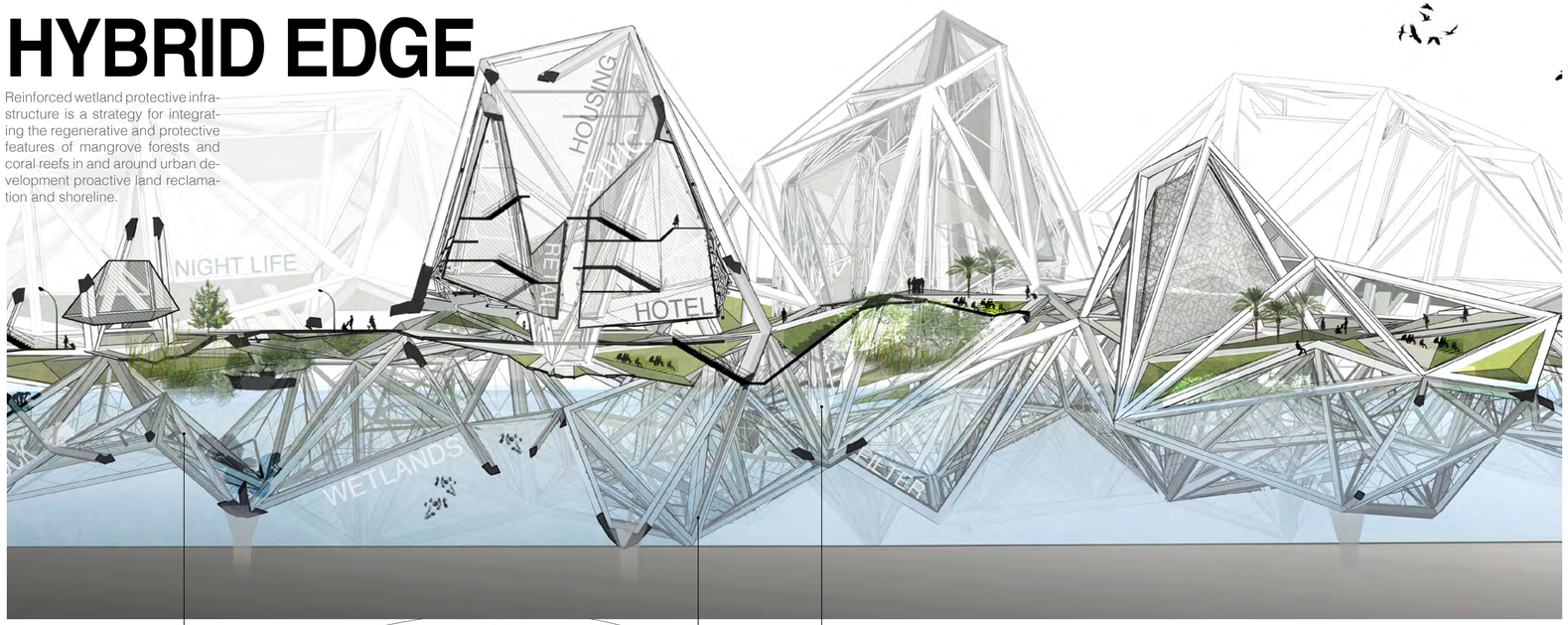




HYBRID EDGE

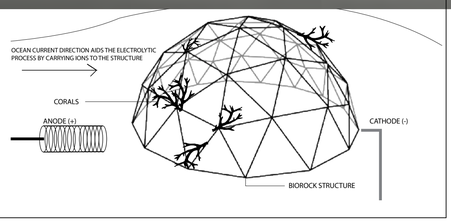
025- B

Reinforced wetland protective infrastructure is a strategy for integrating the regenerative and protective features of mangrove forests and coral reefs in and around urban development proactive land reclamation and shoreline.

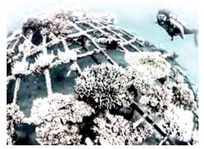


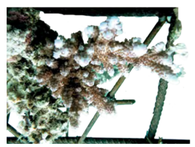
WETLAND FILTER_
UNDERWATER MESH

BIOROCK
TECHNOLOGY



Biorock® is a Patented Process Owned by Biorock Inc.





Biorock technology is the best known technique for restoring damaged coral reefs, building new ones, and greatly increasing populations of reef fish and shellfish. Biorock can be used to grow solid limestone rock structures in the sea of any size that can serve as breakwaters for coastal protection, but unlike normal breakwaters, Biorock structures get stronger with age and are self-repairing.

DESIGN_

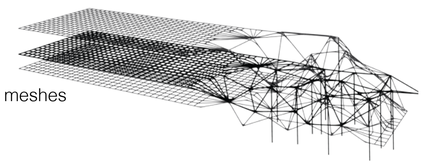
DESIGN: This one big mesh is subdivided in three meshes with the same DNA but each with particular characteristics that depend on use. The bottom one, a more fragmented mesh, is the wetland filter with the Biorock Technology, which needs more surface area so that new organisms can latch to (hence is more fragmented).

The transition mesh, serves as a circulation layer connecting the top mesh with the bottom one, more of a human scale landscape. This is a more horizontal plane with more subtle geometry, and calculated slopes. Just like organisms latch to the unde rwater mesh, the new city buildings latch to the top mesh, which is spatially more vertical and robust. That one holds the buildings for the new coastline.

METHOD_

regular urban grid manipulation
grid pinching to create spatial pockets

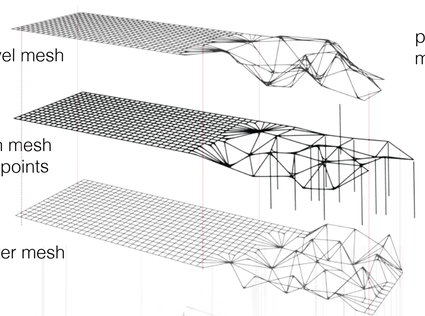
3 merged meshes



upper level mesh

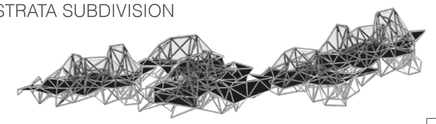
transition mesh
meeting points

underwater mesh



permeable mesh

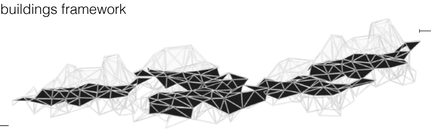
STRATA SUBDIVISION



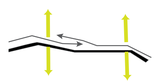
coastline expansion framework:
hybrid porous strata

framework allows spatial pockets for future programs

above water-level mesh-
buildings framework

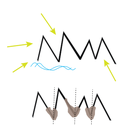


allows vertical and horizontal circulation_ connecting the frameworks

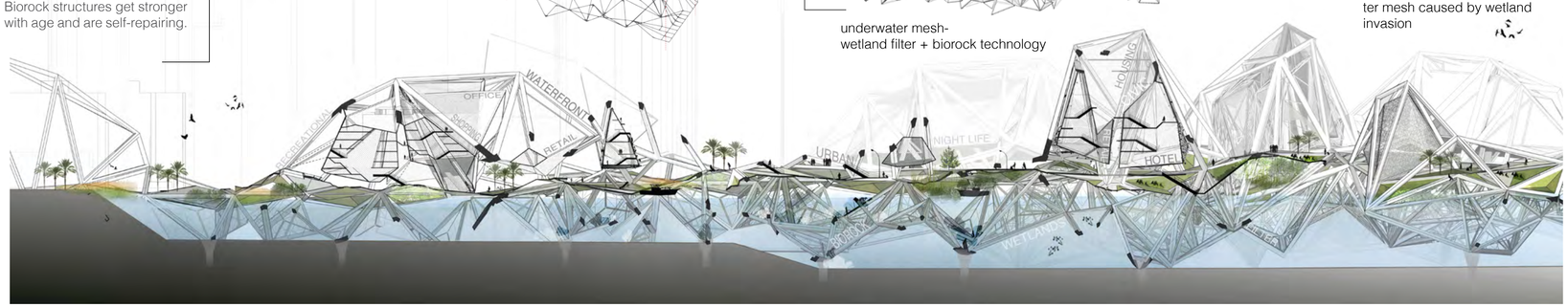


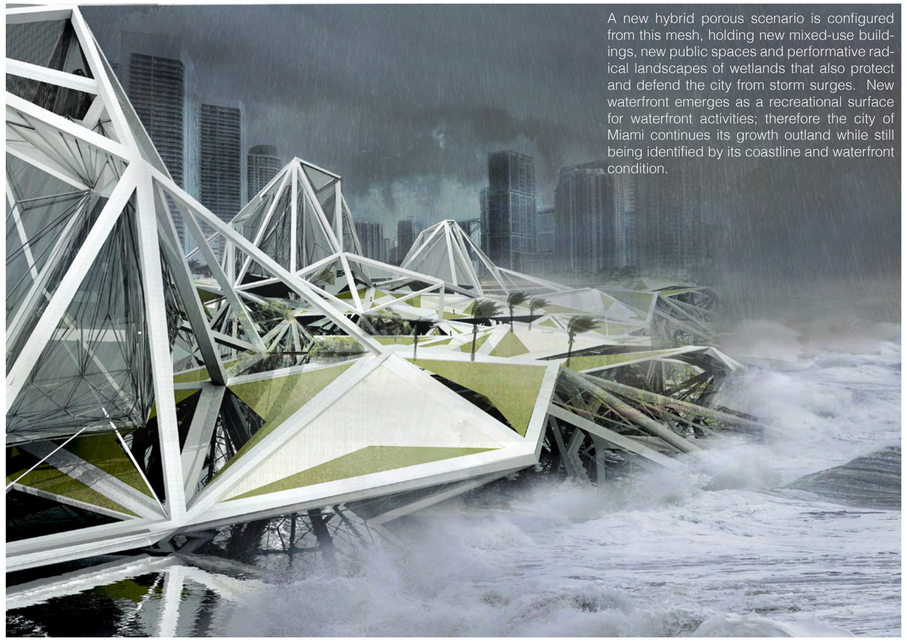
transition mesh-
fluctuating water level
pedestrian circulation

solidification of the underwater mesh caused by wetland invasion



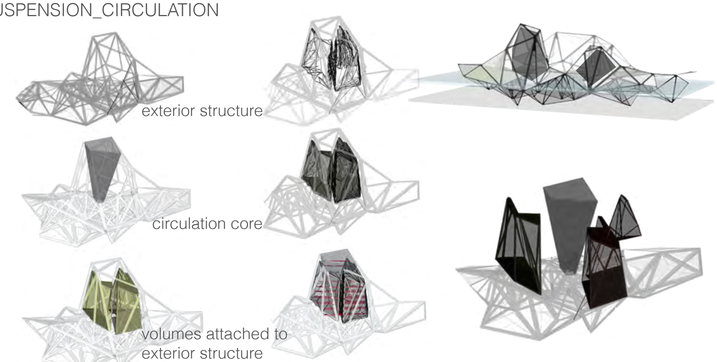
underwater mesh-
wetland filter + biorock technology





A new hybrid porous scenario is configured from this mesh, holding new mixed-use buildings, new public spaces and performative radical landscapes of wetlands that also protect and defend the city from storm surges. New waterfront emerges as a recreational surface for waterfront activities; therefore the city of Miami continues its growth outland while still being identified by its coastline and waterfront condition.

INTERIOR SPACES_ SUSPENSION_CIRCULATION



MULTIPLE VOLUMES
FOR MIXED USE

retail
hotel
office space
wellness areas
housing- condos