SUPER LEVEE
URBAN FARM

Centuries of wasteful land use, including the proliferation of individual lawns throughout much of the developed world, have decimated the ability of natural and urban topography to accommodate changing levels of precipitation and rising sea levels.

The project proposes a global system of levees, serving also as a new brand of urban farms at the city's edge, preserving local ecologies while protecting cities from emerging dangers.

what are the problems?

RISING SEA LEVELS
With the anticipated future climate change, It is estimated that within the next 80 years, the sea level around the world will rise by nearly 1 meter.

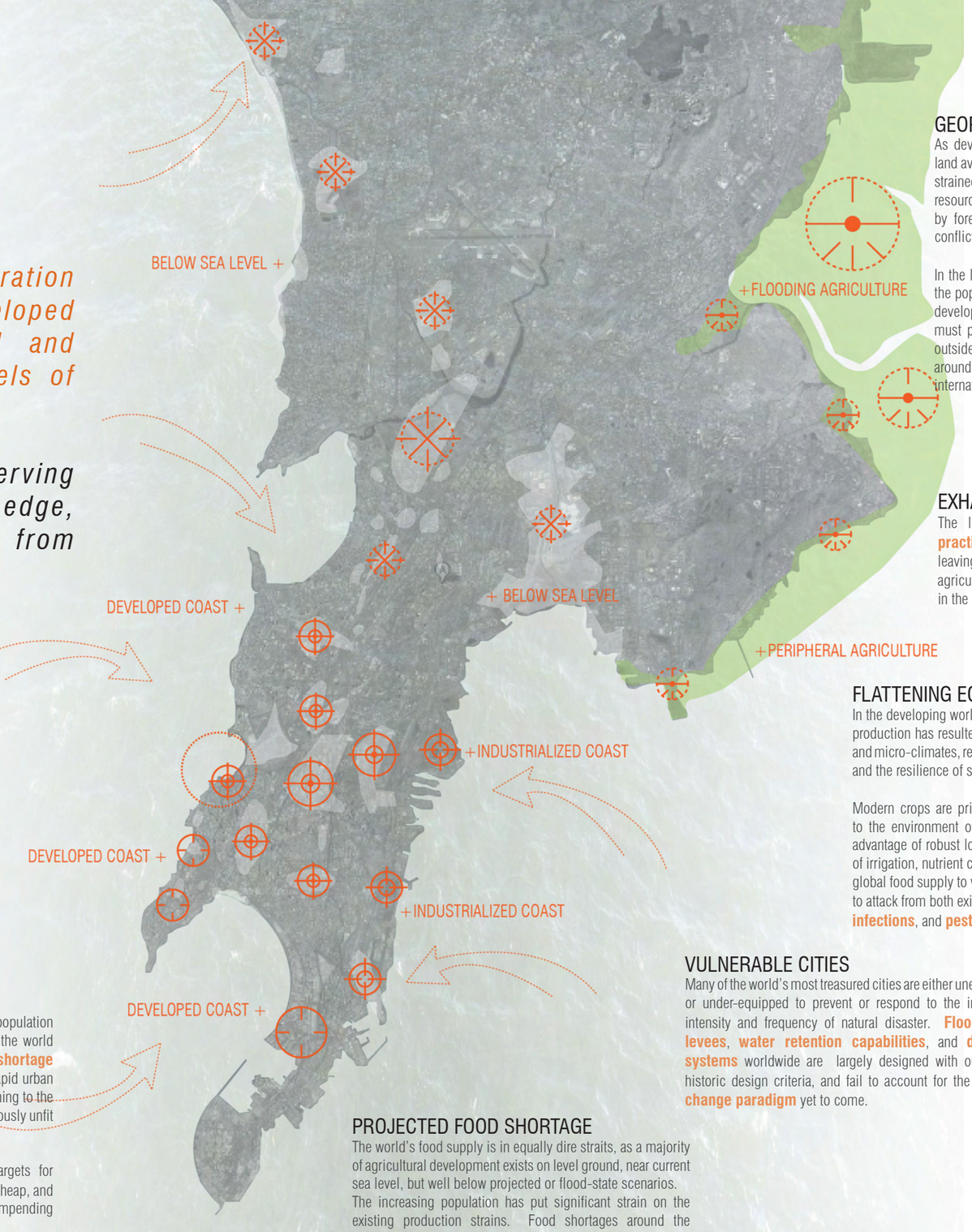
Major cities around the world are poised for certain destruction, founded on or near coastal environments and banks of increasingly **unpredictable rivers**. The increasing threat of damage from **tsunamis**, and the ever-present risk of **seasonal flooding** exacerbates the pressure on cities around the world, and demands an intelligent and cost-effective preventative response.

URBANIZATION / LAND SHORTAGE
For the first time in history, over half of the world's population is living in cities. At the same time, over half of the world is living in poverty. With a **severe housing shortage** threatening the quality of life and sustainability of rapid urban growth, many communities around the world are turning to the only land left available to them, land which is dangerously unfit for development.

Floodplains and oceanic coastlines are prime targets for **informal and illegal settlements**. Land here is cheap, and largely deregulated because of the very real threat of impending natural disaster.

LEGEND

- + BELOW SEA LEVEL
- +FLOODING AGRICULTURE
- +INDUSTRIALIZED COAST
- +DEVELOPED COAST



PROJECTED FOOD SHORTAGE
The world's food supply is in equally dire straits, as a majority of agricultural development exists on level ground, near current sea level, but well below projected or flood-state scenarios. The increasing population has put significant strain on the existing production strains. Food shortages around the world, caused by **drought**, **flooding**, and remote or **limited access** to supply has been a leading cause of **conflict** in the developing world for the balance of the industrial age.

GEOPOLITICAL POLARIZATION
As developed countries have significantly reduced the amount of land available for their own supply, they are turning to these already-strained areas to supplement their own supply. The natural, national resources of a majority of the globe are then stripped away for use by foreign populations, further exacerbating the desperation and conflict in the developing world.

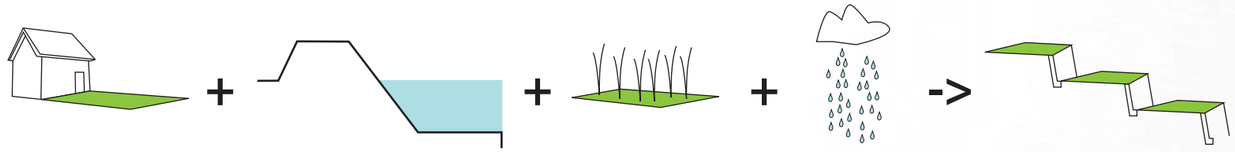
In the long run, this **agricultural colonialism** is harmful to both the populations it serves, and the populations it exploits. While the developed world loses many of its resources, the industrialized world must pay exorbitantly for shipping costs, and crisis management outside of their legal and sovereign territories. As resources around the world become more scarce, this model of business and international relations will quickly become unsustainable.

EXHAUSTED FARMLAND
The limited reach of current **shallow crop rotation practices** is woefully underdeveloped and undersupported, leaving much of the suitable land available currently for agricultural production **infertile** or in need of **remediation** in the years to come.

FLATTENING ECOSYSTEMS
In the developing world, the systematization of the agricultural production has resulted in the homogenization of ecosystems and micro-climates, reducing the overall strength of biodiversity and the resilience of staple food crops.

Modern crops are primarily **monocultured**, and not suited to the environment of which they are a part, failing to take advantage of robust local ecologies and their natural systems of irrigation, nutrient cycling, and pest control. This opens the global food supply to vulnerability, making it more susceptible to attack from both existing and yet unknown **viruses**, **fungal infections**, and **pests**.

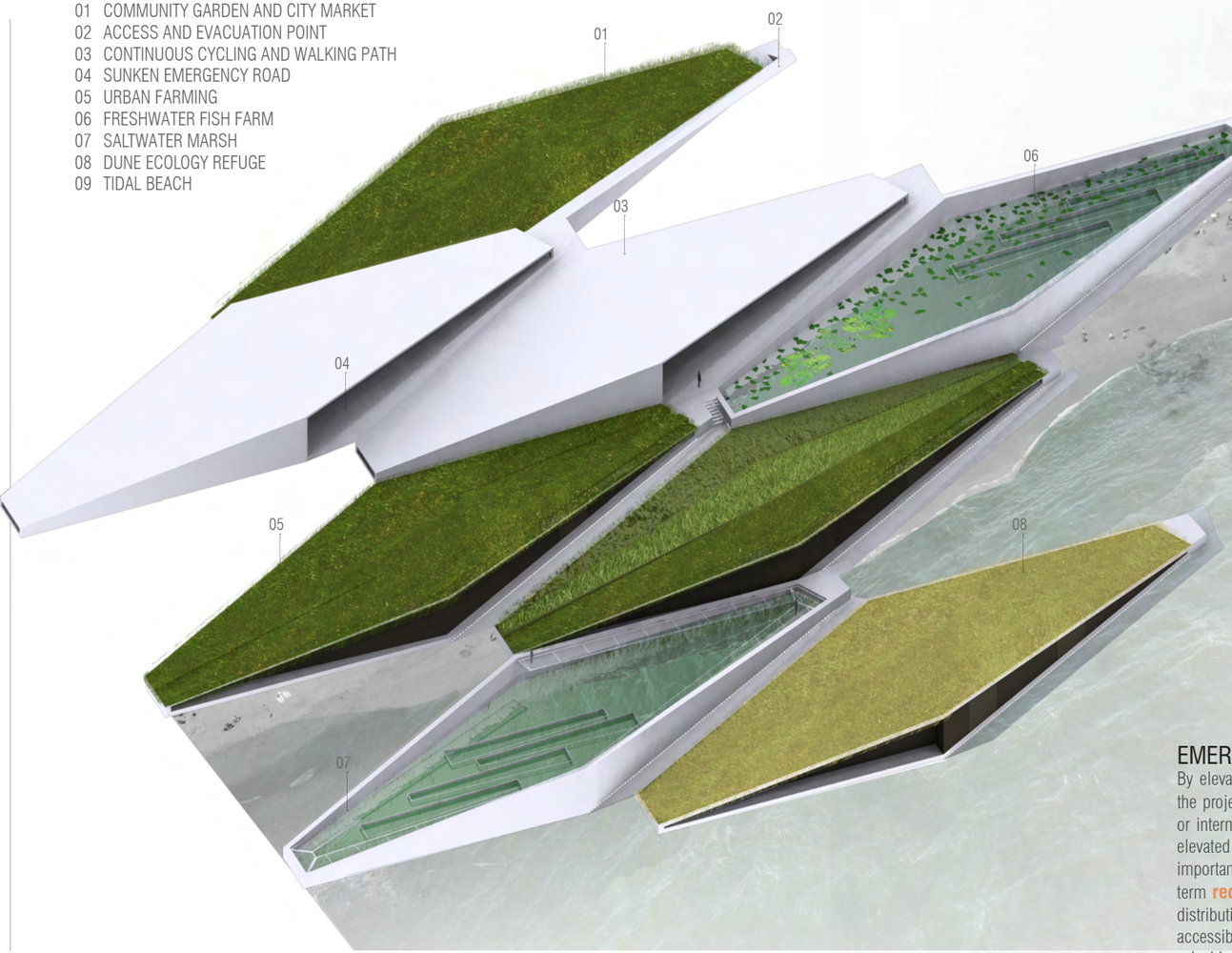
VULNERABLE CITIES
Many of the world's most treasured cities are either unequipped, or under-equipped to prevent or respond to the increasing intensity and frequency of natural disaster. **Flood walls**, **levees**, **water retention capabilities**, and **drainage systems** worldwide are largely designed with outmoded, historic design criteria, and fail to account for the **climate change paradigm** yet to come.



PROJECT PROGRAM DIAGRAM

The project expands necessary infrastructural and environmental improvements to propose a more productive urban and personal life.

01 COMMUNITY GARDEN AND CITY MARKET
02 ACCESS AND EVACUATION POINT
03 CONTINUOUS CYCLING AND WALKING PATH
04 SUNKEN EMERGENCY ROAD
05 URBAN FARMING
06 FRESHWATER FISH FARM
07 SALTWATER MARSH
08 DUNE ECOLOGY REFUGE
09 TIDAL BEACH



AERIAL DIAGRAM OF LEVEE COMPONENTS

what are the solutions?

PROTECT AND DEVELOP

We propose a two-fold approach in addressing the many and various problems facing the future of the world's cities and food supply: (1)Protect existing **coastal and riverfront cities** from the effects of climate change and global food shortage, and (2) Develop **future and emerging settlements** to help reverse or mitigate their effects

PROGRAMMING THE "SUPER LEVEE"

By appropriating and expanding "**super levee**" construction technology, planning principles and grading strategies, the city is reconnected with the waterfront, and its natural heritage. Incorporating and accommodating **coastal** and **riverfront highways**, while providing the groundwork for citywide **mass transportation** within the new construction, access to the city and the features of the project are facilitated.

BALANCED ECOLOGIES

The project restores **natural ecologies** to the coastline, long missing flora and fauna diversity. New complex ecosystems foster **sustainable growth** and **natural energy harvesting**. All waste and water is re-purposed, reused, and recycled either back into the city infrastructure or natural water bodies, restoring balance on the margin between constructed land and natural territory.

MIXED URBAN USE

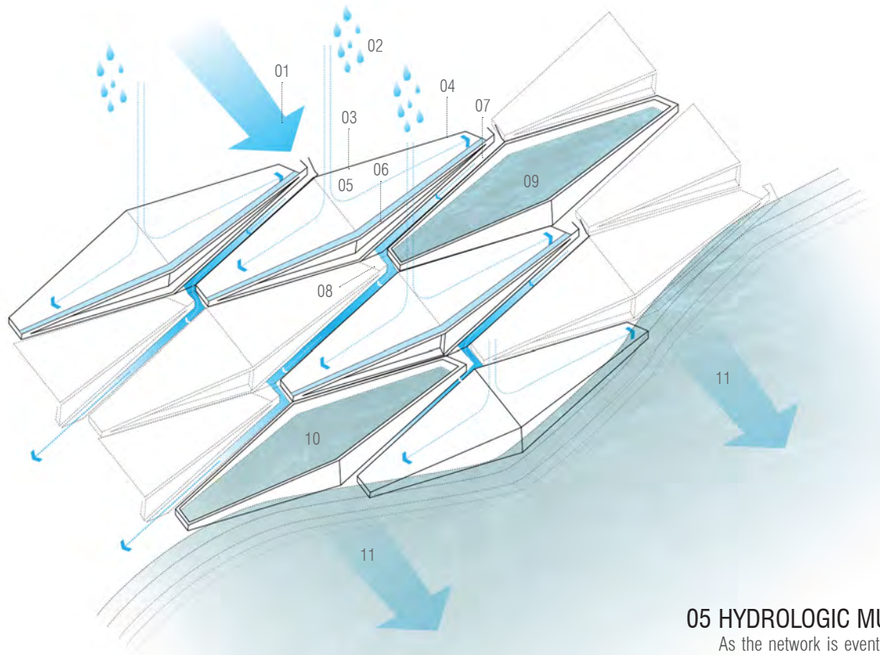
The project provides an **economical**, **multi-use architectural** and **infrastructural** intervention to be deployed at a variety of scales in existing cities and emerging communities around the world. Surpassing the primary need for **protection** from rising waters and potential flooding or natural events, the project also provides a rich substrate for urban **agricultural development**. Maximizing the impact of the necessary protective intervention while minimizing its visual impact and physical divisiveness, the re-purposed coastal land becomes a new **civic realm**.

EMERGENCY PREPAREDNESS

By elevating the perimeter and coastal edge of urban areas, the project also serves as an ideal **staging area** for local or international **disaster relief** efforts. In flood scenarios, elevated roadways, like those the project provides, can serve important functions in the immediate **recovery** and long-term **reconstruction** of neighboring areas. Facilitating the distribution of **emergency supplies**, along a localized, accessible traffic corridor, the elevated roadway will prove a valuable gathering point and for the locally and regionally displaced.

WATERFLOW DIAGRAM

01 URBAN RUNOFF INLET
02 RAINFALL
03 EMERGENCY RESERVOIR
04 RETENTION BLADDER
05 SLOPED PLANTED ROOF
06 PERMEABLE MEMBRANE
Filters runoff and agricultural waste
07 PERMEABLE PATHWAY
Filters runoff through remediating plantlife
08 IRRIGATION + DIRECTIONAL CONTROL
Control gates and valves ensure fresh water reaches zones where it is needed for farming or balancing reservoirs.
09 FRESHWATER RESERVOIR / FISH FARM
Uses filtered runoff
10 SALTWATER RESERVOIR / MARSH
Uses filtered freshwater runoff and tidal surges
11 OUTLET TO OCEAN
Filtered water released to sea



03 WATER RETENTION SYSTEM

The large surface area of planted roof acts as a natural water retention system for the city, accumulating **urban runoff**, increased **rainfall**, and **tidal surges** within the system. Implemented on a national or global scale, the network acts as a **bladder**, holding precious freshwater and mitigating the rise of ocean levels.

01 RECLAIMED LAND

The super-levee project provides an ordered and systematic approach to the reclamation of land and the production of new landfill, appropriating the **non-toxic** and **biodegradable waste** of the city to contribute to the city's longevity.

02 MARINE REMEDIATION

The re-introduction of marine ecology and the provision of a series of natural, **small scale harbors**, ensures the sustainable development of the waterfront, while allowing for its eventual **remediation**. Plant life at the water's edge **filters toxins** and sponsors algal growth, providing new **micro-climates** for aquatic and amphibious life at the city's edge.

05 HYDROLOGIC MUSEUM

As the network is eventually flooded, samples of ocean water and marine life are automatically **encapsulated** in each staged level, providing a **snapshot** of both local and global marine conditions. With the melting polar caps, captured water at the highest levels of the network would be less and less salty, and the **striation** between the ecologies of the different levels would be highlighted in a **hydrologic museum**.

04 URBAN FARM + PARKLAND

The hyper-densified global city is able to rekindle a connection with nature, providing **productive urban greenspace** at its edges. The circuitous and continuous route along the water's edge is ideal for recreation and casual transportation, incorporating **walking**, **jogging**, and **cycling paths** screened from the bustle of the city, and without interruption by auto and train traffic.

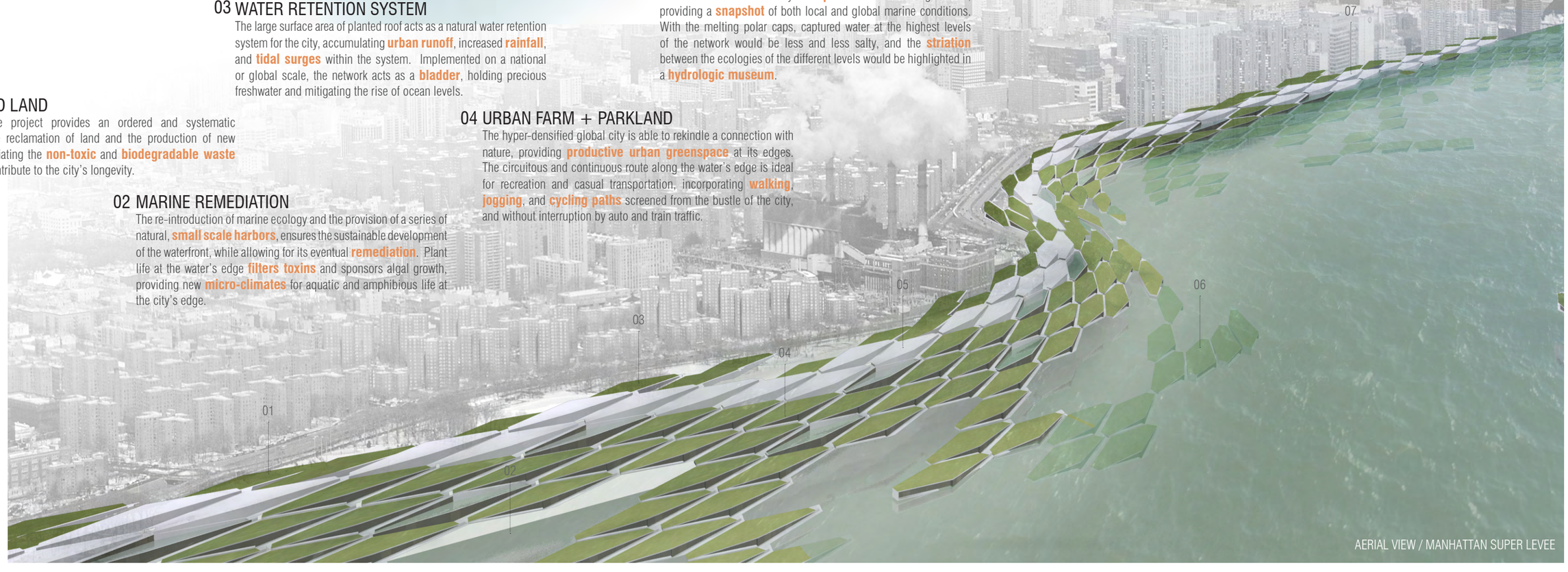
what is the impact?

07 EMERGENCY EVACUATION

At the peaks of the network, areas are pre-designated as **evacuation** and **staging** areas for response to ecologic, natural, and man-made **disasters**. With the support of surrounding **markets** and **water filtration** systems, these areas come pre-supplied with the means to support **temporary** and **long-term recovery** efforts.

06 CYCLICAL FLOOD FARMING

As the network responds to the swells of tidal surges and events, the agricultural plots can take advantage of **robust farming practices** used throughout the world. By embracing flood farming of rice, grains, and hardy plants growing in sandy and silty soil, the city **expands** its food **production** while **reducing** its ecological **impact**.



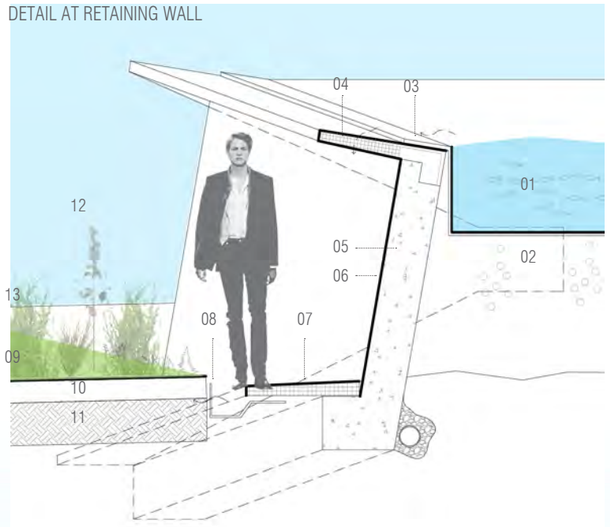
AERIAL VIEW / MANHATTAN SUPER LEVEE

Each stage of the levee supports the next. Clippings, compost, and surplus crops from farming levels are used as nutrients and food for a series of fish farms, marshes, and restorative dune ecologies. Waste from marine life and nutrients from algal habitats are then used to fertilize farm levels, making the levee a complete ecology.

PERMEABLE RETAINING WALL

The system of retaining walls is composed of a combination of **hardscape** elements and **permeable membranes**, regulating the interchange of **ecological by-products** and necessities from one level to the next.

DETAIL AT RETAINING WALL



01 FISH FARM HATCHERY
02 FISH FARM WASTE COLLECTION
03 OVERFLOW AND RUNOFF CHANNEL
Draws oxygenated water back into aquatic farming
04 PERMEABLE PLANTING SURFACE
Filters runoff from rainwater and aquatic farming, planting fertilized by fish waste
05 RAMMED EARTH RETAINING WALL
Retains runoff from levels above
06 LOW MAINTENANCE VERTICAL PLANTING
Provides additional biodiversity, air purification, and water purification for runoff
07 PERMEABLE WALKWAY
Naturally filters water into irrigation channel below
08 IRRIGATION CHANNEL
09 AGRICULTURAL LAND
10 WORM FARM COMPOSTING
Worm cultures assist in the decomposition and nutrification of agricultural waste
11 ENRICHED SOIL
12 INSECT CULTURE POLLINATION
13 SURPLUS COLLECTION + REDISTRIBUTION
Excess farm yields and gleaned crops are fed to insect larvae, which in turn feed fish

how does it work? ECOLOGIC DOWNCYCLING

06 ACCESS + EVACUATION

The uppermost part of the levee structure is used for emergency evacuation in the case of **severe urban flooding** or the **terminal breach** of the levee from rising sea levels.

08 CITY MARKET

Inner terraces create space for reservoirs, screen the highway from direct impact with the views, while also serving as smaller community gardens and farmer's market. Surplus produce and tools can be traded or sold in the market bringing citizens of all backgrounds together in the **sharing and distribution of fresh food.**

04 URBAN FARM

The **terraced levee maximizes land** surface suitable for **agricultural production**. By recycling run-off and rain water, solid waste for composting, and biological waste from a diverse ecosystem, the new superlevee becomes food-generating infrastructure, **the cultivated front lawn of the city**.

05 FRESHWATER FISH FARM

Carbon-filtered **water** from the Urban Reservoir is channeled to feed **fish ponds**. The ponds, delineated by permeable biodegradeable membranes on compacted earth, collect the biological waste produced by its organisms to **fertilize agricultural production** below.

03 SALTWATER MARSH

Taking advantage of **intertidal deposits** during the day, and flood tidal changes **during flood season**, the salt marsh is one of **the most productive ecosystems on earth**. Seasonal cordgrass growth and decay feeds thousands of organisms from bacteria to fish, producing the most naturally **nutritional fertilizer** for use in agriculture cultivation.

02 DUNE ECOLOGY REFUGE

At the base of the levee landscape, the structure recreates **dune ecologies**, with low hardy shrubs and sandy soil providing rigidity to the base of the structure, while sheltering surrounding habitats from erosion and wind. This fragile landscape, often neglected in coastal development, will serve as a much needed **refuge for endangered species**.

01 TIDAL BEACH

Beach areas are well defined, **protected by the levee structure**. Recreational sunbathing and water sports are encouraged in and around the lowest structures. The armature itself acts as a viable micro-climate and habitat for clinging sea creatures and plant life, responsive to the changing tidal levels.

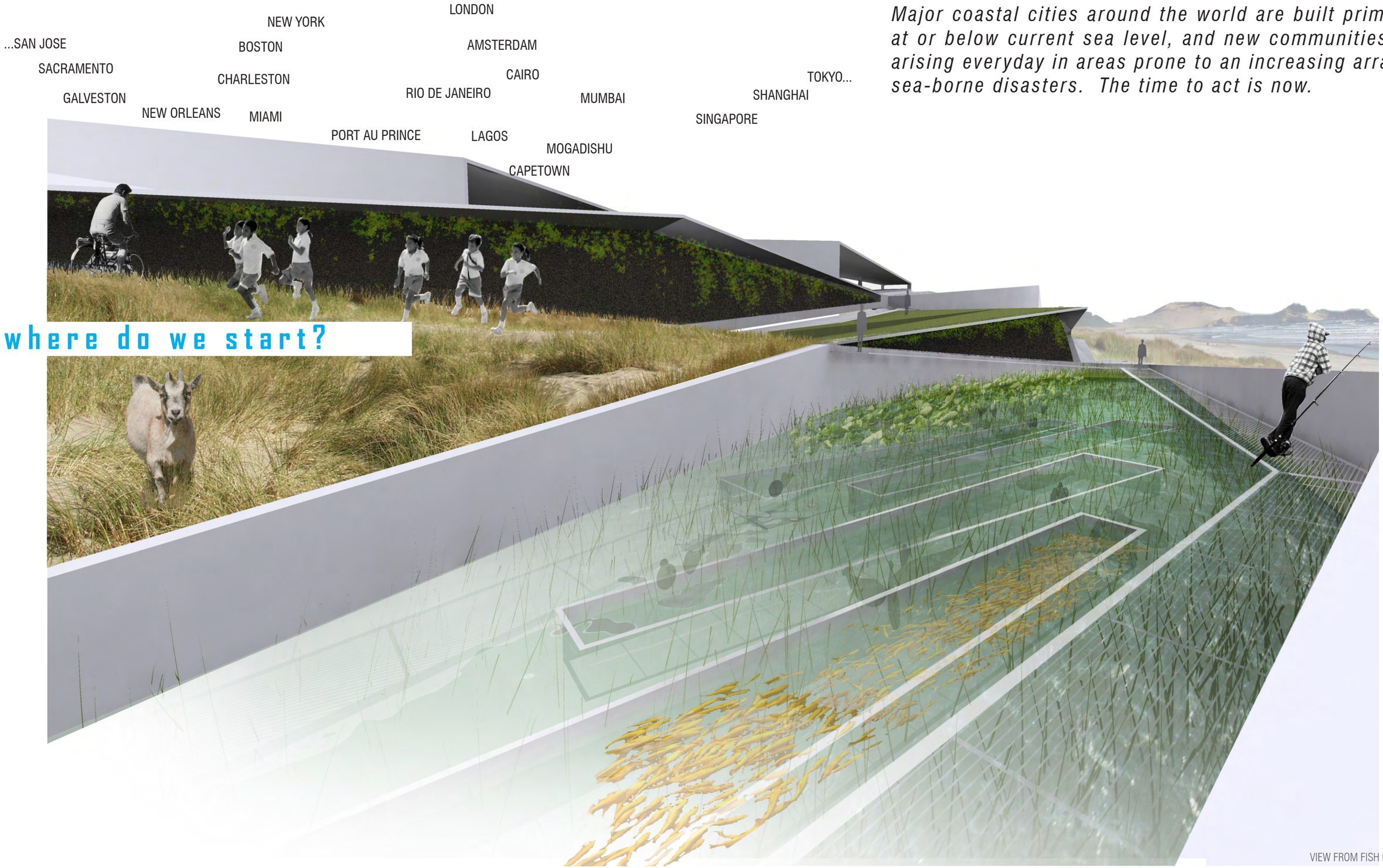
07 SERVICE ROAD

The evacuation area benefits not only from **dry points of access** and proximity to **service roads**, but will continue to filter and supply **drinking water** and **surplus farm yields** to the population in need during a disaster.

09 URBAN RESERVOIR / WATER BLADDER

On the city side, the infrastructure houses a **reservoir for urban-runoff**, channelling rainwater into the farm ecologies when water is scarce, and acting as a first line of defense for storm surges and excess spillage from rising sea levels. The reservoirs filter water to a gray level suitable for filling fish and critter ponds.

Major coastal cities around the world are built primarily at or below current sea level, and new communities are arising everyday in areas prone to an increasing array of sea-borne disasters. The time to act is now.



VIEW FROM FISH FARM