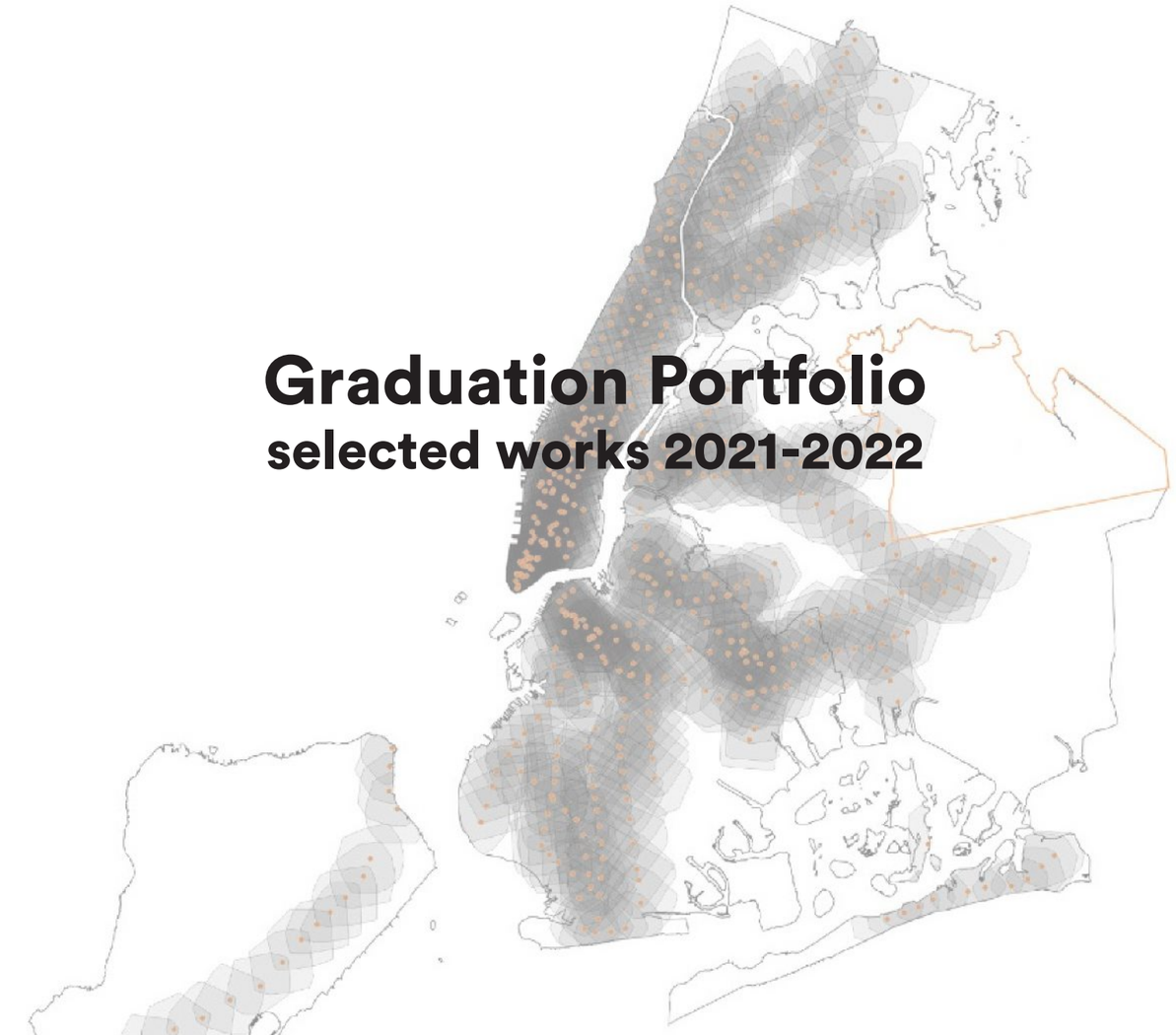

Graduation Portfolio
selected works 2021-2022

SIYU LEI

MSAUD, Class of 2022

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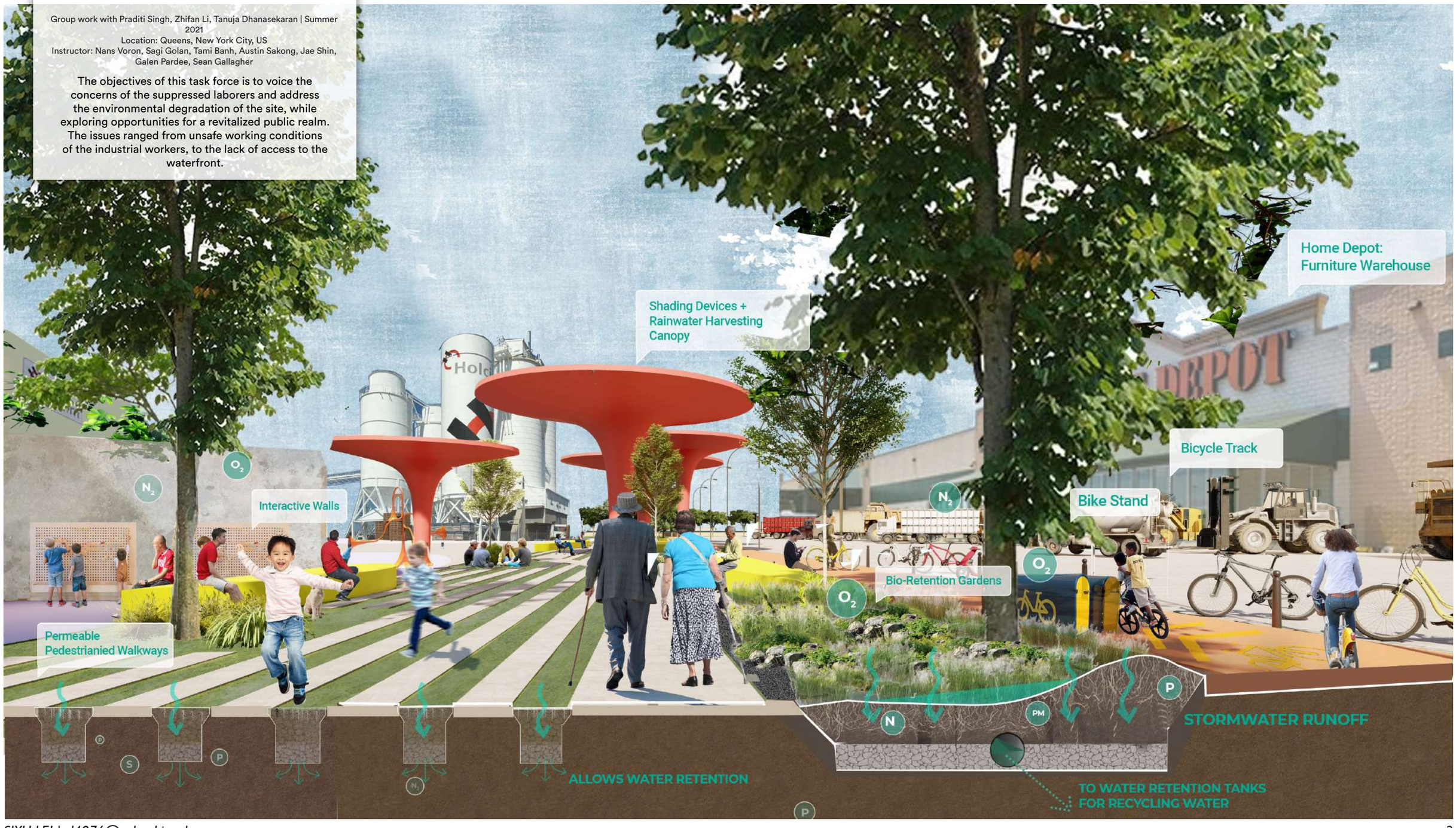
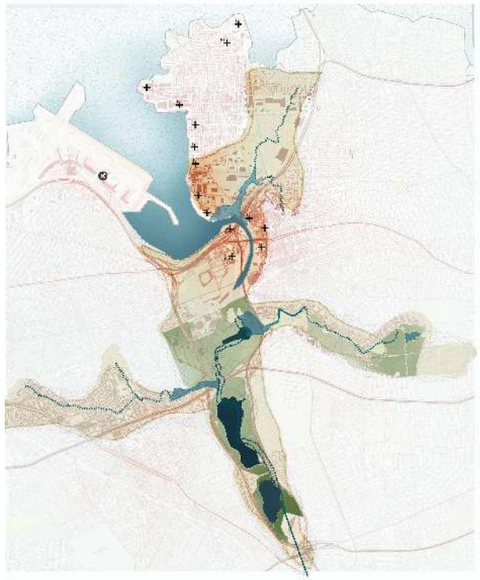
[1] Sponge city - Reimagine Flushing Waterfront

Group work with Praditi Singh, Zhifan Li, Tanuja Dhanasekaran | Summer 2021
Location: Queens, New York City, US
Instructor: Nans Voron, Sagi Golan, Tami Banh, Austin Sakong, Jae Shin, Galen Pardee, Sean Gallagher

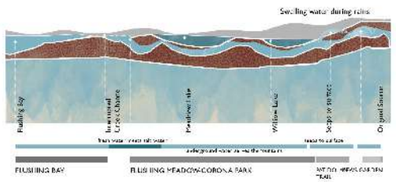
The objectives of this task force is to voice the concerns of the suppressed laborers and address the environmental degradation of the site, while exploring opportunities for a revitalized public realm. The issues ranged from unsafe working conditions of the industrial workers, to the lack of access to the waterfront.

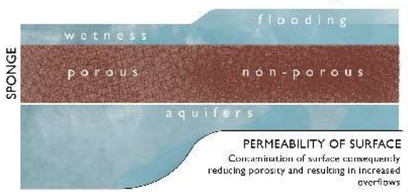


Site Analysis



ECOLOGY OF FLUSHING CREEK | expanse of orignal wetlands and buried creek





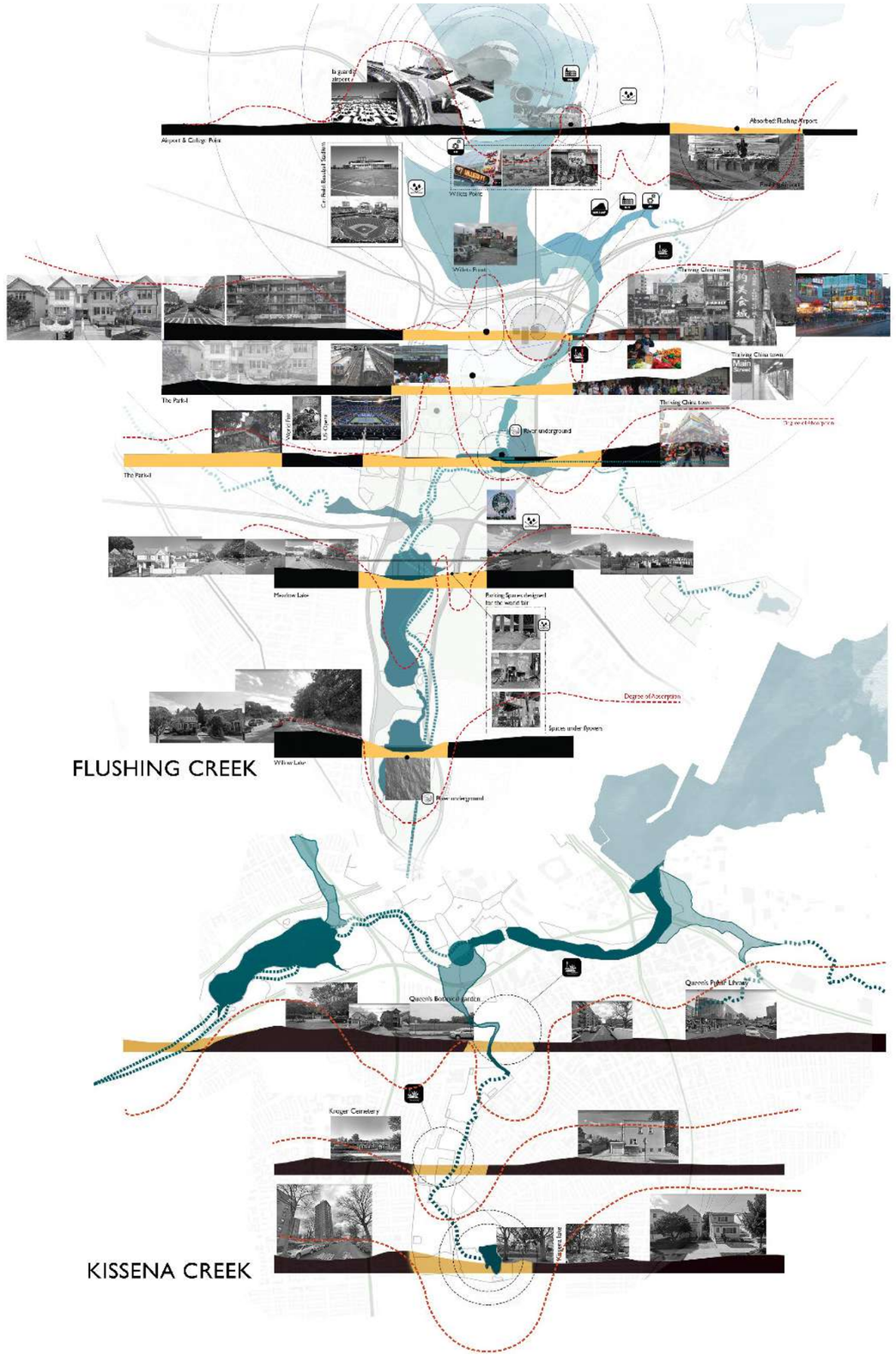
JOURNEY OF FLUSHING CREEK | CONCEPTUAL SECTION

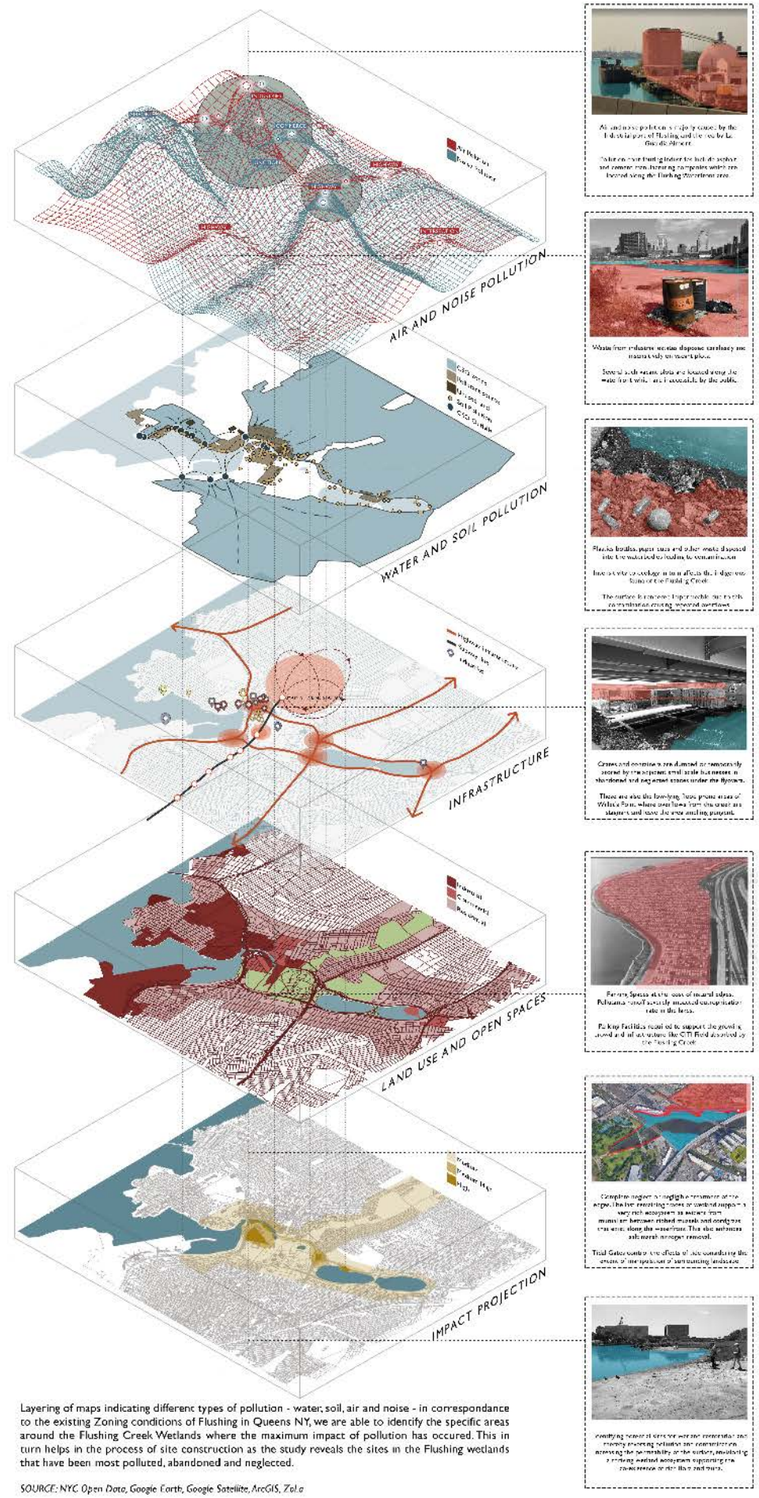
ECOLOGICAL SPONGE

Throughout its history, while Flushing has been a 'sponge' for diverse factors ranging from social, economical to ecological ecosystem - its growth has taken place under the shadow of ecological neglect. We intend to study the role of this 'sponge' and the layers contributing to its neglect - consequently identifying regions where these layers overlap the most.

- Communities
- Businesses
- Recreational Events
- Pollutants
- Sewage
- Water

CITY AS A SPONGE





Layering of maps indicating differenc types of pollution - water, soil, air and noise - in correspondance to the existing Zoning condicions of Flushing in Queens NY, we are able to identify the specific areas around the Flushing Creek Wetlands where the maximum impact of pollution has occured. This in turn helps in the process of site construction as the study reveals the sites in the Flushing wetlands that have been most polluted, abandoned and neglected.

SOURCE: NYC Open Data, Google Earth, Google Satellite, ArcGIS, Total

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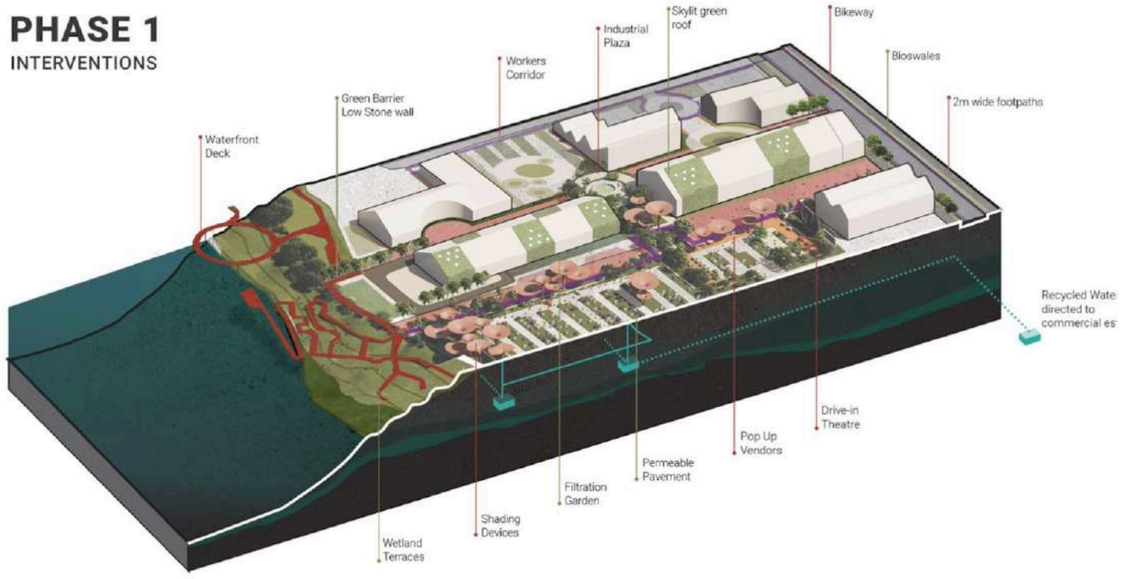
PHASE 1
INTERVENTIONS



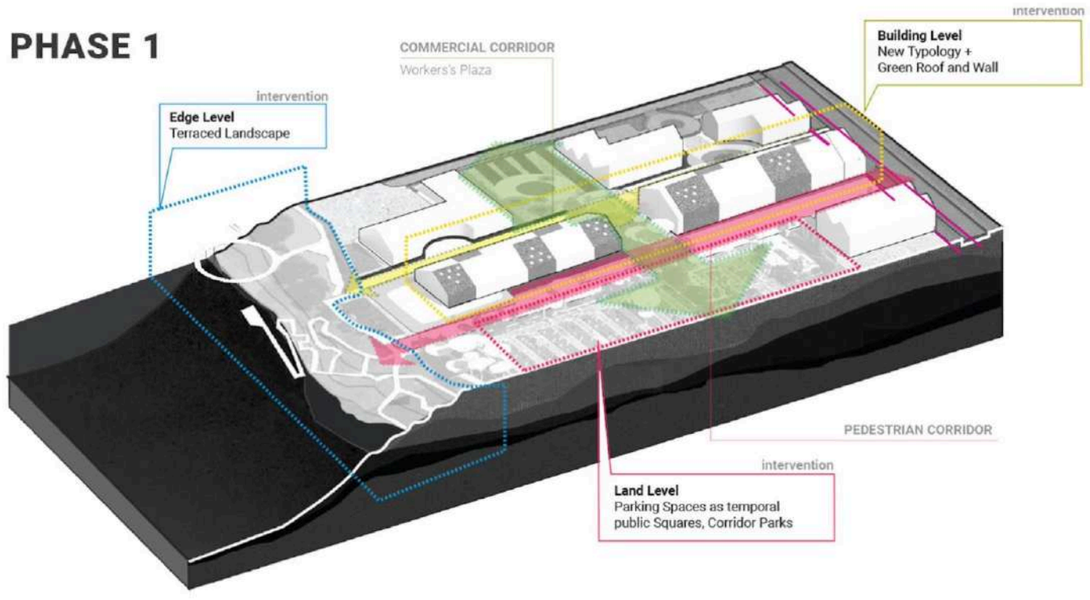
Community Parks
Utilisation of blocks
Available Land
Improve Green infrastructure coverage and network

Green Facade
Roof Greening +Skylights
Vertical Greening
Increase 3D greening of site

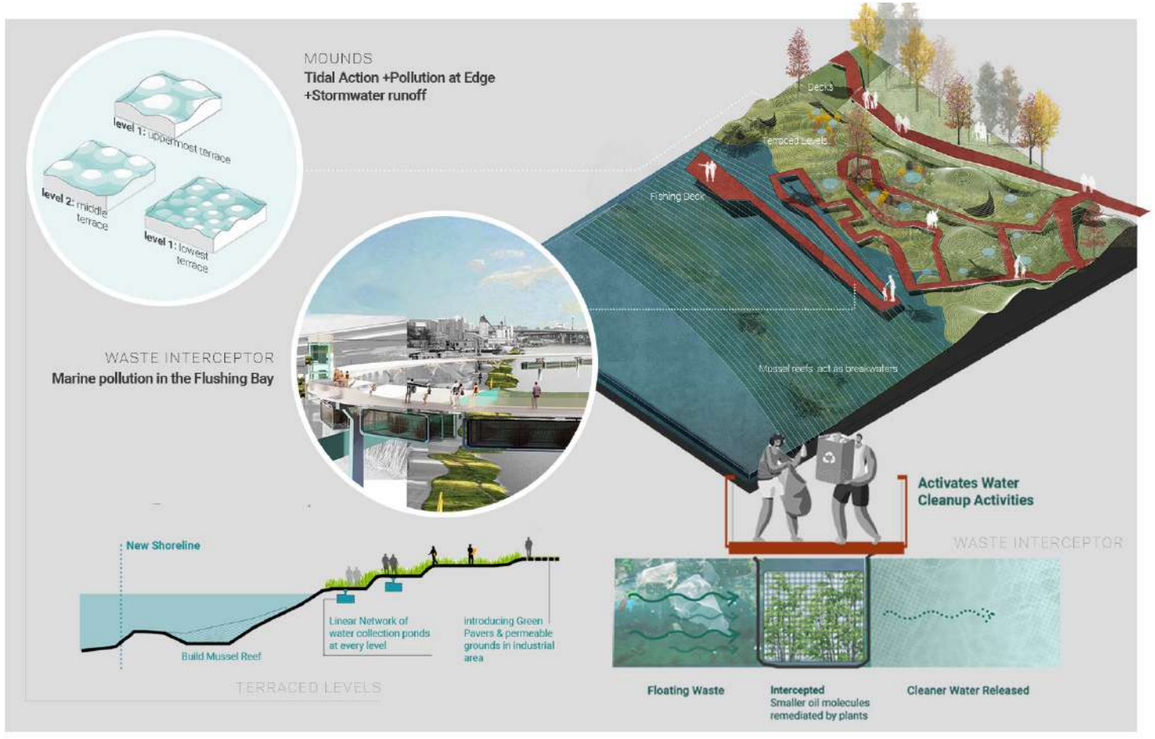
Green Corridor
Continuous Green Corridor
Connects adjacent green patches

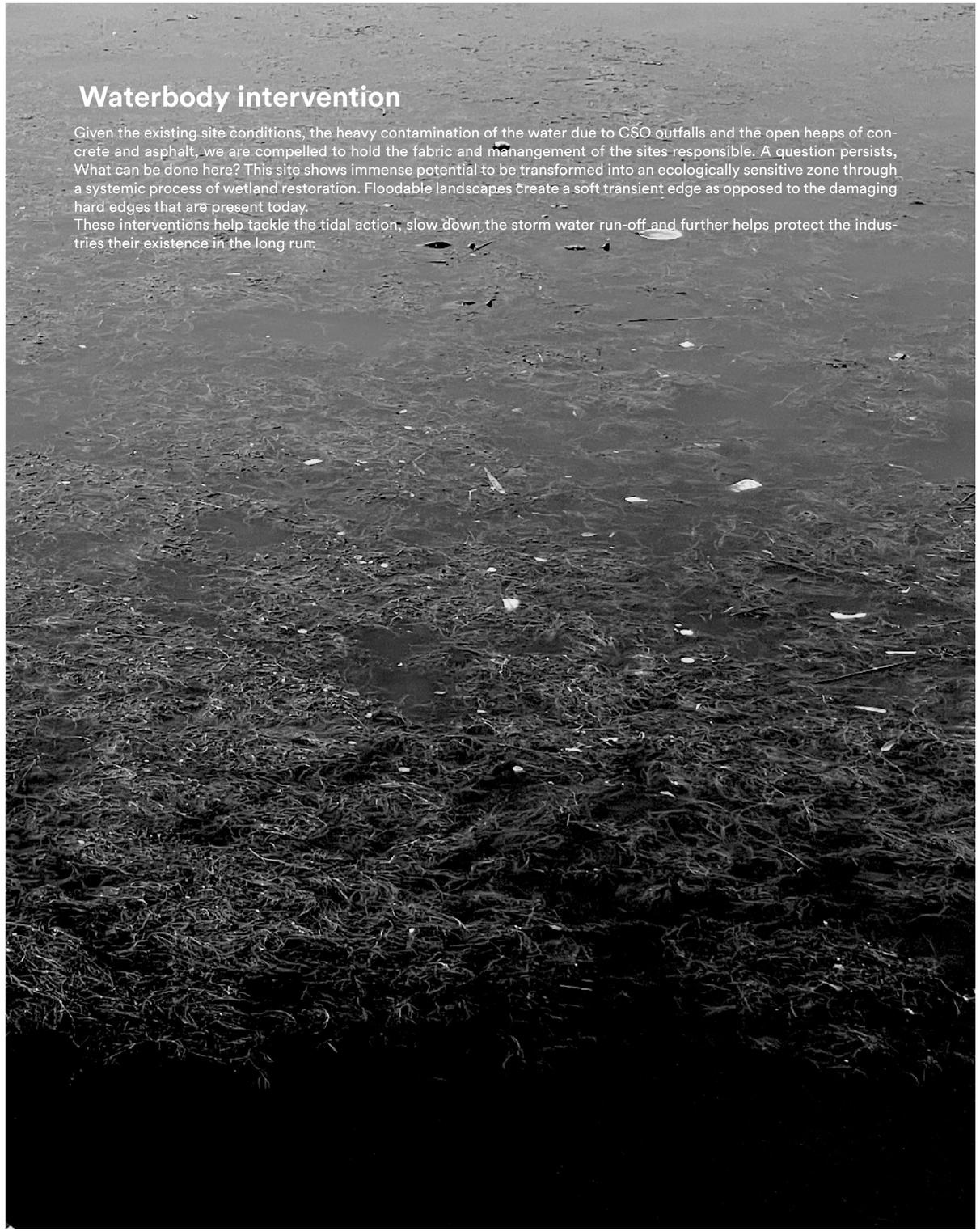
Community Participation
Collaboration with schools and neighbourhoods in urban greening and Green infrastructure

PHASE 1



LEVELS OF INTERVENTION

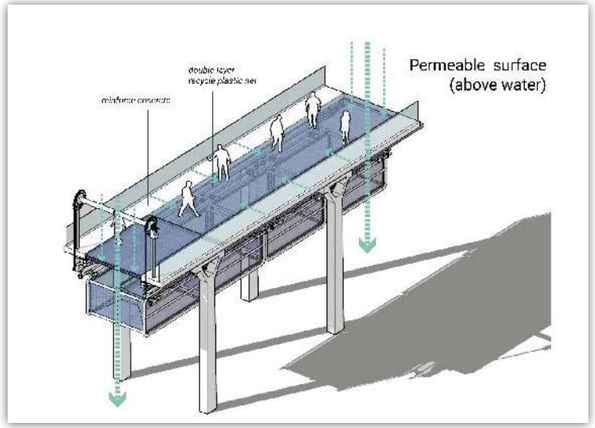


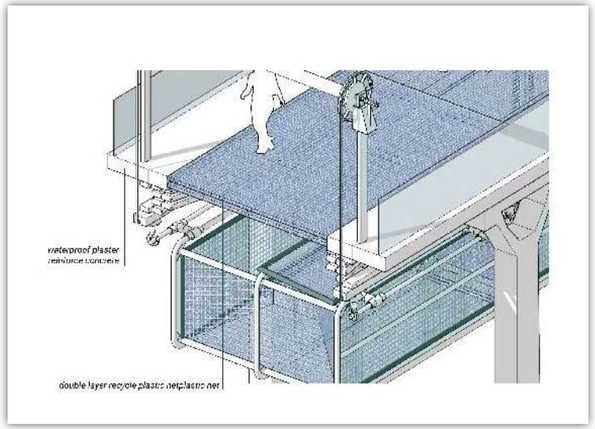


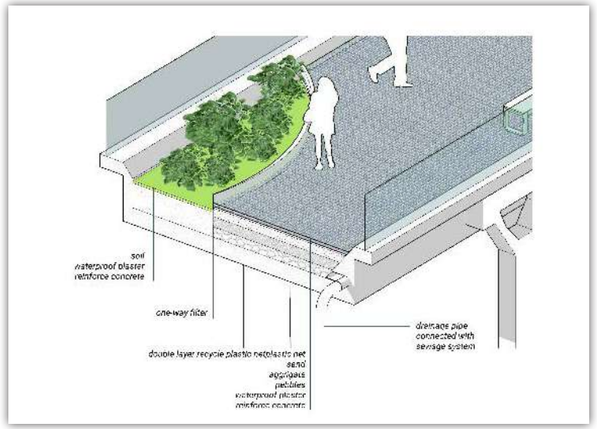
Waterbody intervention

Given the existing site conditions, the heavy contamination of the water due to CSO outfalls and the open heaps of concrete and asphalt, we are compelled to hold the fabric and manangement of the sites responsible. A question persists, What can be done here? This site shows immense potential to be transformed into an ecologically sensitive zone through a systemic process of wetland restoration. Floodable landscapes create a soft transient edge as opposed to the damaging hard edges that are present today.
These interventions help tackle the tidal action, slow down the storm water run-off and further helps protect the industries their existence in the long run.

Biofilter Bridge

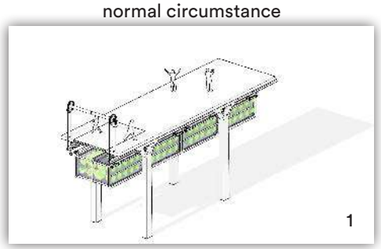




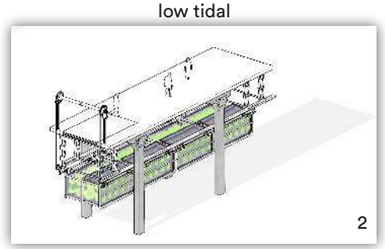


Working Steps of Biofilter Bridge

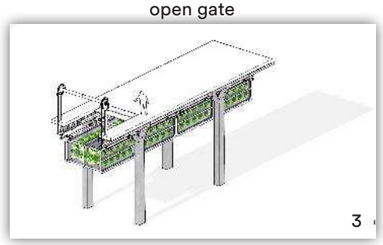
normal circumstance



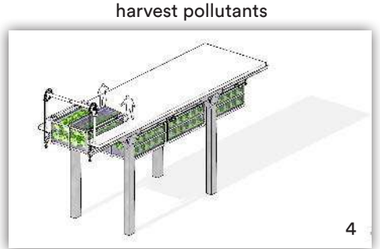
low tidal



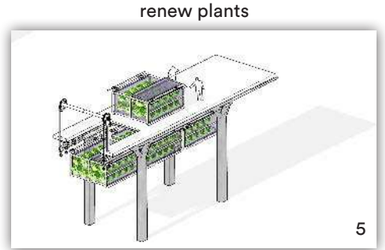
open gate



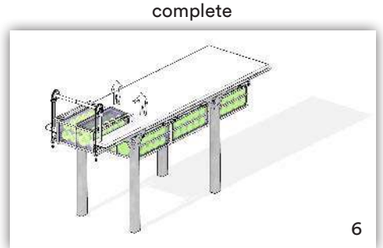
harvest pollutants



renew plants



complete



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Industrial Plaza

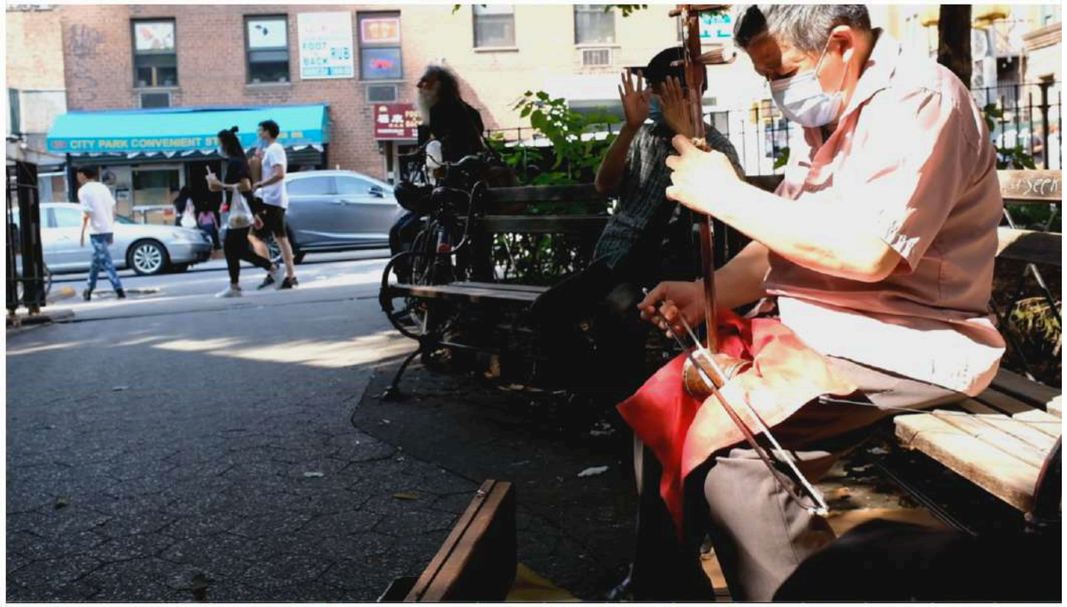
The issues of accessibility raised by the residents of Flushing was evident. The industrial edge physically disconnects the people from the waterfront. The entire fabric is automobile and heavy vehicle centric, discarding the pedestrian needs. You raised concerns about how we do not know what happens beyond these industrial edge, on the other side of College Point boulevard and that you would like to have access to the waterfront. This identified potential, addresses just that. A series of connected corridor parks will allow the public to access the waterfront through the industrial zone. To enable this, large parking areas show the scope to be transformed into a temporally active community spaces. Our observation was that the way an industrial worker interacts with this site is different from the way a common person does. While the workers are much closer to the waterfront, they are neither able to see nor access it. The strenuous working conditions make it hard for them to relax during their break time due to lack of resting areas.

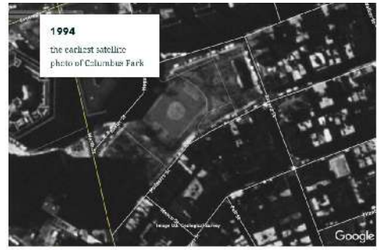
[2] Reading New York Urbanism

Individual work | Summer 2021
Location: Columbus Park, New York, US
Instructor: Cassim Shepard

Built in 1911, Columbus Park locates at the southwest corner of Chinatown in Manhattan, New York. Since the construction of the park, it has been demonstrating the contradiction and compromise between the needs of the community and the intention of the authority. At the beginning, people were even not allowed to walk on the grass, and now, non-profit organizations are founded in the community spontaneously to fight for their own rights concerning the construction and maintenance of the park.

storymap link: https://storymaps.arcgis.com/stories/c2c3b1abff504c2d91d151bab5246946





1896 and before

The land that Columbus park was built on was once America's first slum called Five Points neighborhood before **1896**.

1897

In **1897**, Mulberry Bend Park opened with fences prohibiting people from walking on the grass.

1911

In **1911**, the open space once known as "Paradise Park", then "Murderer's Alley", then "Mulberry Bend", is renamed "Columbus Park".

1930-1939

In the **1930s**, when the Great Depression hits and the Works Progress Administration erects a limestone recreation center, the vendors are kicked out. Fences go up one by one, which still exists today.

1965

Due to the Immigration and Nationality Act of **1965**, which allows many more asian immigrants into the country, the population of Chinatown increased dramatically.

2001

In **2001**, a conference was held to bring public awareness of the horrible conditions of the columbus pavilion neglected by the public in Columbus Park

2002

In January of **2002**, Friends of Columbus Park is founded as a not for profit organization based in NY Chinatown, Manhattan. Friends of Columbus Park organize activities to address the problem of decaying conditions of the park facilities. In **May of 2002**, NY Chinatown residents supported NYC Parks efforts in applying for the UPARR grant for the restoration of the Columbus Park, which was awarded in May of 2002.

2005

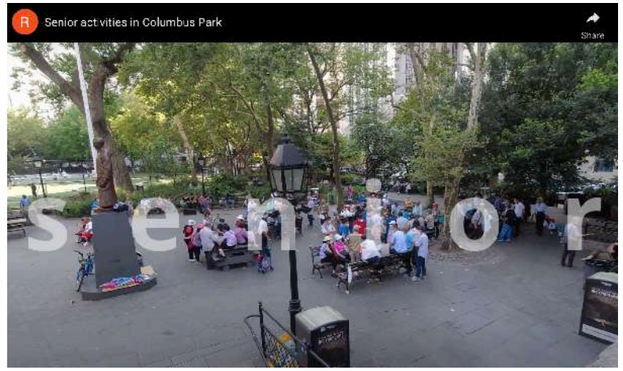
In **early 2005**, columbus park was redesigned with a triad of public space that includes athletic playing fields, an intimate tree-filled square, and a restored multi-use pavilion. In **October 2005**, the reconstruction of columbus park finished.

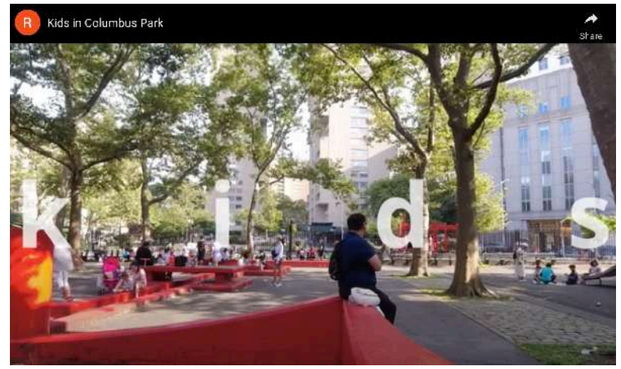
2019

In **2019**, after 8-years negotiation, the plaza in Columbus park was renamed as Dr. Sun Yat-sen Plaza. And the statue of Sun Yat-sen is placed in the center of the plaza permanently.

2021-

Nowadays, Columbus park serves as a recreational space for multi-age groups from the nearby neighborhood, as well as a popular spot for Chinese seniors throughout the whole New York city to gambol and play cards together.

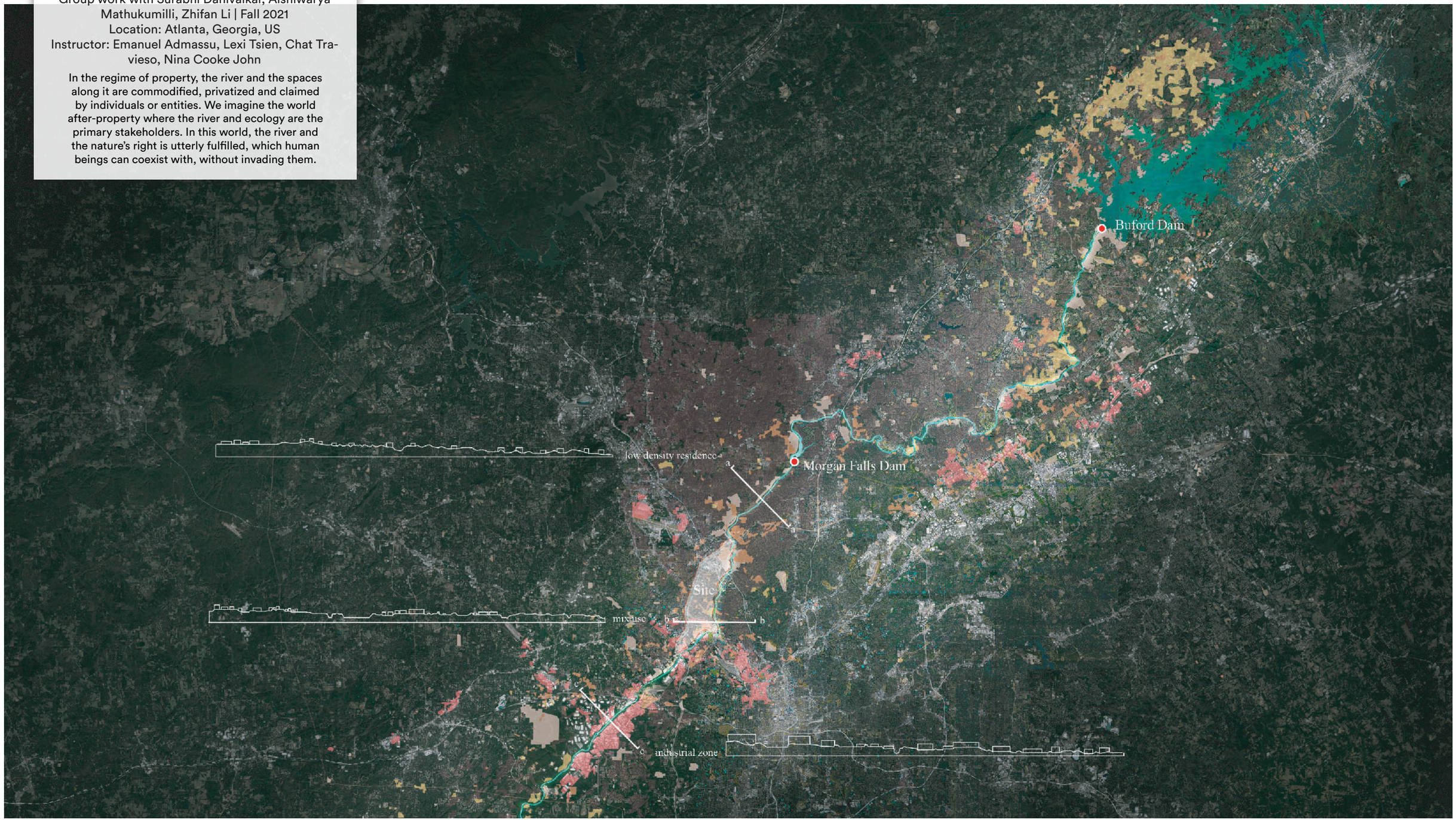


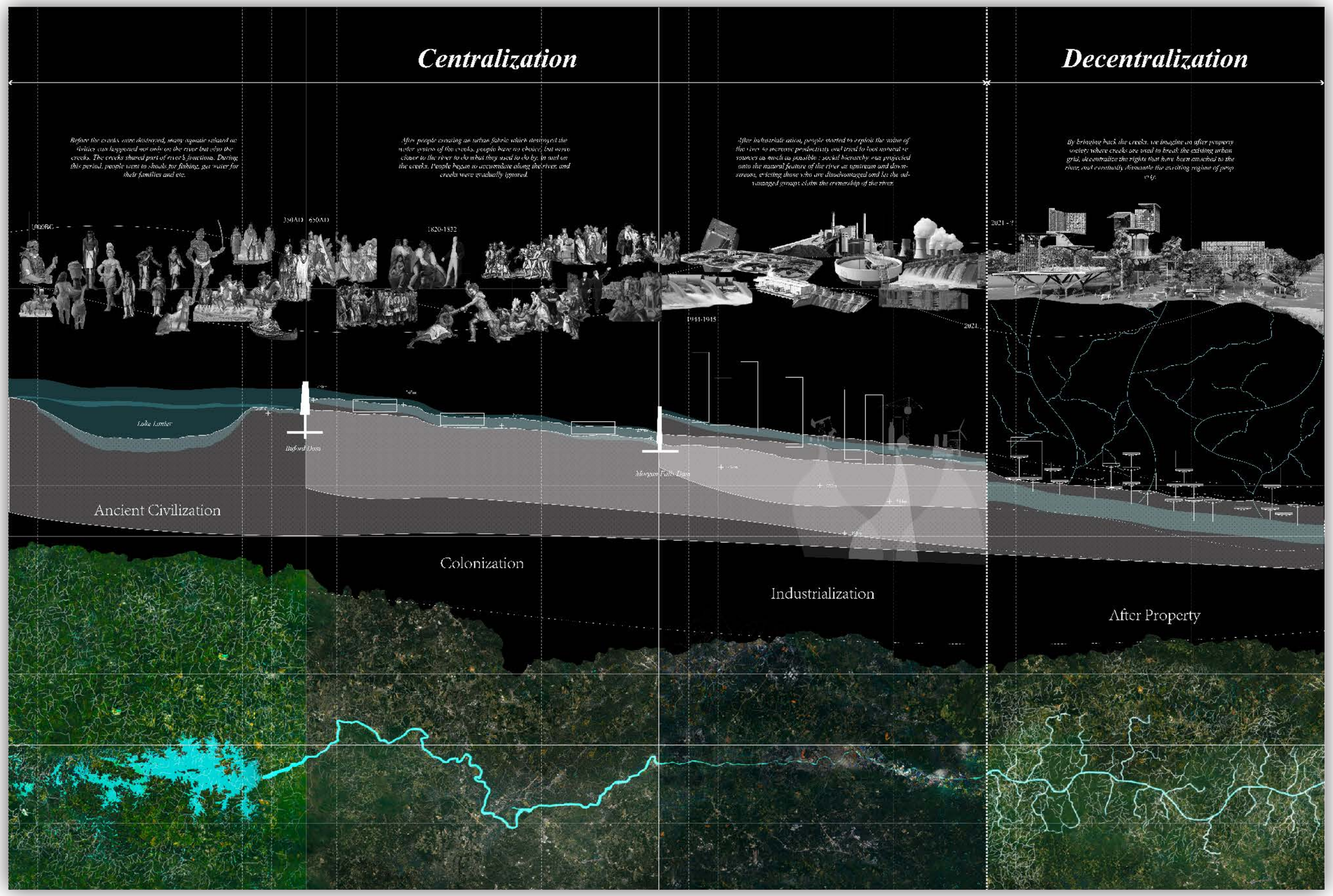


[3] Decentralize the Chattahoochee River

Group work with Surabhi Dahivalkar, Aishiwarya Mathukumilli, Zhifan Li | Fall 2021
Location: Atlanta, Georgia, US
Instructor: Emanuel Admassu, Lexi Tsien, Chat Travieso, Nina Cooke John

In the regime of property, the river and the spaces along it are commodified, privatized and claimed by individuals or entities. We imagine the world after-property where the river and ecology are the primary stakeholders. In this world, the river and the nature's right is utterly fulfilled, which human beings can coexist with, without invading them.



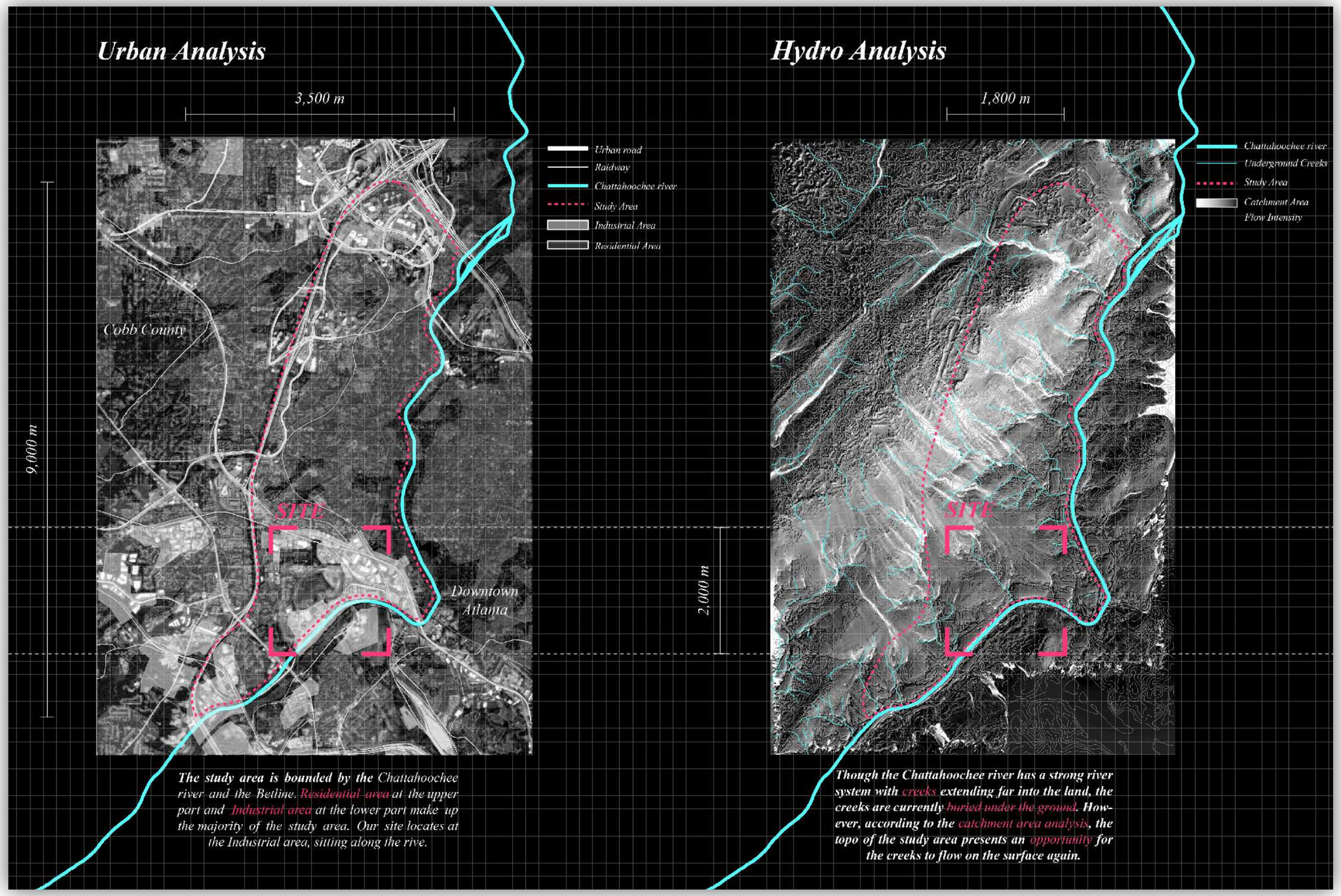


Centralization vs Decentralization

Private family homes, Factories and Electricity-generating dams centralized the river, commodifying, privatizing and claiming the Chattahoochee river.

In the regime of property, the river and the spaces along it are commodified, privatized and claimed by individuals or entities. We imagine the world after-property where the river and ecology are the primary stakeholders. In this world, the river and the nature's right is utterly fulfilled, which human beings can coexist with, without invading them.

Throughout history, from ancient civilization, colonization and industrialization, the fabric created had affected and damaged the flow and changed the width of the river and creeks.
As a response to this, we imagine a world after property with a new fabric brought back by the creeks, using these creeks to break the existing urban grid, decentralizing the rights that have been attached to the river, and eventually dismantling the existing regime of property.



Site Analysis

To keep the sanctity of the northern region, the accumulation of the sewage and water treatment plants are strategically positioned at this line of segregation, carrying the pollutants and waste material to the southern area with the downward flow of the river. Environmental and Social injustice is evident with the high health risk from cancer in this area and at this point of divide.

The study area is bounded by the Chattahoochee river and the Beltline. Residential area at the upper part and industrial area at the lower part are the majority landuse of the study area. Our site is located at the industrial area, sitting along the river. Though the Chattahoochee river has a strong river system with creeks extending far into the land, the creeks are currently buried under the ground. However, according to the catchment area analysis, the topo of the study area presents an opportunity for the creeks to flow on the surface again.

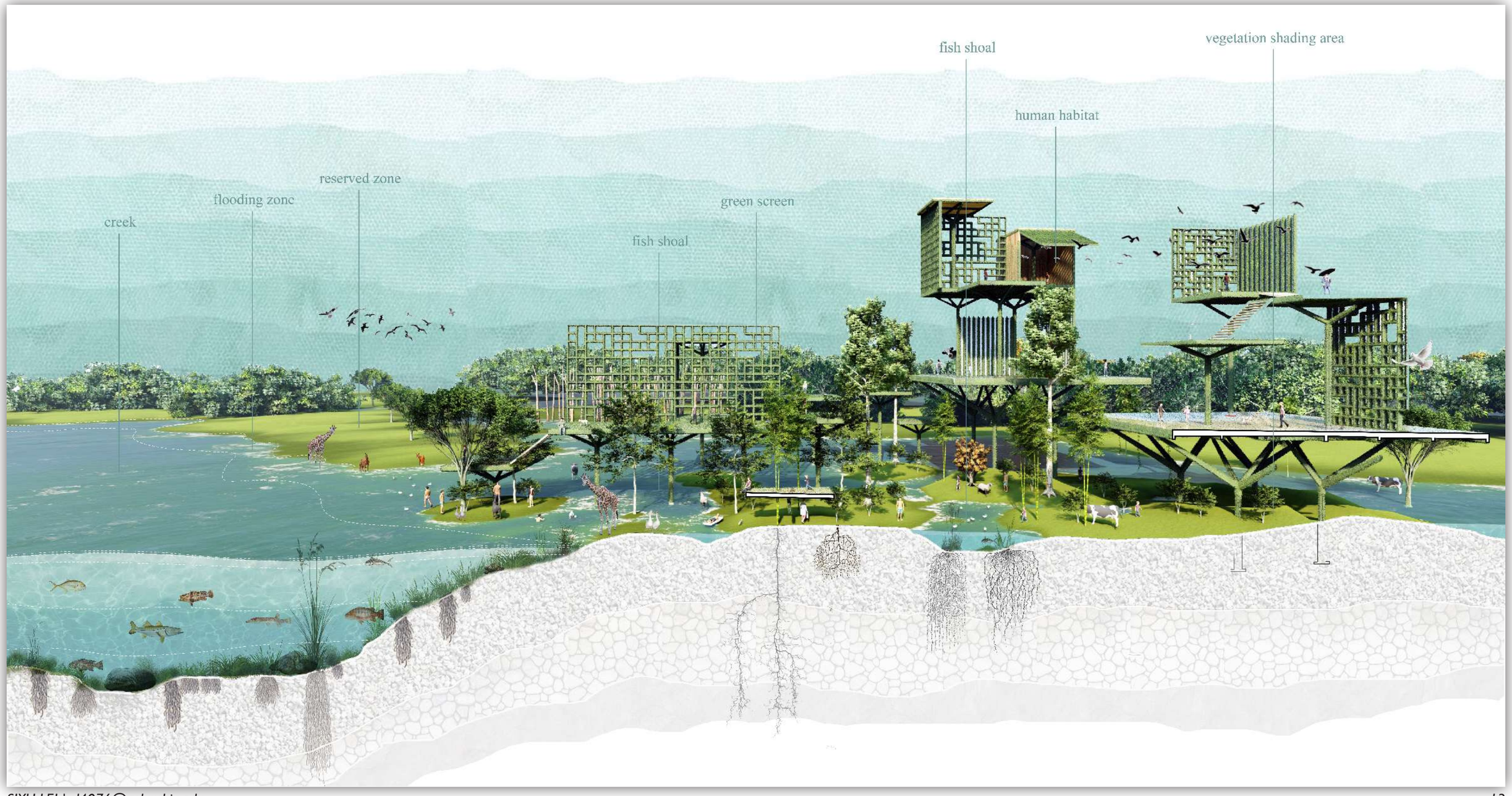
Zoom in to our site, the railway on the east part is segregating the community from the upper part and the lower part; with the residential area at the east part privatizing the creeks' flowing area; the warehouse commodifying the land; and the coal burning plant claiming and polluting the river.

Multi-scale interventions

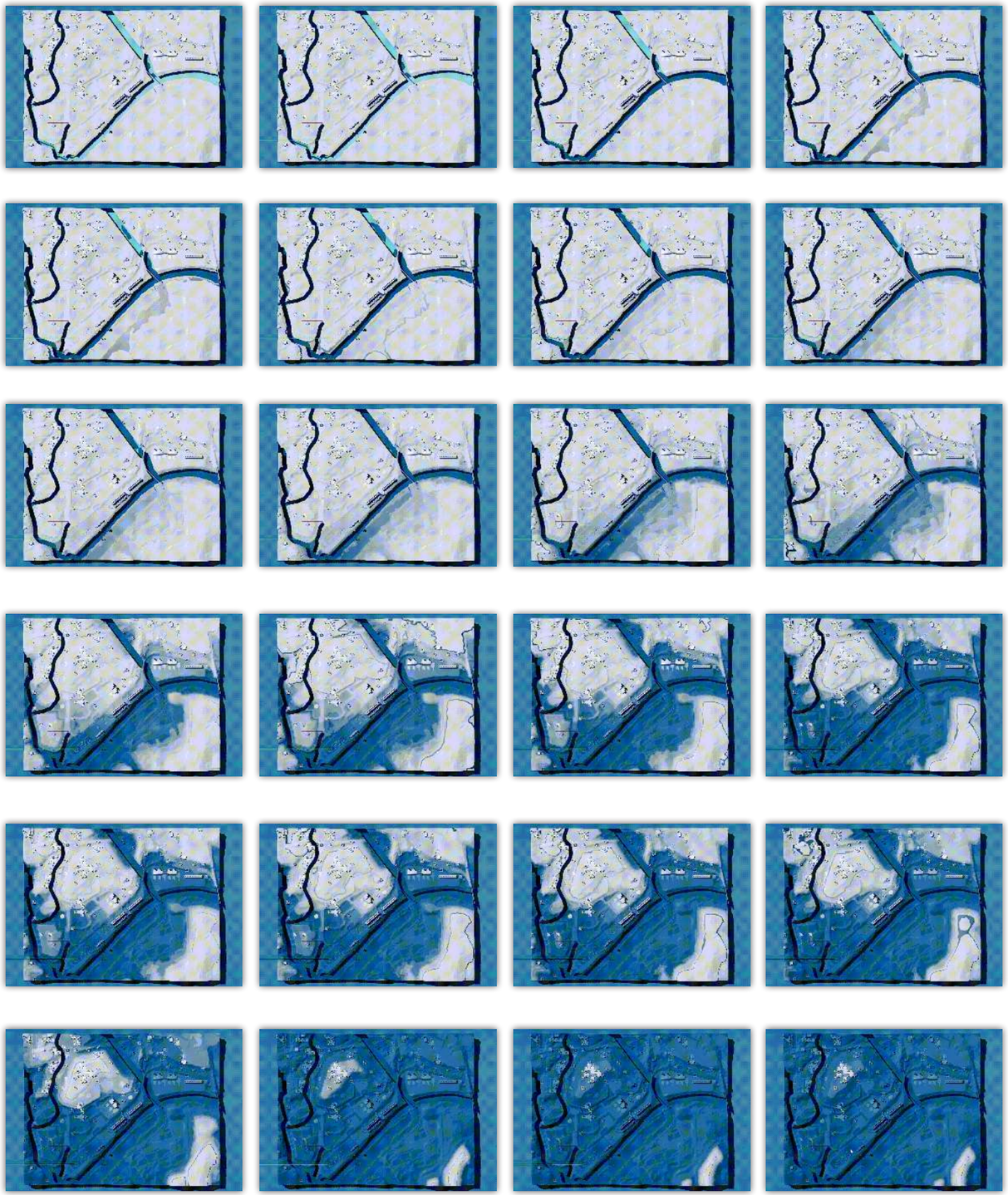
We proposed 4 different scaled interventions, which are breaking the infrastructure, connecting communities, removing and preserving part of the industry and finally, add and dissolve the modules into the landscape. Our concept is to break the existing urban grid, and create a new organic fabric with diverse connections by bringing back the creeks.
The buffer next to the water system is designed as the floodable territory of the creek and the river. It is simply and purely for ecological rejuvenation, for purification of water and biodiversity.
Through these systems of buffers, we want to bring back WHAT WAS. These zones will have communal activities through a flexible landscape which facilitates the expansion and contraction of the water system through climate change
The land then created, where people build their structures, have no permanent ownership here, only - temporary leasing of the structure built on this common land. Where the relationship of humans to property is questioned. By breaking the boundary of the belt line and railroad, we emphasize the existence of the creeks, and add more train stations in our site to connect the communities once segregated by the railroad.

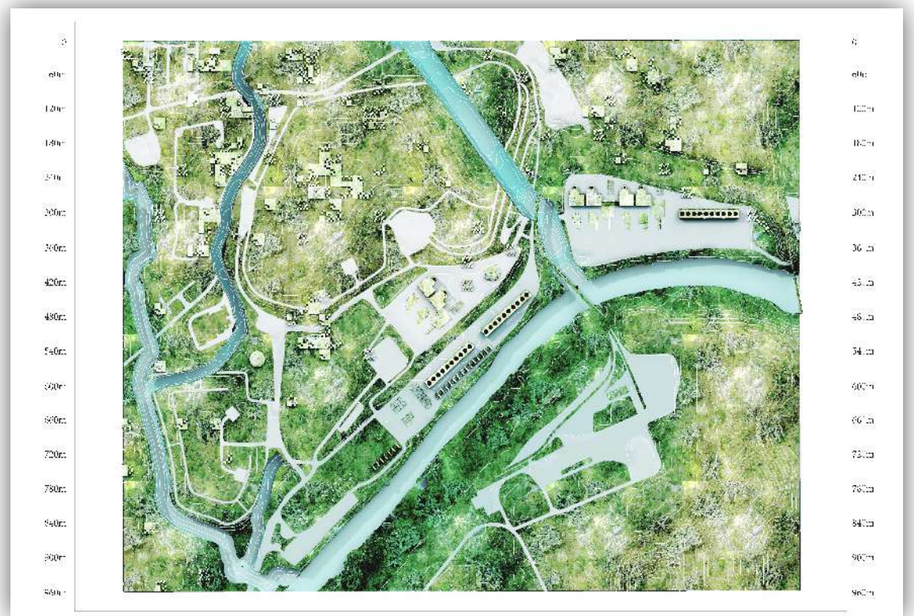
Perspective Section

From this section, animals, vegetation and humans co-exist in different levels of the structure. Humans are no longer the dominant factor of the structures built, on the contrary, they give ways to the growth of water, trees and animals. As tidal changes, the function of each module will also change accordingly. Spaces close to water will gradually be occupied by nature, becoming the habitats for aquatic animals or plants. Timber beams and frames, which are collected and refurbished from the existing neighborhood are used for the construction of the basic structure. This structure not only offers a conventional living space for human beings but, most importantly, it provides shading spaces for young trees and aquatic animals, so the trees can grow slower and stronger, aquatic animals can hide from extreme sun light and thus the whole ecology system becomes more resilient to extreme weather conditions. The new structures built would be able to nourish ecology where humans coexist with nature. The structures will primarily house flora and fauna whilst also being homes for people. They blend into the landscape, leaving a minimum footprint. The buffer, primarily for the sanctity of the river, also serves as an access to people.



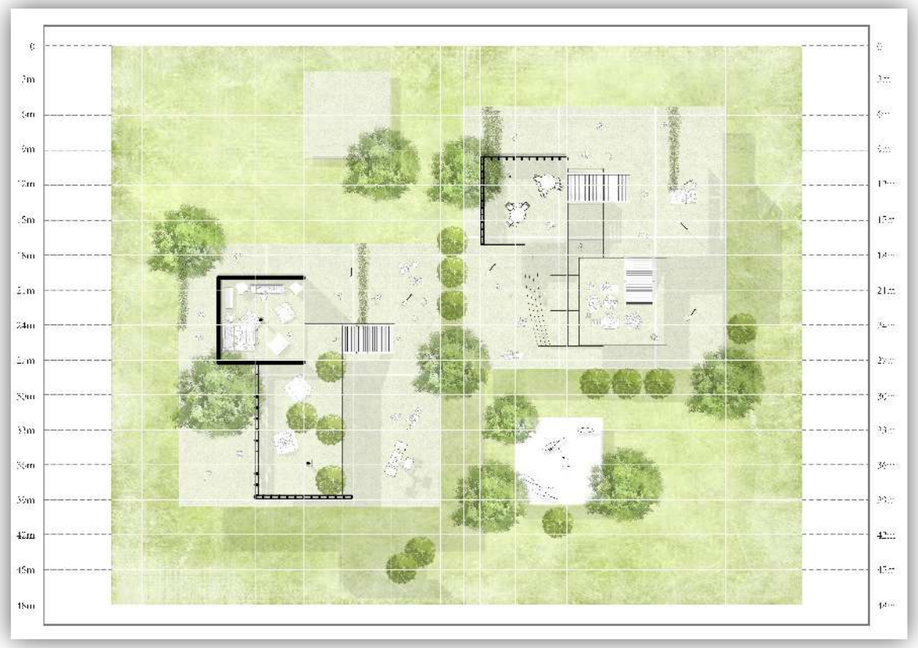
100-year Flooding Analysis





Master Plan

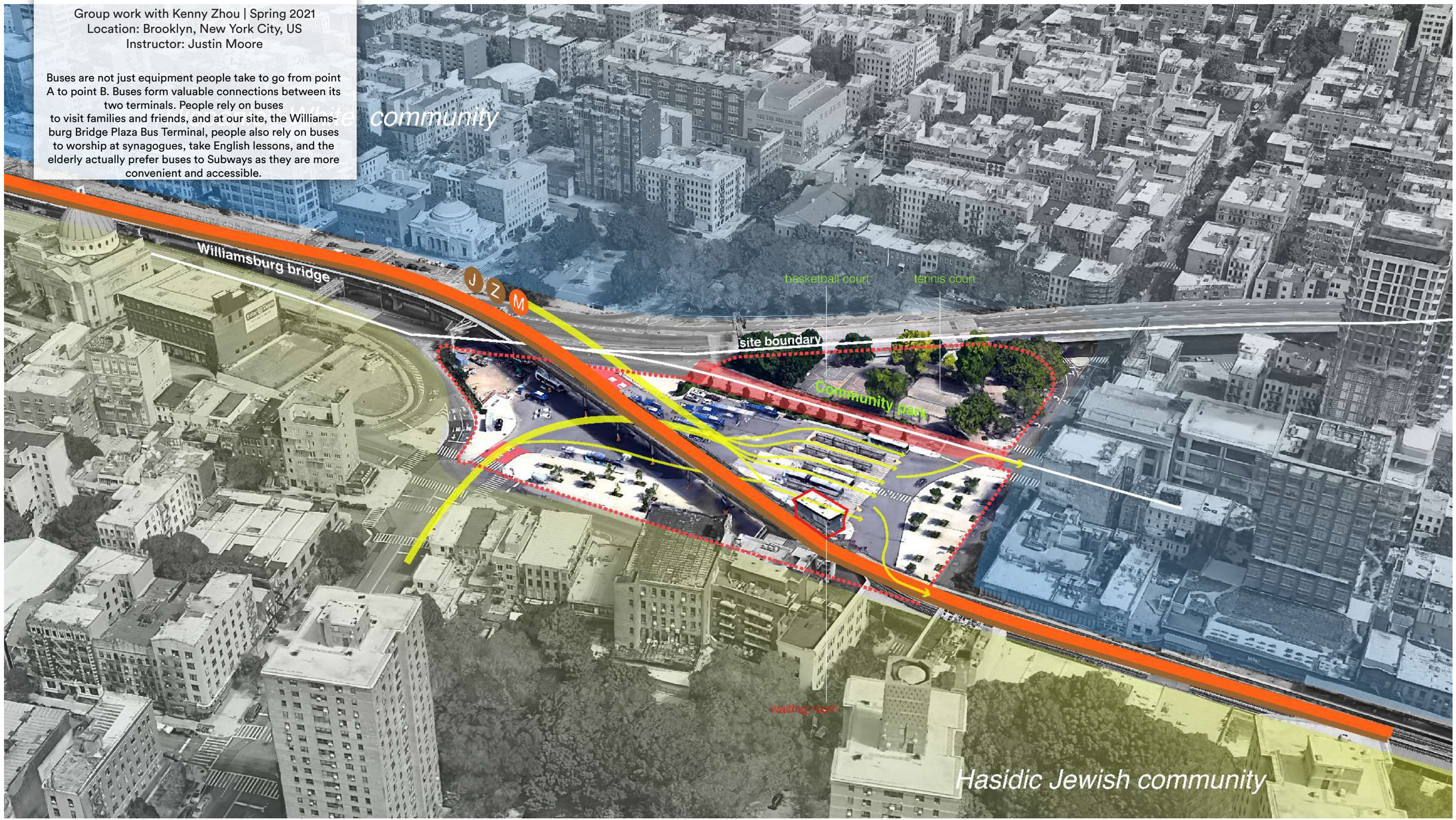
Floor Plan



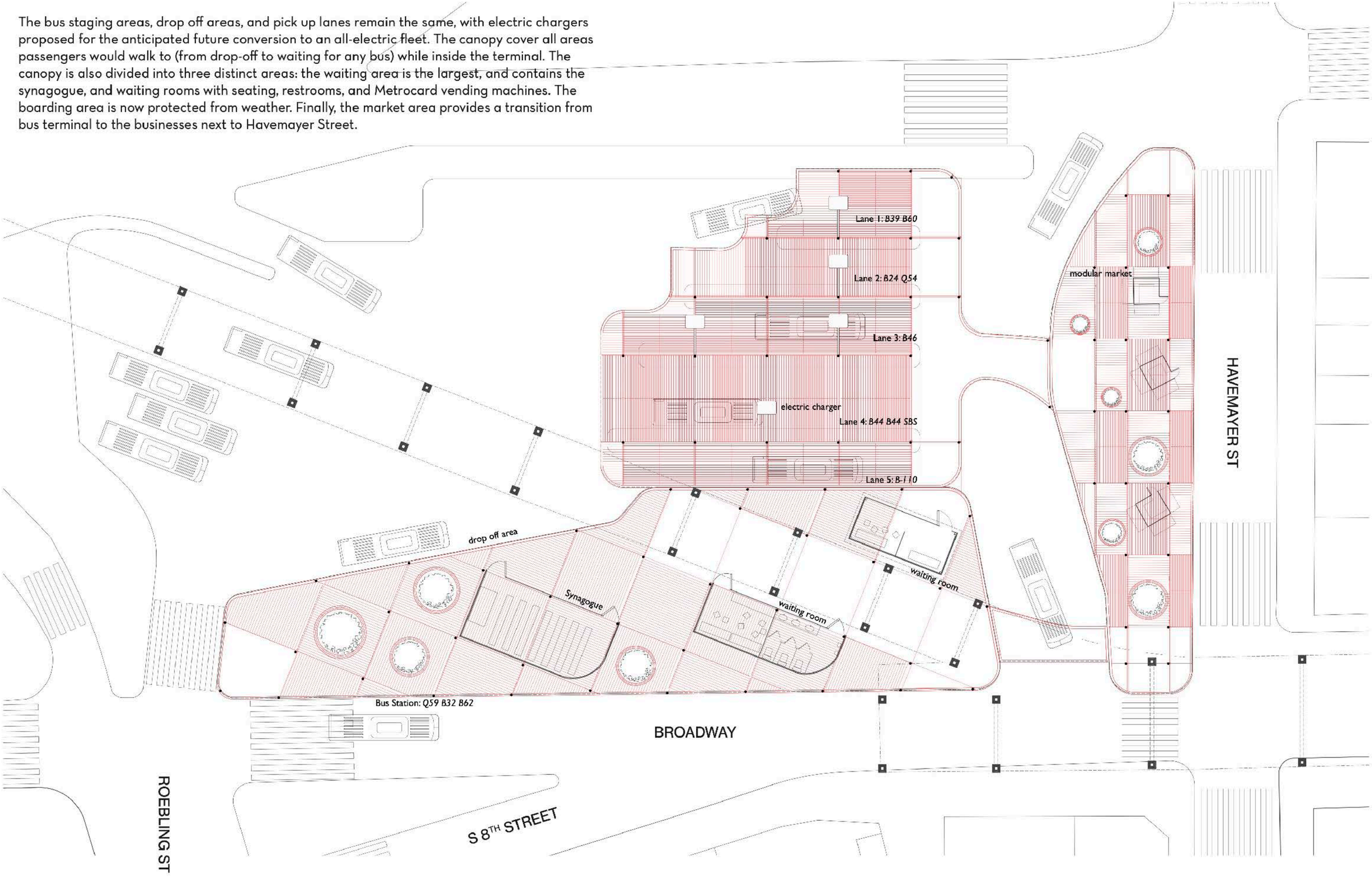
[4] Williamsburg Bus Terminal Renovation

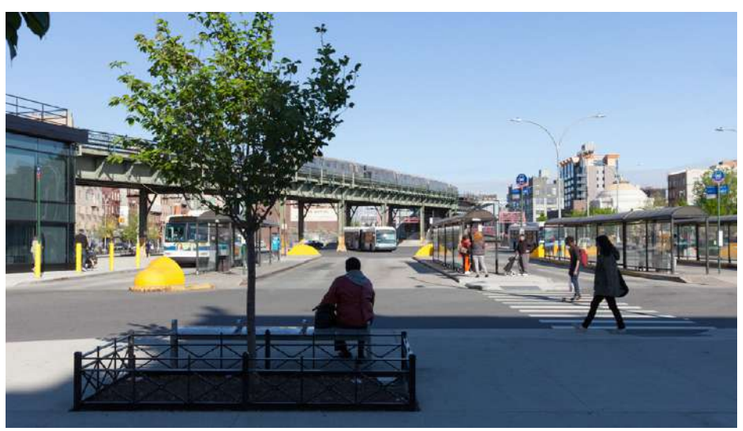
Group work with Kenny Zhou | Spring 2021
Location: Brooklyn, New York City, US
Instructor: Justin Moore

Buses are not just equipment people take to go from point A to point B. Buses form valuable connections between its two terminals. People rely on buses to visit families and friends, and at our site, the Williamsburg Bridge Plaza Bus Terminal, people also rely on buses to worship at synagogues, take English lessons, and the elderly actually prefer buses to Subways as they are more convenient and accessible.



The bus staging areas, drop off areas, and pick up lanes remain the same, with electric chargers proposed for the anticipated future conversion to an all-electric fleet. The canopy cover all areas passengers would walk to (from drop-off to waiting for any bus) while inside the terminal. The canopy is also divided into three distinct areas: the waiting area is the largest, and contains the synagogue, and waiting rooms with seating, restrooms, and Metrocard vending machines. The boarding area is now protected from weather. Finally, the market area provides a transition from bus terminal to the businesses next to Havemayer Street.





Current Williamsburg bridge plaza bus terminal. Image: Elizabeth Felicella for MNLA Landscape Architects.

Electrical charging equipment is mounted for every bus lane. The pedestrian crossing is painted in yellow on the ground and is shielded from weather by a connecting segment of the canopy linking the market and the boarding areas.

Current Williamsburg bridge plaza bus terminal. Image: Elizabeth Felicella for MNLA Landscape Architects.

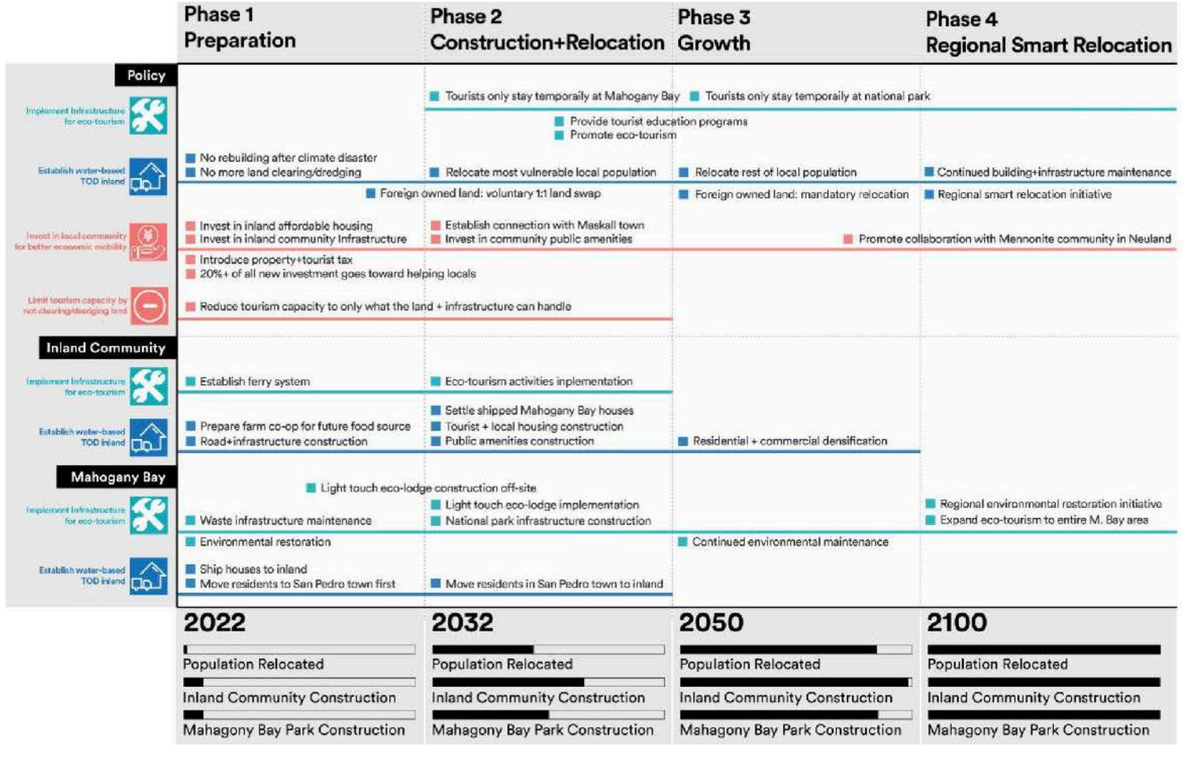
This view shows the small synagogue in the terminal for the Hasidic community. Clear directional signage point to riders exactly where they need to go to complete their trips.

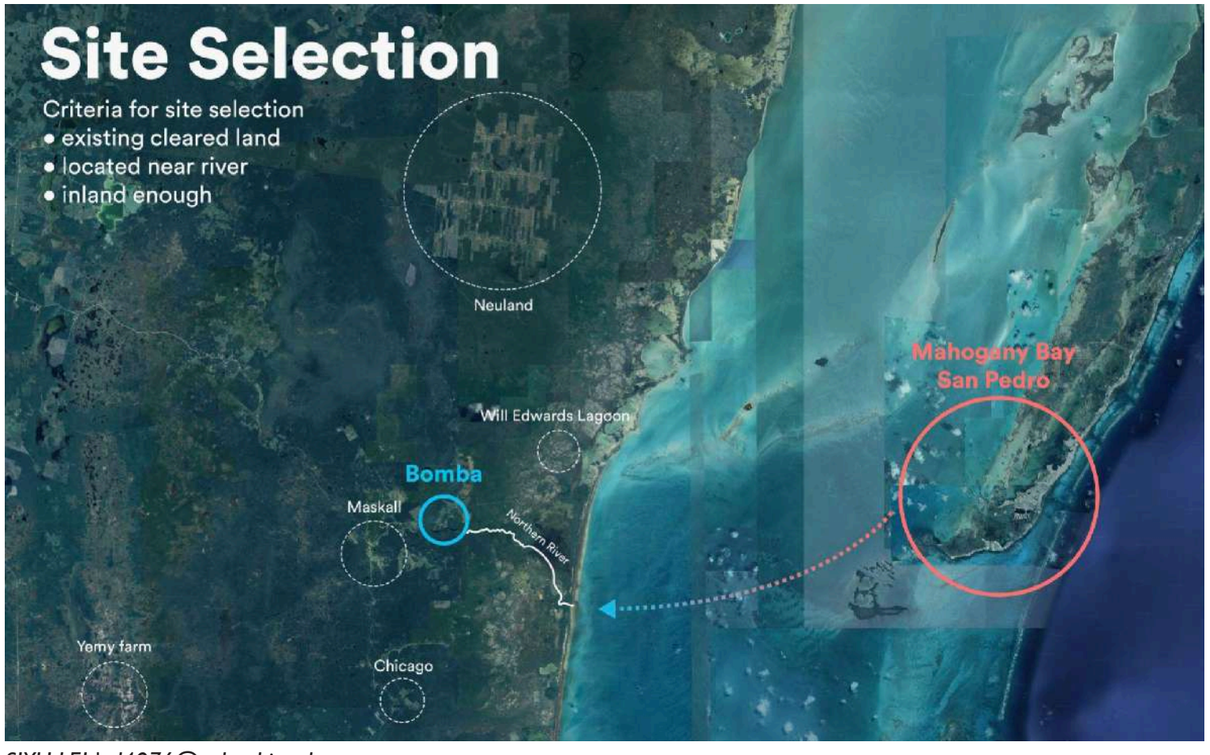
[5] Smart Relocation- Mahogany Bay

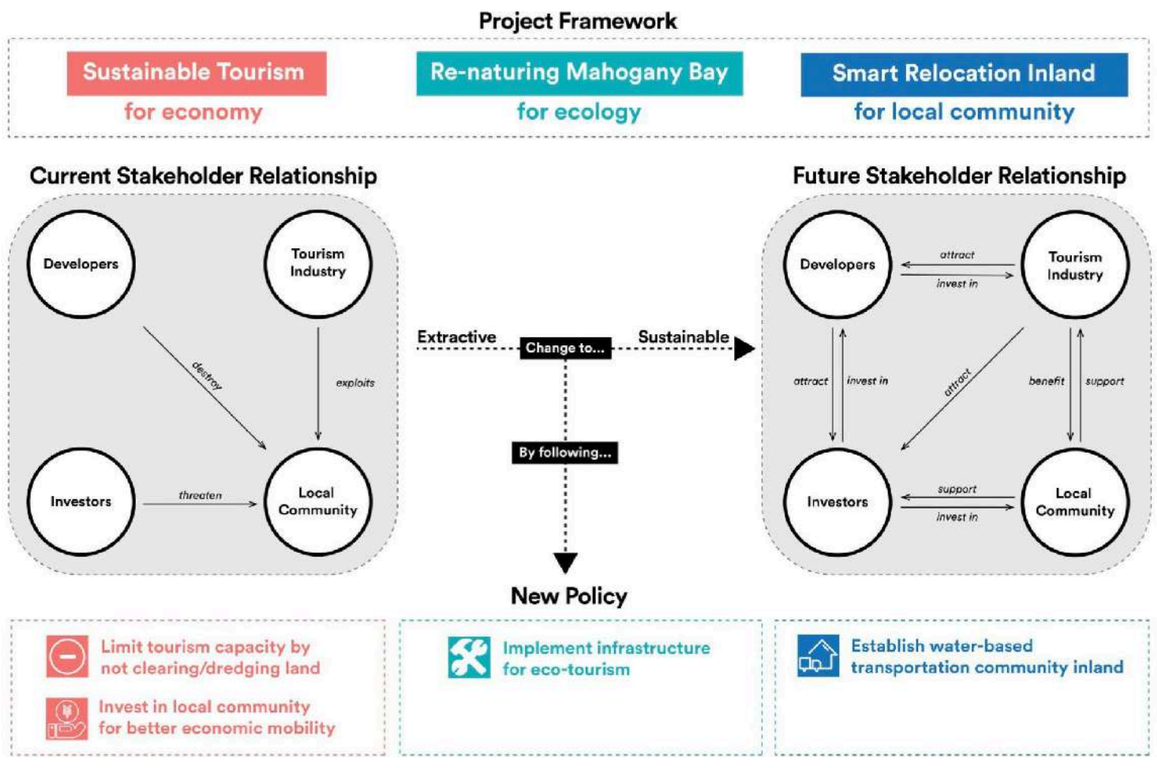
Group work with Kenny Zhou, Zhifan Li, Jie Kong
Spring 2022
Location: San Pedro, Belize
Instructor: Kate Orff

San Pedro's current model of consumer-based tourism and unchecked development is unsustainable for the future. Unjust land ownership and increasing climate threats further exacerbates these issues.
In order to preserve locals' livelihoods and to sustain the strong tourism economy, we propose to the Belize government a pilot to develop a long-term smart relocation and eco-tourism initiative.

Main Street, Bomba
Inland Community







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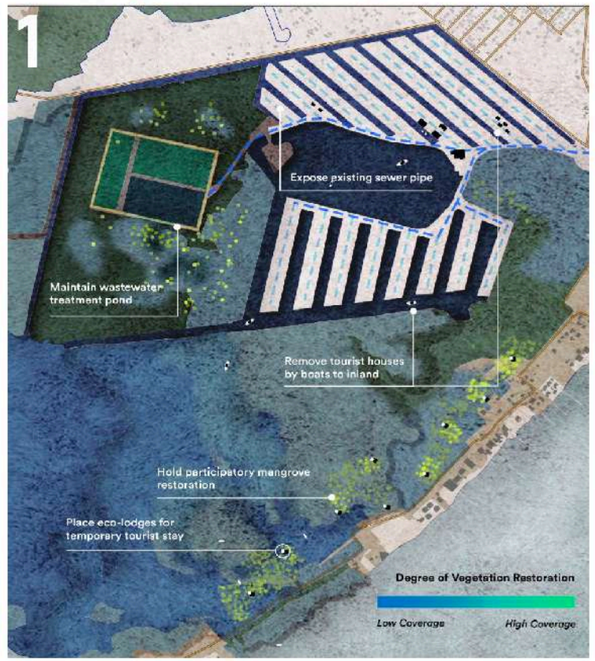
Phase 1 Preparation

Create a sustainable stakeholder relationship, begin infrastructure work to prepare for relocation

POLICY
- Reduce tourism capacity
- Invest in inland housing+ infrastructure
- Introduce property+tourist tax
- 20%+ investment to help locals move
- No rebuilding after climate disaster
- No more land clearing/dredging
- Foreign owned: voluntary 1:1 land swap

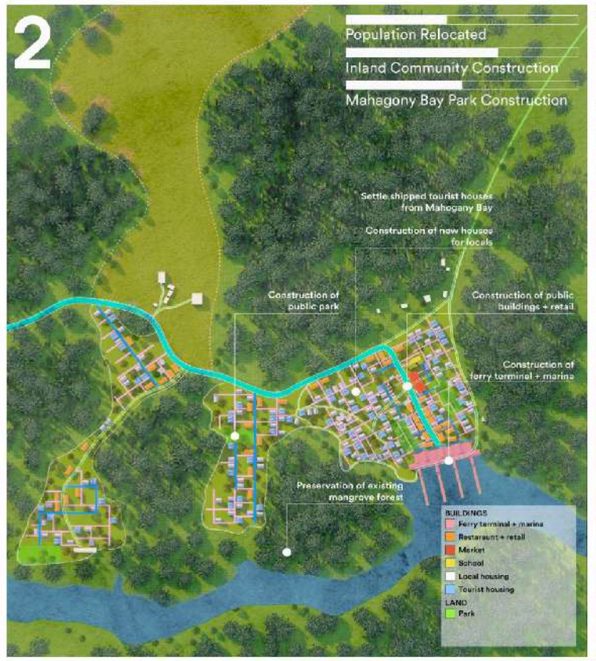


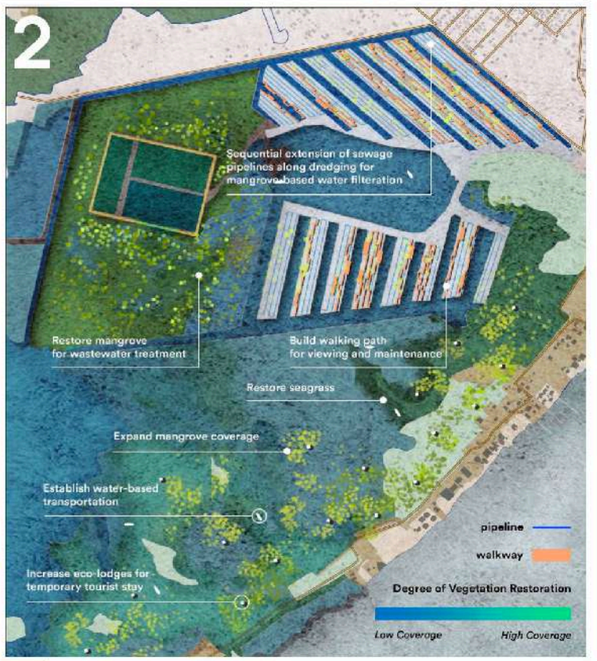
2022 — 2032 — 2050 — 2100

Phase 2 Construction+relocation

Interim residential and tourism model while construction + relocation are in progress

POLICY
- Establish connection with Maskall town
- Invest in community public amenities
- Introduce property+tourist tax
- 20%+ investment to help locals move
- Tourists stay temporally at Mahogany Bay
- Promote eco-tourism
- Relocate most vulnerable local population
- Foreign owned: voluntary 1:1 land swap



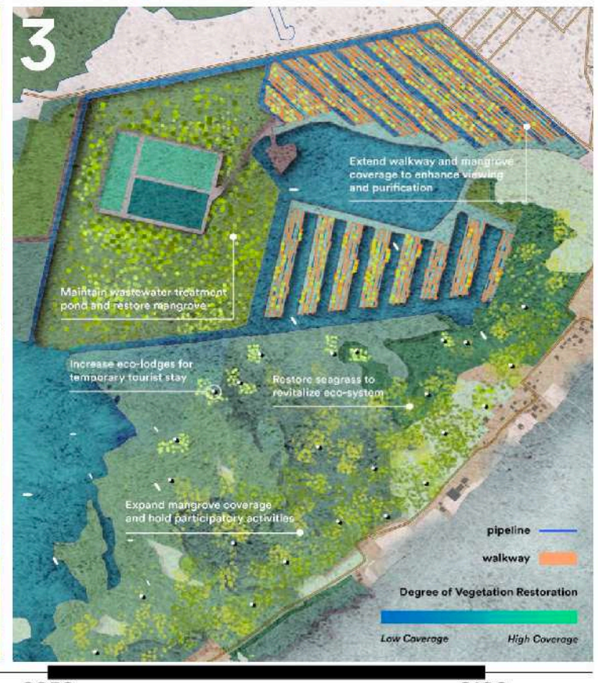


2022 — 2032 — 2050 — 2100

Phase 3 Growth

Debut of fully operational inland community and Mahogany Bay national park

POLICY
- Continued investment in inland community
- Promote collaboration with Mennonites
- Promote Eco-tourism
- Tourists stay temporally at national park
- Foreign owned: mandatory relocation
- Relocate rest of local population

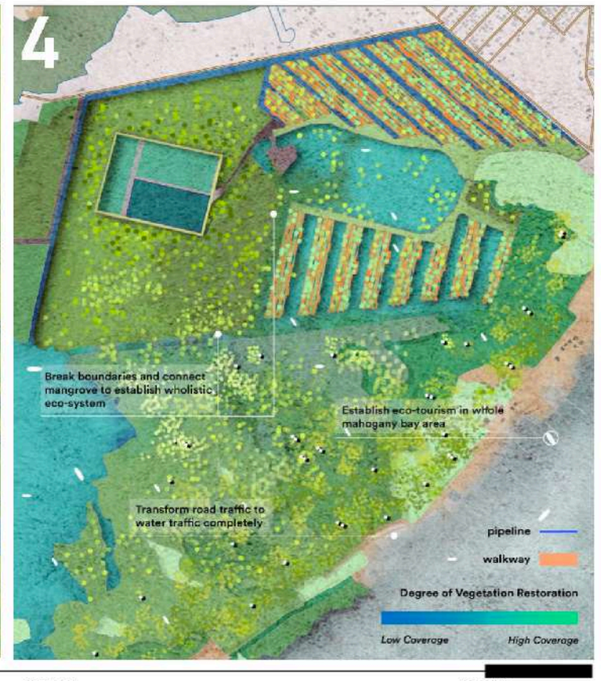


2022 — 2032 — 2050 — 2100

Phase 4 Regional Expansion

Belize will set a global standard for regional smart relocation + eco-tourism initiatives

POLICY
- Continued national park maintenance
- Regional environmental restoration + eco-tourism initiative
- Continued building+infrastructure maintenance
- Regional smart relocation initiative



2022 — 2032 — 2050 — 2100

SIYU LEI | sl4976@columbia.edu


Ecological Restoration
Mahogany Bay National Park
Environment conducive to viewing and biodiversity
Boats for transportation
Porous pipe to discharge wastewater
Walkways for viewing and regular maintenance
Mangrove to purify wastewater
Seagrass to revitalize underwater eco-system


Public Plaza, Bomba
Inland Community

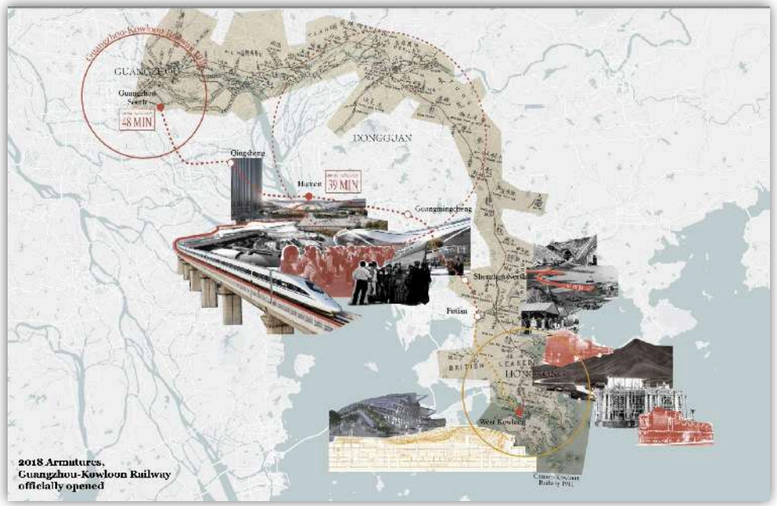

Farm CO-OP
BEST FARM PRODUCTS
from BOMBA
Main Street, Bomba
Inland Community

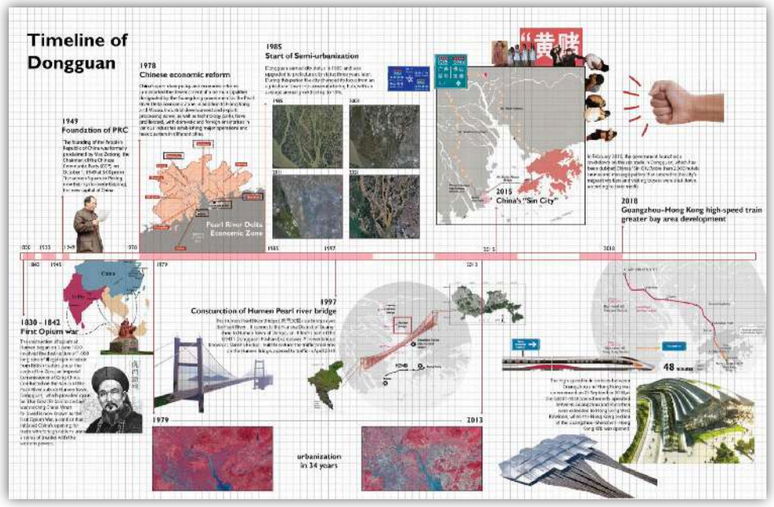

Mangrove Kayaking
Mahogany Bay National Park

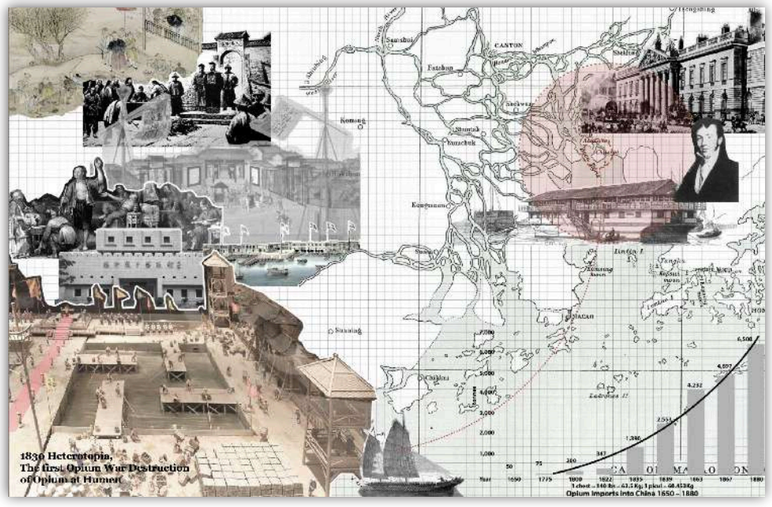
[6] Recombinant Urbanism

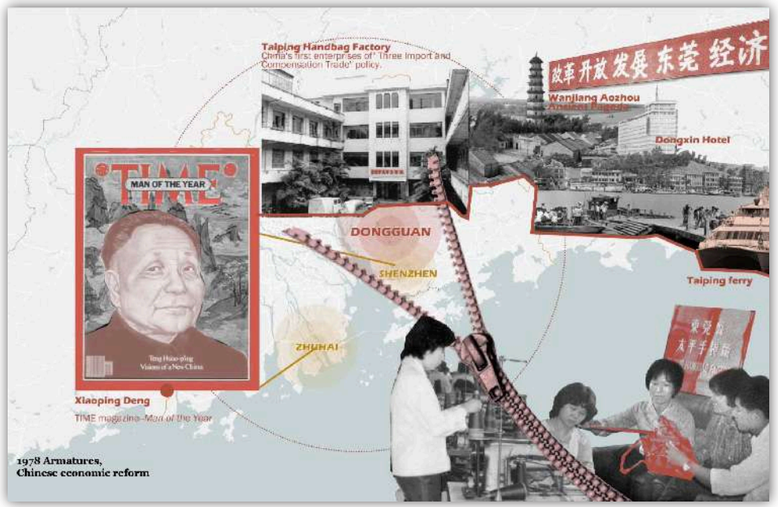
Group work with Yuening Jiang, Siyu Xiao, Jiayi Zhao
Spring 2022
Location: Dongguan, China
Instructor: David Shane

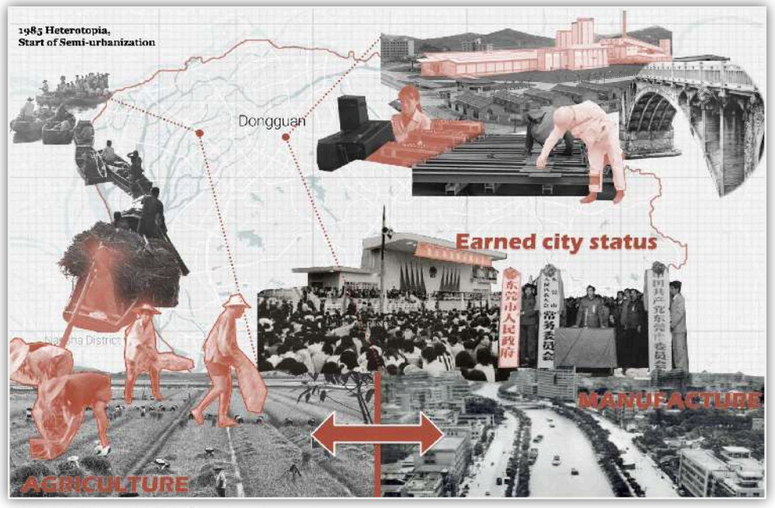
We believe dongguan is a place that sits at a critical location for the development of the surrouning big cities that has been long ignored. It used to be a vessel containing all the underground industries, welcoming marginalized young workers as a marginal town, thriving in a way that's not sustainable, but now it's gradually becoming an inclusive place with exciting opportunities for locals, foreign investors and youngsters.

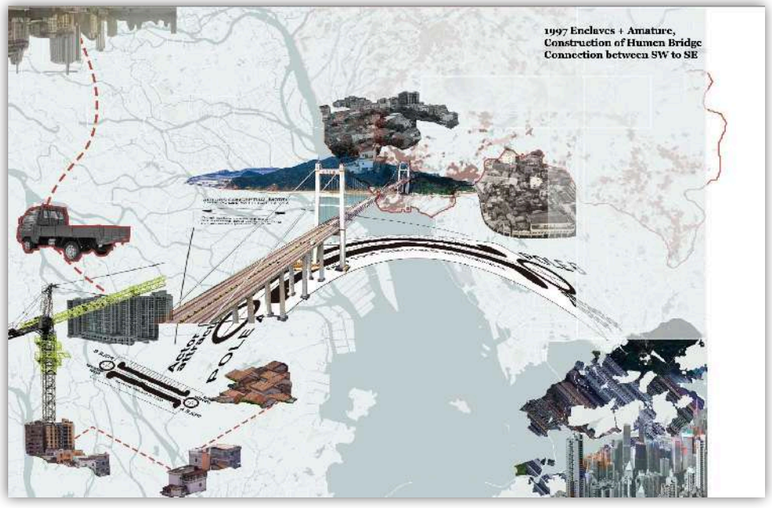








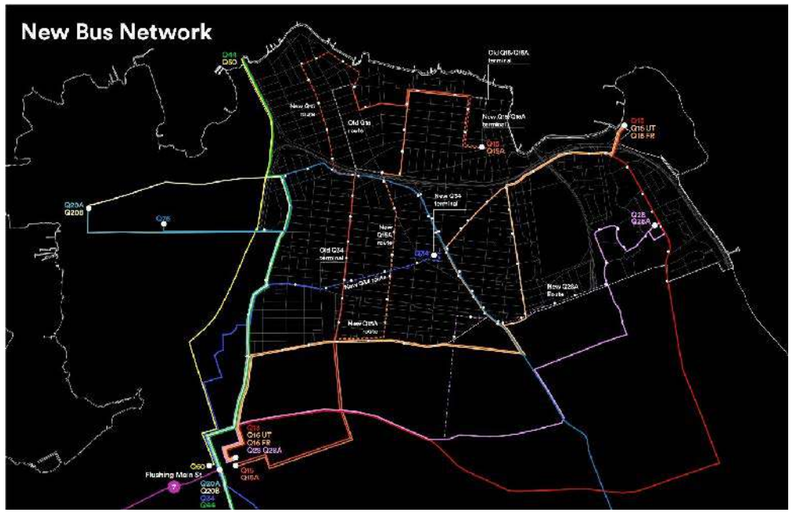


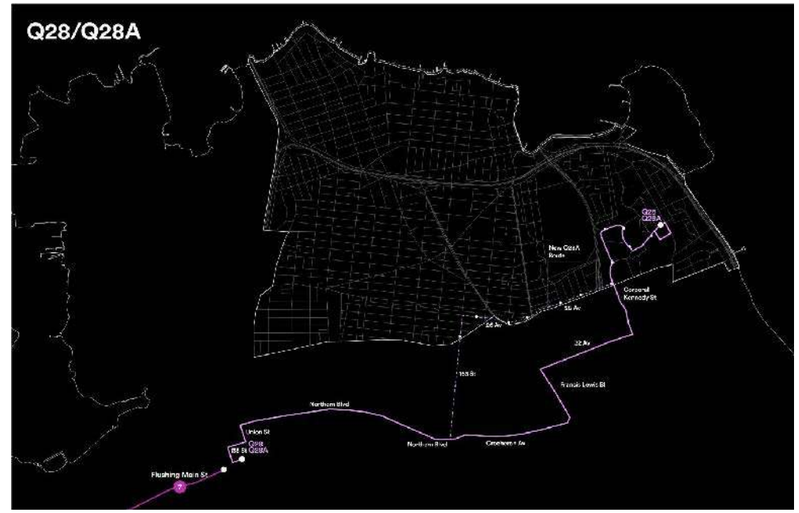


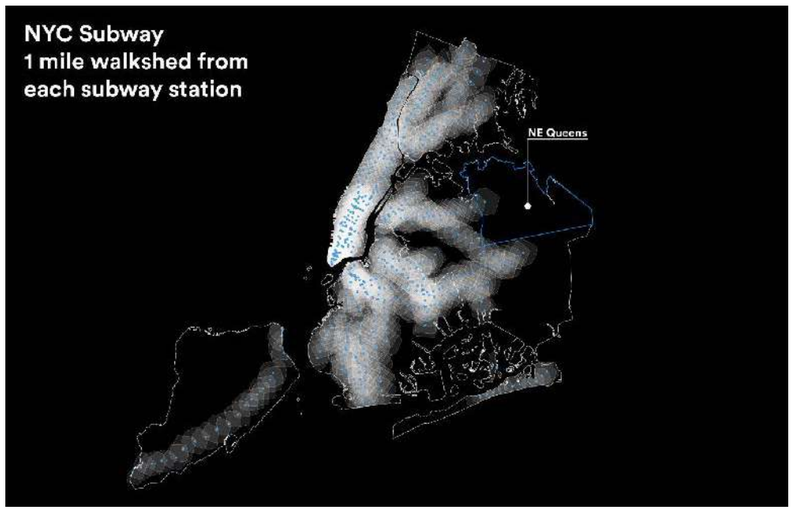
[7] Data mining the city

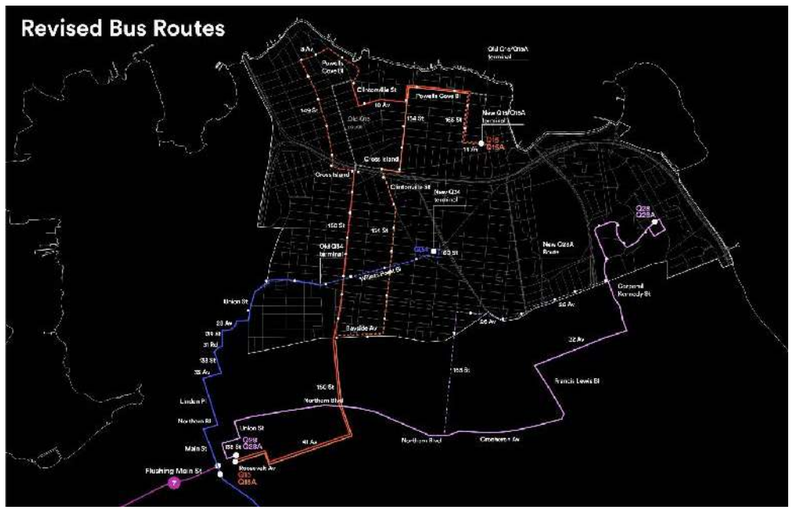
Group work with Kenny Zhou
Spring 2022
Location: Queens, New York, US
Instructor: Richard Chou

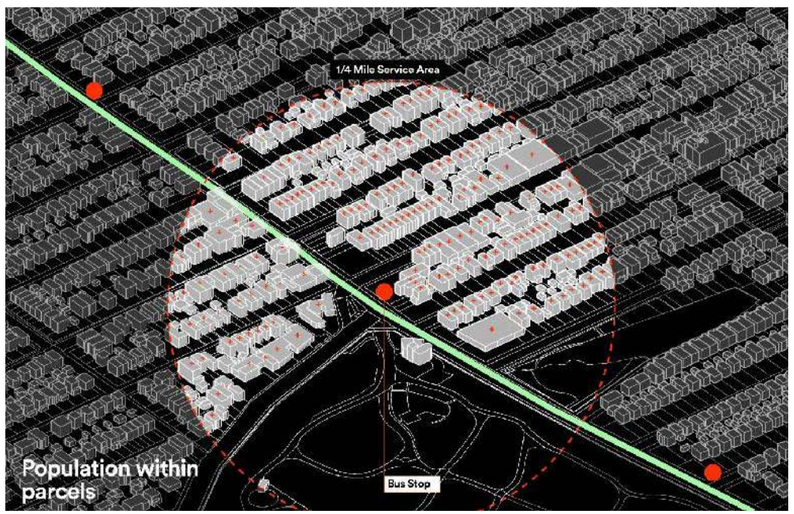
Good connectivity, high efficiency, and ample service are essential ingredients to fully realize the potential of public transit. Many morning rush commuters in Northeastern Queens rely on buses to connect them to the only subway station in the area, but some have to use other means — including driving — because they live too far from the nearest bus. Current buses may not be using the most efficient routes, and stops might be too close or too far away. Using the neighborhoods of Whitestone-Beechurst as an example, how can we better design the bus network there to improve existing service, to reach underserved populations, and to accommodate for future population growth?



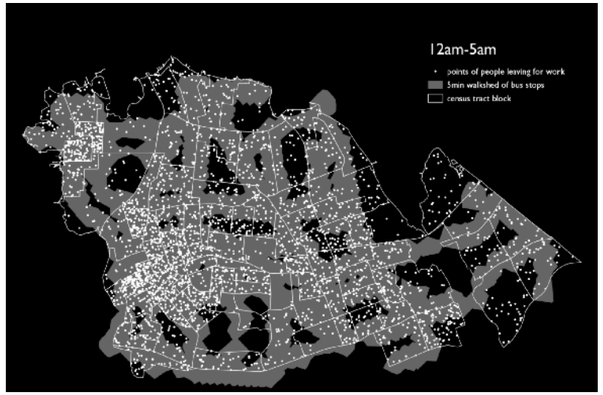


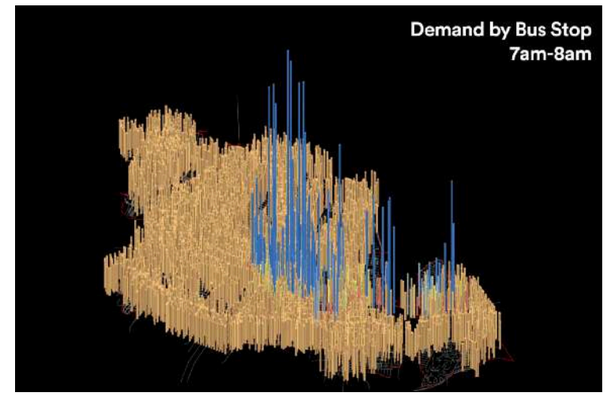


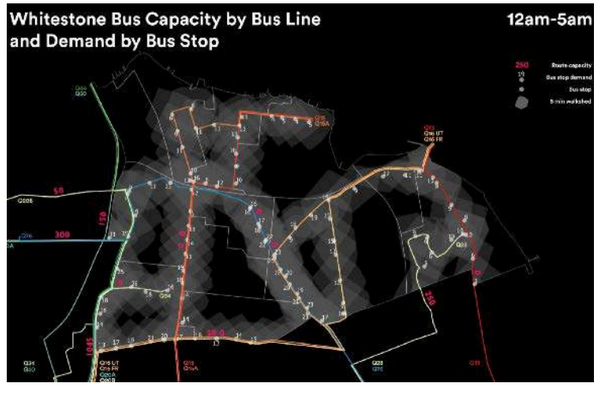


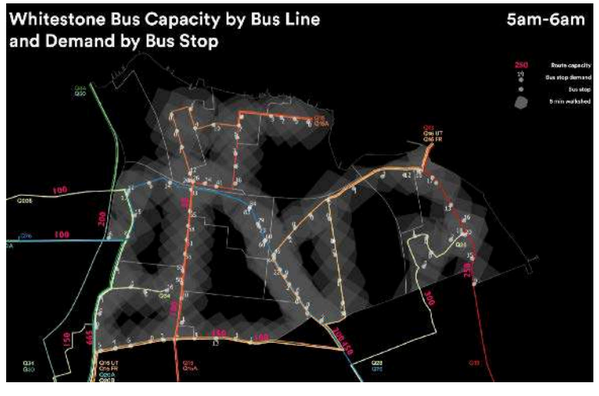


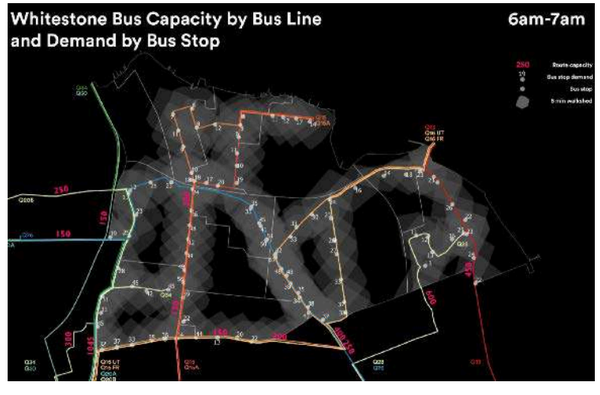
Demand-capacity analysis

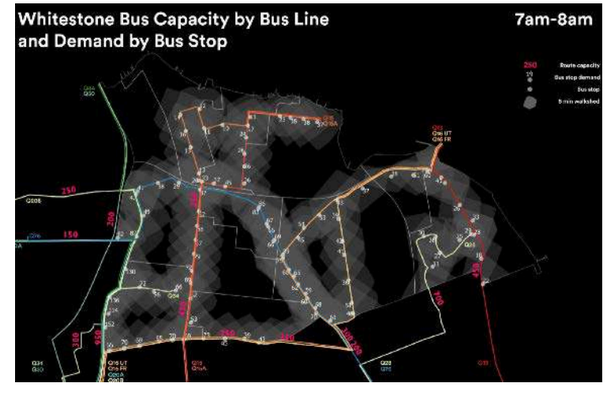










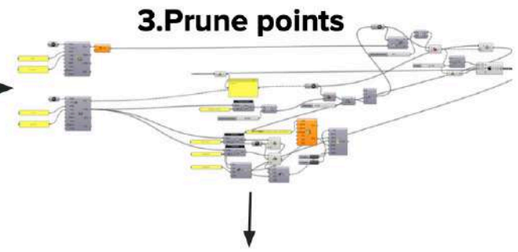


[8] Exploring urban data in machine learning

Group work with Ningyuan Deng, Shuhua Li, Yingjie Liu, Jiayi Zhao | Spring 2022
Location: Manhattan, New York, US
Instructor: Boyeong Hong

This project examines the street vegetation rate in Manhattan borough of New York City by extracting static street view images from Google Street View API, conducting image processing based on an efficient neural network model and comparing socioeconomic status of each neighborhood with vegetation rate at census tract. convenient and accessible.

Methodologies: step 1 - extract data points



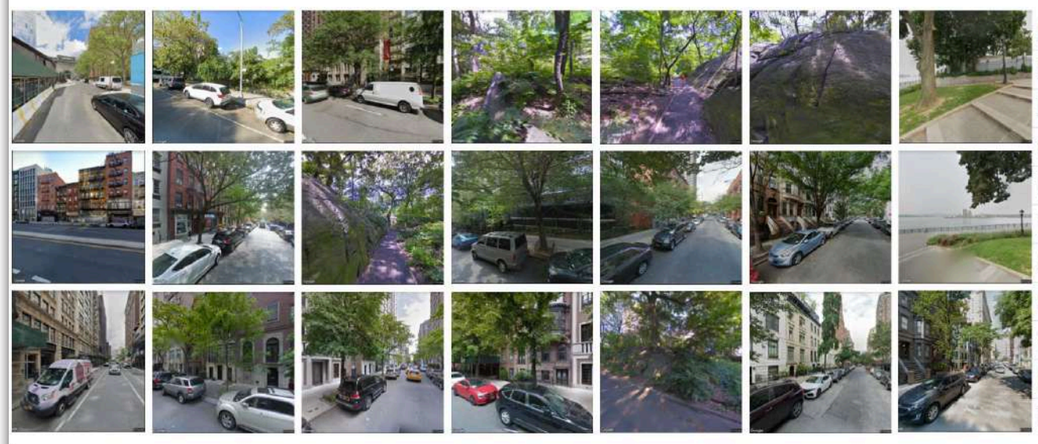
X	Y
-74.01777317	40.70651837
-74.01734744	40.7071512
-74.01687315	40.70779823
-74.01699375	40.70482531
-74.01463449	40.70463676
-74.01777322	40.70862629
-74.01701188	40.70829567

X	Y
-74.01155121	40.70320275
-74.01133563	40.70237017
-74.01157276	40.70413419
-74.01156378	40.70448504
-74.0115541	40.70483595
-74.01142049	40.70563079
-74.01093311	40.70669755

X	Y
-74.01639638	40.70801927
-74.01746291	40.70598745
-74.0183124	40.70634331
-74.01582884	40.70209087
-74.01587557	40.70172566
-74.01566286	40.70193877
-74.01568112	40.70154915
-74.01159529	40.70351267
-74.01158509	40.70379907

4.Output csv

Methodologies: step 2 - get street view images



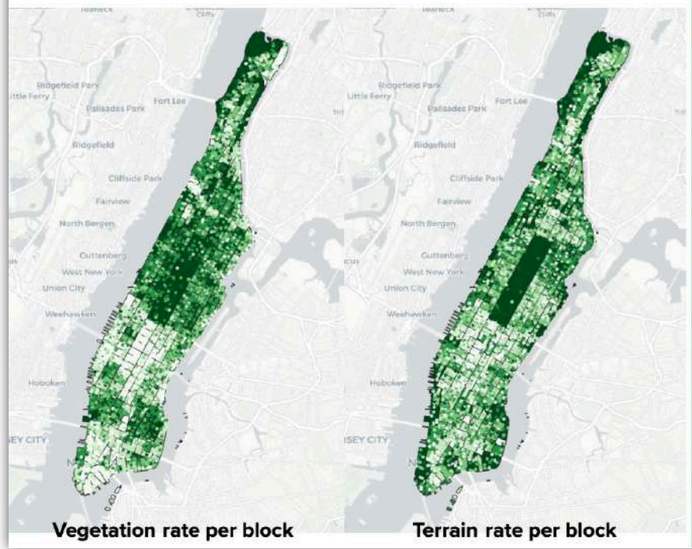
pic_40.85989102,-73.924882
pic_40.80392438,-73.950139
pic_40.77965258,-73.951912
pic_40.77965258,-73.951912
pic_40.77965258,-73.951912
pic_40.77828038,-73.970883
pic_40.77828038,-73.970883
pic_40.77828038,-73.970883
pic_40.77828038,-73.970883
pic_40.77801458,-73.965565
pic_40.77801458,-73.965565

```
https://maps.googleapis.com/maps/api/streetview?size=400x400&location=47.5763831,-122.4211769
&fov=80&heading=70&pitch=0&key=YOUR_API_KEY&signature=YOUR_SIGNATURE
```

Methodologies: step 3 - extract greenery rate

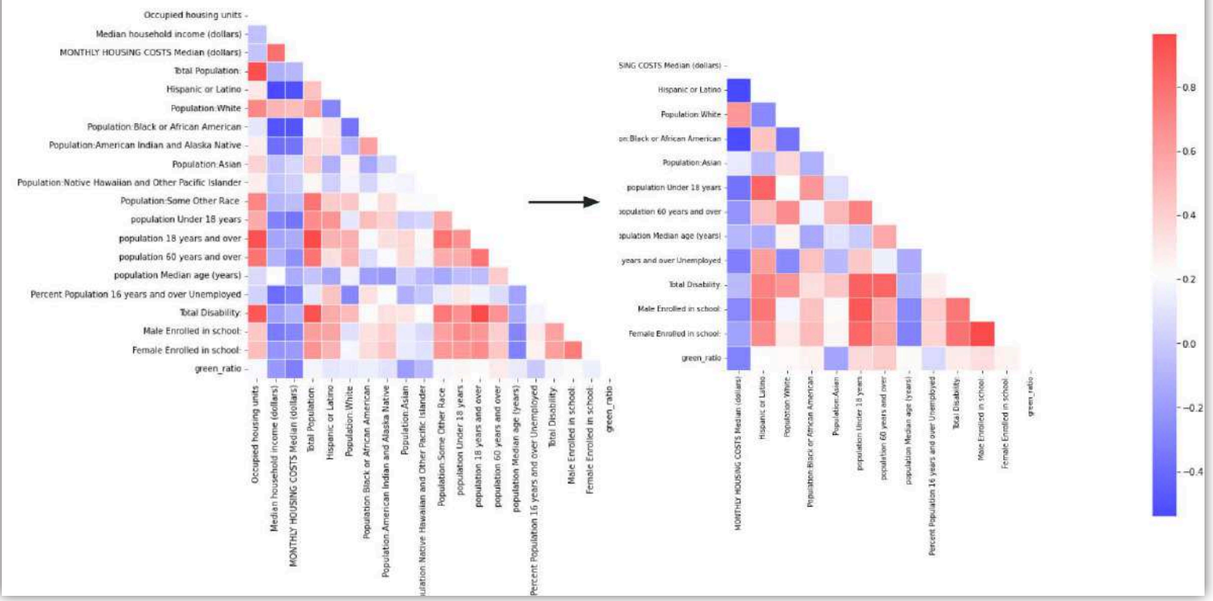
Point	map_9	map_10
pic_40.70154914,-7	4.15401	6.6
pic_40.70154914,-7	0.72899	7.4
pic_40.70154914,-7	3.92284	15.1
pic_40.70154914,-7	0.28591	13.2
pic_40.7019427,-74	0.04025	0.0
pic_40.7019427,-74	0.46368	0.0
pic_40.7019427,-74	0.0124	0.0
pic_40.7019427,-74	0.10014	0.3
pic_40.70209357,-7	37.01706	7.4
pic_40.70209357,-7	36.26881	6.2
pic_40.70209357,-7	44.07368	1.0
pic_40.70209357,-7	27.77443	11.1
pic_40.70237017,-7	0.00477	0
pic_40.70237017,-7	0.32825	0.1
pic_40.70237017,-7	1.82915	0.0
pic_40.70237017,-7	0.02174	0.0
pic_40.70243984,-7	0.01888	0
pic_40.70243984,-7	2.44503	0.8
pic_40.70243984,-7	0.00687	0.0
pic_40.70243984,-7	4.30775	0.7
pic_40.70257088,-7	0.1339	0.4
pic_40.70257088,-7	14.03847	0.1
pic_40.70257088,-7	8.47225	0.0
pic_40.70257088,-7	0.93536	0
pic_40.70351552,-7	0.2718	0.0
pic_40.70351552,-7	4.37717	0.0
pic_40.70351552,-7	9.91058	0.0
pic_40.70351552,-7	0.00076	0.0
pic_40.70364062,-7	3.86524	0.7
pic_40.70364062,-7	11.74355	0.1

Methodologies: step 4 - calculate average greenery rate with census tract block

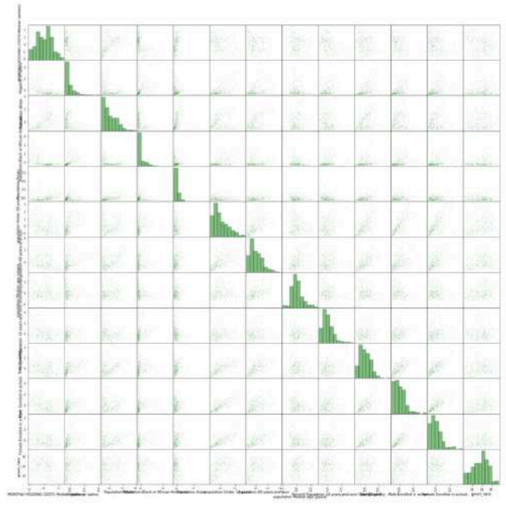


GEOID	Sum and avg of terrain rate		Number of points in each block	Sum and avg of vegetation rate		Num points bl
GEOID	sum_map10	avg_map10	point_coun	sum_map9	avg_map9	point
36061000201	8	0.5117412	16.0000000...	276.993940...	17.31212125	16.00
36061000202	187860000...	1.9450310	48.0000000...	698.884740...	14.56009875	48.00
36061000600	93.3614899...	2.3083288	52.0000000...	715.340630...	13.75655058	52.00
36061000700	120.0331000...	0.5855289	28.0000000...	103.7901100...	3.70678964	28.00
36061000800	16.39481000...	1.0005200	36.0000000...	377.6611300...	10.49058694	36.00
36061000900	36.01872000...	1.4780680	36.0000000...	46.3130799...	1.28647444	36.00
36061001001	53.2104500...	2.2964950	12.0000000...	133.1163399...	11.09302833	12.000
36061001002	27.5579400...	1.5814425	32.0000000...	433.749010...	13.55465656	32.00
36061001200	50.6061600...	4.9280658	12.0000000...	154.4732999...	12.87277500	12.000
36061001300	59.1367899...	1.9175968	48.0000000...	375.7732400...	7.82860917	48.00
36061001401	92.0446499...	7.8135980	20.0000000...	514.0737599...	25.70368800	20.00
36061001402	156.2719600...	0.5808475	16.0000000...	151.1989600...	9.44993500	16.00
36061001501	9.29355999...	1.1614600	28.0000000...	167.0185099...	5.96494679	28.00
36061001502	32.5208799...	0.6545075	12.0000000...	24.67746000...	2.05645500	12.000
36061001600	7.85409000...	0.9725364	64.0000000...	844.980580...	13.20282156	64.00
36061001800	62.2423299...	0.818825	24.0000000...	341.802209...	14.24175875	24.00
36061002000	19.65179999...	0.5868925	4.00000000...	71.04416000...	17.76104000	4.000
36061002100	2.34757000...	0.3735095	64.0000000...	416.2763199...	6.50431750	64.00
36061002201	23.9046100...	0.8987437	24.0000000...	552.9237499...	23.03848958	24.00
36061002202	21.5698499...	1.3930812	8.00000000...	116.11271999...	14.51409000	8.000
36061002400	11.14464999...	1.9439610	20.0000000...	238.866050...	11.94330250	20.00
36061002500	38.8790200...	3.1951092	28.0000000...	238.430399...	8.51537143	28.00
	89.4630600...					

Methodologies: step 5 - compare greenery rate with neighborhood features



Methodologies: step 5 - compare greenery rate with neighborhood features

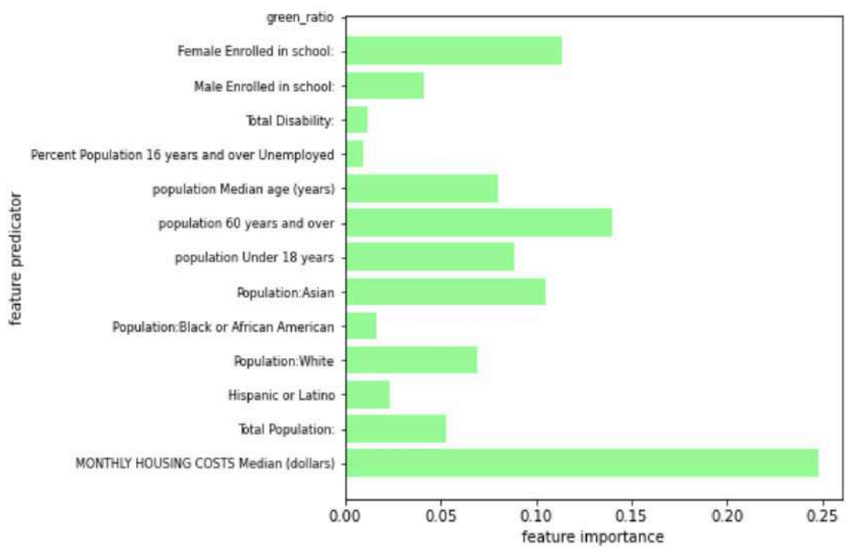


OLS
Training score : 0.4
MSE: 40
Test score : 0.1
MSE: 36

Ridge:
Training score : 0.37
MSE: 40.06
Test score : 0.07
MSE: 48.49

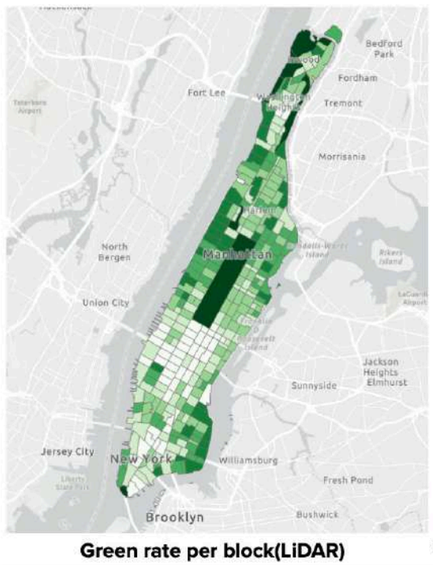
Lasso
Training score : 0.36
Test score : 6.38

Methodologies: step 5 - compare greenery rate with neighborhood features

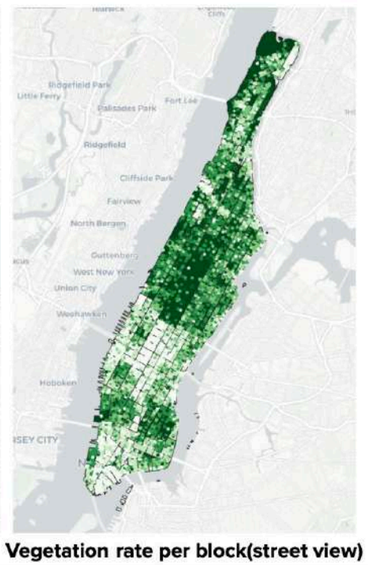


Decision tree regressor: Feature importance

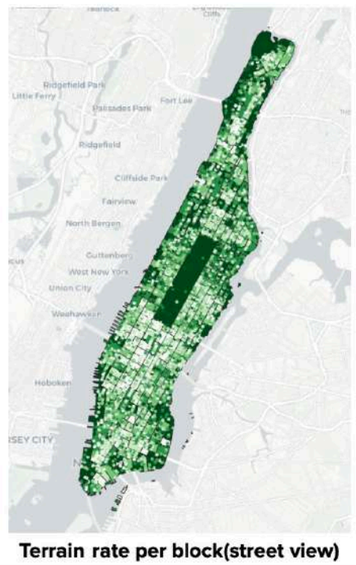
Methodologies: step 6 - LiDAR comparison



Green rate per block(LiDAR)



Vegetation rate per block(street view)



Terrain rate per block(street view)