

An aerial photograph of a city waterfront, likely New York City, showing a dense urban grid and a large body of water. Several people are seen swimming in the water, creating white splashes. The overall color palette is dominated by various shades of teal and blue, giving it a monochromatic, aquatic feel.

MANNAHATTA

TRANSFORMATION FOR URBAN & SOCIAL RESILIENCE ON NEW YORK WATERFRONT.

QUENTIN DESFARGES



CHALMERS
UNIVERSITY OF TECHNOLOGY

MANNAHATTA

TRANSFORMATION FOR URBAN AND SOCIAL RESILIENCE ALONG THE EAST RIVER WATERFRONT, NEW YORK CITY.

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MASTER THESIS PROJECT

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Master Program for Architecture - MPARC

Urban + Architectural Design Laboratory

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*cover photo: HSBC global warming swimming pool, Mumbai
(Credit: @Ogilvy & Mather)*

*“ In every project we do, we need the nature of Frederick Law Olmsted,
the quality of Jane Jacobs, and the quantity of Robert Moses. “*

- Alexandros Washburn

Merci !

To the excelling Chalmers team, tutoring my work for the last 2 years.

Carl-Johan & Ana Betancour, for your amazing availability at any moment and your interest in my work, always pushing me forward. All the best in Umeå!

Joaquim Tarrasó for supervising my work progress over the year, from Göteborg & New York. Thank you for your professionalism and your level of exigence!

To my fellow students and friends, **Laureen, Valentina, Simon, James & Magda** for the interesting discussion and your support. For the crazy weekends working at school, and the parties to relax. Summer is here! Good luck in your careers!

Lynne & Henry, Lilah, Damaris, Daniel, Kathleen, Peter & Laura and the Lower East Side community for your warm welcome in New York, your interest in my work and all the great inputs to my project. LES rocks, keep fighting for the best!

Martin, Tyler & Marcel, Sabra, Margaux, Todd, J.&J. for all the fun in New York!

My **Homies**, best friends and talented architects. You made me what I've become, thanks for believing in me, for your support and constructive critics!

Last but not least, to my big lovely family, for the support needed to live abroad. **Domi et Hervé**, merci de m'avoir appris à voir le monde du meilleur côté ainsi que de m'avoir toujours soutenu dans mes choix, ce diplôme est pour vous!

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Reading Instructions

This project was presented after its completion on three different occasions.

First, on May 12st 2015, an oral presentation was held to present the Master Thesis work to the academic jury of Chalmers University composed of my supervisor Joaquim Tarrasó, my examiner Dag Tvilde, internal and external critics Anna Kaczorowska and Knut Eirik Dahl as well as my fellow students.

Then, the project posters and models were exposed from June 3rd to June 10th in the atrium space of the Architecture building on Chalmers campus for a public exhibition and an open presentation of the work on June 3rd 2015.

Finally, the final version of this booklet was completed and sent to the jury for examination in August 2015. It aims at presenting the material produced during this semester, which has been previously showcased on posters and models.

This booklet is not intended to be read as a book from cover to cover, but as a notebook that you can flip through and first take the images and illustrations. It presents the project process in a chronological order, from the choice of the subject to the early research about the subject, the field study through the design completion. The booklet contains all relevant informations about the thesis work and its results, but not everything I thought of during the process.

For more information, contact me at: [**quentin.desfarges.au@gmail.com**](mailto:quentin.desfarges.au@gmail.com) !

Abstract

Climate Change is here. The projected rise of temperatures and sea level for the coming century is threatening coastal cities and low-lying deltas. Heat waves, average and extreme rain and flash floods risks are projected to increase, threatening ecosystems and human settlements, health and security.

With nearly 400,000 residents living in flood-prone areas, New York suffered a lot when Hurricane Sandy hit the U.S. East Coast on October 2012. The Lower East Side is a big public reservoir and hosts a vulnerable population in case of a catastrophe. This neighborhood is one of the last in Manhattan to be filled with such a diversity of cultures, religions, and languages. It is the historic first stop for immigrants but residents are concerned about the gentrification process going on.

The goal of this Master Thesis is to develop a project that will help the city to become more resilient towards storm surges and flooding scenario. It also aims at rising awareness of the New Yorkers about climate change, and to reconnect them with their natural environment while enhancing the waterfront with new cultural and community amenities for the social resilience of the neighborhood.

Based on a detailed analysis of the city and in dialogue with local associations and residents, to anchor the project in real lifestyles and existing needs, the thesis will reintroduce the concept of Mannahatta, meaning "Island of Many Hills", as it was formerly called by the Lenape Indians. This urban design of a new topography of connected hills along the waterfront will address the needs of different sectors in one solution, to protect and enhance the built environment and the community in the Lower East Side neighborhood of Manhattan, New York City.

| **climate change** | **Sandy** | **resilience** | **community** | **New York City** |

HELLO!

About me

A 22 years old boy from the city of Lyon, France.



me and architecture

I hold a bachelor in Architecture from my hometown university, the Ecole Nationale Supérieure d'Architecture de Lyon (ENSAL). This degree gave me the opportunity to work on a wide variety of projects, from the urban planning to the construction detail. With a diverse and excellent team of architects, planners, engineers, historians, artists, etc, I have been exploring the influence of the architect in the contemporary world. This bachelor program gave me a three years experience, working on developing different building typologies such as housing (from the single-family house to the apartment building), many institutional projects (museum, art gallery, school, library, pavilion), and commercial.

Studying for the Master Program for Architecture at Chalmers (MPARC), in Göteborg, I have found interesting courses and an important focus on urban development and building design in which the concern of sustainability and people are at the center of attention. Student of the Urban and Architecture Design Studio for the past two years, I had the opportunity to develop projects from the urban scale to the construction detail, developing strategies for the challenges of the XXIst century, as climate change, global warming, sea level rise, flooding, housing pressure, ... In my opinion, if a design has somehow to mirror society, it has to be carried out taking care of the peculiarities of the project area. Therefore, it is important to be flexible and open-minded in order to adapt the design approach following the changes of society.

me and water

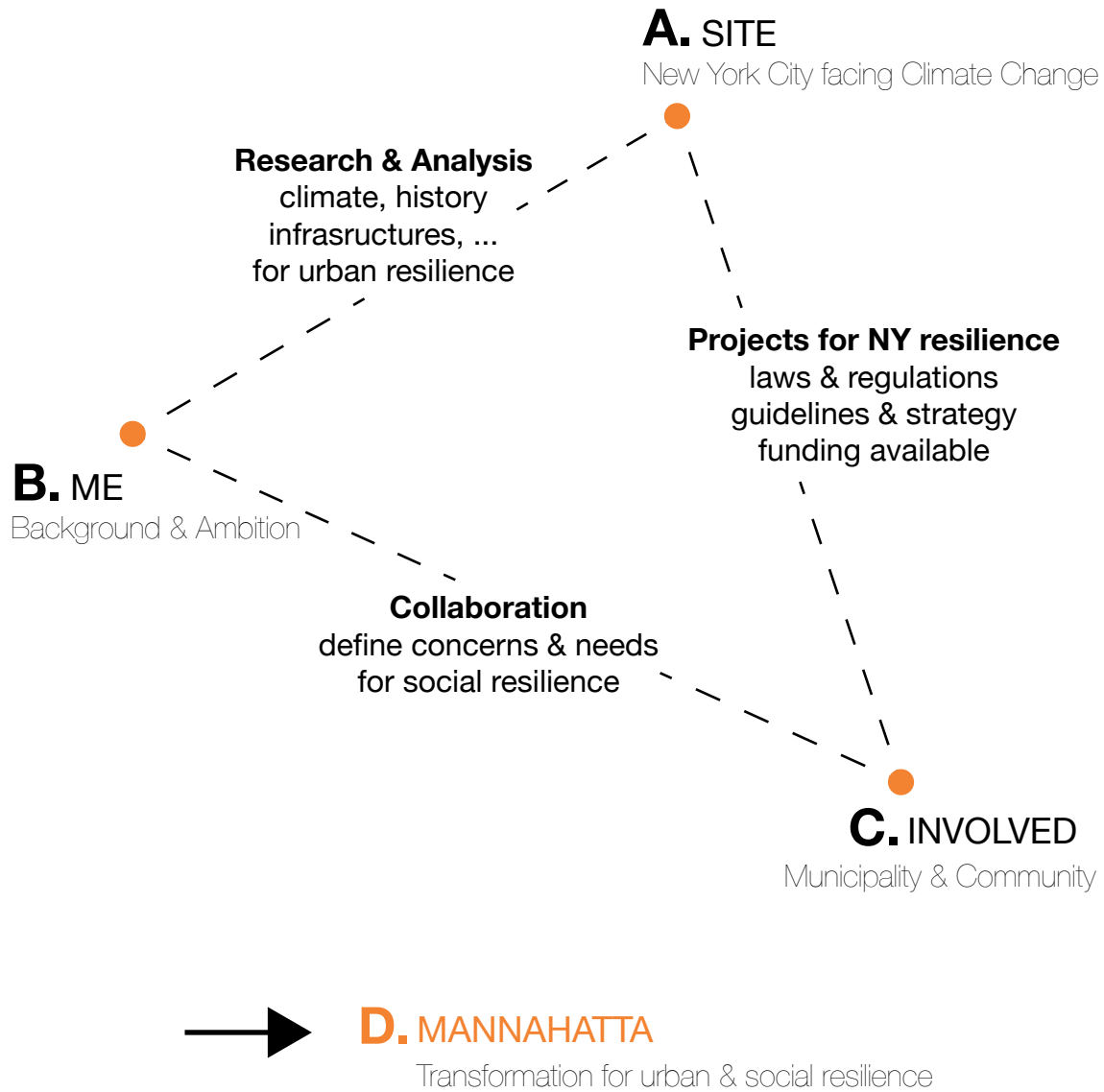
Water covers 70% of the planet, but only 3% of it is freshwater. **The Blue Gold** is becoming a rare resource, many of the water systems that keep ecosystems thriving and feed a growing human population have become stressed. Climate change is altering patterns of weather and water around the world.

The projected rise of temperatures and sea level for the coming century are threatening coastal cities and low-lying deltas. Heat waves, average and extreme rain and flash floods risks are projected to increase, threatening ecosystems and human settlements, health and security. I believe that cities and their communities must be physically protected from the effects of climate change. It is an opportunity to design in a way that will reconnect people to their natural environment and raise awareness of the issues we are facing today.

me and New York

In the winter 2011, I had the chance to visit **The Big Apple**, and to meet its inhabitants. On October 29th, the hurricane Sandy caused over 68\$ billion damages and killed 233 people along its path. Studying in France at the time, I witnessed the storm from the news on TV. Some of my New Yorkers friends were deeply affected by the storm. Lynne & Henry Urban wooden house was completely flooded, ruining lots of their personal belongings, furnitures and causing severe damages to the house insulation and structural stability. I witnessed, helpless, their social media outreach to help for cleaning and rebuilding with Sandy's victims.

When I had the chance at Chalmers to choose my Master Thesis subject, I realized that now was the chance for me to take the opportunity to develop a project for the urban and social resilience of New York City.



Method

The planning and design of a project for urban and social resilience against climate change in New York City is a vast and complex task. It must be relevant in terms of sustainability and durability, able to cope with the climate change challenges of the XXIst century. Moreover, it must be coherent with its location, and in connection with its context to be integrated in a very dense and complex urban fabric in New York City, a world economy force filled with a very strong history, a complex organisation and a wide variety of actors. Therefore, to understand the threats the world is facing and to maximize the site potential required a thorough analysis and research, on which the project is based.

First, the research were held from Göteborg using internet and book medias, to gather existing information and develop my personal knowledges. Once I understood the organisation of the City and the challenges it was facing, I decided to work with the Lower East Side neighborhood of Manhattan.

Later in the process, I got in touch with the stakeholders of the area, and the second phase of the project was a two months field study in New York to meet them. I had the opportunity to talk with residents, to assist to association meetings, I have been in touch with the main community groups of the neighborhood. All those exchanges and the study of previous plans developed by officials or by the community gave me the opportunity to understand what they are struggling with nowadays as well as their concerns for the future of the neighborhood they would like to live in.

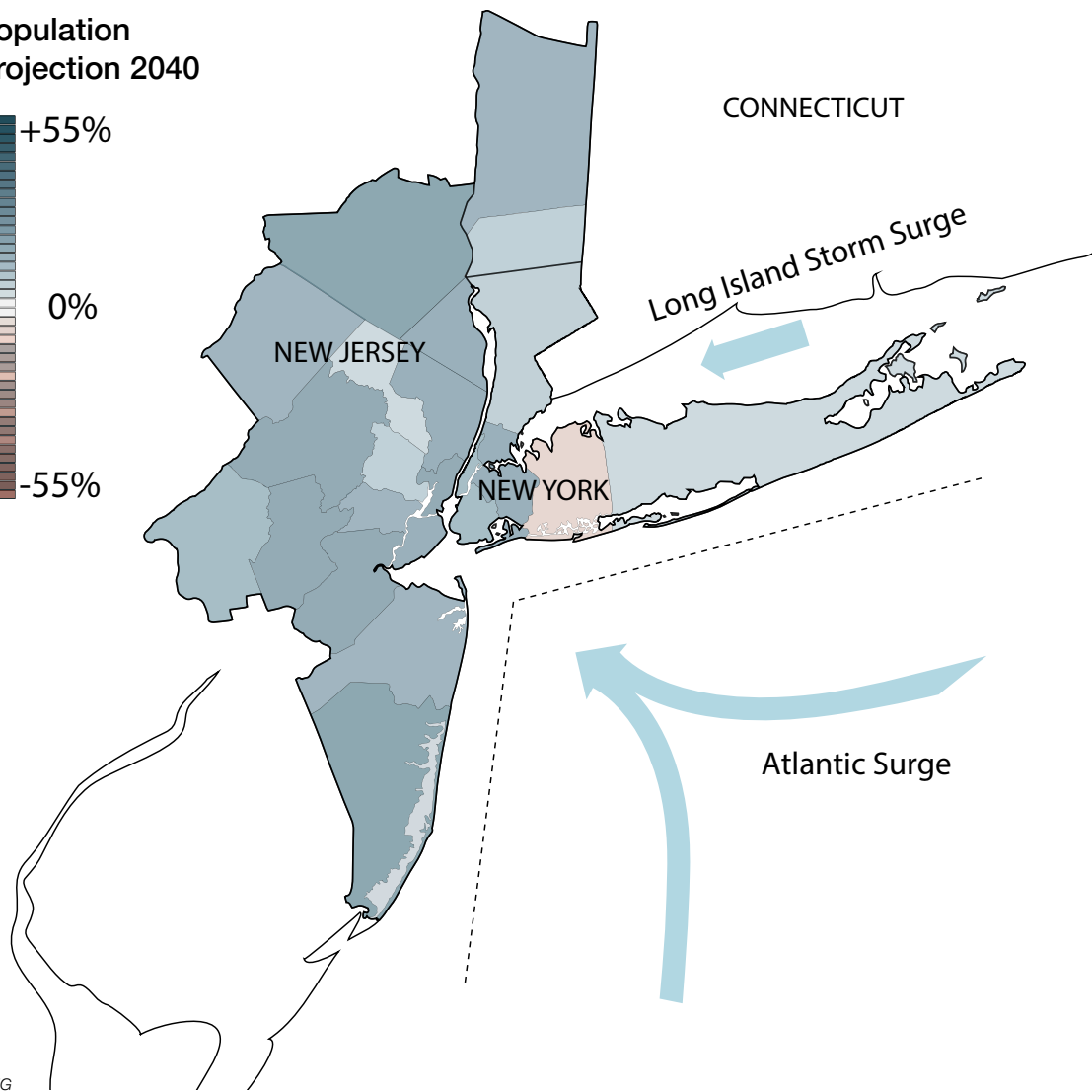
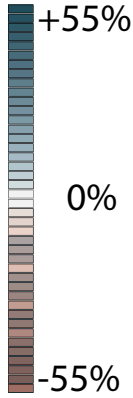
Then, it was time to return to Göteborg and develop my strategy. Not an utopia, but a design able to cope with the threats the city is facing, relevant towards climatic aspect, and anchored in reality and lifestyles of the site and its users.



Flooding in New York City

I. INTRODUCTION

Population
Projection 2040



@BIG

The New York bight threatens growing vibrant urban centers

We have a problem!

Discovered by mistake in 1492 by Christopher Columbus sailing for Asia, America has been a country of immigrants connected to water, people sailing from Europe through the Atlantic Ocean looking for a new land of opportunities.

New York City is composed of 5 boroughs, Staten Island, Manhattan, Brooklyn and Queens which are all islands, and the Bronx. Water is often called the sixth borough. The City connection to its rivers and ocean, along 930 kilometers of waterfront has been a love-hate relationship over the centuries.

New York has landfilled its rivers during 300 years to expand its territory for the ever-growing immigrant population and the needs for housing, manufacturing and commercial areas, to become a powerful and influent world city. 20% of Manhattan actual land has been gained on both the Hudson and the East rivers, and the city economy rest a lot upon its biggest industrial harbor on the East coast and shipping connection to Europe and Asia.

However the designers at the time of expansion were not aware of the concept of climate change, global warming and sea level rise, and their designs rarely integrate flood-proof solutions. The city has been facing many extremes weather scenario over time, big storms, powerful hurricanes, heavy rainfalls, droughts,... Until the deadly hurricane Sandy hit the City in 2012 and show the world that we have a limited amount of time left to get ready for the XXIst century challenges.

The threat water represents to the land and its inhabitants is seen in New York as a great opportunity, it is a lever for innovative ideas and projects. And the City is a testing site, but the strategies developed could be adapted and implemented in every country worldwide facing the same problems.



Sandy & the USA

October 29th 2012. Hurricane SANDY

In the West Atlantic Ocean, North America is extremely exposed to tropical weather as hurricanes and tropical storms. In the context of climate change, as the earth grows hotter, those meteorological events are likely to become stronger and more frequent to affect the United States East Coast.

On October 22 2012, Sandy is formed in the Atlantic Ocean. Its path took quite a different direction from the usual hurricanes tracks coming from the Bahamas. The probabilities for it to hit the US coast was very low. Moreover, Sandy was heading towards region faced by a dilemma: vibrant urban centers, poised for growth, which are simultaneously threatened by their waterfront location, as the almost 90 degree angle of the New York Bight act as a funnel, directing storm surge directly into the hearth of the city [p.14]! Its intensity decreased while progressing towards the American coast, but 50% of the Greater New York Area was at risk of flooding. Reckoned as a storm category 3 on the Saffir-Simpson hurricane wind scale, the hurricane Sandy established records for its size (1800km diameter), damages cost (over \$68 billion) and deaths along its path (286 people killed in 7 countries, 43 New Yorkers).

On October 26, a statewide state of emergency and a pre-disaster declaration were announced. Flights cancelled, public transit system suspended, bridges and tunnels closed, schools closed and evacuation of many areas at risk, close to the waterfront or on elevations less than 5 meters above sea level were ordered. Everybody was waiting for the storm.

Sandy storm surge hit New-York City on October 29, the East River overflowed its banks, flooding a large section of Lower Manhattan up to 4.3m (14ft.) in Battery Park. Strong winds and heavy rainfall teared down a few trees as well as a four



@David Shankbone



@AFP



@AP



@AP973

story Chelsea building's facade collapsed. Several subway stations and tunnels were severely flooded, and some neighborhoods were destroyed by the storm, as the Rockaways Beach houses in Queens or Red Hook district in Brooklyn.

An electrical substation in Lower Manhattan the Con-Edison power plant along the East River in the Lower East Side was flooded causing a power outage in a vast area, creating a new neighborhood in Manhattan: SoPo, for South of Power.

The hurricane Sandy ended on November 2, somewhere inland the USA.

New-York wasn't ready to face such an extreme weather, and is still not!

No long-term design existed to prevent the hurricane. The municipality did its best to protect the city with improvised solutions, as inflatable gates, wooden panels and sandbags. The houses weren't not resistant enough to face the winds and the extreme flooding, the waterfront of the city wasn't protected from the waves and the rising water level coming from the Hudson river.

During the hurricane, many residents found shelters in schools, community centers, where they could find food and other vital supplies. But many had to find refuge for a longer time as the power outage and reparation of the city damages took a long time, from days to weeks or even months for the most unfortunate.

The city needs to develop for urban and social resilience to face future risks !

@Lynne Urban



Henry & Lynne URBAN

Long Island residents

@Lilah Mejia



Lilah MEJIA

GOLES Disaster Relief Coordinator

@Sabra Nasri



Sabra NASRI

French expatriate in NYC

@BIG



Daniel TAINOW

LESEC Education Director

Testimonies

Lynne URBAN | Long Island resident

« On October 29, 2012 [...] my husband and I sat in our Amity Harbor home waiting for the storm. Our home was built in 1950 [...] We have a canal behind it, as well as a main canal at the end of the road. Never before had water entered our house, and we had never worried about high tides before. There was a different feeling this time.

As the wind changed, the rain came, and the lights flickered. Henry was not worried because during hurricane Gloria the water came over the docks onto the road, as well as during hurricane Irene, but went no further. It was not yet high tide but the water travelled up the road. At 6 pm it was on the lawn. At 7pm it was on the top step of our porch. At 8:30pm the water was rising in from every corner of our house. It continued to surround and fill our home until 10pm. [...] Spiders that made their home in our crawl space under the house were running for their lives and ran right up our legs. [...] The water came up two feet [...] and soaked the walls, the floors, and the contents of the first floor of our house.

What followed was nothing short of a miracle, many miracles. [...] Dear friends and family offered their homes for us to stay in; they offered storage space to house our belongings that were saved. [...] They started a fundraising site to help rebuild our house. [...] Mormon helping hands came to our home every Sunday after Sacrament service and lifted our burdens. [...] The crew also walked the neighborhood after the local scout troop came by and gave us food and drinks.

I've always told our children "In all things there is a victory.". This experience has been nothing less. The out pouring of love, help, and friendship here has been life altering. There is no room left in my heart for feeling loss... only gratitude. »

Lilah MEJIA | GOLES & LES READY Disaster Relief Coordinator

« The Lower East Side is a flat area, during Sandy, you can imagine that we would be underwater, it was coming all the way up to 3 meters. The sewer system exploded, there was shit all over the place, literally, ... the grass doesn't grow anymore. They had to cut down trees that were touched by the salt water. The City is planning to plant one million trees, but where? maybe not in that area... Trees are good, they keep the atmosphere cool. With all this concrete, you can't imagine how hot it is here in the summer, you get strike by the heat as soon as you go out. And we don't have much green spaces either, people go to the East River Park for barbecue.

People didn't evacuate because Irene a year earlier wasn't tough, they thought it was about to be the same... I left because I had a baby at the time. But I was afraid of burglars, scouting empty flats. I went to some friends house on Long Island, but I came back a few times to check the place, I quickly ran out of gas! »

Sabra NASRI | French expatriate in NYC for 4 years

« I lived through the hurricane Sandy from the Lower East Side. American people and officials are very preventive [as we experienced during the Juno Blizzard early 2015]. When they warned the population towards hurricane Irene the year before, everybody was ready for the worst (food supply, backup generators...),

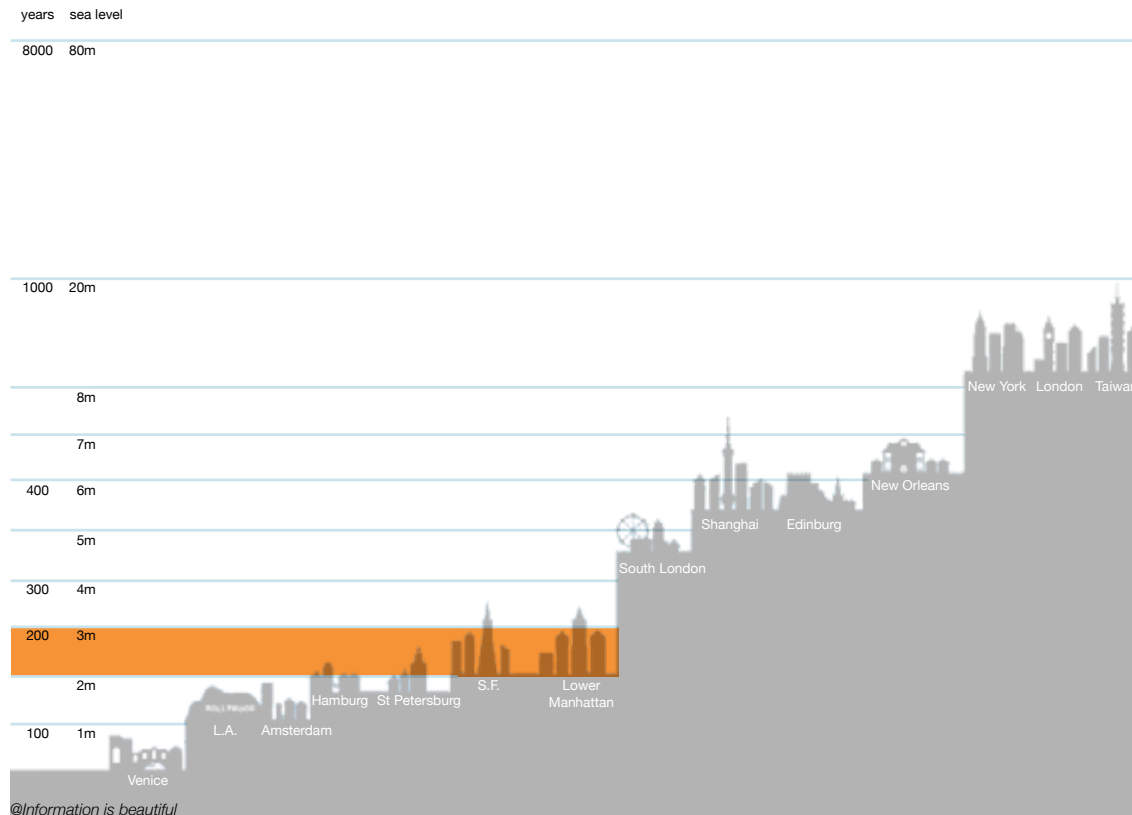
but nothing really happened. Everybody then expected something similar for the Hurricane Sandy in 2012, and inhabitants didn't take it as seriously as they should have. My boyfriend by the time managed to rent a car while the medias started to worried of the strength of the storm. We didn't evacuate the building, and we didn't suffer any flooding, but the City turned into an apocalyptic vision.

As the power plant exploded, we didn't have electricity for at least five days, no hot water and no phone signal was available. Without electricity, the shops security alarms didn't work anymore and many of them were robbed. Moreover, there was no food left available on the island, but thanks to the car, we were able to drive to Brooklyn for groceries and other essential supplies. »

Daniel TAINOW | LESEC Education Director

« Me and my wife had just moved a few months earlier to the Lower East Side when Sandy hit New York. We didn't want to risk being trapped in our building without water and electricity. Friends living in Brooklyn proposed to host us for the duration of the storm and we accepted. We're glad we did, our building ground floor was flooded as many others in the area. The electrical equipments which were located in the basements after 9/11 were ruined and the buildings lost their water pressure, there was no more running water (no tap water, no toilet,...).

People now want to make sure their concerns are taken into consideration by the municipality. Among other things, the City is thinking about the possibility to put the electrical generators back on top of the buildings, to protect them from water in case of another flooding scenario, which would be great. »



Sea Level Rise

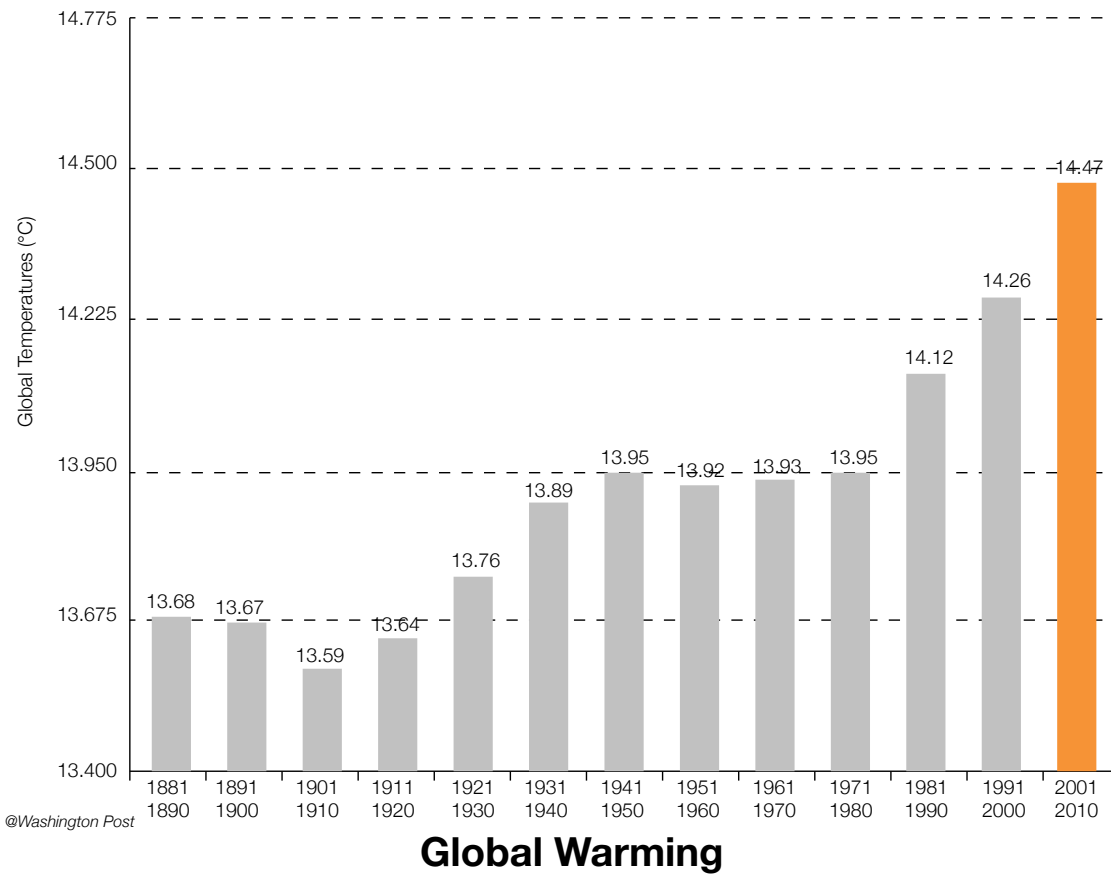
Climate Change

[Oxford Dictionary] A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

The Intergovernmental Panel for Climate Change (IPCC) was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO). It aims at providing the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts.

There has been a shift in the responsibility of climate change. While the IPCC declared in 1990 that "the observed increase in air temperatures could be largely due to natural variability.", they stated on the latest assessment report on November 2nd 2014 that "there is a probability of over 95% that climate change is the product of human activity.". Human activity has led to a large increase of CO₂, mostly due to the burn of fossil fuels in the atmosphere, which will tend to warm up. Evidences for climate change are unequivocal; significant rise in global temperatures (0.85°C) and global sea level (20cm) have been measured over the last hundred years. More extreme climate events depend on the energy we consume and the greenhouse gas we emit, and the building sector has an important part to play in that role.

Buildings consume more energy than any other sector, nearly half (47,6%) of all the energy produced in the US according to the Energy Information Administration (EIA). Moreover, buildings is the largest contributor to climate change as the building sector is responsible for nearly half (44,6%) of US CO₂ emissions in 2010.



Scientific projections for 2100 are a rise in temperatures between **2.8°C and 5.4°C**, and sea level to rise between **52cm and 98cm**, threatening coastal cities and low-lying deltas. Furthermore, the increase in the frequency of extreme weather events is expected to create a variety of conditions threatening ecosystems and human settlements population, health and security as well as infrastructures, parks and landscapes. These impacts include heat waves that are more frequent, intense and longer lasting; brief and intense precipitation events that can cause flooding and sewage overflow; storm related coastal flooding; and possibly increased drought periods.

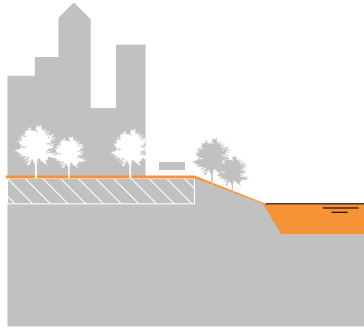
After the hurricane Sandy hit New York, I want to develop a strategy that would take all those threats in consideration but mostly able to deal the flooding issue the city is facing from sea level rise and storm surges.

Flood [FEMA]:

A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (at least one of which is the policy's holder property) from:

- overflow of inland or tidal waters
- unusual and rapid accumulation or runoff of surface waters from any source
- mudflow

Climate change has no boundary and it is therefore essential to have international climate negotiations to overcome the challenges the world is facing. Governments must craft a broad, balanced and durable agreement strengthening the international climate effort. Those efforts must be concluded at the next climate conference, Paris Climat 2015.



MoMA PS1 - Rising Currents
2010

New York, A New Urban Ground
dlandstudio + ARO



@dlandstudio

Case Studies

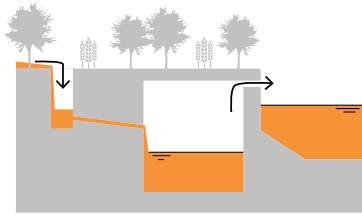
Climate change is a worldwide problem and many city facing regular flooding, are thinking or have even already implemented strategy and projects in order to protect their territory and inhabitants from the climate change threats.

New York, A New Urban Ground - dlandstudio + ARO

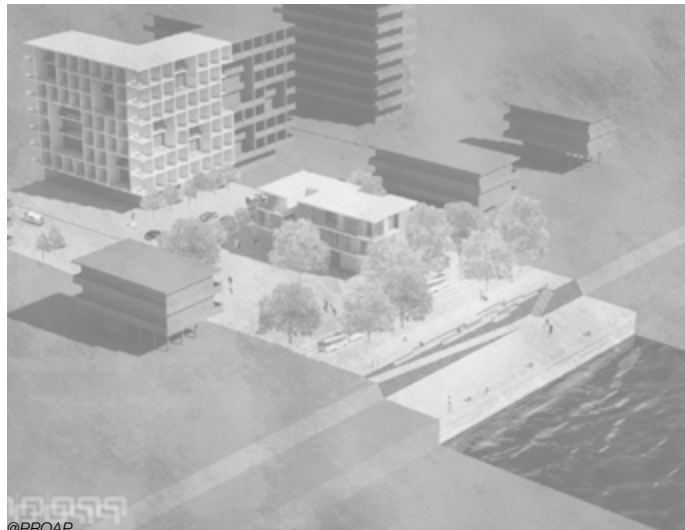
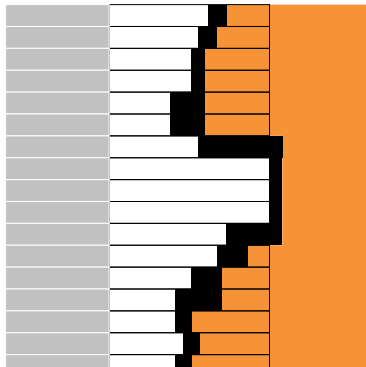
This exhibition was calling attention to Manhattan vulnerability to climate change impacts, aiming towards collaborations to develop projects for the waterfront. Five interdisciplinary teams proposed solutions to the effects of climate change, for soft infrastructure interventions that could make NY more ecologically sound and resilient in responding to raising sea levels and storm surges.

Based on an analysis of the oppositional relationship existing between the built city and water, dlandstudio & ARO proposed "A New Urban Ground" of an integrated organization and combination of natural and hard infrastructure systems. Perimeter wetlands, a raised edge, and sponge slips paired with new street infrastructure systems protect the island from flooding in the event of a large storm. Two components form an interconnected system: porous green streets and a graduated edge. To keep the surface water out of the city's combined sewer system, the water during typical rain events will infiltrate porous streets. In larger storms, the streets filter and carry water to the new wetlands around the island to enrich the coastal ecologies. Three interrelated, high-performance systems are constructed on the coast to mitigate sea level rise and storm surge force: an upland park network, freshwater wetlands, and salty marshes. This project is a thinking of urban design as a combination of natural ecologies with engineered infrastructure systems to transform the city performance and experience.

JAPAN 2009
G-Cans
Water Discharge Tunnel



ANTWERP 2006
The Piano
Proap/WIT



Japan - G-Cans, Water Discharge Tunnel

Completed in 2009 after 17 years of construction, the G-Cans Project located in the outskirts of Tokyo Metropolitan Area are a good example of Japan's technological development towards flood control. Five concrete containment silos of 210,000m³ each will collect overflowing water of the city's major waterways and rivers during heavy rain and typhoons seasons, and send it to a 350,000m³ tank located 50 meters beneath the surface. When the tank and tunnel fill, the engineers can turn on the heart of the system, which is a series of four turbines powered by jet engines similar to those used in a Boeing 737 airplane, able to rapidly funnel floodwaters to the nearby Edo River.

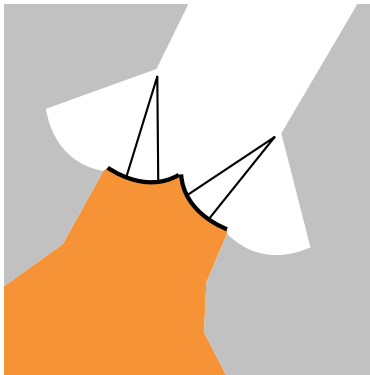
Antwerp - The Piano, Proap/WIT

Former industrial area, the 6km of Antwerp linear quays are now a dead zone of parked cars. Already protected by a 1.35m concrete flood barrier above the quay wall, blocking access to the river, the city must develop in compliance with the state's Sigma Plan, a regional flood-prevention initiative which requires it to be fortified to withstand a 4,000 year storm, which results in a 2.25m high flood-protection system. "Landscape is created by successive processes, not by one action", the designer team then proposed a diagrammatic strategy, presenting a table of scenarios with different approaches to reduce things to a blank slate where a process could be developed. That process is generated by ten topographical sections that read from above like the keys of a piano, each addressing the river in a different manner, and articulating together to form a continuous keyboard answering Sigma demands while connecting the city to its river. The spaces will be left relatively open and unprogrammed, with minimal landscaping and few permanent structures. When flooding will inevitably come, there won't be much to destroy but the city beyond will be protected.

THE NETHERLANDS
Delta Works
1960-1998



ROTTERDAM 1997
Maeslantkering
Storm Surge Barrier



The Netherlands - Delta Works

Holland used windmills already for hundreds of years ago to pump water away from the low-lying area.

After the North Sea flood in 1953, killing nearly 3,000 people in Northern Europe, a "Deltaplan" was established in Holland to block the estuary mouths of the Oosterschelde, the Haringvliet and the Grevelingen, to reduce the length of dykes exposed to the sea along the Dutch coastline with a series of construction projects (dams, sluices, locks, dykes, levees and storm surge barriers). Some mouths were to remain open because of the important shipping routes to the port of Rotterdam and Antwerp, and the works are combined with road and waterway infrastructure to stimulate the economy of the Zeeland province and improve the connections between the ports.

Rotterdam - Maeslantkering

The modern barrier at Hoek van Holland outside Rotterdam was completed in 1997 to prevent water from the Nieuwe Maas waterway to harm the city.

One of the largest moving structures on Earth, it is a keystone of the very extensive Delta Works network to protect inland waterways. The two rotate gates have so far only been used in a real situation once during a storm in 2007 (with successful results), but closes once a year to check its functioning. It then takes one hour to fill the floating docks with water and 1h30 to get them in place closing the channel. The barrier is designed to temporarily withstand high water levels up to +4.0m, including a permanent sea level rise of +0.5m.

In Rotterdam, new development must be today built at +5.0m above sea level.



@ericanderson

1609 Mannahatta vs. 2015 Manhattan

II. ANALYSIS

New York History

Initiated by Dr. Eric Sanderson in 1999, the Welikia project aims to «go back in time» to understand the initial landscape and biodiversity of Manhattan.

The Lenape Indians have built settlements and farmed land for centuries before Europeans showed up. The Native American called the island **Mannahatta** which means "island of many hills" due to its rolling topography. The natural landscape of the island is composed of 570 hills, 60 miles of stream, 20 ponds, 300 springs, counting 55 different ecological community types on Manhattan (forest, grass-lands, wetlands, pond, stream, estuarine, beaches, coastal oak-pine forest, red maple swamps, ...). This environment provided life to a rich biodiversity of over 1000 species of plants and vertebrate animals (24 species of mammals, 233 birds, 32 reptiles and amphibians, 85 fish, and 627 species of plants) beavers, wolves, black bears, mountain lions, passenger pigeons, heath hens, timber rattlesnakes, tree frogs, bog turtles among others.

Broadway was then a walking trail, running from Battery Park northward as far as Boston, MA (300km), as a trade route.

1524

New York location is discovered at first by Giovanni da Verrazano on January 17, and is named after the King Francis I of France, earl of Angoulême. He describes it as "a very agreeable situation located within two small prominent hills, in the midst of which flowed to the sea a very big river, which was deep within the mouth: and from sea to the hills of that (place) with the rising of the tides, which we found eight feet, any laden ship might have passed."

1609

New York is then (re)discovered by the Dutch sailer Henri Hudson seeking a faster route for spice trade to Asia. He bought the island from the Indians for a figurative 24\$ and set up the first non native settlement on Manhattan to commerce beaver skin with Europe.

New Amsterdam, a colony of the Netherlands is established by the Dutch West India Company in 1626. Fort Amsterdam is built, it is a military base located on a site clearly visible and identifiable from the harbor. They rose "Het Cingle", a wooden wall to protect the city from Northern outsiders and will become Wall Street. They strengthened the East Side shoreline with a bulkhead and dig "Heere Gracht" (Gentlemen's Canal) inside the city (filled in 1676 to become Broad Street). The Indian walking trail is named "Bredestraat" (wide street) and still has a very important role in the urban fabric.

1664

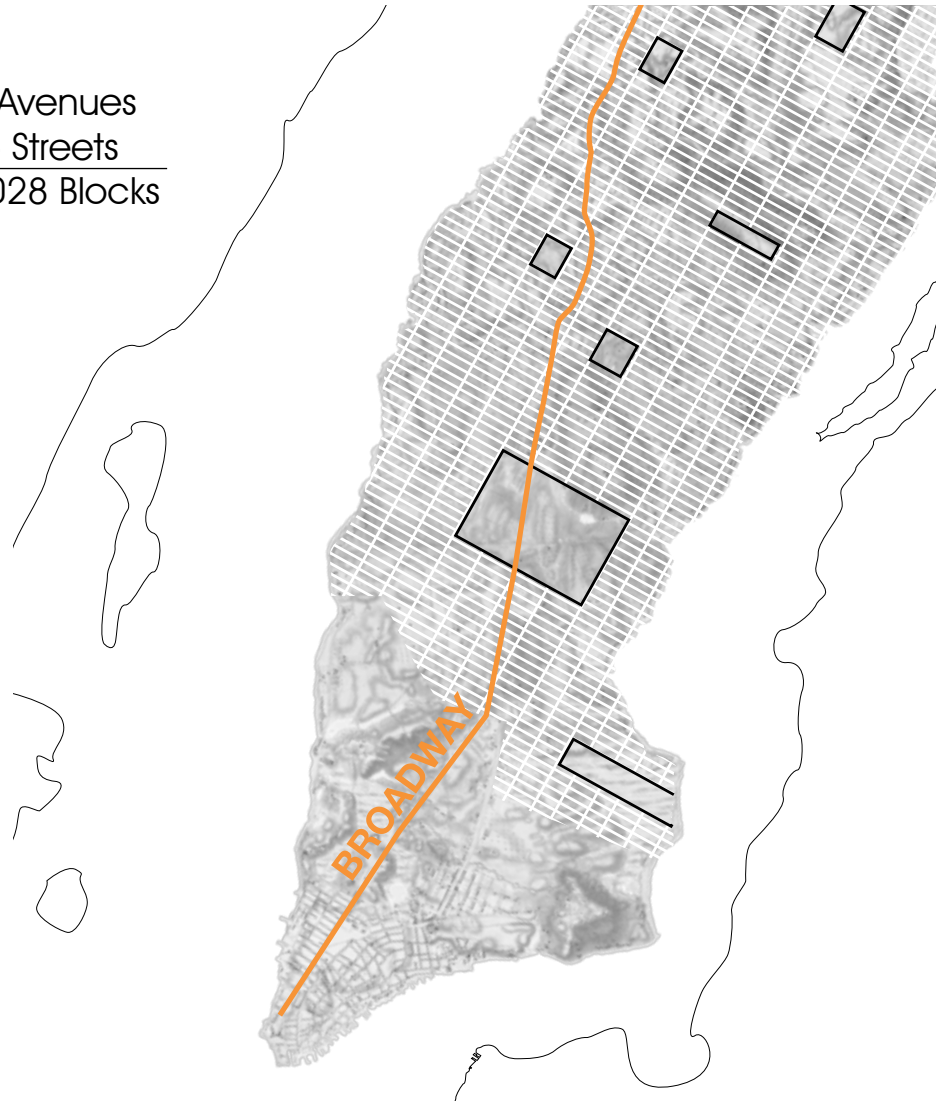
New Amsterdam is seized by the British who named it after the King's brother James, Duke of York, to become the English city of New York.

They extend the shoreline farther out into the Hudson river, and seawalls are built to host a battery of canons defense against Dutch and French armies (nowadays Battery Park). Bowling Green becomes the City first official park in 1733.

1783

American Revolution, the Declaration of Independence is signed in Washington and New York because a city in the United States of America.

12 Avenues
x 155 Streets
= 2 028 Blocks



1811 New York Grid

1811

The Commissioners' Plan is elaborated to design the streets of Manhattan between the 14th street and Washington Heights.

"The Grid is above all a conceptual speculation. In its indifference to topography, to what exists, it claims the superiority of mental construction over reality. The plotting of its streets and blocks announces that the subjugation, if not obliteration, of nature is its true ambition." -Rem Koolhaas in Delirious New York.

1857

Frederick Law Olmsted, considered as the father of American landscape architecture, designs Central Park.

1950s

«Those who can, build. Those who can't, criticize.» **Robert Moses** was the "Master Builder" of mid-20th century New York City. Sometimes compared to Baron Haussman in Paris, he was an important figure in the development and urban planning in the United States. His decisions favoring highways over public transit, not focused on a neighborhood based design but the American dream of the open road, influenced a generations of architects, engineers and planners. During his career, he build more than 2,5 million acres or parkland in NY State, 658 playgrounds in NYC, 670km of parkways and 13 bridges!

Battery Park City was built in 1967 on the Hudson River, its landfill was the earth and rock being excavated for the foundations of the original World Trade Center.

1960

At the same period, in her book "Death and Life of Great American Cities", the journalist **Jane Jacobs** rose against Robert Moses and its vision for the city. On neighborhood (West Village) based study, she fought for the preservation of NY.



“SoPo” - NYC “South of Power” neighborhood after Sandy

2001

The 9/11 terrorist attacks on the WTC introduced a new thinking on the alternatives for the future of New York City. What place for a memorial in a business area?

Manhattan represents only 8% of the city land and hosts 19% of its inhabitants but provides 67% of jobs and 46% retail sales! The skyline of Lower Manhattan is constructed as the image of a bar graph, multiplying wealth and fantasy of pure and perpetual increase in density. But the hyper concentration of the World Trade Center was not optimal by any standard other than profit. And many other areas of the city need jobs, construction and greater concentration. Designers need to think of a new model as a polycentric metropolis, Manhattan remaining its center but restoring a network of autonomous, more resilient neighborhoods fabric: mix-used and self-sufficient.

2003

The North-East black out deprive New Yorkers of electricity, due to a software bug.

2010

The MoMA exhibition, Rising Currents aims towards interdisciplinary collaboration to develop soft infrastructures projects for Manhattan waterfront, to the effect of climate change, to make New York more ecology sound and resilient in responding to raising sea levels and storm surges. [see more in the case study p.28]

2012

SANDY hit New York.

REBUILD BY DESIGN

HUD+SRTF
2013-2014



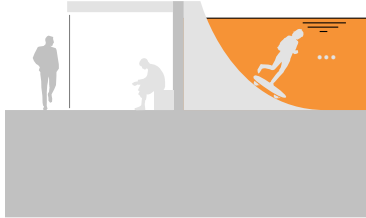
Rebuild by Design competition

US Department of Housing and Urban Development (HUD) and Hurricane Sandy Rebuilding Task Force launched an open 3 phases competition in 2013, for multidisciplinary teams of architects, engineers, planners, social scientists, and civic organizations to develop proposals for what the future region of NYC should look like.

The projects are on a regional scale to promote cooperation across political boundaries. They develop a catalog of designs that address specific challenges and could be implemented across the region.

After selecting 10 finalists Design Opportunities to be pursued in the Final Stage on November 10, 6 projects were awarded in June 2014:

- **BIG U** for Manhattan (BIG Architects)
- **Living with the Bay** for Long Island (Interboro)
- **New Meadowlands** for New Jersey (MIT CAU+ZUS)
- **RDSD** for Hoboken (OMA)
- **Hunts Point Lifelines** for the Bronx (PennDesign/OLIN)
- **Living Breakwaters** for Staten Island (SCAPE)



MANHATTAN, NY - RBD

The BIG U - B.I.G.
2013 - in progress...



@big

Manhattan - The BIG U, Bjarke Ingels Group

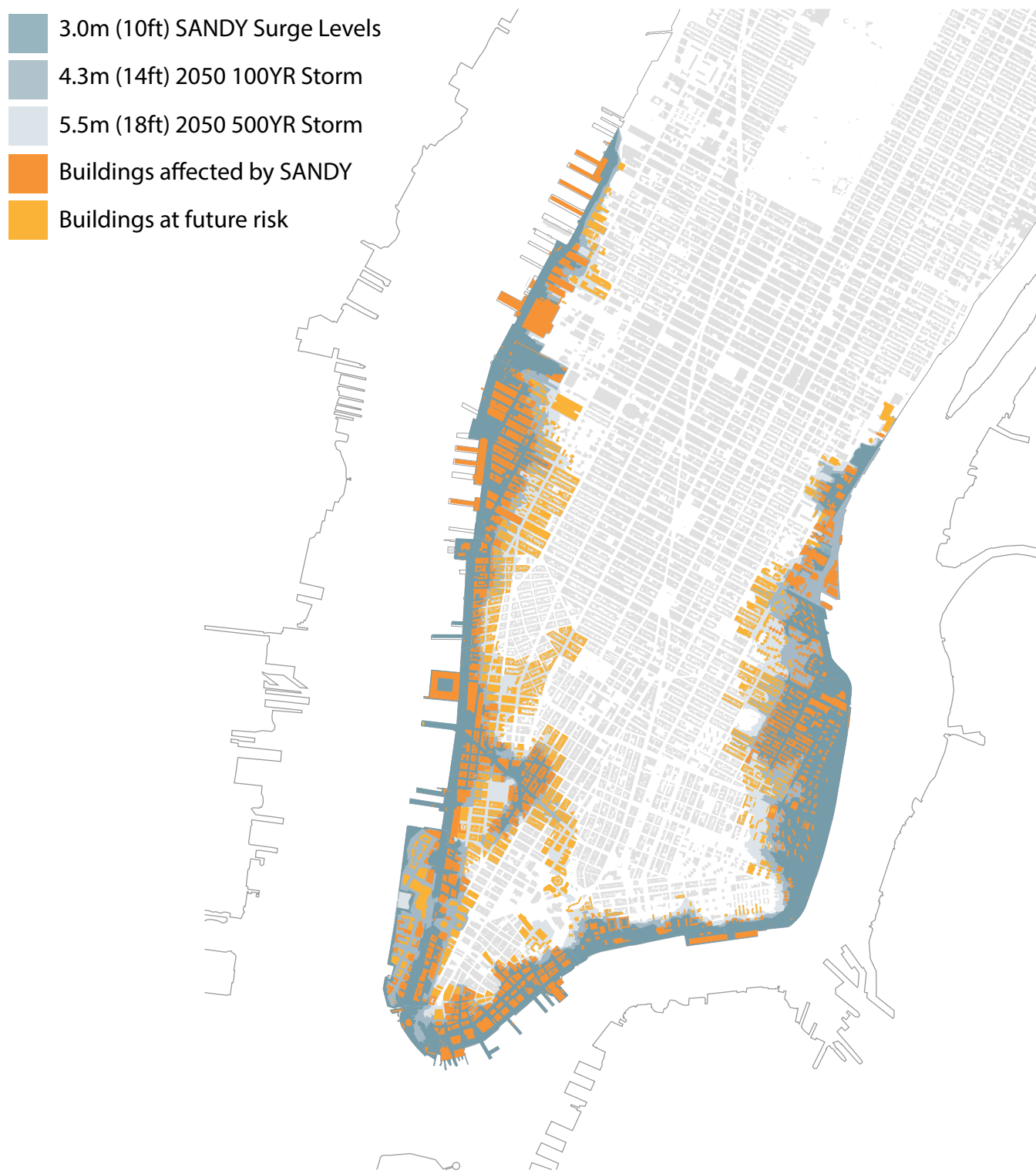
BIG aims at involving the community and neighborhoods into the flood protection and its design process for physical and social resiliency, for the project to provide social and environmental benefits to the community and public realm.

It is a system that addresses the needs of different sectors (housing/energy/transit..) in one solution for 10 linear miles around the island of Manhattan. This solution is then compartmentalized in different sectors, flood-proof between each other and able to be built incrementally according to the existing plans and the funding available to prioritize vulnerable areas as the Lower East Side. In this neighborhood, BIG proposes 3 compartmental designs along the East River, next to the East River Park, the Two Bridges and the Financial District.

The designers think about the Long-Term perspective, that the berm is the first phase of a future potential decking system over the FDR Drive, impossible now because of cost and feasibility. Also, by the time the mobility patterns will have changed and the removal of the FDR Highway could become possible.

East River Park - The Bridging Berm

The Bridging Berm is one compartmental design which has been awarded \$350 million in January 2015 to be implemented in the Lower East Side. In the Park, BIG designed a 5km dike along the FDR to protect the highway and the city inland from flooding. This new topography will improve the green spaces and try to re-connect the city to its river with many "green" bridges above the road.



Sandy Storm Surge and Future Flooding Risk for Manhattan

Manhattan Strata

New York City is home to more than 8 million residents, nearly 400,000 of whom live in buildings that are physically vulnerable to coastal flooding and sea level rise. Faced with an aging building stock, an expanding 100-year floodplain, and rising insurance costs, NYC's coastal communities need to be better prepared.

Lower Manhattan in number:

10 miles of coastline

200 000 residents

285 million built square feet

52,7 million annual visitors

95 000+ low-income, elderly, or disabled residents

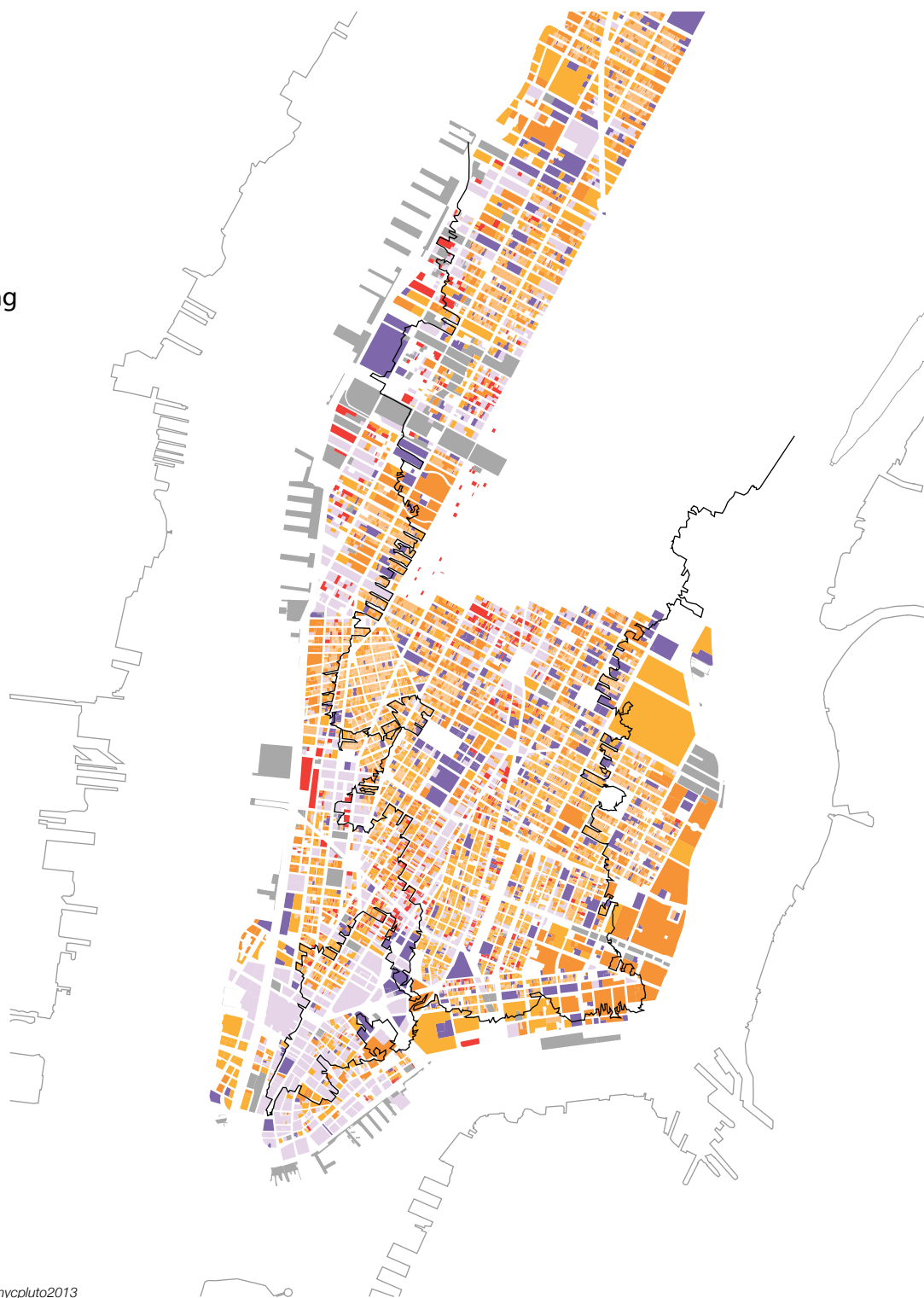
In this analysis of Manhattan, I will pinpoint the main aspects that help me to choose the Lower East Side as the right area to develop my Master Thesis project!

The Lower East Side is exposed to flooding

The flooding map of Manhattan reveals the initial shoreline of the island, Manna-hatta. Nearly 20% of the city has been built by landfilling on the Hudson river and nature tends to reclaim its rights as we experienced during Sandy.

As architects designing to face the climate change challenges, we must think of the project on a long-term basis for its resilience on the longest period as possible. Therefore, I will base all my analysis of NYC according to the latest scientific assessment on the more extreme weather scenario, which is to protect the City from a 500-year flood, which has a 0,2% chance of occurring in any given year.

- 1 & 2 Family
- Walk-Up
- Elevator
- Mixed Use
- Commercial
- Manufacturing
- Utility
- Public



@nycpluto2013

Manhattan Land Use

The Lower East Side is residential

The Zoning Map of Manhattan [in Appendix] shows the willingness of the planners and politicians to develop the city while saving a diversity in its urban fabric, especially between the built and the green environments. In this very diverse urban fabric, the areas in the floodplain are mainly Manufacturing on the West Side, Commercial on Lower Manhattan, and Residential on the Lower east Side.

New York city's integrated mix of land uses, contributes to its vibrancy and appeal, workers, students, residents and tourists meet and mingle in the streets at all hours. In Manhattan, this diversity is evident, 24.7% of the uses are purely residential, 26% are street-level activity uses (commercial and industrial uses) and 11.6% are meant for the public institutions (schools, museums, hospitals).

The Lower East Side is a public housing reservoir

Nearly 14,000 of Manhattan's 53 890 NYCHA-run units are located in the CB3 area. The Lower East Side's affordable housing represents some of the last places where working-class and low-income residents can live in proximity to Manhattan's vast array of jobs and opportunities. Built between the 1930s and 1970s, many of the buildings need repair; most were built according to a towers-in-the-park model that created cherished, if unimpressive, open space around the houses but also isolated them.

The Lower East Side lacks green open spaces

Despite the expanse of East River Park, the LES is underserved by parks, with only 0.7 acres of parkland per 1,000 residents. There is little variety among the types of open spaces available - flat squares and ballfields make up the majority of

SUBWAY

1

2

3

9

4

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6

7

A

C

E

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D

F

Q

G

J

M

Z

L

N

R

S

BIKE

— Bike Path / Greenway

— Bike Path Special Hours

— Bike Lane

— Bike Route

— On-Street Route

FERRY

— NY Waterway

— BillyBey

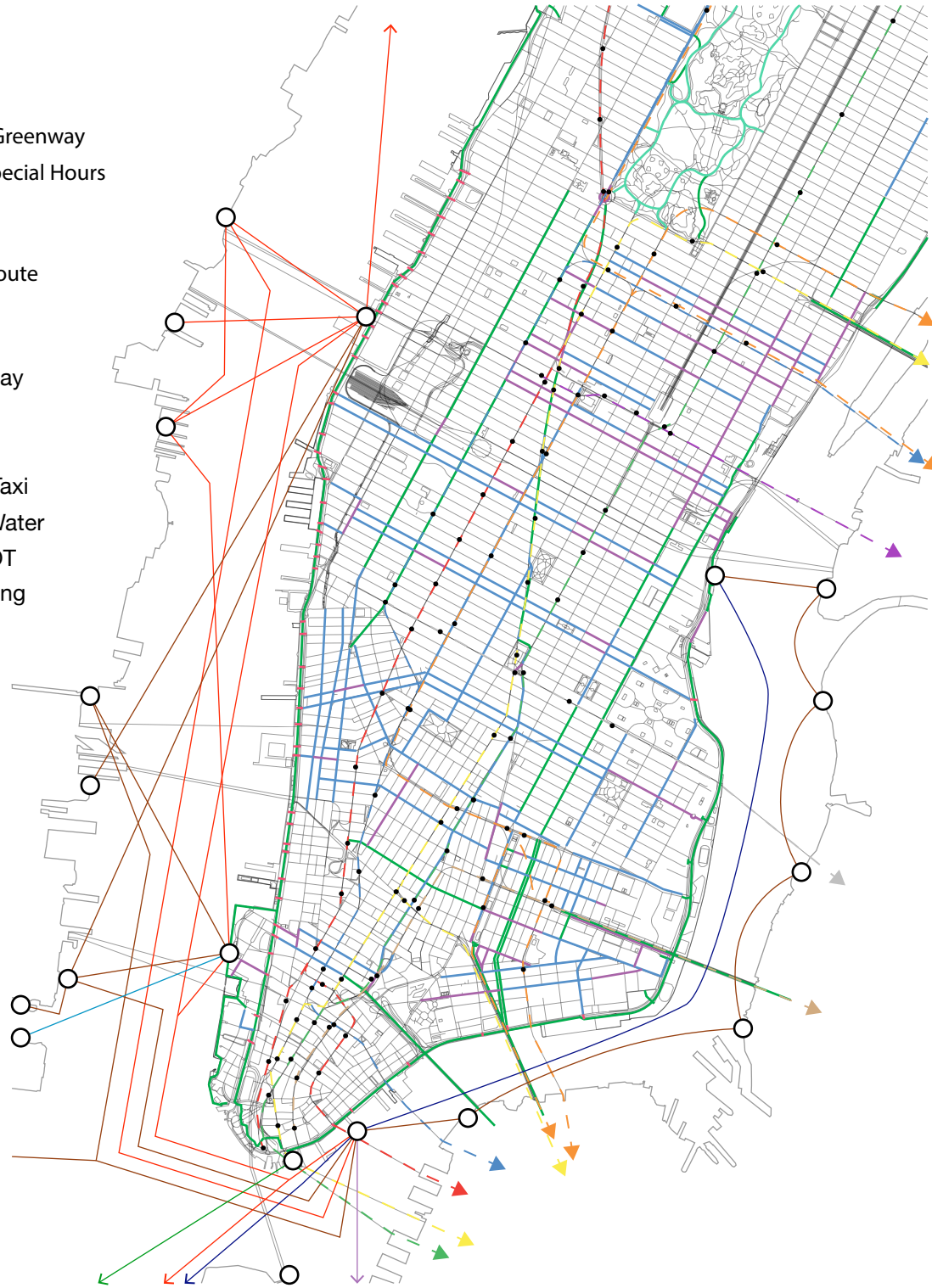
— Seastreak

— NY Water Taxi

— Liberty P. Water

— NY City DOT

○ Ferry Landing



Manhattan Mobility - Bike, Subway & Ferry lines

assets, with many ballfields and courts available only to paying members of leagues. In a dense city like New York, open space contributes to improved mental and physical health. Green open spaces create room for relaxation and gathering, while relieving extreme temperatures in the summer and improving local air quality. Well-designed, they can incorporate green infrastructure that reduces pressure on combined sewer systems, thereby improving water quality. They also provide an escape from urban density that is available at no cost to all.

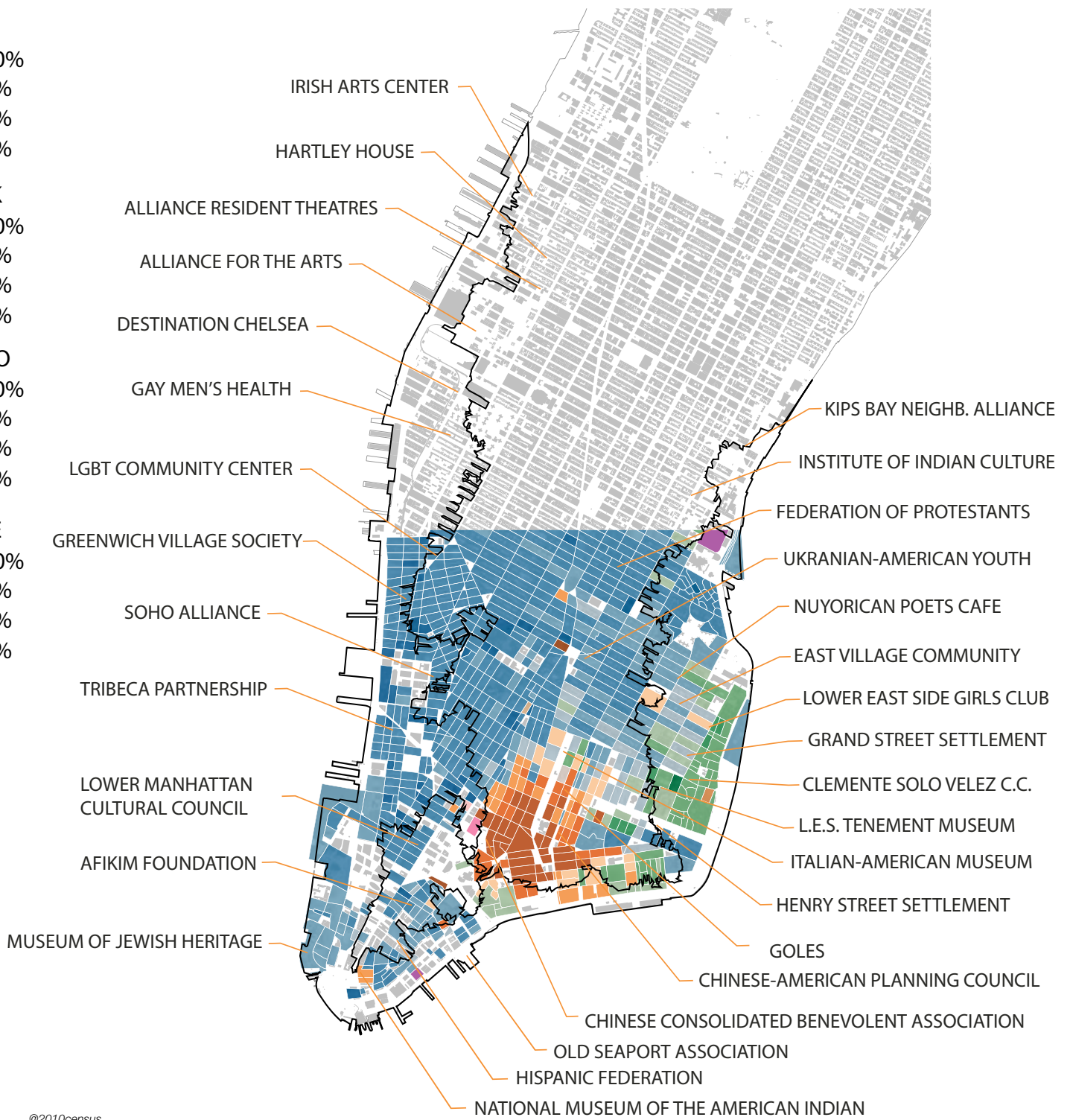
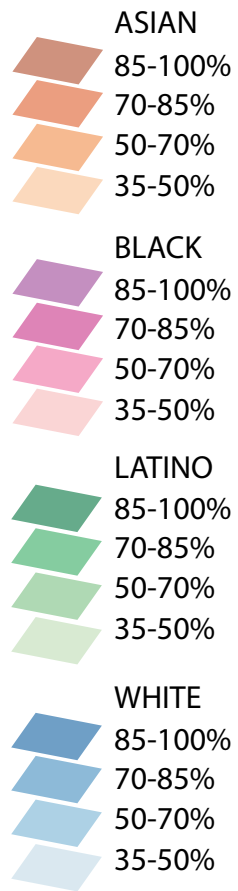
The Lower East Side is disconnected

Although it is crisscrossed by six subway lines, the Lower East Side has very little access to transit. And many of the city transportation infrastructure is located in the floodplain area, exposed to sea level rise and storm surges!

The subway system of New-York, MTA, opened in 1904, is a time and money efficient public transportation system. The subway follows the orthogonal grid which makes transversal connections harder. Most of the lines are linear, running along the main avenues up and downtown. However, subway lines pass over and under the LES neighborhood; from the Brooklyn Bridge to 14th Street, there are only 2 subway stations west of 1st Avenue and Allen Street, both of which are located below Houston Street. The L.E.S. is served by busses, which are generally slower, less reliable than subways, and require more transfers.

Ferry lines are important as they were still fully functional after Sandy to connect Manhattan to others boroughs while car and subway tunnels were flooded.

The city aims at a sustainable mobility, developing the public transit system (bus, carshare) as well as many green infrastructures for pedestrians and cyclists, for recreational and commuting uses, trying to get rid of cars in the city center.



@2010census

Manhattan Ethnicity & Cultural Community Groups

The main goal is to give the waterfront back to the population. The Manhattan Waterfront Greenway is a 32 miles route that navigates around the island. They developed the Citibike for the public rental and use of bicycles throughout the city, and test the temporary closure of streets for soft transportation modes only. Security and diversity of New York transportations modes are vital for the city attractivity, accessibility and development.





Lack of transit poses an additional burden on residents who are low-income, elderly, disabled, or otherwise vulnerable, requiring them to walk longer distances to access goods and services, and increase car dependence among populations that may not be able to afford private vehicles. Lack of public transportation may endanger these populations in times of emergency.








The Lower East Side is underprivileged

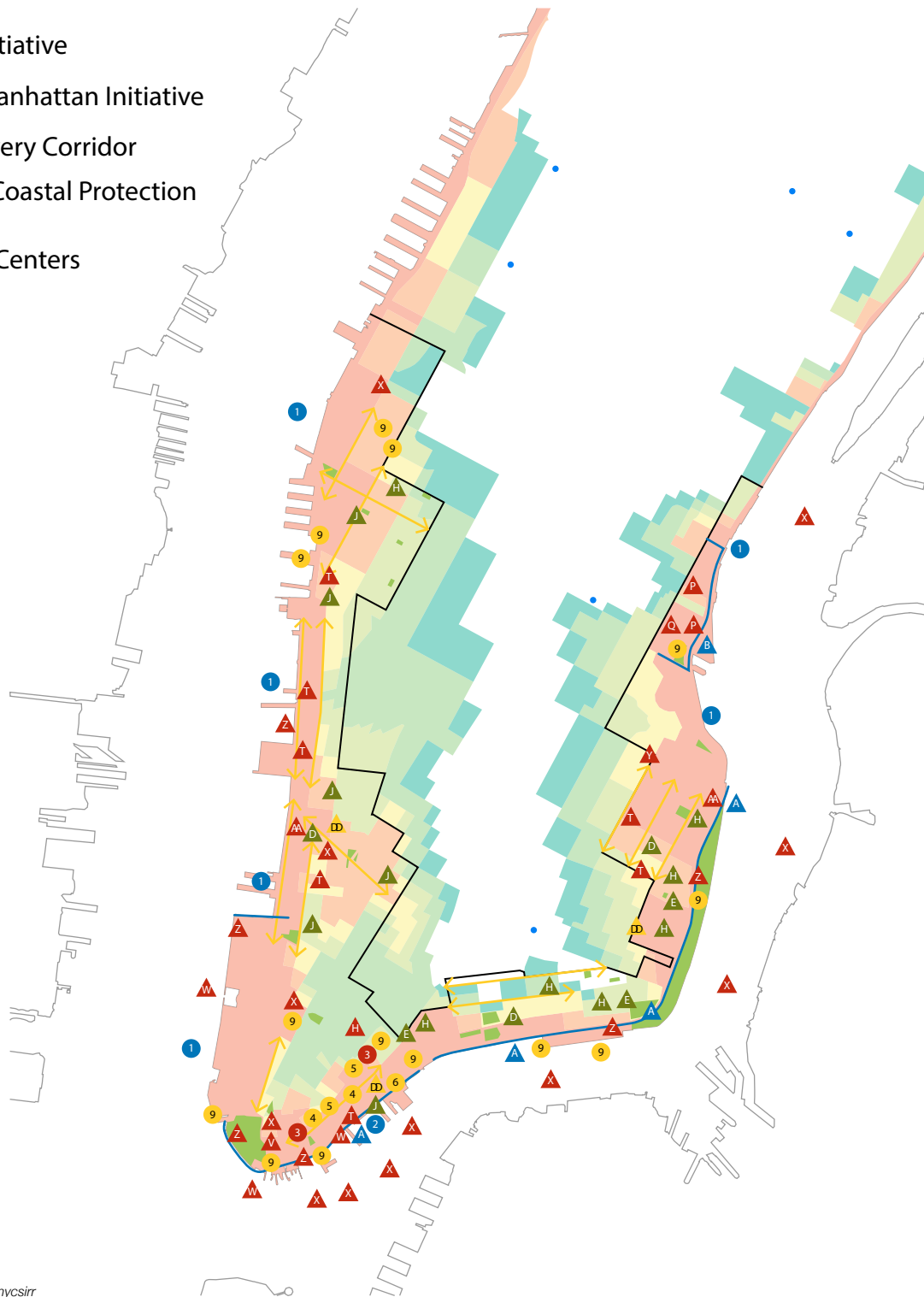
The Manhattan population, with high income for many, still has a more vulnerable population on the L.E.S.. A gentrification of that neighborhood is going on, with many households with higher income moving in, creating a very diverse mixing community. In 2011, 46% New Yorker live under the poverty threshold with an annual income inferior than \$46,000 for a family of 4 persons.

The Lower East Side is diverse!

While New York is generally perceived as diverse, the 2010 Census show us that the plurality of residents in the vast majority of blocks in Manhattan below 60th Streets is actually white. Immigrants communities formed in specific neighborhood as the LES which is filled with a diversity of cultures, religions, languages, and is immensely proud of its heritage as a historic first stop for many immigrants.

-  Citywide Initiative
-  Southern Manhattan Initiative
-  Retail Recovery Corridor
-  First Phase Coastal Protection

-  Evacuation Centers
-  Zone 1
-  Zone 2
-  Zone 3
-  Zone 4
-  Zone 5
-  Zone 6



@nycsirr

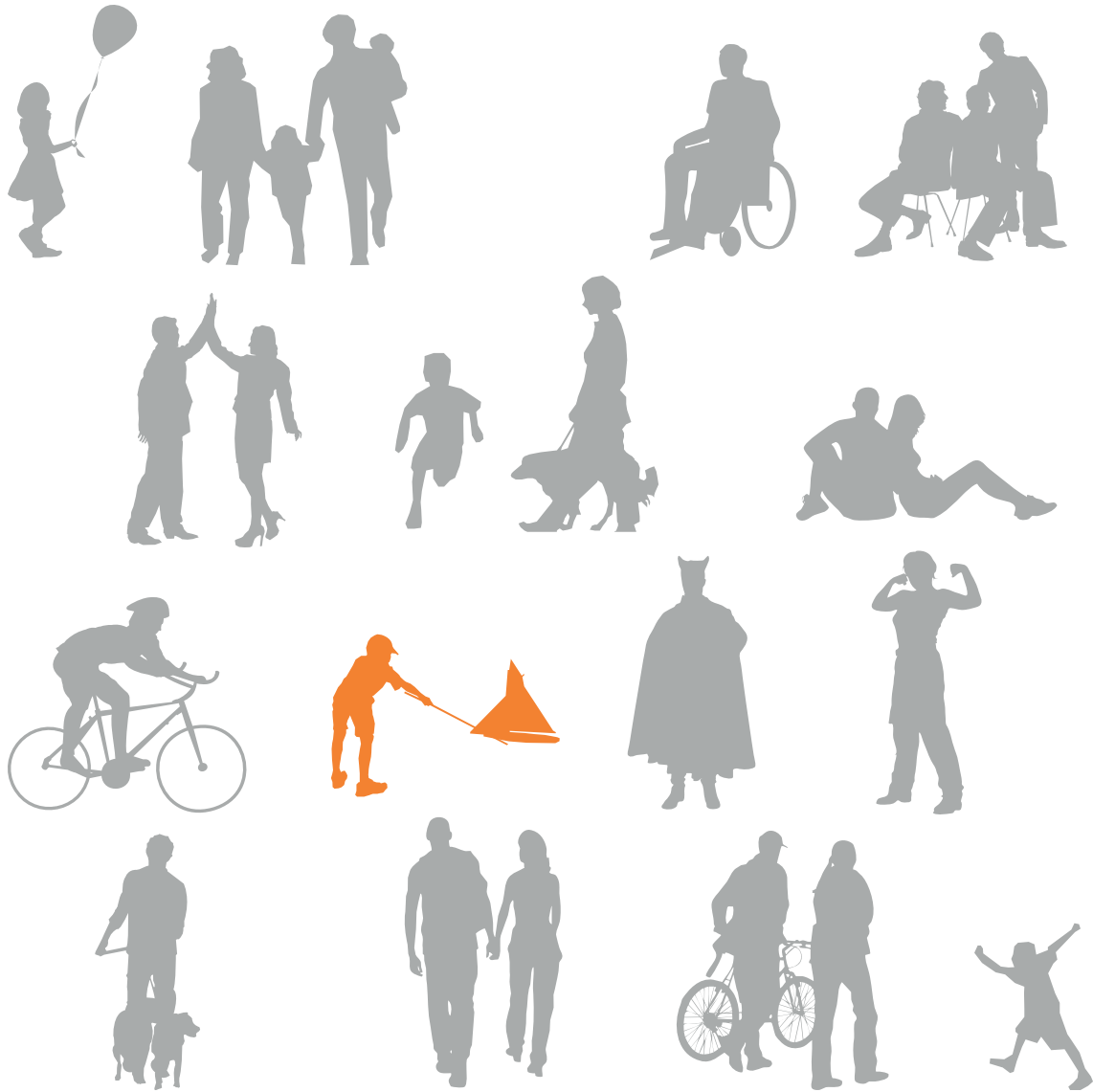
The S.I.R.R. Report Map for Lower Manhattan resilience

The Lower East Side prepare for the future

Inhabitants and Associations are very powerful in decision making for the city. Local communities are active and rally for dialogue and negotiation. They claim, propose, act and manage projects, to anchor the project in reality and lifestyles.

The strength of the New York City Authority is to fix objectives and make them readable to the public, through plans and guidelines. PlaNYC is an agenda for the planning of a new territory with a wide range of thematics for sustainability justice. Vision 2020 goal is to develop New York City Comprehensive Waterfront. PlaNYC 2030 aims at a sustainable and resilient city of more than 9 millions inhabitants and want to improve environmental infrastructures and New Yorkers quality of life. It proposes cross-references processes so that they assist instead of fighting each other and focuses on land use (housing, transformation...), water (pollution, accessibility...), mobility (public transit and soft modes efficiently...), energy (consumption, renewable...), air (quality, trees, waste...) to deal with the climate change challenges we are facing.

The Special Initiative for Rebuilding and Resiliency was launched in December 2012. It aims at shaping an understanding of what happened during Sandy, the risks Lower Manhattan faces in relation to climate change and what approaches make sense to address them. New Yorkers participated in those workshops to discuss issues affecting their neighborhoods and exchange their priorities for the future of their communities considering: the **coastal protection** with flood protection systems and multi-purpose levees; the **building environment** to improve flood and wind resiliency; the **community and economy recovery** to improve and promote local commercial corridors and implement investments; **infrastructures** to harden power distribution (electric, natural gas, steam plants) and protect fragile constructions (hospitals, tunnels, ferry terminals).



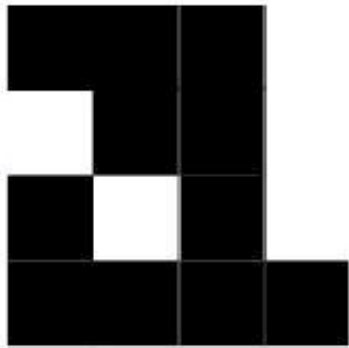
Social Resilience

[Rockefeller Foundation] The timely capacity of individuals and groups—family, community, country, and enterprise to be more generative during times of stability and to adapt, reorganize, and grow in response to disruption.

In today's complex world, escalating rates of burn-out, secondary traumatization, moral distress, and needless tragedy show us the need to take the human capital in consideration, when designing a project that will be viable and keep pace with the relentless changes of our society for its own durability.

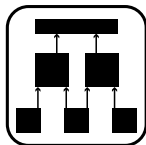
The Social Resilience Model (developed by Threshold GlobalWorks) aims at using the social resilience system to amplify resilience within and across social systems, developing collaborative networks at all scales. At the heart of this model, the essential building blocks for global resilience are the human beings, then at a micro-level resilience come the family and the community, and a macro-level comes the resilience of the region and the nation.

The key values of social resilience are to promote survival, respect, engagement, dignity, and livelihood within the community, and to build capacity for creativity and generativity at all levels. We must exercise prevention and invest during non-crises periods, to enhance the human and social capital. Finally we must maintain on-going assessments and actions and continually engage the stakeholders.



Inter & extra-disciplinary network

Architects, planners, students, researchers,
retired, politics, unemployed, activists, residents...



Bottom Up strategy on small scale projects
to transforme and reappropriate neglected urban spaces



Empower citizens for the long term
for decision-taking and action in their city

Atelier d'Architecture Autogérée (AAA)

The French AAA studio is a great example of social engineered architecture, not working on building physically but rather building socially, a dialogue, an exchange between the stakeholders for the reappropriation of the city.

AAA is a collective platform for research and action about the urban mutation and cultural, social and political emerging practices in the contemporary city. It is managed through an inter-disciplinary network, open to various actors: architects, artists, students, researchers, retired, politics, unemployed, activists, residents and all the concerned users. A self-managed architecture begins with the merging of people, desires, skills.. Those associations are not always consensual, but the role of the architect is also to build something from the confrontation and to accompany subjective propositions. Such architecture is different from the conventional practices, but find itself in new forms of association and collaboration, based on exchanges and reciprocity with inhabitants as well as with the interested institutions, whichever scale they are.

AAA proposes an "urban tactic" to accompany processes from the local to the urban environment where the decisions are taken in inadequation to the actual territorial mobilities. Through design, the architects explore the reappropriation of neglected urban spaces and the creation of new urbanity concepts with reversible layout, daily life experience and the involvement of all users. More accessible to the public, those spaces are an urban experimentation in contradiction to the growth of density and control. Highlighting the role of the inhabitant and user as a political condition, they develop tools for the symbolic appropriation of the spaces at proximity and empower the citizens for decision making and action for their city. Those tools include networks between neighborhoods, nomadic architecture, self-managed spaces, cultural production stages...



Manhattan Neighborhoods in the 500 Years Floodplain

Lower East Side Collaboration

From the day the hurricane Sandy hit New York to nowadays, the community organisations have been working together to help the victims of the storm and to think about the future of their neighborhood. Many local groups coordinated the biggest relief effort in NYC's history, mobilizing thousands of volunteers to collect data to coordinate disaster relief, canvassing homes to know what people needed and where. They managed the shelters and provided residents with vital goods after the storm, and they continue working on raising fundings for mutual aid in affected communities, and work on long-term rebuilding for more robust, sustainable neighborhood.

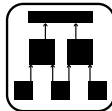
During my study trip to New York, I had the opportunity to meet many of those local stakeholders, to assist at meetings and to interview them. Those exchanges helped me to understand what are their concerns and what they would like to see for the future for their home and their neighborhood.

OCCUPY SANDY

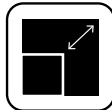
Activist Group



Community-based



Bottom-Up strategy

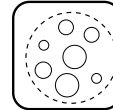


Small scale actions



LES READY

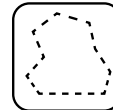
Long Term Recovery Group of the LES



Coalition organisation
37 community groups & institutions



Coordinating preparedness
for future disasters



Focus on CB3 area
and its surroundings



Occupy Sandy

Occupy Sandy grew out of a coalition of activists groups, with the policy employed from the wider Occupy Movement: transparency, community-based, governance, horizontal power dynamics, inclusivity, and a drive for justice.

After Sandy, they coordinated the largest relief effort in NYC's history, mobilizing over 6,000 volunteers before Christmas (more than 4 times the Red Cross). They collected data to coordinate disaster relief, canvassing homes - to figure out who needed what and where, and then organized volunteers and goods to meet those needs. It focuses on mutual aid in affected communities rather than charity, and long-term rebuilding for more robust, sustainable neighborhoods.

LES Ready [Meetings 01/12 & 02/09]

LES Ready started right after the hurricane Sandy hit New York City. It is a coalition of 37 community groups and institutions that cooperatively coordinate response, resources, preparedness planning and training in response to Hurricane Sandy and for future disasters. They rally once every month, and their work focus on Manhattan's Community Board 3 area and the immediately adjacent neighborhoods.

Working with the LES inhabitant, they wish to ensure that even the most vulnerable population in the community are prepared, trained for and recover from disaster. To communicate information related to disaster response and preparedness, to provide for a long-term recovery and mitigation and to advocate for and thereby assure additional long-term assistance in the wake of disasters.

GOLES
Community Group



Community advocacy



Tenants rights on housing



Disaster preparedness

Mayor's Office
NYC Authority



\$ for housing



\$ for infrastructures



\$ for coastal resiliency



Good Old Lower East Side [Meeting 01/12]

A neighborhood housing and preservation organisation serving the LES since 1977. They are working on building solidarity and collective power to fight against the issues that oppress the residents and to create a world they want to see.

Dedicated to tenants' rights, homelessness prevention, economic development, and community revitalization, they fight against displacement and gentrification, for the preservation and the expansion of the low-income housing stock. They want to assert the community interests over the use of public space and ensure a clean and healthy environment where people can live, work and play.

New York City Mayor's Office [Meeting 01/15]

The Mayor's Office is the first and most important authority in New York City, they work a lot on the city development towards resilience.

When designing a project for the City, the municipality always have to take the resident opinions in consideration, then, the collaboration is essential to the well-being of the public realm and the long-term viability of the project.

The City, in collaboration with HUD launched the Rebuild by Design competition in 2013 and the design selection and awards in 2014. They hosted a public hearing for the Action Plan amendment, of the RBD program, and the fundings allocation. This meeting is followed by active discussions between the different stakeholders of the project; the municipality, the local associations and the designers team.

LESEC & Grow NYC Associations



Non-profit Associations



Community-based



Environmental education



Smith House T.A. NYCHA residents



Rent controlled



Community power



Building damages
(afterSandy)



NEW YORK CITY
HOUSING
AUTHORITY



Lower East Side Ecology Center [Meeting 01/12]
Grow NYC [Meeting 02/12]

LESEC and GrowNYC are independent and not for profit organisations running on public and private fundings. Working in connection with the city agency of NYC Department of Parks & Recreation, they propose community-based programs for sustainability as recycling, composting, greenmarkets, public gardens,... for all New Yorkers!

They work a lot in collaboration with schools and community centers for children education on environmental issues facing NYC, to teach them how to take responsibility for solving those problems. They manage several educational gardens within the New York City boundaries and aim to improve NYC's quality of life through programs transforming communities block by block and empower residents to secure a clean and healthy environment for future generations.

Smith House Tenant Association [Meeting 01/23]

Every single free plot in Manhattan is valuable, expensive and hunted by many developers for construction. The NYCHA projects, built as the tower-in-a-park typology, propose a lot of free, green and often underused spaces within their plots.

Residents of the NYCHA, the Smith House tenants, living in the Two Bridges neighborhood, fight hard to maintain and develop those public spaces and assert the community self-determination to keep them free and accessible for all.

**Henry Street Settlement
University Settlement
Hamilton-Madison House**
Community Associations



For the impoverished residents
immigrants, low-income families,...



Basic social services and programs
housing, health care, education, art, aging support,...



Community empowering for all
ages, genders, cultures, religions, ...



Henry Street Settlement - Boys & Girls Republic [Meeting 02/13]
University Settlement [Meeting 02/23]
Hamilton-Madison House [Meeting 02/25]

Founded nearly 130 years ago, the Lower East Side settlements and community centers are non-profit organisations running on private donations and public funds from the State and the City. They establish the idea that immigrants and low-income families deserve basic services like education, decent housing, access to open space, and support for the aging.

Their first principle is that to strengthen a community, you must strengthen families, providing a range of services and support. Those services run from social services, to art and health care programs, and are accessible to people of all ages, genders, cultures, religions,...

They fight for the community inclusion in development of the City public realm. For example, there is no subway access to handicapped residents in the CB3 area : only buses are accessible. Moreover, the CB3 has a high elderly and disabled population, extremely vulnerable in case of a disaster, and as its population is very diverse with a lot of immigrants, the language can be a barrier for many residents to understand the municipality and be involved in the development process of the public realm.

Settlements are also working on creating and developing job opportunities for the Lower East Side residents. Henry St. Settlement Jobs Plus is a program which helps residents from the LES (90% from Wald & Riis House, and their relatives) to gain an high school equivalence, accessible from 18 to 70 years old. They connect the residents to jobs training and internship and provide financial counseling for residents to learn about savings, rent paying...

The Project HOPE was launched by the LES Settlements after Sandy for a year, and aimed at connecting people to the resources they needed, from housing issues to residents mental health. People were traumatized by the hurricane rage, the explosion and fire at the Con-Edison power plant, as the elevators were out of power and the stairwells in the darkness, many residents were blocked in the buildings upper floors.

Henry St. Settlement provide a wide range of services. The Abron Art Center host theater play, danse classes, and other creative activities for residents. Boys & Girls Republic is a youth center that proposes after-school programs and sport activities for the LES children. They also have offices working on eviction prevention and residents displacement. They host a family shelter for single mom with children and run a clinic for mental health.

University Settlement focus on the LES, but it is also active in Brooklyn, where they proposes services for all ages and interests. For children, they have programs running from before the kid birth (Early Head Start, working with mothers) to family child care programs. For the youth, they run after-school programs, summer camps, "The Door" for LGBT youth and "Talent Search" for the creative ones.

Working with teens is important. Often considered as the most vulnerable population in the LES, they need to develop themselves to be more confident and have higher chance of a bright future. The University Settlement Houston / Bowery Community Center is operated for kids with special needs. For Adults, the settlement works with eviction prevention and adult literacy program (teaching English as a second language). Finally, for the seniors, they propose education, art, recreation and nutrition programs for active, connected and cared for citizens.

NYCHA host many community centers infrastructures on their properties, connected to the housing project, and they want the Settlement to run them. The DYCD (Department of Youth and Community Development) proposes a program, but it shouldn't be too much define, and propose flexibility to access the various and changing needs of the population.

The Settlements agreed that there is always a need for more associations, volunteers and especially for more building facilities. A building that could be operated and shared between the existing organisations, to expand their scale of actions and their influence on more areas in the neighborhood, as residents never go too far from their home. There is also a need for spaces that the Lower East Side residents could share and rent for private events (baby shower, birthday parties,...), those spaces don't exist yet and many residents are unable to host such events because they can't receive too many guests at their private place.





III. MANNAHATTA

Lower East Side Analysis & Strategy



- Retail Recovery Priority
- First Phase Coastal Protection
- Citywide Initiative
- Southern Manhattan Initiative
- Coastal Protection
- Community & Economic Recovery
- Buildings
- Critical Infrastructures



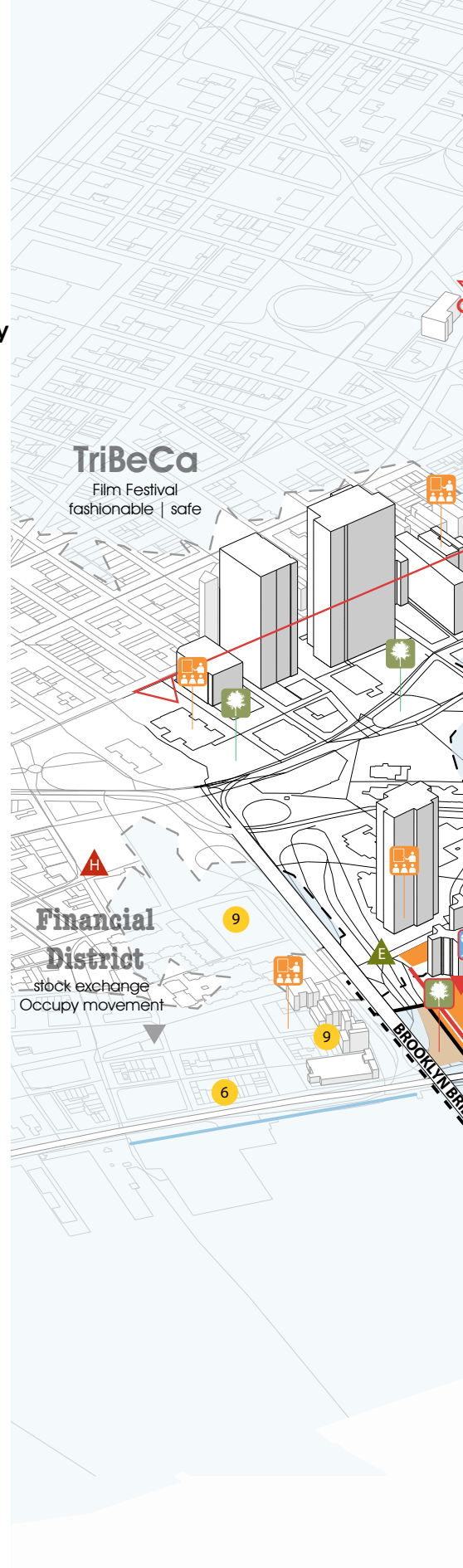
- Underused Spaces
- Connection to the waterfront
- 500 Year Storm (0.2%) + 5.5m Flood protection



- Public Parks & Gardens
 - Sport & Recreation Areas
 - Education Facilities
 - Art Exhibition Spaces
- NEW Amenities**



- Henry Street Settlement
 - University Settlement
 - Hamilton-Madison House
- NEW Facilities**





SoHo

artist loft apartments
art galleries & shopping

NoHo

artsy | loft apartments
historic preservation

East Village

young | cheap
counterculture | nightlife

Nolita

supplies | artists
expo, retail & restaurants

Little Italy

former Italian population
Italian catering

唐人街

Chinese pop. | young
parallel economy

BOWERY

coolwell | "farm" projects
public parks & gardens | arts

ABC City

immigrant population
gentrification activism

Lower East Side

immigrant | working-class
community activism

Two Bridges

tenement buildings
public housing

GOMPERS HOUSES

SMITH HOUSES

RUTGERS HOUSES

LAGUARDIA HOUSES

VLADECK HOUSES

FDR DRIVE

MANHATTAN BRIDGE

MONTGOMERY STREET

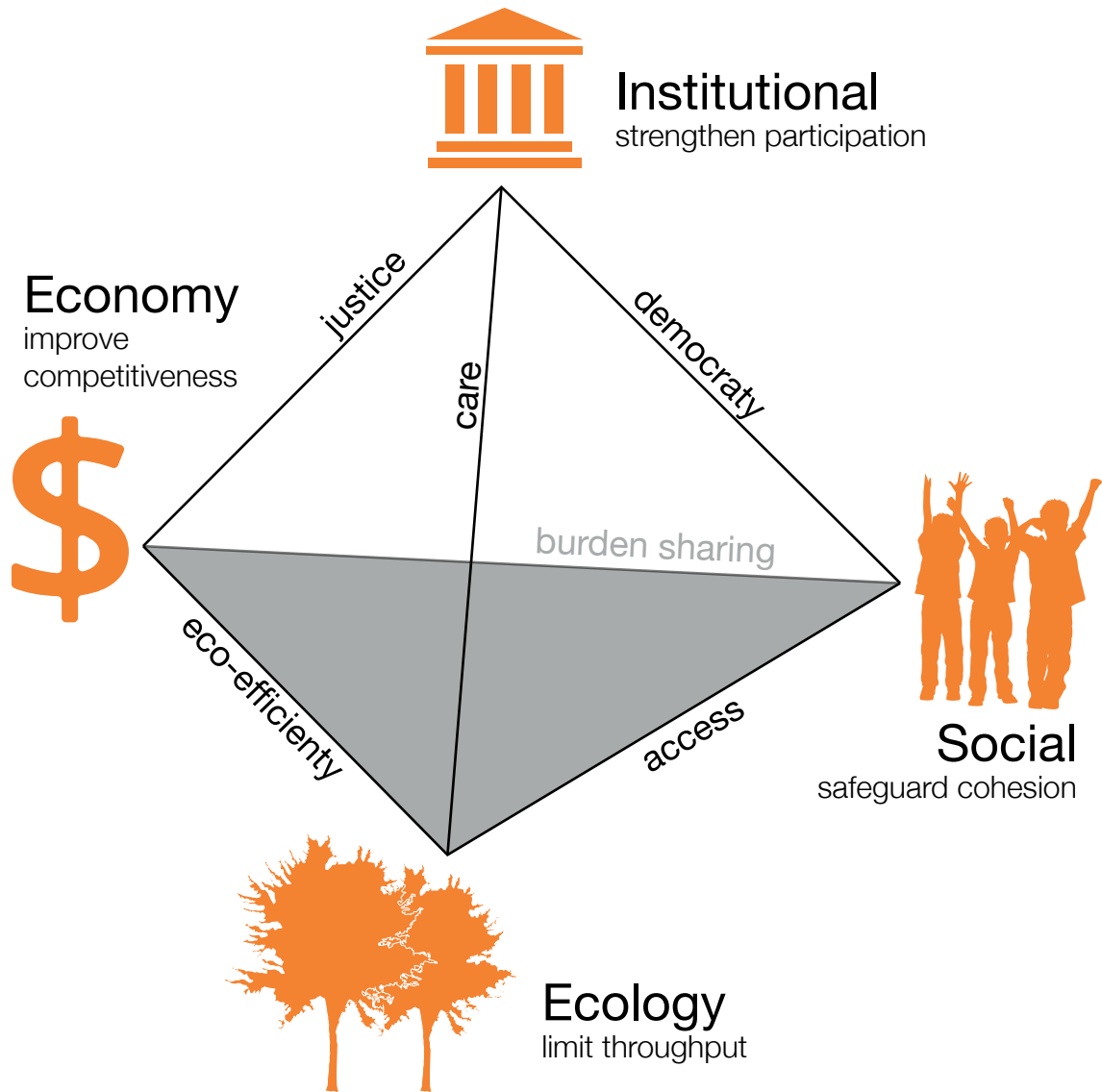
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9

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Strategy

Prism of Sustainability

As a variation of the traditional image of durability that depends on ecology, sociology and economy, a prism of sustainability was initiated by a researcher at the German Wuppertal Institute which also included the institutional dimension. Institutional in that case means caring about political, organizational and societal mechanisms and approaches, by some, also called social capital. This dimension becomes particularly interesting and important when it comes to the implementation of a big scale project on a complex area.

The links between the four dimensions are at least as important as the dimensions themselves. Without the connection between, for example economics and institutional aspects, then the four dimensions would be interpreted instead as separate loops, expressed solely as prerequisites for maintaining that particular subsystem.

To reach a high sustainable level on both the viability and the durability of the overall design and its implementation, we will locate the project within those four dimensions and their interactions.

After reviewing existing plans for the East River Waterfront development (O.U.R. **A People's Plan**, NYC **Transforming the East River Waterfront**, Richard Rogers **The Shift to the City**) as well as meeting and interviewing the LES community, I was able to understand their concerns and their needs so that the waterfront development would meet their expectations of what their home area should look like.



Institutional dimension

When designing a project for a vulnerable population which is actively claiming for their rights, it is important to engage the public participation and awareness early and throughout the design process. The community involvement is the most important ingredient in vibrant public spaces. A participatory design process engages local residents and stakeholders, leading to a sense of ownership and leading to a long term stewardship. Community members also help the designer to obtain a depth of understanding about the site and the neighborhood and anchor the project in real lifestyles.



Economical dimension

Lower East Side inhabitants want access to free and low-cost services. The new programs, services and businesses along the waterfront must be affordable and accessible to long-time residents of the community. Commercial uses are not a priority as only a few people want business purpose in the development. Another important aspect is the high level of unemployed residents of the Lower East Side, and the waterfront development is a good opportunity to engage public participation in the design process and create jobs for the residents.

The sport and recreation area must be free and accommodate all ages, the grocery shops and retail vendors must propose low-cost products. There must be many and various non-profit organizations running sports, educational and environmental programs.



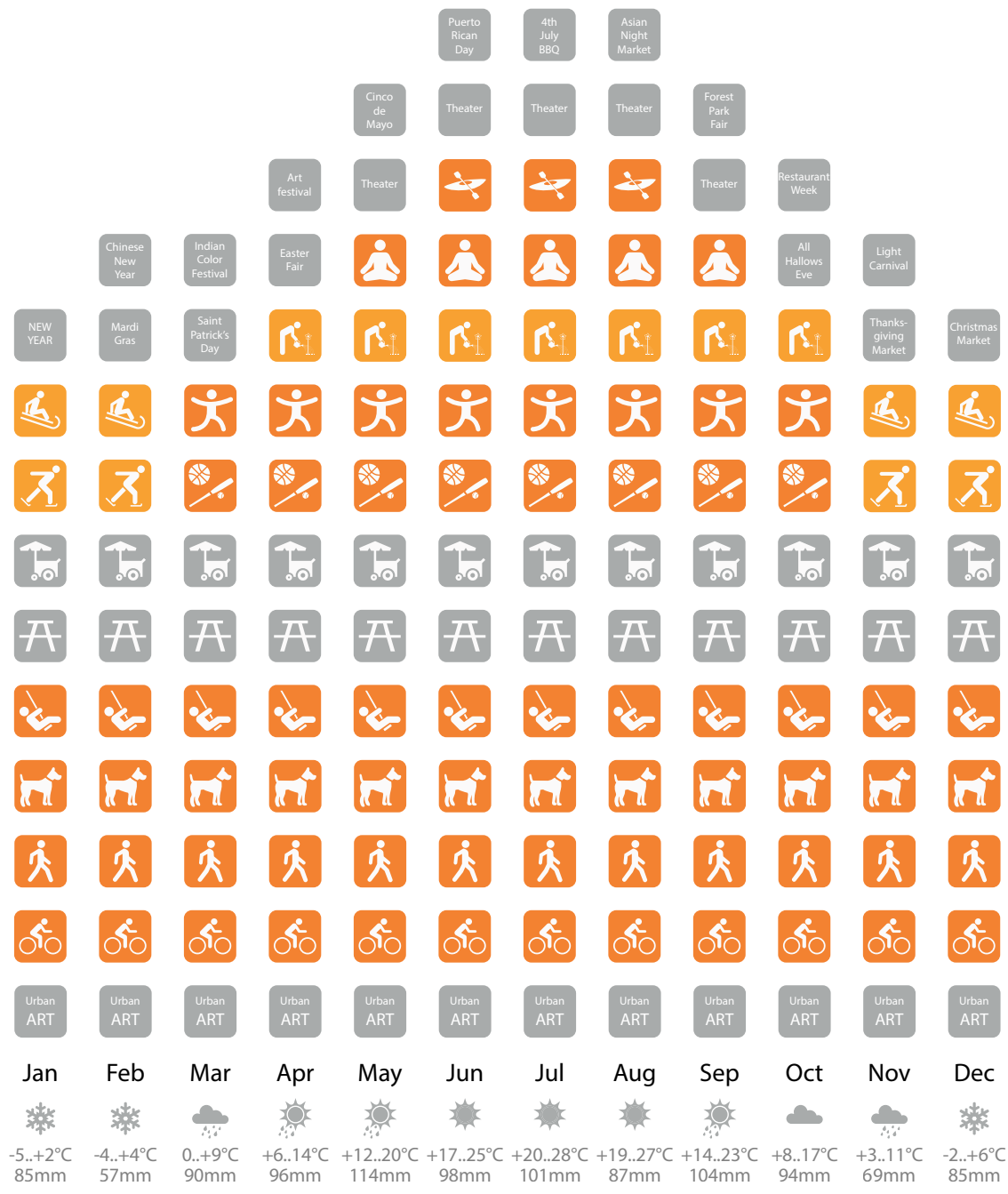
Ecological dimension

The Lower East Side lacks green spaces. In a dense city like New York, open spaces contribute to improve mental and physical health. Green spaces create room for relaxation and gathering, while relieving extreme temperatures in the summer and improving local air quality. Well-designed, they can incorporate green infrastructure that reduces pressure on combined sewer systems, thereby improving water quality. They also provide an escape from urban density available at no cost, and reconnect inhabitants to their natural environment.

In response to the flooding and storm-surges scenario, the vegetation planted in the floodplain area must be hearty, salt and inundation tolerant. Well-designed landscapes can help sequester carbon dioxide, and mitigate the heat island effect, reducing ambient temperatures by providing shade and evaporative cooling. Trees, shrubs and perennials must enhance wildlife habitats by selecting species which seeds attract and provide for food and shelter (birds, butterflies, insects,...).

As flooding and heavy precipitations will increase, we must consider onsite stormwater management strategies. Absorbent landscapes with healthy soils allow rainwater to infiltrate, reducing excess runoff, erosion, sedimentation and flooding. Water can be used as an important source of energy production.

Last but not least, the soil is a vital element to the landscape sustainable viability and durability. Support for the vegetation, it regulates and cleanses the water supply and provides for biological habitats. We must select it wisely and consider sustainable alternatives (recycled soil, engineered soil, compost,...).



Programming for activities all year



Social dimension

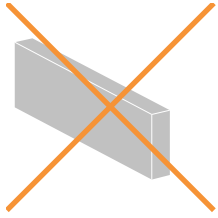
The Lower East Side is very diverse and host an immigrant population, filled with a diversity of cultures, religions, languages,... and the programs, services and businesses must reflect and preserve the rich cultural diversity of the neighborhood. In this matter, art is a good media, and the residents want to see more local and public art, prioritizing local artists and developing new flexible spaces for cultural events, as well as promoting the local use of the space as mural for graffiti for street artists to display without fear of prosecution.

Education is very important, especially for low-income residents who want educational programs for adults and children through the local schools and the community-based associations focusing on environmental and social issues.

Programs must improve the health and quality of life of residents. They must have access to healthy food, fresh produces, more fruits and vegetables and to host more green and farmers markets stands selling affordable and healthy food.

Inhabitants also seek more social services, a necessary component of the community for the waterfront development, especially important for the low-income. There must be a variety of services available through multi-use community centers on a daily basis including health services, translation assistance, language classes, eviction prevention and other case management. The services must be tailored to the needs of the community and appropriate to the cultures, to better understand what is happening in the community.

Finally, we must design for broad appeal and accessibility, using Universal Design to ensure access for users of a variety of ages and abilities, and to anticipate how the demand for amenities will change as demographics and context shift.

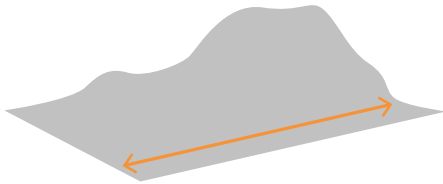


We don't want an engineered floodproof wall along the river!

Concept

The design concept comes from a strong historical analysis of New York City. The word **Mannahatta** was used by the Lenape Native American Indian to qualify Manhattan which was at the time, an "Island of Many Hills".

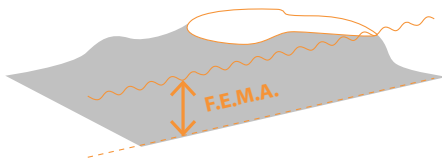
The easiest and cheapest solution when dealing with flooding issues is to build a linear engineered wall, that would stop the flooding in place and time, but which would also cut the City and its community from the waterfront and wouldn't make for good urbanism



Adapt the hill thickness to weave in the underused spaces of the urban fabric.

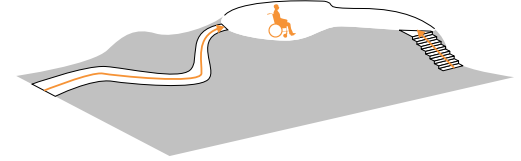
I want to reintroduce and reinterpret the concept of hills on the island, to create a new topography along the Lower East Side waterfront, dealing with flooding and improve the public realm for the urban and social resilience of the City.

The Manhattan's NYCHA campuses offer a lot of underused valuable spaces that residents are fighting for, against developers, in order to keep it for public use. My project will be a minimal intervention, using those leftover spaces to develop a flood-proof barrier and anchor those spaces in the public domain. The hills thickness will weaves in between buildings, along roads and highways to adapt to the existing fabric of the site and to the proposed program.



Adapt the hill height to the maxi flooding levels recommended by FEMA.

The hills will take in consideration the NYC guidelines, the FEMA and SIRR reports to assess the site's future risks of flooding due to 500 year storms! A storm which has a 0.2% chance of happening in any given year. The created dyke must then be at a height of +4.58m above the river level (+2.75m above bulkhead).

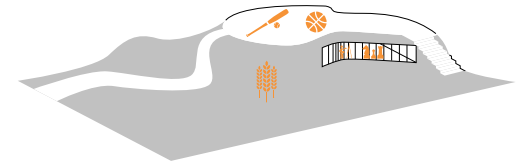


Working with dykes, we must work with Universal Design concepts and tools to ensure access for users of a variety of ages and abilities, including persons with mobility, visual, hearing, or cognitive impairments [ADA Guidelines and best practices for accessibility].

Work with Universal Concept to design hills that are accessible to everybody!

The dikes will propose various typologies to host a very diverse program, on top of it (ballfields), underneath it (community center) and connect to the existing programs and uses in adjacent buildings. In relation to the water, the project also propose diverse typologies of buildings, floating, semi-floating and most of the constructions must be flood-tolerant is they are threaten by it.

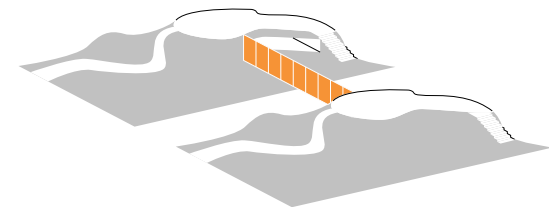
The Mannahatta project is a great opportunity to strengthen and develop the existing network of social infrastructures, community centers, settlements and community-based organizations of all sort.



The Lower East Side residents want an attractive program of sport & recreations activities, education programs, and access to various social services. We must think on the long-term of the project, and propose a flexibility of uses that will allow the project to evolve as user groups do. We must provide recreational opportunities for diverse groups and promote social interaction and integration.

An attractive program for activities, education, art, and social services for the community.

To strengthen the connection between the city and the East River, we must not build on the roads that connect to the waterfront. The road cut the topography, and the discontinue networks of Hills is interconnected with deployable gates to be set up by the city in case of a storm to create a linear flood-proof barrier. [see flood gate design p.105]



Connect the hills with deployable gates to be set up in case of a storm.

Users



Access



Playground



Open Space



SMITH HOUSES

FDR DRIVE (elevated)

BROOKLYN BRIDGE

171

121

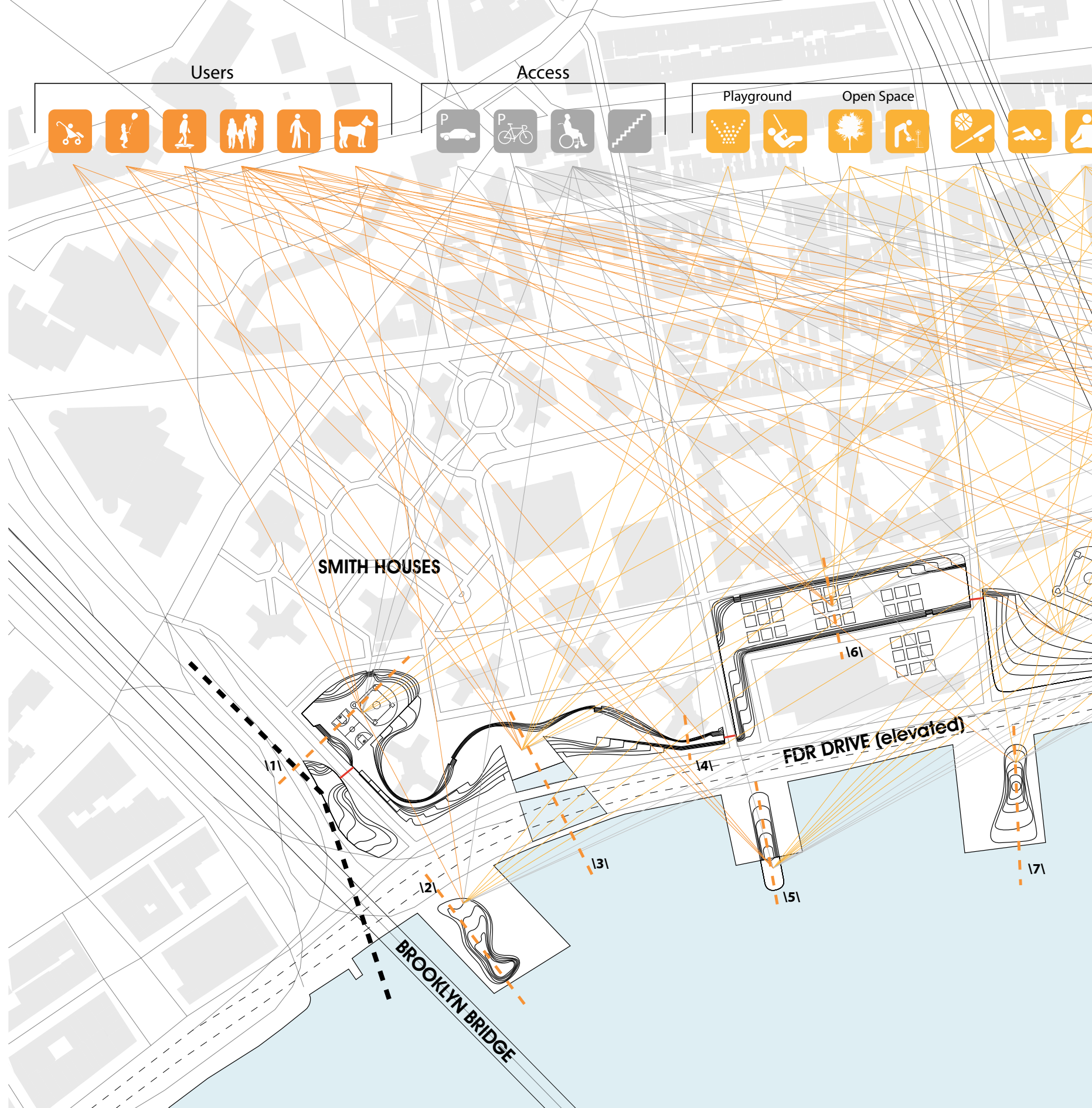
131

141

151

161

171



Activities

Sports



Winter sports

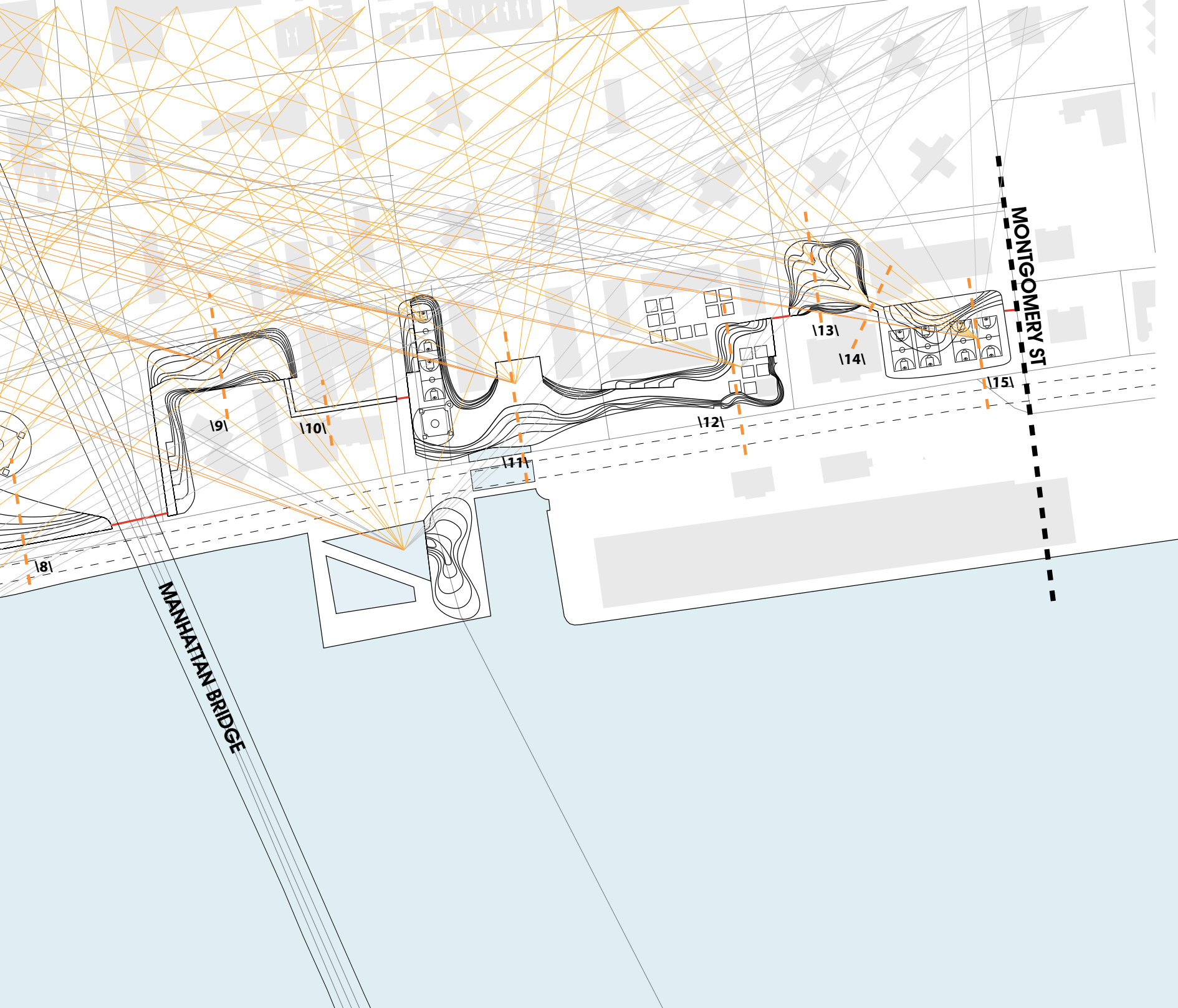


Education & Creativity

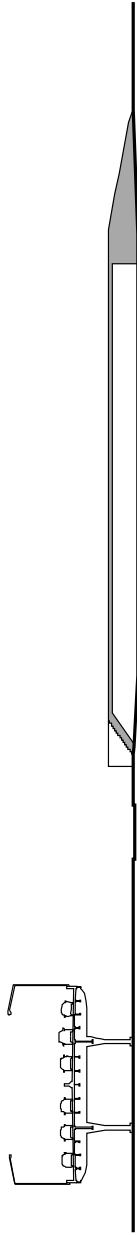


Urban
ART

Services



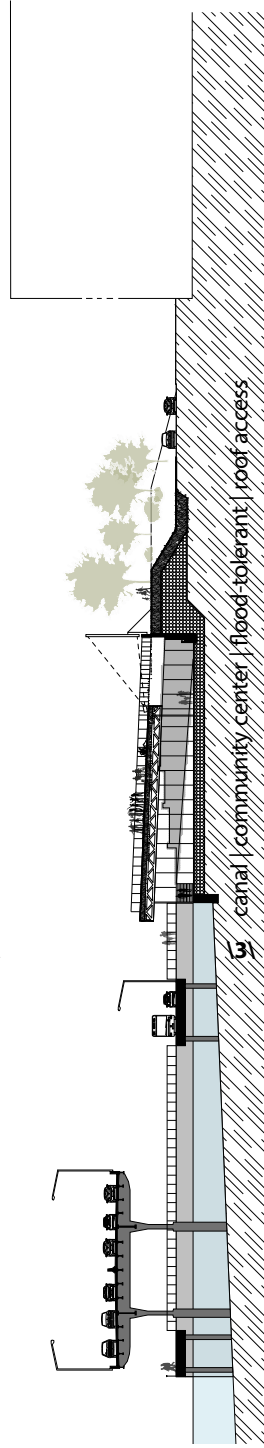
Evolution of the hills along the East River Waterfront



1 | parking lot | ballfields | basketball | baseball | playground



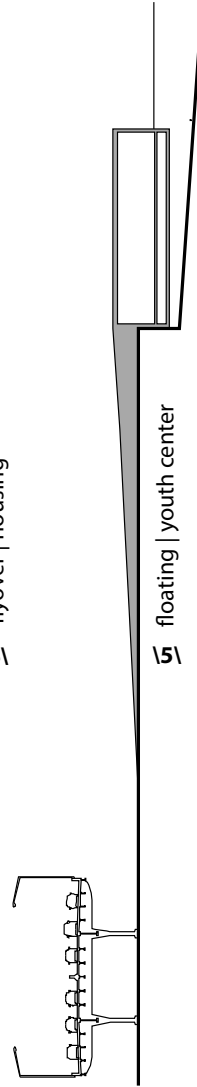
2 | pier | observatory | fauna & flora | fishing



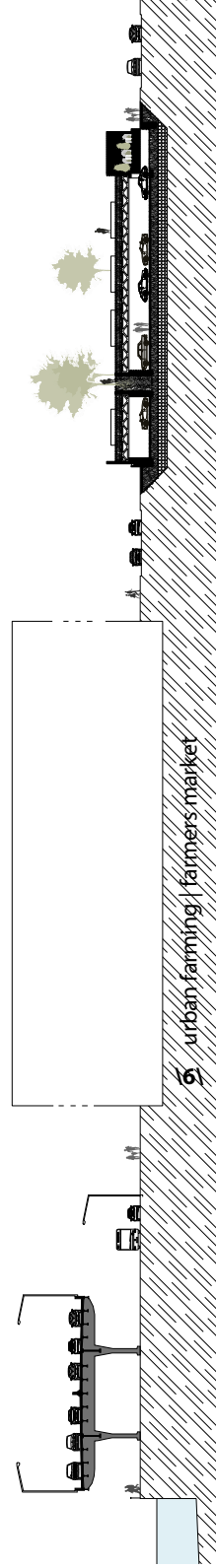
3 | canal | community center | flood-tolerant | roof access



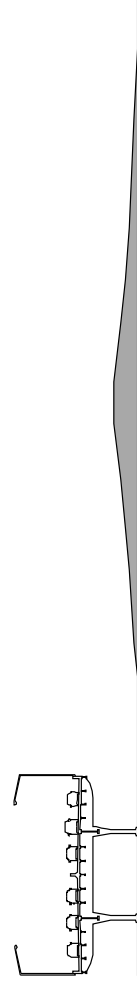
4 | flyover | housing



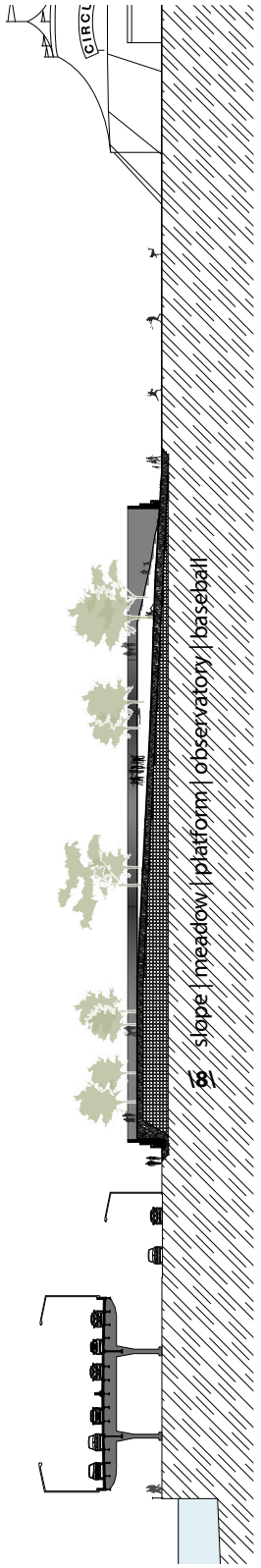
5 | floating | youth center



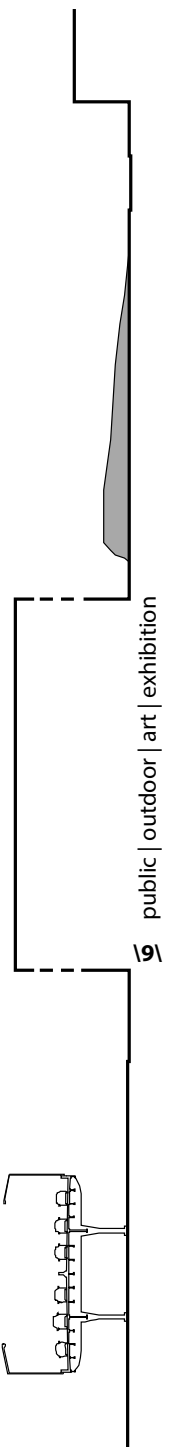
6 | urban farming | farmers market



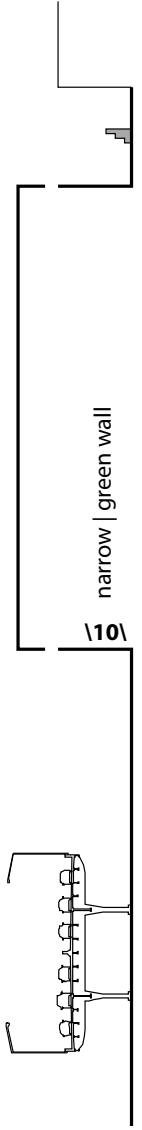
7 | urban farming | aquaponics | green markets



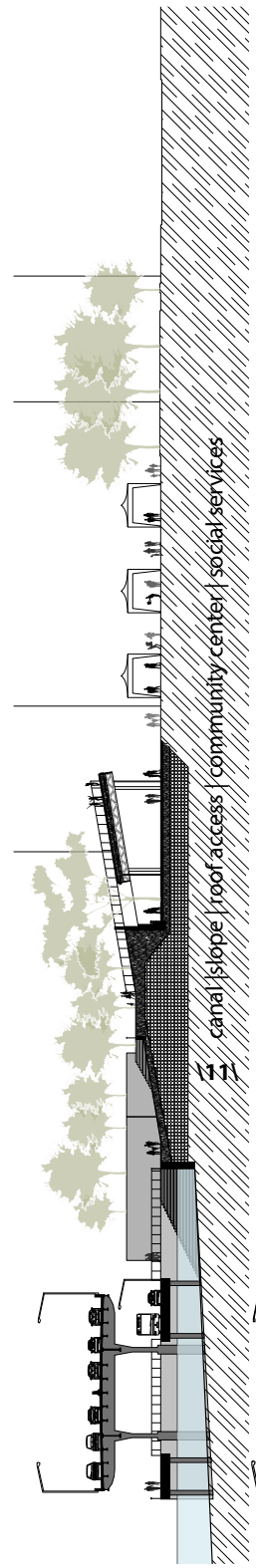
10 slope | meadow | platform | observatory | baseball



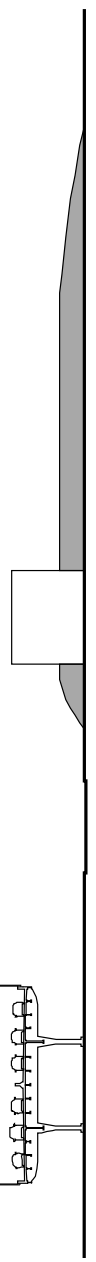
9 public | outdoor | art | exhibition



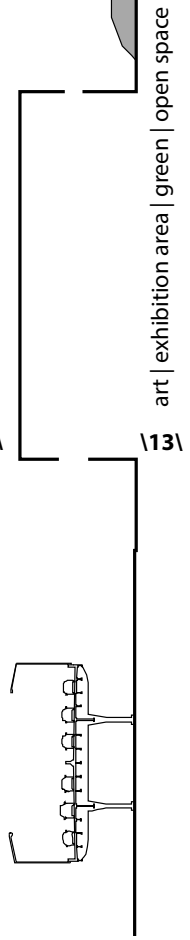
11 narrow | green wall



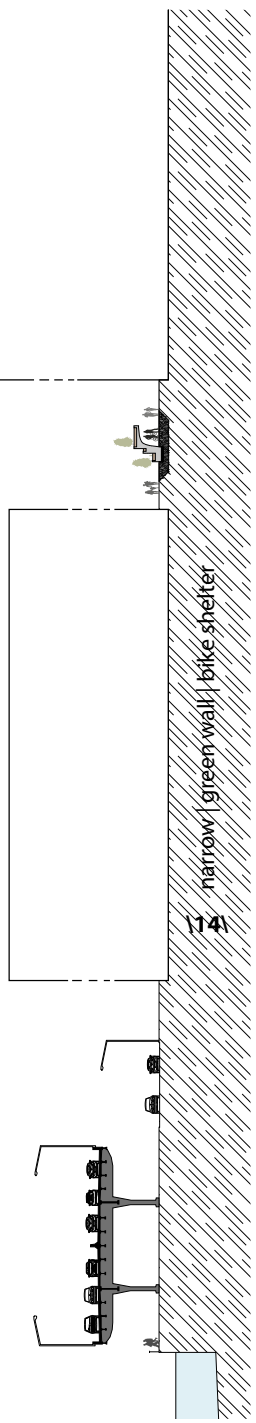
11 canal | slope | roof access | community center | social services



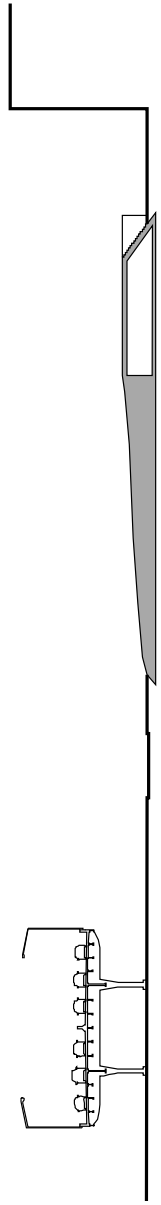
12 urban farming | land use | food production | farmers market



13 art | exhibition area | green | open space



14 narrow | green wall | bike shelter



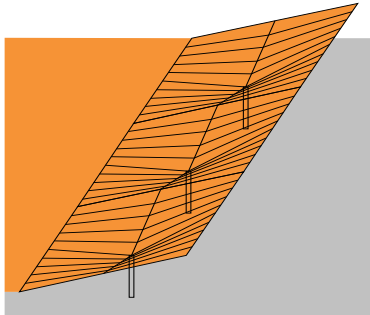
15 school | education | art | after-school | sport & recreation area

**Seen from Williamsburg Bridge,
the dyke is used all year around.**

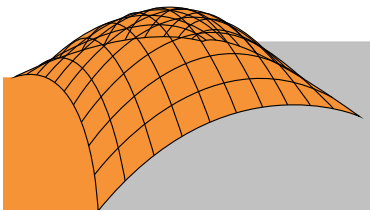




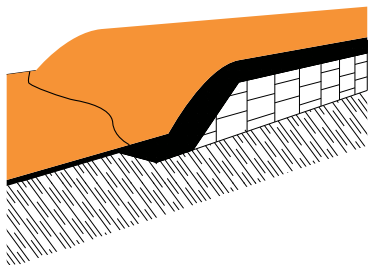
**SURFACE-ACTIVE
Structure**
[factory roof]



Gridshell Structure
[Crater Lake Installation
24° Studio]



EPS GEOFOAM
[Maggie Daley Park
Chicago]



Design Strategy

Construction Alternatives

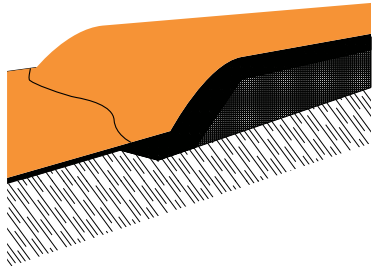
There are different ways to build a new topography on an urban context. I have been looking at different solutions, from engineered systems as surface-active and grid shell structures. They develop a surface that can be flood-proofed and can easily accommodate a program underneath. But they are highly material consuming and can be hard to accommodate to a complex site as the one in New York. Then, I started looking at creating topography as a volume, as the EPS geof foam solution can help us develop, but then, as we are not facing any weight restrictions, why not work directly with the soil from New York?

Soil & Vegetation

Much of Manhattan soil consists of fill from other sites. Some of the fill extended the shoreline of the islands; in many cases, the fill came from excavating for subways and large buildings with deep foundations and lower level construction.

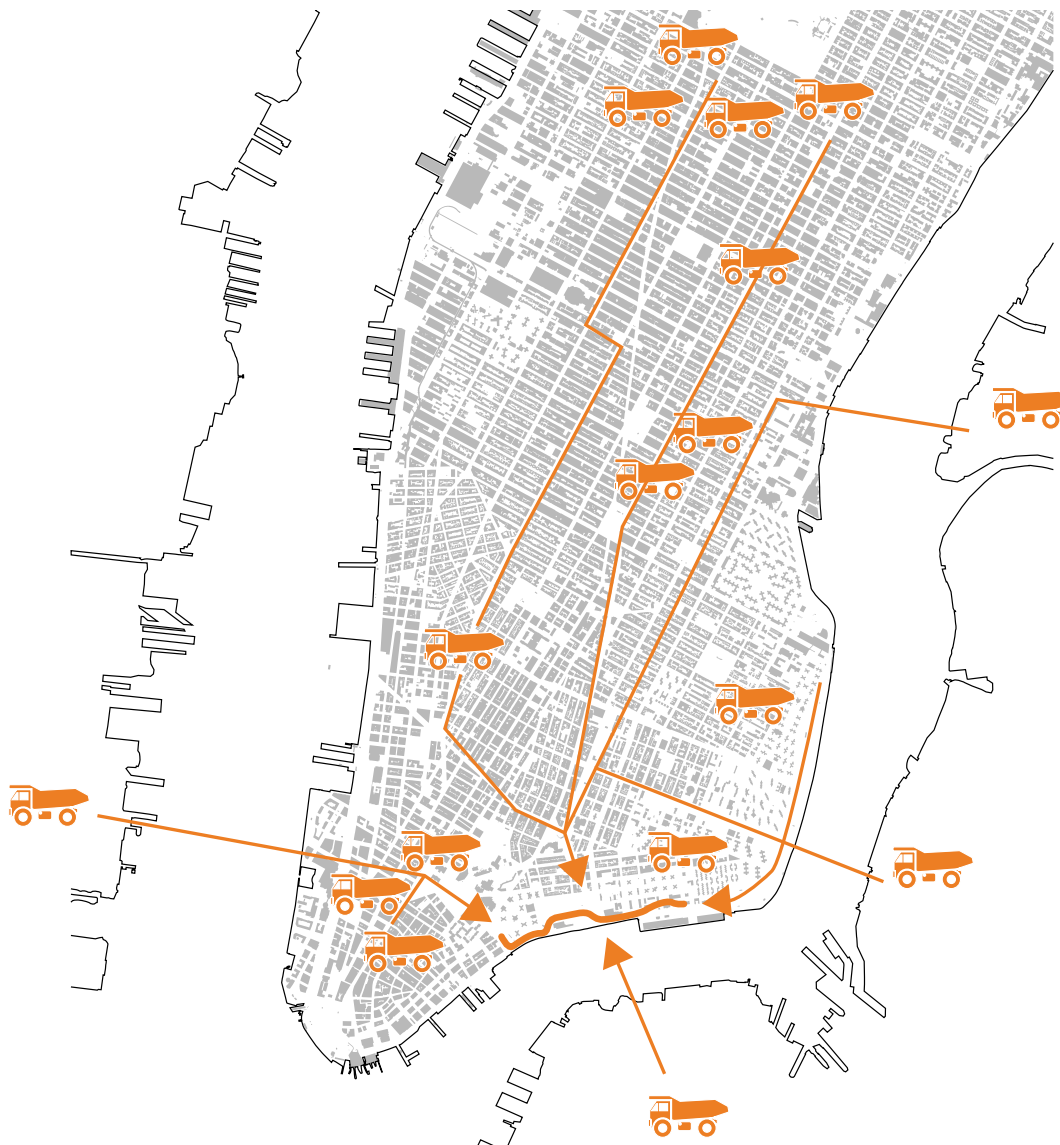
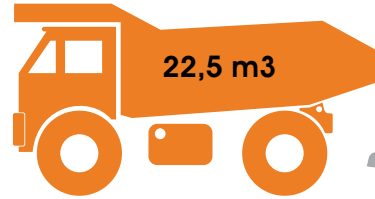
Soil is an important component of an urban park structure. Healthy soils are the support for vegetation, they have a great capacity to capture and clean water, transform pollutants, make nutrients available, and sequester carbon emissions. There is no one soil for every project, soils must provide the appropriate planting medium for the proposed landscape. Early in the design process, existing soils must be analysis and paired with a realistic programming to match stormwater management and plantings goals over the long term.

NYC SOIL !



**Volume of Soil needed:
approx. 125 000m²**

x 5 560



Sometimes for a new project development in the City as a community garden or a landscape design, new soil must be brought in from outside New York City and poured into constructed raised beds, which is an expensive solution.

There are sustainable alternatives answers. In a city as New York, there is always a lot of new construction and demolition operations going on in the neighboring area of the project, it is therefore important to take in consideration the use of recycled concrete aggregate, that may otherwise be shipped to a landfill, as a substitute for beneath structures or paved areas.

Compost is another solution against importing virgin soil for the top layer of a landscape project. It is the idea to "grow soil" by turning the city food waste into an highly organic matter, that would increase the soil structure, porosity and density, creating a better plant root environment. It would also increase infiltration and permeability of heavy soils, in order to reduce erosion and runoff.

Finally, engineered soils are sustainable products to meet critical programming needs. Generally making use of derelict materials, they provide a greater range of design and construction opportunities than naturally occurring soils.

With an adequate soil volume and depth, trees, shrubs and plants can achieve their mature size in a healthy environment. The project will protect existing onsite vegetation, its stormwater management, air quality and microclimate benefits., to promote the ecological viability of the site.

In order to deal with heavy rainwater and potential flooding of the site area, I propose a list of trees, shrubs and perennials that are salt and flood tolerant. They aim at enhancing the environment, reducing the urban heat island effect and improving biodiversity and animal habitat.



Salt & Inundation-Tolerant, Vegetation for Manhattan Waterfront !

Scientific Name	Common Name	Sun Exposure	Soil Moisture	Height	Lifespan	Comments
TREES						
<i>Acer saccharum</i>	Sugar Maple	Shade	<i>Average</i>	24m	400years	Fantastic orange fall color; classic maple syrup
<i>Betula Nigra</i>	River Birch	Full Sun	<i>Average/Wet</i>	12/21m	40/50years	Modest yellow color; seeds attract birds
<i>Celtis occidentalis</i>	Hackberry	Full/Part Sun	<i>Wet</i>	+12m	200years	Salt tolerant, berries attract birds and mammals + butterfly host, urban condition
<i>Cornus Florida</i>	Flowering Dogwood	Full Sun	<i>Average</i>	7.6/9m	80years	Large white flowers in spring; loved by wildlife
<i>Fraxinus pennsylvanica</i>	Green Ash	Full/Part Sun	<i>Average</i>	12/25m	50years	Grows fast; tolerates salt; yellow fall color, good tolerance in urban conditions
<i>Juniperus virginiana</i>	Eastern Red Cedar	Full/Part Sun	<i>Dry/Average</i>	9/12m	795years	Good for screening; attracts birds
<i>Liriodendron tulipifera</i>	Tulip Poplar	Full Sun	<i>Average</i>	12/30m	500years	Attracts hummingbirds, squirrels; butterfly host plant
<i>Tilia americana</i>	Basswood	Part Sun/Shade	<i>Average/Wet</i>	18/24m	200years	Wood used for carving; nectar makes honey; seeds attract wildlife
<i>Magnolia Virginiana</i>	Sweet Bay Magnolia	Sun	<i>Average/Wet</i>	30m	130years	Large, conspicuous, scented flowers, clean, attractive foliage, fast growth. evergreen foliage
<i>Nyssa sylvatica</i>	Black Tupelo	Full Sun	<i>Wet</i>	18/24m	650years	Flowers source of honey and fruits for birds
<i>Populus Deltooides</i>	Eastern Cottonwood	Full Sun	<i>Wet</i>	20/40m	100years	Leaves food for caterpillar
<i>Quercus Alba</i>	White Oak	Full Sun	<i>Average</i>	25/30m	300years	
<i>Quercus Palustris</i>	Pin Oak	Full Sun	<i>Wet</i>	18/22m	120years	Ease of transplant, fast growth, pollution tolerance
<i>Quercus Rubra</i>	Red Oak	Part Sun/Shade	<i>Average</i>	28m	200years	

SHRUBS						
<i>Amelanchier arborea</i>	Common serviceberry	Full Sun	<i>Average</i>	5/12m		white flowers (bees), edible reddish-purple fruit pome popular for birds, harvested for pie & jam
<i>Aronia Melanocarpa</i>	Black Chokeberry		<i>Wet</i>			ornamental & food product
<i>Baccharis Halimifolia</i>	Groundsel Tree	Part Sun/Shade	<i>Wet</i>	4m		provide wildlife food and cover, flower abundant nectar attract butterflies
<i>Cephalanthus Occidentalis</i>	Buttonbush		<i>Wet</i>	1/3m		birds eat the seed, nectar attracts hummingbirds, insects, bees. On slope to help control erosion
<i>Clethra Alnifolia</i>	Sweet Pepperbush			1.5/3m		
<i>Iva frutescens</i>	Saltmarsh Elder			3.5m		salt ok. not so tolerant to flooding
<i>Lindera Bzoin</i>	Spicebush			5m		yellow flowers. flower popular for birds
<i>Myrica pensylvanica</i>	Northern Bayberry	Full Sun	<i>Dry/Wet</i>	1.5/2.5m		Semi-evergreen; transplants well
<i>Prunus Maritima</i>	Beachplum	Full Sun	<i>Dry</i>	4m		salt-tolerant and cold-hardy. Fruits for jam
<i>Rhus Typhina</i>	Staghorn Sumac	Full/Part Sun	<i>Dry</i>	5m		Red fall color; red fruit winter food for birds and wildlife
<i>Sambucus Canadensis</i>	Black Elderberry	Sun	<i>Average</i>	+3m		edible flower & berry.
<i>Vaccinium Angustifolium</i>	Lowbush Blueberry		<i>Dry</i>	0.6m		fire resistant, fruit edible, blue-green leaves
<i>Viburnum dentatum</i>	Southern Arrowwood	Full/Part Sun	<i>Average/Wet</i>	2.5/6m		White flowers; bright blue edible bird-attracting fruit
<i>Vitis Labrusca</i>	Fox Grape	Full Sun				for Urban Farming
PERENNIALS						
<i>Aquilegia canadensis</i>	Wild Columbine	Part Sun/Shade	<i>Average/Dry</i>	0.3/0.7m		Unique red and yellow flowers attract hummingbirds
<i>Arctostaphylos uva-ursi</i>	Bearberry	Sun	<i>Average</i>	5/30cm		good to control erosion
<i>Caltha palustris</i>	Marsh Marigold	Full Sun	<i>Wet</i>	0.3/0.6m		bright yellow flowers in spring and summer
<i>Chasmanthium latifolium</i>	River Oats	Full Sun/Shade	<i>Average</i>	14.5m		Grass turns copper in fall; bamboo-like appearance
<i>Limonium Carolinianum</i>	Marsh Rosemary			1/30cm		purple flower
<i>Symphotrichum novi-belgii</i>	New York aster	Sun				late summer color shade of blue pink and white
<i>Distichlis Spicata</i>	Saltgrass	Sun	<i>Dry/Average</i>	10cm		EXTREMELY SALT TOLERANT (& PRODUCTION)
<i>Juncus Gerardii</i>	Blackgrass	Sun	<i>Wet</i>			
<i>Panicum Amarum</i>	Bitter panicgrass	Full Sun	<i>Average</i>	2.5m		dune stabilization (erosion),
<i>Panicum Virgatum</i>	Switchgrass	Full Sun	<i>Average</i>	2.7m		Warm season grass; sod forming; red-tinged foliage
<i>Schizachyrium Scoparium</i>	Little bluestem	Sun	<i>Dry/Average</i>			prevent erosion
<i>Schoenoplectus pungens</i>	Common Threesquare	Sun	<i>Wet</i>	1.5m		in water
<i>Solidago spp.</i>	Goldenrod	Full Sun	<i>Average/Dry</i>	1/2m		Common yellow wildflower
<i>Spartina Patens</i>	Saltmeadow grass	Sun	<i>Wet</i>			pollution filter, buffer against flooding and shoreline erosion
<i>Spartina Pectinata</i>	Prairie cordgrass		<i>Wet</i>	3m		not for prolonged floods, against erosion



@michaelstirmemann

Rafael Guastavino Brick Vault, City Hall, NYC

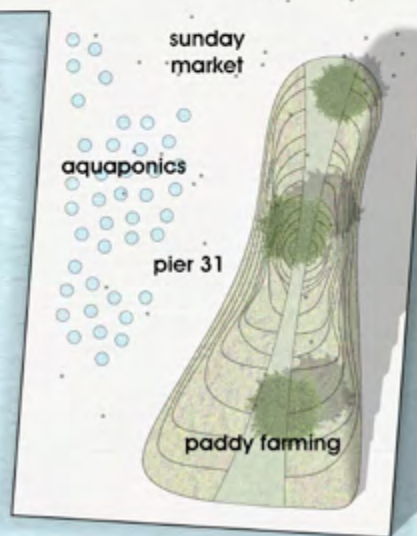
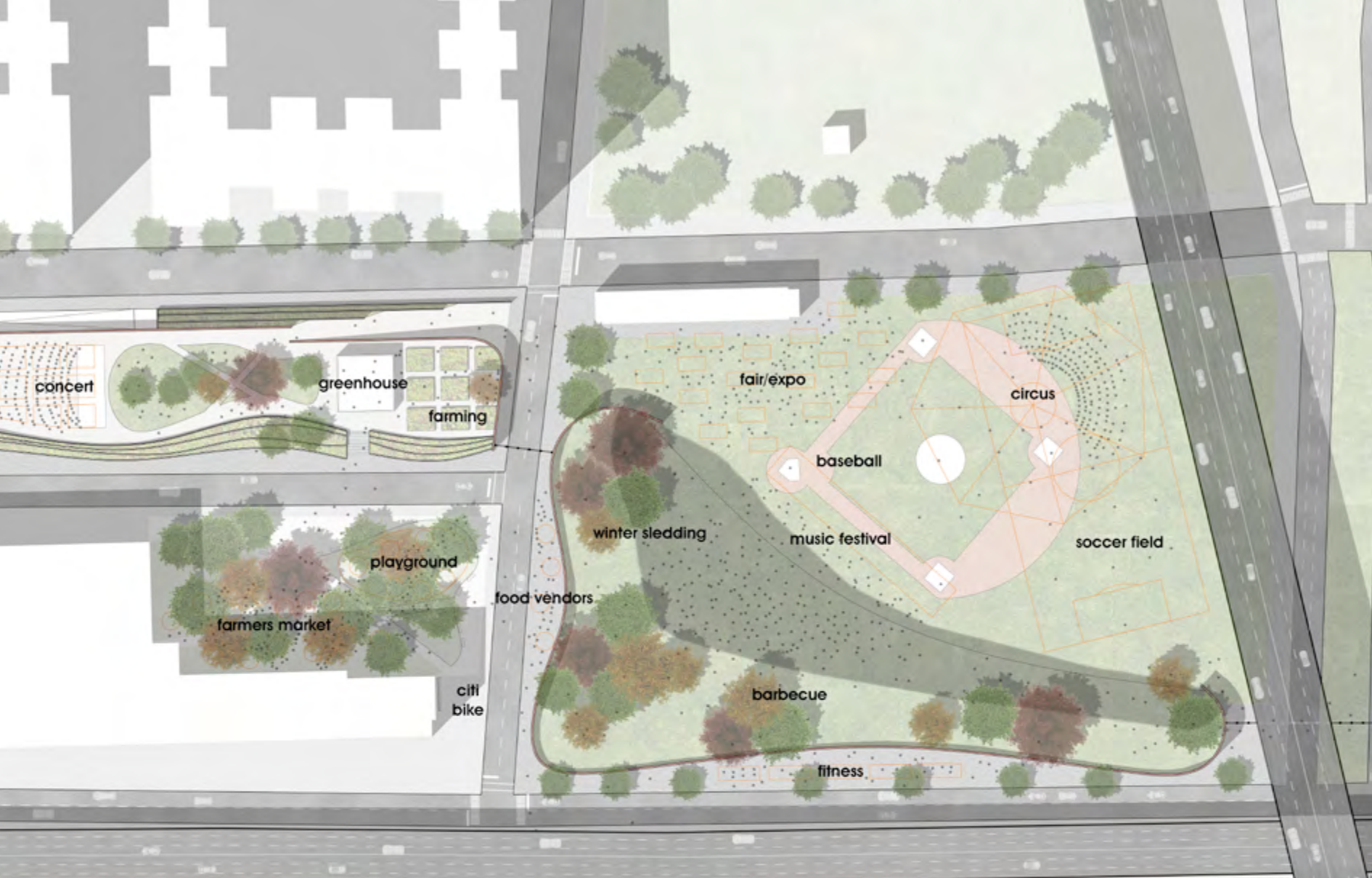
Design Application

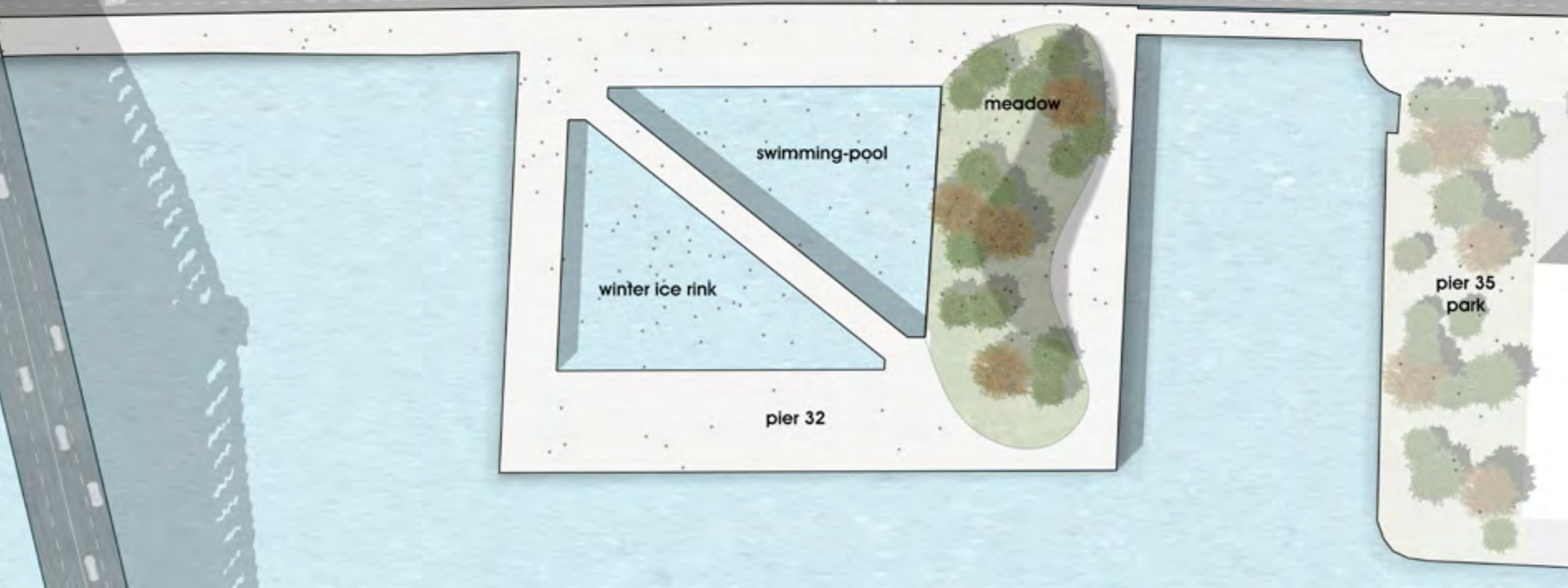
While designing a project in New York City, it is important to be coherent on the project materiality. The city has a rich architectural culture, and the City is well known for its red brick, as we can see it in the work of the architect Rafael Guastavino and its brick vault in Central Terminal Train Station. The Tenement buildings of the 19th century and the NYCHA social housing projects of the late XXth century, are both multi-family dwellings for immigrants and workers in the urban fabric of the City and make an extensive use of the red brick and steel for structural and safety issues (fire escape stairwells), as they are cheap, industrialized and non-flammable materials.

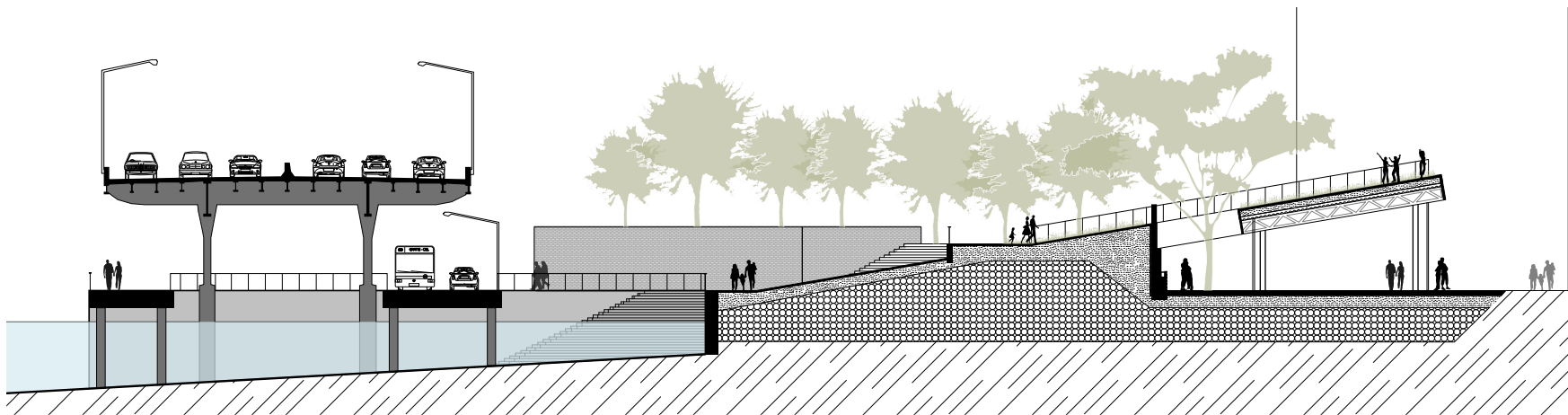
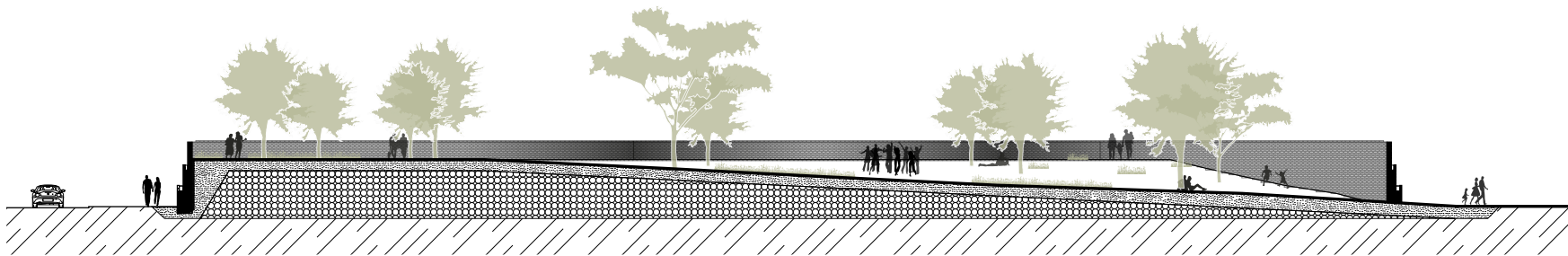
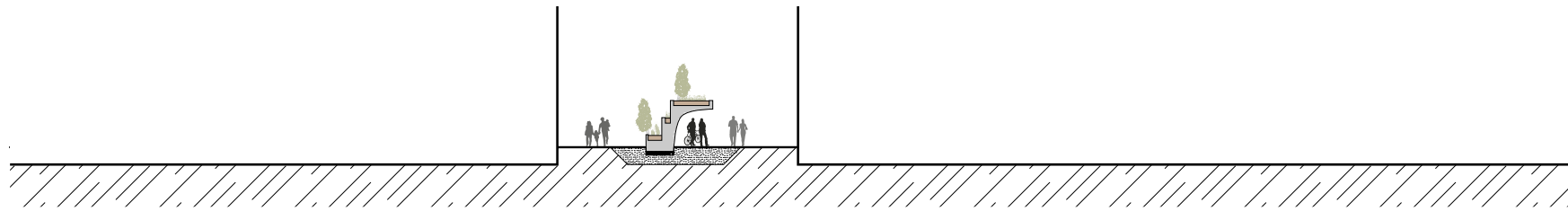
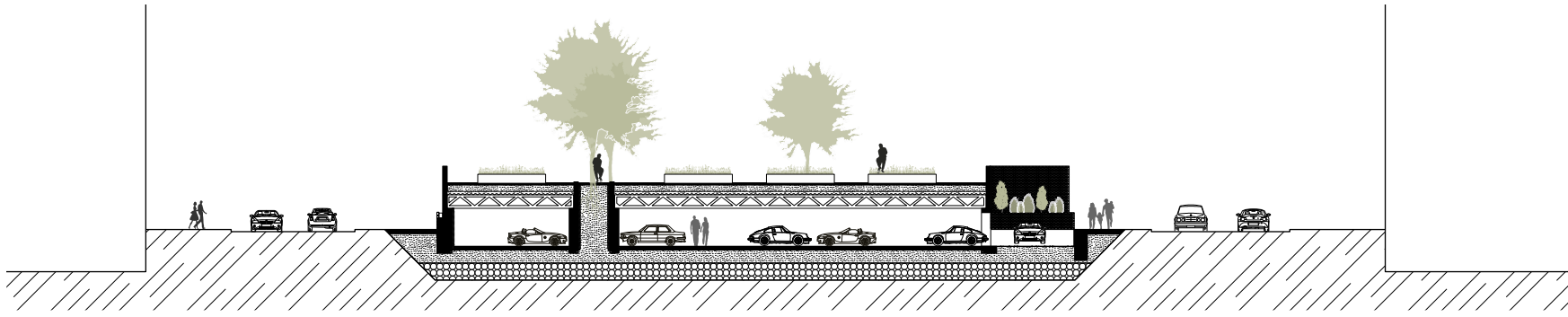
Mannahatta Project is a network of dykes able to withstand a one in a 500 years storm scenario and propose a variety and a flexibility of uses within its space, to enhance the public realm and engage the population for their neighborhood.

As many parking spaces as possible are created within the dikes, as it is an important element for the community. Urban farming lots are set up, it is an opportunity for the residents to reconnect with nature and to grow themselves healthy vegetables, in accordance with the soil testing to avoid any contamination. The new urban space created is anchored in the public domain for the community use only. It will be left unprogrammed and free of fixed use as much as possible to enable the inhabitants and users to easily appropriate it and to host temporary events as circus, concerts, music festivals, cars shows or any other public exhibition.

The hills will host pavilions, community centers, youth centers, that will propose a variety of programs for social services to empower the community!

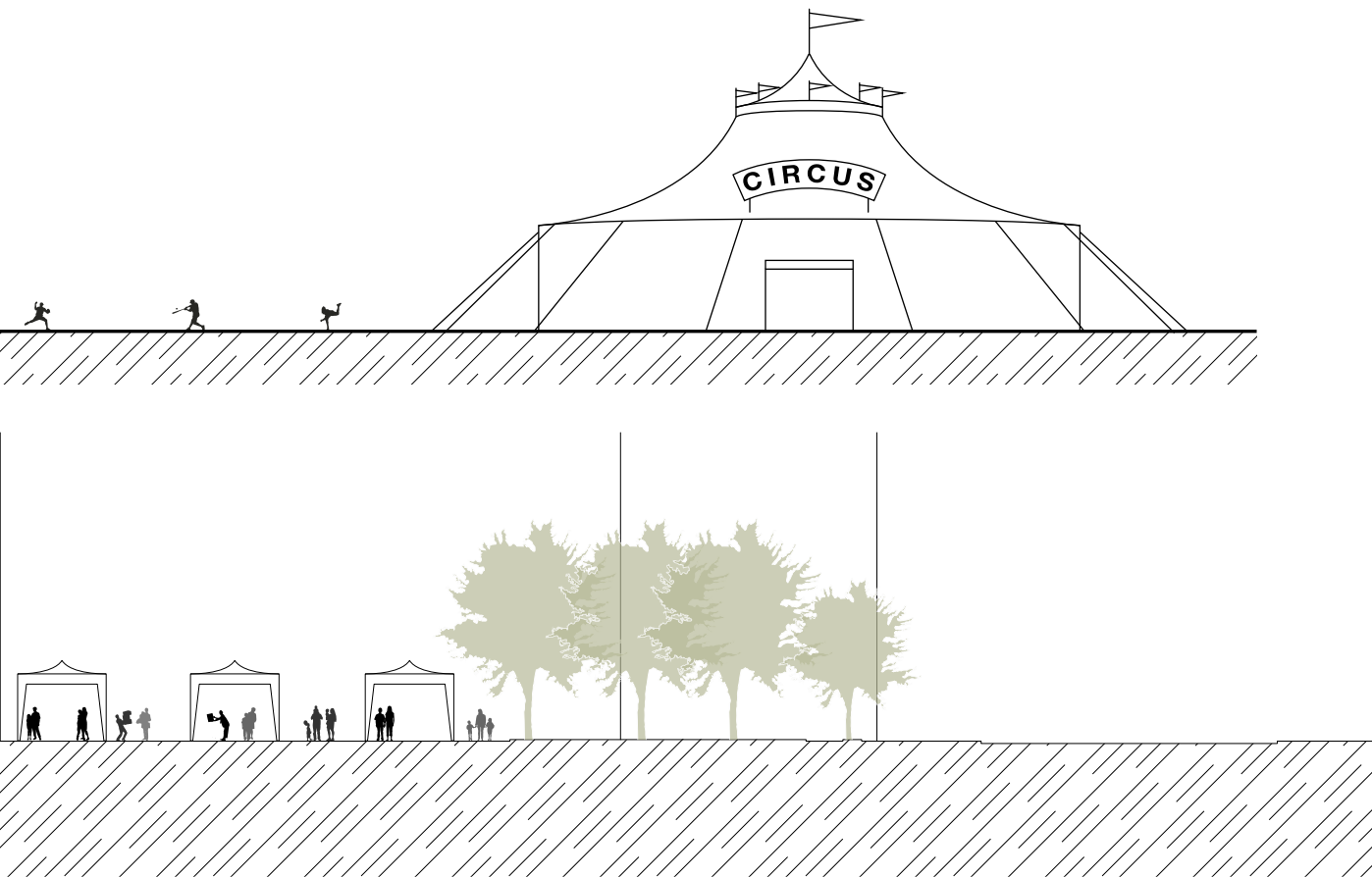


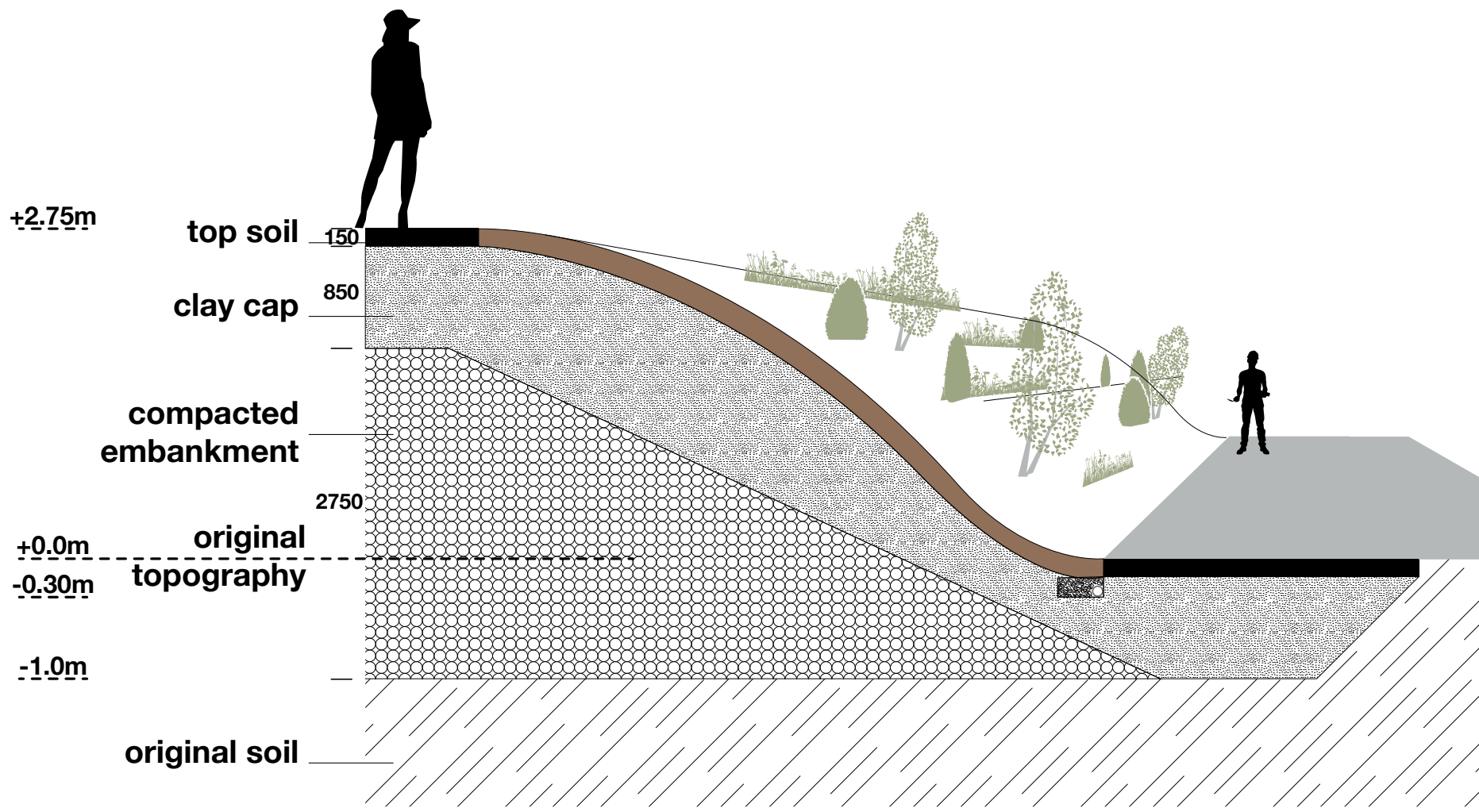




We create a network of hills that narrows and thickens, in order to adapt to the existing urban fabric environment. It anchors the underused spaces in the public domain. Existing parking lots are conserved as much as possible and positioned underneath the hills, where we find a variety of green and open spaces for urban farming, sports and recreation activities.

The hill can either be a green wall or a meadow slope that act as an amphitheater to watch sports or artistic performances, green space for barbecues and relaxing activities. It also integrates new facilities for education, art, sports and community centers to enhance the Lower East Side community.





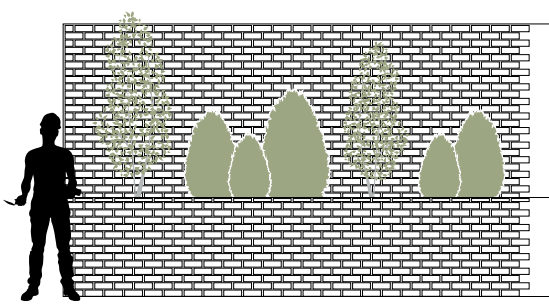
In Depth

The dike is built by different layers. On the original ground, a first layer of compacted embankment, mostly imported from Manhattan construction and demolition operations [see Soil & Vegetation p.133], will provide the dike stability and drainage. Then, a second layer of clay cap, made of virgin or engineered soil will allow the healthy development of the vegetation. Finally, a top layer of either soil (compost), stone or plastic materials will provide for different uses as vegetation plantings, pathways or activities.

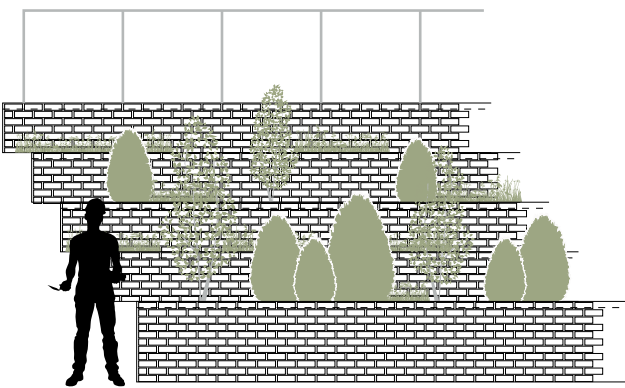
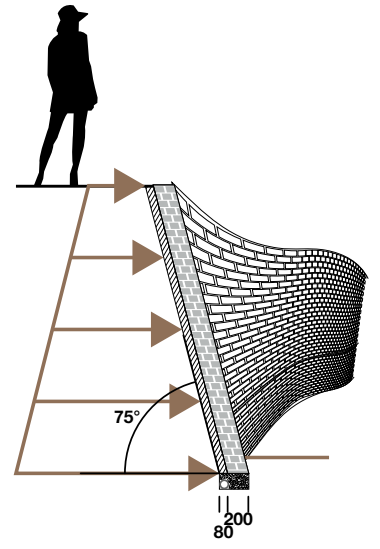
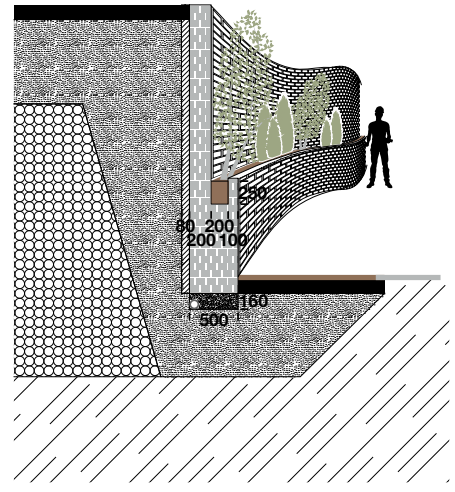
Soil must be protected from the water in case of a flooding scenario, to not be washed away. In that matter, we will use the brick material. The work of stereotomy will help to design different brick walls and gabion with various qualities according to their location and their use. A brick wall can host vegetation, be straight or to zigzag in its environment, it can also become a vault.

The wall is a structural element present all along the project design, it supports a steel structure when there is a pavilion and allow the roof to be accessible. When the hill hosts a pavilion (community center, youth center or other), I work on the design of a patio to develop the relation between the two levels, the one of the building and the one of the roof. The brick wall becomes apparent and the patio enlightened the space underneath the hill.

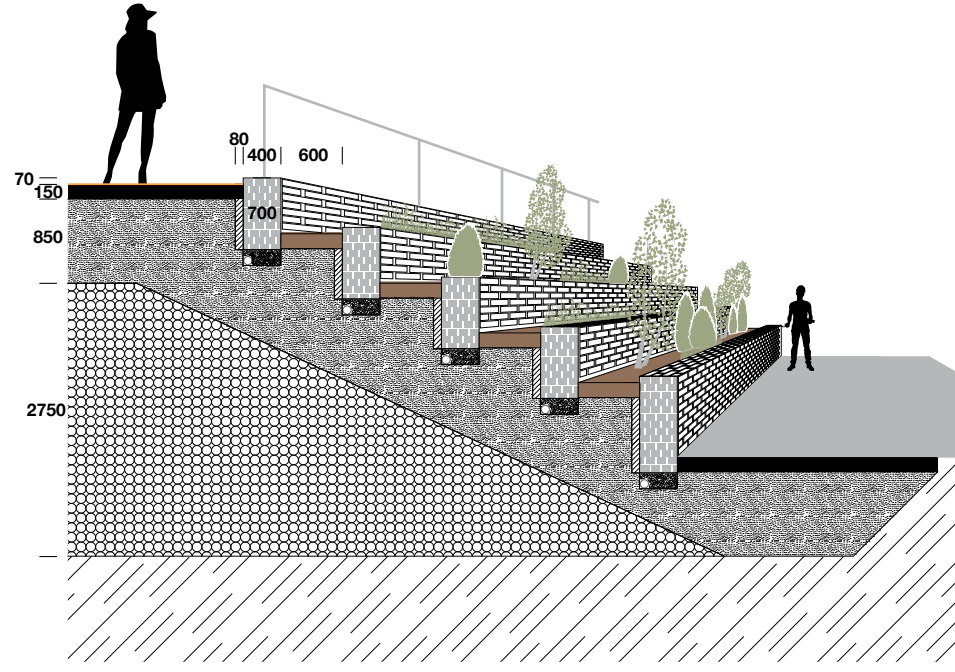
Finally, the hills are connected with deployable flood-proof gates to be set up in case of a storm.

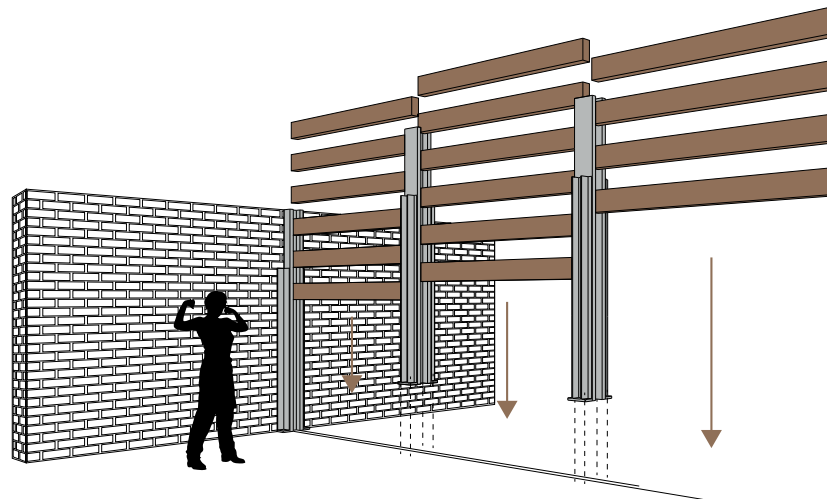
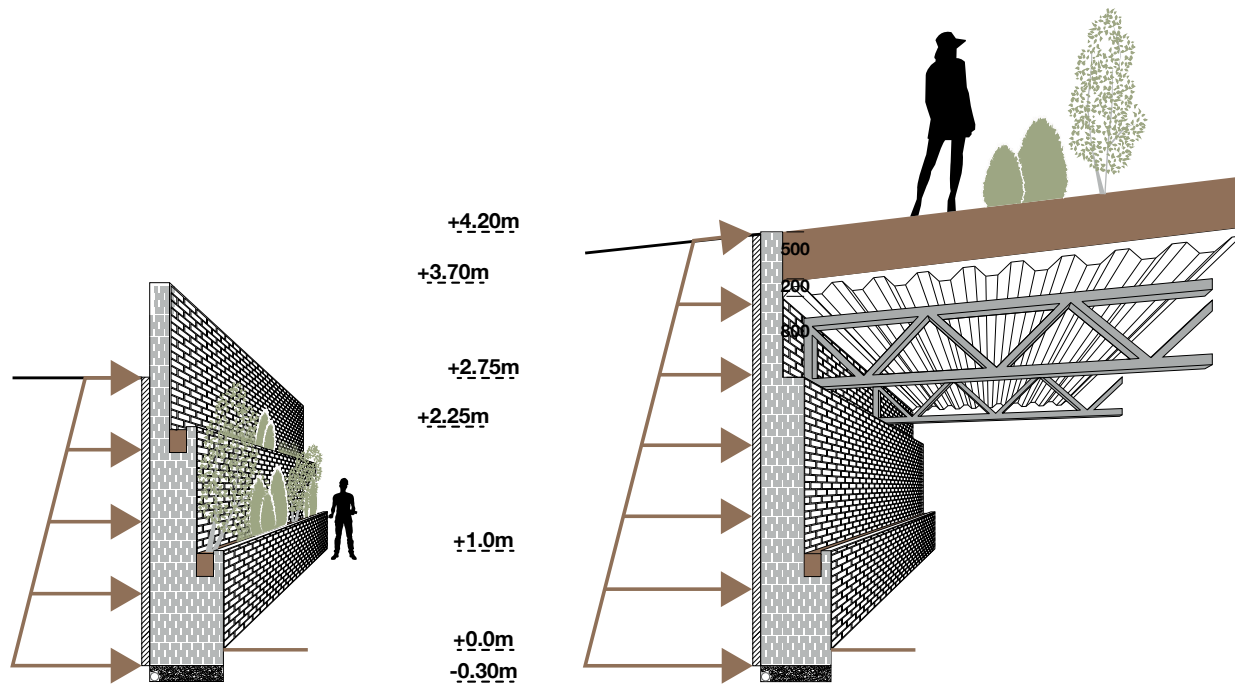


+2.75m
+1.0m
+0.0m
-0.3m



+3.75m
+2.75m
+2.25m
+1.75m
+1.25m
+0.75m
+0.0m
-0.30m
-1.0m





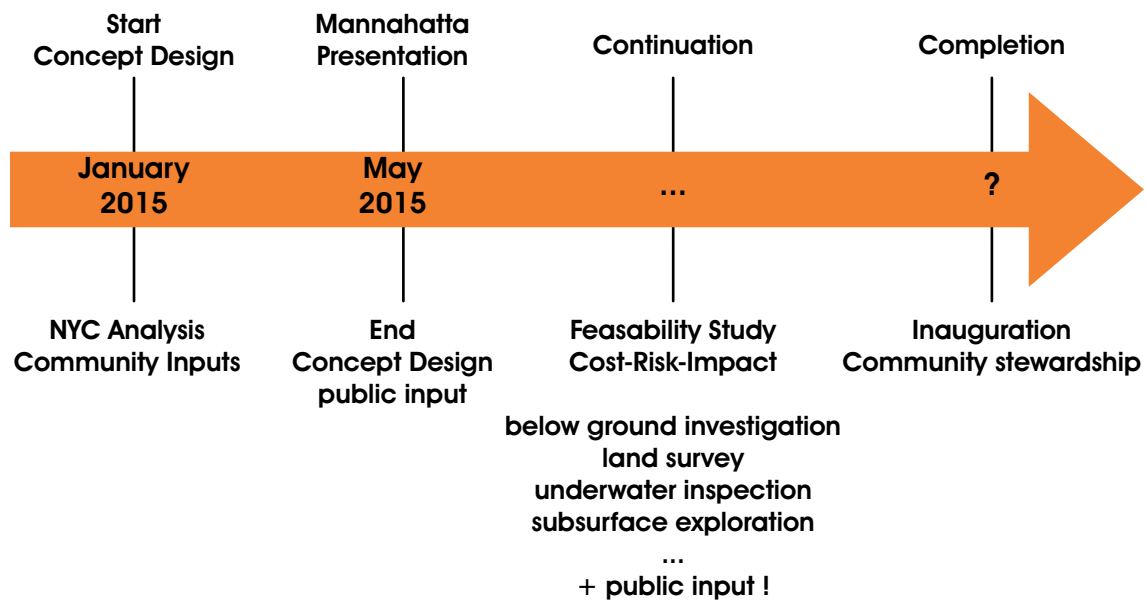


I ❤️ MANNAHATTA



IV. THIS IS NOT THE END

MANHATTA PROCESS



Scope and continuation

Architecture is an iterative process.

Mannahatta project is a unique intervention, which relates to a definite site at a specific time and is connected to a peculiar population.

Mannahatta stops at an early design development stage, but aims at a viable and durable design over time.

It is designed in connectivity and synergy with its environment, connecting with existing circulation routes, ecological areas and social systems, and in accordance to the flooding risk it is facing, to increase the vitality and functionality of the existing built environment.

It engages the public participation early on and throughout the design process if it would have to be continued, to be anchored in the reality. It is an important aspect to encourage the users involvement and to promote community ownership, in order to inspire long-term stewardship of the newly created space.

It is designed for broad appeal and accessibility, as it accommodates expectations from the local community and the projected future residents. Neighborhood demographics can change rapidly over the life of a project, then it is important to understand how the population and the local program needs will shift, so the design can incorporate that change. Mannahatta proposes a flexibility of spaces that can accommodate a variety of uses to evolve as user groups do.

Finally, a continuous survey of the area is a good way to help the design to adapt to the changing population and needs with small urban interventions.

Conclusion

The specific design of Mannahatta relates to the area along the East River waterfront, in-between the Brooklyn Bridge and Montgomery Street in the Lower East Side of Manhattan. However, this project introduces a new strategy in such an urban environment, working with hills and developing a network of dikes in an urban context, a strategy which can surely be implemented elsewhere!

In order to protect an area from storm surges and flooding scenarios using the Mannahatta strategy of a hills network, the site must provide enough free or underused spaces that can easily be transformed and redefined as a dyke. Moreover, in accordance to the site and context's demands and needs, it should be developed in order to provide for more green spaces, sports and recreation areas as well as to host social facilities for the local community and the public.

This Master Thesis has been all about the process. I have learnt a lot during the research, about climate change, global warming, sea level rise, extreme weather scenarios (especially hurricanes). I have learnt a lot during the analysis about New York City, its spatial and political organisation.

Finally, I have learnt the most during the field study, from the day I arrived in NY to the day I departed, thanks to the welcome I received and my implication within the local community groups and different associations of the Lower East Side. I have been involved in many meetings and debates about the inhabitants' organisation and the projects going on in the neighborhood. I was able to witness the struggle many immigrants or low-income residents were facing, how much the LES inhabitants were fighting for their rights at all times in one of the World Eco-

onomy Force as New York City, for affordable accommodation, to have access to cheap, local, and healthy food, to have access to free education for the children and elders, or even to preserve the green spaces from developers and to anchor it in the public domain for everybody to access and use.

All this new knowledge acquired during the process of this new experience has been helping me to cope with the situation at all time.

It helped me to understand the past, where the city of New York comes from and how it has been evolving through the centuries to what it is today, the disasters it has been facing and how New Yorkers have been dealing every time with the situation to recover and grow from it. In the same time, it helped me to face and challenge the future risks Manhattan is facing for the XXIst century, regarding the climate change threats and the rising population in a dense urban fabric. How the ongoing gentrification process of the City will drive poorer population afar from the City to make space for the richer. How hard we must keep fighting to prevent catastrophe scenario and protect the population, to rise inhabitants awareness towards the climate change risk and how to react if a disaster comes to happen again.

The local community groups in the Lower East Side (LESready) are an essential key to the puzzle in the way that they are very active, they rally and connect the different levels in the city organisation, from the residents to the municipality and the design professionals in order to help develop the city in the right direction, making sure everybody's rights will always be respected.

I will conclude this Master Thesis work saying that we should continue developing projects that will allow us to live in a safe world where human rights are respected and where we could closer to our natural environment. We must design cities that are welcoming to everybody and able to cope with future natural threats.

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Glossary

AIANY: American Institute of Architects New York
BIG: Bjarke Ingels Group
CB: Community Board
CD: Community District
DYCD: Department of Youth and Community Development
EIA: Energy Information Administration
EPS: Expanded Polystyrene (foam)
FDR: Franklin Delano Roosevelt
FEMA: Federal Emergency Management Agency
GOLES: Good Old Lower East Side
HUD: Housing and Urban Development
IPCC: Intergovernmental Panel for Climate Change
LES: Lower East Side
LESEC: Lower East Side Ecology Center
LES READY: Lower East Side Ready
MoMA: Museum of Modern Art
MTA: Metropolitan Transportation Authority
NYC: New York City
NYCHA: New York City Housing Authority
NYS: New York State
OUR: Organizing and Uniting Residents
RBD: Rebuild by Design
SIRR: Special Initiative for Rebuilding and Resiliency
UN: United Nations
UNEP: United Nations Environment Programme
USA: United States of America
WMO: World Meteorological Organization

In relation to the climate change challenges and the hurricane Sandy that hit the city of New York in 2012, this Master Thesis Project aims at transforming the East River waterfront to reach urban and social resilience, in the Lower East Side of Manhattan.

Based on a detailed analysis and in dialogue with local associations and residents, to anchor the project in the reality of lifestyles and existing needs, the design will protect the City and its community and enhance the public realm.

| **climate change** | **Sandy** | **resilience** | **community** | **New York City** |

CHALMERS

