SMART CITIES AND URBAN PRODUCTIVITY

MCKINLEY FUTURES STUDIO 2016
COLLEGE OF BUILT ENVIRONMENTS
UNIVERSITY OF WASHINGTON

McKinley Futures Studio 2016

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ACKNOWLEDGEMENTS

We would like to extend our gratitude to **Jan and David McKinley** for making this studio possible. Since 1991, the Jeannette and David McKinley Futures Endowment has promoted the exchange of ideas and information related to the study of far futures, with the aim to inform and enrich professional education in the College of Built Environments and beyond. The endowment makes possible special programs that offer CBE students the opportunity to learn about the roles of research and design in developing scenarios of the possible, probable, and preferred future of practice in the allied design and planning professions. Since its inception, the endowment has supported lectures and special programs, and now, an annual studio series. Smart Cities & Urban Productivity is the third interdisciplinary studio in this series.

David McKinley, FAIA, has practiced architecture in Seattle and the Pacific Northwest since 1953. After apprenticing with Paul Thiry, FAIA, as a designer/ draftsman (1953-54) and serving as a first lieutenant in the US Army Corps of Engineers (1954-56), McKinley joined the office of Paul Hayden Kirk, FAIA, becoming an associate (1958), then firm principal and director of design in the newly incorporated firm of Kirk, Wallace, McKinley & Associates (1960). Beginning in 1978, he served as president and general manager of The McKinley Architects, and the chairman of McKinley Gordon Architects in 1989.

David has received over 90 local, regional, and national design awards representing dozens of noteworthy projects, including the UW Faculty Club, the University Unitarian Church, UW Odegaard Undergraduate Library, UW Meany Theatre & Thesis Hall, the UW “Red Square” underground garage and campanile, Bowmer Theatre, Ashland, Or., Magnolia Branch Library, Washington Mutual Tower (1201 Third Avenue), 1111 3rd Avenue, and the Wells Fargo Center towers - all in Seattle, and the One Bellevue Center and Symetra Financial Center towers both in Bellevue. Mr. McKinley continues to work as a professional design consultant. He and Jan currently reside full-time in Wailea, Hawaii, on the island of Maui.

In the College of the Built Environments, we would like to thank **John Schaufelberger**, professor and dean, UW College of Built Environments, **Jeff Hou**, professor and chair, UW Department of Landscape Architecture, **Brian McLaren**, associate professor and chair, UW Department of Architecture, and **Edgar Gonzales**, CBE assistant dean for advancement, for their support. Special thanks to **Augusta Milford** for her dedicated contribution to the production of this document.

This studio benefited from a wide range of professional interests and investment from collaborators. To our studio consultants, who fostered the discourse of futures thinking, urban productivity we say “Thank you:” **Brandon Born**, associate professor, UW Department of UDP; **Josh Brevoort**, architect and futurist, zeroplus; **Roark Congdon**, lecturer, UW Department of Architecture; **Kailin Gregga**, lead designer, Best Practice Architecture; **Tera Hatfield**, experience designer, Wieden + Kennedy; **Amy Lindemuth**, ASLA, Associate, Mithun; **Stephen Merlino**, fantasy author, SFWA member; and **Edgar Pieterse**, South African research chair in urban policy & director of the African Center for Cities.

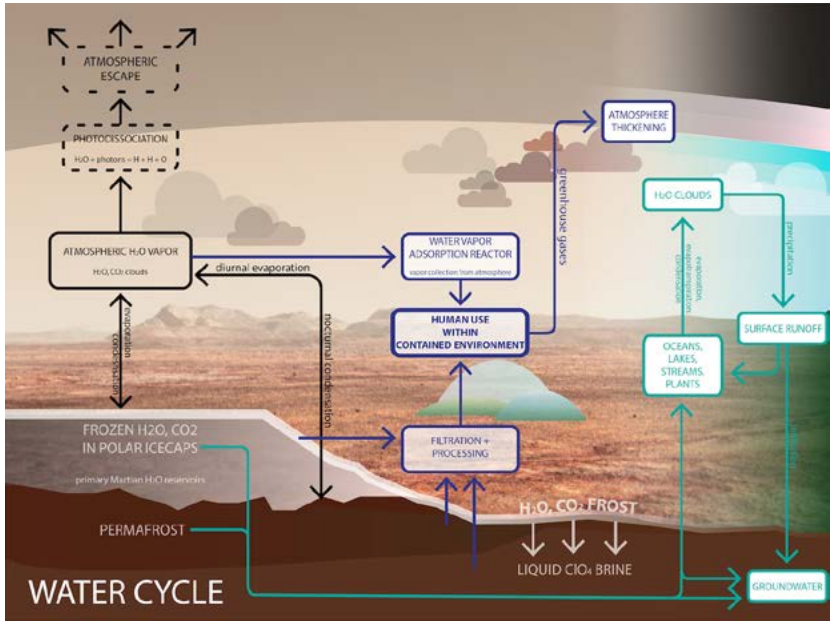
Finally, many thanks to our guest reviewers during the midterm and final studio reviews for their insights and commentary: **Neeraj Bhatia**, architect and urban designer, California College of the Arts; **Ann Marie Borys**, associate professor, UW Department of Architecture; **Josh Brevoort**, architect and futurist, zeroplus; **Liska Chan**, associate professor in landscape architecture, University of Oregon; **Kailin Gregga**, lead designer, Best Practice Architecture; **Myer Harrell**, AIA, principal and director of sustainability, Weber Thompson; **Susan Jones**, FAIA, architect and founder, AtelierJones; **Jason King**, ASLA, Associate, Mithun; **David McKinley**, FAIA; **Garry Papers**, Senior Land Use Planner/ Design Review, City of Seattle, SDCI; **Julie Parrett**, senior lecturer, UW Department of Landscape Architecture; **Meredith Sattler**, architect, Cal Poly San Luis Obispo and Affiliate Faculty at University of Arizona Biosphere 2 Facility; **John Schaufelberger**, professor and dean, UW College of Built Environments; **James Suehiro**, FAIA, principal, Suehiro Architecture; and **Jamie Vanucchi**, landscape architect, Cornell University.

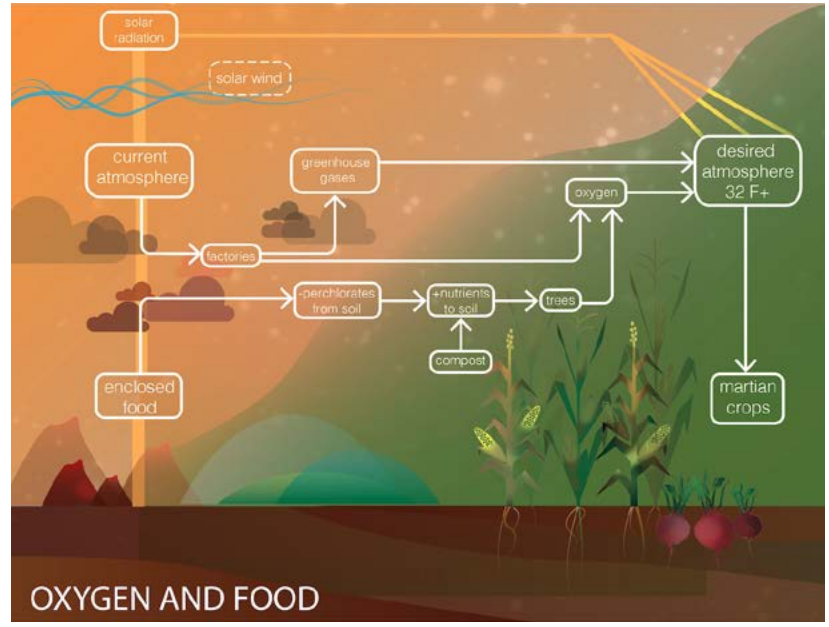
INTRODUCTION

Cities have long been understood as hubs of creativity and productivity. They are locations of innovation across all sectors of the economy, serving to advance technologies through a complex network of agents, policies, and institutions. In the future, cities will increasingly rely on smart city concepts, which utilize technologies, both old and new, to enhance urban performance and community well-being, to reduce costs and resource consumption, and actively engage residents through co-design practices that allow urban areas to learn, adapt, and innovate and thereby respond effectively to changing conditions.

With an expected doubling of the global urban population to 7 billion in 2050, the productivity, resilience and self-sustainability of smart cities is of upmost concern. Cities need to produce, handle and recycle their own resources and can no longer solely depend on their hinterland to provide a nexus of water, energy, and food resources. Supported by the United Nations, this nexus of resource systems represents a confluence of contemporary and future issues and concerns for all cities. Metropolitan regions are actively seeking to address the challenges presented through this nexus, but often address them in isolation, constrained by sectoral boundaries. What is needed are deep evaluations that go beyond single sector solutions to consider broader influences and interdependent impacts that serve to enhance the dialogue pertaining to the complexity of cities as well as to improve efforts of collaboration and coordination.

This studio engages these challenges investigating experiential, empirical, measurable, and analytically integrated information to develop future scenarios for urban environments. The work presented in this book is the result of these deep investigations to identify strategies and proffer predictions that relate to the possible, probable, and preferred future conditions of urban environments worldwide.





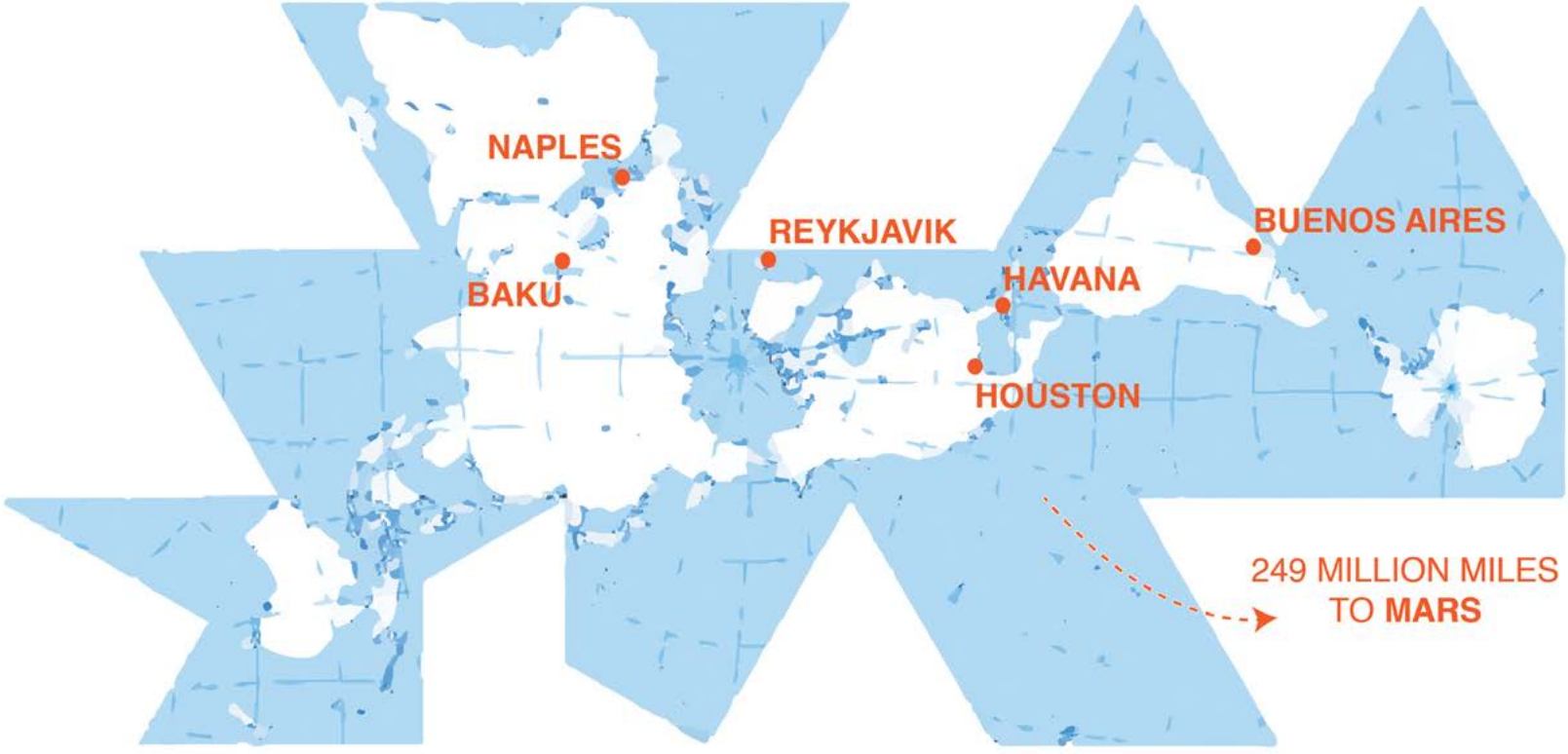
MARTIAN WATER, ENERGY, AND FOOD NEXUS

STRUCTURE

The Smart Cities and Urban Productivity McKinley Futures studio was structured to engage students in an interdisciplinary and vertically integrated learning environment that focused on identifying, scoping, and exploring urban design challenges for today and into the future. As a research and design studio, the students were challenged to investigate and disseminate understanding in clear and concise graphic formats that formulate narrative engagements with the future of their selected cities.

This interdisciplinary and vertically integrated studio was comprised of undergraduate and graduate students with home departments in Architecture, Landscape Architecture, and Urban Planning and Design. The students were organized into seven teams and assigned a particular global climatic zone – arctic, temperate, sub-tropical, and tropical. Within each of these zones the student teams researched and selected cities that engaged their interests within the context of the nexus of resources, and were asked to iteratively develop scenarios through which the contextually specific issues related to this network could be investigated. The cities selected included: Baku, Azerbaijan; Buenos Aires, Argentina; Havana, Cuba; Houston, U.S.; and, Naples, Italy. While one group initially selected Reykjavik, Iceland, the students' research and interests focused more broadly on the entirety of the country and its evolving relationship with the larger Arctic region. A final group chose to extend the efforts beyond our world to explore the potential urban futures related to the colonization of Mars.

In order to relate the complexity of these locations into a an approach that is accessible to a broader public each team was asked to generate a narrative, or structured story, through which their ideas were developed and presented. The following sections of the book provide these narratives within a graphically informed context, and represent a diverse set of approaches and ideas that range from the possible to the probable to the preferred futures of these locations.



DYMAXION PROJECTION OF THE EARTH'S SURFACE

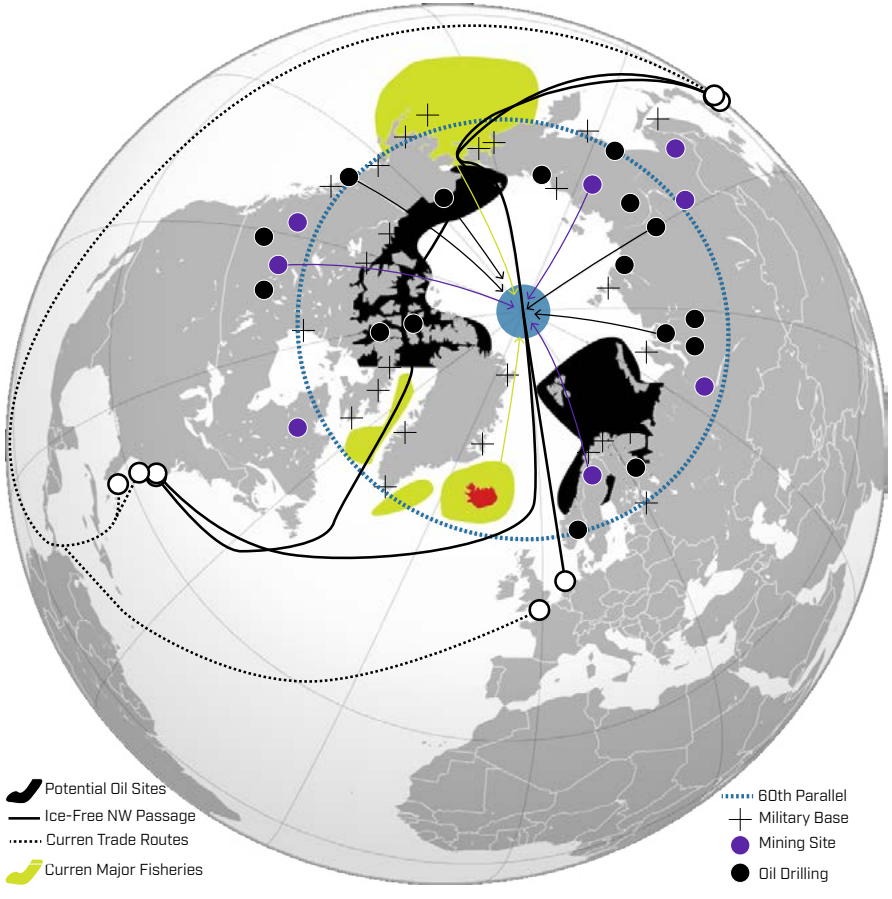
ICELAND - ARCTIC - WORLD

This project conceives Iceland as central to managing geopolitical issues related to the Arctic, and explores the future of the country as an energy-independent, global hub for data and sustainable technologies. Geothermal-powered data centers, robotic ecological initiatives, and floating marine research stations will be some of the key features of this new sustainable and data-centric landscape.

This project proclaims that within the century, Iceland will be globally recognized for its sustainable and informational strengths, and will provide these services for other countries around the world as a central feature of it's economy. Iceland will become central to the longterm managment and stewardship of Arctic resources. It will build upon its intellectual and technological capacity to develop alternative energy systems.

Over the next century, Iceland will become energy independent through a diversified approach to energy production. Due to the prevalence of sustainable energy methods, the connectivity, and the cold climate, Iceland will become recognized as a desirable environment for large-scale data centers and technology development.

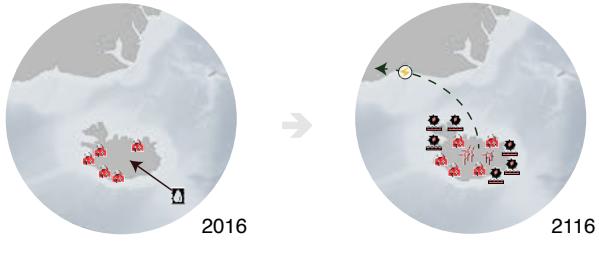
ALEX DAO, ANDREW PRINDLE, JIAWEN WEI



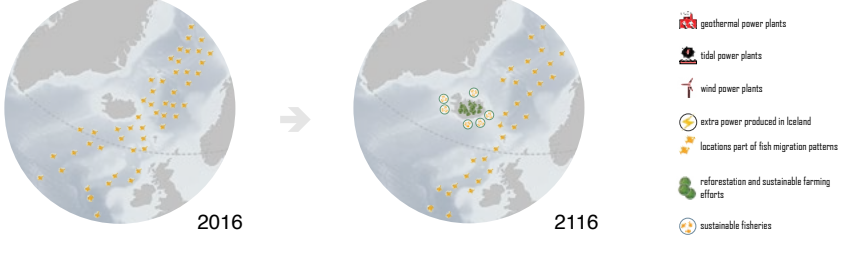
ARCTIC STEWARDSHIP

Icelanders realize that in order to maintain their way of life, they will need to establish sustainable fisheries and address environmental issues related to extensive deforestation. All of the advances in social, technological, and environmental sustainability made over this period will uniquely position Iceland to become a prominent stakeholder in the management of arctic resources and a contributer to environmental education at a global scale with an emphasis in community sustainability.

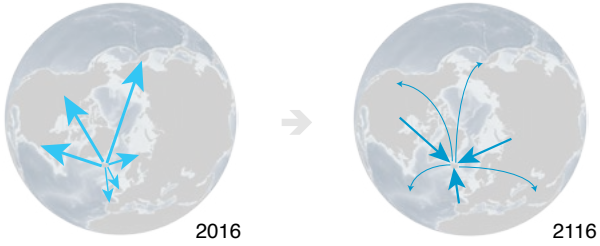
ENERGY PRODUCTION



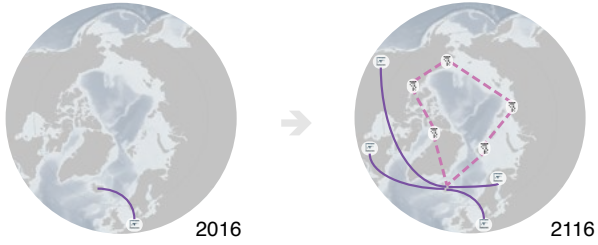
FOOD-WASTE CYCLE



EDUCATION / CONSULTING



COMPUTING / DATA TECH



native Icelandic students studying abroad

foreign students studying in Iceland

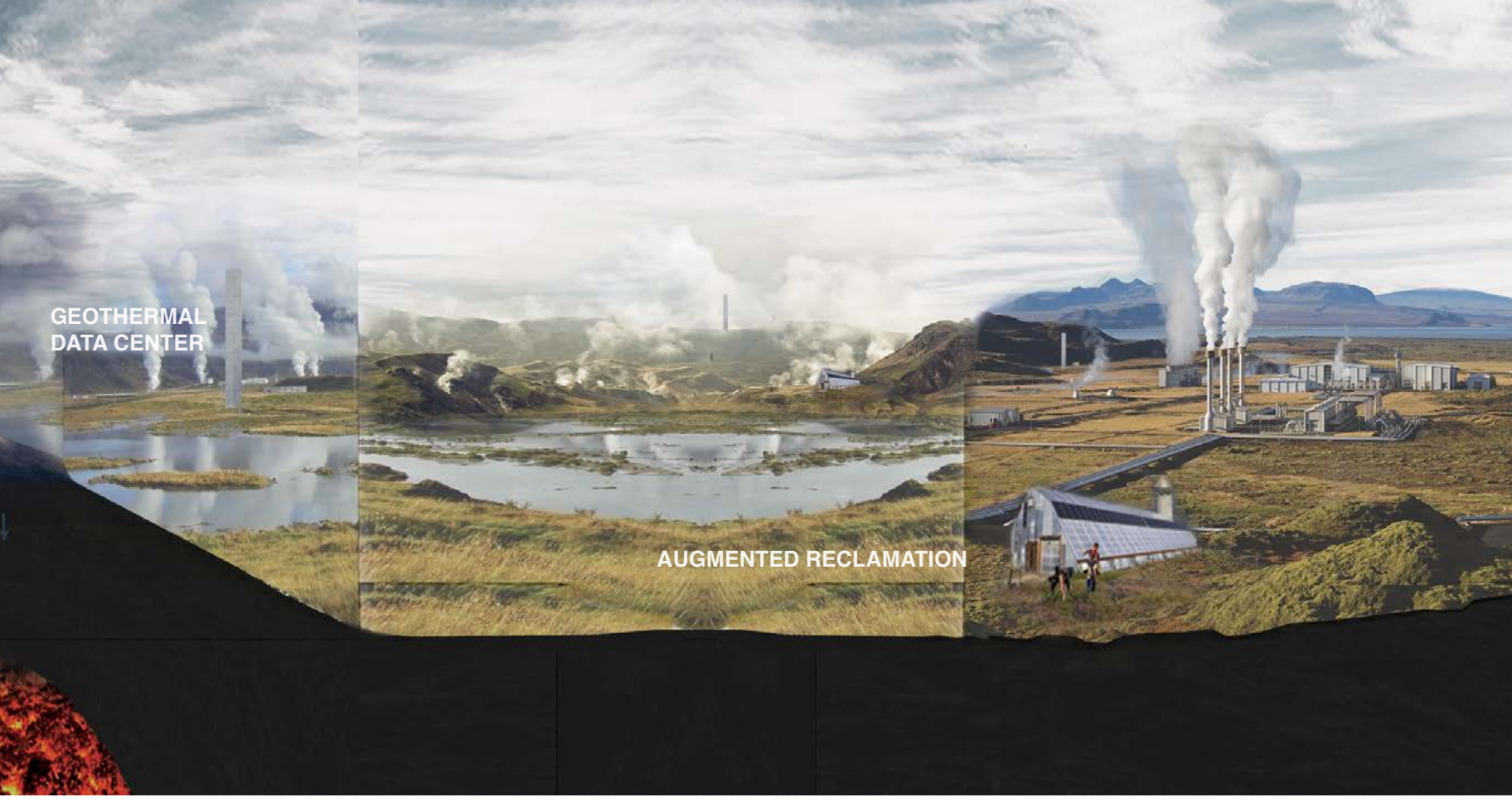
export of sustainable technology consulting services to countries in need

computing technology companies

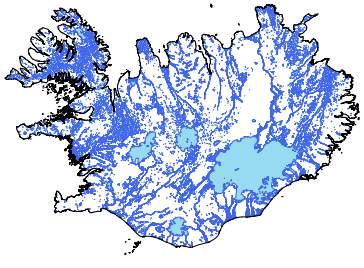
data network between branch locations of computing technology companies

climate monitoring data collection centers

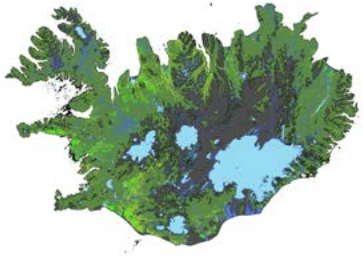
data network monitoring climate change in the Arctic



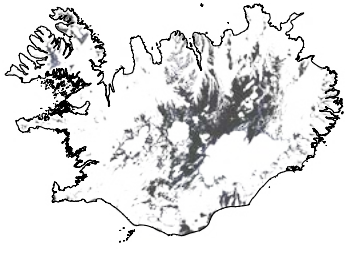
GLACIER + RIVER SYSTEM



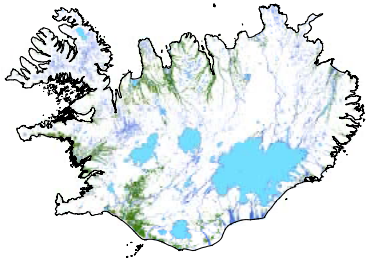
BASIC LAND COVER ANALYSIS

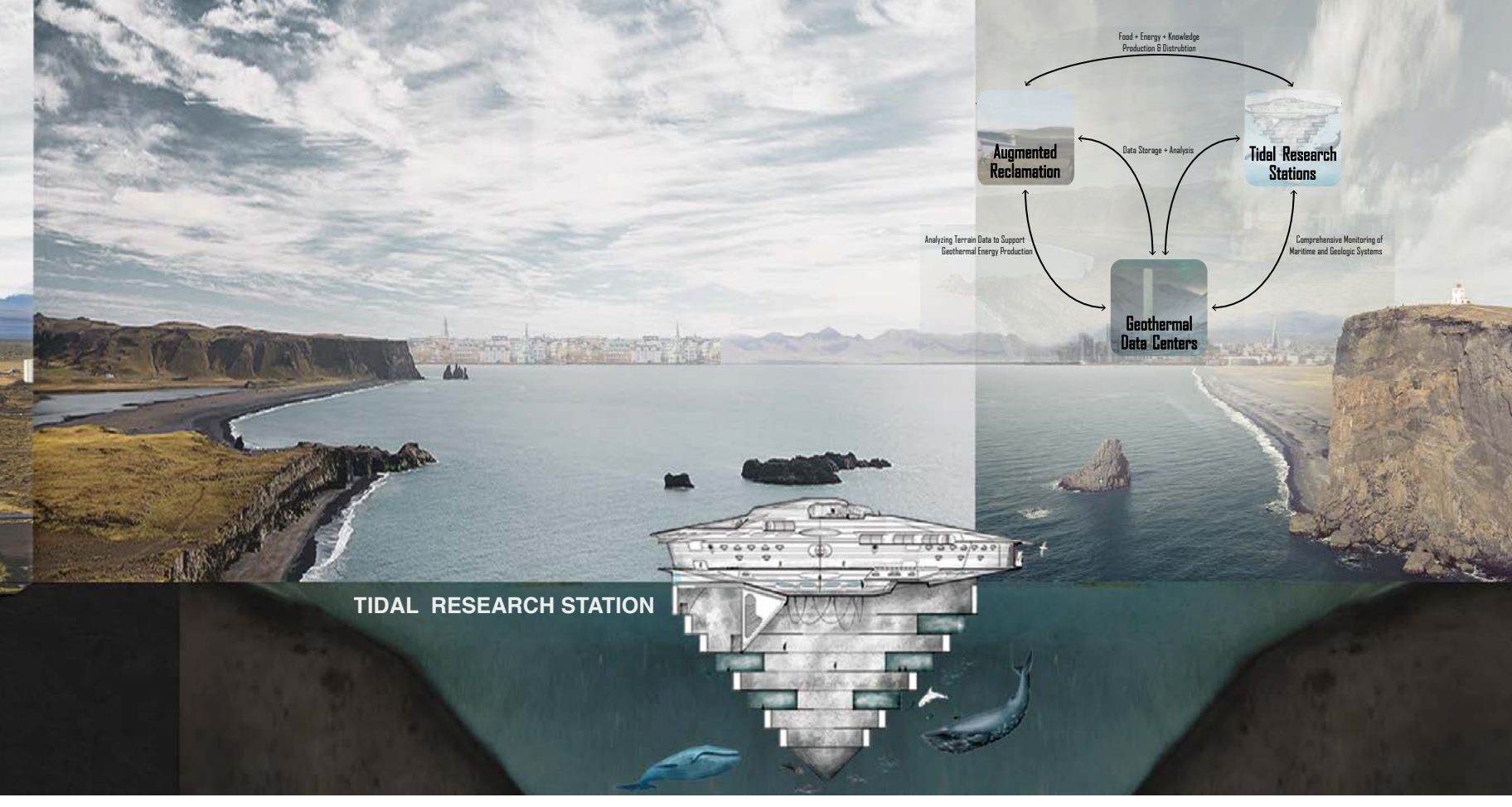


SEVERE AREAS OF EROSION

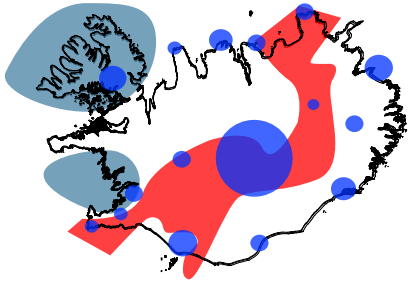


HYDROLOGY + FORESTS





ALTERNATIVE ENERGY SOURCES



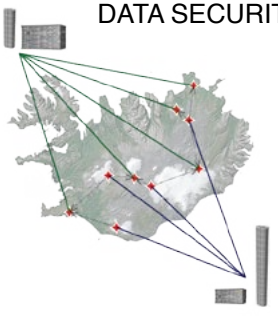
High Tidal Energy Production Areas
High Wind Energy Potential Zones
High Geothermal Energy Production

Iceland's sustainable energy potential offers a unique opportunity to leverage it's geographical location on two levels. Globally, its location and energy systems offer an ideal condition for data infrastructure and exchange. Locally, Iceland's position as a leader in technological development offers an opportunity to precisely intervene in its marine, aquatic, and terrestrial systems for research and knowledge production. The project's goal is to leverage both scales in order to sustain Iceland into the future, while simultaneously promoting opportunities to productively integrate with the region's geopolitics through data-driven research and management.

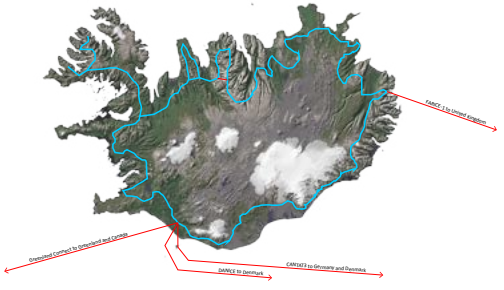
GEOTHERMAL DATA CENTER

As part of a data network across Iceland, these geothermal data centers provide power to Icelandic cities as well as data-processing and storage services. These centers are a vitally important part of Iceland's future as a global hub for sustainability, technology, and data. The information stored and processed in these hubs work to support global data companies, local marine research efforts, Icelandic ecological health initiatives, the Arctic Climate Data Collection Network, and the development of local and worldwide sustainable technologies.

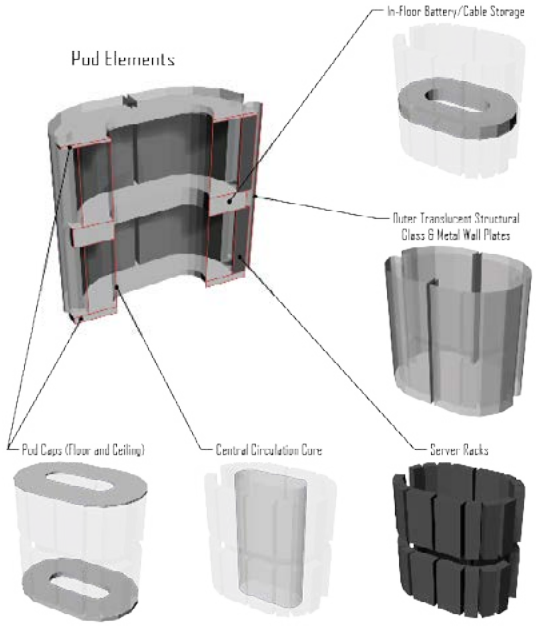
DATA SECURITY SYSTEMS



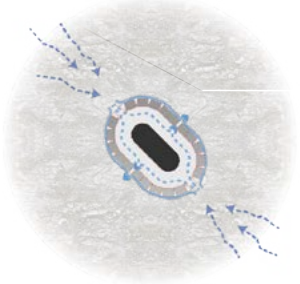
FIBER NETWORK

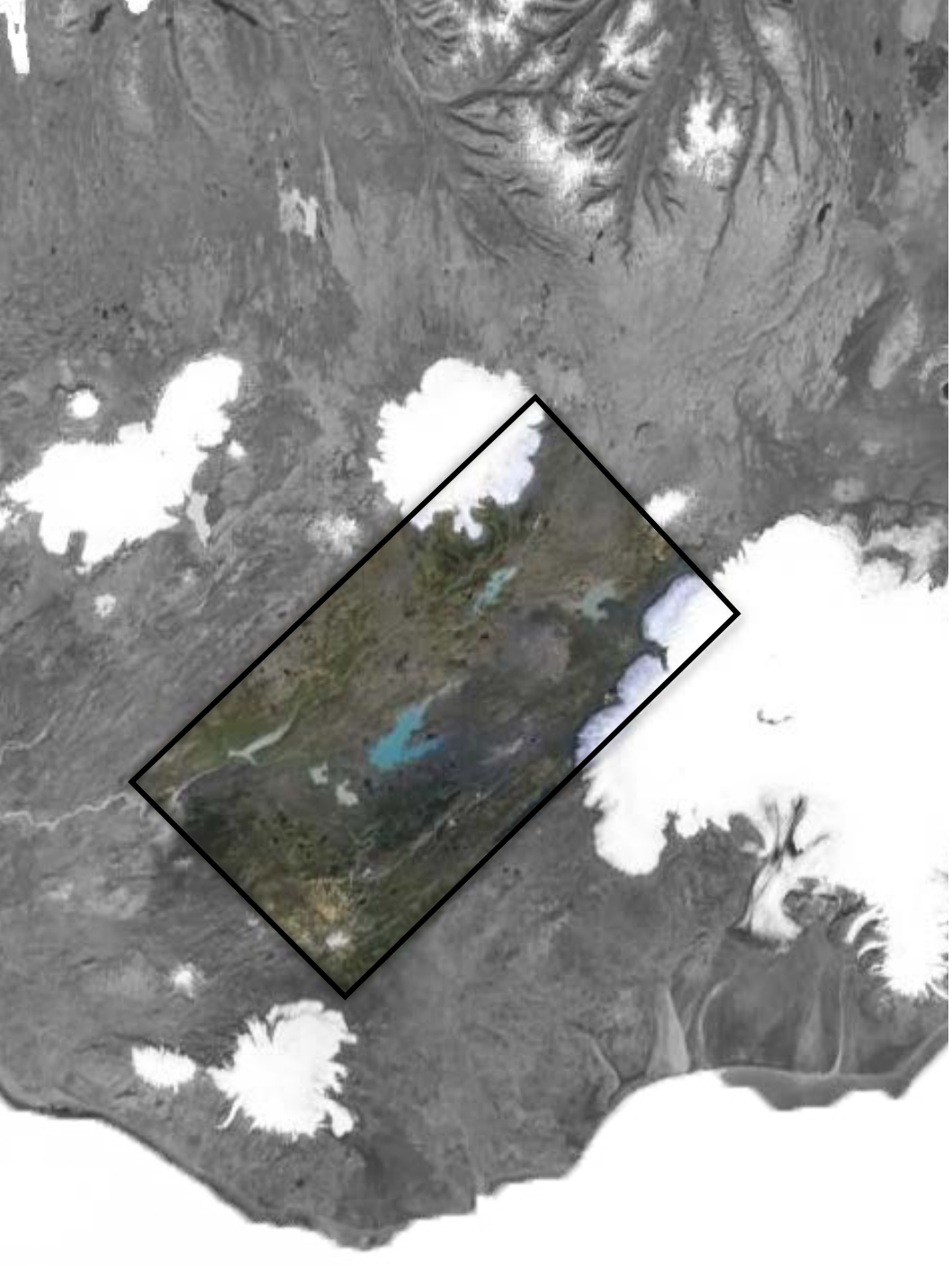


DATA CENTER POD ELEMENTS



NATURAL VENTILATION COOLING

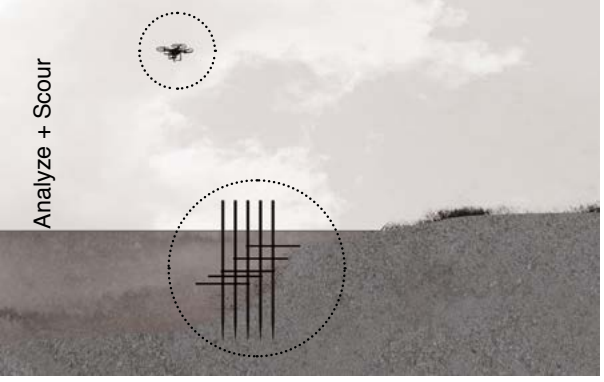


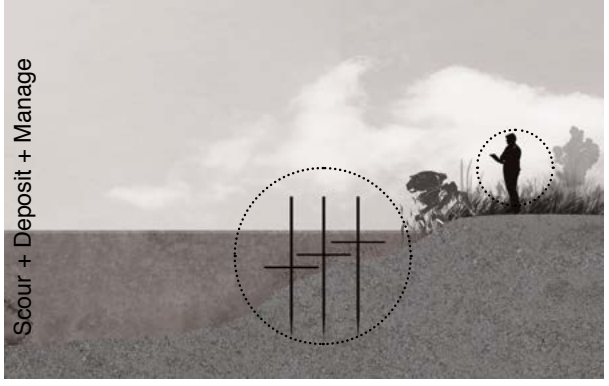


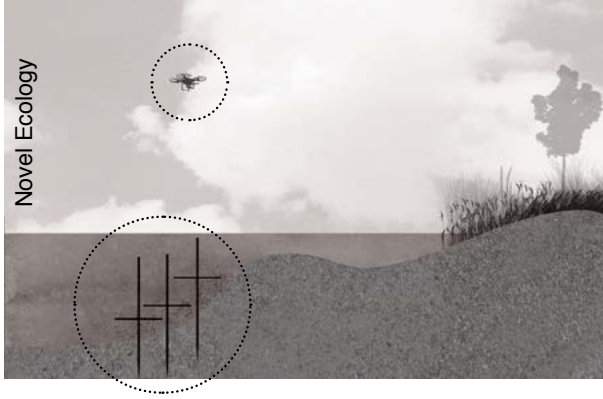
AUGMENTED RECLAMATION

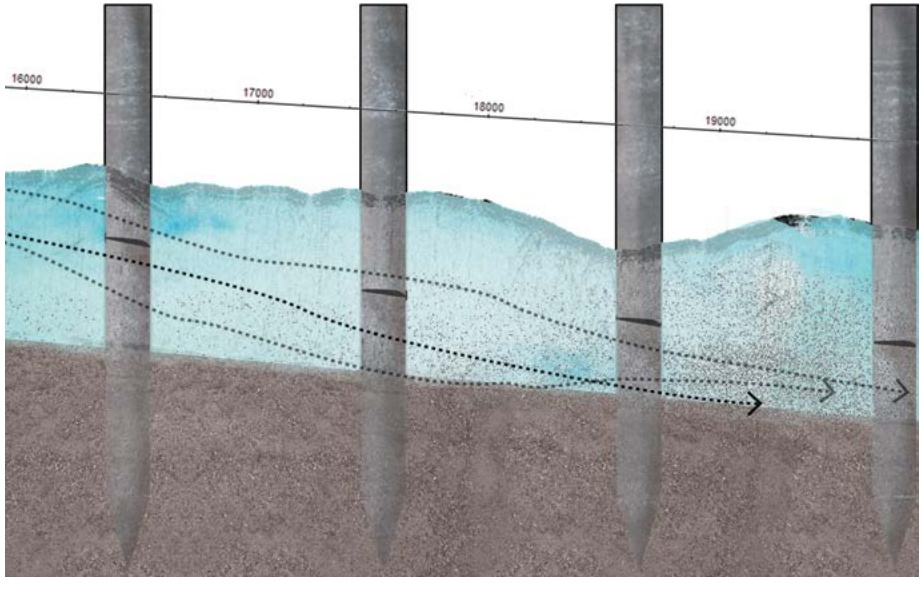
Iceland's future as a digital and technical hub offers technology and data infrastructure capable of monitoring and intervening in landscape processes in a targeted and highly specific fashion.

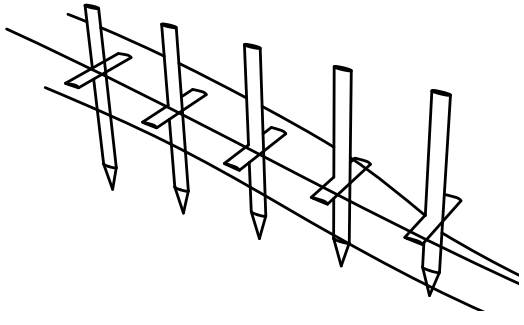
Iceland's erosion regime is currently the worst in the temperate world and is expected to only worsen with climate change. Suffering a 96% loss in tree cover and centuries of overgrazing, Iceland's soil erosion offers an opportunity to cultivate a cyborg ecology where data and human/robot partnerships are able to mitigate soil loss through the conversion of problematic landscapes into cultivated fields where data and nature respond to each other.



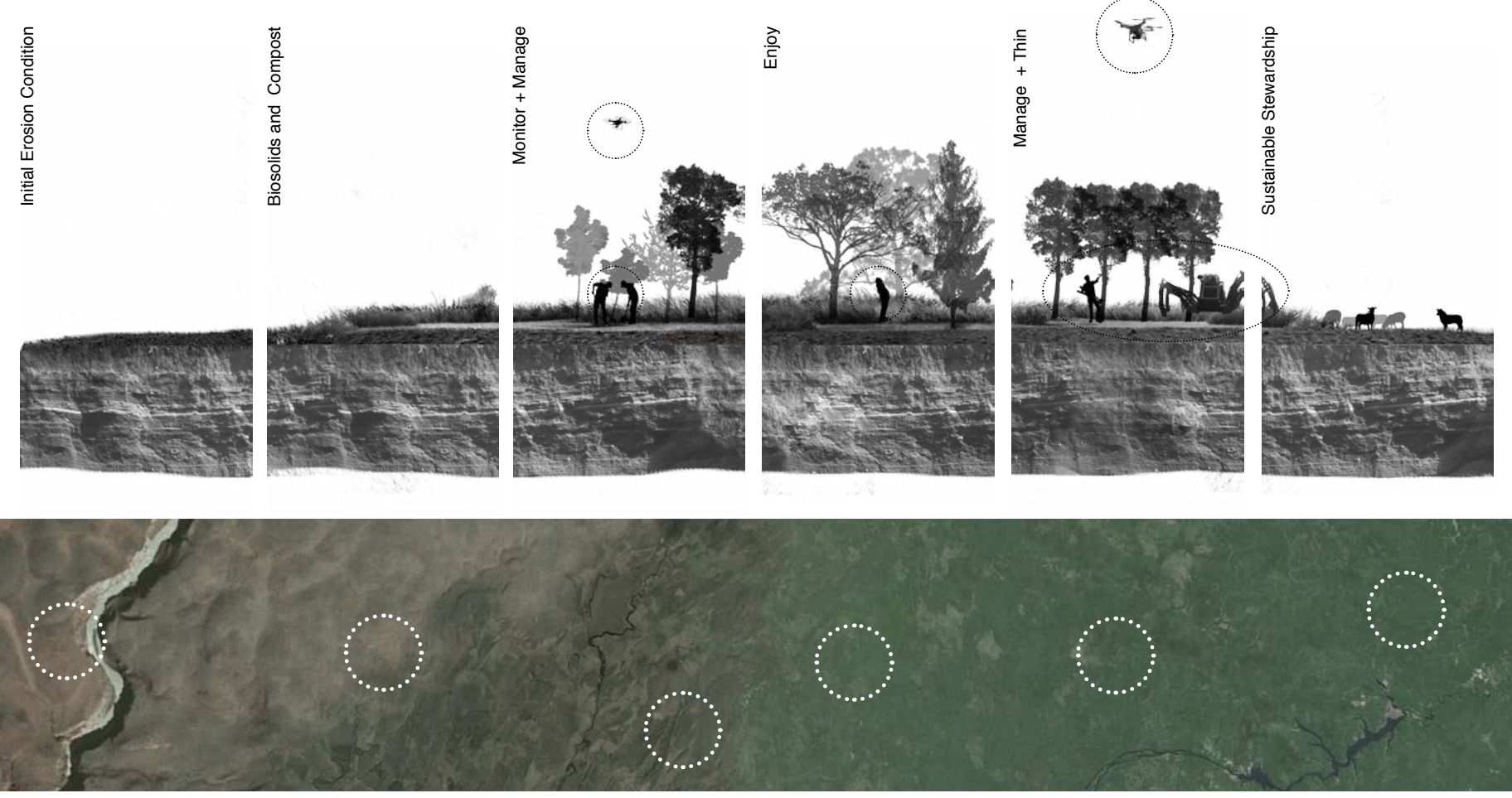








As climate change accelerates glacial melt, Iceland's river will carry large amounts of sediment. The River Fins operate much like an airplane wing or a hand out of a window on the highway. This device uses precision scanning and manipulates water movement to precisely scour and deposit sediment to create flood and climate change buffers.

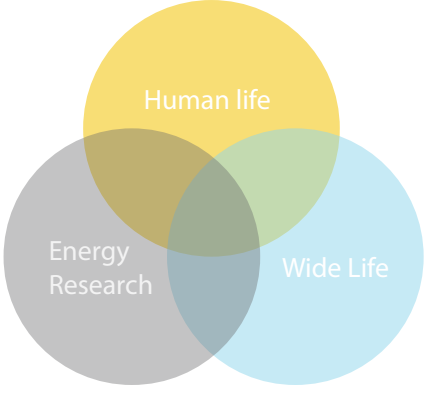


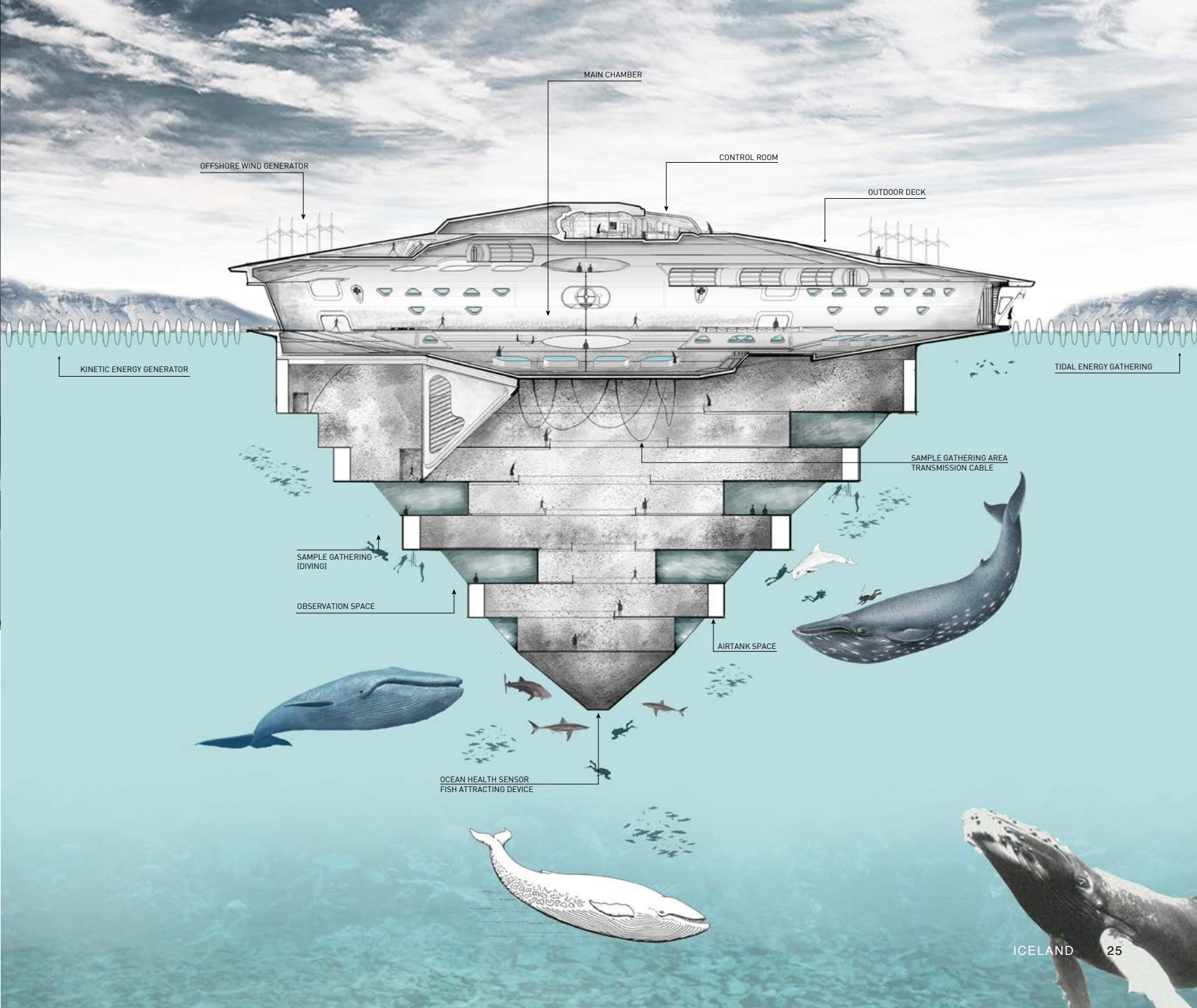
CYBORG ECOLOGY

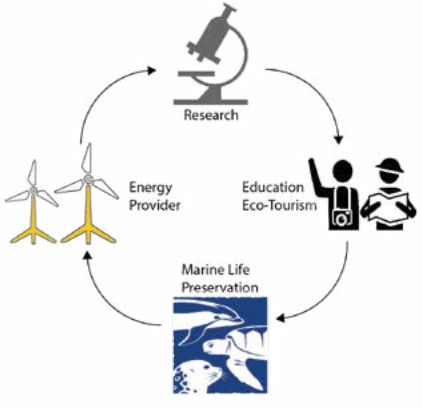
Advanced land scanning and the application of biosolids and composts from urban areas provides a healthy soil base. This soil makeup allows for initial targeted suites of pioneer species to stabilize soils. The emergent cyborg ecology lays the groundwork for future forms of agriculture and land management. A mature forest ecosystem can then be productively managed for both recreation and wood products, allowing for Iceland's tourism and tradecrafts industry. Ultimately, forest and meadow ecosystems can then be stewarded and the sheep grazing and timber harvesting that destroyed Iceland's soils can sustainably be reincorporated to Iceland's landscape and economy.

MARINE RESEARCH STATION

Rapidly changing oceans due to climate change will present serious challenges to Iceland's heritage of living closely with the sea. However, by leveraging technology and sustainable energy, this design allows for cultural continuity and well tuned stewardship through the design and deployment of mobile monitoring stations. We envision these stations as emerging from Icelandic intuition and innovation and operating in cooperation with fellow Arctic nations so that we can collectively work towards understanding climate change's effect on our oceans.




MAIN CHAMBER
CONTROL ROOM
OFFSHORE WIND GENERATOR
OUTDOOR DECK
KINETIC ENERGY GENERATOR
TIDAL ENERGY GATHERING
SAMPLE GATHERING AREA
TRANSMISSION CABLE
SAMPLE GATHERING
(DIVING)
OBSERVATION SPACE
AIRTANK SPACE
OCEAN HEALTH SENSOR
FISH ATTRACTING DEVICE



ENHANCED OCEAN STEWARDSHIP

This marine and energy research station also allows for tourism in order to publicize these research efforts and engage the global public with ways to move toward enhanced ocean stewardship. Ultimately, the goal of this design is to apply our vision for stewardship through the application of technology and data to our knowledge of the ocean and our relationship to it.

LIFE ON MARS

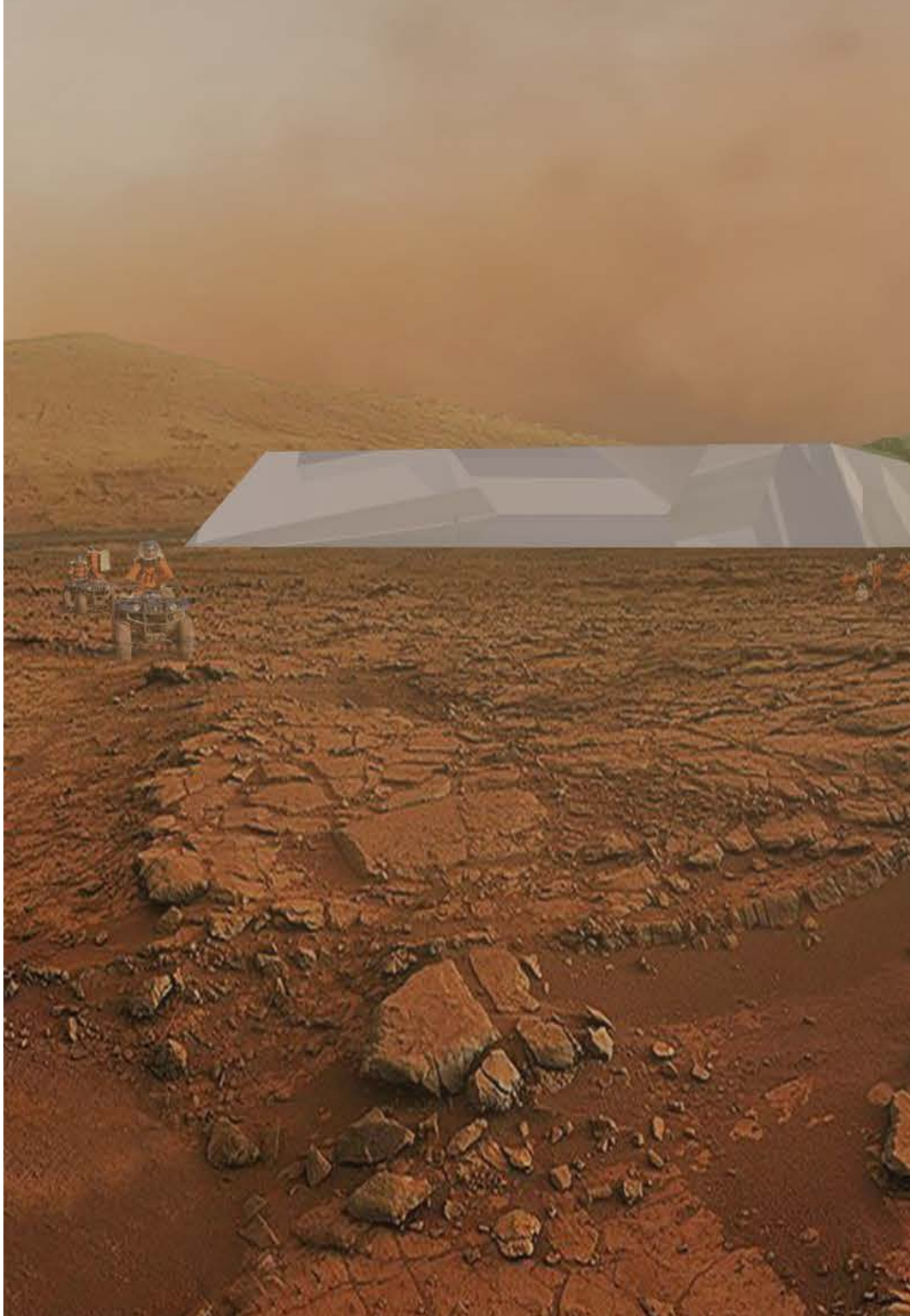
WELCOME TO WHAT IS NEXT

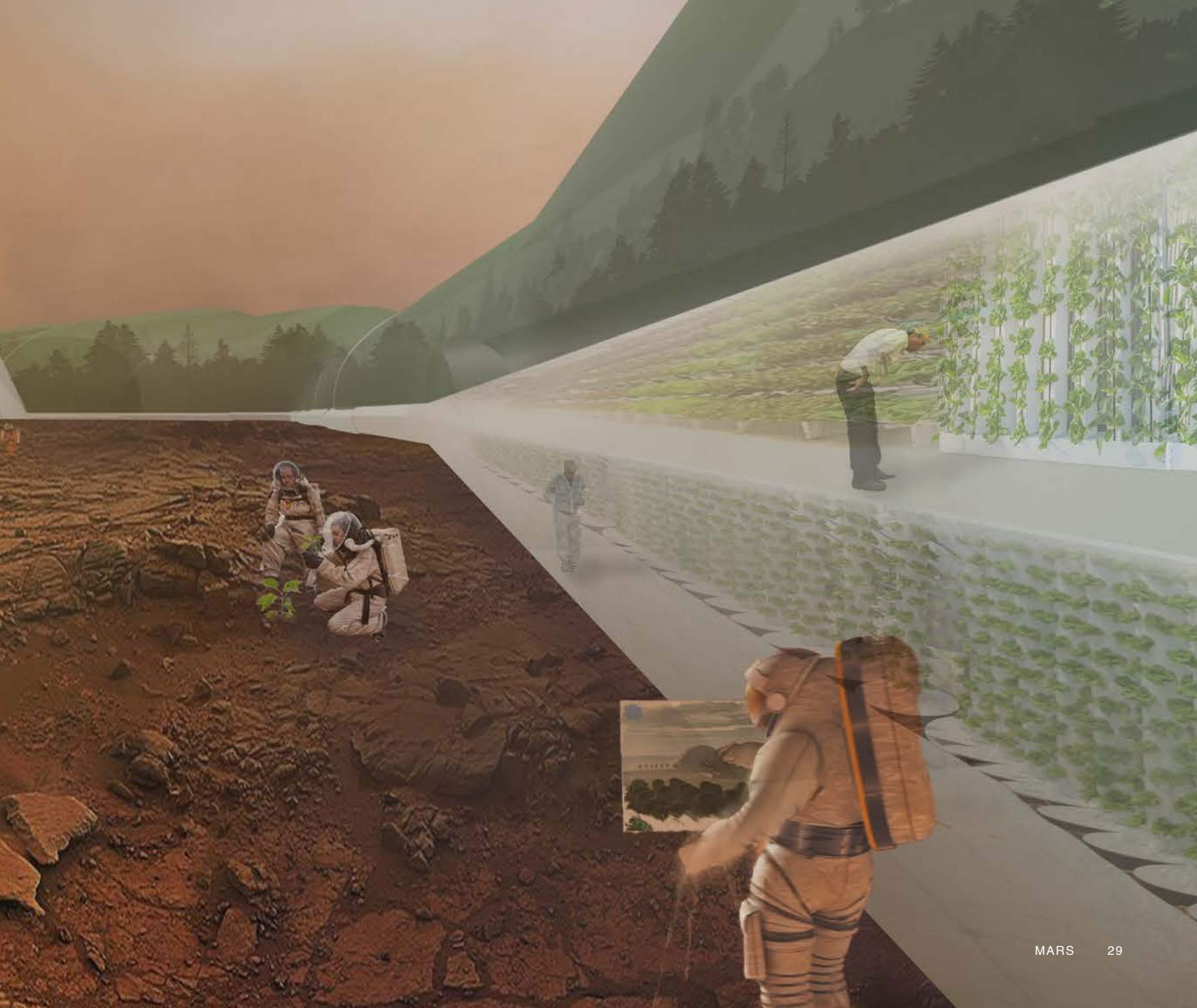
Good morning future Martians, and happy Launch Day! We welcome you to the Martian 2200, heading to Curiosity Village of Gale Crater on Mars. Our flight time today is eight hours and thirty-five minutes, arriving on Mars at 5:35GCT.

Currently on Gale Crater the winds are from the West - peaking at 45 miles per hour - and visibility is limited due to the recent sand storm. When we arrive, it will be the 53rd day of January so you can expect the temperature to hover around -33 degrees Celsius or -92 degrees Fahrenheit. However, the temperature within Curiosity Village is stable at 20 degree Celsius or 68 degrees Fahrenheit.

Now that we have exited earths atmosphere and there is no more turbulence, please move about the cabin and meet the other 4,000 passengers, as they will be your neighbors once we have reached Gale Crater. We will be landing in a few hours, but before we touch down, please check out this short presentation by some of our scientists to learn more about what you can expect for your life on Mars here in 2200.

JACKSON BLALOCK,
KATELYN BRISTOW





2016 massive start-up funding

2023 Earth - Space Collaborative created

2024 exploration

2027 initial settlers selected

2029 settlers embark on mission

2030 PNEUMATIC STRUCTURES

2033 successful 3d printed structure

2035 first SOIL BARN printed

2036 phytoremediation begins

2041 first forest planted

2059 RIBBON grows

2115 LUNGS produce 100% of oxygen needs

2115 first forest mature

2130 CLUSTER dwellings proliferate

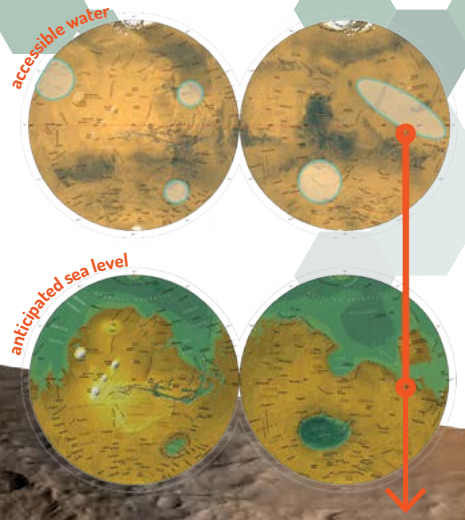
2143 RIBBON grows

"THE LANDING"
in the Aeolis Mons Foothills

Aeolis Mons
5.5km elevation

Aeolis Planum
ancient river deltas
Bradbury Landing historic site

"The Landing"
est. 2024
pop. 6,095



GALE CRATER
cradle of Martianity

abundant "R+R"
research +recreation

2200

2190 CURIOUSITY VILLAGE printed

2200 LAUNCH DAY

2200 first mass migration from earth

2221 RIBBON grows

2221 more villages printed

2367 emerging autonomy

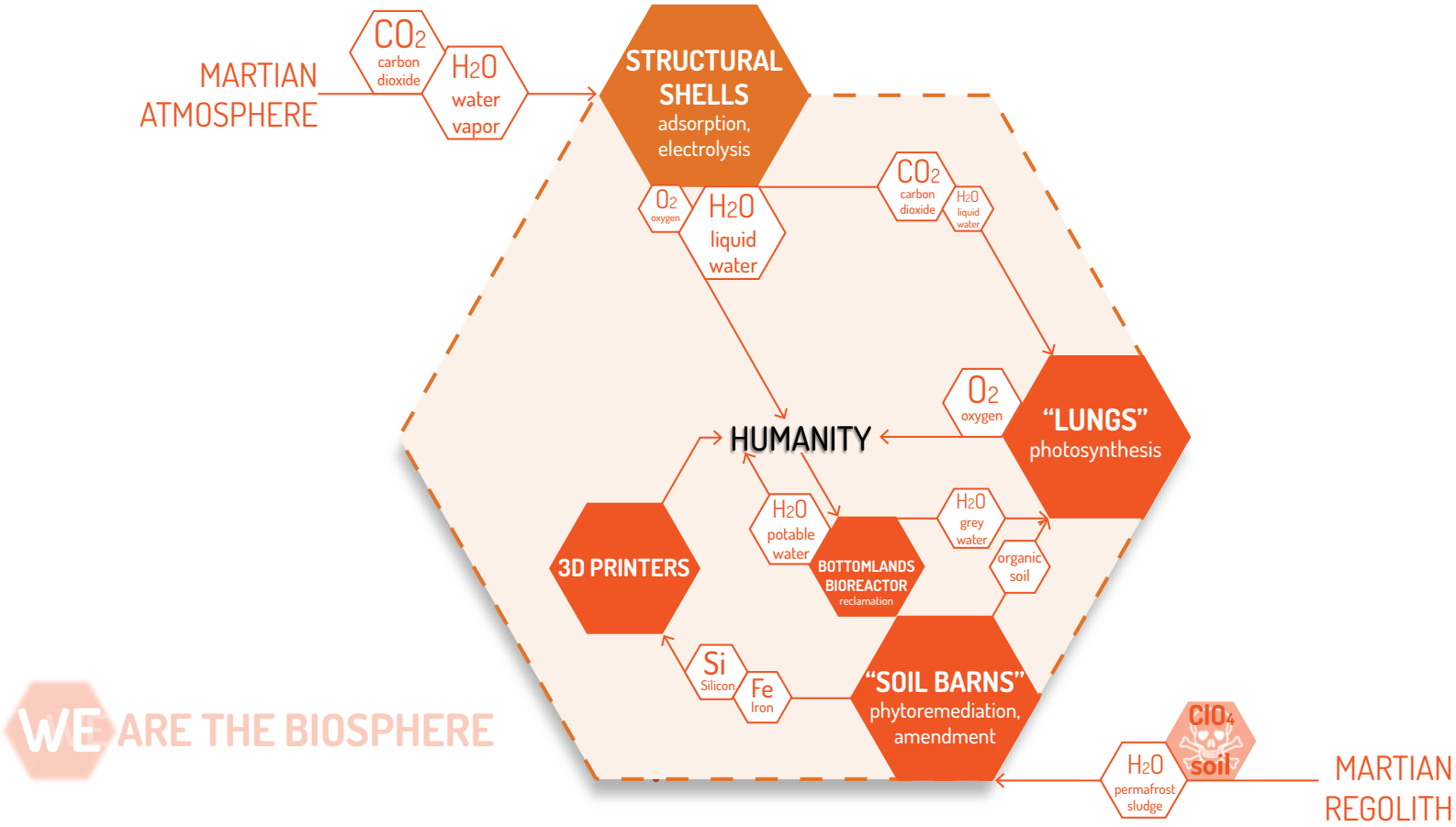
2400 Martian independance day

2470 Martian vernacular develops

2500 mass migration from earth

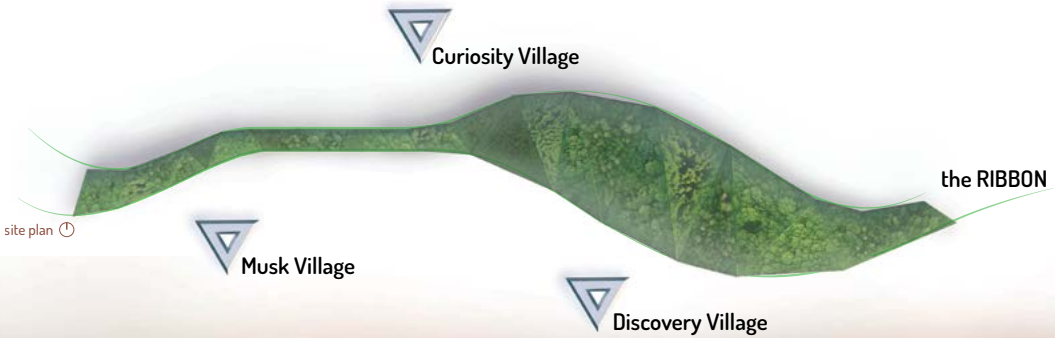
SITE LOCATION: RIBBON OF LIFE IN A FROZEN DESERT

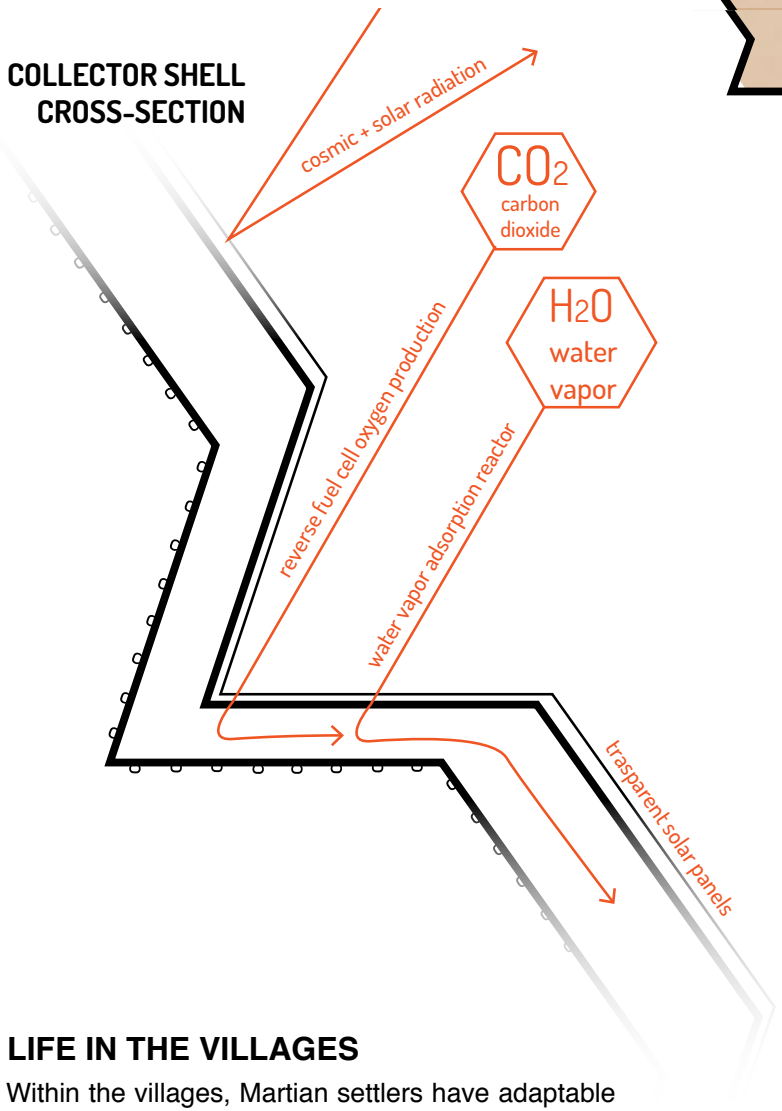
The settlement location was chosen due to its close proximity to a water supply and because there is a lot known about this foreign location already as it has already been explored by the Curiosity Rover.



A NEW NEIGHBORHOOD

The Martian settlement is made up of two parts - the Villages and the Forest Ribbon. The villages are where Martians live and spend most of their time; the Forest Ribbon makes long-term life possible on Mars. It supplies the villages with oxygen needs and growth over time. Life on Mars is attainable through careful consideration of the available resources on Mars and the required resources for sustained human life.





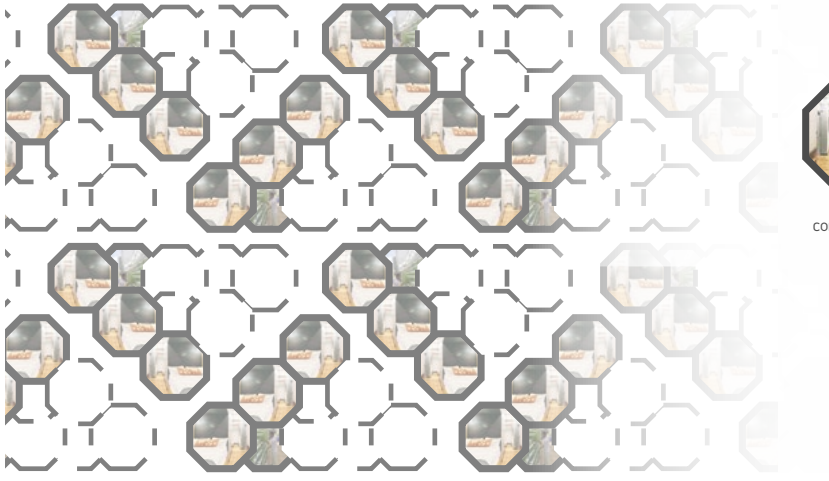
COLLECTOR SHELL

oxygen production
water collection
transparent solar panels
radiation barrier
embedded LED lighting
3D-printed structure
integrated habitation

LIFE IN THE VILLAGES

Within the villages, Martian settlers have adaptable spaces to grow produce, interact with friends, work, and carry out daily life like they would on Earth. Humans are protected in the villages by a superskin collector shell. The 3d-printed shell harvests oxygen from the atmosphere, collects moisture for water consumption, and acts as a radiation barrier. The shell also acts as structural skin, which integrates octahedron shaped housing units.

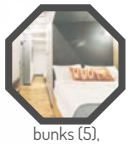
0 6 12 24m



CLUSTER ALLOTMENTS at MOVE-IN
80 sq m personal space
50 sq m agriculture
190 L water per day
550 L oxygen per day
+11,300 sq m communal ribbon forest

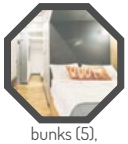
2200 CE

initial habitation cluster:
basic living provisions for 15
future growth through infill


bunks (5),
communal area


agriculture


bunks (5),
flex space


bunks (5),
re-cycling

2210 CE

adapted habitation cluster:
customized by group of 15
variable use of cluster


aquaculture


agriculture


agriculture


forage forest


housing


communal use


semi-public


housing


re-cycling

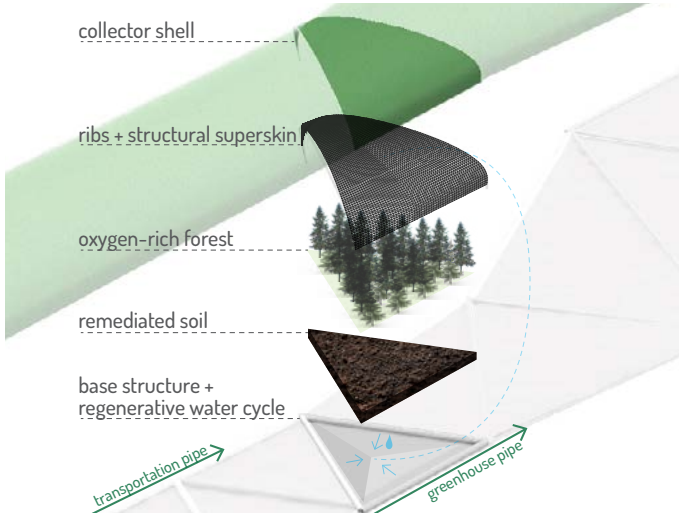
MARTIAN CLUSTERS = MASS CUSTOMIZATION

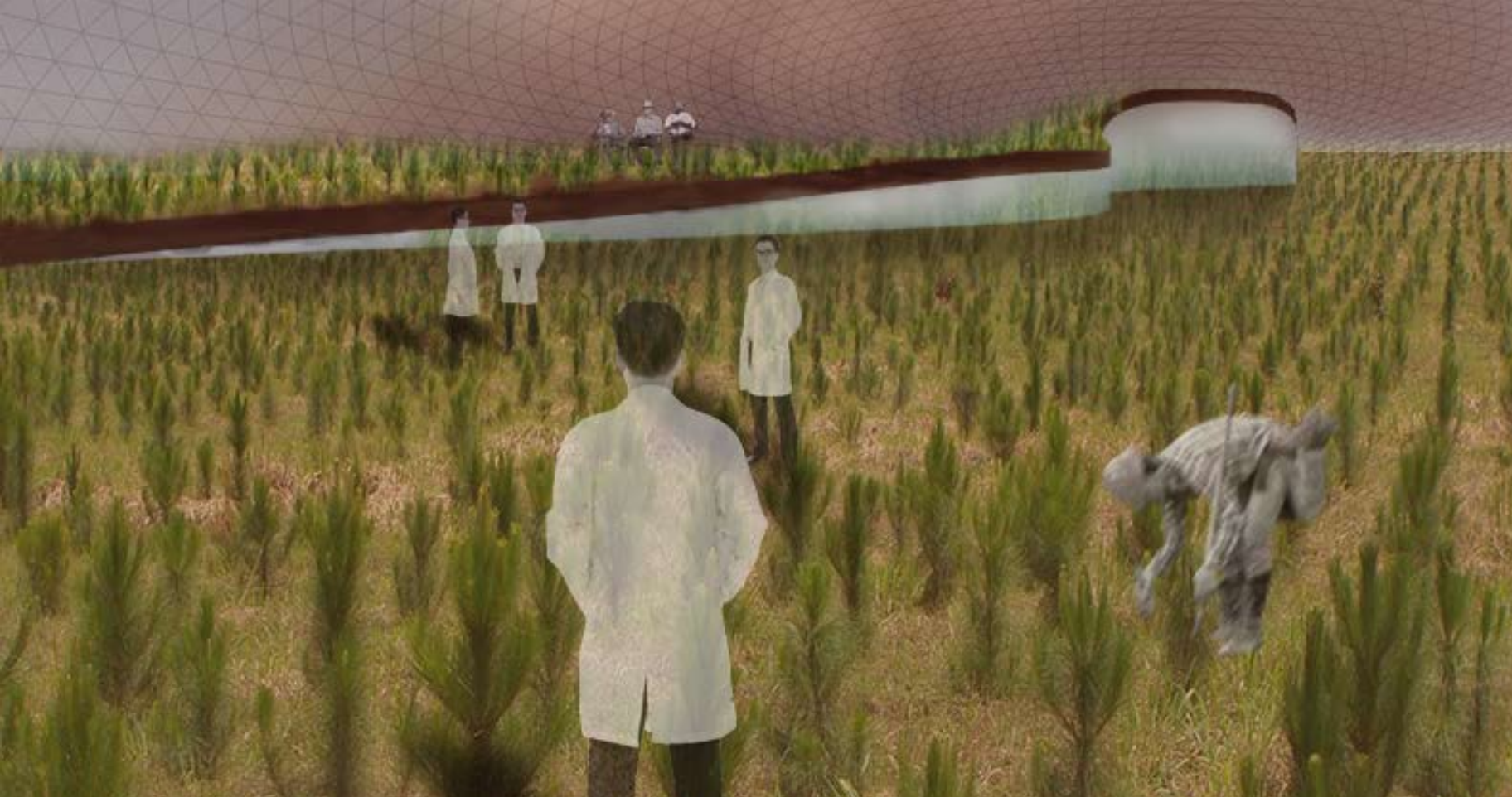
CLUSTER CONFIGURATION

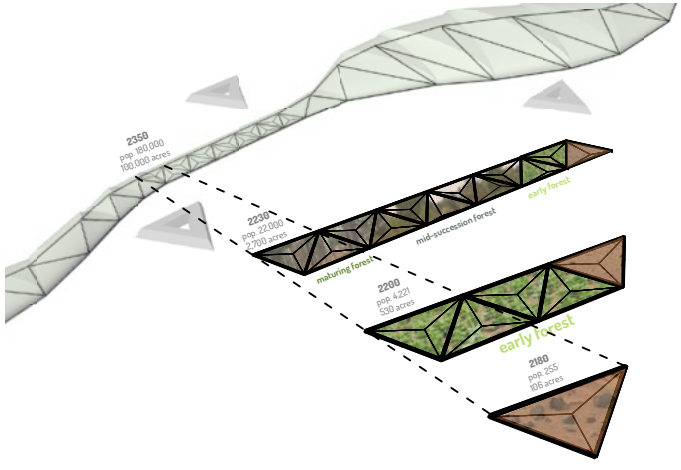
The octagedron housing units are grouped in clusters of nine. Up to 14 people live in each cluster, which allows enough space for each person to grow sufficient food and collect sufficient water through the collector shell protecting their housing units. Each unit is completely adaptable through 3D-printing technologies and can be customized over time.

THE FOREST RIBBON

The forest ribbon provides each village with all of their oxygen needs. It is comprised of a layered system consisting of a triangular base, which includes a regenerative water cycle, soil, forest, structural ribs, and superskin - all enclosed within a collector shell that shields the vegetation from the intense radiation.





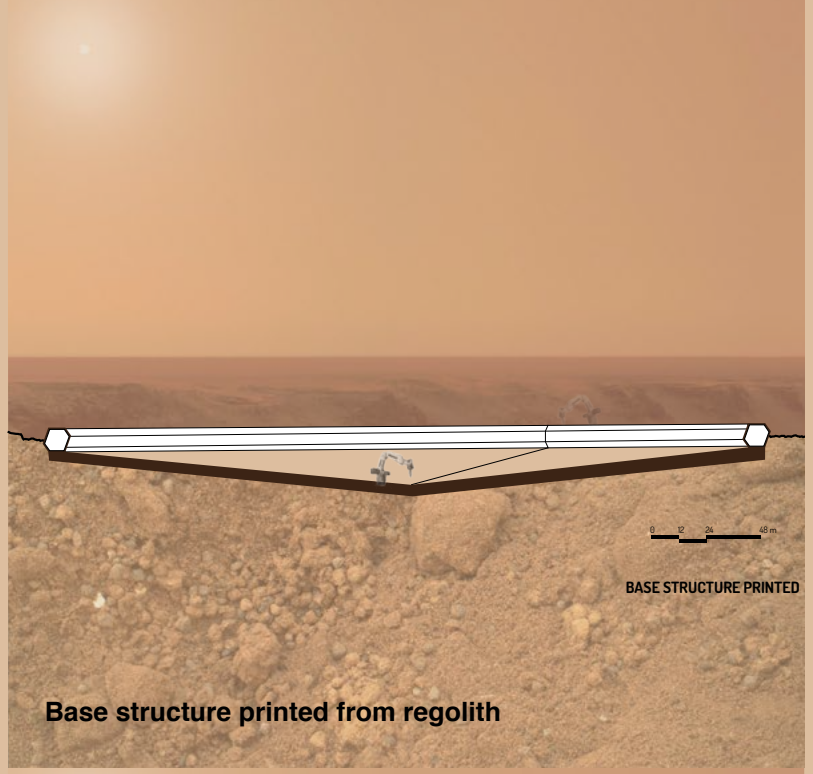


THE GROWTH OF THE RIBBON

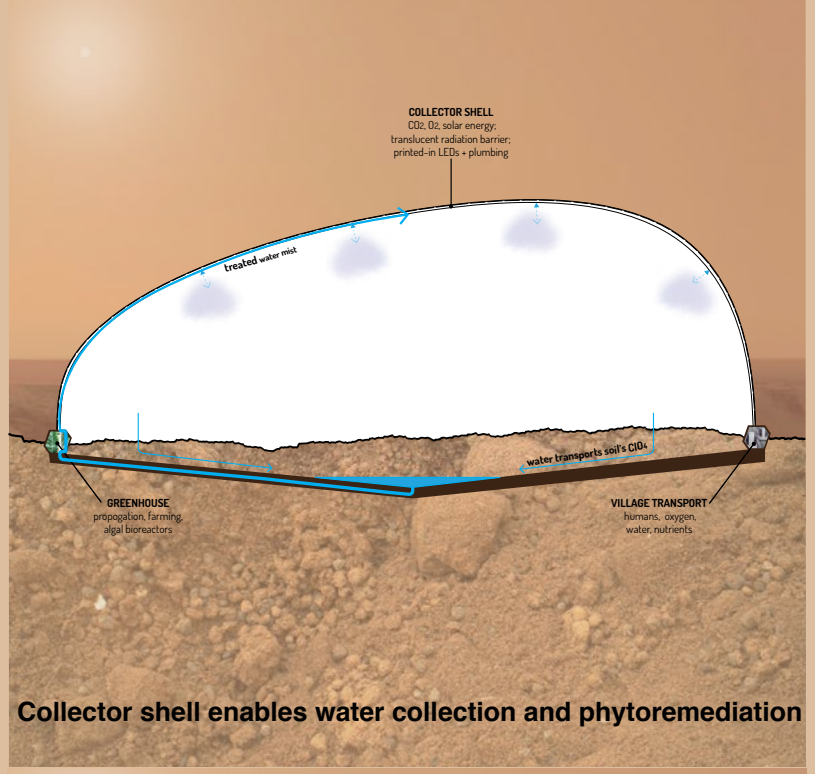
The forest ribbon began as a 50-acre soil barn with a triangular base. The triangular form allows the forest to seamlessly be added onto over time, creating a growing ribbon across the landscape. This ribbon sets up a system that takes into account the population increase over time as more people settle on Mars and more oxygen is needed.

THE GROWTH OF THE FOREST

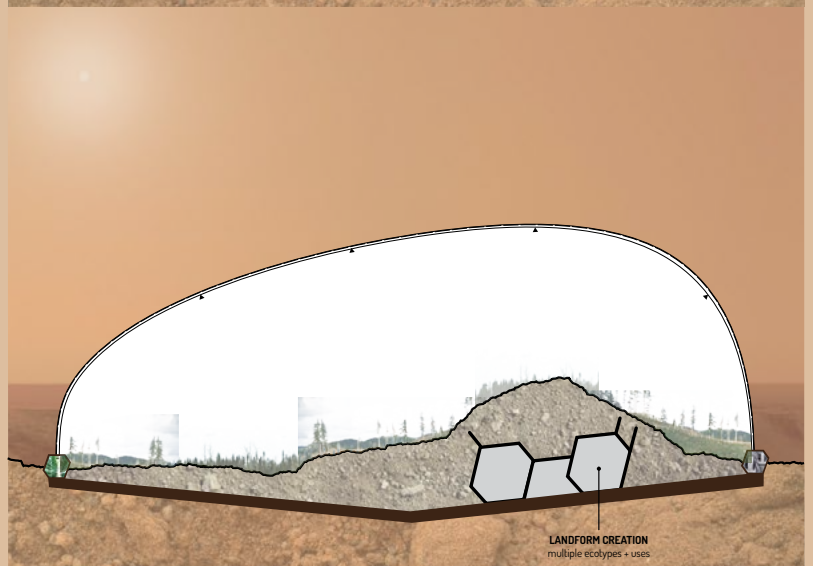
The creation of a forest within the forest ribbon takes several steps over long period of time. First, the base is 3d-printed from elements found within the regolith. Then the collector shell is created, which includes a regenerative water cycle, collecting all unused water at the triangulated base. Phytoremediation begins to cleanse the soil that is filled with perchlorates. Then the soil can be landscaped and formed to create topographical changes. Forest starts are planted and can then grow to full maturity, producing more oxygen each day. The forest ribbon provides a place for recreation and relaxation away from Martians' home and work life within the villages. It provides a different environment to explore, which has great psychological benefits. A big concern with deep space travel is the associated psychological risk. The forest ribbon creates a much needed recreational outlet, allowing Martians to hike, explore, climb, and have family vacations.



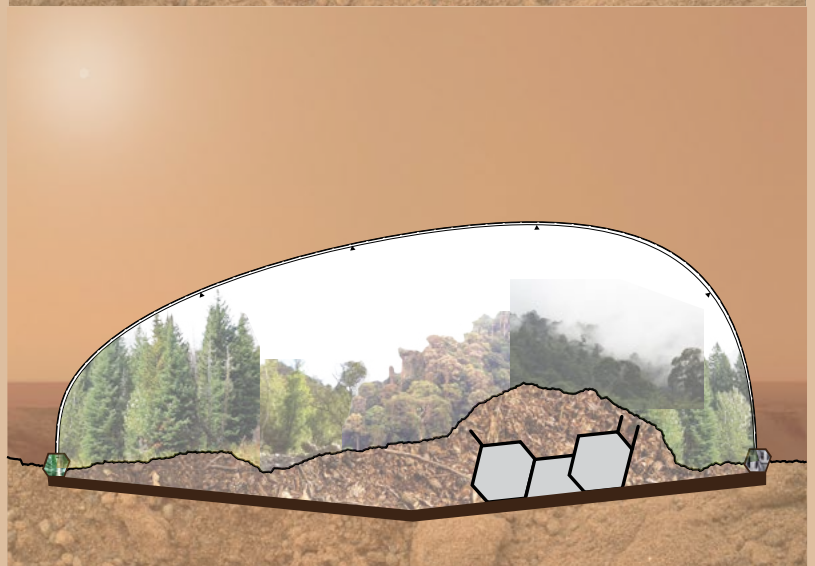
Base structure printed from regolith



Collector shell enables water collection and phytoremediation



Soil landscaped and forest starts planted



Forest matures and produces more oxygen each day

THE SYNDICATE

SYSTEMS OF POWER AND WASTE IN NAPLES, ITALY

Throughout its history, the city of Naples, Italy has been in relatively constant economic and political turmoil. This turmoil is in part perpetuated by the increasingly pervasive criminal organization called the Camorra, which derives its income primarily through waste management. In 2016, Naples is less known for its history and picturesque beaches, and more for the waste that burns on its streets.

This project examines the potential for the city to emerge from its current socioeconomic problems through reforms led by the Camorra, as they turn Naples into a city that thrives on state-of-the-art strategies for waste management and recycling, while generating community and furthering the control of the Camorra over everyday life.

Naples is a city of turmoil, continually conquered by peoples from near and afar, and more recently from within by the Camorra. The Camorra is a criminal organization with an international presence that pervades every facet of daily life, but they derive their primary source of income from waste management.

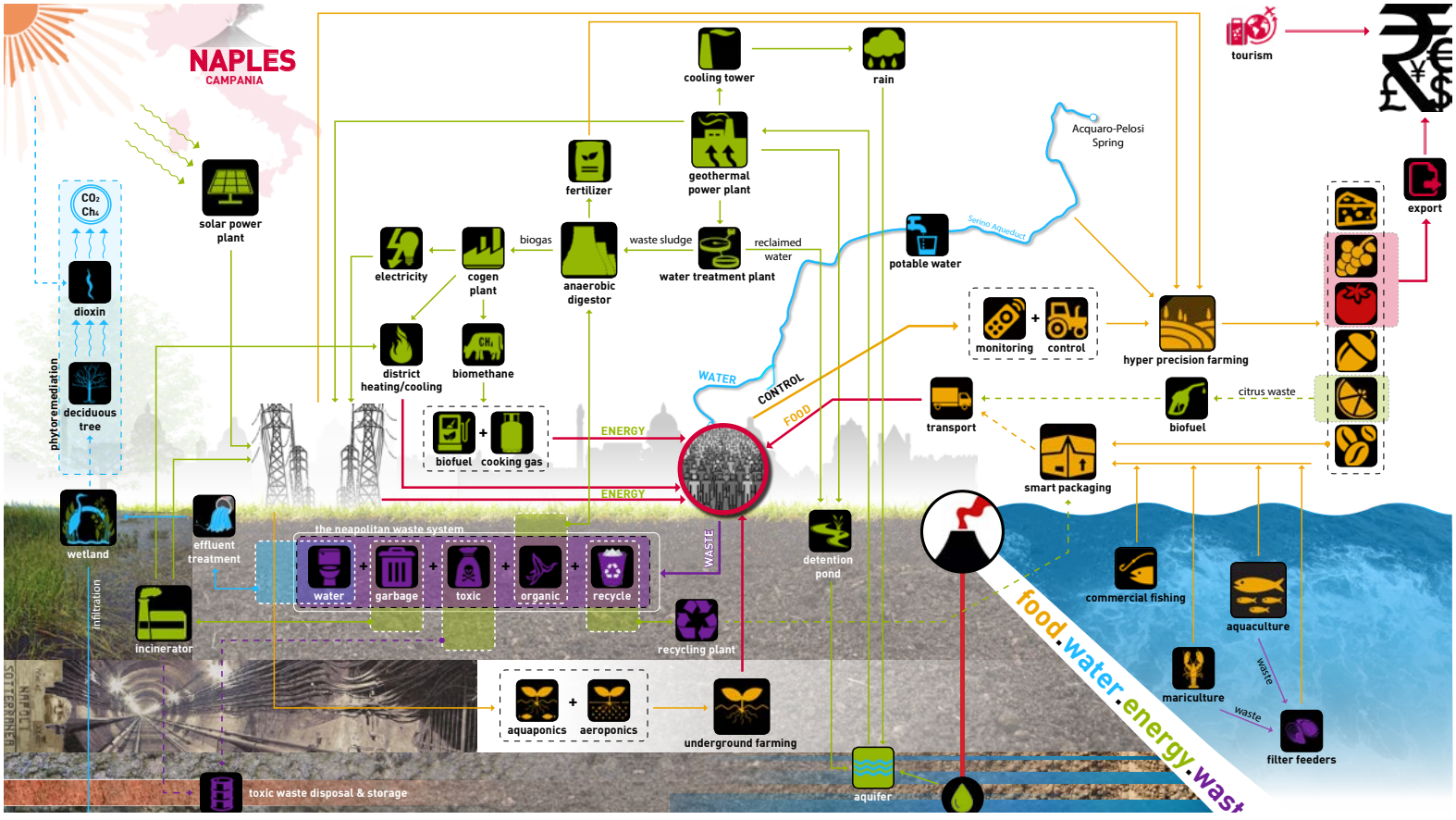
The issues surrounding the management of solid waste in Naples are enormous, as once productive agricultural lands are degraded through legal and illegal dumping. These activities lead to more insidious impacts related to polluted soils and human health issues in the Campania region.

KAREN CHAN, STEPHEN TRIGUEIRO, RISHABH UKIL


LEVIATHAN

CAMORRA

a horizontal organizational structure and a micromanaged business model that breeds a highly resilient system

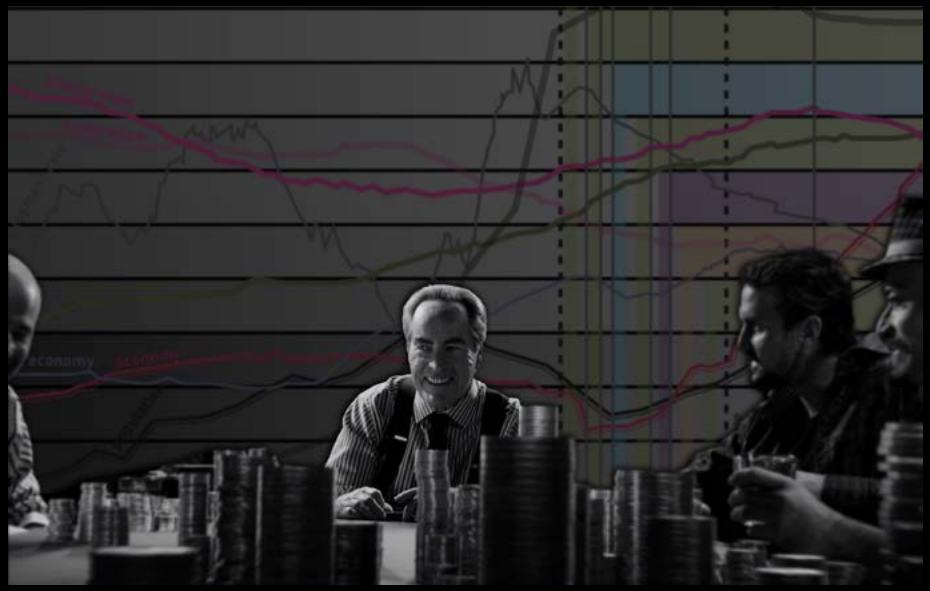


THE CAMORRA

The success of the Camorra as a crime syndicate is the horizontal structure of the organization, which is formed by multiple clans that are constantly in war with each other. As opposed to the pyramidal structure of a typical mafia clan, the Camorra are a highly resilient and ever-expanding organization.
In this scenario, due to blighted socioeconomic conditions, the southern portion of the Italian peninsula is cut off from the prosperous north.

The city of Naples is forced to turn to the Camorra to revive their fortunes as waste is used as a valuable resource to build a new future.
Naples enters a critical phase where the city is struggling to preserve its past glory and gets embroiled in political conflict and economic insecurity. The prosperous north decides to cut off its economic ties with the ‘rats’ of the south as Italy divides in half.


ZEAL
ENTROPY

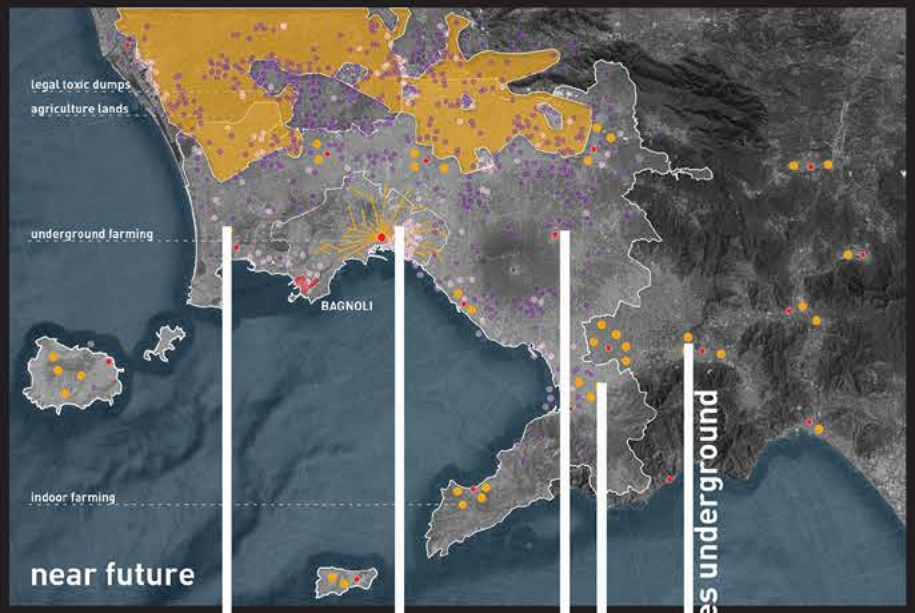


THE CAMORRA EXPANDS

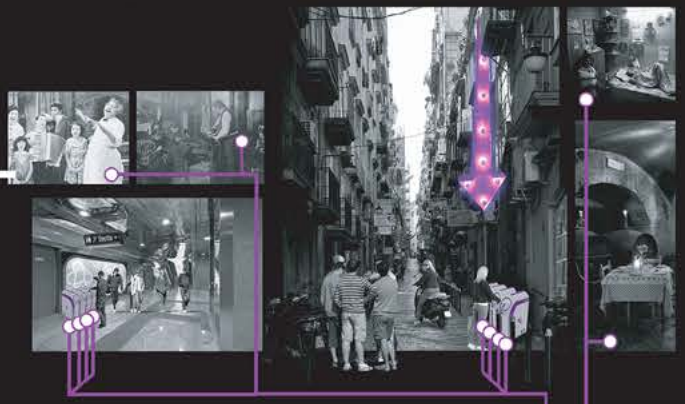
The split from the north draws the southern region, especially Naples, into a period of uncertainty and depression as the gritty Neapolitans starts to lose their familiar identity. Chaos erupts as the Camorra exerts its influence on daily life amidst this power struggle and economic turmoil. The youth flee in search of greener pastures, leaving behind an aging population in the city.

Naples goes through a period of darkness that is characterized by economic depression and deterioration of social life.The 'ostracized' south, now led by the Camorra, devices a slew of economic measures and alters their business model to suit the changing times.The Camorra becomes more aggressive in the system of waste management as they advertise around town to raise awareness of their economic measures, including the grand idea of building a waste-to-energy plant. The Camorra realize that their business must stretch outside of the Naples city limits in order to maximize their economic potential. They identify Bagnoli, the site of an old steel mill on the south-western coast of the city, as the potential location of the waste-to-energy plant.

The Camorra takes stock of the situation and identifies existing resources and potential future technologies to draw up a masterplan for the Campania region. It dawns on them that their past handling of waste has damaged the rich agricultural lands, so they start to clean up the existing trash sites. As they come to the realization that remediating the soil will take time, they decide to put all their capital into building the behemoth called 'bioloom' to champion the art of soil remediation and hyper precision farming.



when farming goes underground



the art of
waste management

emergence of bagnoli

Naples gets back it's farmlands

NAPLES UNDERGROUND: you go down before you come up

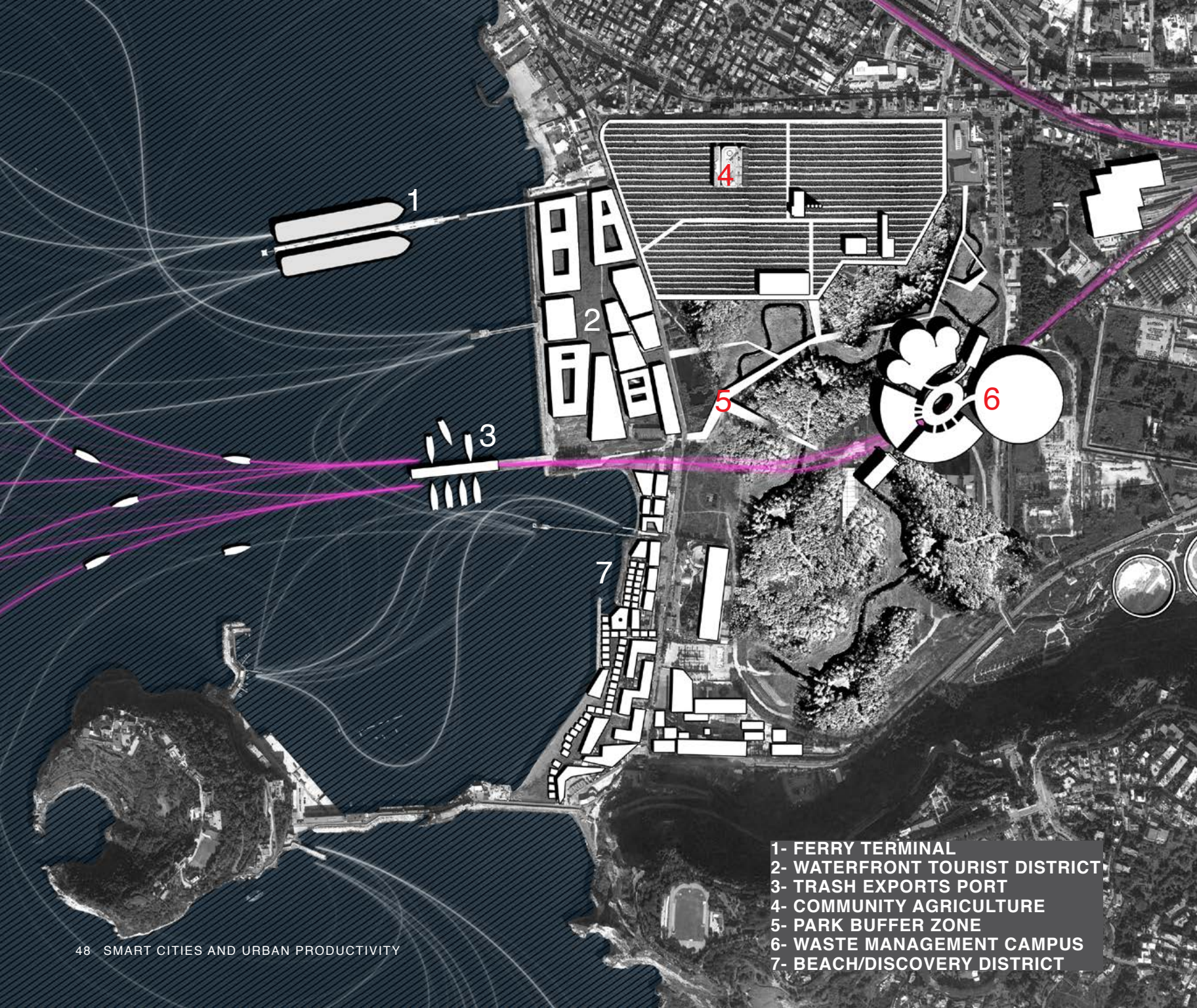
At this time, the Camorra discovers the potential of the cavernous subterranean network of the Naples Underground and the idea of "you go down before you come up."

The city begins to convert the existing subterranean network into an underground farm to supplement food production as the surface is cleaned up. The potential benefits of underground farming begin a new era of alternative farming in Campania, as traditional farming methods wait for the soil to remediate. Surrounding towns replicate the underground farming techniques of Naples by starting their own indoor farming methods in abandoned warehouses.

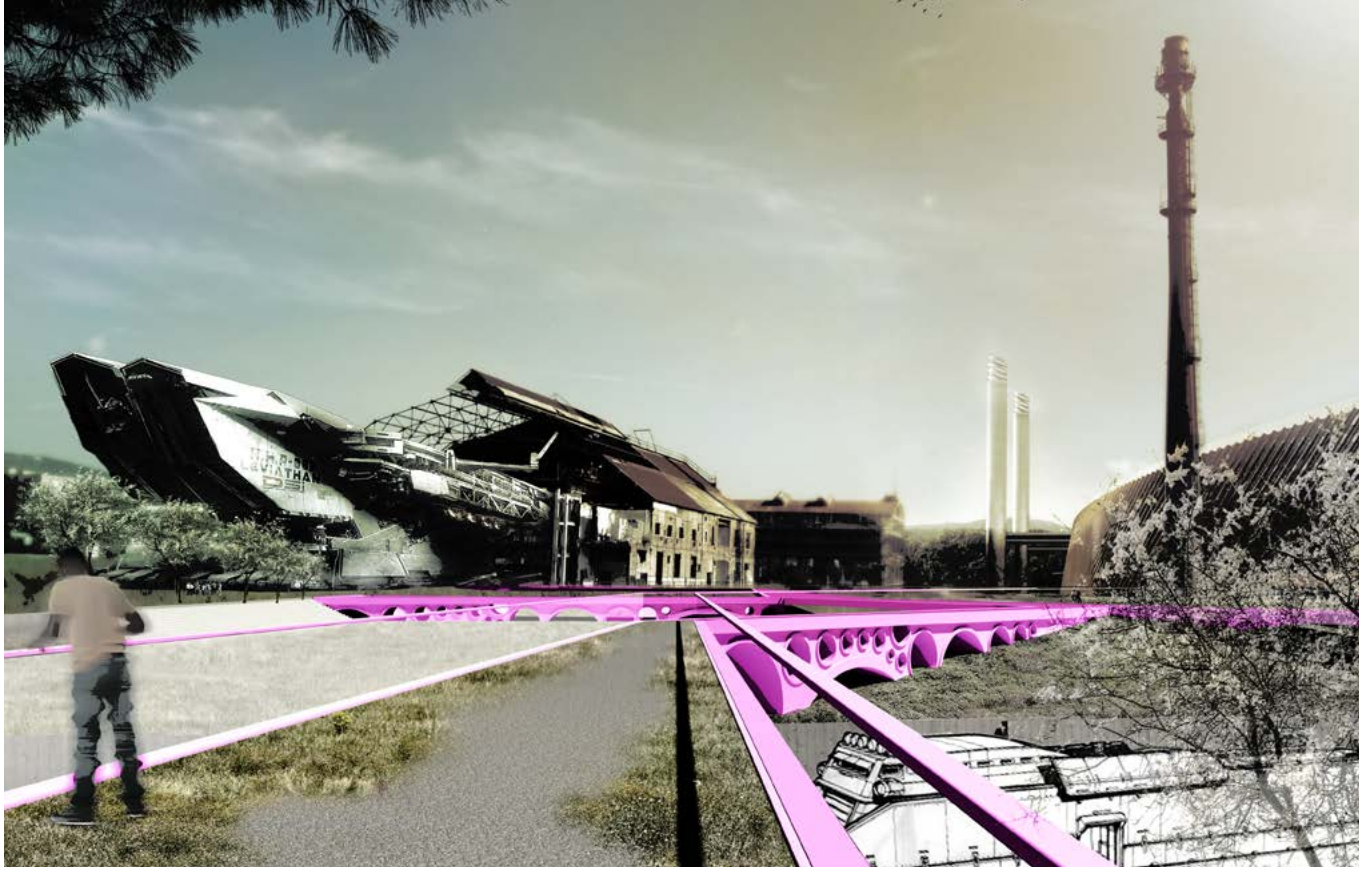
The existing trash dumping sites are gradually cleaned up to provide raw materials for the newly constructed waste-to-energy plant at Bagnoli. This major clean-up operation generates countless jobs, bringing back the youth as well as immigrants.

As the 'bioloom' moves across the land, cleaning up the toxic soil, agriculture takes off on these reclaimed lands in the northern part of the city. Finally, the time has come to convert the subterranean network and expand it to create the necessary infrastructure required to sustain a single-stream waste recycling system that is predominantly automated.

Naples' art of waste management begins with the roadside trash bins that act as automated compacting machines, which are collected by 'trash bots' at night and transferred to a bot district station to be sorted and packaged. Next they are transferred using driverless trains to Bagnoli for further processing into usable energy and products that can be marketed.



1- FERRY TERMINAL
2- WATERFRONT TOURIST DISTRICT
3- TRASH EXPORTS PORT
4- COMMUNITY AGRICULTURE
5- PARK BUFFER ZONE
6- WASTE MANAGEMENT CAMPUS
7- BEACH/DISCOVERY DISTRICT

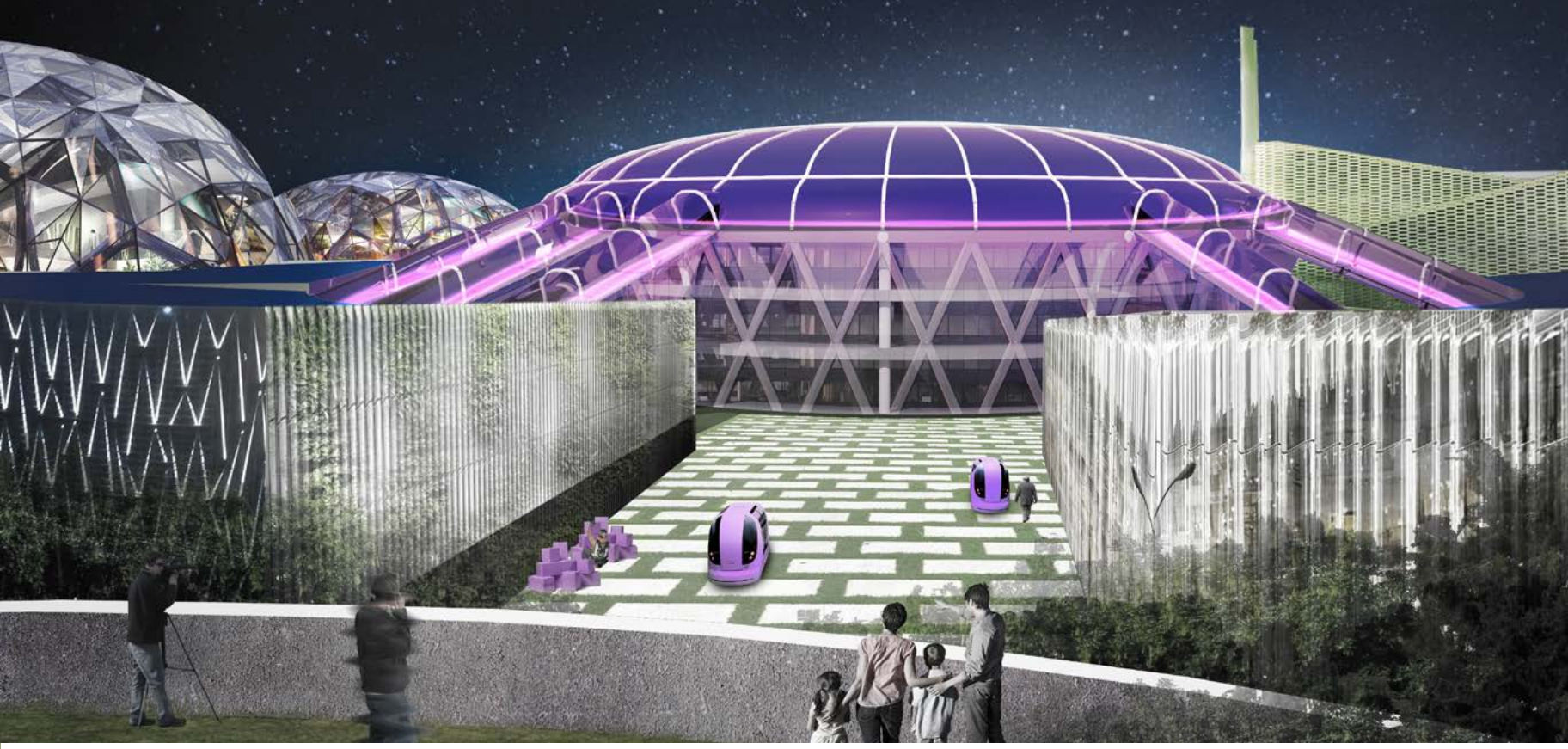


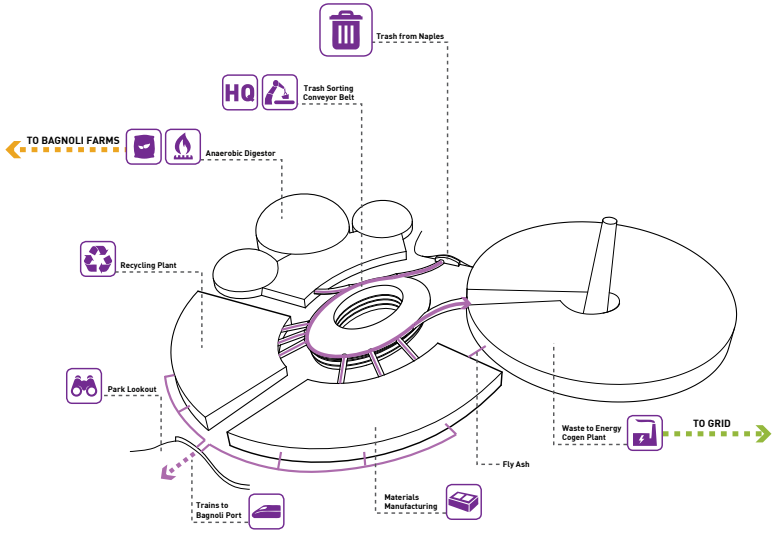
BAGNOLI

The now relentless Camorra succeeds in developing a waste-to-energy plant at Bagnoli and begins efforts to convert it into an industrial park. This promotes Bagnoli as a tourist destination where people can come in close proximity to the industrial areas. Naples uses the image of people interacting with a fully operational industrial plant to publicize to Italy and the rest of the world in order to reinvigorate its ailing tourism sector.

Bagnoli takes shape as a tourist hub through the ferry terminal, as private yachts and cruise ships create a flurry of activity at the waterfront. The waterfront becomes a hotspot for incoming tourists. People are encouraged to take tours of the waste-to-energy plant in order to understand how waste is recycled and treated. The growing success of Bagnoli as a tourist destination allows the city to develop agricultural land on the northen part of the site, promoting the idea of urban agriculture.

The industrial park at Bagnoli becomes an attraction to the Neapolitans. As they begin to grasp the idea, they come to terms with the fact that the much maligned Camorra has actually begun to promote Naples to the world and taken steps to bring back the glory days to Campania.





WASTE-TO-ENERGY PLANT

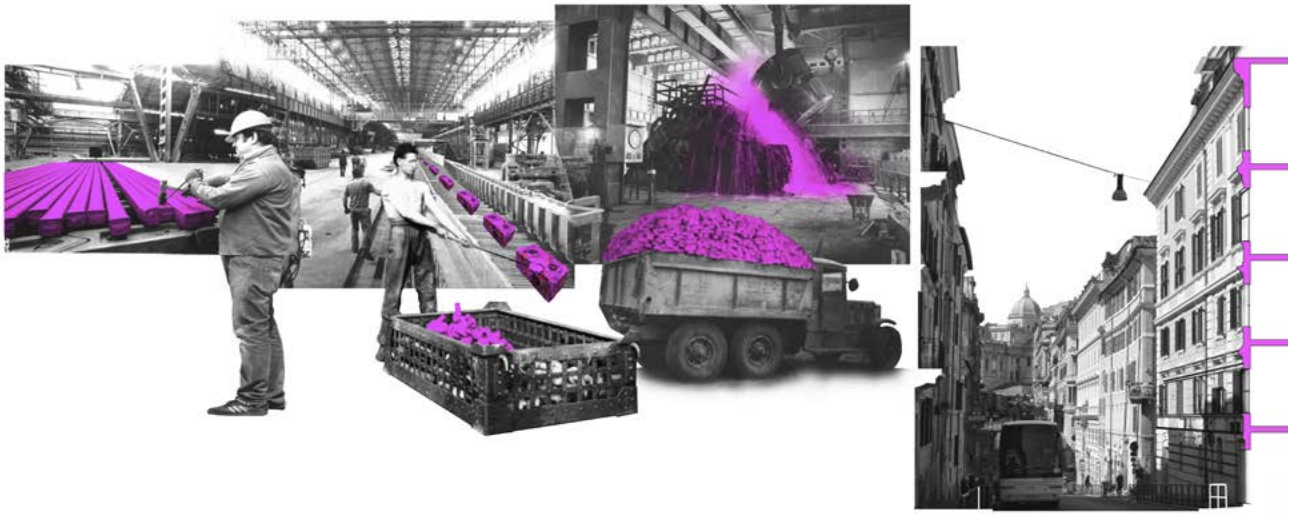
The industrial power plant at Bagnoli uses a conveyor belt system to circulate incoming trash. Inside the campus headquarters, trash sorting robots use a sensor system to maneuver the trash from the conveyor belts to the transport tubes.

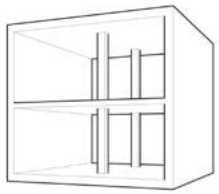
The anaerobic digestor, recycling plant, material manufacturing plant, and waste-to-energy plants are each in separate buildings, but they are all part of the whole, paying homage to the Camorra's horizontal structure. From vegetated open spaces, workers see the trash being maneuvered in the tubes soaring above them.

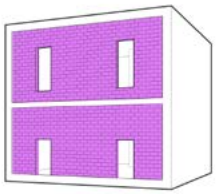
TRASH AND TOURISM

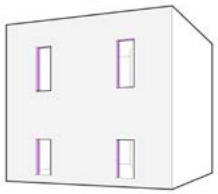
Approaching the end of the 21st century, Naples gains its new reputation as a world leader in waste management. Tourists flock to Bagnoli to make a pilgrimage to its world-class trash-to-resource district. Pedestrians, tourists, and locals alike experience the trash systems around them as they pass through landscaped berms and pathways. Lookout points provide picturesque views of the industrial campus and the export piers, where the trash and its byproducts are being moved around in the city. The trash is also embedded into the landscape structures, from the parapets to the deck they stand on.

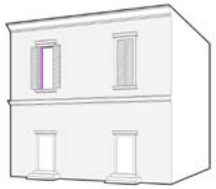
The Bagnoli waterfront emerges as the site for a vibrant Neapolitan life. Emerging techniques and approaches to waste recycling, both practical and artistic, become a source of pride for Neapolitans.











FULL CIRCLE

“One person’s trash becomes another person’s treasure” as a whole lifestyle is generated surrounding the recycling of waste.

Waste as a resource gains further prominence as waste-to-construction materials emerge as a viable alternative to traditional methods of construction, without altering the style of architecture in the Campania region.

Naples as a city completes a full circle, as ‘waste’ once dumped and burned on the streets of the historic city a century back is now being collected, processed, and converted - ready to be marketed as the gritty Neapolitans immerse themselves into a lifestyle that is unlike anywhere else.

POST-OIL BAKU

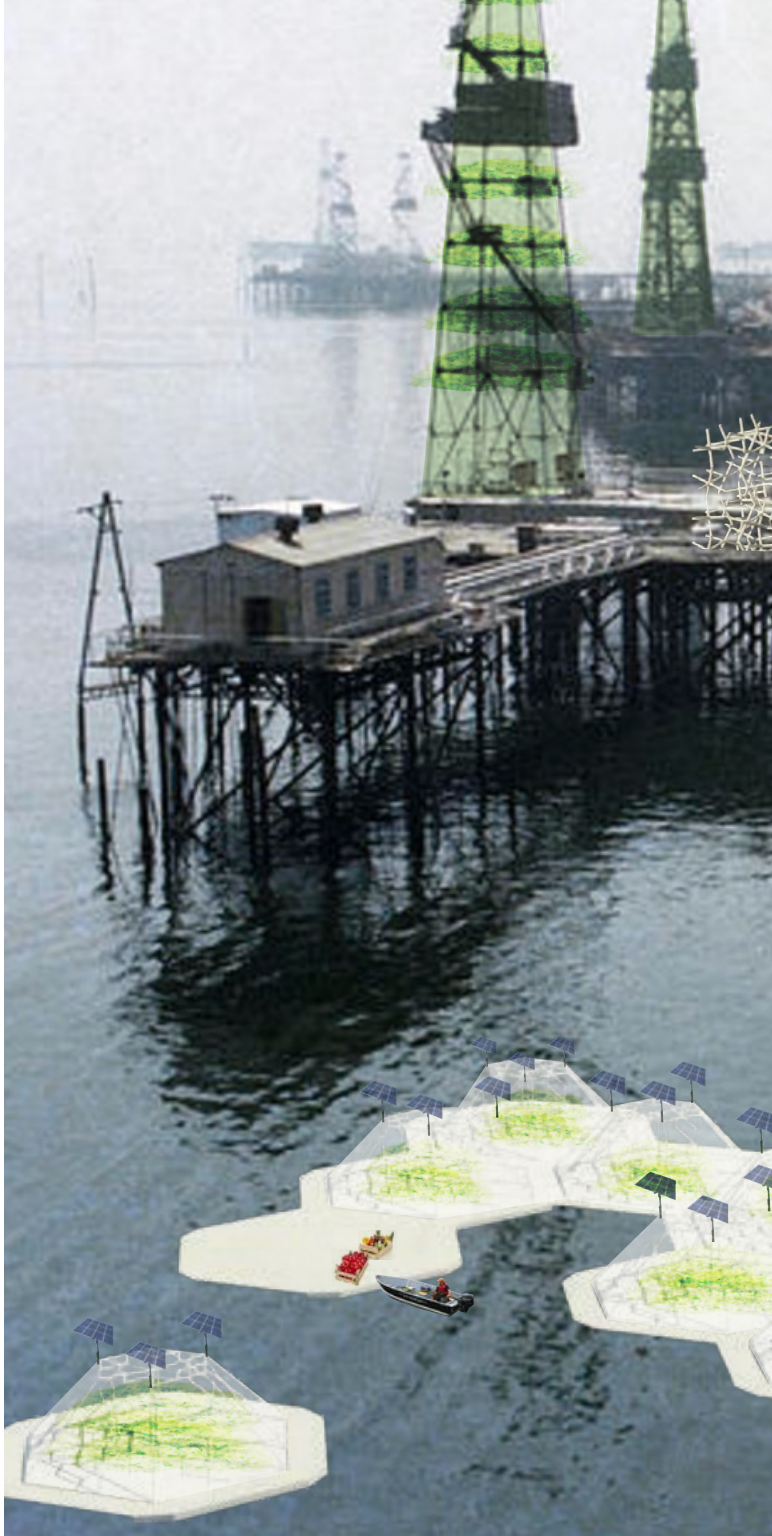
MOVING TOWARD RESILIENT AGRICULTURE AND HYDROLOGY

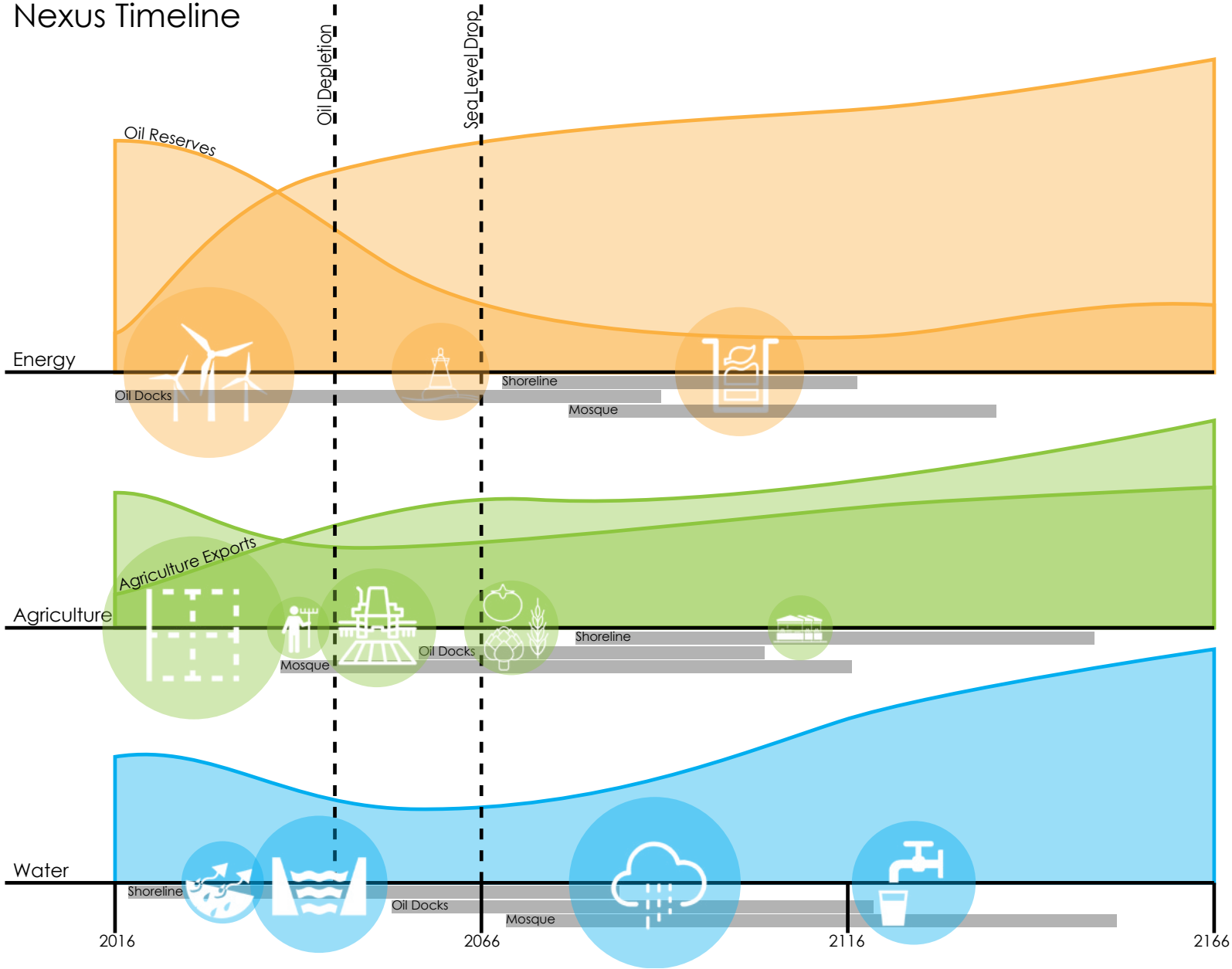
In approximately 30 years, the oil dependent city of Baku, Azerbaijan will face the imminent crisis of oil scarcity in the Caucasus region, forcing the city to turn to more resilient alternatives for their energy production and economy. Since Baku is situated on the coast of the Caspian Sea, water will become a major source of energy, replacing oil with current turbines (which take advantage of the eddy currents created by the Absheron Peninsula) and point absorption devices that harvest wave energy. These waves are primarily caused by the strong winds on the Caspian, which also provide opportunities for wind turbines on the water and throughout the city.

Oil is not only Baku's main energy source, but also the core of their economy. When the oil runs out, Azerbaijan will have to diversify its exports. Using the existing irrigation infrastructure, as well as excellent soil in rural Azerbaijan, the eventual privatization of farmland will make agriculture the most likely alternative to oil as an export. This increased demand for agriculture and shift in land ownership will bring more revenue to rural Azerbaijanis, increasing their standard of living, which is much lower than in urban areas.

However, the crops will mainly supply commercial companies and their exports, so the poor communities in the cities and suburban areas will not reap the benefits of this new industry.

HIROSHI ICHIKAWA, AUGUSTA MILFORD, JEREMY SMITH




Nexus Timeline
Oil Depletion
Sea Level Drop
Oil Reserves
Energy
Oil Docks
Shoreline
Mosque
Agriculture Exports
Agriculture
Mosque
Oil Docks
Shoreline
Water
Shoreline
Oil Docks
Mosque
2016
2066
2116
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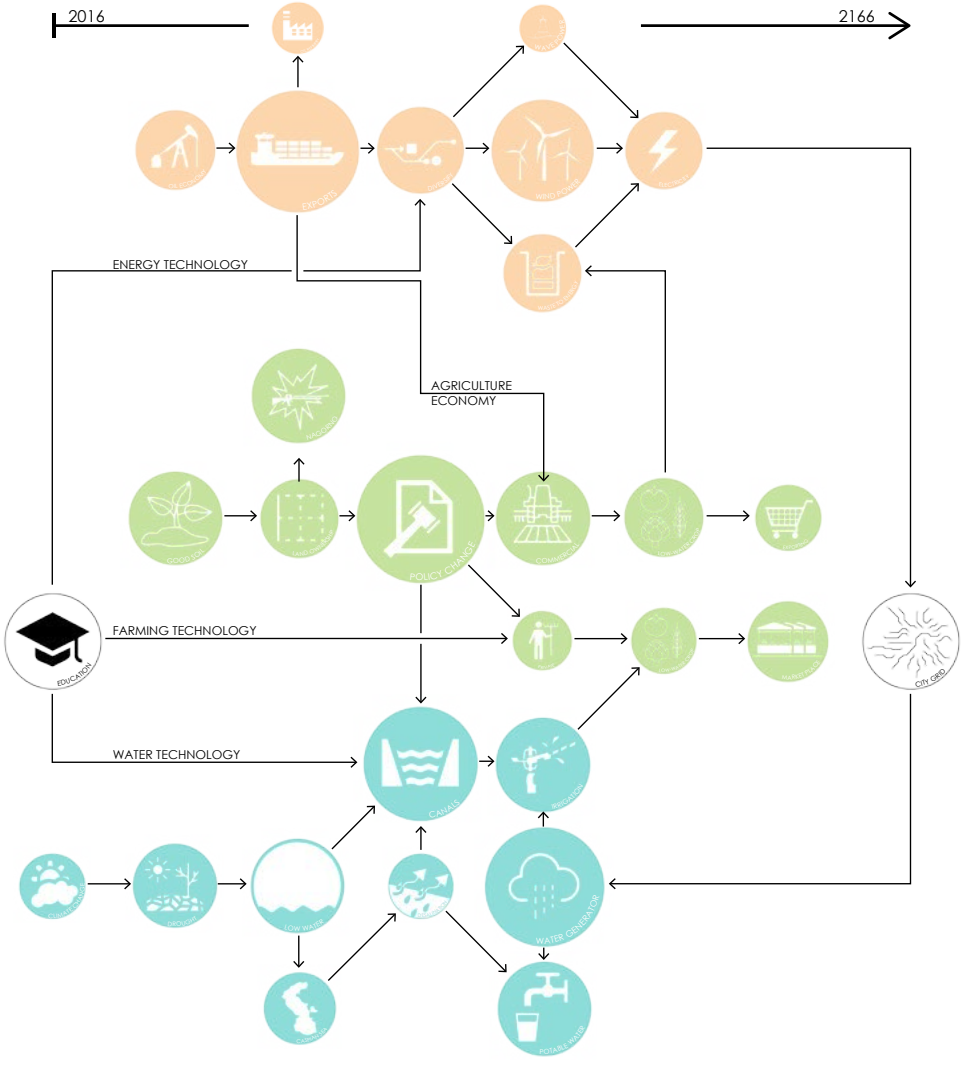
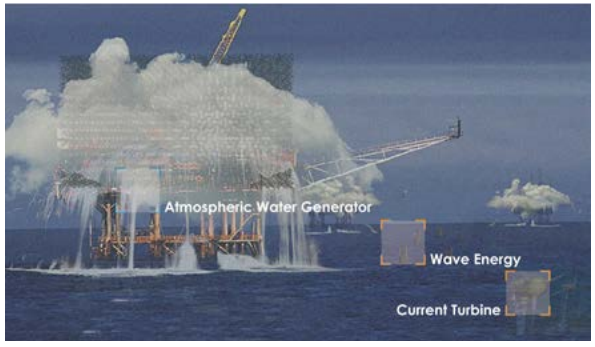




These communities will need to become more self-sustaining, utilizing the city's network of mosques, the soon-abandoned oil infrastructure on the Caspian Sea, and the ever increasing shoreline (from sea-level drop) for resource development and distribution on multiple scales.

With impending desertification in the Caucasus Region due to global climate change, the conservation and generation of potable water and clean water for the agriculture industry also becomes crucial. Atmospheric water generation will be applied on multiple scales to provide drinking water throughout the city and to replenish the Caspian Sea, as the sea level drops an expected 3 meters.

Mangroves will cleanse seawater of harmful toxins from oil production so that it can be used for fish farming on the Caspian Sea. Seawater greenhouses will produce fresh water for hydroponic farming. Sunflowers planted in abandoned oil fields will purify the groundwater through phytoremediation, preparing the soil for more water-efficient crops.

A new structural system based on Islamic geometry will also function as condensation piping for the atmospheric water generation as well as the saltwater greenhouses.

AGRICULTURE AND RESOURCE MANAGEMENT

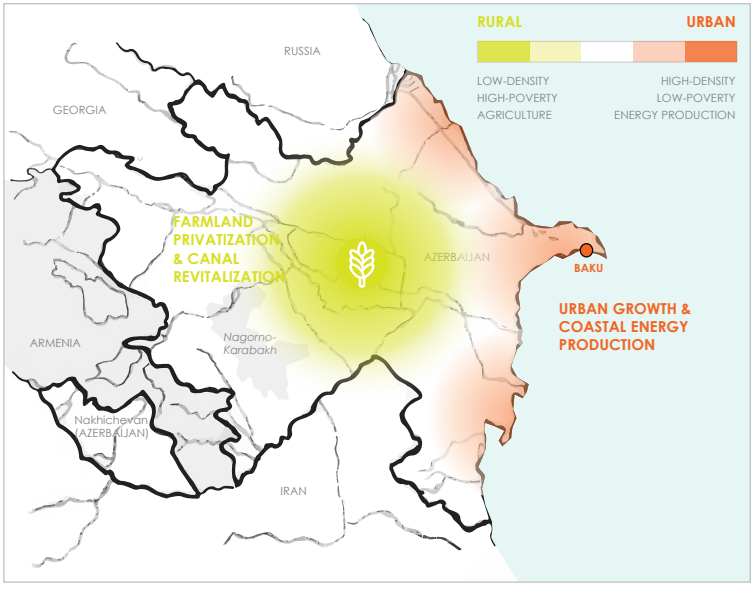
To address the issue of increasing agriculture and water resources, there are four project sites located within the city of Baku.

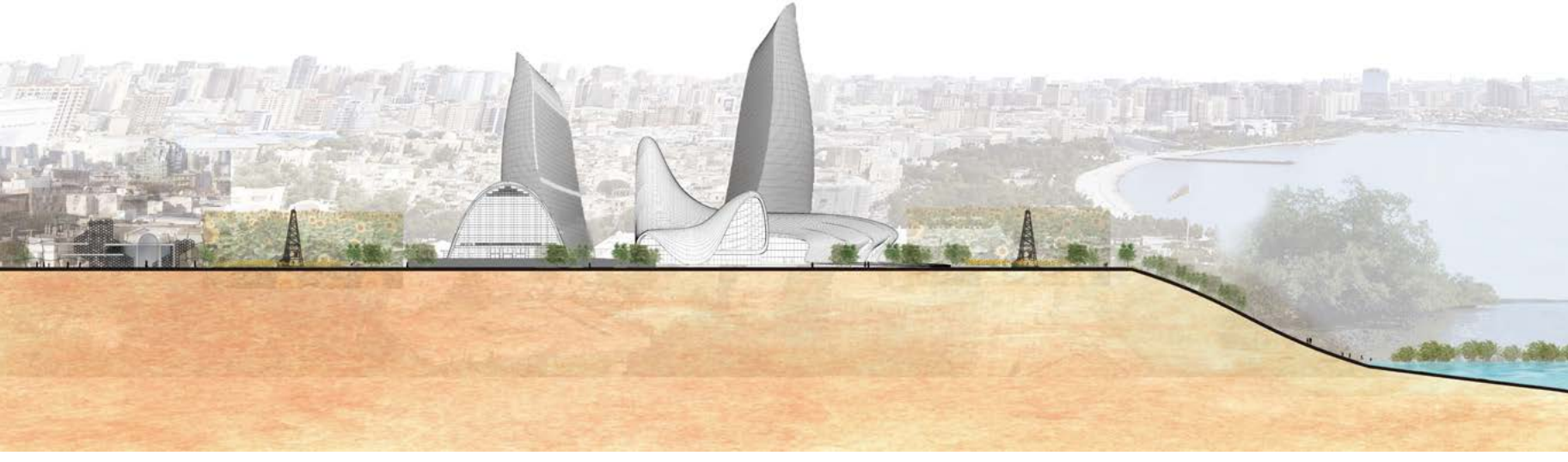
Oil fields will be cleaned of pollution and transformed into farmland.

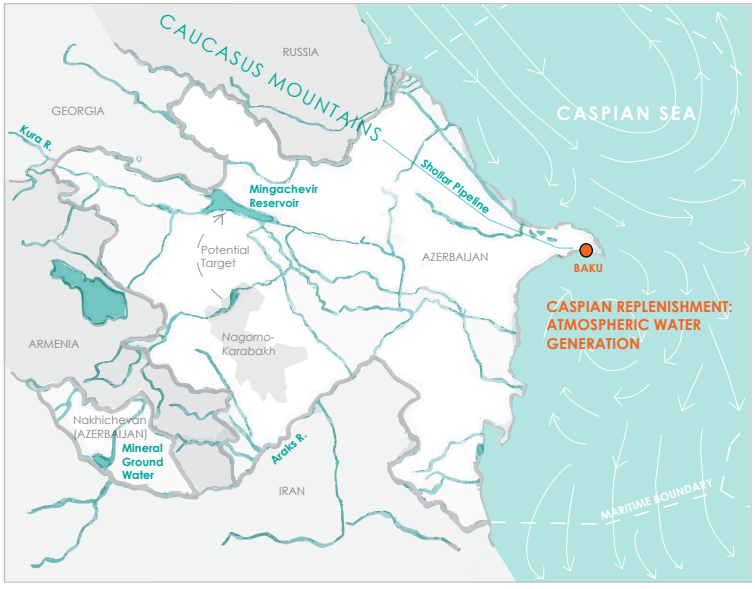
Mosques will be retrofitted with additional infrastructure to turn them into community centers.

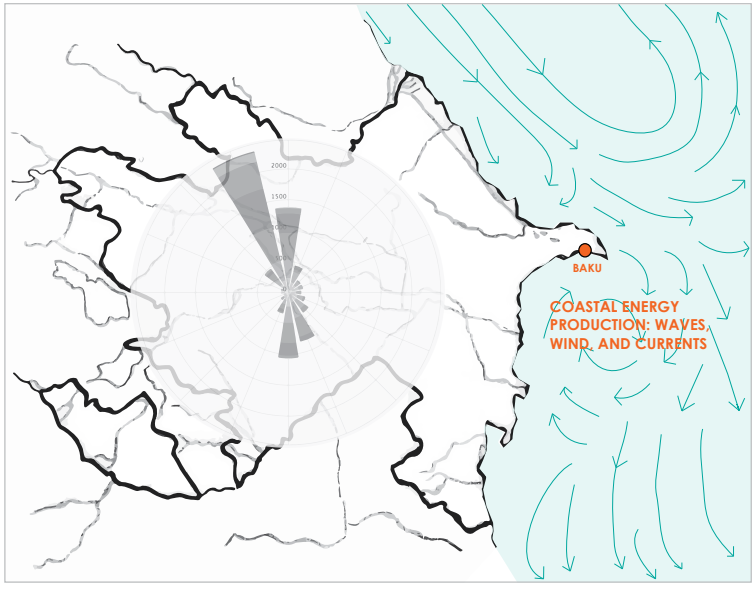
The shoreline will be planted with mangroves to clean the water. Algea farms will produce bio-fuel.

The existing oil dock network will host sturgeon fish farms and saltwater greenhouse communities.



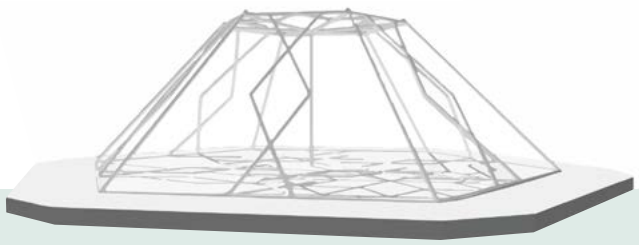


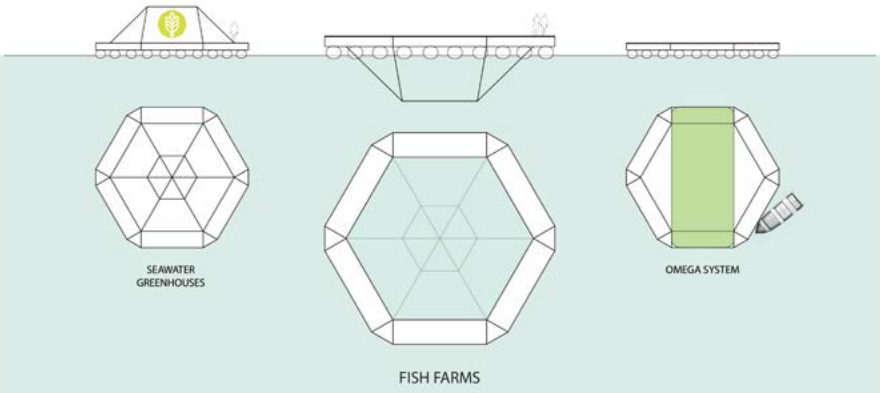

CAUCASUS MOUNTAINS
RUSSIA
GEORGIA
Kura R.
CASPIAN SEA
Mingachevir Reservoir
Shollar Pipeline
Potential Target
AZERBAIJAN
BAKU
CASPIAN REPLENISHMENT: ATMOSPHERIC WATER GENERATION
ARMENIA
Nagorno-Karabakh
Nakhichevan (AZERBAIJAN)
Mineral Ground Water
Araks R.
IRAN
MARITIME BOUNDARY


BAKU
COASTAL ENERGY PRODUCTION: WAVES, WIND, AND CURRENTS

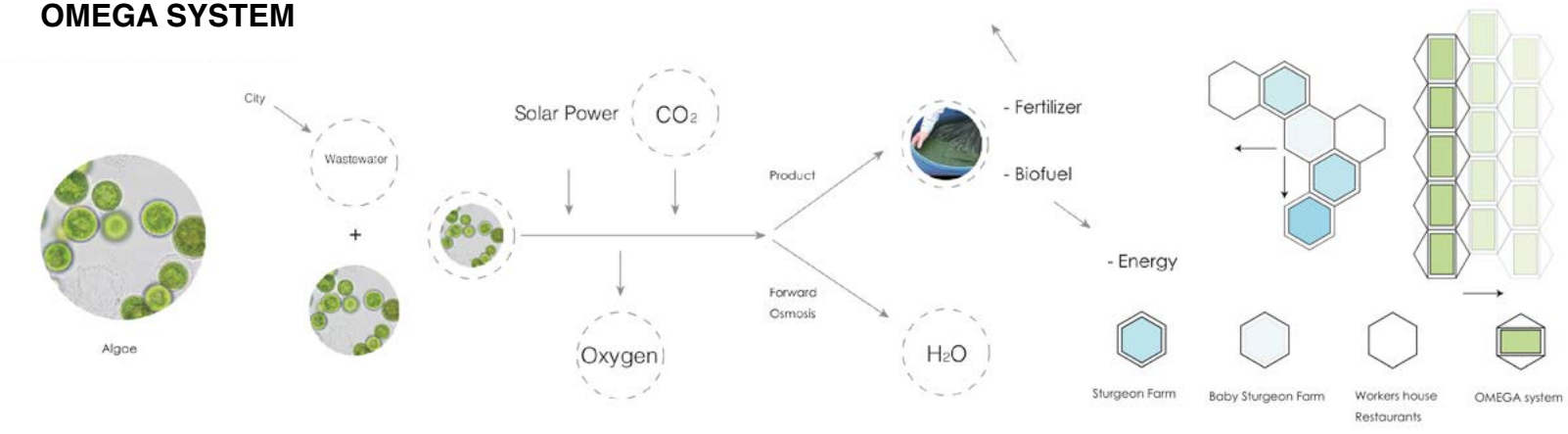
FLOATING FARM COMMUNITIES

New floating farm communities stem from the abandoned oil docks. Floating pods use solar panels to convert salt water to fresh water to grow crops in greenhouses.

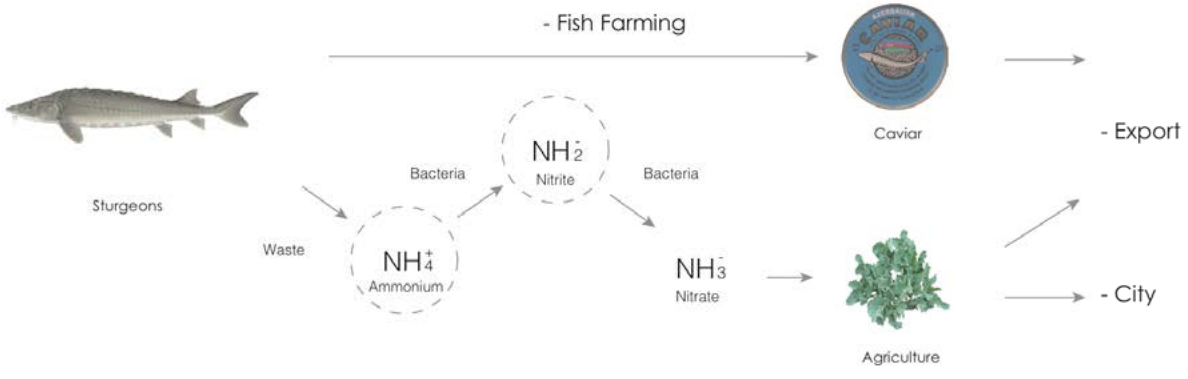



SEAWATER
GREENHOUSES
FISH FARMS
OMEGA SYSTEM

OMEGA SYSTEM



FISH FARM/ AQUAPONICS



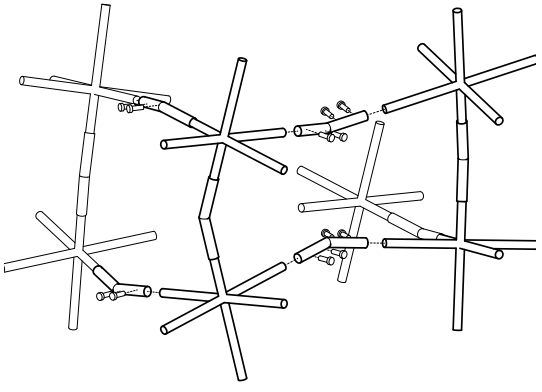
MANGROVES

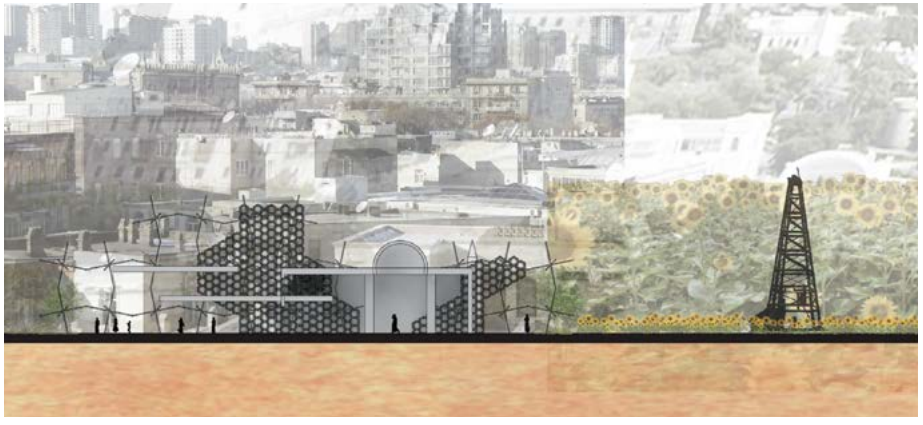
PHYTOREMEDIATION

At a large scale, sunflowers phytoremediate polluted oil fields that have been abandoned after Baku's economic shift away from oil. At a smaller scale, they populate neighborhoods surrounding mosques, which serve as religious and cultural hubs that are distributed throughout the city.

MOSQUES AS COMMUNITY CENTERS

School, energy plant, and water tower additions to Sabunchi Mosque incorporate a 3D pentagon structural system and an overlapping hexagonal facade system. These spaces enclose a market plaza shaded by the structural system, which also functions as an atmospheric water collector.





REIMAGINING A GREENER HOUSTON

Houston, Texas – one of the fastest growing and most diverse cities in the United States, has expanded through a relatively unfettered approach to management and oversight over the last 100 years. This development approach has created a city that is rich in resources, yet still vulnerable to shifting economies, climate change, and significant population influx.

As we look to the next century and consider the nexus of Water, Energy, and Food, Houston has significant advantages that need only be leveraged effectively to fortify its growing population - especially those neighborhoods that are most at risk - against globally-impacted and unavoidable shifts in resources.

Taking a close look at Kashmere Gardens - one of the city's most vulnerable neighborhoods - this project focuses on strategies to stabilize each sector of the nexus and create varied and scalable solutions for Houston's impending issues. The primary foci result in a three pronged approach: protect from present and future flood events; create a self-sustaining food supply and eliminate urban food deserts; and transition from fossil fuel to a new algae-based renewable energy economy.

KASIA KEELEY, KA-CHUNG KWOK, JIALE REN

Due to the combined effects of rapid population growth, increased impervious surfaces, decreased consistency of rainfall, and increased intensity of storm events, Houston is experiencing highly variable issues with water. In 2014, Houston experienced one of its most significant droughts, and in 2015 and 2016 experienced record rainfalls over brief windows of time. Climate scientists project that these events are only to become more intense over time. Houston's current implementation of urban detention ponds is only capable of handling 0.1% of the water from any flood event. Category 2 Hurricane Ike cost Houston an estimated $29 billion in damages and climate projections show storms of a similar magnitude hitting once every 16 years, if not more frequently.

With high costs to the city and homeowners, our proposal calls for moving populations out of areas that are most at risk for flooding and reducing impervious surfaces in exchange for prairie wetlands, designed to accomodate inundation and drought. These areas will provide space for water to drain away from homes during floods, with the additional amenity of urban wildlife recreation areas. Likewise, a system of swales, runnels, and backyard cisterns throughout populated neighborhoods will allow for water to be captured, stored, and treated at residences. These strategies are projected to reduce overall stormwater runoff and reduce homeowner damages.

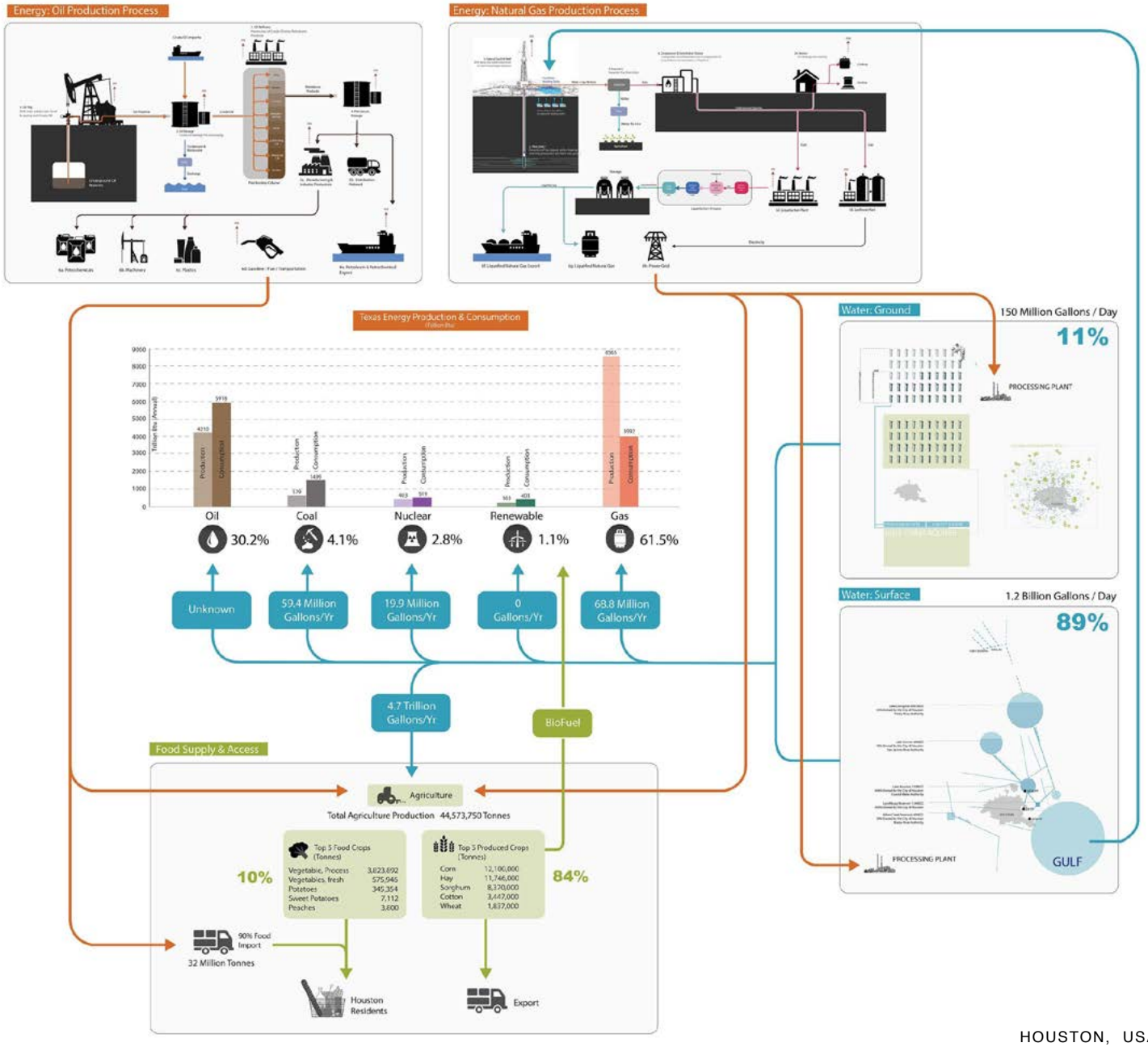
Populations of high-risk flood areas have the opportunity to relocate nearby to new, high-density urban neighborhoods that are flood-resilient and contain vertical farms for neighborhood food access. Today, Houston has an agriculture industry that heavily subsidizes biofuel production for energy supply, with as much as 90% of food for local consumption imported into the city.

Urban sprawl, combined with a lack of public transit options, has resulted in large portions of Houston's urban environment becoming food deserts, which equate to minimal nutritional food access for low-income residents. Our proposal uses new vertical farm community centers, situated in high-density neighborhoods, as a means of providing secure food access to nearby residents.

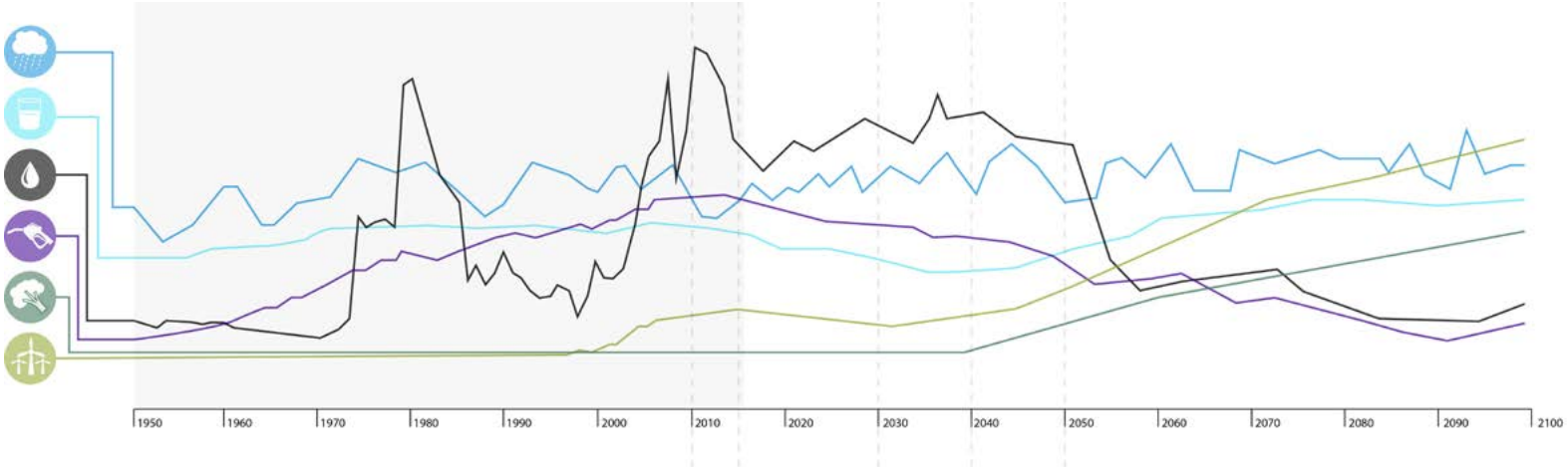
Proclaimed as the "Energy Capital of the World," Houston has built its foundations on the prosperity and exponential growth of global fossil fuel consumption. With an economy that is based on the extraction and export of fossil fuel (primarily crude oil and natural gas), along with the manufacturing and processing of fossil fuel related products, the future of this city is prime for a significant shift as the world awakens to the effects of global warming and the end of fossil fuel supplies. Utilizing existing auto infrastructure, algae biofuel production and consumption can be situated adjacent to the areas that need it most - highways. Highways provide ample surface area as well as necessary CO2 for algae production - a form of energy that is cheaper, greener, and easily adapted to an already existing fossil fuel economy. A new algae-based energy economy has the opportunity to carry Houston into the 22nd century with a more sustainable and environmentally resilient energy source that does not ask Texans to make a drastic change to their way of life.

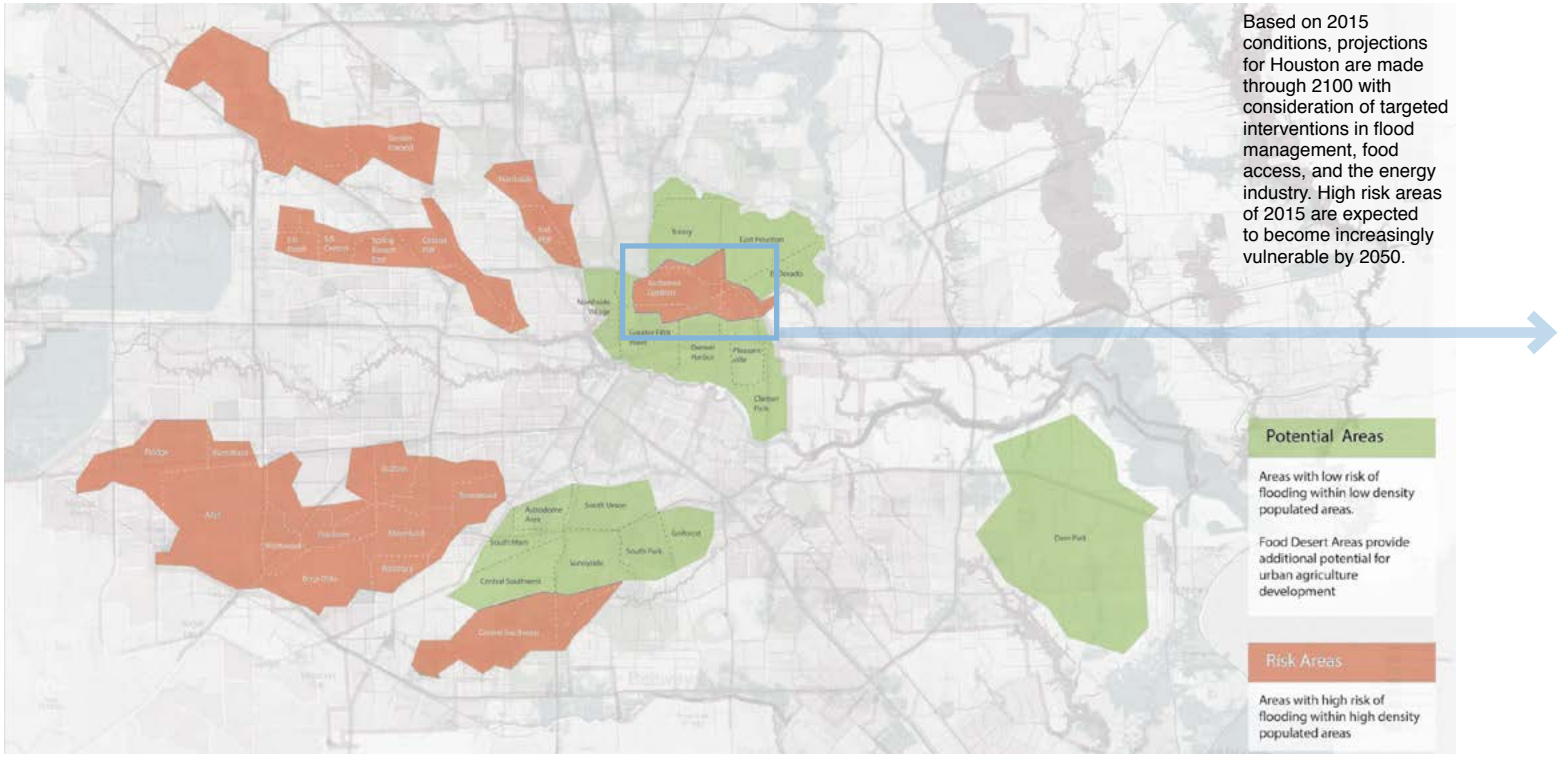
In addressing irreversible climate change effects and an inevitable end to the fossil fuel economy, this study has focused on the nexus of energy, food, and water and Houston's unique position within the next 75 years. In order to create long-term stability, one must look at the redistribution of resources from both a top down and bottom up approach that addresses the needs of those communities most at risk alongside the greater Houston fabric. Poised with a cheap supply of energy and a growing investment in renewable energy, Houston can capitalize on existing infrastructures, buildings, and low density neighborhoods to create alternative economies, food security, and climate resilience.

WATER, ENERGY, AND FOOD NEXUS



HOUSTON SPECULATIVE TIMELINE





PROPOSED ACTION

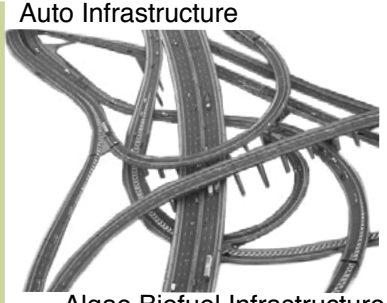
Flooded Property

Flood Management
Vegetative Cover
Recreation
Wildlife Habitat

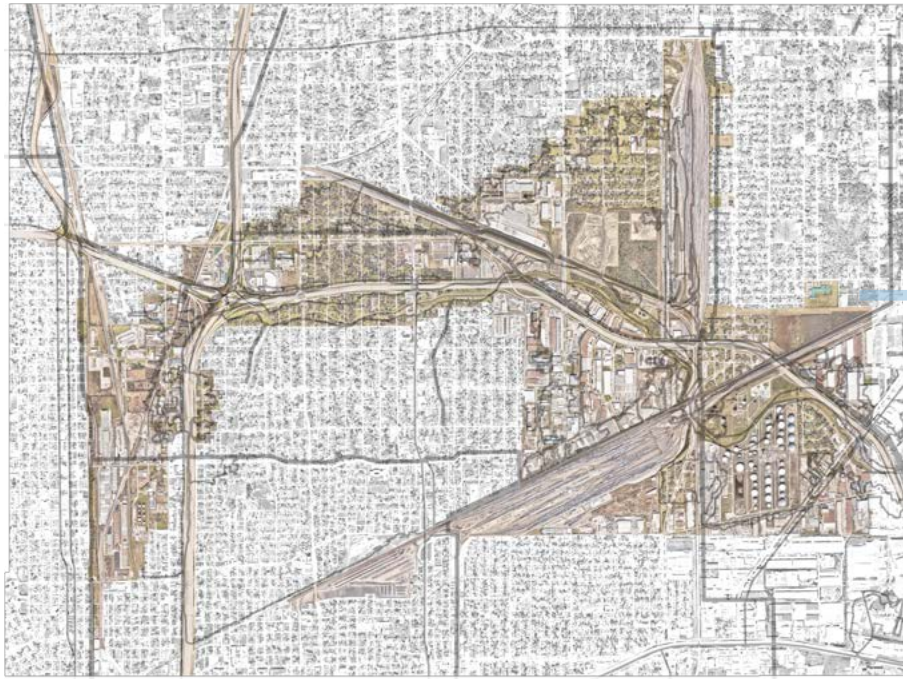
Retired Oil Industry

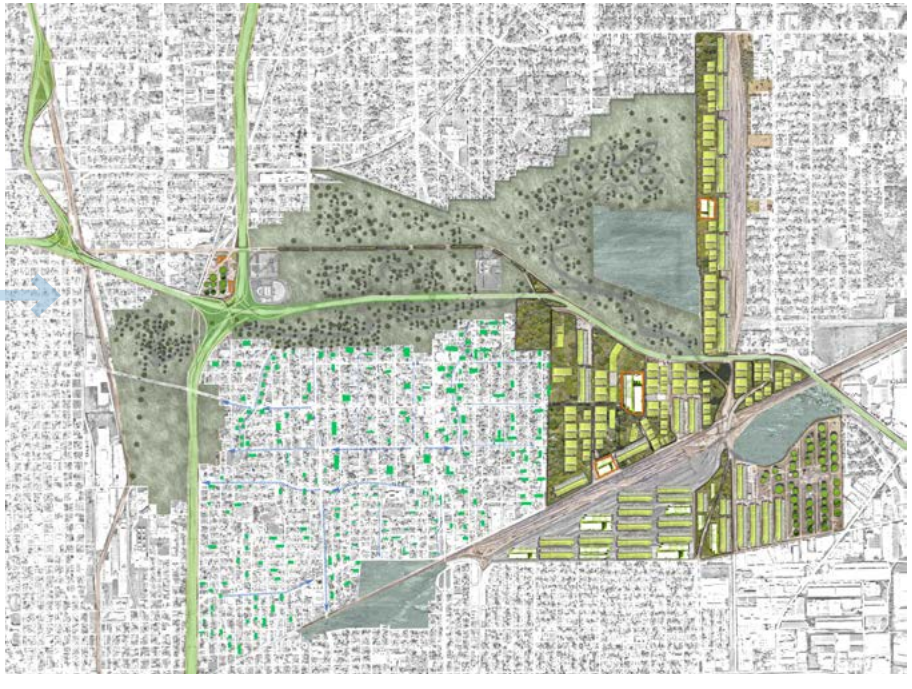
Algae Biofuel Plant
Vertical Farm
Reduced Industry
Increased Residential
Biosolid + Wastewater Plant

Auto Infrastructure



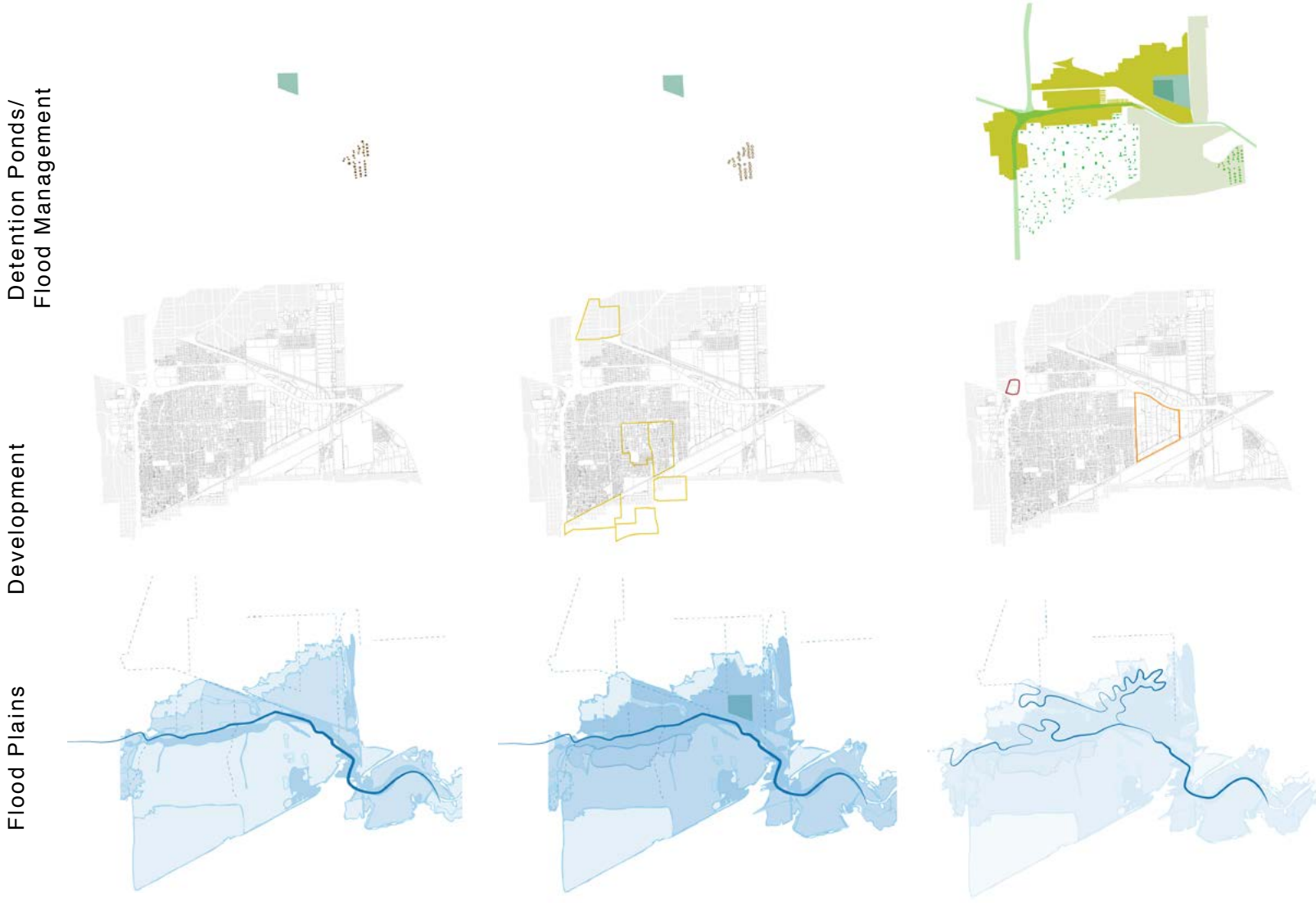
Algae Biofuel Infrastructure
Storm Water Management
Maintained Transit Network





KASHMERE GARDENS: 2015 CONDITION

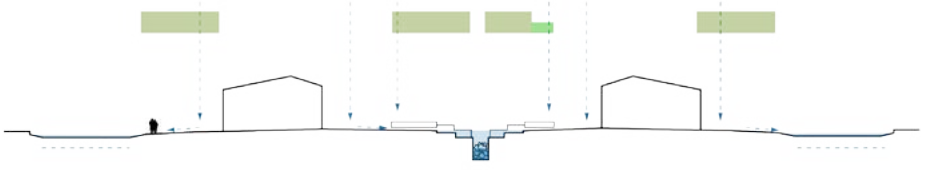
2050 MITIGATION PROPOSAL



Minimal flood mitigation efforts for Kashmere Gardens in 2015 and increased development by 2050 will exacerbate flood zones. Our proposal for 2050 will introduce multiple approaches to flood mitigation, including the re-introduction of a wetland prairie system, neighborhood swales and cisterns, and concentrated development in flood resilient neighborhoods centered around local food access.

PRAIRIE WETLAND

NEIGHBORHOOD



Prairie Wetlands convert 1,500 acres of medium density development in high-risk flood zones to a prairie ecosystem, mimicing historic vegetation conditions and handling an increased intensity in storm events with a decrease in steady rainfall.

The Neighborhood management plan utilizes open space in yards and vacant properties as places for small-scale water detention, offering hyper-local flood management and water storage.

NATIVE GRASSLAND
PHYTOREMEDIARY
DROUGHT TOLERANT
PRODUCE
ALGAE

FLOOD CONDITION
WATER TABLE

VERTICAL FARM / HIGH DENSITY AREA

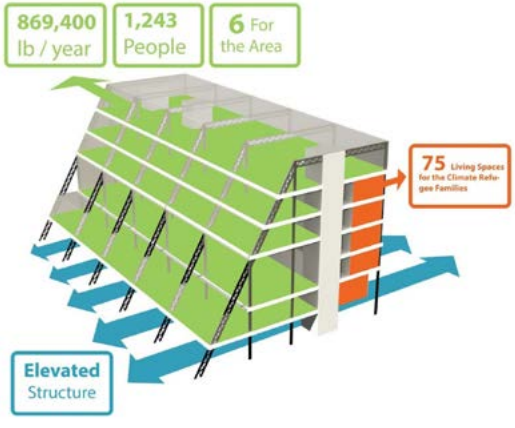
New Vertical Farm community centers will provide food access, job opportunities, and safe spaces in case of flood events. The Vertical Farm buildings are shaped specifically for maximum light exposure, and conveyor belt growing systems allow for even light distribution for plants.

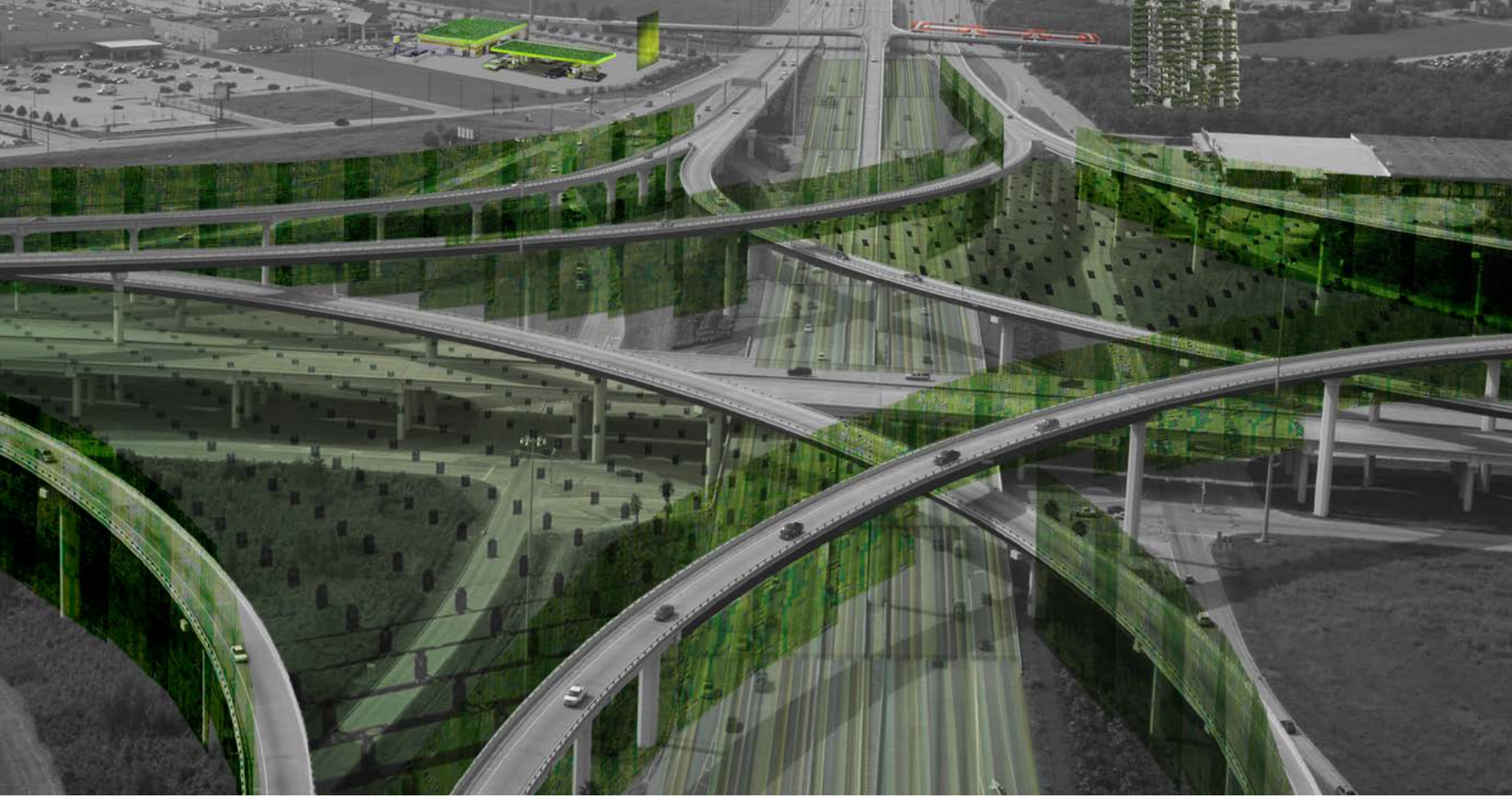
Food Access Issue

Lack of Crop Land for Food

Climate Refugee Relocation

Flood Threat


869,400
lb / year
1,243
People
6 For
the Area
75 Living Spaces
for the Climate Refu-
gee Families
Elevated
Structure



ALGAE BIOFUEL INFRASTRUCTURE

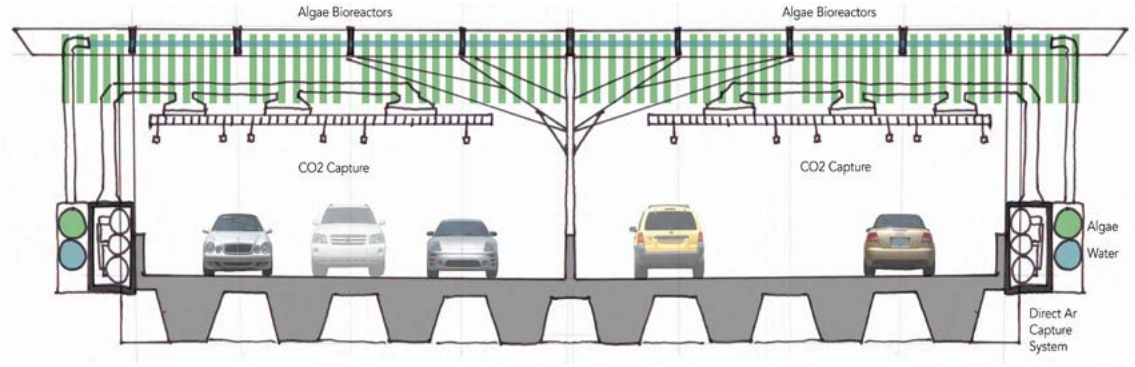
Algae bioreactors combined with CO_2 capture technology are retrofitted on existing freeways to harness CO_2 emissions released by vehicles for the growth of algae biofuel. This system is based on a 3-part strategy utilizing the surface, edge, and interstitial spaces of a freeway system to maximize growth area and yield.

URBAN ALGAE PRODUCTION STRATEGY

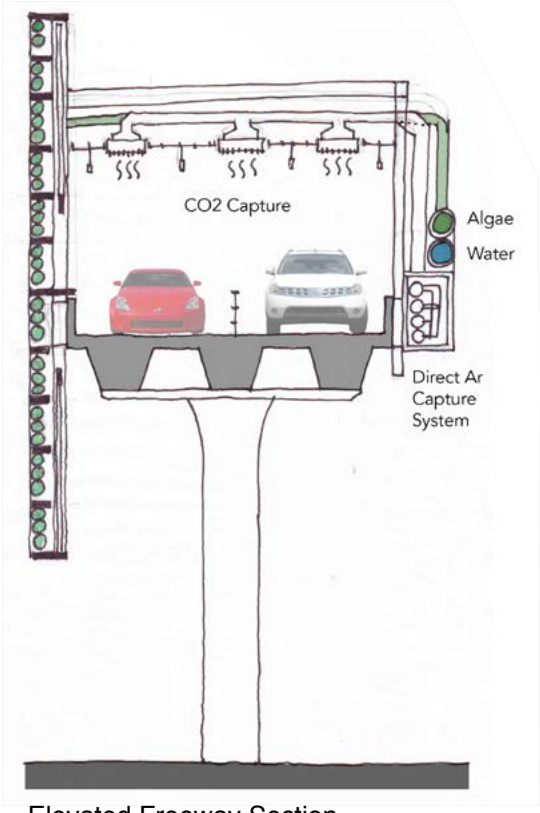
The average US gas station sales:
1.46 million gallons/ year

2016 highest output algae biofuel production:
8,000 gallons per acre/ year

1.46 million gallon of biofuel production:
200 acres of land for algae growth



Multi-lane Freeway Section



Elevated Freeway Section

Amount of Algae Growth Area to Provide for 1 US Gas Station Annually

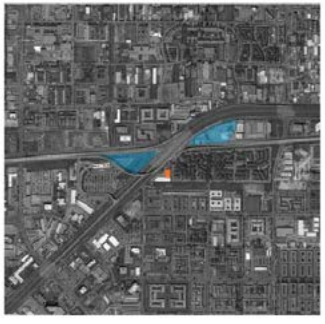
450x
amount of land

Top Surface

50%-60%
Growth Surface

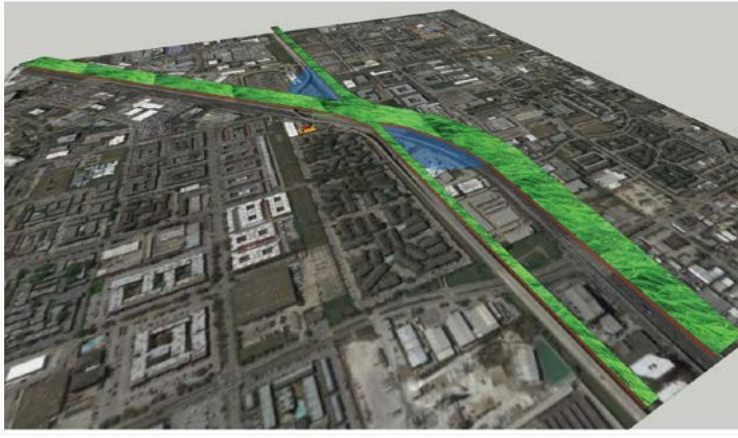
Edge Surface

10-15%
Growth Surface

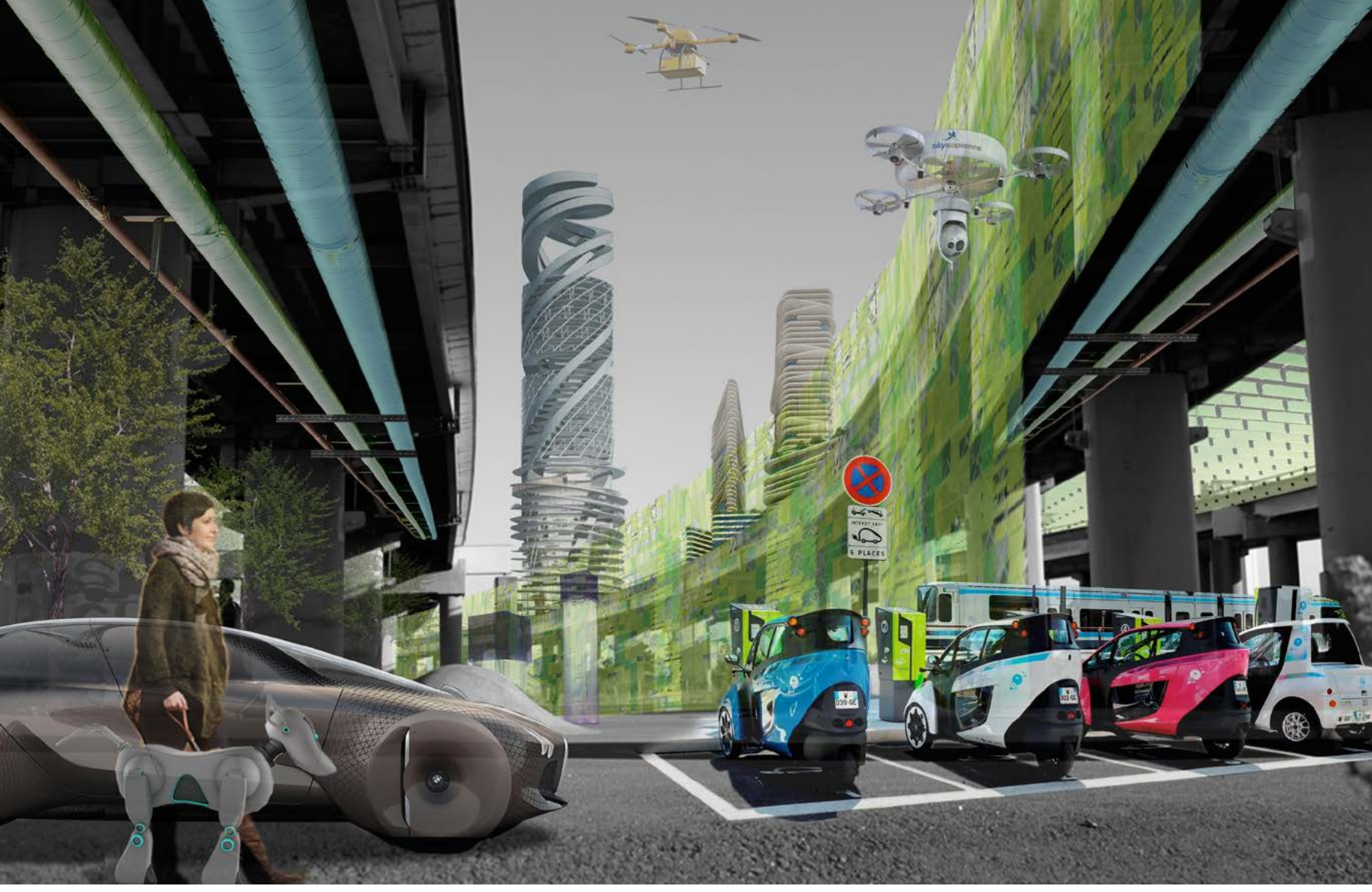


In-between Surface

15-25%
Growth Surface



Algae bioreactors provide liquid fuel to power existing diesel fueled vehicles, as well as future-generation high-efficency biofuel vehicles.



Algae Infrastructure system enhances the urban air quality and pedestrian experiences under the freeways.

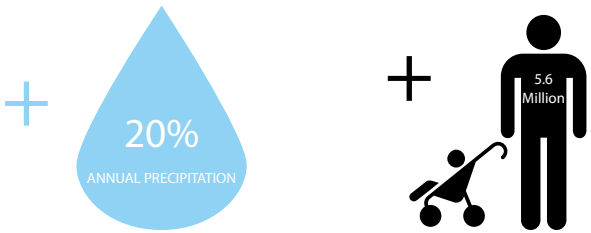
BUENOS AIRES' BLUE FUTURE

FOOD SECURITY AND CLIMATE MIGRATION

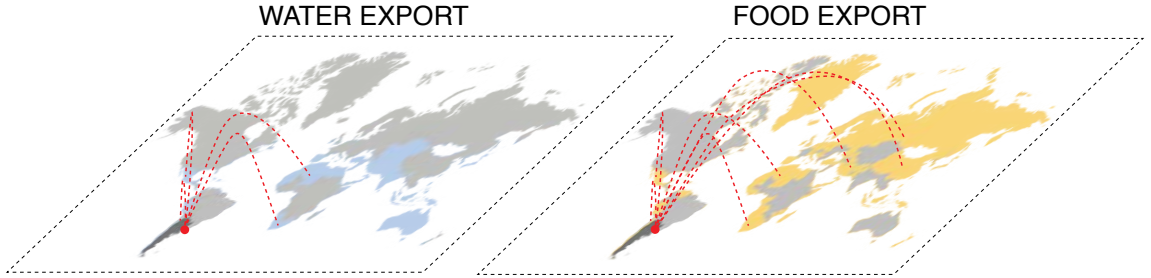
The impact of climate change on agricultural production in South America and around the world will be devastating. Desertification and crop failure are already driving climate refugees to migrate to regional capitals, such as Buenos Aires, Argentina. Unlike many cities, Buenos Aires will see a surplus of water due to increased precipitation, proximity to rivers, and underground water sources.

As a result of its liberal migration policy and availability of water, the city will become a destination for climate refugees. In anticipation of a population explosion, the city will leverage its social and natural resources to become an international hub for water technology research and development.

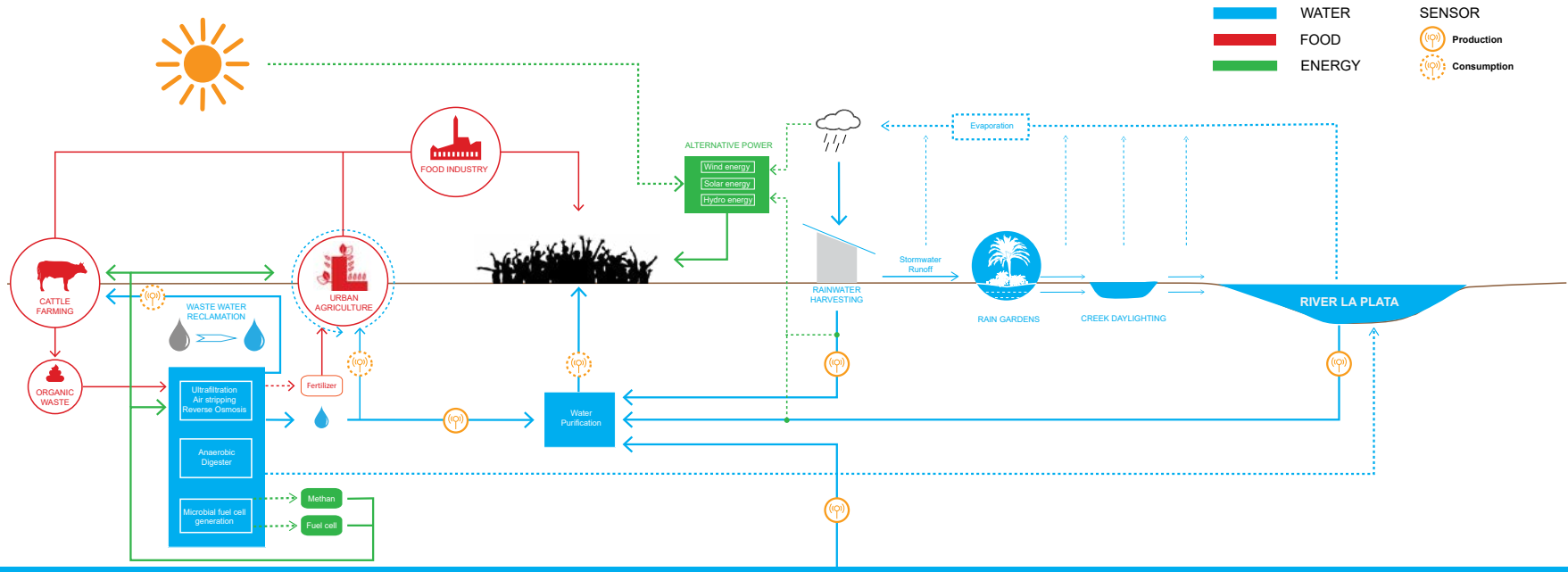
This new economic sector will provide jobs and create sustainable sources of food and energy. A new municipal water program uses sensors placed around the city to manage the city's water system from source to waste treatment. Additional infrastructure projects will address urban flooding through extensive green stormwater infrastructure, centered around subterranean urban streams. Furthermore, informal settlements will be built to provide transitional housing for climate refugees.

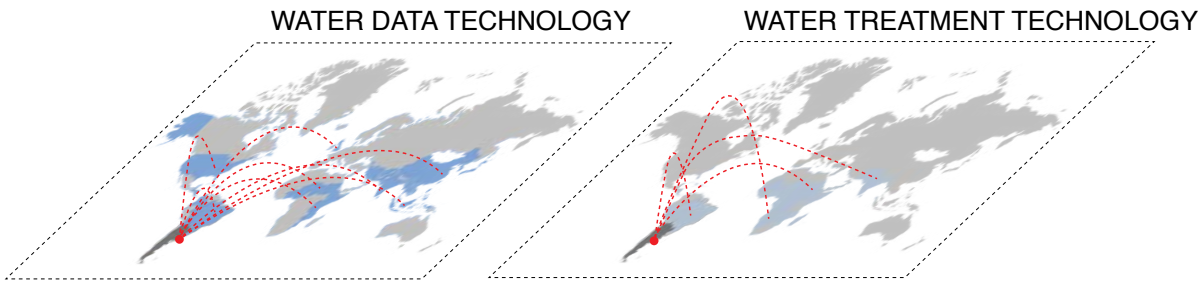


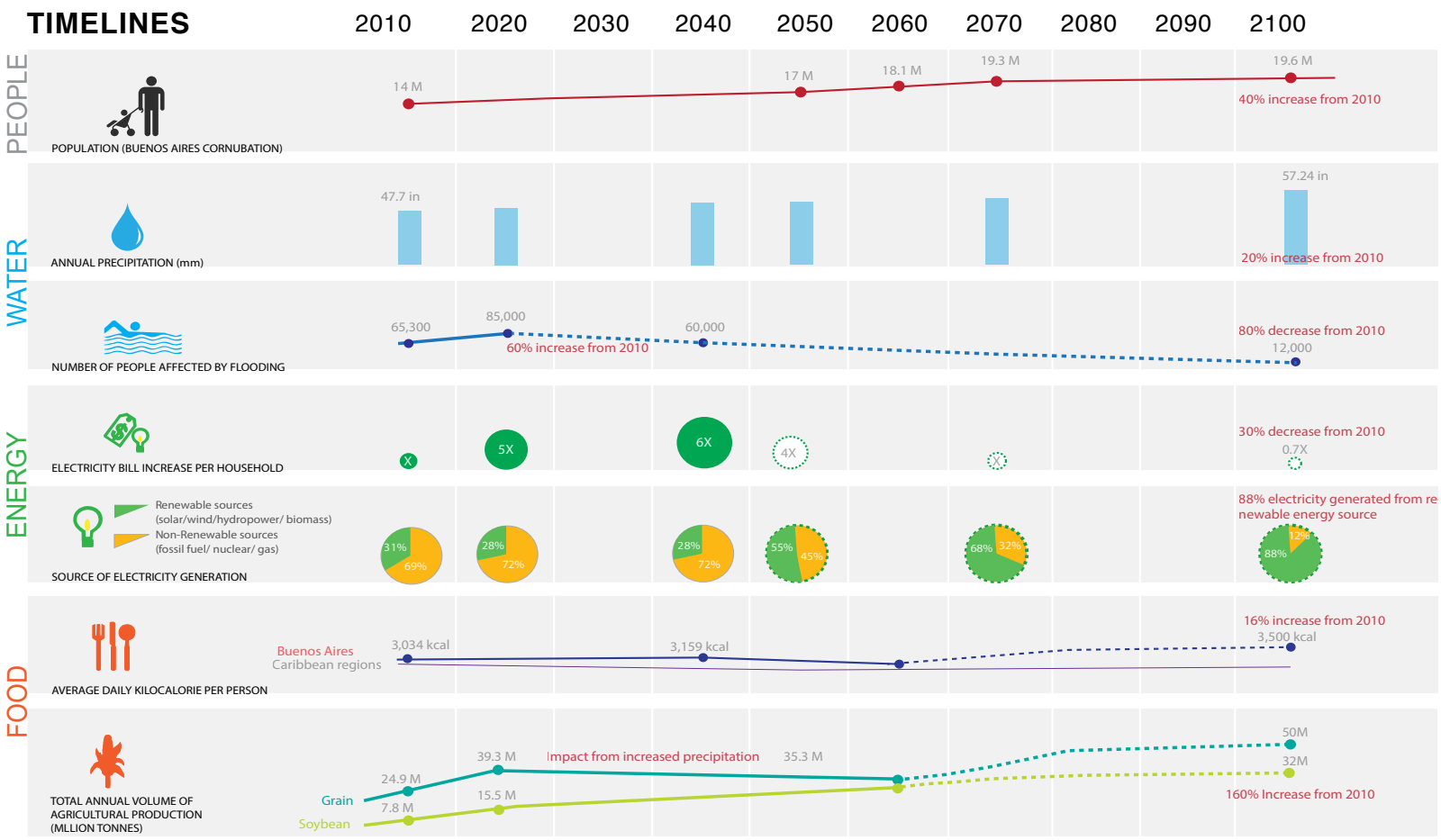
RICH FREITAS, VY NGUYEN, XINYUAN SHEN



WATER, ENERGY, AND FOOD NEXUS



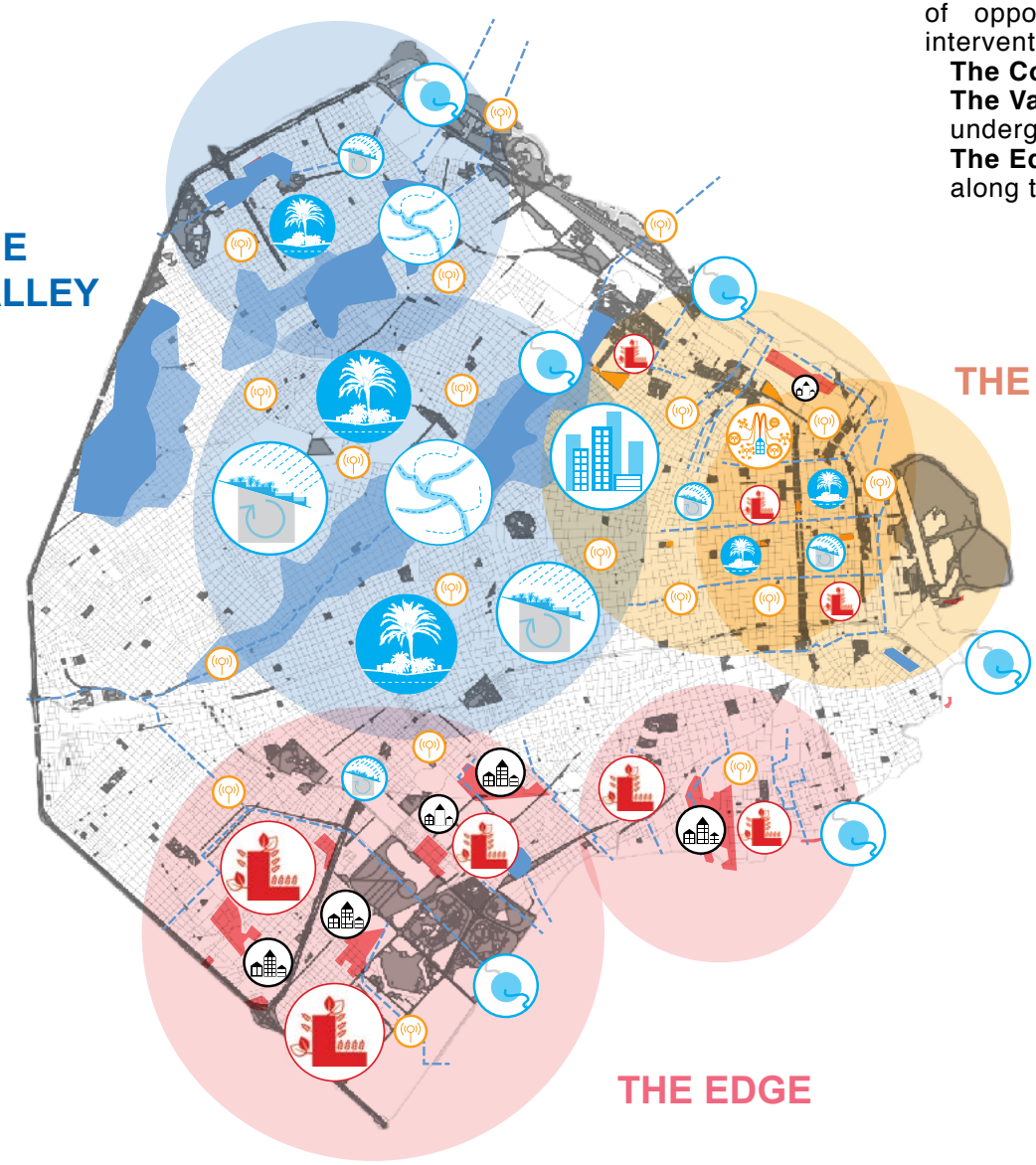

WATER DATA TECHNOLOGY
WATER TREATMENT TECHNOLOGY


TIMELINES
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
PEOPLE
POPULATION (BUENOS AIRES CORNUBATION)
14 M
17 M
18.1 M
19.3 M
19.6 M
40% increase from 2010
WATER
ANNUAL PRECIPITATION (mm)
47.7 in
57.24 in
20% increase from 2010
NUMBER OF PEOPLE AFFECTED BY FLOODING
65,300
85,000
60% increase from 2010
60,000
80% decrease from 2010
12,000
ENERGY
ELECTRICITY BILL INCREASE PER HOUSEHOLD
X
5X
6X
4X
X
30% decrease from 2010
0.7X
SOURCE OF ELECTRICITY GENERATION
Renewable sources
(solar/wind/hydropower/ biomass)
Non-Renewable sources
(fossil fuel/ nuclear/ gas)
31%
69%
28%
72%
28%
72%
55%
45%
68%
32%
88% electricity generated from renewable energy source
12%
88%
FOOD
AVERAGE DAILY KILOCALORIE PER PERSON
Buenos Aires
Caribbean regions
3,034 kcal
3,159 kcal
16% increase from 2010
3,500 kcal
TOTAL ANNUAL VOLUME OF AGRICULTURAL PRODUCTION (MLLION TONNES)
Grain
Soybean
24.9 M
7.8 M
39.3 M
15.5 M
Impact from increased precipitation
35.3 M
50M
32M
160% Increase from 2010

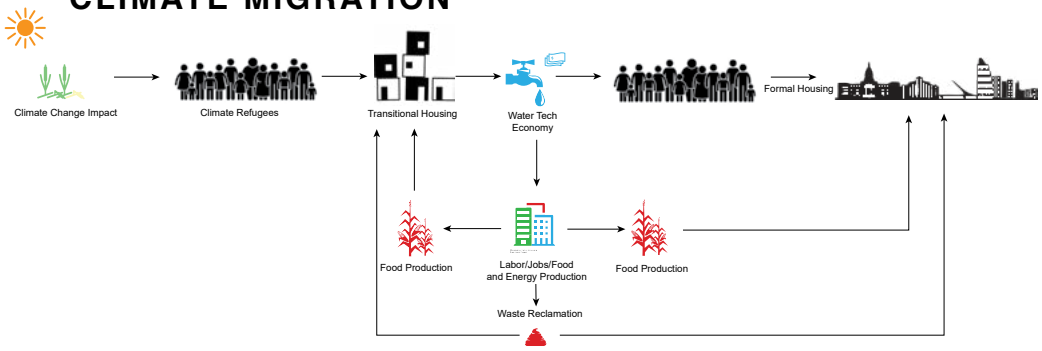
AREAS OF OPPORTUNITIES

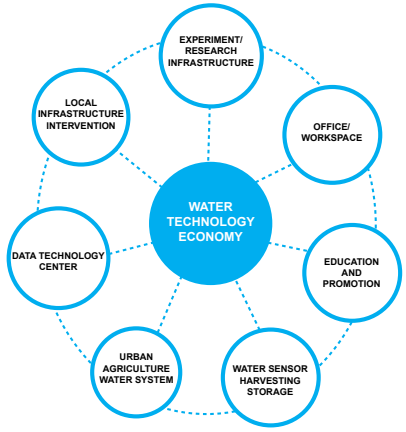
Based on the city's natural topography and existing urban structures, three distinct areas of opportunities are identified for future interventions:

The Core central business district
The Valley - a flood-prone area due to the underground watershed
The Edge - existing informal settlements along the low plain at Matanza River



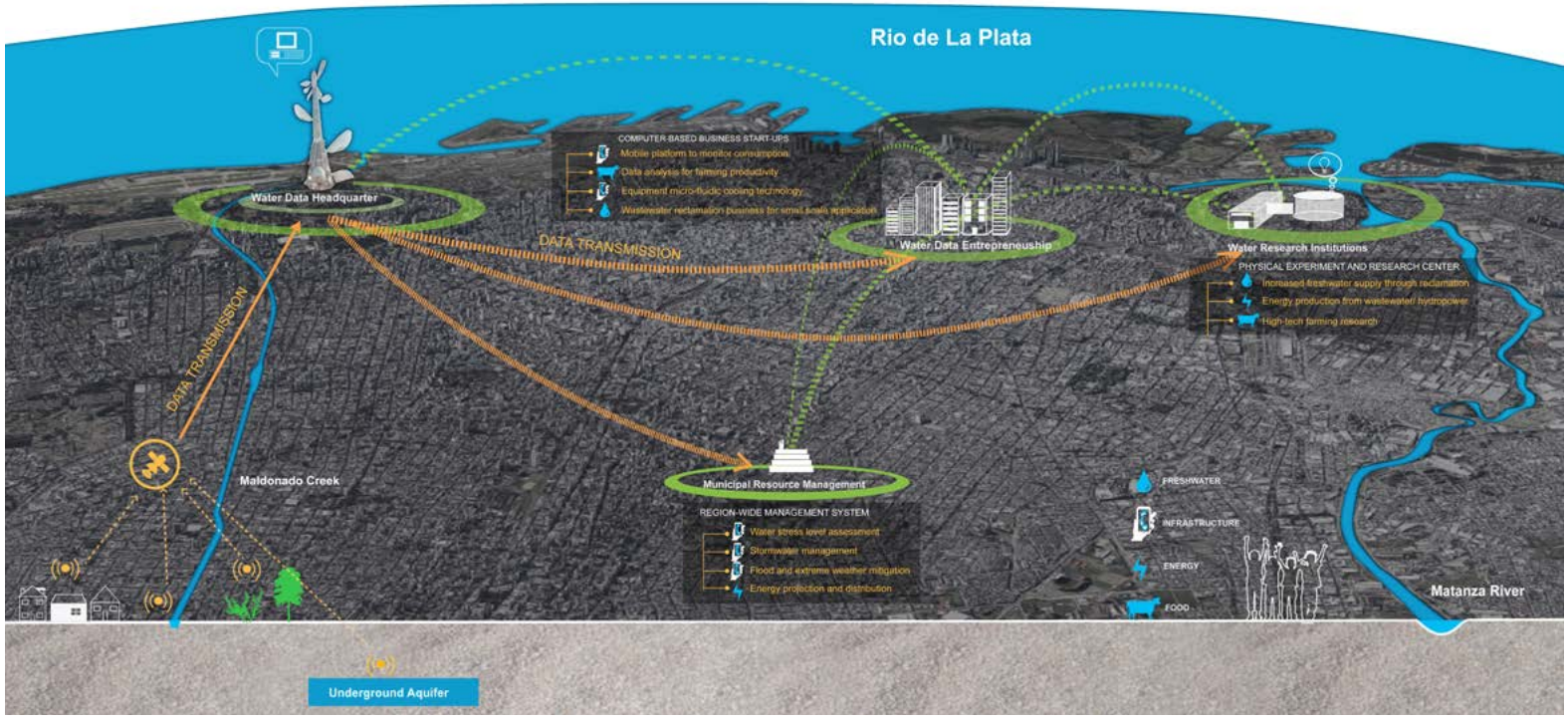
CLIMATE MIGRATION

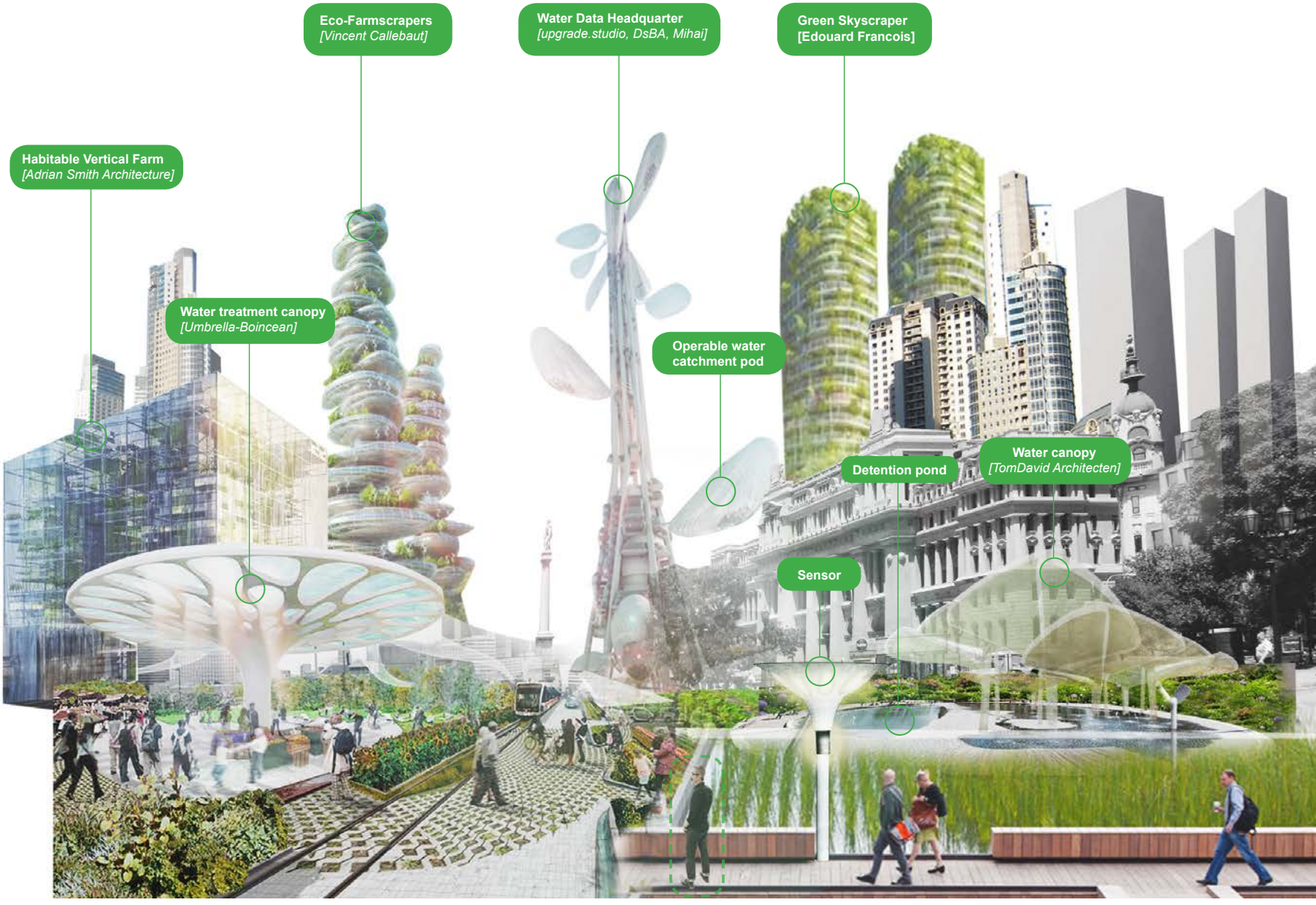




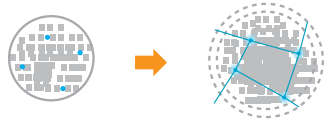
SPATIAL MANIFESTATION OF THE WATER-TECHNOLOGY ECONOMY

WATER INFRASTRUCTURE




Eco-Farmscrapers
[Vincent Callebaut]
Water Data Headquarter
[upgrade.studio, DsBA, Mihai]
Green Skyscraper
[Edouard Francois]
Habitable Vertical Farm
[Adrian Smith Architecture]
Water treatment canopy
[Umbrella-Boincean]
Operable water catchment pod
Detention pond
Water canopy
[TomDavid Architecten]
Sensor

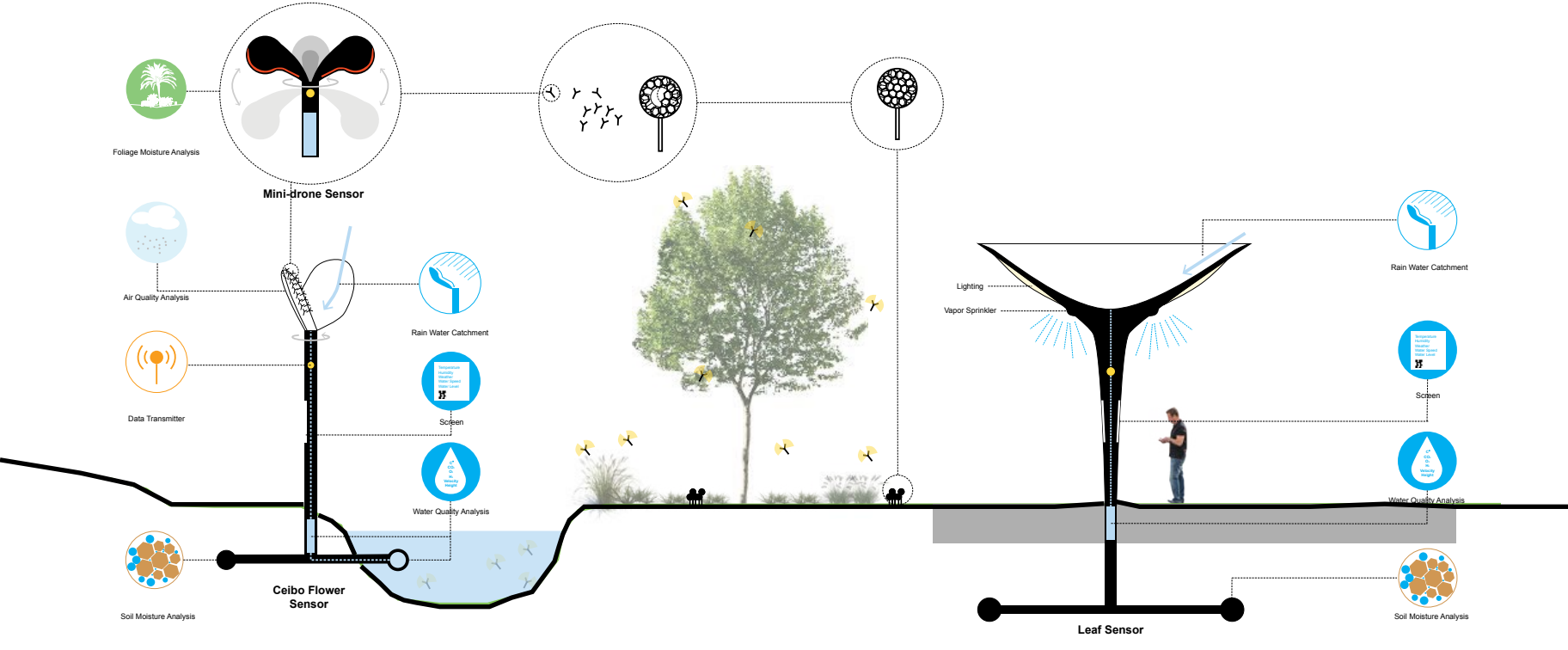
THE CORE



Ceibo Flower

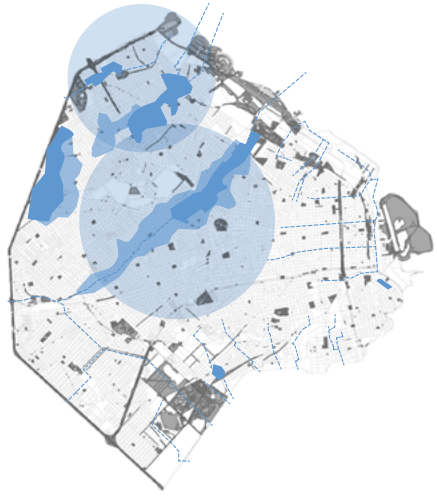
Dandelion

Ceibo Leaf

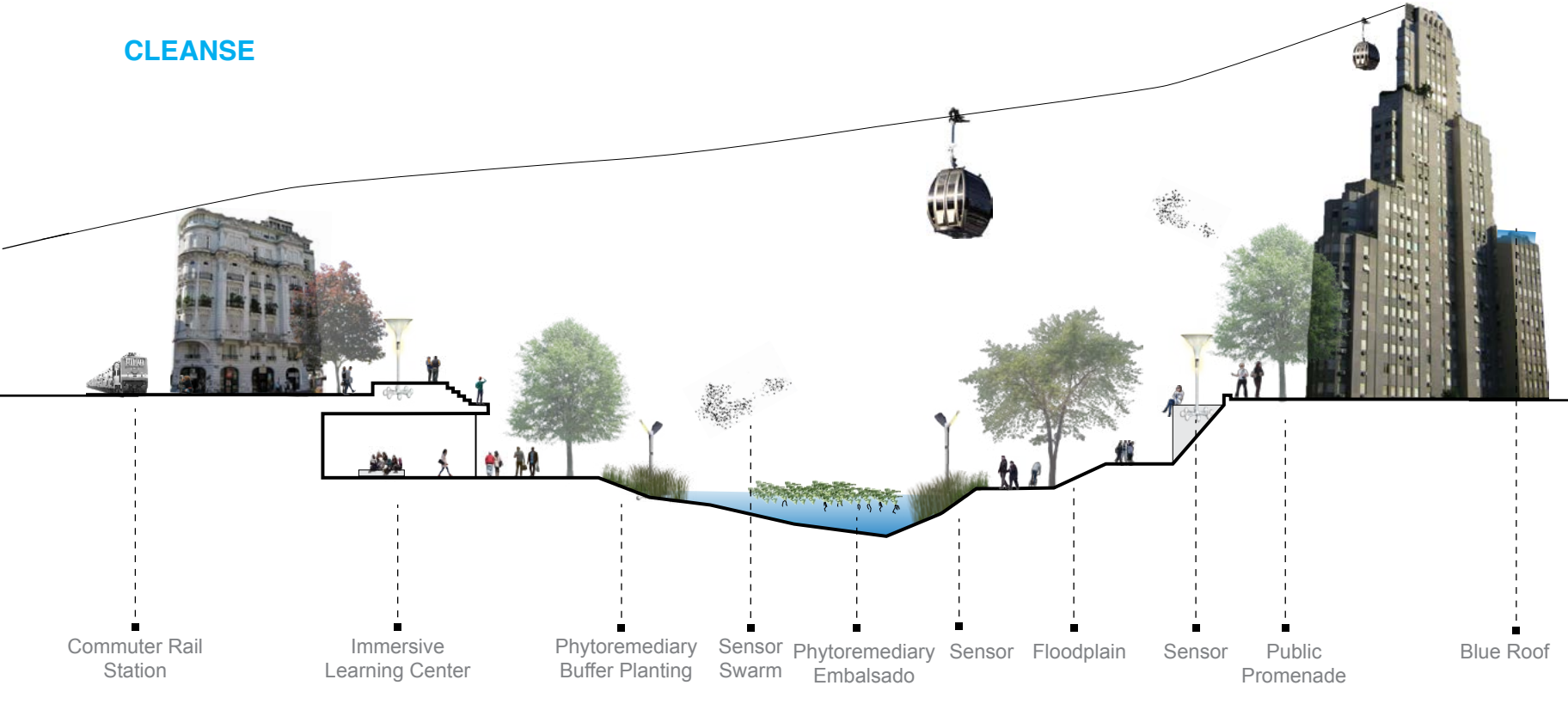



Hydro-car
Sensor Swarm
Embalsado
(Hyacinth “island”)
Sensor
Floodplain
Promenade
Greenhouse Farm

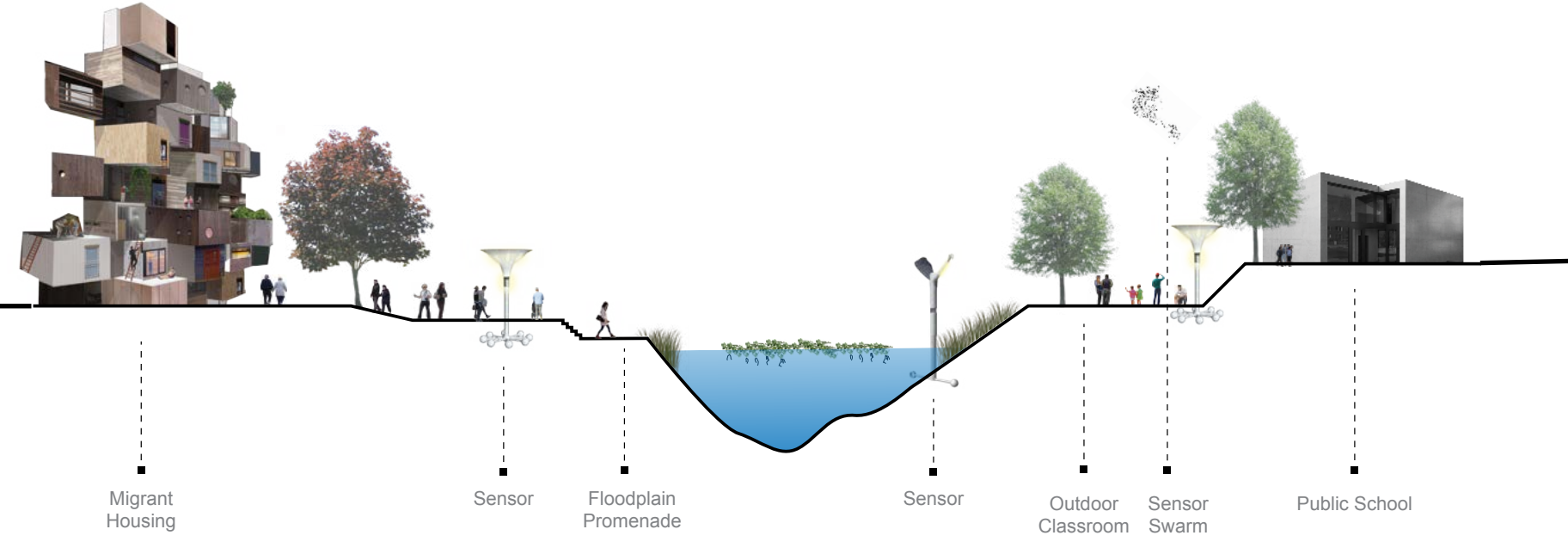
THE VALLEY



CLEANSE

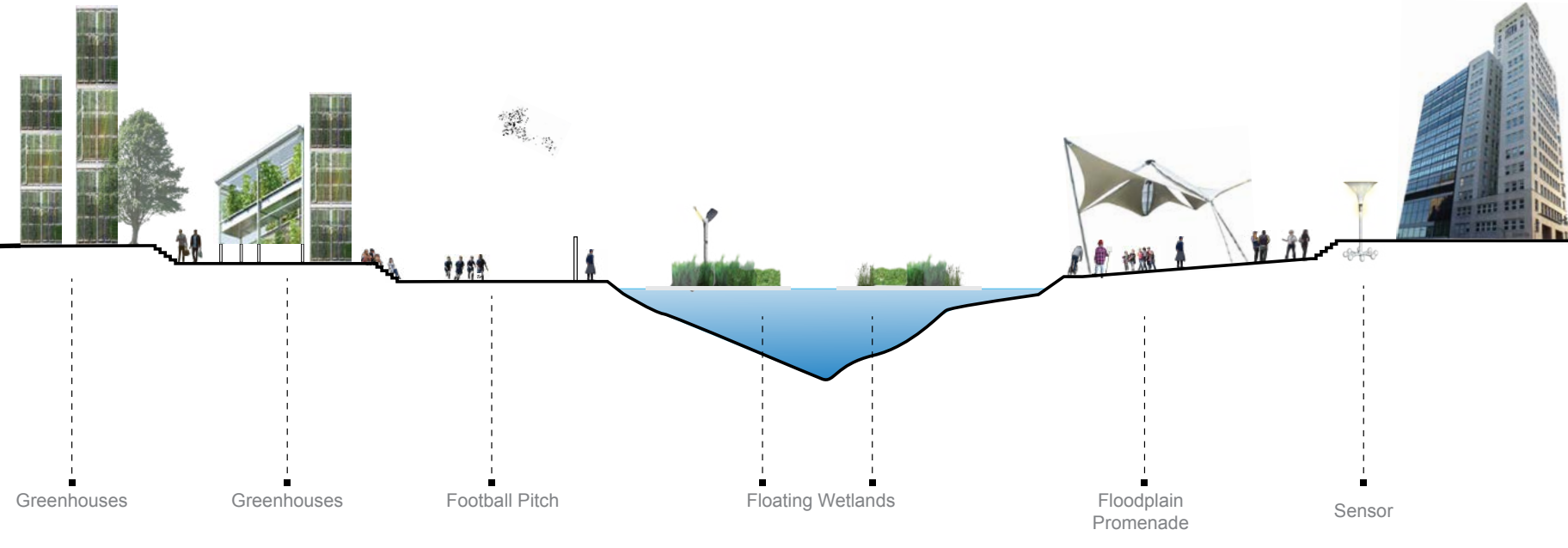


INTERACT


Migrant Housing
Sensor
Floodplain Promenade
Sensor
Outdoor Classroom
Sensor Swarm
Public School

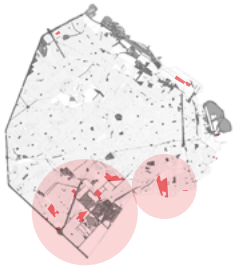

grow
interact
cleanse

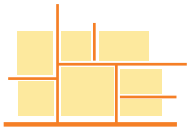
GROW


Greenhouses
Greenhouses
Football Pitch
Floating Wetlands
Floodplain
Promenade
Sensor


Construction Drone
3D Printer
Stair connection from roof to street
Water Data Headquarter
Walkway connecting Housing to Adjacent Building
Wind powered Public Transit
Water Catchment
Street entrance
Sensor

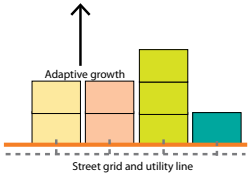
THE EDGE



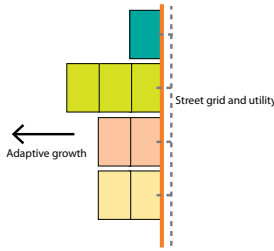


Primary street and secondary streets

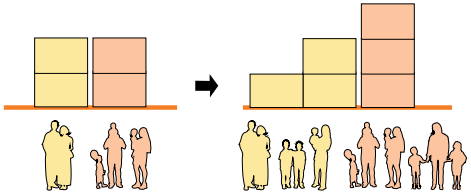
CIRCULATION PATTERN



CONVENTIONAL URBAN GRID

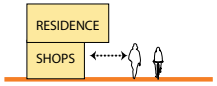


PROPOSED GRID

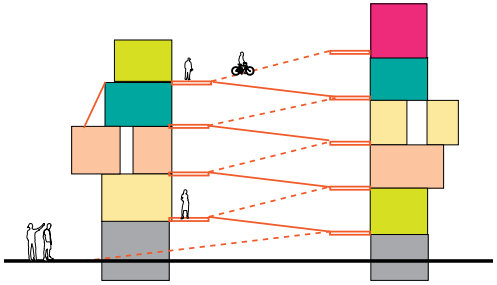


BUILDING FLEXIBILITY FOR EXTENDED FAMILIES

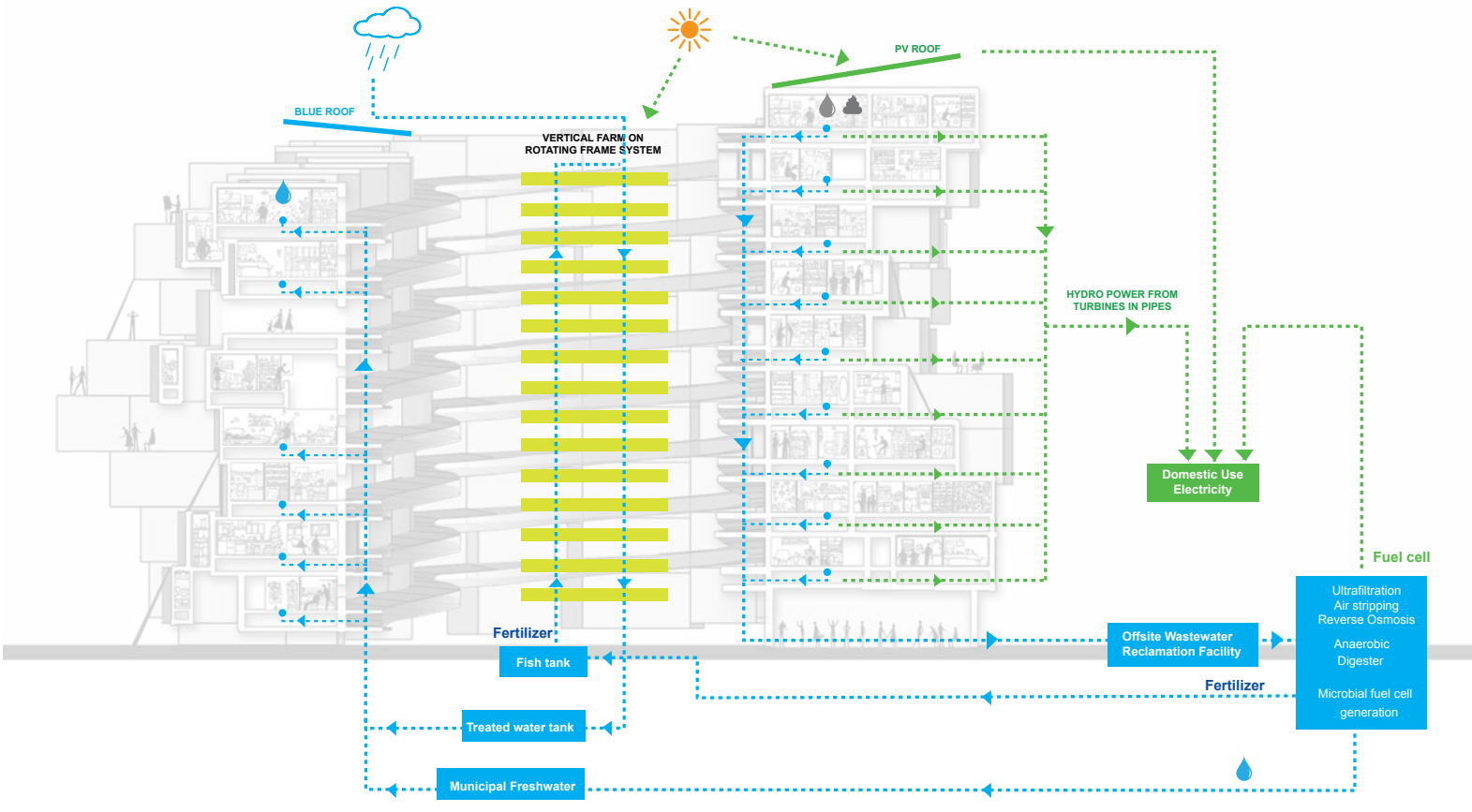
CONTINUOUS SPIRAL RAMP CONNECTING UNITS VERTICALLY
WITH ACCESS POINT OUT TO ADJACENT BUILDINGS

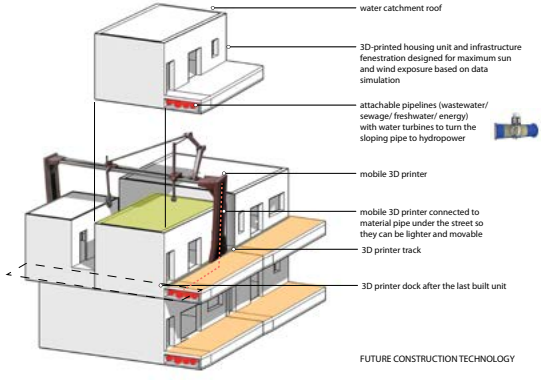


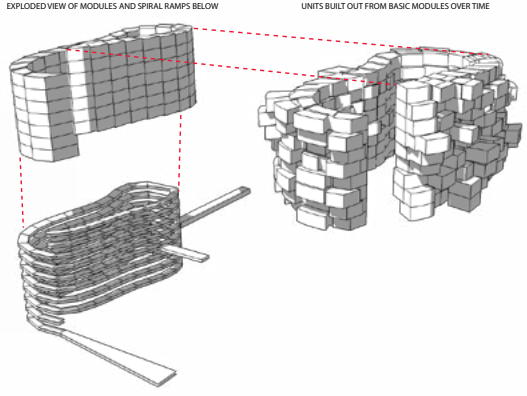
MIXED-USE HOUSES AND STREET CONNECTION




Alleyway to roofspace
Community space
Connection to outside elevated walkway
Vertical Farm
MANOS DE MI MADRE


PV ROOF
BLUE ROOF
VERTICAL FARM ON
ROTATING FRAME SYSTEM
HYDRO POWER FROM
TURBINES IN PIPES
Domestic Use
Electricity
Fuel cell
Ultrafiltration
Air stripping
Reverse Osmosis
Anaerobic
Digester
Microbial fuel cell
generation
Fertilizer
Offsite Wastewater
Reclamation Facility
Fertilizer
Fish tank
Treated water tank
Municipal Freshwater


water catchment roof
3D-printed housing unit and infrastructure fenestration designed for maximum sun and wind exposure based on data simulation
attachable pipelines (wastewater/ sewage/ freshwater/ energy) with water turbines to turn the sloping pipe to hydropower
mobile 3D printer
mobile 3D printer connected to material pipe under the street so they can be lighter and movable
3D printer track
3D printer dock after the last built unit
FUTURE CONSTRUCTION TECHNOLOGY


EXPLODED VIEW OF MODULES AND SPIRAL RAMPS BELOW
UNITS BUILT OUT FROM BASIC MODULES OVER TIME

REVOLUCIÓN POR EL BARRIO

HAVANA, CUBA

This project presents the development of Havana, Cuba into a city comprised of self-sustaining regions that are community-oriented and agriculturally-driven. The project proposes a vision that looks into the year 2090, to the post-oil economy, where Cuba has evolved to depend on alternative sources of energy.

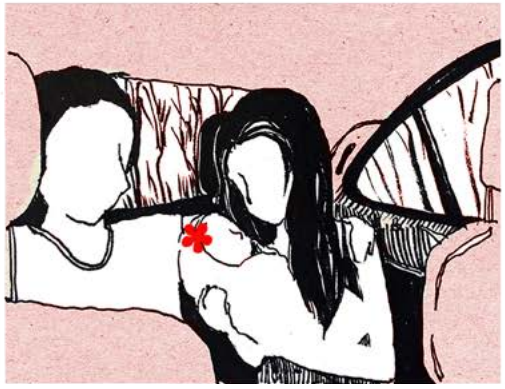
The government's power in Cuba has significantly declined, becoming a mere icon, while people turn to their communities for the production of energy and food. Each community is centered around a HUB that serves as a point of sustenance and gathering for the neighborhood.

The primary narrative is relayed through windows into the life of "Evelyn" - a life-long Havana resident - and the production of her lunch.

THERRESA SHANNEN BUDIHARDJO, CHRIS HALL, XIAORUO ZHANG


CUBA
EN CADA BARRIO
REVOLUCIO

2019



EVELYN'S BIRTH

Evelyn was born into a Cuba where the government still had a tight grasp on the country.

2023

US LIFTS EMBARGO

When Evelyn was four, she saw the first US trade ships arrive at the coast of Havana. However, since it was still a wary government, afraid of what happened with the fall of the Soviet Union, they limited trade and tried to stay independent.

2036

CAR-FREE HAVANA

When she was 17, Evelyn saw Havana become the first major city to ban the use of automobiles and turn toward trams as an alternative form of transportation.

Havana is on the brink of change. The project's future vision of Havana is driven by Havana's existing conditions:

REVIVAL AFTER THE FALL OF THE USSR
Cuba lost its trade partners. Because of the fall of the Soviet Union, Cuba became the first country to hit peak oil.

THRIVING URBAN AGRICULTURE
Havana is home to one of the biggest agriculture involvements in the world, with 90% of the food produced inside city limits.

DETERIORATING INFRASTRUCTURE

CHANGING POLITICAL STRUCTURE
The leadership transition to Raul Castro is leading to a more decentralized system.

D.I.Y CULTURE
Because Cuba has been isolated from technology and other resources, citizens have had to invent things themselves.

The following interventions propose a future of Havana, created in three different scales: the city scale, the building or the neighborhood scale, and the individual scale.

2041

WORLD OIL CRISIS

Evelyn saw why the cars were banned as the world suffered from the oil crisis.

2047

HURRICANE MARTA

The biggest hurricane in Cuban history knocked down the centralized power grid and promoted decentralized power.

2073

HURRICANE FE

The decentralized power system was tested by Hurricane Fe. Evelyn saw that some areas still maintained power.

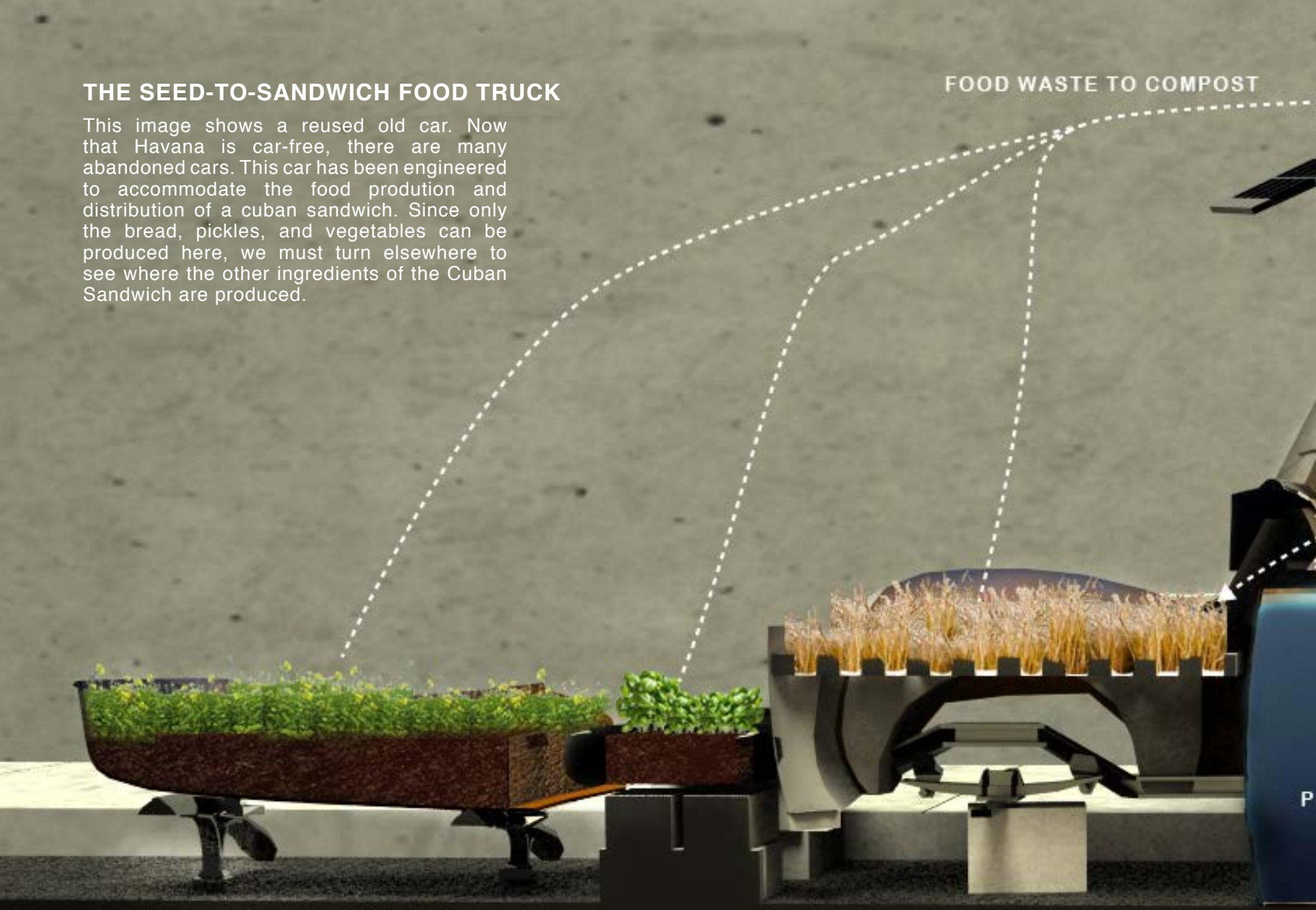
2090

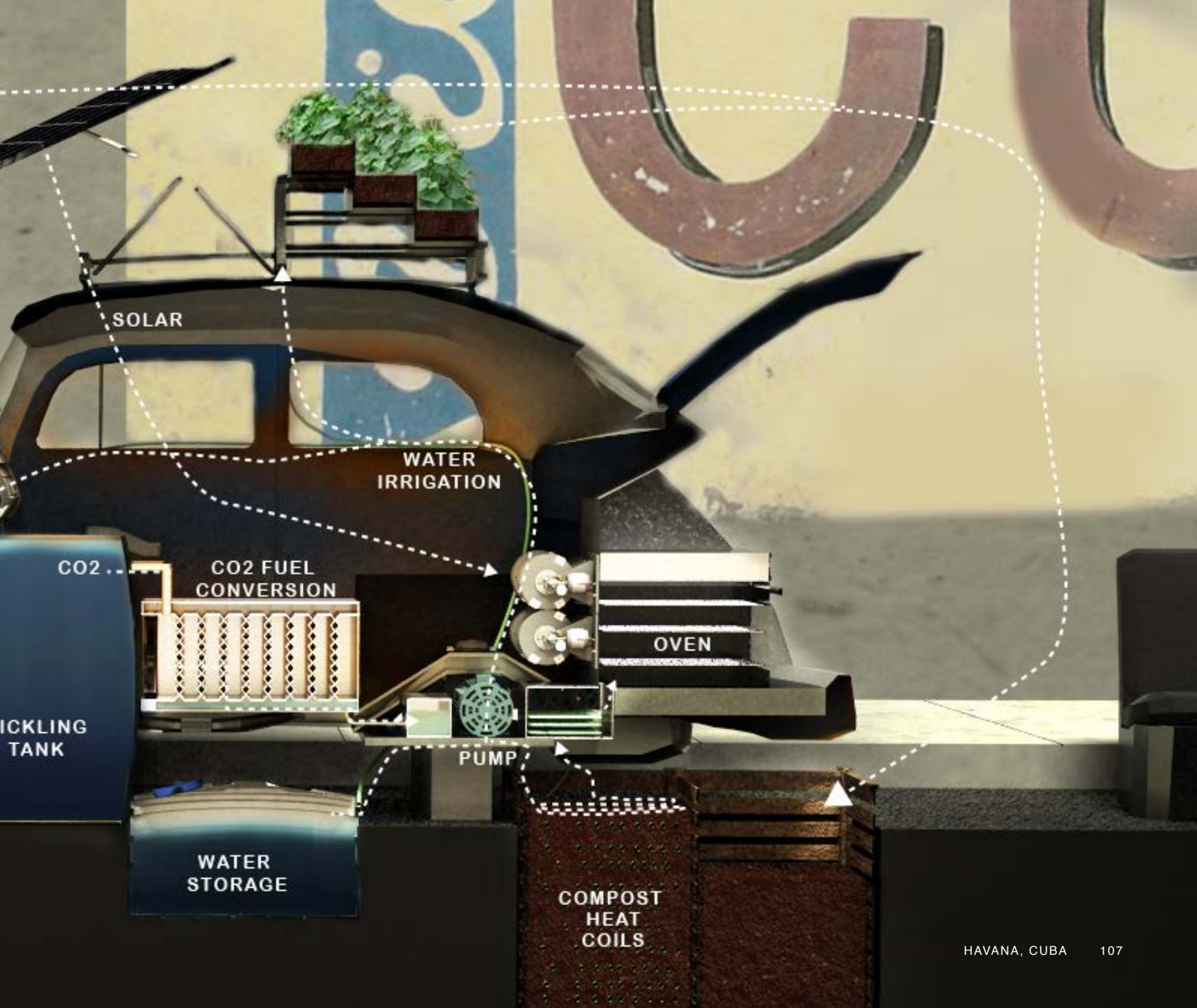
PRESENT DAY HAVANA

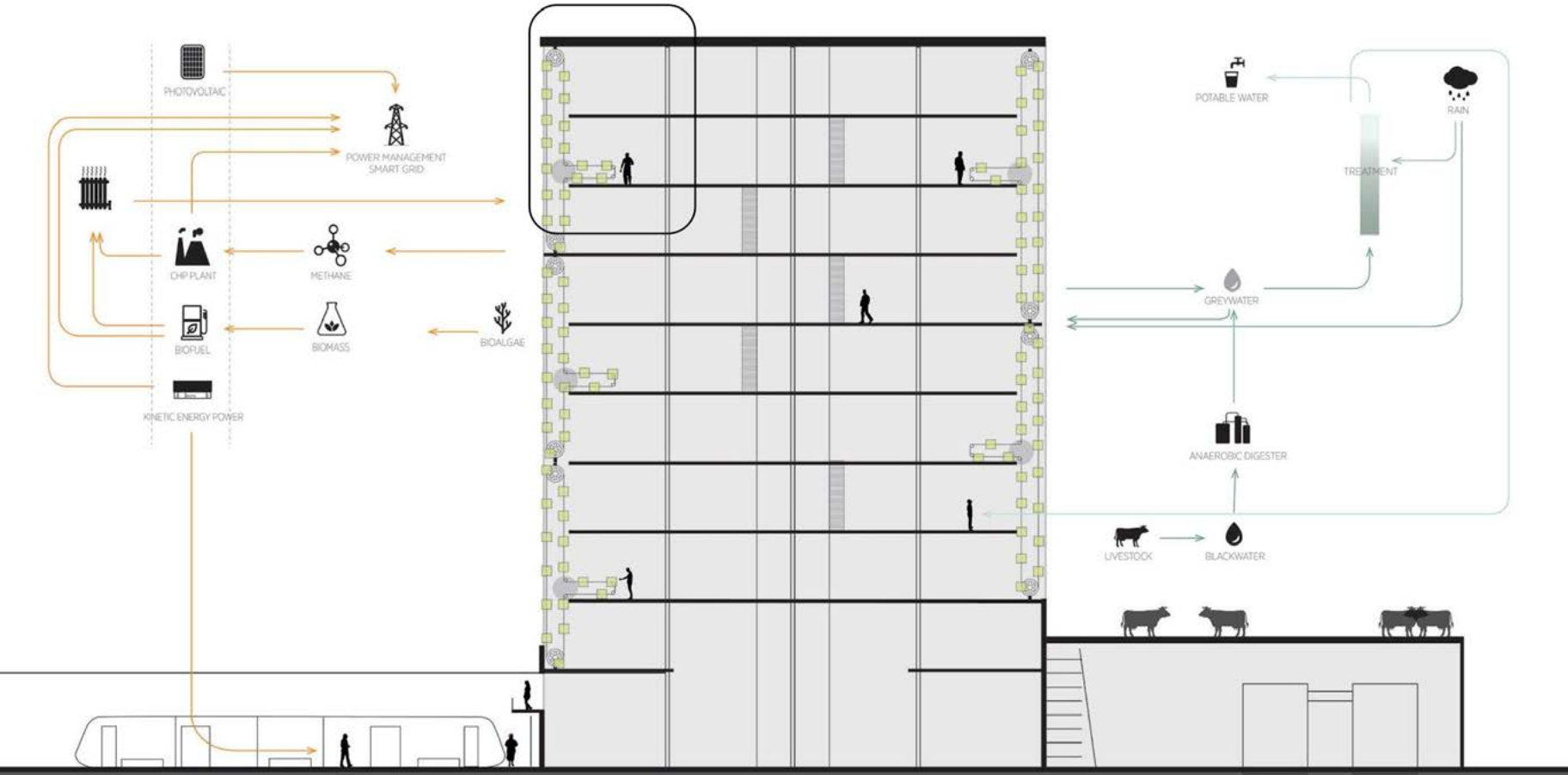
Now we join the 71-year-old Evelyn as she eats a cuban sandwich. We see how the daily life of a person living in Havana might look in 2090.

THE SEED-TO-SANDWICH FOOD TRUCK

This image shows a reused old car. Now that Havana is car-free, there are many abandoned cars. This car has been engineered to accommodate the food prodution and distribution of a cuban sandwich. Since only the bread, pickles, and vegetables can be produced here, we must turn elsewhere to see where the other ingredients of the Cuban Sandwich are produced.




SOLAR
WATER
IRRIGATION
CO2
CO2 FUEL
CONVERSION
OVEN
ICKLING
TANK
PUMP
WATER
STORAGE
COMPOST
HEAT
COILS



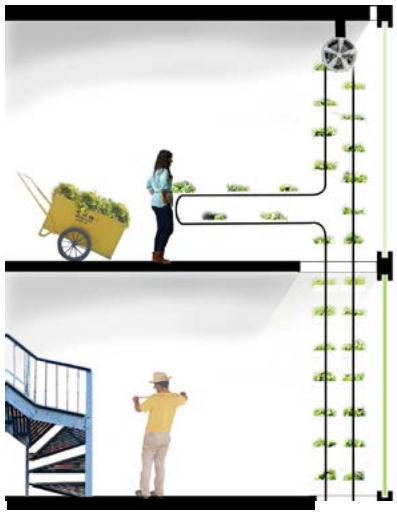
THE HUB

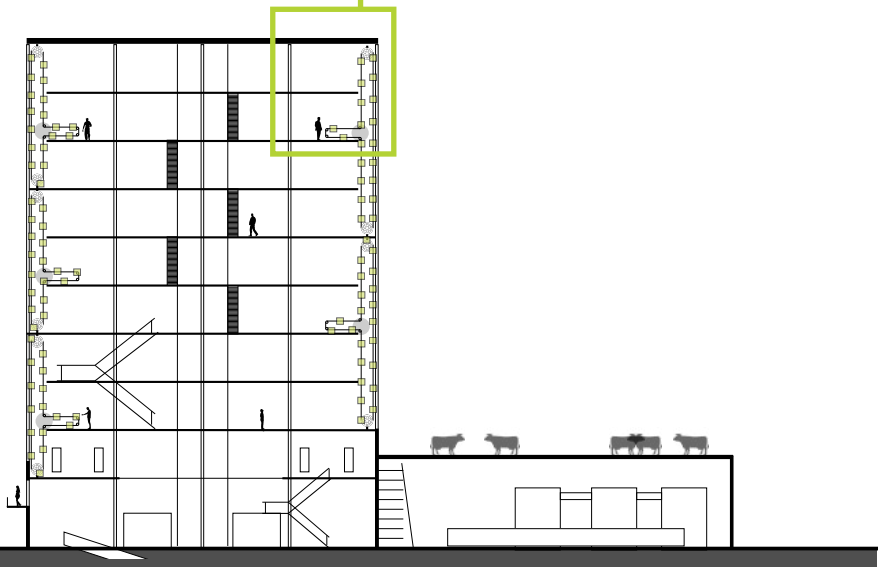
The bioalgae facade generates biomass in its panels, which feed into a gasification tank that turns the biomass into heat to power the generator. The excess CO_2 is fed back into the panels.

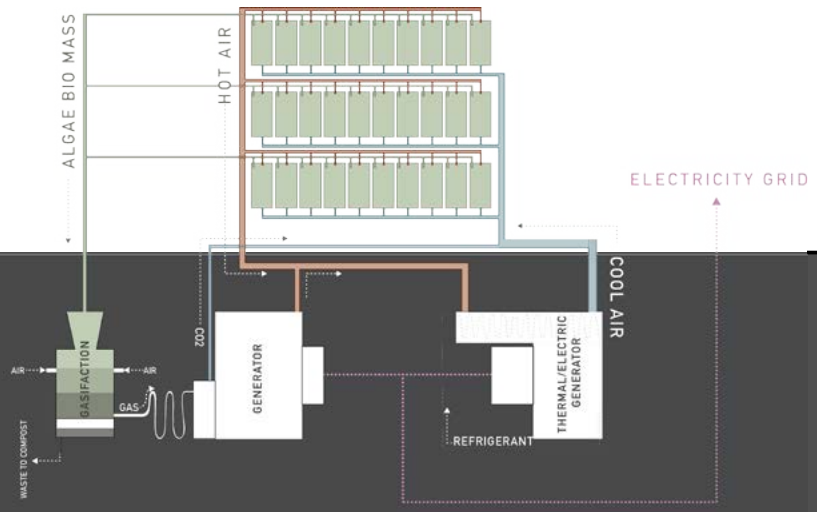
PLAZA VIEJA

We zoom out to see where the food truck is located - Plaza Vieja. Havana has transformed into a hyperlocalized city with hubs that serve smaller parts of the city through the production of food, water, and energy. This particular hub is an adaptive reuse of an abandoned building, situated in a dense neighborhood in the old town. To be able to accommodate the amount of people living in this area, the hub utilizes vertical farming and a bioalgae facade.


SITE
10 MIN WALK
Bike Lane
Principal Pedestrian Roads
Subway Line
Site
Tram Stop
Agricultural Land
Settlements



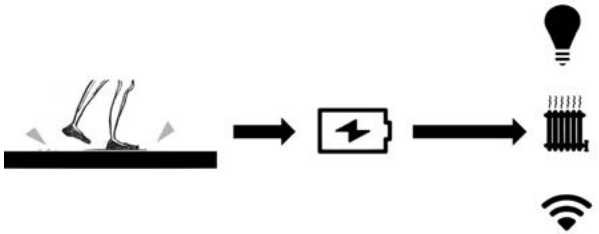



ALGAE BIO MASS
HOT AIR
ELECTRICITY GRID
COOL AIR
CO2
AIR
AIR
GASIFACTION
GAS
GENERATOR
THERMAL/ELECTRIC GENERATOR
REFRIGERANT
WASTE TO COMPOST

VERTICAL FARMING AND KINETIC ENERGY

The opposite section shows how vertical farming works with conveyor belts to allow crops to receive equal amounts of sunlight throughout the day. It also allows the workers to easily access the plants for care and harvest. The bioalgae panels on the facade are placed on tracks as solar control. This hub contributes cheese to the cuban sandwich by processing milk from cows.

Additionally, on the Plaza Vieja, kinetic energy tiles have been installed to harvest footsteps as kinetic energy, powering electricity, heating, and internet.

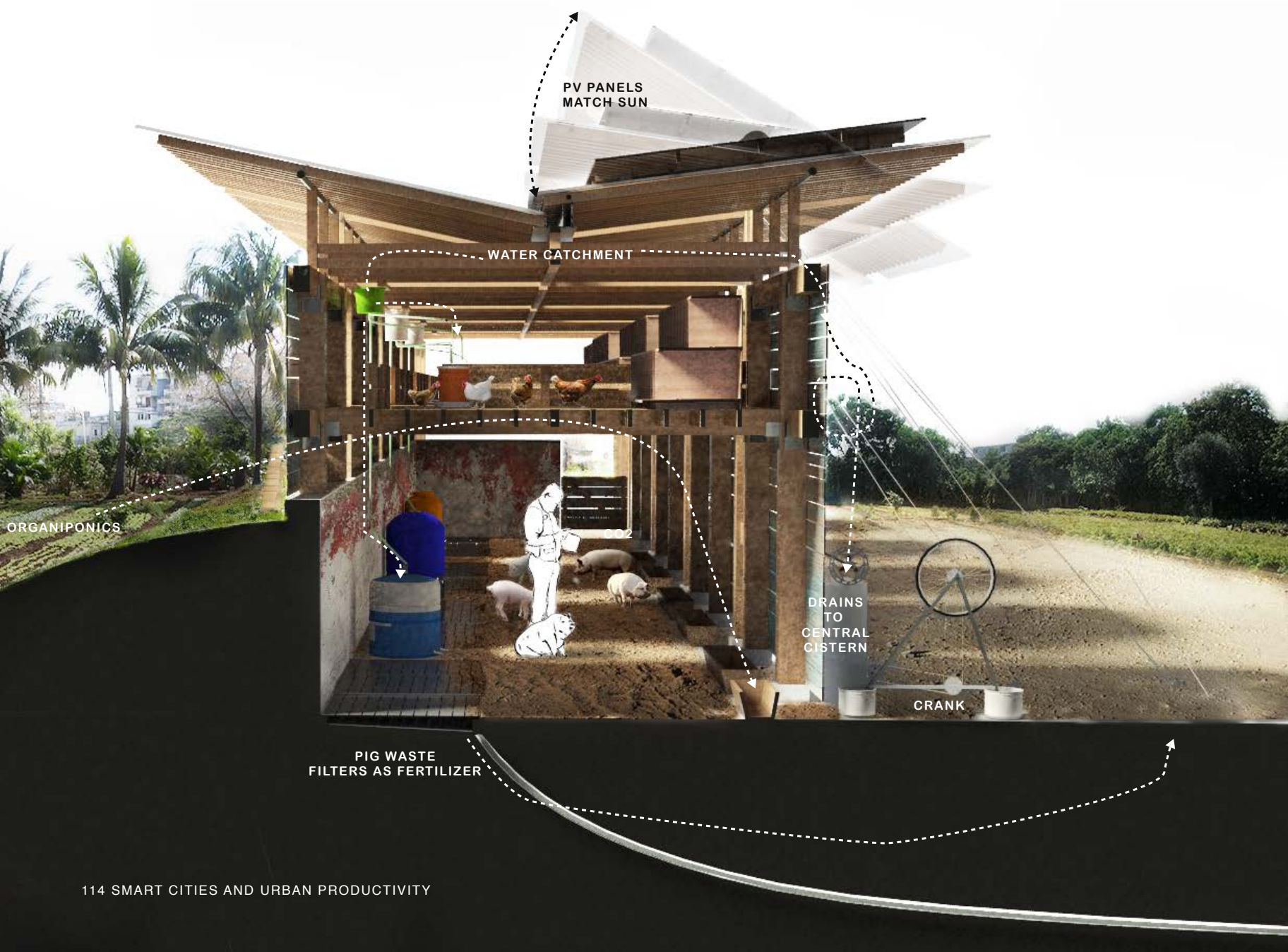


CAR-FREE HAVANA

The cuban sandwich still needs its most important ingredient, which is pork meat. Since pigs are not raised in the old town area, they have to be imported from other hubs on the outskirts of Havana by tram. Trams are the “new” alternative form of transportation, as Havana has become car-free. The trams are fueled by biomass from the bioalgae facades that are visible on buildings throughout the city. Additionally, reused coco taxies use rooftop PV panels to harvest solar power.


GENERATOR
AIR
OVEN
DRYING
PYROLYSIS
GAS
REDUCTION
OXIDATION
CONVERSION
TANK
WASTE TO COMPOST


75% 1500AH

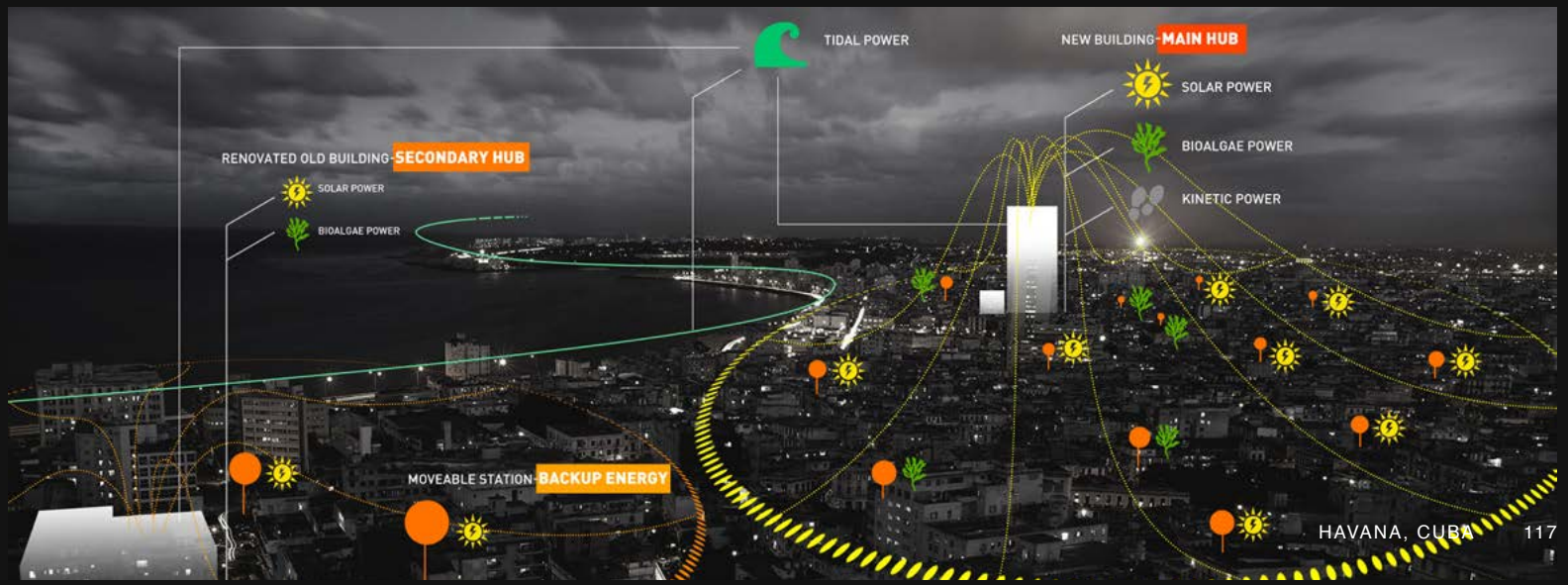

PV PANELS
MATCH SUN
WATER CATCHMENT
ORGANIPONICS
CO2
DRAINS
TO
CENTRAL
CISTERN
CRANK
PIG WASTE
FILTERS AS FERTILIZER

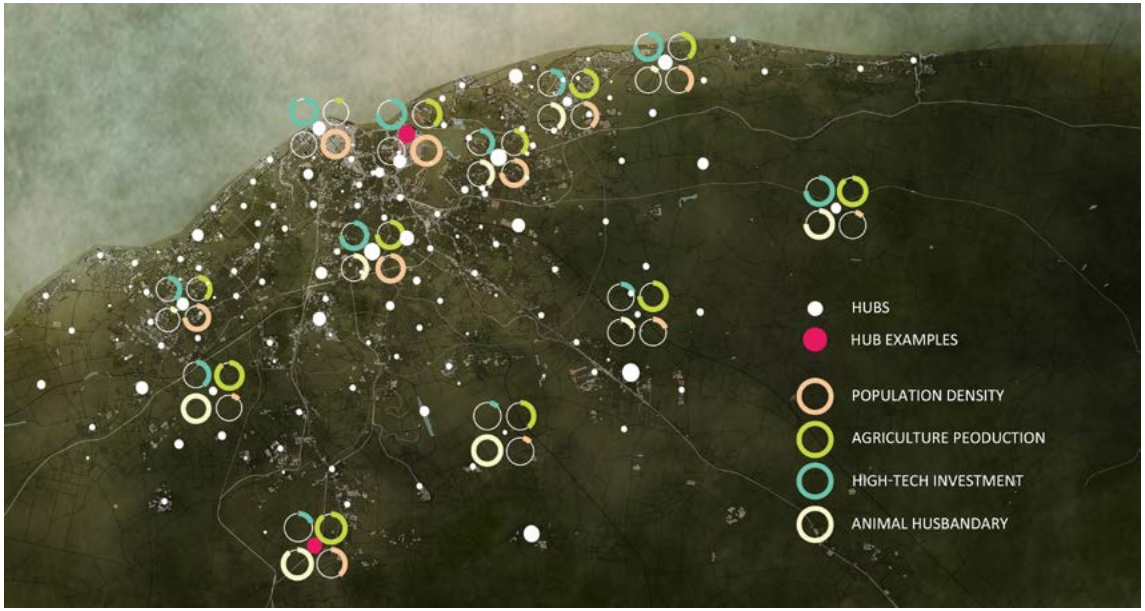
LIVESTOCK FARMING

This hub is a collective community gathering space for food, energy, and water. It is located in the area called Santiago de Las Vegas, which has abundant farmlands that produce sufficient vegetables for the community. It focuses on animal farming. It also enforces the idea that nothing goes to waste. The roof of the building is engineered so that it can tilt to optimize the amount of sun received by the solar panel. Rainwater is consumed by the animals and powers the generator.

MOBILE BACKUP ENERGY GENERATOR

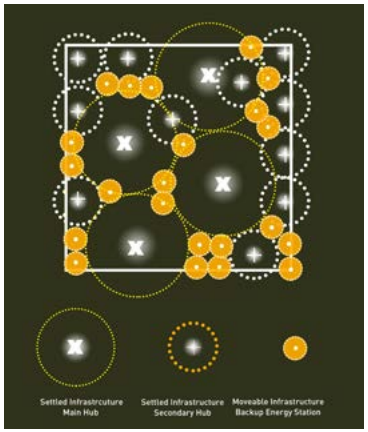
At the city scale of Havana, there are different hubs scattered throughout the urban fabric. Each hub serves an area surrounding it; its size varies depending on the hub's ability to produce food. Each location has a main hub, a secondary hub, and a mobile backup energy generator. This mobile generator, which reflects the DIY culture of the people of Havana, is created by a bicycle, with bioalgae lubricants and movable solar panels on top.


TIDAL POWER
NEW BUILDING-MAIN HUB
SOLAR POWER
BIOALGAE POWER
KINETIC POWER
RENOVATED OLD BUILDING-SECONDARY HUB
SOLAR POWER
BIOALGAE POWER
MOVEABLE STATION-BACKUP ENERGY



NETWORK OF HUBS

Each hub has unique characteristics, shaped by the distinctive conditions of the hub's surroundings.



In section, every aspect in this possible future projection comes together. All of its components work together to create a self-sustaining Havana, where Evelyn can enjoy a cuban sandwich.

REFLECTIONS

“To be able to visualize the future is the first step to actualizing it, which involves both technological innovation as well as cultural transitions. The important of a studio like this, is that it highlights the need for socio-cultural and environmental ecologies to be designed and integrated.”

Neeraj Bhatia, California College of the Arts

“The McKinley Futures Studio provides students with the critical challenge of addressing our most pressing issues related to human dwelling and settlement. The *Smart Cities and Urban Productivity Studio* work was impressive for its systemic, cross-scale approach and the inspiring and hopeful imaging of our collective future. This diverse body of work makes a compelling case for the urgent need for problem-framing at the scale of city and region and the key role of design in shaping hardworking and vibrant urban landscapes.”

Jamie Vanucchi, Cornell University