# GRADUATION PORTFOLIO


## SHUHUA LI

GSAPP MSAUD, CLASS OF 2022

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# A GOOD NEIGHBORHOOD

*Group Member: Kimberly Ramirez, Gloria Mah, Jake Tiernan, Shuhua Li*
ARCHA6849_001_2021_2 - URBAN DESIGN STUDIO I, Summer 2021
Flushing, NYC

Homelessness is an epidemic in New York City. Each night, tens of thousands of New Yorkers find themselves and their families in shelters that are hectic, overcrowded, and cost the city millions of dollars. **Permanent housing is a human right, and all of these people deserve the dignity of their own home.**

However, homelessness is not just an issue of housing. Mental health crises are a leading cause of homelessness among those in the shelter system, and the trauma of experiencing homelessness often only exacerbates these issues. Even after being placed in supportive housing, people oftentimes find themselves back on the streets. It is a cyclical issue, and one that must be addressed as such.

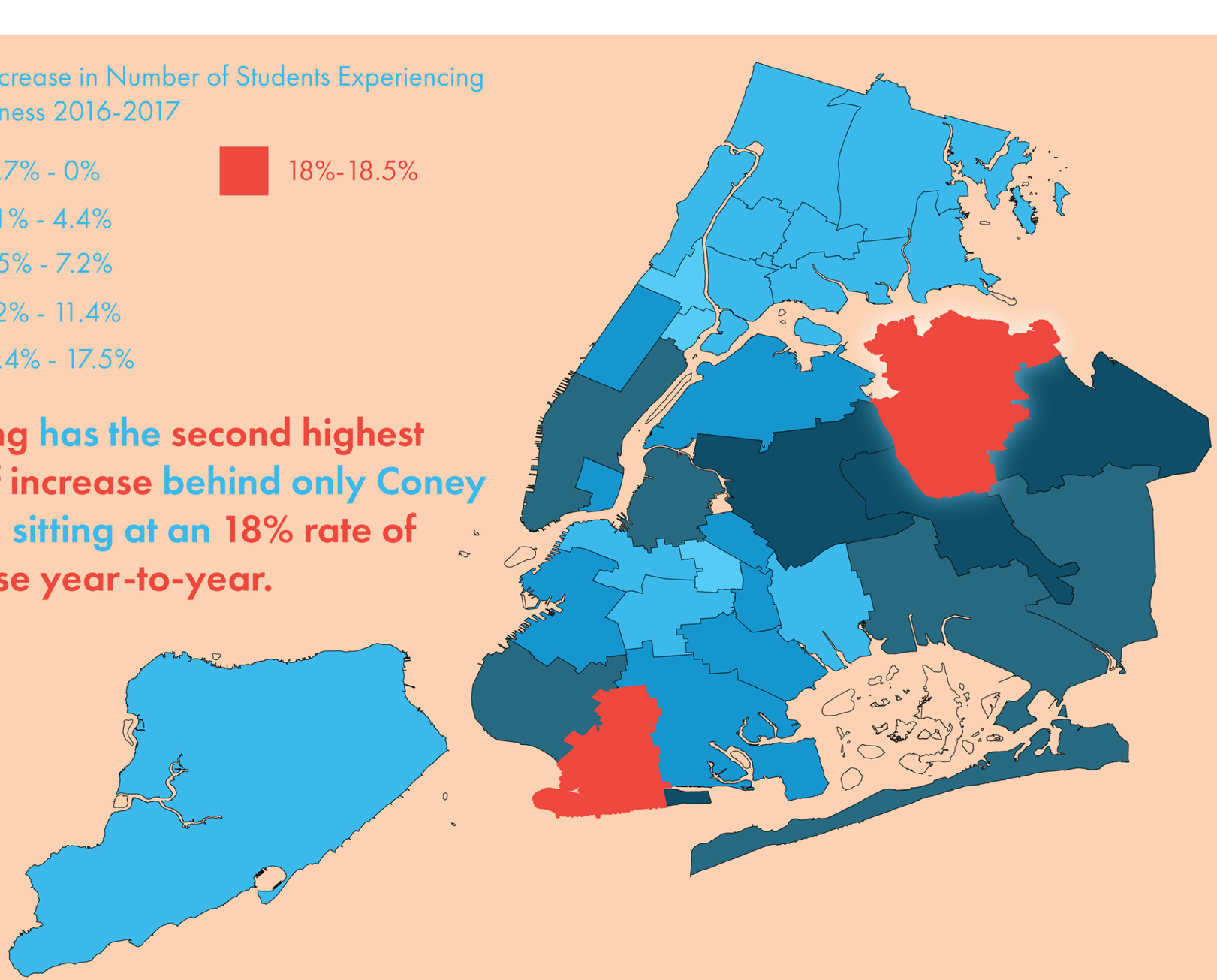
**A new methodology of housing is needed then, one that focuses not only on housing individuals, but on providing them a comfortable environment in which to heal and re-acclimate to the community around them.** By focusing on homelessness as a holistic issue rather than just one of housed or unhoused individuals, we then work towards putting an end to its cyclical nature. In doing so, we will not only give the people the dignity they deserve, but also gain additional funds to allocate to the communities those who had previously experienced homelessness join.

# HIGH RATE OF INCREASE OF STUDENTS EXPERIENCING HOMELESSNESS IN FLUSHING

Percent Increase in Number of Students Experiencing Homelessness 2016-2017

- -1.7% - 0%
- 0.1% - 4.4%
- 4.5% - 7.2%
- 7.2% - 11.4%
- 11.4% - 17.5%
- 18%-18.5%

**Flushing has the second highest rate of increase behind only Coney Island, sitting at an 18% rate of increase year-to-year.**



As of April 2021, there are **51,399** people sleeping in shelters in New York City each night. Of that, around **77%** of that population are families with children. We are concerned about this, as experiencing homelessness has an extremely negative impact on the well-being of children. **1 in 5** are likely to develop severe emotional problems, while half will experience depression, anxiety, or withdrawal by the time they are 8 years old.

Per the Housing New York Plan, the Department of Homeless Services should be **shifting the limited resources from building new shelters**, which costs over half of the budget, **to contracting units from developers within new, mixed use developments to act as supportive housing**. It should then **shift the money saved into providing additional mental health care and support**, hoping to break the cyclical nature of homelessness as caused by mental health.

## VIDEO LINKS:

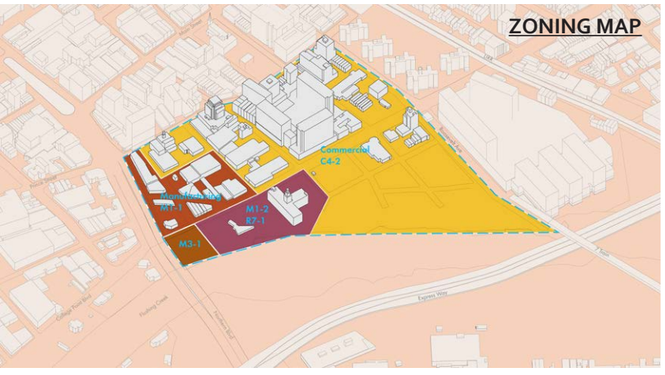
**MANIFESTO VIDEO:**
https://youtu.be/egz6dR5cqNI

**INFOGRAPHIC VIDEO:**
https://youtu.be/VDaOcwlBcYg

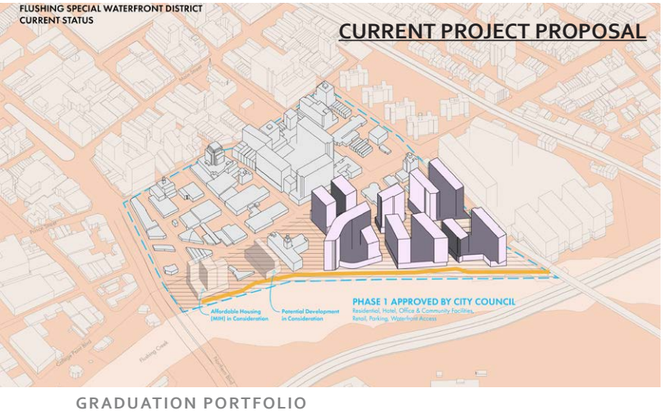
# MODIFICATION OF EXISTING PROPOSAL TO SUPPORTIVE HOUSING AND MENTAL SERVICES

The part of the original proposal did not address the needs of the community for affordable and supportive housing. The proposal should work with DHS and the Department of Parks. So that the project will not only have fair mandatory inclusionary housing per the new development, but will also carefully consider the experience that families who have experienced homelessness will go through in the design and layout of our supportive housing buildings, units, streets and public spaces.

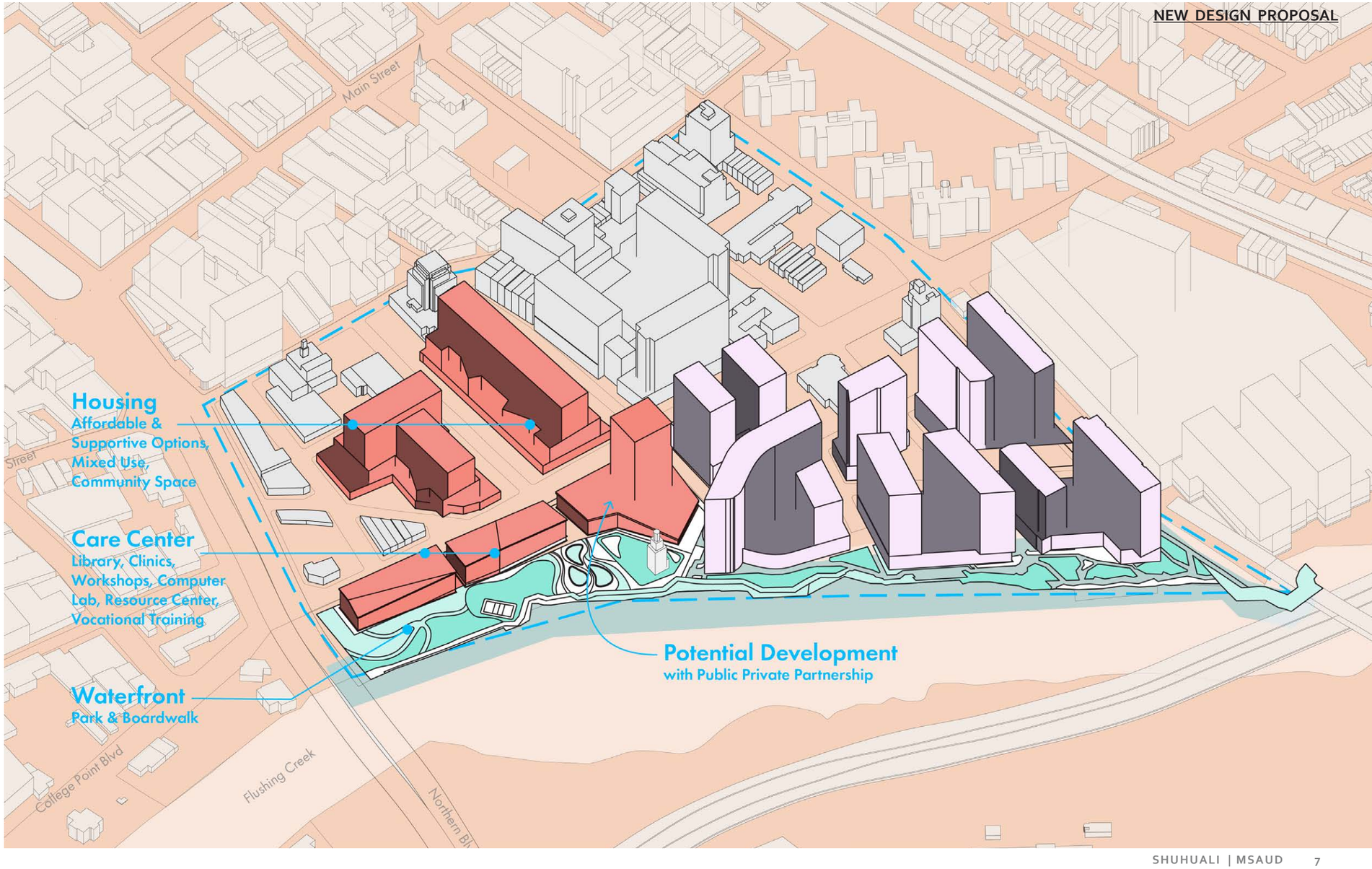
LAND USE MAP



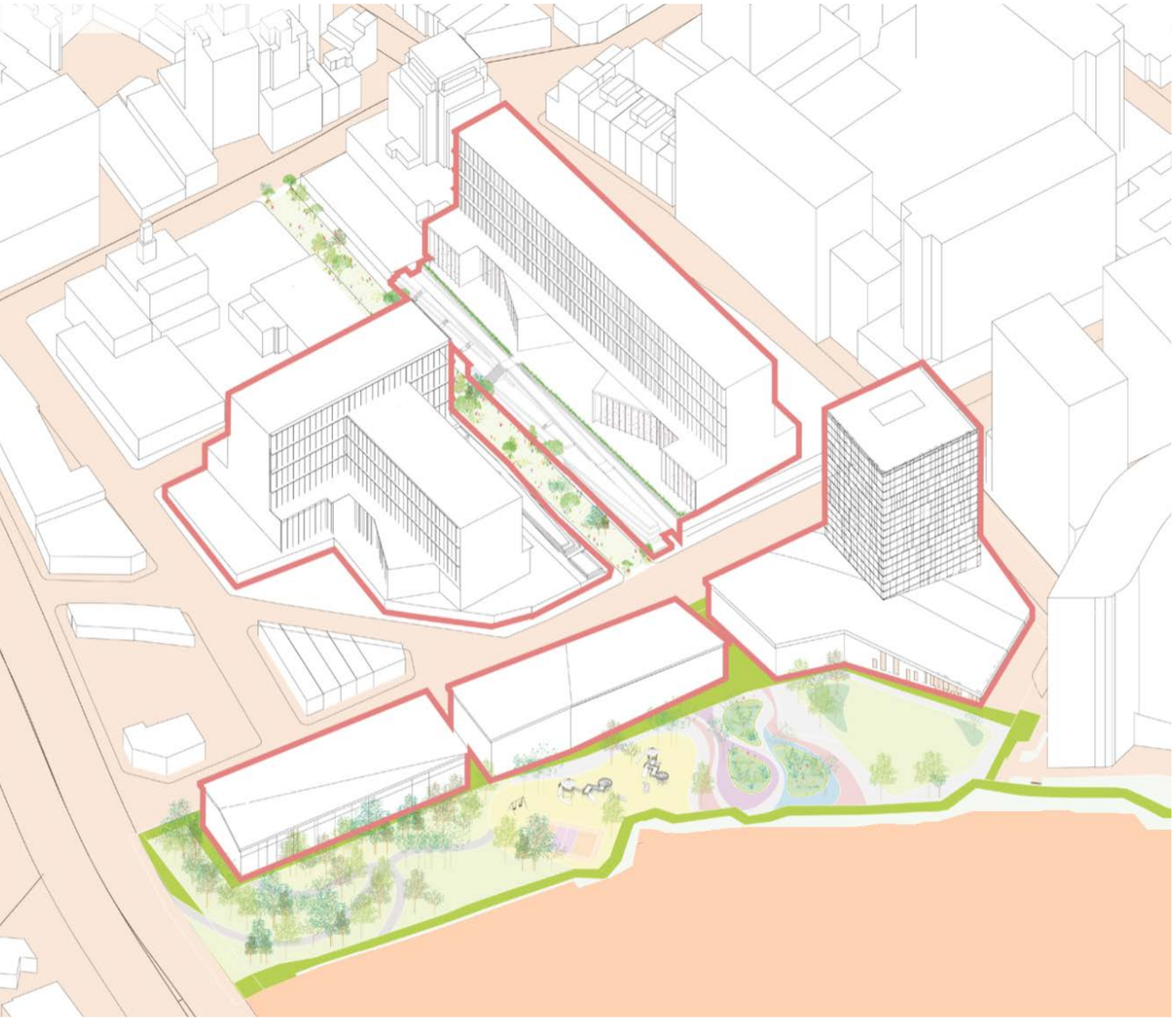

ZONING MAP




CURRENT PROJECT PROPOSAL



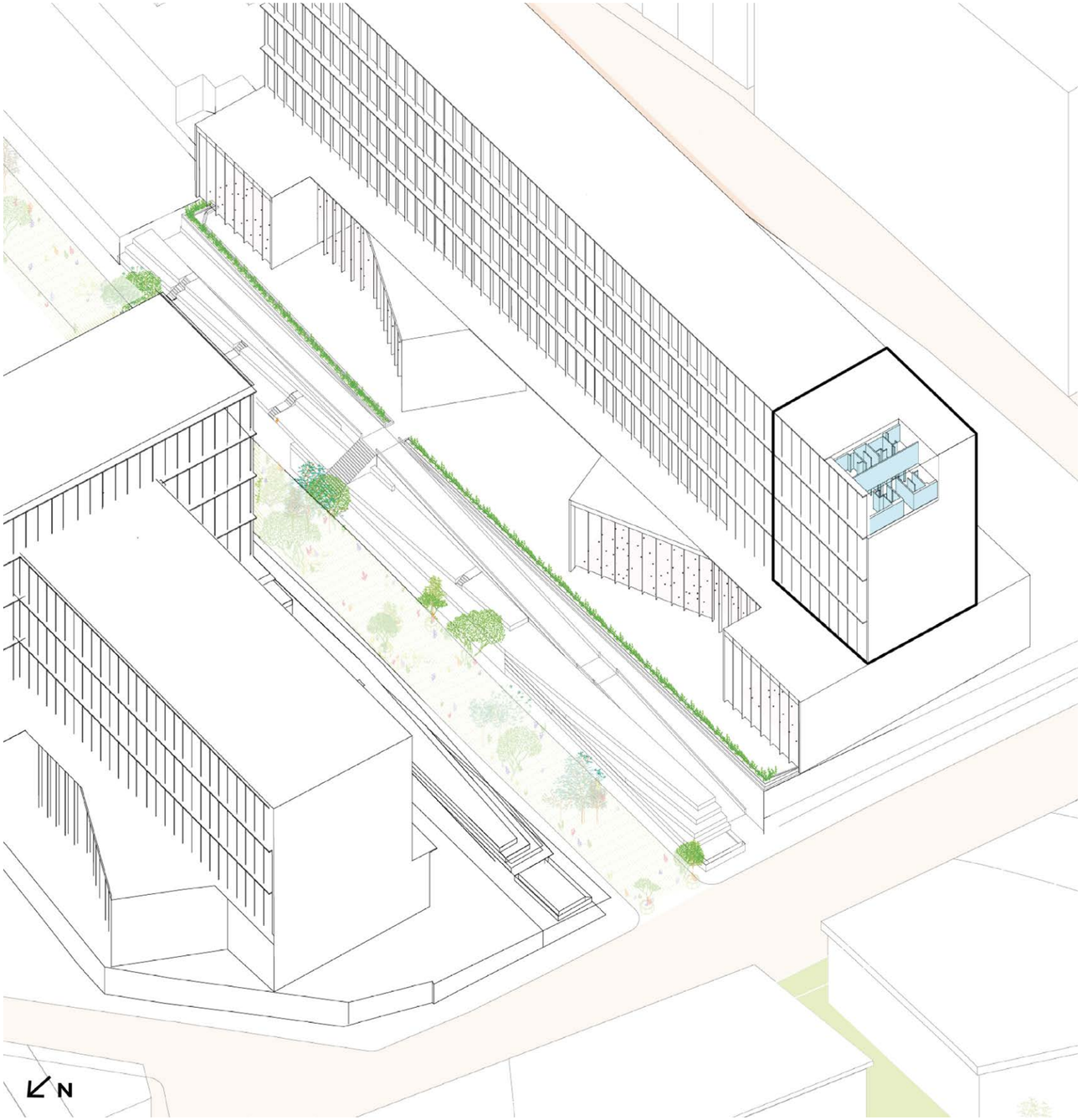
## CREATE A SUPPORTIVE INFRASTRUCTURE OF SUPPORTIVE HOUSING WITH PEDESTRIAN ORIENTED STREETSCAPE CONNECTING TO THE WATERFRONT FOR RECREATION, CARE, AND RESOURCES



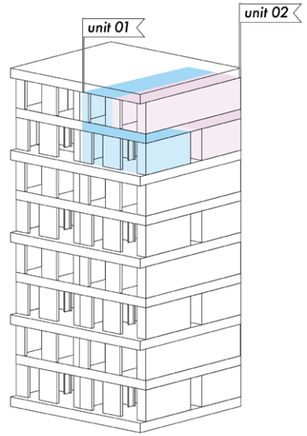
NEW STREET CONNECTION AS PUBLIC SPACES

# NEW MIXED-USE DEVELOPMENTS

Through small design changes like **increasing opportunities for natural sunlight, and widening hallways**, we can design spaces that becoming welcoming to a group of people who are transitioning into a place they must now call home. Starting at the unit scale, these new developments can become spaces that feel inviting to these families, as opposed to foreign and temporary.

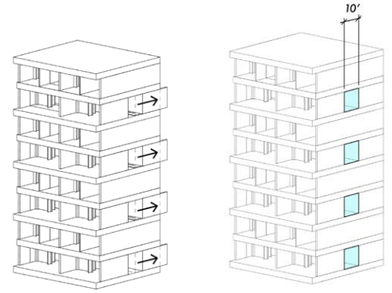



# NEW HOUSING UNITS FOR PHYSICAL AND MENTAL HEALTH

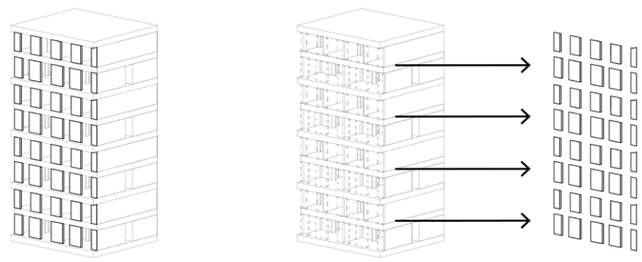



**TYPES OF UNITS**

**ORIGINALLY PROPOSED HALLWAYS**




**WIDENING HALLWAYS IN NEW DESIGN**



**INCREASING OPPORTUNITIES FOR NATURAL SUNLIGHT**

# EXTENDING CARE INTO THE LANDSCAPE WITH PUBLIC HEALTH SERVICES

# " N O - C O P " C I T Y

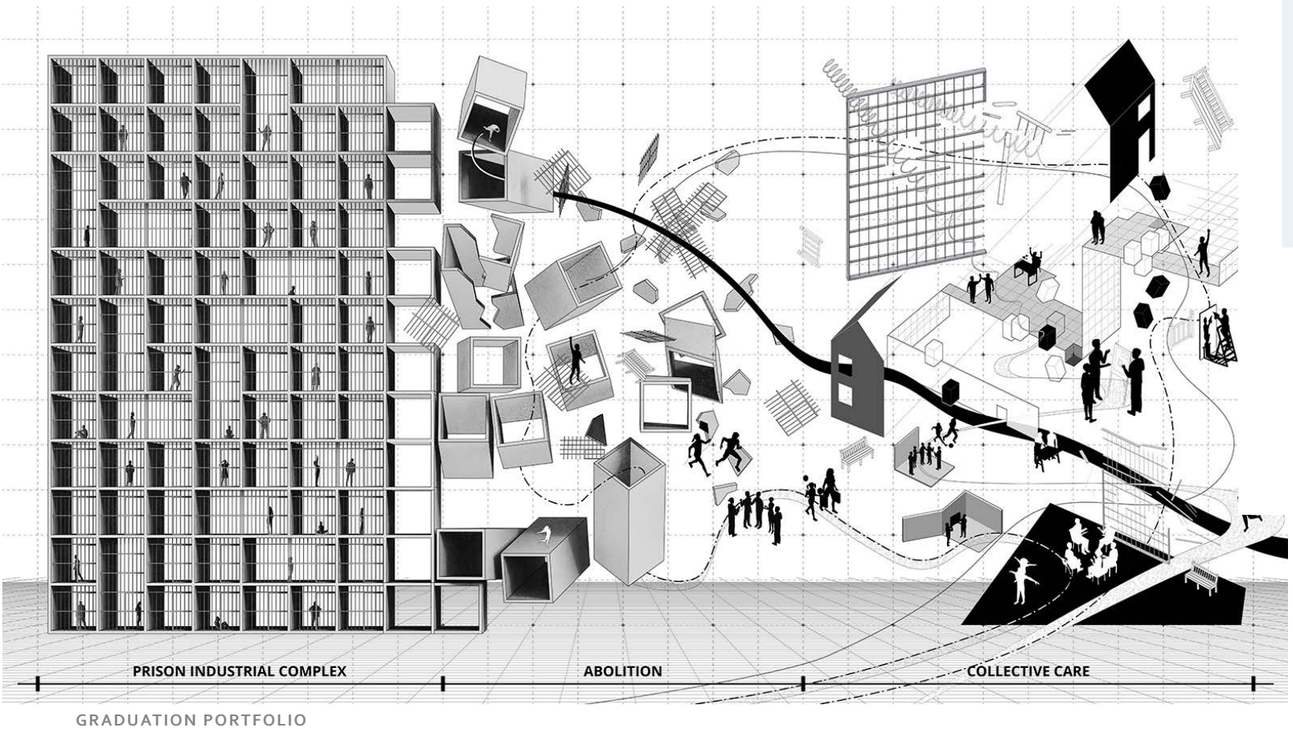
*Group Member: Rongxin Tang, Jiaxin Li, Jiayi Zhao, Shuhua Li*
ARCHA6820_001_2021_3 - URBAN DESIGN STUDIO II Atlanta After Property - Fall 2021
Atlanta, GA

## Definition of Property:

Policing system is a military force used by the ruling class to protect private property and oppress people with opposing interests. Public funding always favors mega developments and capitalist interests over the needs of communities. Thereby, the expansive policing and prison system become venues of profits and punishment under the name of maintaining public safety.

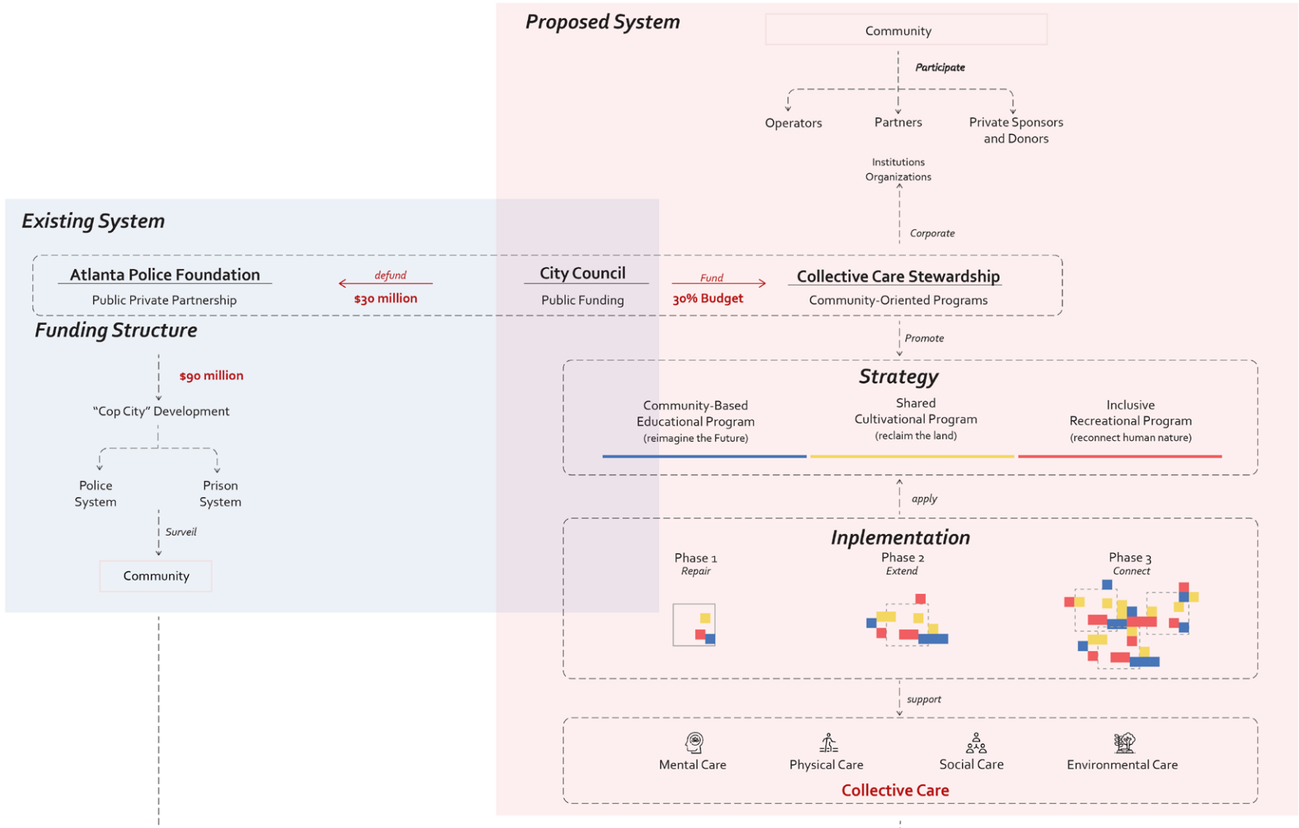
## Definition of After Property:

Public funding should be shifted from the policing system to systems of care. In our world after property, these systems of care will directly oppose existing socio-economic hierarchies and empower historically disadvantaged communities. We have attempted to demonstrate this new world through spatial interventions that address public health and safety as determined by community based activism and leadership.



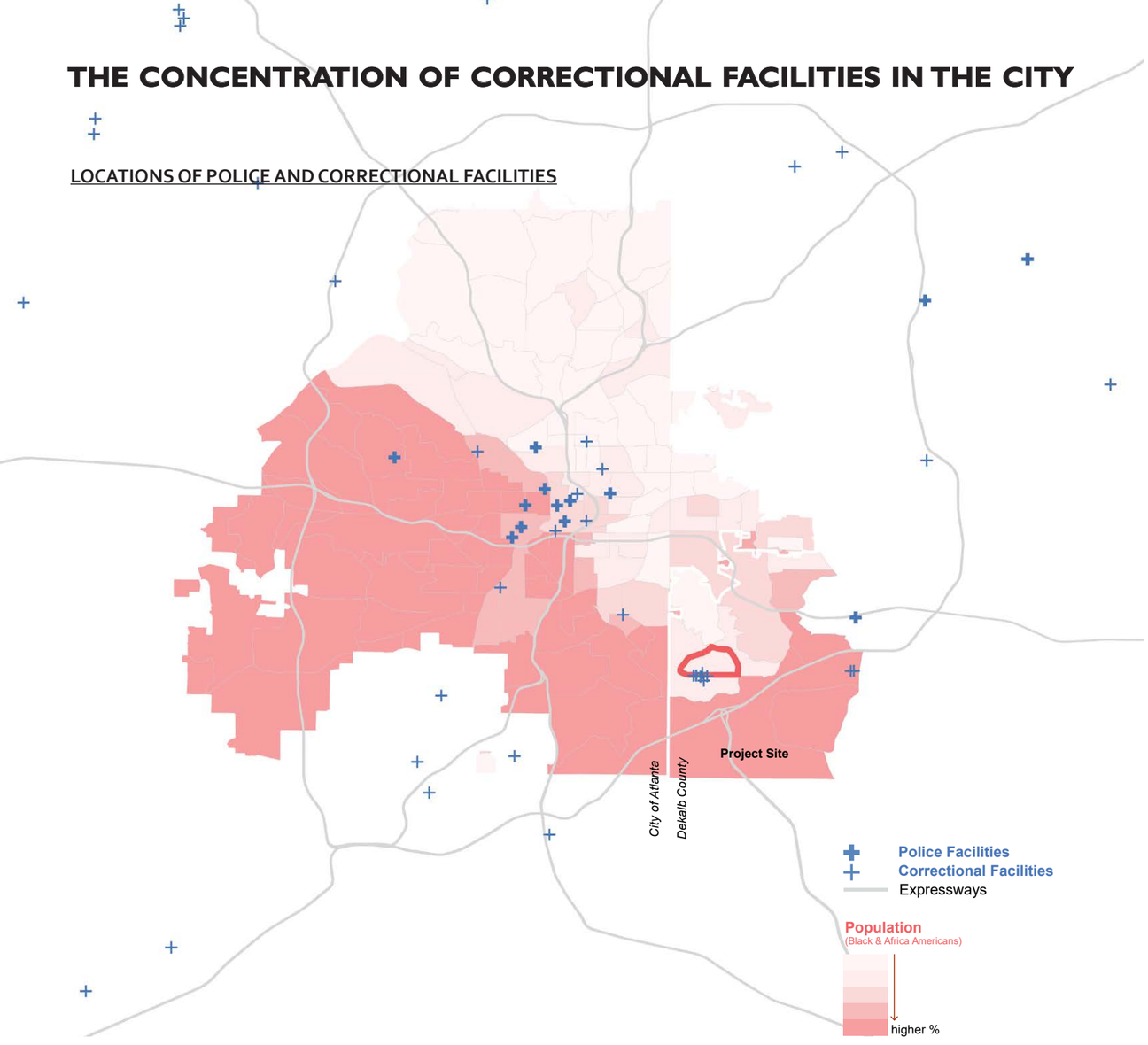

# E X I S T I N G V S . N E W S Y S T E M S

**Public funding should be shifted from the policing system to social needs and services through a new collective system. Our project aims to imagine a world without police by proposing a new system that will empower the communities to protect their interests.**
This system will address public health and safety through collective care by creating three community-based programs, which are educational, cultivational, and recreational programs.

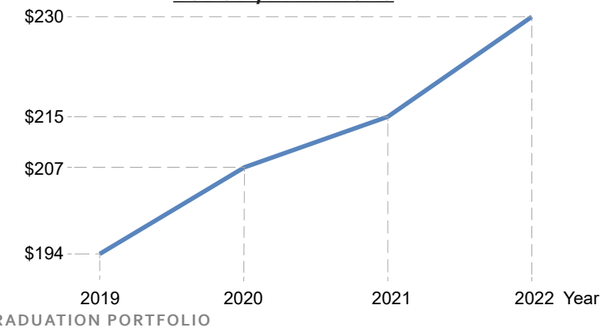


# THE CONCENTRATION OF CORRECTIONAL FACILITIES IN THE CITY

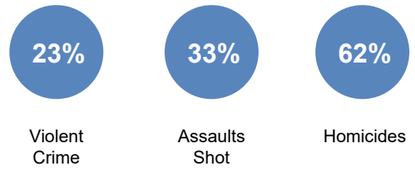
LOCATIONS OF POLICE AND CORRECTIONAL FACILITIES



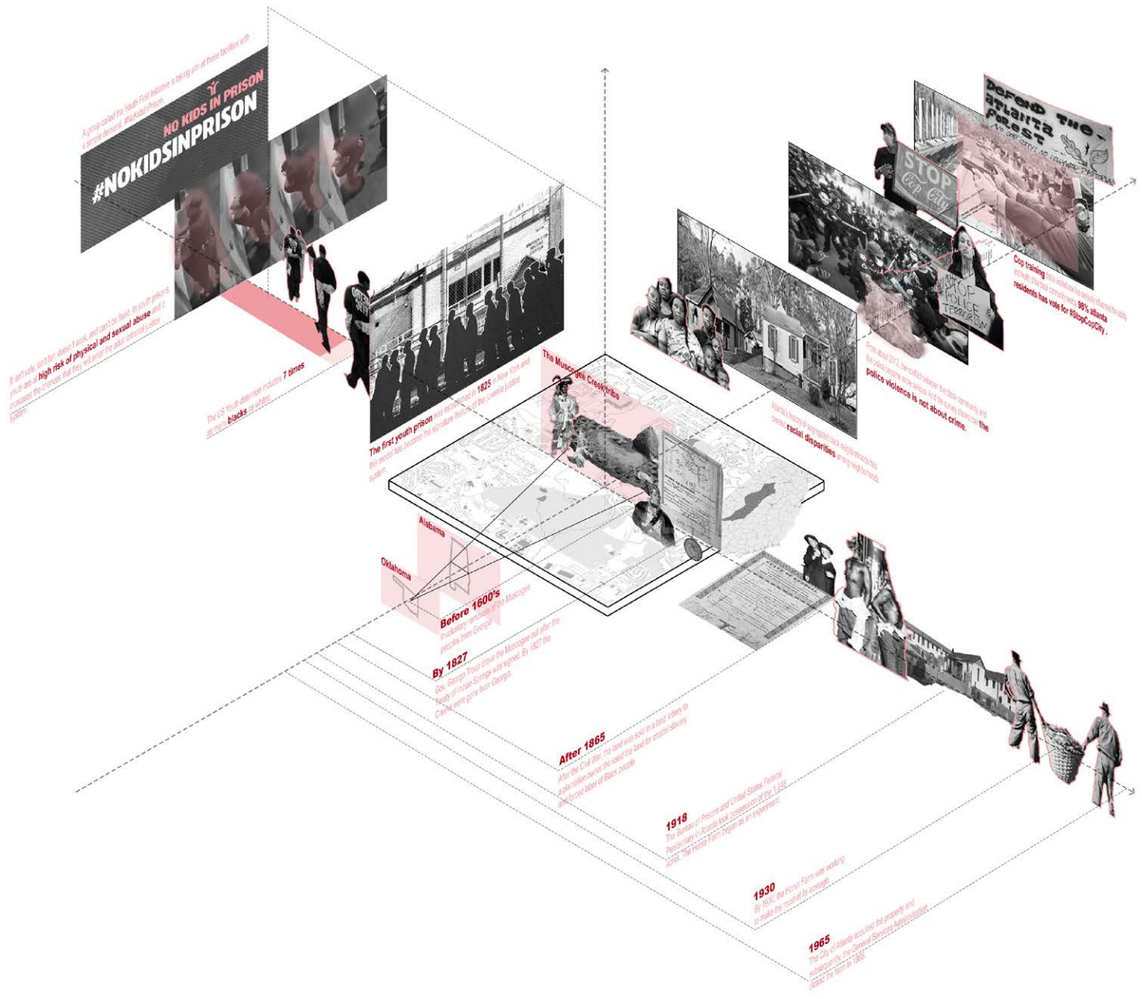

INCREASE OF ATLANTA POLICE BUDGET, IN MILLIONS

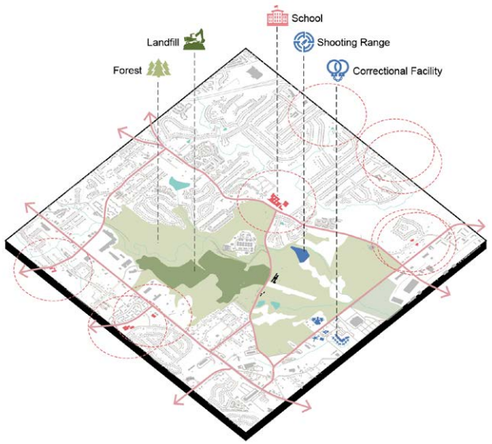



PERCENTAGES OF CRIMES INCREASED FROM 2019 TO 2020

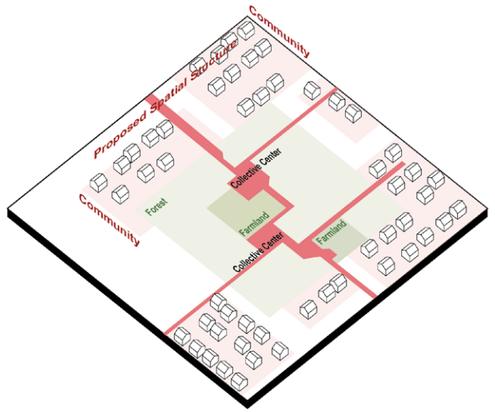



# SURVEILLANCE ON THE LAND TILL NOW






SITE ANALYSIS



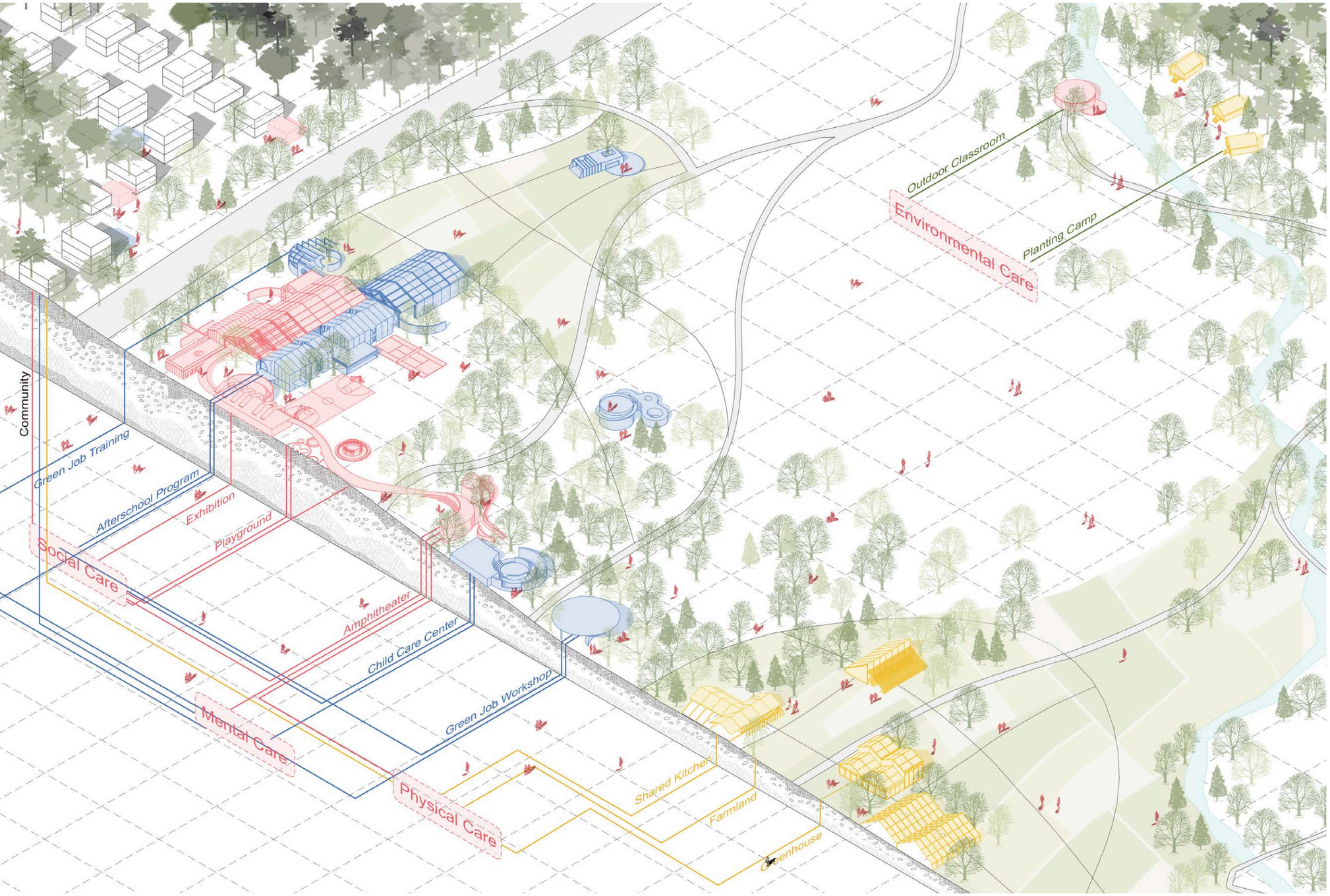

SPATIAL STRATEGY

PROPOSED SPATIAL STRUCTURE

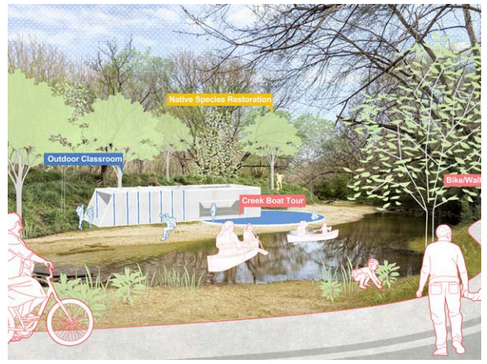
# ACCESSABLE COLLECTIVE PROGRAMS INTEGRATED WITH FOREST

School Shuttle Line
Remediation Forest
Edible Forest
Farmland
Collective center
School
Bus Stop
1km around School

# BUILDING A COLLECTIVE AND MUTUALLY SUPPORTIVE COMMUNITY THROUGH SOCIAL, SPIRITUAL AND PHYSICAL CARES

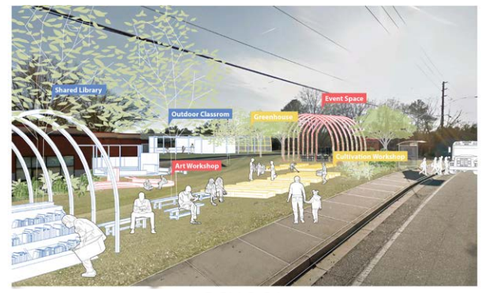


COMMUNITY



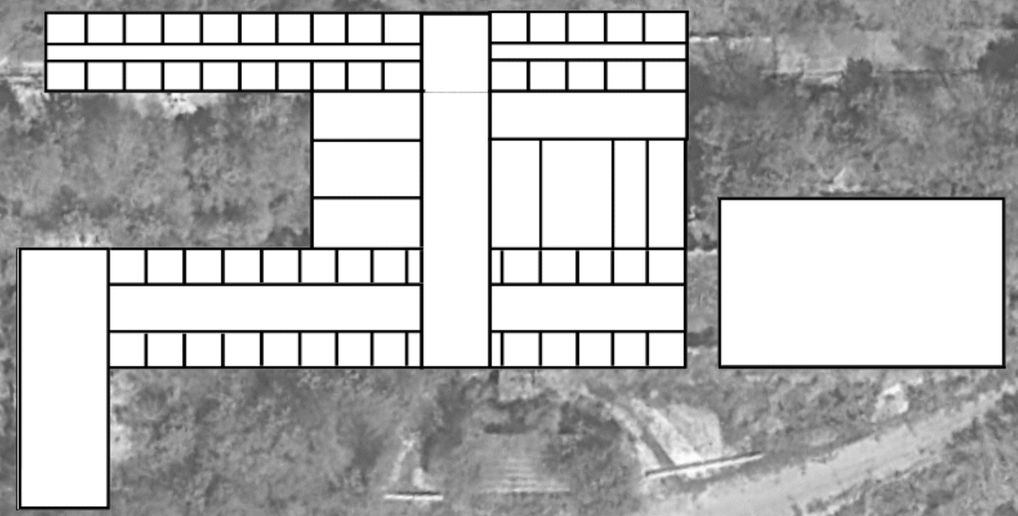

RIVER

COLLECTIVE CENTER

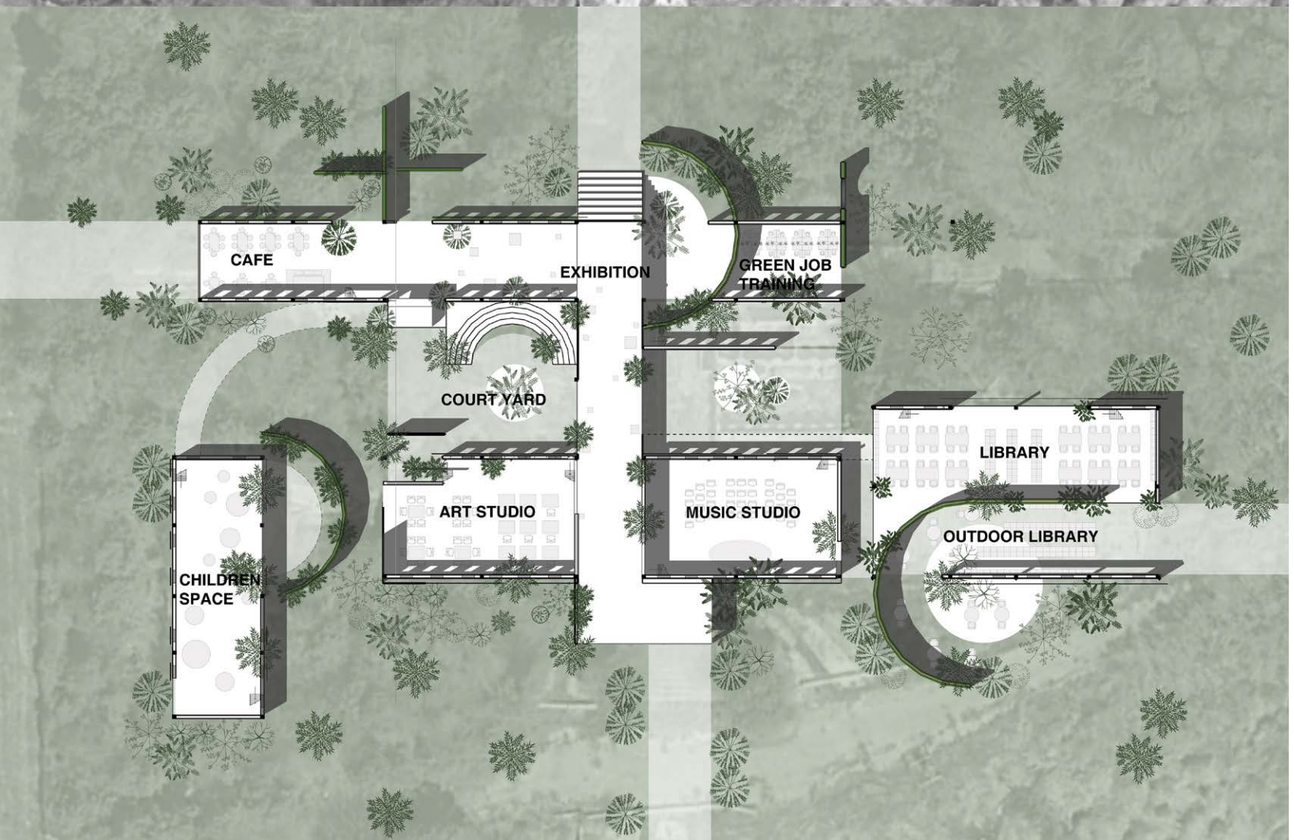



SCHOOL

## REPAIRING THE OLD PRISON STRUCTURE TO HAVE MORE OPEN SPACES AND DIVERSE COLLECTIVE PROGRAMS

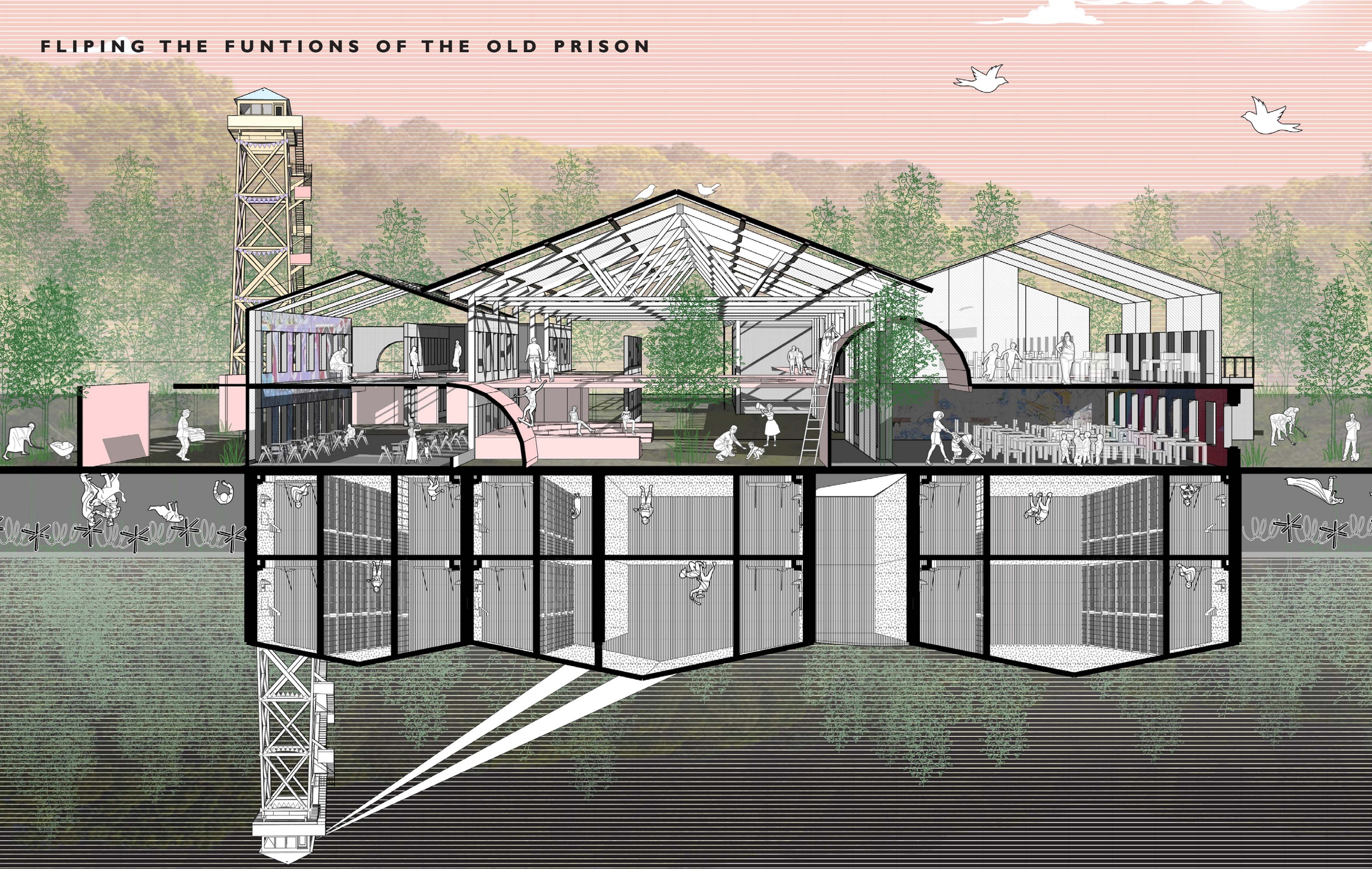


Old prison floor plan




## INTERWEAVING THE COLLECTIVE PROGRAMS WITH NEARBY NEIGHBORHOODS AND PUBLIC INFRASTRUCTUTRE

# FLIPING THE FUNTIONS OF THE OLD PRISON



OLD PRISON FARM

PHASE I

PHASE II

PHASE III

# ESTABLISHING COLLECTIVE SYSTEMS IN THREE PHASES

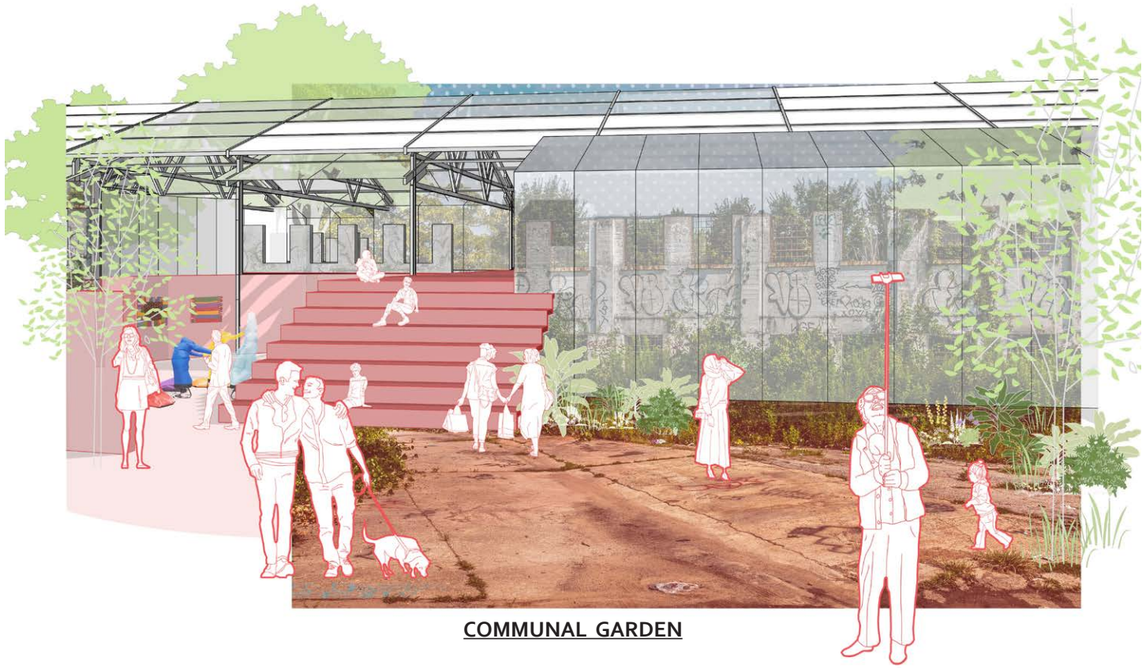
You are not allowed to be here! Go back to work!!!

Would you like to have more green spaces over here?

I finally have spaces to grow food and share with my neighbors.

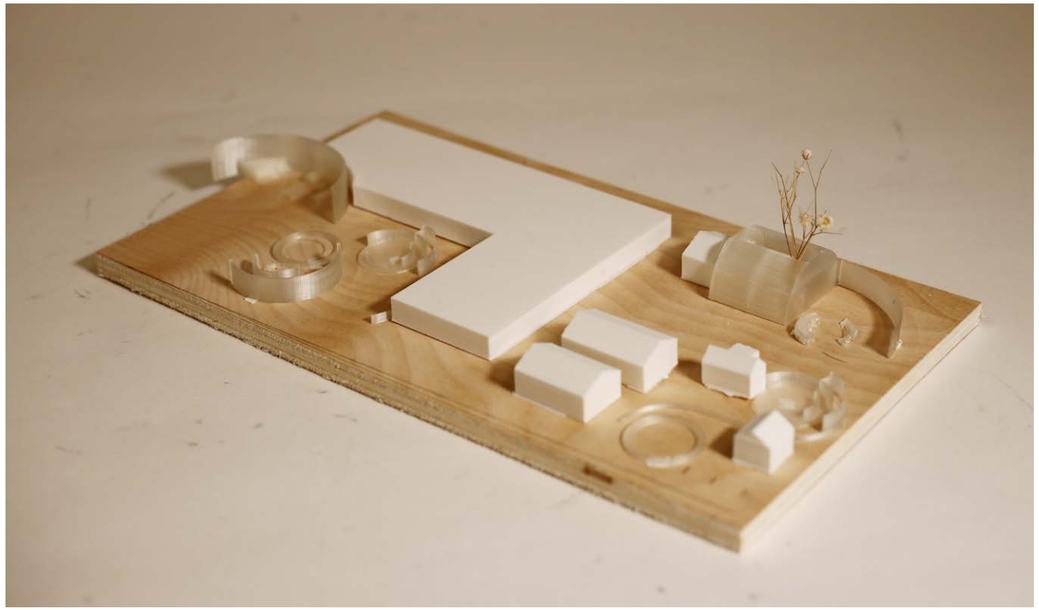
My daughter very enjoy building bird houses with her classmates.

# STUDYING AND TESTING THROUGH MODELING

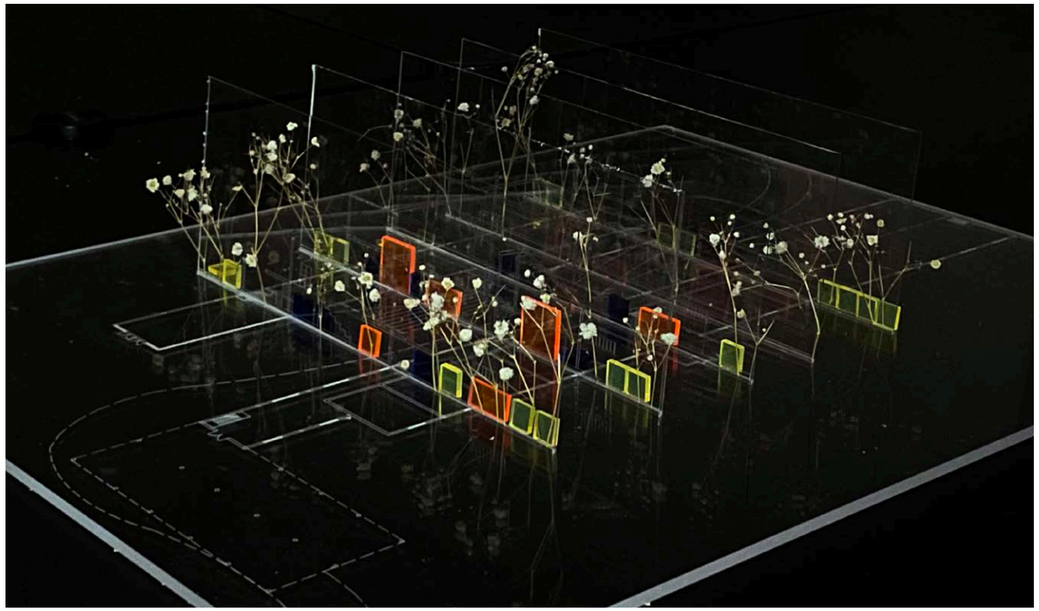


COMMUNAL GARDEN

ART STUDIO



INTEGRATING COLLECTIVE PROGRAMS TO THE EXISTING BUILDINGS



REPURPOSING THE OLD PRISON BY OPENING UP AND ADDING NEW PROGRAMS

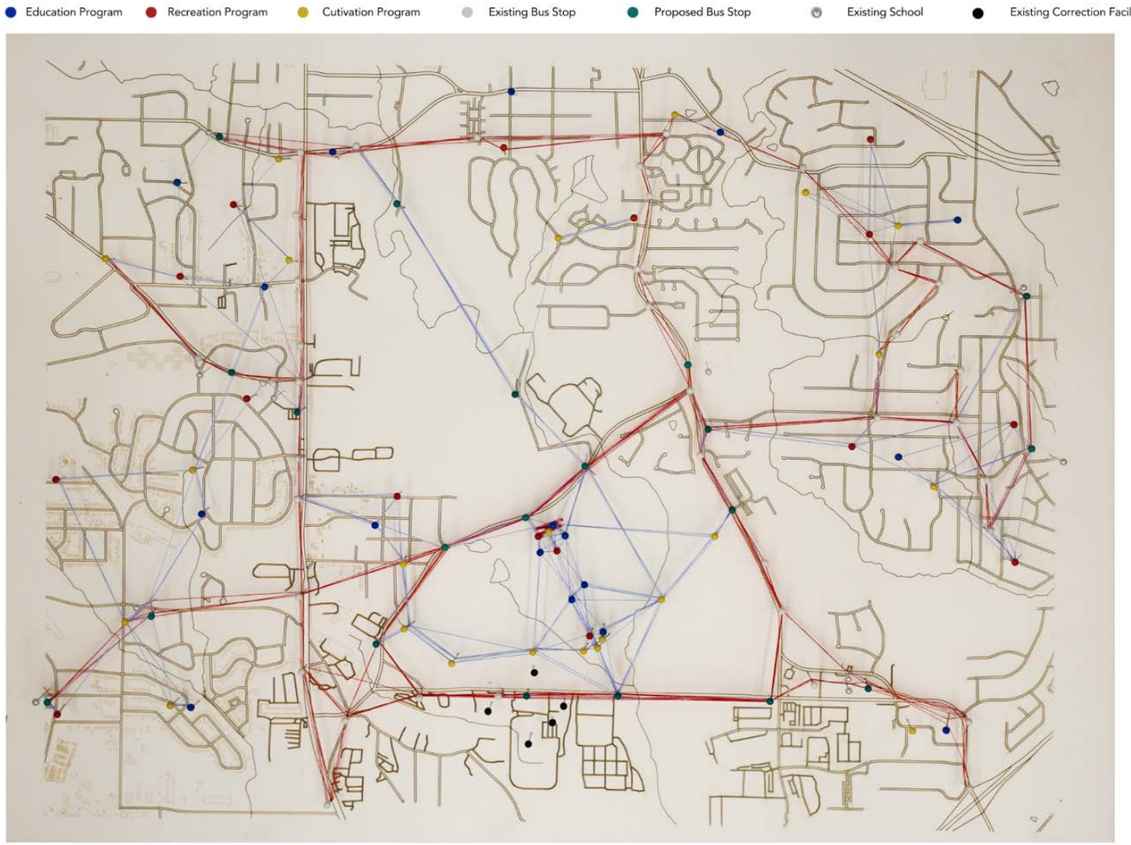
# TOWARD SUSTAINABLE LADYVILLE IN 2080

*Group Member: Lingpeng Zhu, Jiaxin Li, Jiayi Zhao, Shuhua Li*

MESO AMERICAN REEF_ URBAN DESIGN STUDIO III - Spring 2022

Ladyville, Belize

Ladyville is a suburban village experiencing an influx of population from Belize city and surrounding areas. It is facing the challenges of losing habitats, wastewater pollution, and seawater rise that threaten the livelihood and ecosystem of this area. What if the wetland habitats and natural resources in Ladyville are protected and restored, and the village grows interdependently and sustainably with its natural assets? Thereby, we propose a design framework to manage anticipated growth in Ladyville by implementing the water-sensitive driven design.

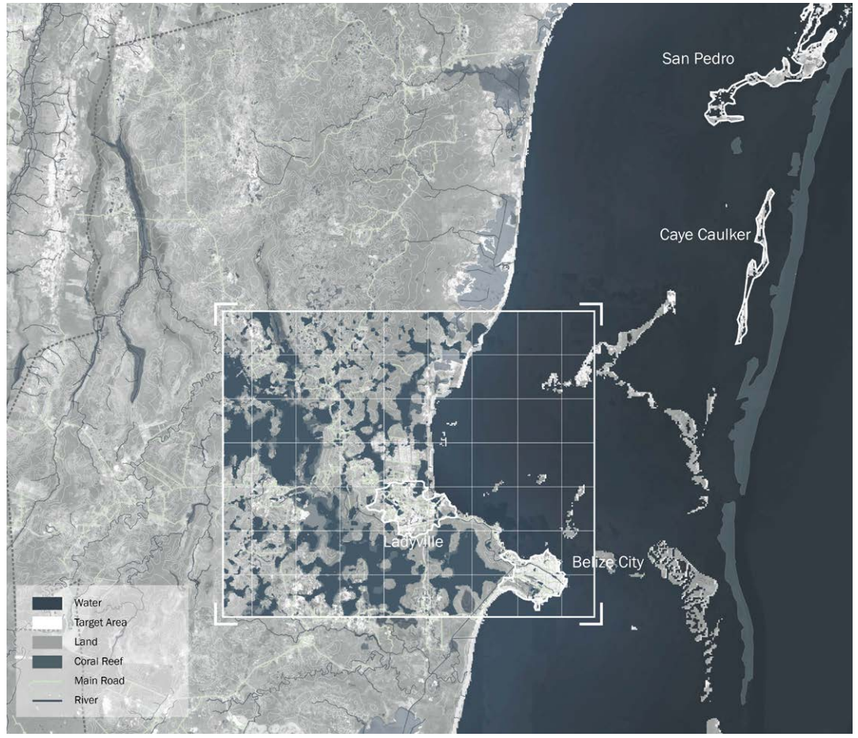



**CONNECTION & CIRCULATION**

# CHALLANGES THAT LADYVILLE IS FACING NOW

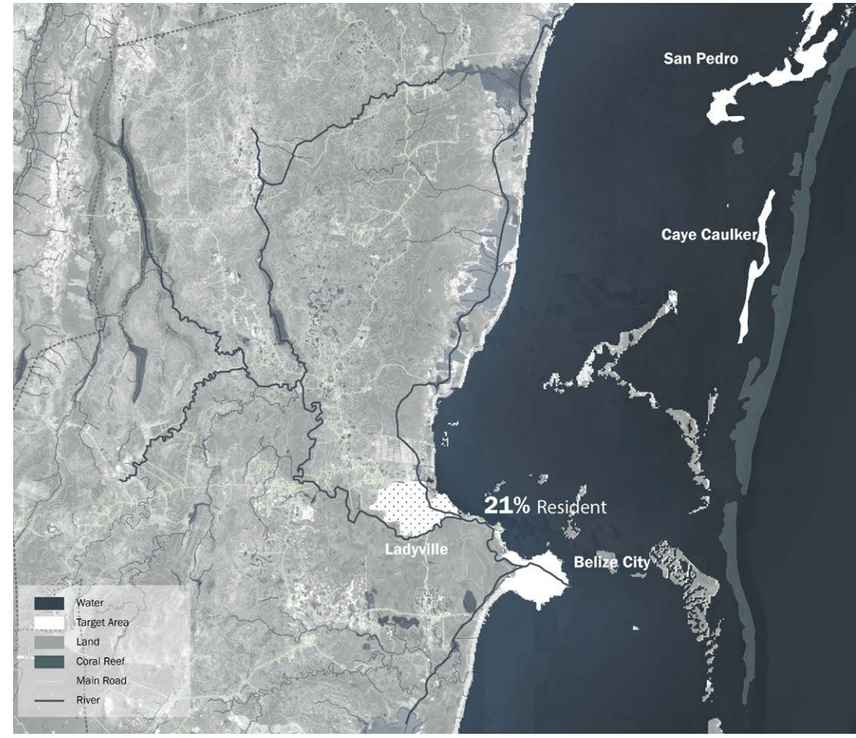
## POPULATION INFLUX

Recently, Ladyville is experiencing a rapid influx of population from surrounding areas, including residents from Belize City, San Pedro, and Caye caulker, and tourists coming from the Philip S. W. Goldson International Airport.




## SEA LEVEL RISE

In addition, Ladyville is located about 10 ft above sea level,  facing threats from sea level rise with a 4 ft increase in sea level in 2080. Inundation remains a big problem to be solved.



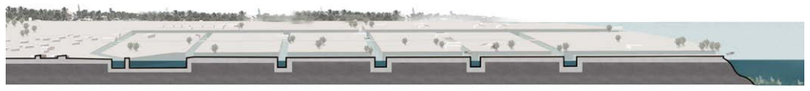

## WASTEWATER POLLUTION

Besides, treating wastewater has been a crucial issue for the communities in Ladyville. 21% of Residents in Belize suffer from wastewater treatment, which leads to an urge to upgrade the sewage system.

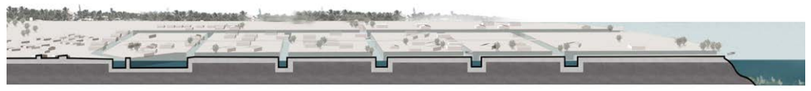
# FEATURED SITES IN LADYVILLE CHANGED OVER TIME

## VISTA DEL MAR

**1963** *Mangrove and Littoral Forest*

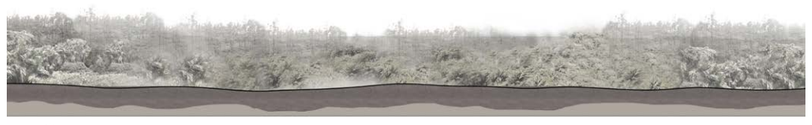


**1969** *Construction of Vista Del Mar*



**2005** *Increase of Residential Buildings*

## INTERNATIONAL AIRPORT

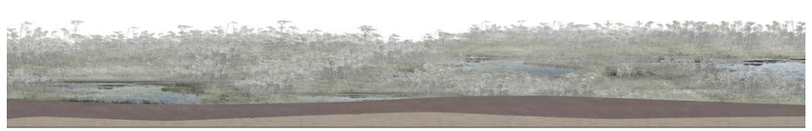


**1963** *Tropical Rain forest*

**1947** *Construction of the Airport*

**2021** *Industrial Development around the Airport*

## SUBURBAN COMMUNITY



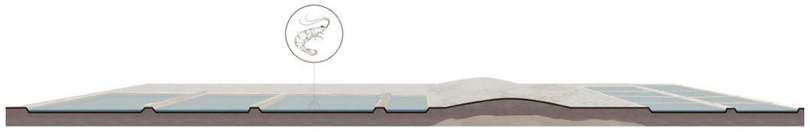
**1935** *Pineland*

**1985** *Development of Suburban Area*

**2021** *Suburban Sprawl*

## SHRIMP FARM

**1963** *Pineland*



**1982-2007** *Shrimp Farm*

**2020** *Abandoned Shrimp Farm*

# CHALLENGES & ASSETS IN LADYVILLE

**13%** annually riparian deforestation rate

"We don't have a proper drainage system in our communities, which is a big problem. And everything flows into the rivers, creeks or our coastal area." ——Pepe, Environmental engineer consultant

FLOODING

ABANDONED SHRIMP FARM

SUBURBAN UNMANAGED EXPANSION

WATER POLLUTION

SHRIMP FARM

ECO-TOURISM

DEVELOPMENT ON WETLAND

DEFORESTATION

SEA LEVEL RISE

INTERNATIONAL AIRPORT

WETLAND

Urban area
Mangrove
Forest now
Deforestation

# URBAN GROWTH WITH NATURE

Bus stops
Communities
Roads
Canals
Rivers

Wastewater treatment wetland

Wetland nature reserve

Integrated aquaculture

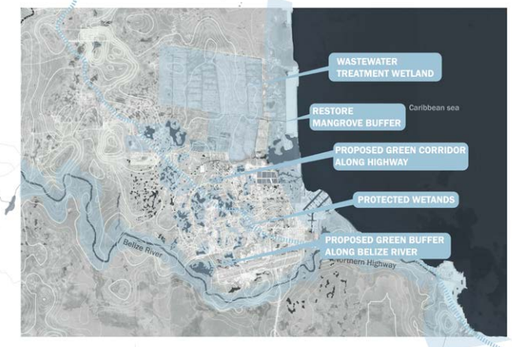
Densified communities

Restored Mangrove

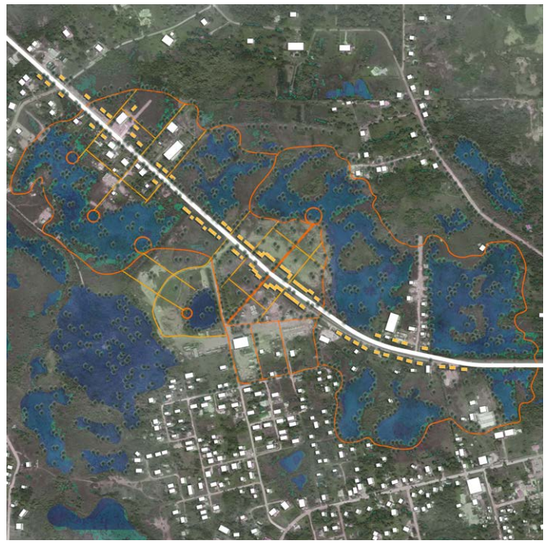
Belize River

Northern Highway

International Airport



# RETHINK A SUSTAINABLE SUBURBAN GROWTH MODEL



**NOW -**

Urban Sprawl Is Damaging The Wetlands

**2080-**

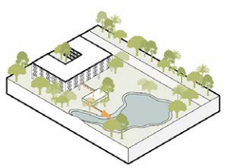
Wetland Restoration and Renaturing

Transit Oriented Corridor on High Points

## Ddensify

**Resilient Community**

Retrofit

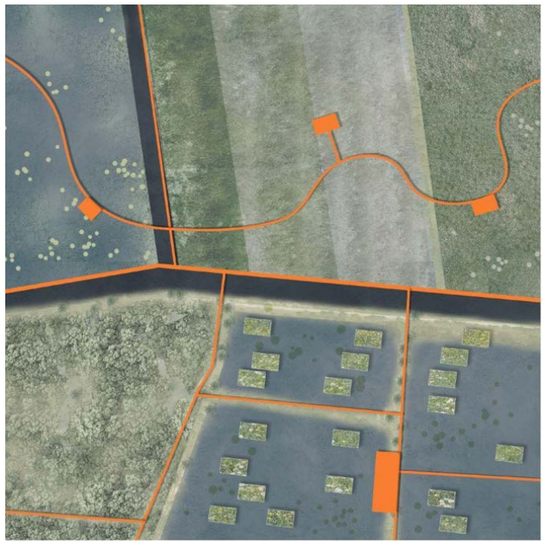


New Community Land Trusts

Public Amenities

**NOW -**

Abandoned Shrimp Farm

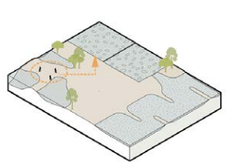


**2080-**

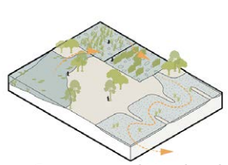
Repurpose into Nature-Based Wastewater Wetland Treatment System and Aquaponics

## reclaim

**Living Infrastructure**



Reclaim Abandoned Shrimp Farm



Constructed Wetland

Wastewater Treatment System

**NOW -**

Endangered Neighborhood

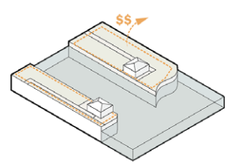
**2080 -**

Mangrove Rehabilitation

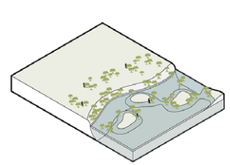
Sustainable Aquaculture and Eco-tourism

## renature

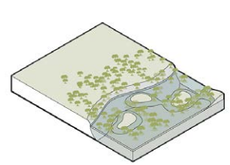
**Diversified Ecosystem**




Buyout Program

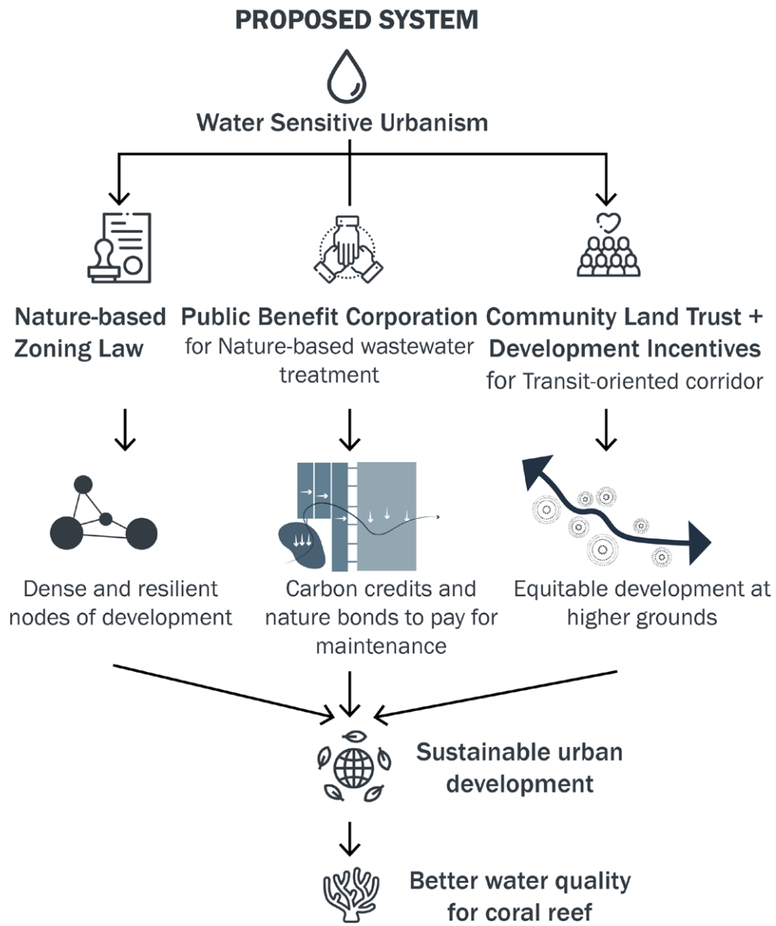


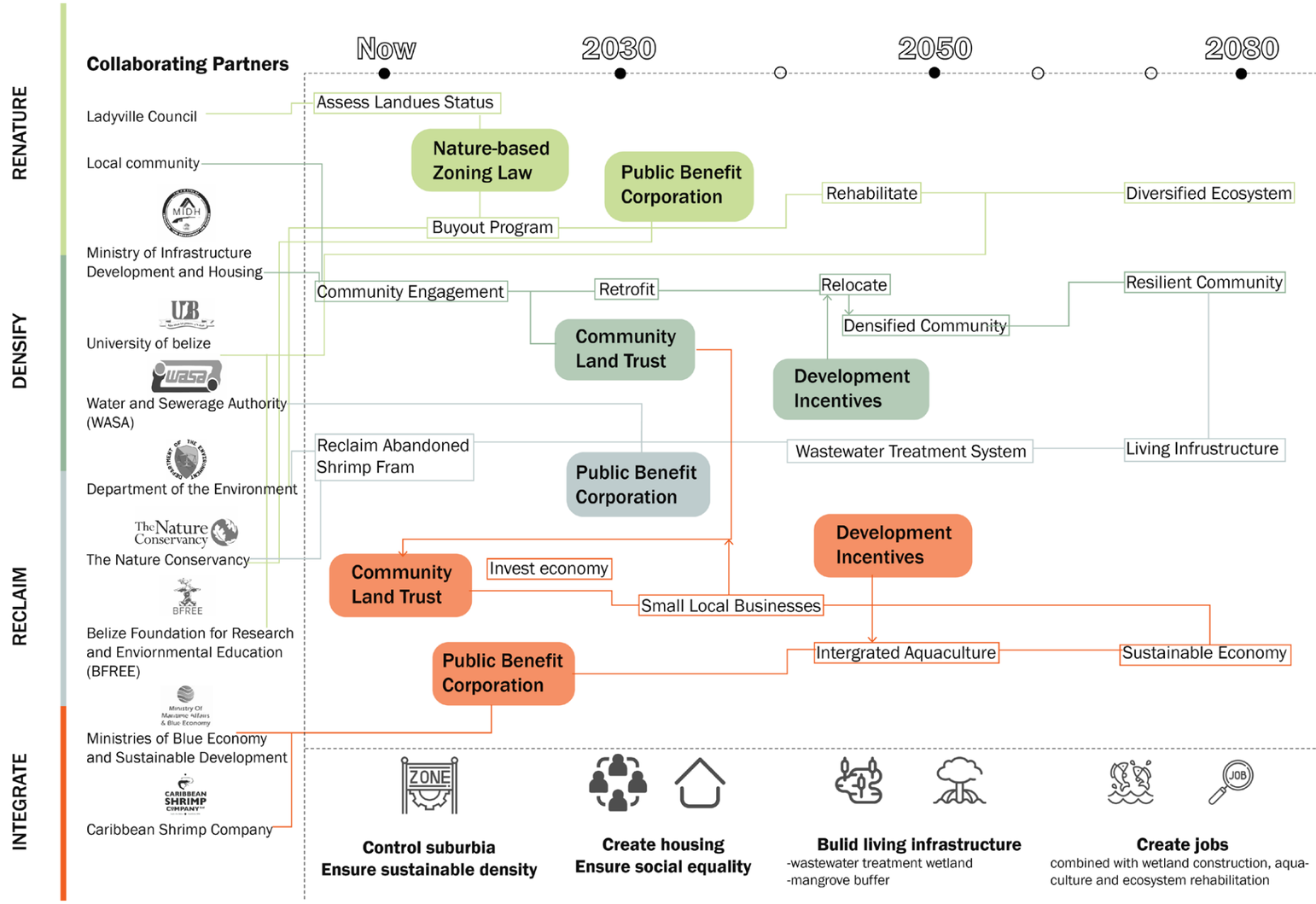
Rehabilitate



Diversified Ecosystem

# PROPOSED WATER SENSITIVE URANISM SYSTEM AND POLICIES RECOMMANDATION IN TIME



# MANAGING WASTEWATER THROUGH BIOPROCESS

Water

Municipal Water

Stormwater

Collectors

Surface Runoff

Neighborhoods

Irrigation / Toilet Flushing

Black Water

Grey Water

Biogas Septic Tank

Restored Wetland

Bioswales

Biogas

Biogeneration

Electricity

Wastewater Biosolids

Fertilizer

Community Garden

Liquid

Canals

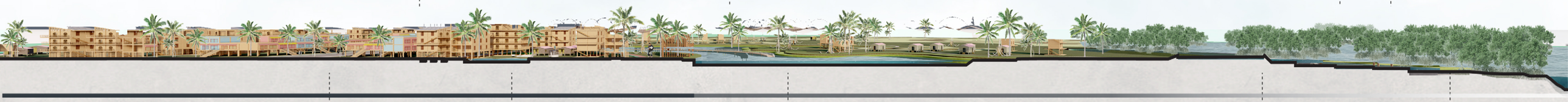
Reccled Water

Major Wastewater Treatment System

Mangrove Buffer (Integrated Aquaculture)

Ocean

Protected Coral Reef



*Transit-Oriented Corridor*

*Community Courtyard*

*Restored Wetland for Wastewater Filtration*

*Wastewater Wetland Treatment*

*Mangrove Buffer*

# VISION 2080 - WATER AND NATURE BASED SUBURBAN GROWTH MODEL

Retrofit existing housing to be adaptive to sea level rise and storm surge

Nature-based community with shared communal spaces

Living infrastructure as wastewater treatment and public amenities

Transit - oriented corridor to stimulate local economy

Sustainable public transit and adoptive community spaces on ground level

Integrated aquaculture and agriculture with wetland wastewater treatment for social and economic values

Eco-tourism and mangrove restoration as educational programs and catalysis for local livelihood

Major Wastewater Treatment System

Canals

Restored Wetland

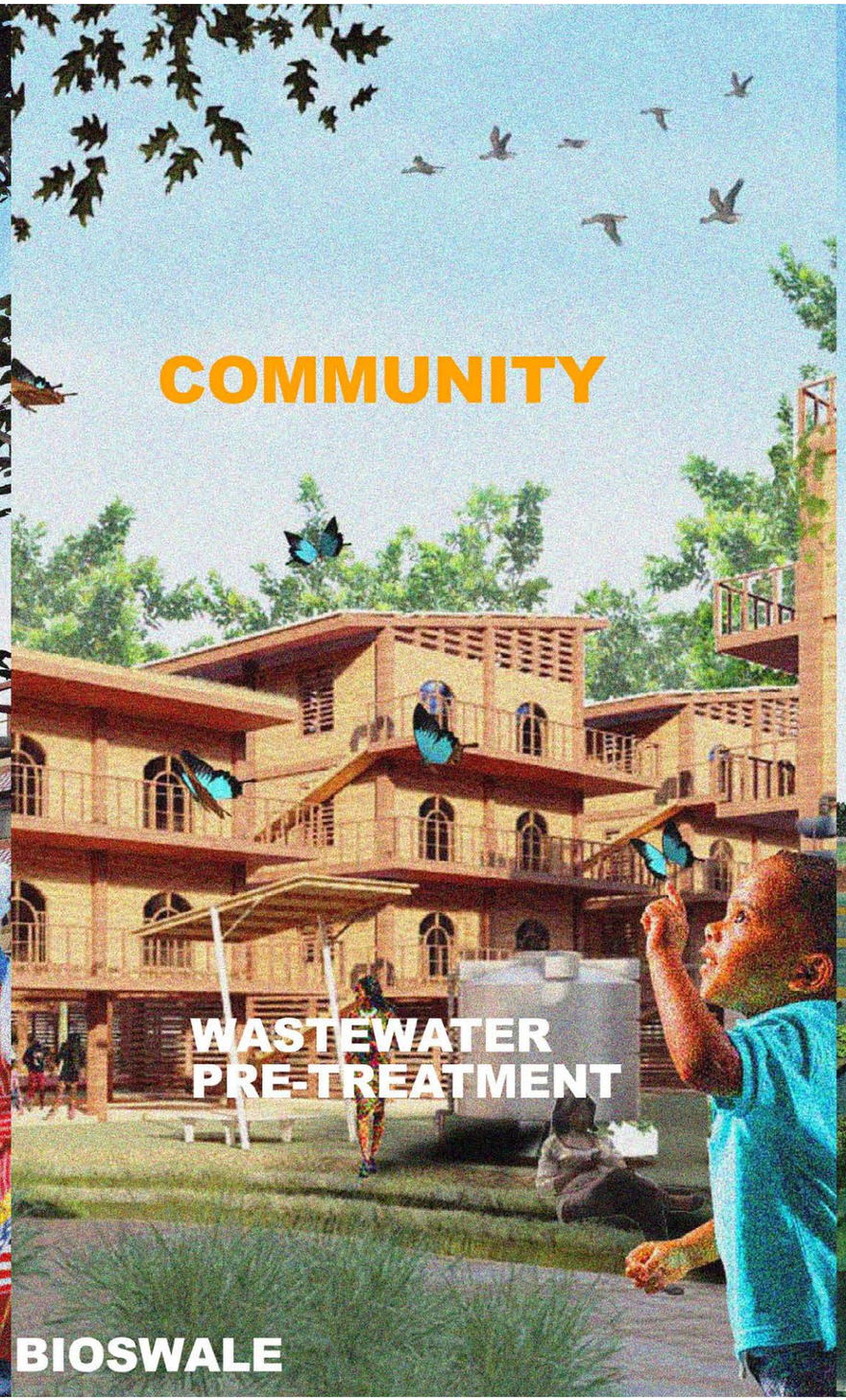
Neighborhoods

Mangrove Buffer (Integrated Aquaculture)

Ocean

Protected Coral Reef

CORRIDOR
BUS STATION
TEMPORARY MARKET


COMMUNITY
WASTEWATER
PRE-TREATMENT
BIOSWALE

WETLAND
WASTEWATER TREATMENT
AQUAPONICS SYSTEM

# FABRICS AND TYPOLOGIES IN TOKYO

*Group Member: Kimberly Ramirez, Shuhua Li*
ARCHA6837_001_2021_3 - FABRICS & TYPOLOGIES - Fall 2021
Okusawa, Tokyo

Okusawa, Japan lies just outside of Tokyo, Japan. The city consists of various generations of houses, each with a very distinct relationship to green space and parking. The history of the built environment lies within each of these generations. Through each generation there has been a change in lot size, with new generation reducing lot sizes and green space. Because each generation holds a very specific relationship between each of these factors, it is possible to recognize when each home was built. The first generation of homes in Okusawa are considered to be constructed around 1940. These homes typically sit on larger lots and a majority of the lot is green space. The built structures on the lot are not significantly large and are typically only one story tall. This generation does not include parking on the lot, only a small sidewalk leads into the property. Through the introduction of the second generation around the year 1962, there are various changes to the lot, reduction is its size being the largest identifying factor of the second generation homes, but followed closely by the introduction of the parking space. In this generation of homes, the green space is significantly reduced to accommodate for the parking space (especially given the reduction lot size), at times only happening in the front of the lot though a long hedge or tall grass. These homes also increase in size, with most now consisting of two stories and at times also including a small covered parking space structure. Moving into the third and fourth generations around 1985 and 2005, respectively, there is a major reduction in lot size and the building lot coverage is very high, with buildings occupying almost the entire lot. In these generations there are little to no room considered green space. Parking spaces are typically located on the front of the lot, also serving as the entrance to each home, the size of which vary from 3 stories to larger complexes of 6-7 stories.

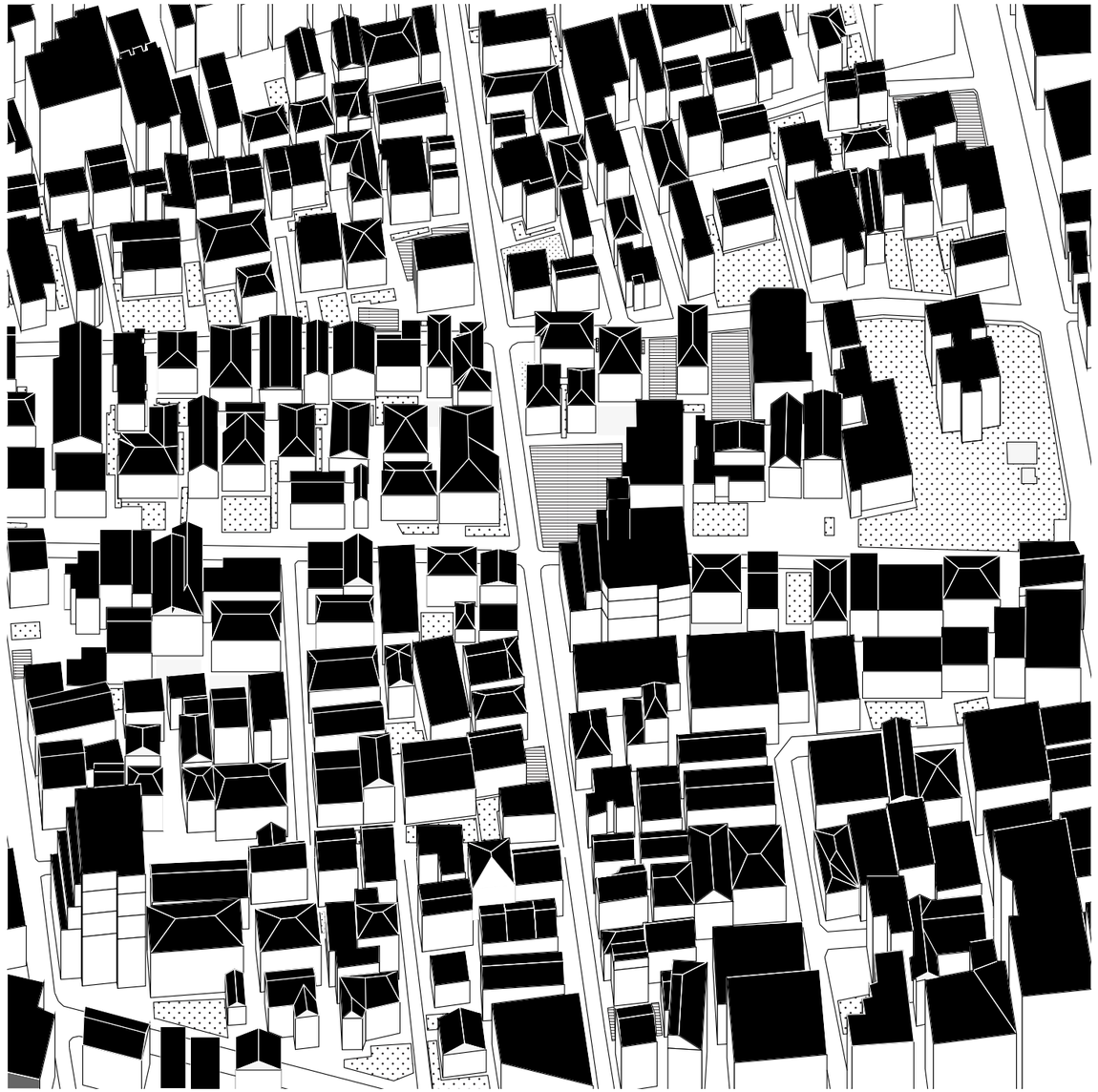
Our proposal works to re-introduce green sauce that has been lost over four generations of housing, with a consideration for the density found in the third and fourth generation homes in Okusawa. Through this proposal there are various scales of dwellings, ranging form 1-3 stories, but each of which consider the relationship to green space. In order to achieve this goal, a level of density must be adopted for the housing, allowing dwellings to existing within either long or short housing blocks surrounded by small amounts of parking, but large amounts of green space. These green spaces can be shared by various buildings and should aim to resemble the large green spaces found in Okusawa for programs like Shrines, and other “pocket-block” program (the term pocket-block referring to large spaces that typically occupy a large amount of space within a block that might include parks, gardens, or shrines). These modules established through the proposal allow for each dwelling to interact with green space, while considering the density that is entering Okusawa as it grows in number of residents.

| Statistical Analysis | Existing Fabric | Proposed Fabric |
|---|---|---|
| Total Project Area | 640,000 | 640,000 |
| Total Building Lots | 229 | 20 |
| Number of Floors | 1-6 | 1-3 |
| Total Building Footprint | 252,928 | 224,455 |
| Building Lot Coverage | 0.6-0.95 | 0-0.5 |
| Total Number of Dwellings | 344 | 852 |
| Subject Lot Area/Dwellings | N/A | N/A |
| Gross Floor Area | N/A | 401,292 |
| Heights & Setback | N/A | N/A |
| Usable Open Space | 59,554 | 232,006 |
| FAR | 0.5-5 | 0.5-2 |
| Total Parking Area | 43,390 | 44,712 |
| Total Parking Spaces (Dwelling) | N/A | N/A |

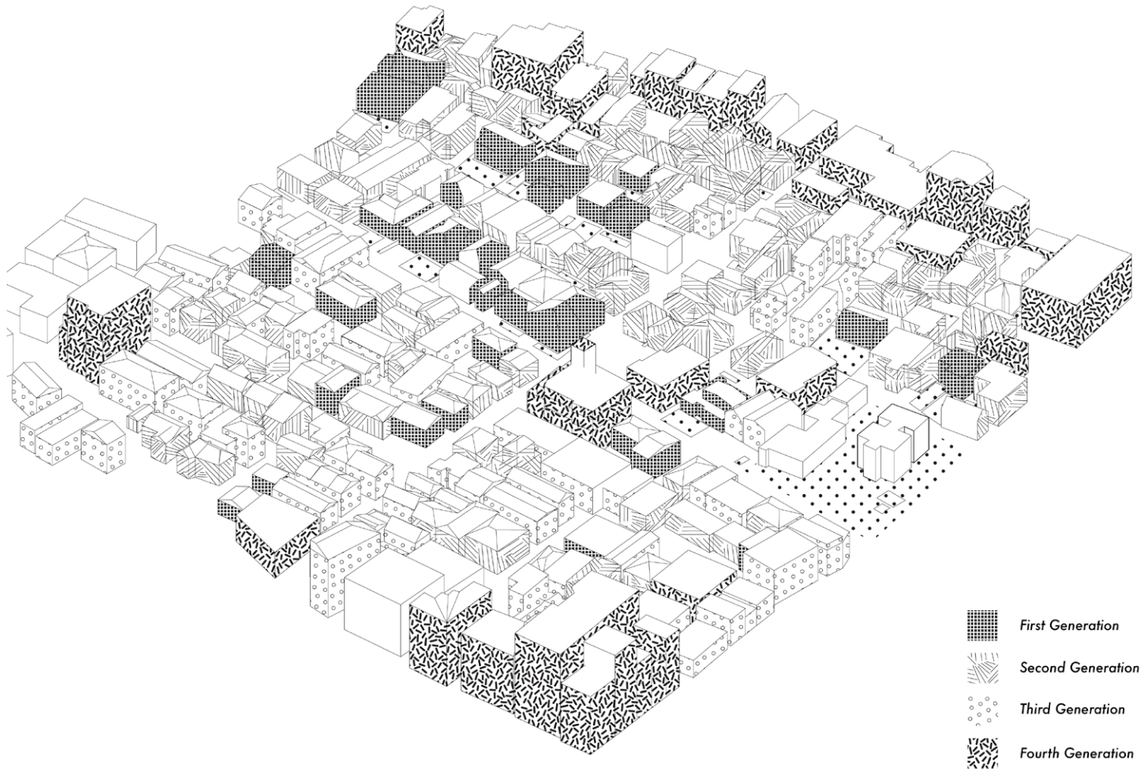
# CONTEXT OF 800FT X 800FT STUDY AREA

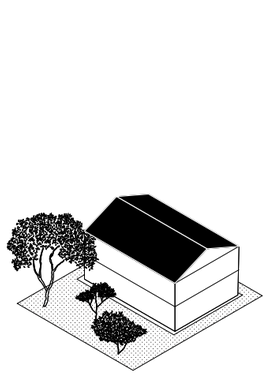
## EISTING SITE PLAN

## EISTING SITE AXONOMETRIC



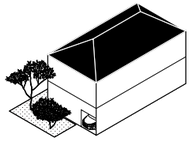
# DIAGRAMS FOR THE EISTING FOUR BUILDING GENERATIONS



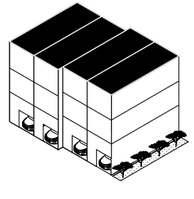
First Generation

FAR: 0.5-1



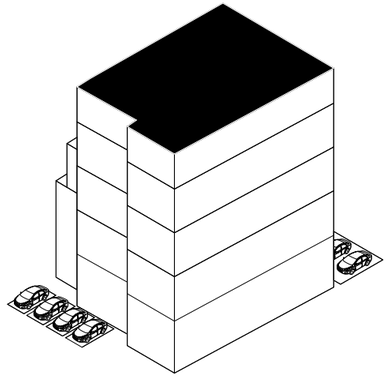
Second Generation

FAR: 1.5



Third Generation

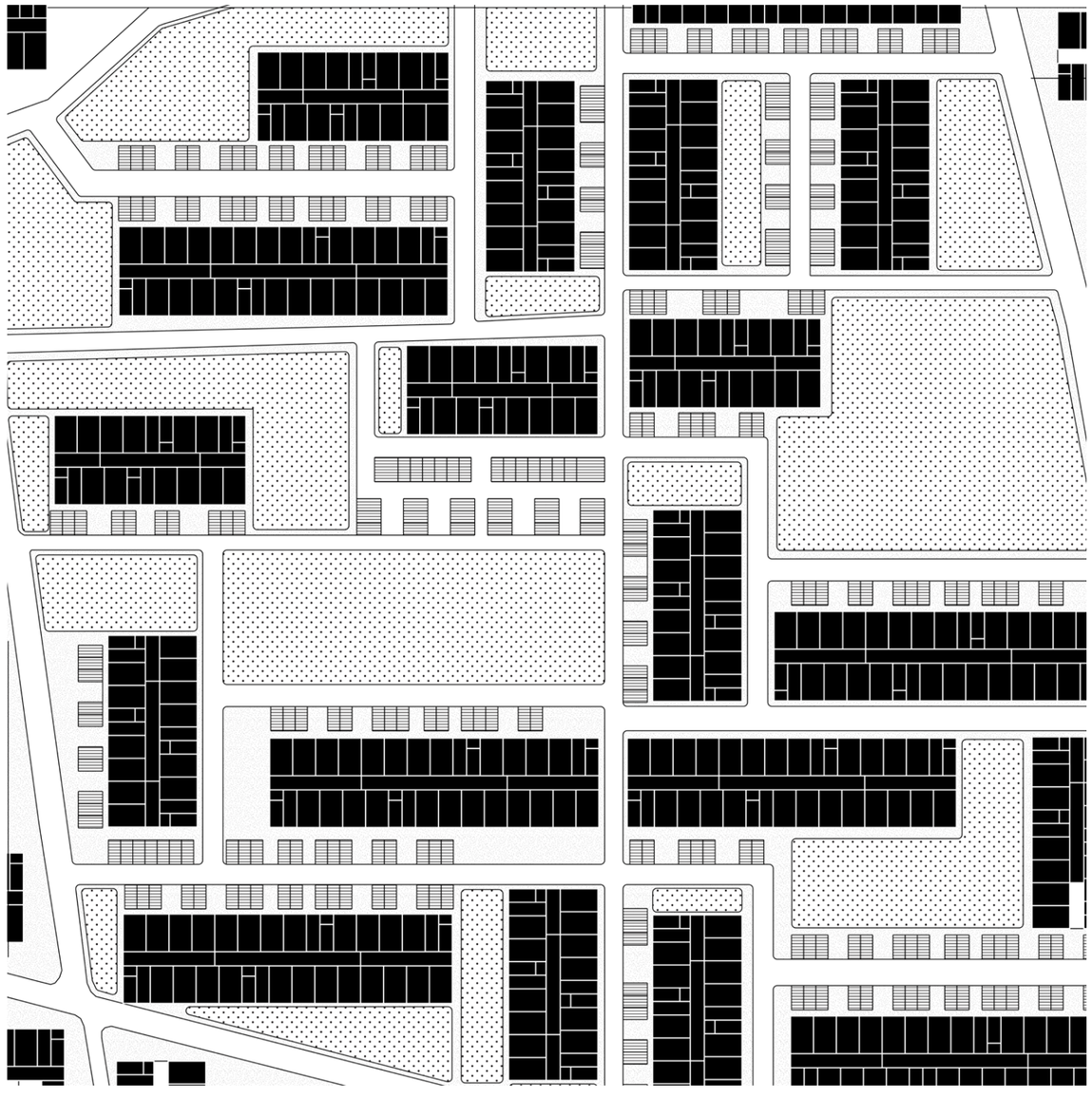
FAR: 3



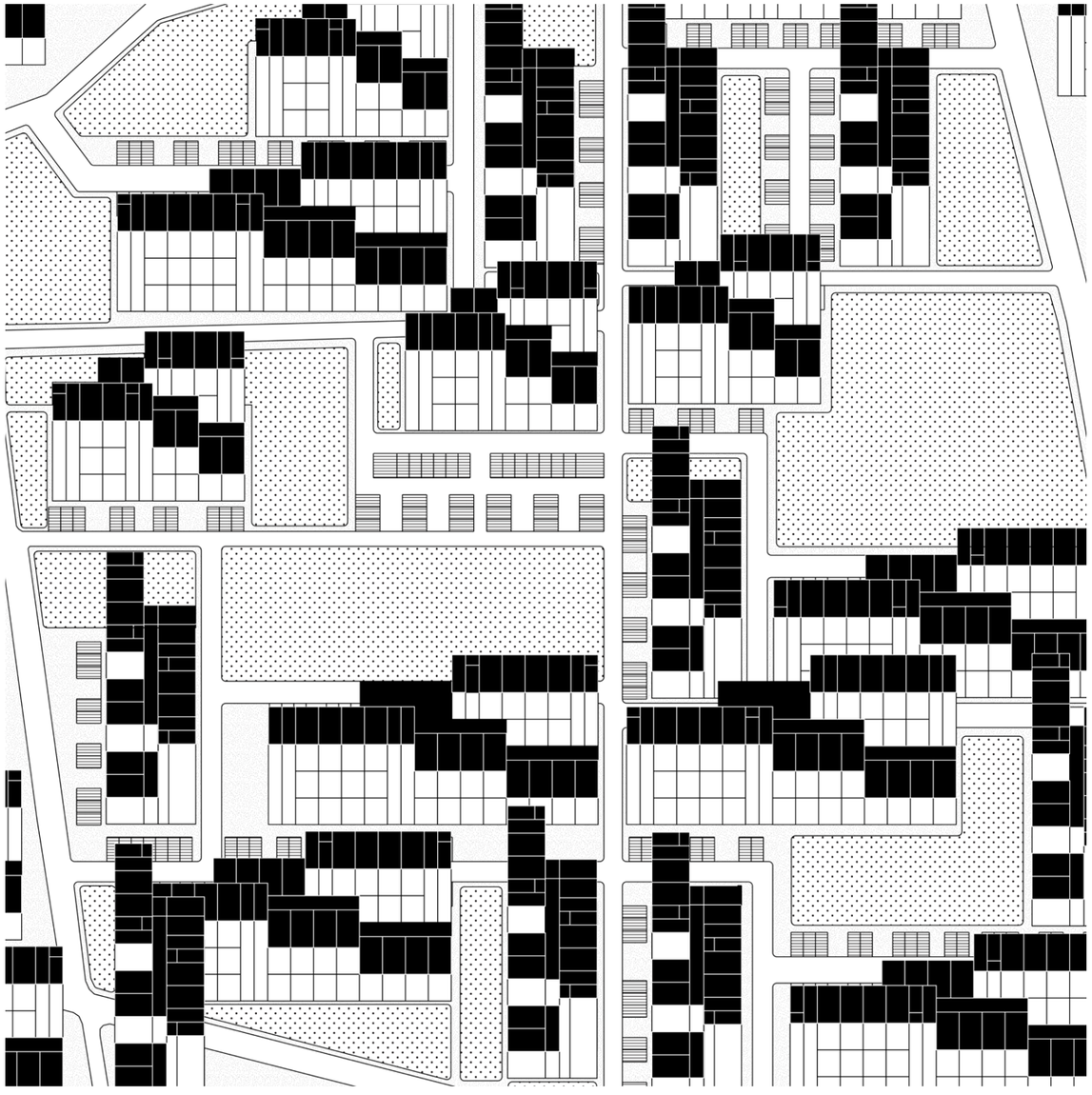
Fourth Generation

FAR: 5

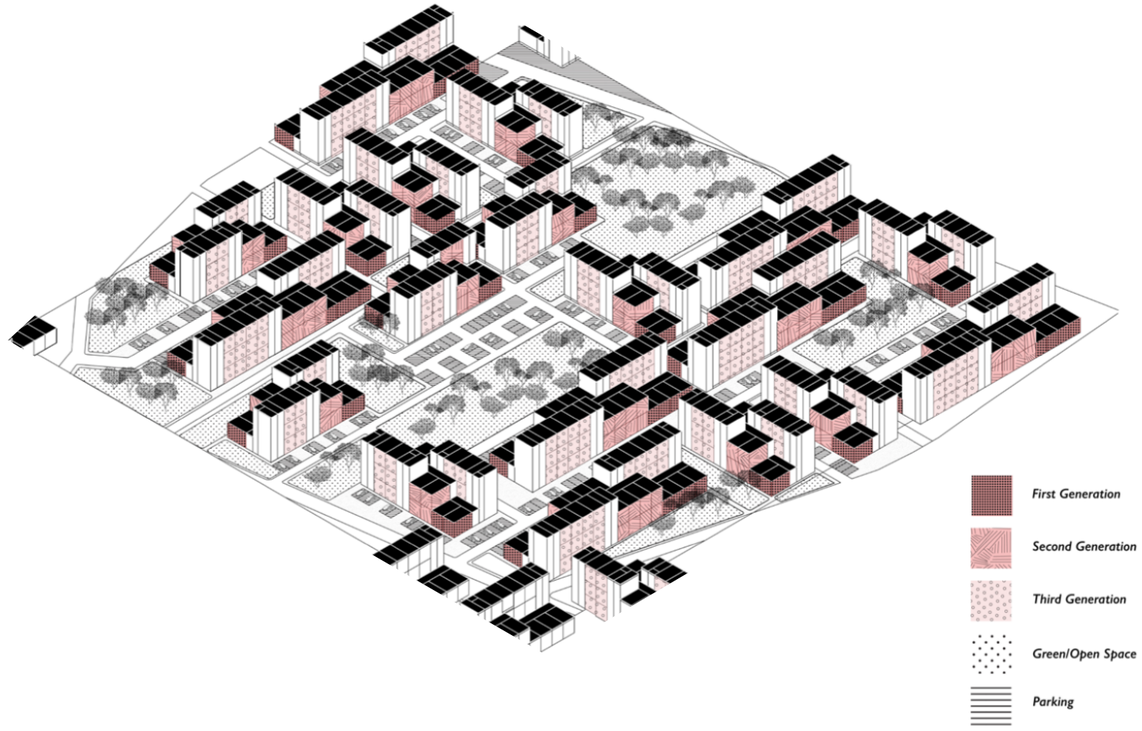
# PROPOSED SITE PLAN

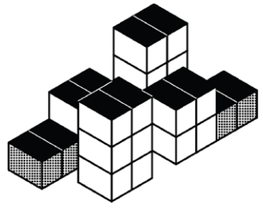


# PROPOSED SITE AXONOMETRIC

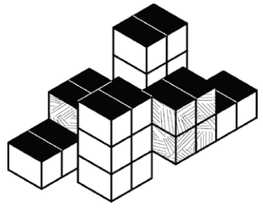


# DIAGRAMS FOR PROPOSED BUILDING GENERATION TYPES

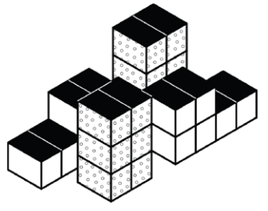


Proposed
“First” Generation

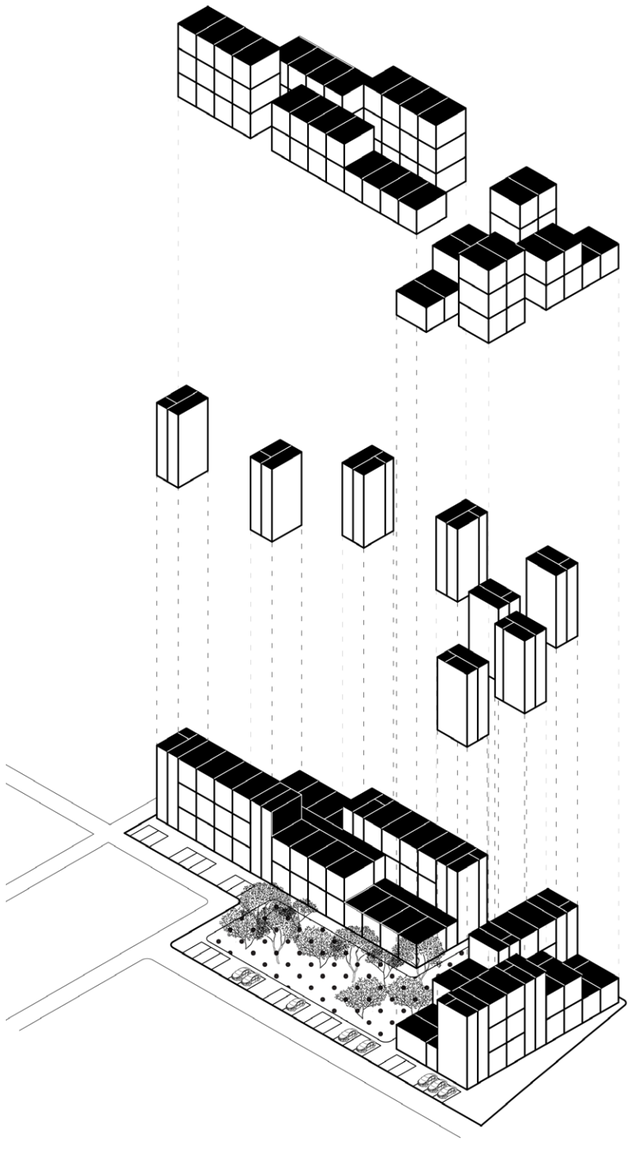


Proposed
“Second” Generation



Proposed
“Third” Generation

# DIAGRAMS FOR THE COMPOSITION OF BUILDING UNITS



**Residential**

**Vertical Circulation**

**Proposed:**
**including green space and parking**

# ASSESSING STREET VEGETATION RATE IN MANHATTAN, NEW YORK CITY

*Group Member: Kenny Zhou, Rongxin Tang, Shuhua Li*

ARCHA4892_001_2021_3 - DATA VIS 4 ARCH, URB, HUM - Fall 2021

**A Retrospective of the faces on the last 21 years of TIME Magazine**

TIME Magazine offers a weekly American-centric perspective of current events and news. The magazine strives to tell stories through people, hence its tendency to feature a single person or multiple people on its covers, linking readers to the cover story. The readership includes people who want to know the latest news, and more generally, well-educated people around the world. 80% of the readership are Americans, and they typically live in urban or suburban areas, hold a college degree, and are around 50 years old.

Every person to appear on TIME Magazine's cover

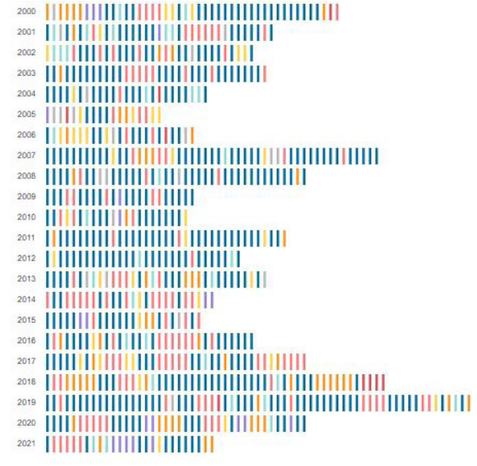
Where do these featured people come from?

The TIME 3-timer club: who has appeared the most?

**Every person to appear on TIME Magazine's cover from 2000 to now**

What types of people tend to be featured on TIME covers? We painstakingly flipped through every single issue to find every person featured from the beginning of 2000 all the way to the latest cover in 2021. The result? Politics and entertainment reign supreme.

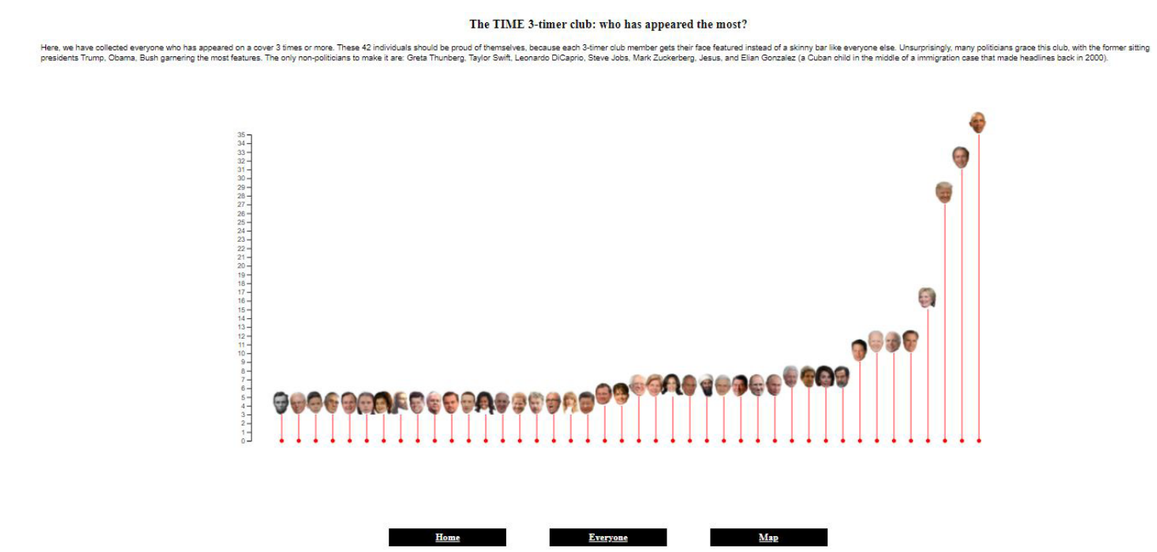
Sort by occupation | Sort by issue date



Home | Map | The TIME 3-timer club

**PROJECT LINK:**

https://centerforspatialresearch.github.io/fall2021_data_visualization/final/




# ASSESSING STREET VEGETATION RATE IN MANHATTAN, NEW YORK CITY

*Group Member: Yingjie Liu, Rae Lei, Jiayi Zhao, Ningyuan Deng, Shuhua Li*

PLANA6113_001_2022_1 - EXPLORING URBAN DATA - Spring 2022

Manhattan, NYC

**ABSTRACT:**

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.

1.Introduction:

Covid-19 has brought many challenges to New York City. During this turbulent time, compared with staying indoors, people tend to spend more time in outdoor green spaces while keeping a safe social distance. More than ever, New Yorkers rely on parks and other outdoor green spaces, like plazas or natural landscapes, to support their physical and mental health. And among all the green spaces, we found street vegetation the most crucial factor that affected the public space experience of everyone involved and the dynamic of streets.

Another benefit of street green spaces is that it is  the most extensive, interconnected network of public spaces in our cities. The fabric of street networks  give them great potential to become a citywide, resilient ecosystem contributing to personal wellness and the health of the natural environment. According to this streetscape design project by Gensler(Theeuwes, 2021), this expansive network street can provide protection against the effects of climate change. In the borough of Manhattan, streetscape space comprises about 30 to 35% of a city's overall land area, more than any other kinds of public spaces.

Thus, to explore the current street vegetation condition, this project will explore the street greenery rate in New York City by analyzing the street view photos and neighborhood features. Through various machine learning methods, we aim to find the answers to the questions listed below:

1.What character of a neighborhood contributes most to a higher greenery rate? For instance, English proficiency, population count of specific age groups or median household income.

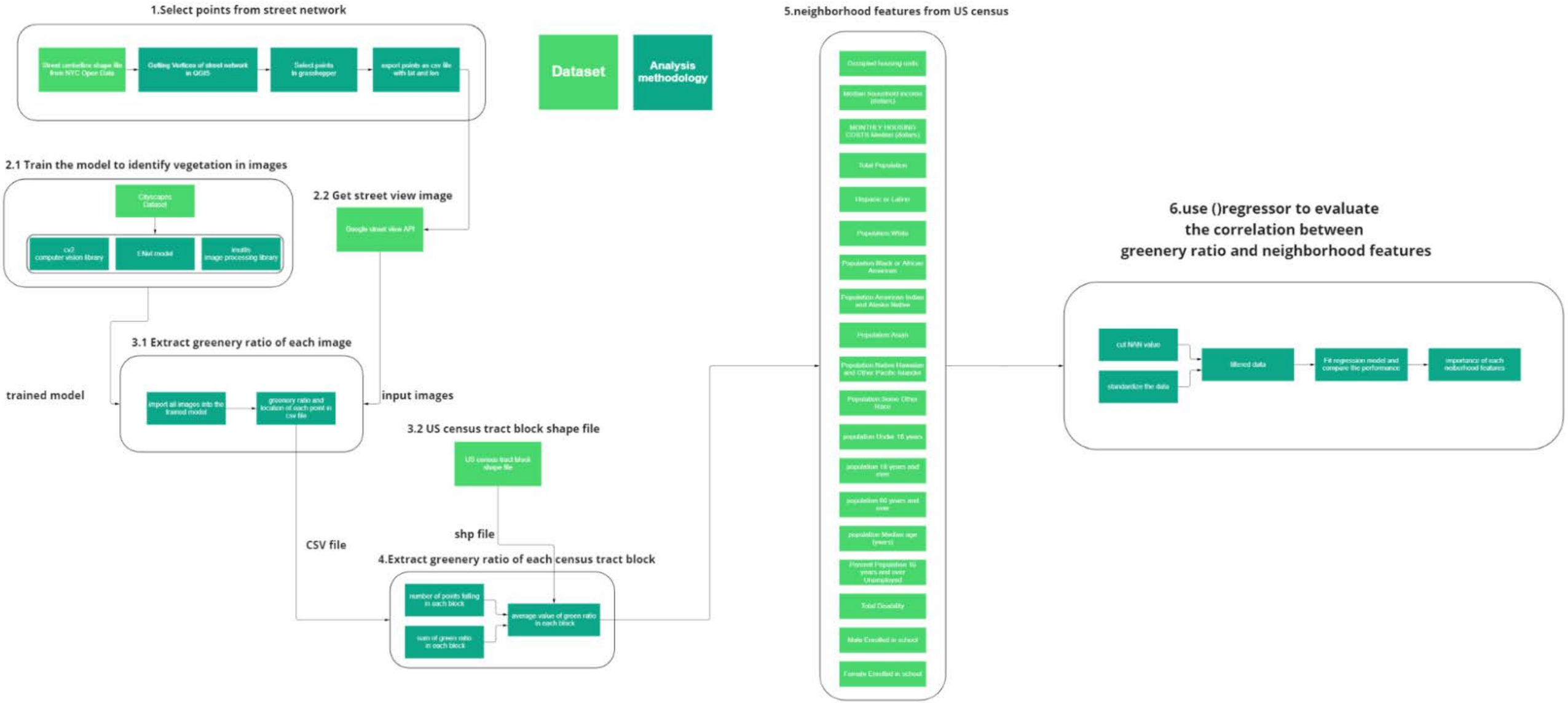
2.Is there an obvious greenery rate gap among all the neighborhoods in New York City?

3.What kinds of urban design strategies or policies can be applied according to the analysis result?

# METHODOLOGICAL FRAMEWORK

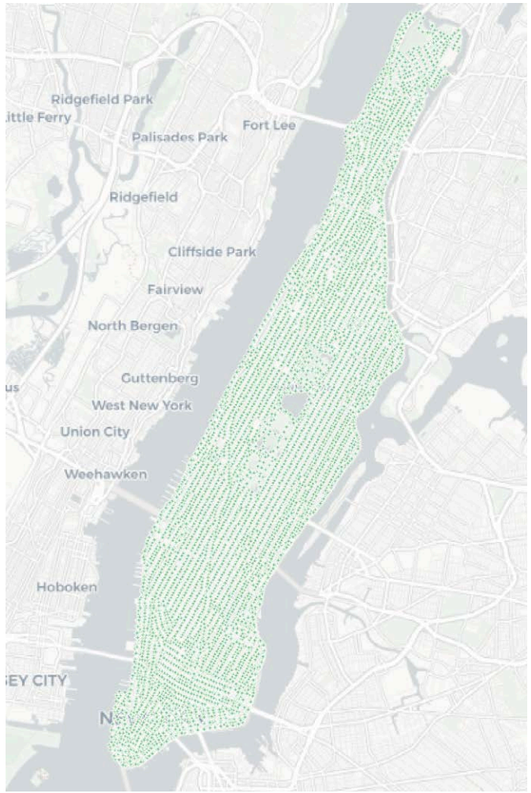
We developed our framework according to the literature review. The whole structure is divided into 2 parts. In the machine learning part, 2000 points were selected  from the street network in Manhattan(NYC Open Data, n.d.), and their location data was extracted in GIS as an URL parameters for google street view api to get street view images. Each viewpoint requested 4 pictures in four different directions. In the meantime, we used the Efficient Neural Network model to identify 2 kinds of street vegetation through pixel based semantic segmentation, bushes and trees. Later we imported all the images we had into the pre-trained model and exported the ratio of selected classes pixel by total pixel amount to calculate the greenery rate of each viewpoint.

And this leads to the analysis part, which is comparing greenery rate with multiple neighborhood features. The exported green rate data was grouped and averaged based on census tract boundaries. The census average greenery rates were then merged with neighborhood features based on GEOID. We set LiDAR data for the comparison group to ensure the accuracy of the data. The result went well. Then through standardizing the data, filtering the no meaning data, fitting three different regression models and comparing the model performance, we managed to find out the correlations and significance level of each feature.

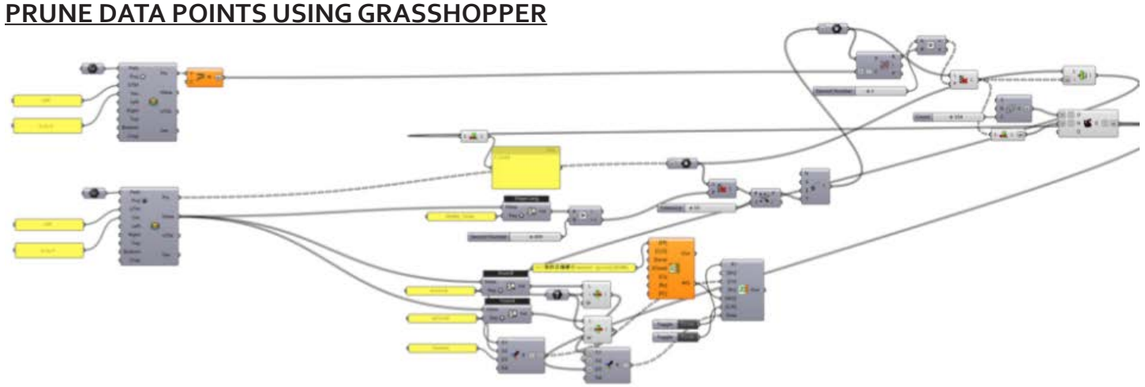


# IMAGE PROCESSING

## FROM STREET NETWORK TO STREET VERTICES




## PRUNE DATA POINTS USING GRASSHOPPER



## EXTRACT GREENERY RATE FROM GOOGLE STREETVIEW PHOTOS

To elaborate the analysis process in more detail, in order to obtain test grid matrix, first we imported the shapefile of street network, extracted all street vertices, which are more than 10,000 points, which might take us a long time to calculate the greenery rate of 40,000 images, so later we used grasshopper to filter the data, deleted duplicated points and points that are too close to each other, which cut down the number of points to 2000, then we export all points with location data.

After we have all the points, we imported the lat and lon of each point into google street view api to get the images we need for further analysis.

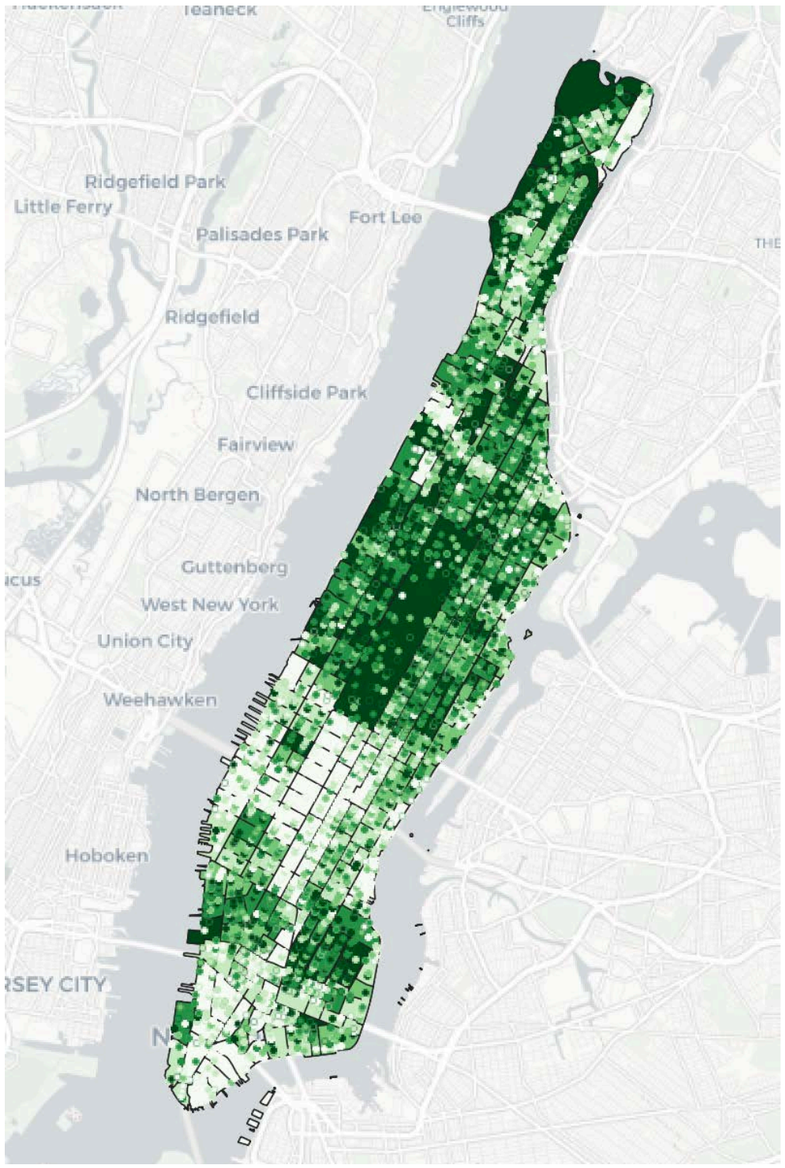
Later, we used semantic segmentation to extract greenery rate. Firstly, we imported the street view images and created a blob, which is a group of pixels that have similar intensity values. Then, we loaded the pre-trained neural network, set the blob as its input, and then extracted the predicted probabilities for each of the classes, like vegetation, terrain, sidewalk, person, etc. Also, we created a class legend that is color coded. For this project, we only need to focus on the vegetation and terrain area. So we exported the vegetation rate and terrain rate of each image for the next step.

# CALCULATE AND COMPARE AVERAGE GREENERY RATE WITH CENSUS TRACT BLOCK

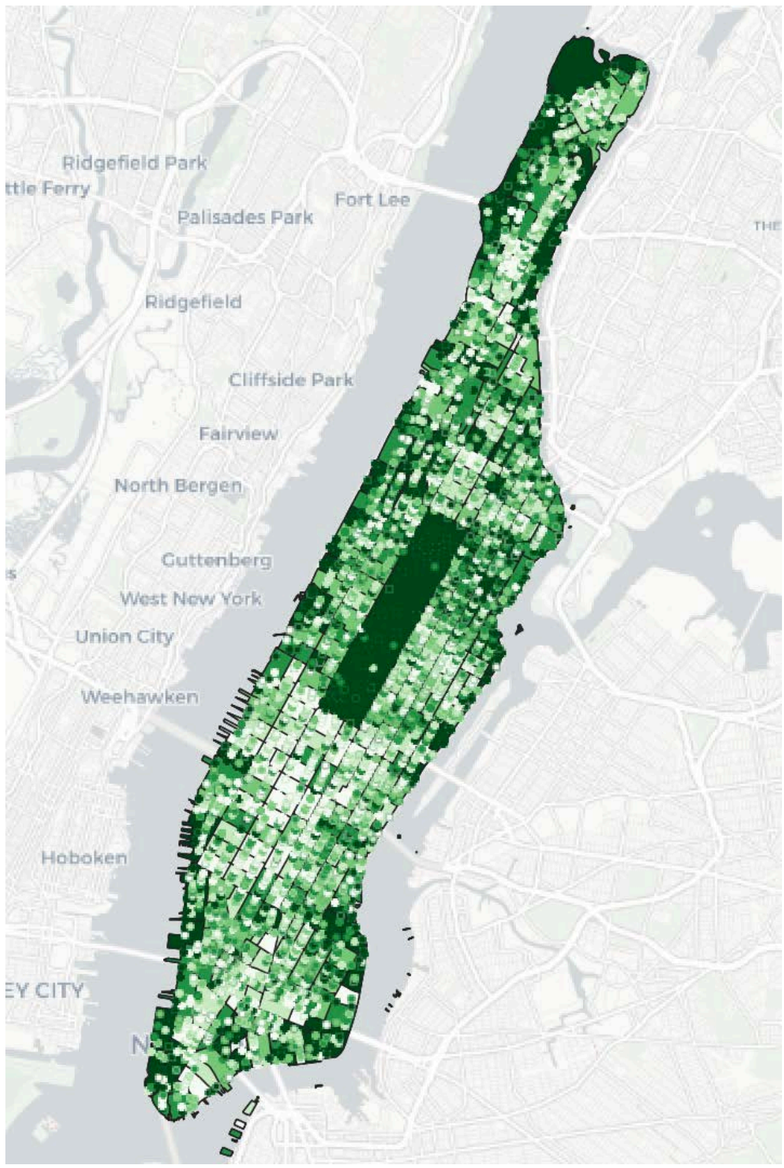
After getting the vegetation and terrain rate, which means the greenery rate of bush and trees, we imported the csv file as a point layer with metadata in QGIS and used points in polygon to count the number of points that fall into each census tract block and sum of greenery rate behind each point. Thus, we got the average greenery rate of each block, and matched them with 21 neighborhood features.

To confirm the accuracy of our results, we generated a map using the 2017 Light Detection and Ranging (LiDAR) data for comparison. Then, we created a choropleth map in ArcGIS to show the green ratio based on census tract blocks. Comparing this mapping with the terrain and vegetation mapping using the street view model, the results reflect the high accuracy of the street view analysis model because of the similar distribution of green ratios.

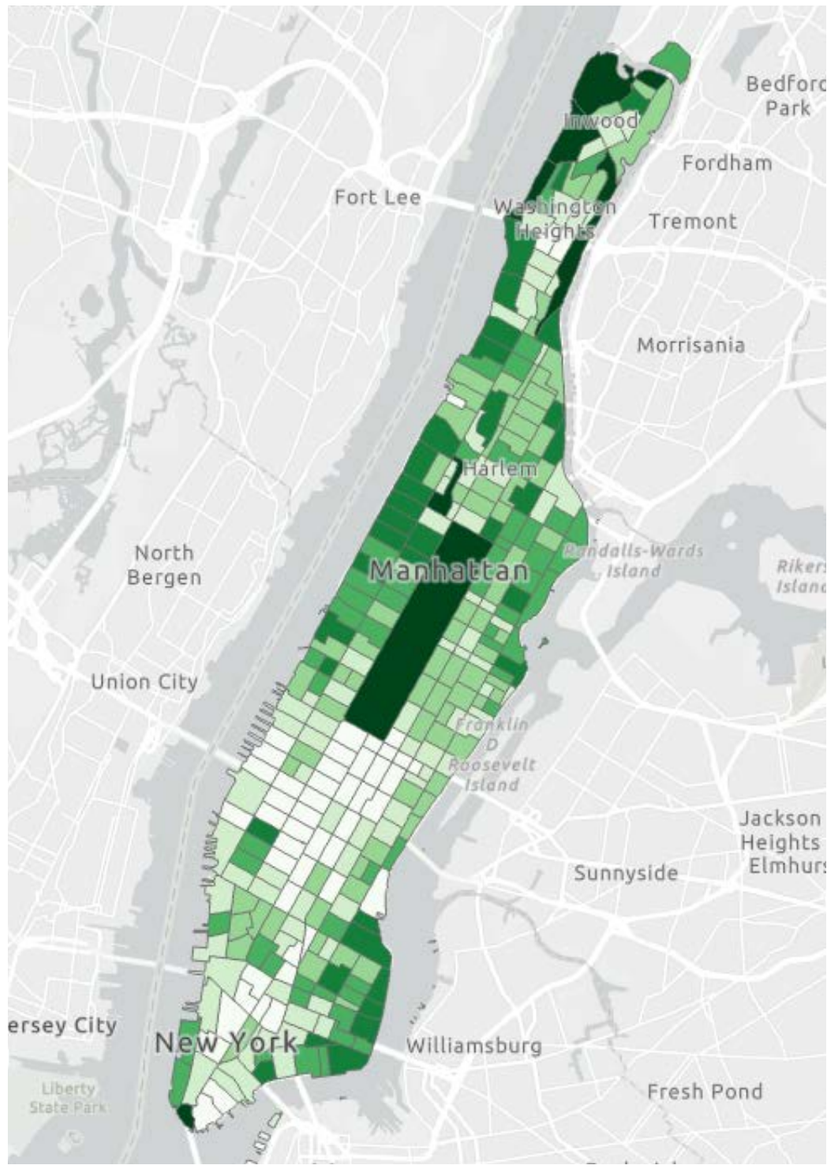
## VEGETATION RATE PER BLOCK (STREET VIEW)



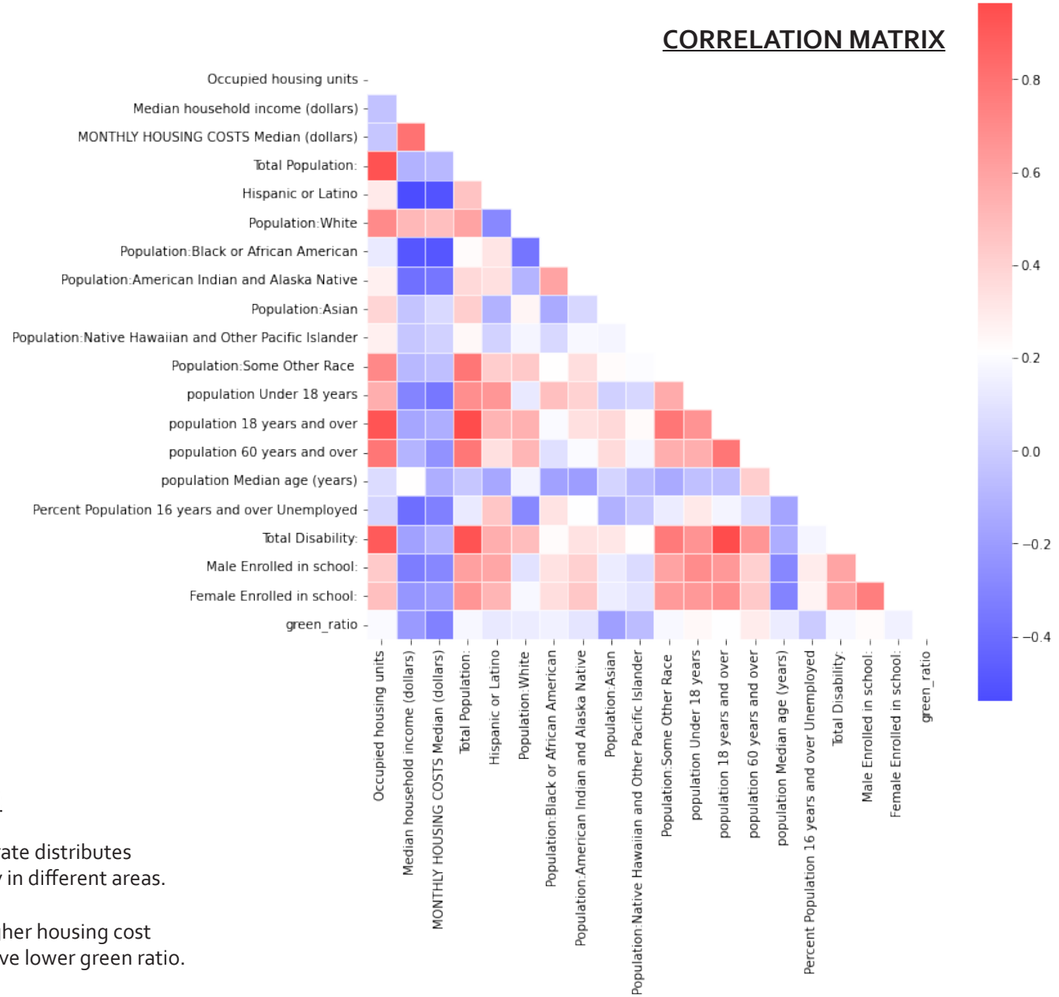

## TERRAIN RATE PER BLOCK (STREET VIEW)




## GREEN RATE PER BLOCK(LIDAR)



## CORRELATION MATRIX



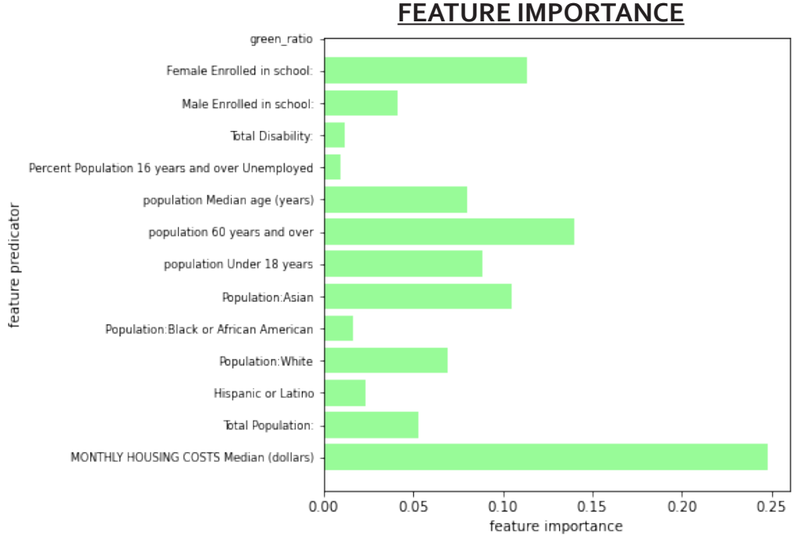

## RESULT:

1. Green rate distributes unequally in different areas.

2. The higher housing cost blocks have lower green ratio.

3. Social Inequality: higher green rate blocks have more population over 60 years and females enrolled in school. However, 'Percentage Population 16 years and over unemployed' is negatively correlated with the green ratio.

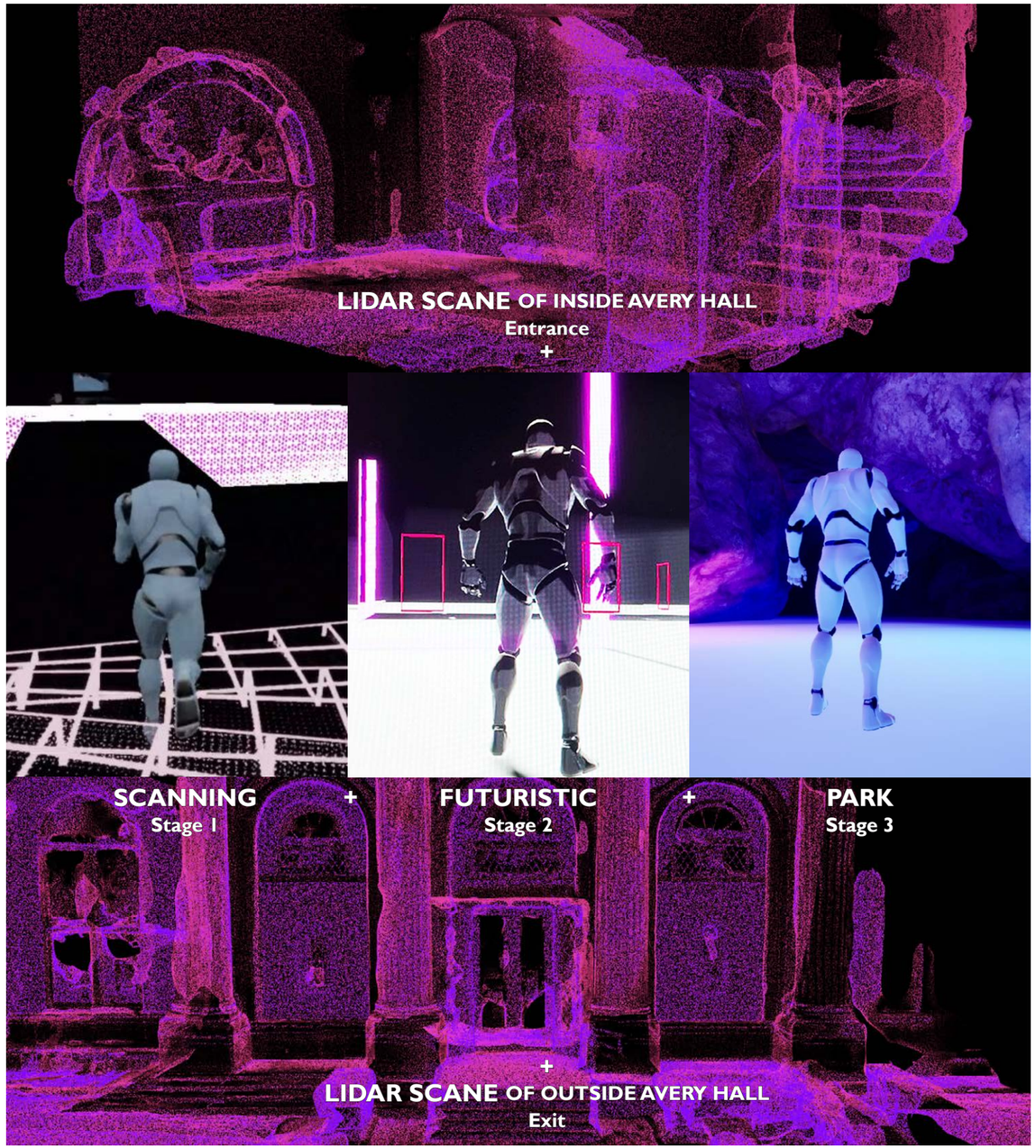
## FEATURE IMPORTANCE

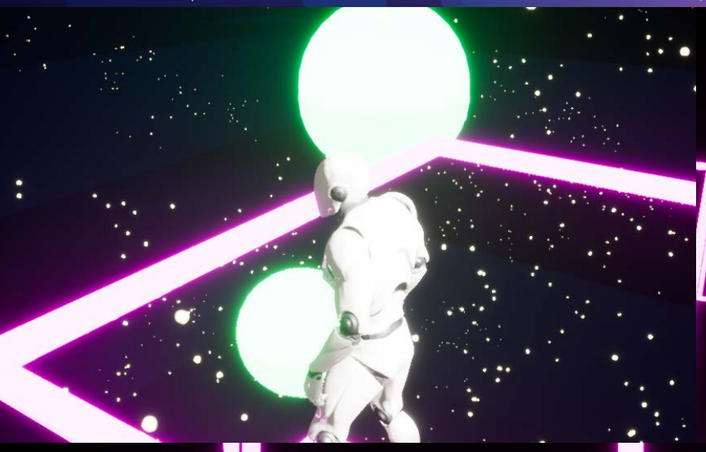


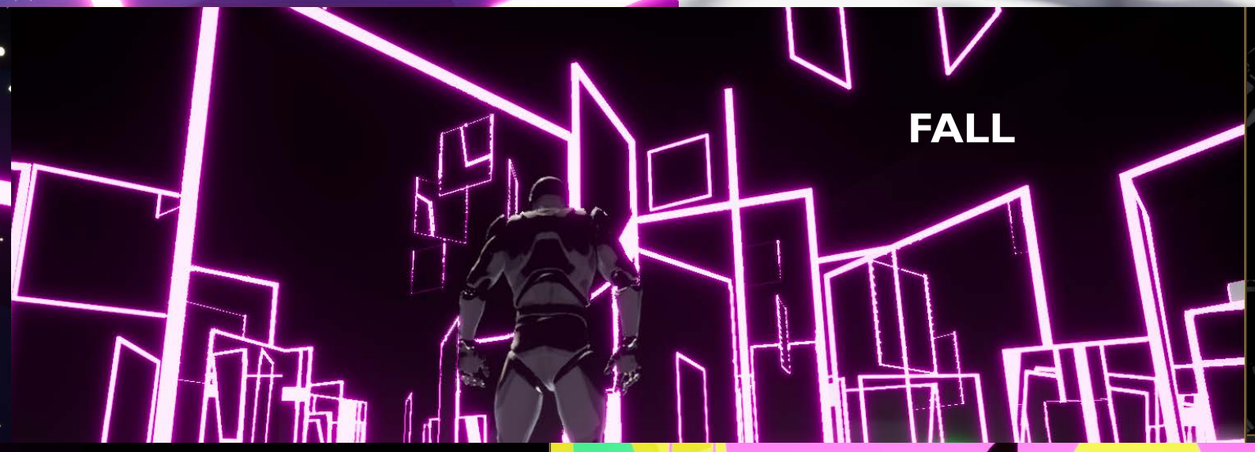

# LABYRINTH - A TIME MAZE

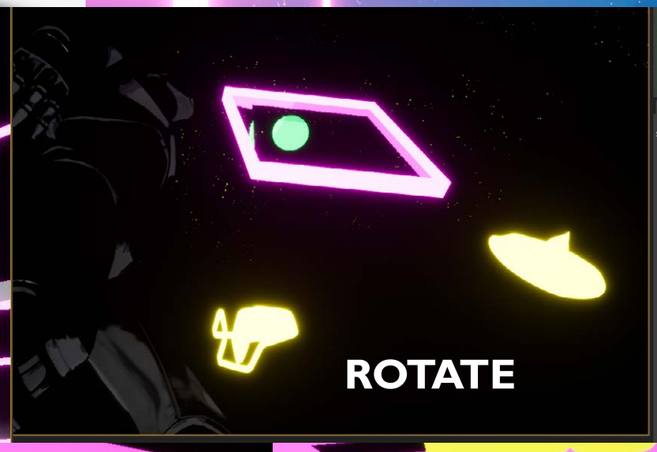
*Group Member: Praditi Singh, Jie Kong, Shuhua Li*
ARCHA4980_001_2022_1 - VIRTUAL ARCHITECTURE- Spring 2022

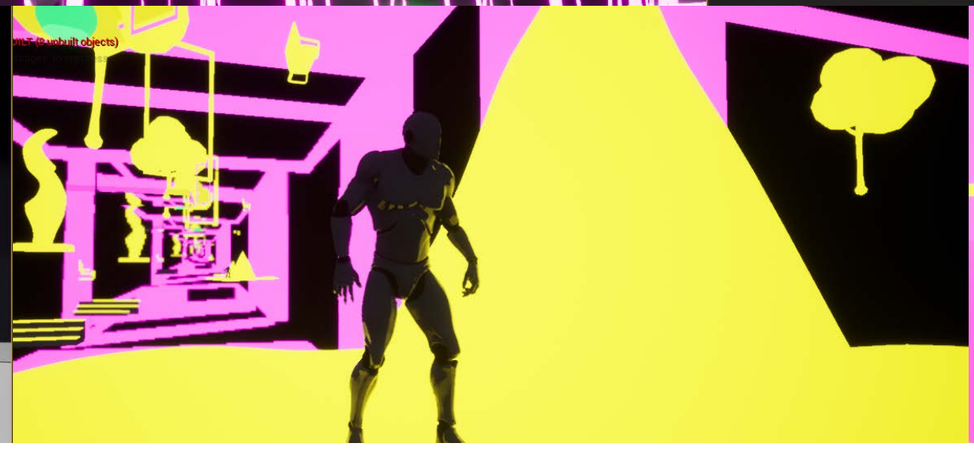
The actor enters an abstract euclidean space with three different sets of interactions. Light Scanning enables a 3D structure, and allows the actor to navigate through different stages, to finally exit into the real world. Timed, he must run to finish the maze in time, else the game ends.









**V I D E O  L I N K S :** https://youtu.be/xiEMYVwdIfM