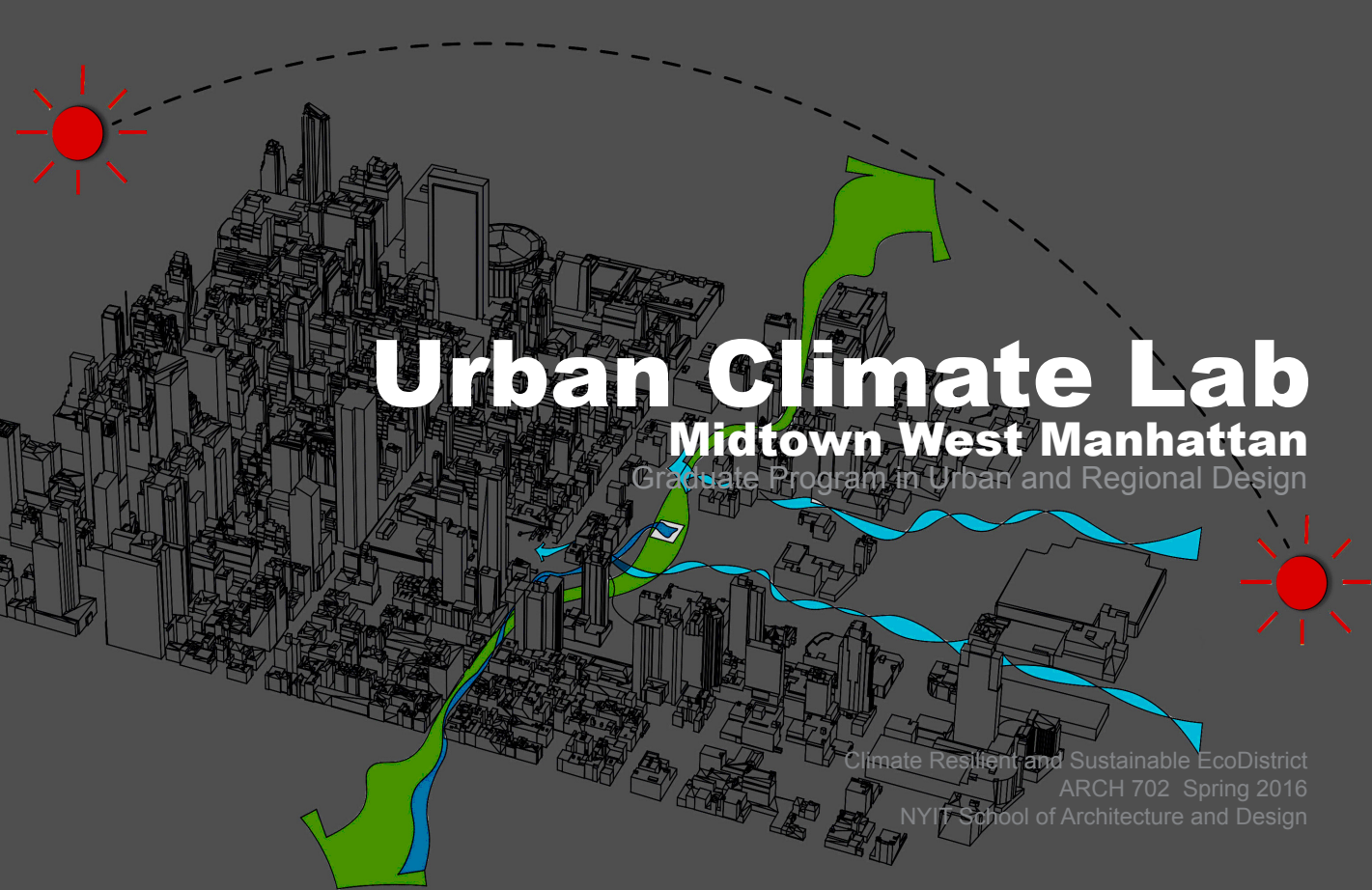

Urban Climate Lab

Midtown West Manhattan

Graduate Program in Urban and Regional Design

Climate Resilient and Sustainable EcoDistrict

ARCH 702 Spring 2016

NYIT School of Architecture and Design

NEW YORK INSTITUTE OF TECHNOLOGY

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Faculty : Jeffrey Raven

CONTENTS

The goal of the Urban Climate Lab is to explore integrated, urban design and planning strategies for creating sustainable and resilient communities that can adapt and thrive in the changing global conditions, meet carbon-reduction goals, and sustain urban populations in more compact settings by providing amenities that people need and want. Students explore how these compact communities can mitigate climate change by reducing Greenhouse Gas emissions through spatial efficiencies, pedestrian access to public transportation and preservation of open space and habitat. The focus this semester is cooling hot cities while leveraging cascading benefits. This design studio engages NYC districts as a research platform and introduces the ideas, representations, and techniques of contemporary urban design and discourse through the lens of a resilient built environment. These districts are home to a diverse population of residents and workers. Students will test the hypothesis that re-configuring urban form according to climate-resilient principles will strengthen community adaptability to climate change, reduce energy consumption in the built environment and enhance the quality of the public realm. Students will develop user-friendly regional qualitative design guidelines backed by cost-benefit performance indicators at the urban design scale. Building massing, urban ventilation, solar impacts, green infrastructure and anthropogenic factors will shape the outcomes. Outcomes in Energy, Transportation, Waste, Water, Green Infrastructure / Natural Systems and other urban infrastructure systems will be evaluated by students for their technical, social and ecological consequences, including flood mitigation.

GLOBAL CHALLENGE

As is now widely recognized, cities can be the main implementers of climate resiliency, adaptation, and mitigation.The Urban Climate Lab explores win-win solutions for configuring climate-resilient compact urban form.

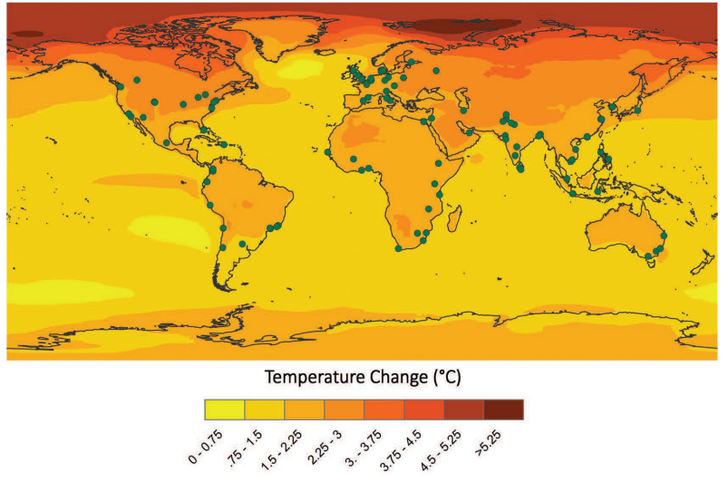
The major finding which we can expect for Climate observation and projections:

• Urbanization tends to be associated with elevated surface and air temperature, a condition referred to as the **urban heat island**. Urban centers and cities are often several degrees warmer than surrounding areas due to presence of heat absorbing materials, reduced evaporative cooling caused by lack of vegetation, and production of waste heat.

• Some climate extremes will be exacerbated under changing climate conditions. Extreme events in many cities include heat waves, droughts, heavy downpours, and coastal flooding, are projected to increase in frequency and intensity.

Source:Assessment Report for Climate Change in Cities, 2016 (ARC 3-2)

Climate Observations and projections



Projected temperature change in the 2050s impacting major cities.

Source:Assessment Report for Climate Change in Cities, 2016 (ARC 3-2)

NYC VISIONS

GROWTH

EQUITY

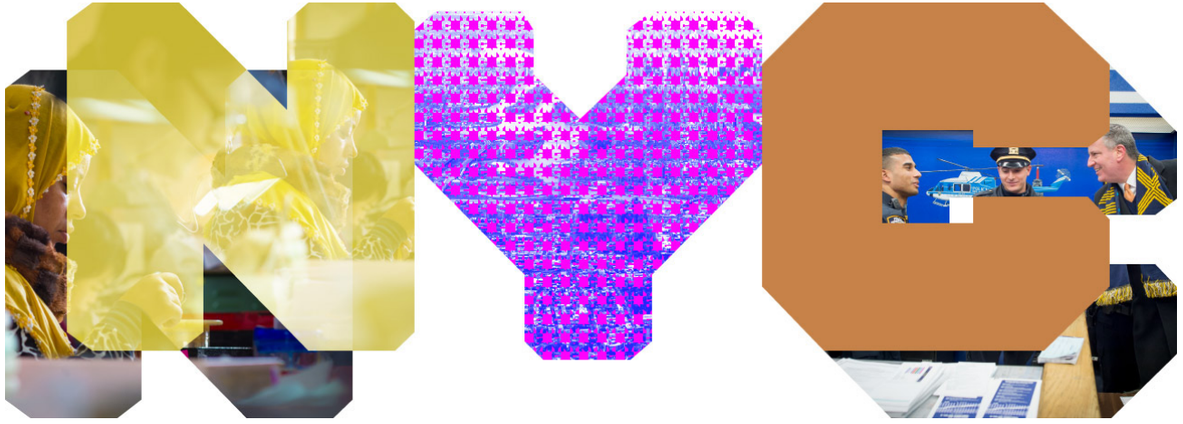
SUSTAINABILITY

RESILIENCY

Source:ONE NYC

ONE NYC

Equaitable Sustainable Resilient



Source:ONE NYC

A Growing City

"New York's growing and aging population will strain the city's infrastructure and put new demands on City services,especially on housing."

Source: ONE NYC

A More Equitable City

"Income inequality has surpassed the national average and 45% of New Yorkers are in or near poverty."

Source:ONE NYC

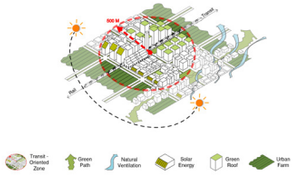
A More Sustainable City

Source: ONE NYC

A More Resiliant City

Source: ONE NYC

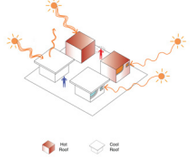
THE EXPANDING AGENCY OF URBAN DESIGN



URBAN CLIMATE FACTORS

Efficiency of Urban Systems

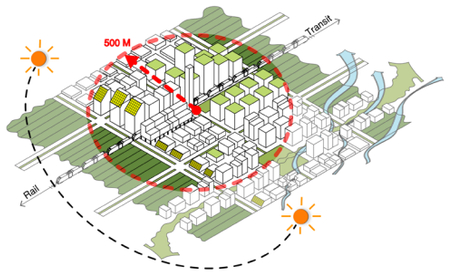
Form & Layout



Heat Resistant Construction Materials

Vegetative Cover

EFFICIENCY OF URBAN SYSTEMS

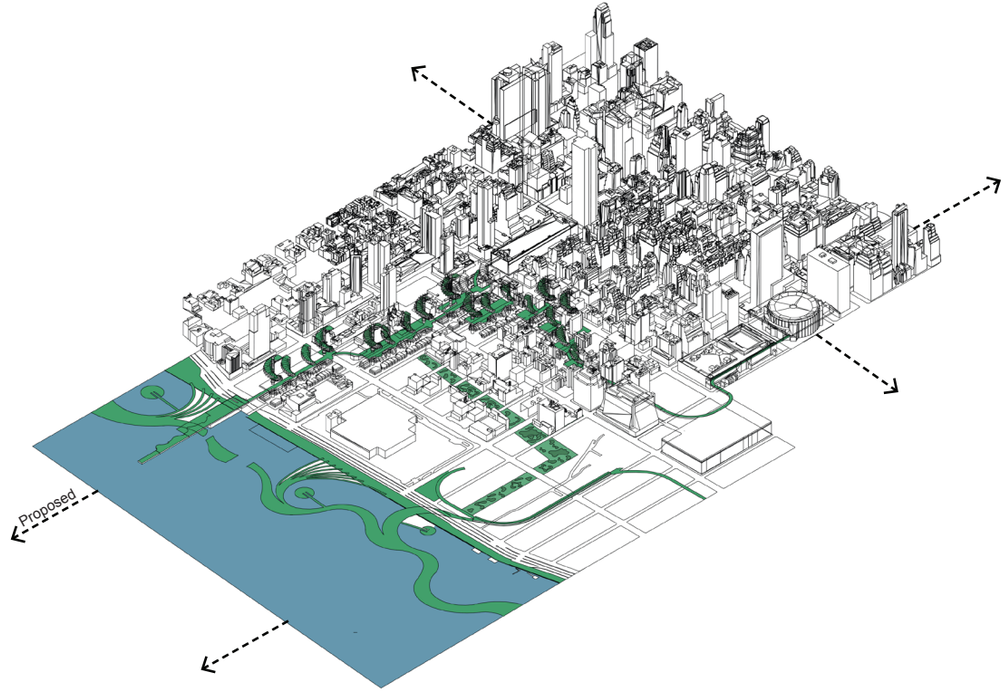


Factors	Tools	Units
Energy Waste Heat		KWH
Transport		VMT
Buildings	On-Site Energy / Indoor Comfort	UTCI/PET
Industry	On-Site Energy / Radiant Heat Map	Temperature

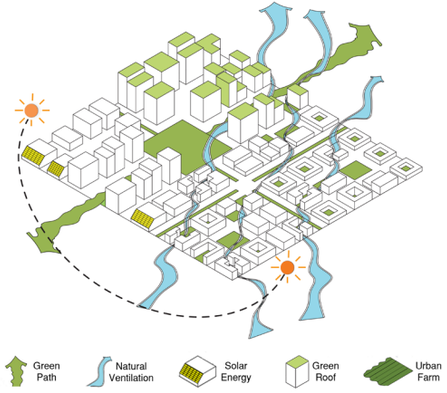
*KWH= Kilo Watt Hour
*VMT= Vehicle Miles Traveled

*UTCI = Universal Thermal Climate Index
*PET = Physiologically Equivalent Temperature

EFFICIENCY OF URBAN SYSTEMS



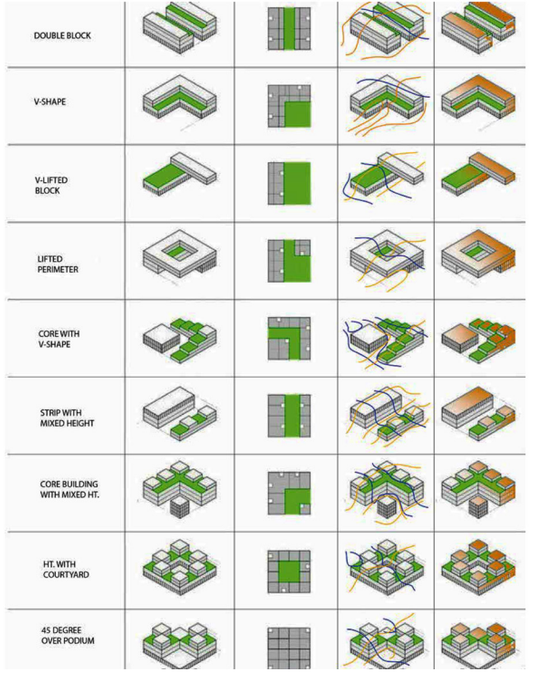
FORM AND LAYOUT

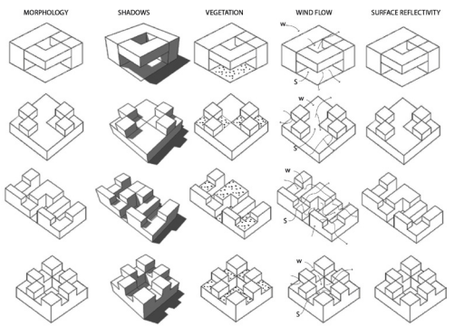


Factors	Tools	Units
Ventilation	Massing Diagrams	FAR / Building Height
Solar Impacts	Wind / Sun Impacts	Solar Radiation /
	Sky View Factos	Wind Speed
	Outdoor Comfort	UTCI/ PET*

* FAR= Floor Area Ratio
*UTCI = Universal Thermal Climate Index
*PET = Physiologically Equivalent Temperature

FORM AND LAYOUT

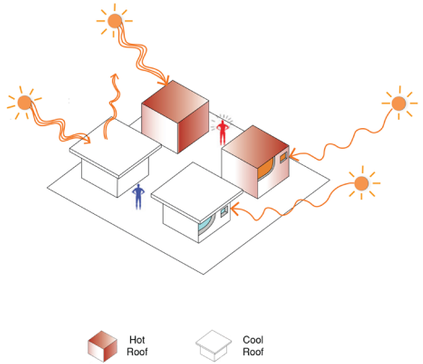




THE DIFFERENT TYPES OF BLOCK MORPHOLOGIES

HEAT RESISTANCE CONSTRUCTION MATERIALS

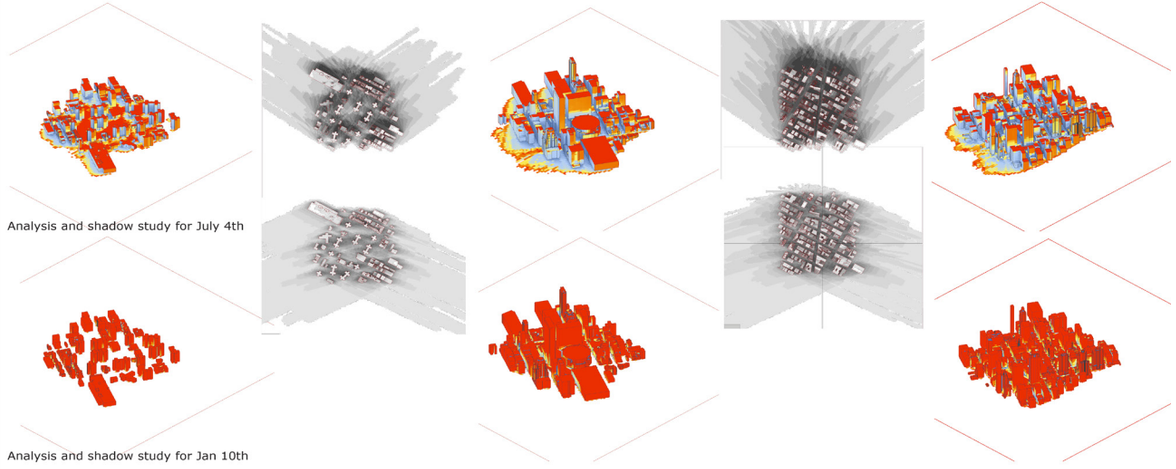
3. Heat - Resistant Construction Material



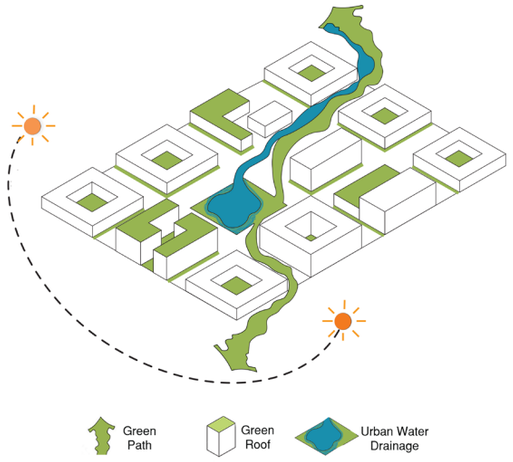
Factors	Tools	Units
Surface Reflectivity	Radiation Analysis	KWH/m^2
Thermal Mass	Building Envelope / Energy Analysis	R Value

** KWH = Kilo Watt Hour*
R = Radiation

HEAT RESISTANCE CONSTRUCTION MATERIALS



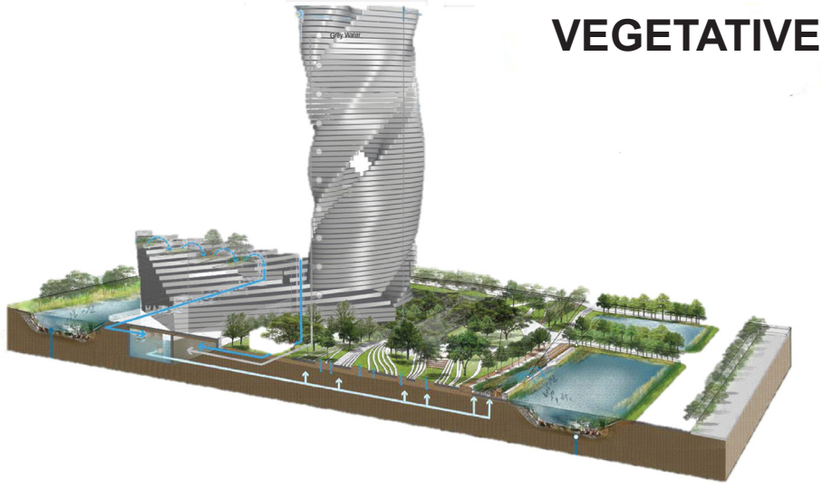
VEGETATIVE COVER



Factors	Tools	Units
Vegetation / Green-Blue Infrastructure	Surveys / Satelitte Images GIS Mapping	% Coverage / Vegetation Type Evapo-Transpiration

**GIS = Geographic Information System*

VEGETATIVE COVER



COMMUNITY SPACES

Landcapes for recreation, social life and small scale food cultivation.

ECOLOGICAL LANDSPACES

Meadows and Forests that provide habitat for other environmental benefits.

BLUE + GREEN INFRASTRUCTURE

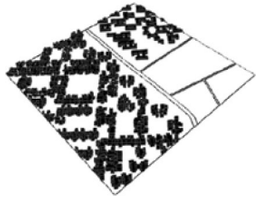
Landcapes that captures stormwater and clean air.

LEARNING FROM PRECEDENTS

world wide solutions for Sustainability and Resiliency

Rotterdam
Netherlands

New Delhi
India



Moscow
Russia

Kopenhagen
Denmark

Kong
Iran

Jaipur
India

Cusco
Peru

Budapest
Hungary

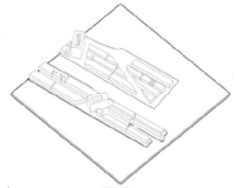
Gardaia
Algeria

Al Qurna
Egypt

Berlin
Germany

Barcelona
Spain

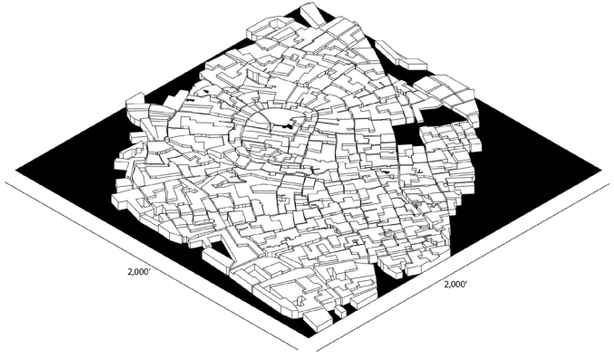
Amsterdam
Netherlands



Venice

Khardaia
Algeria

VIEW OF THE CITY



3D AXONOMETRIC VIEW

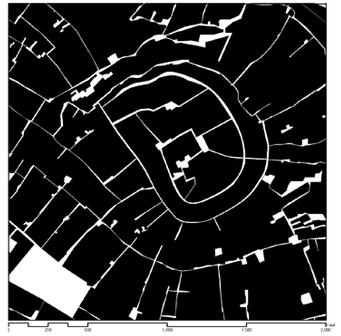
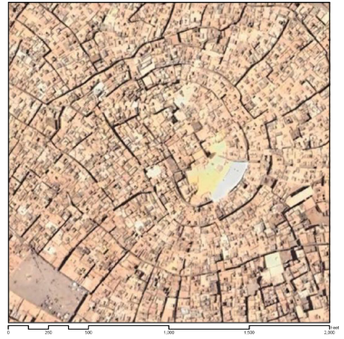


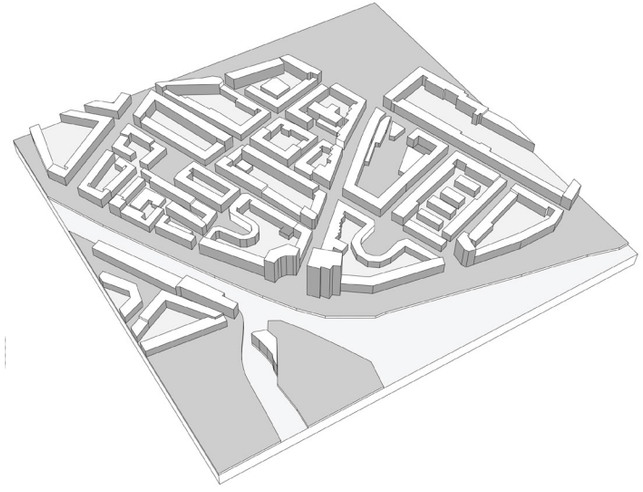
FIGURE GROUND



AERIAL VIEW

Rotterdam
Netherland

VIEW OF THE CITY

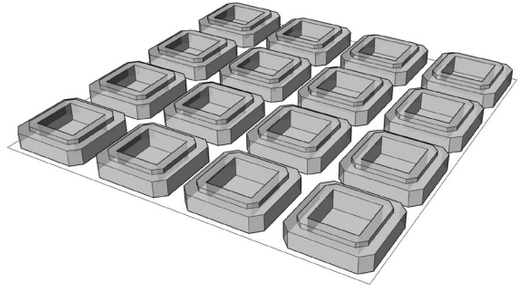


3D AXONOMETRIC VIEW

FIGURE GROUND

AERIAL VIEW

VIEW OF THE CITY



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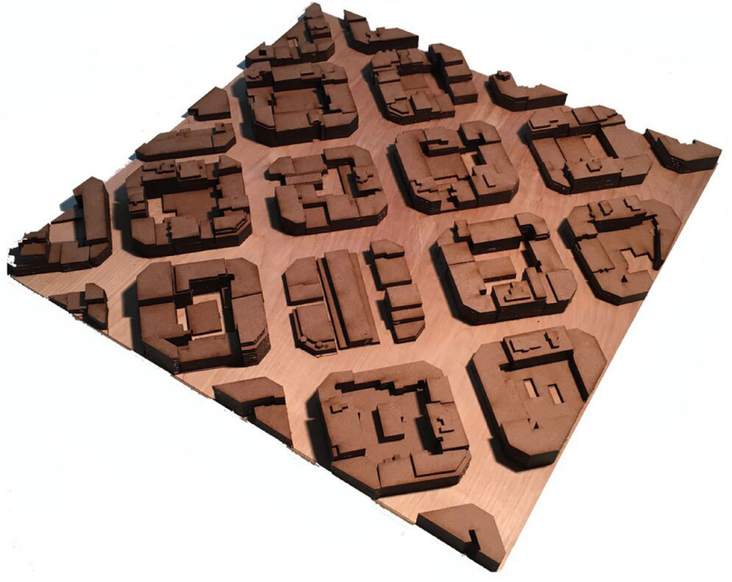


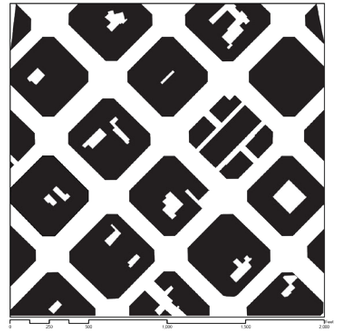
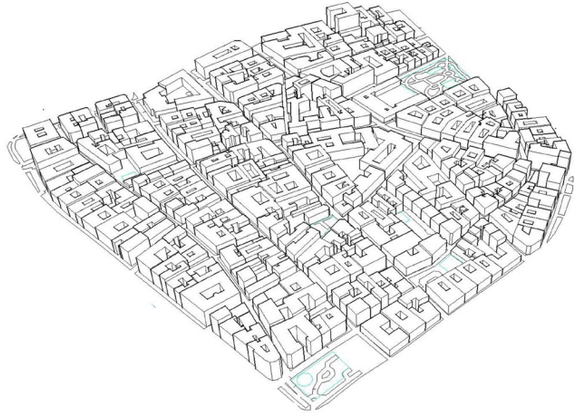


FIGURE GROUND

AERIAL VIEW

Budapest
Hungry

VIEW OF THE CITY



3D AXONOMETRIC VIEW

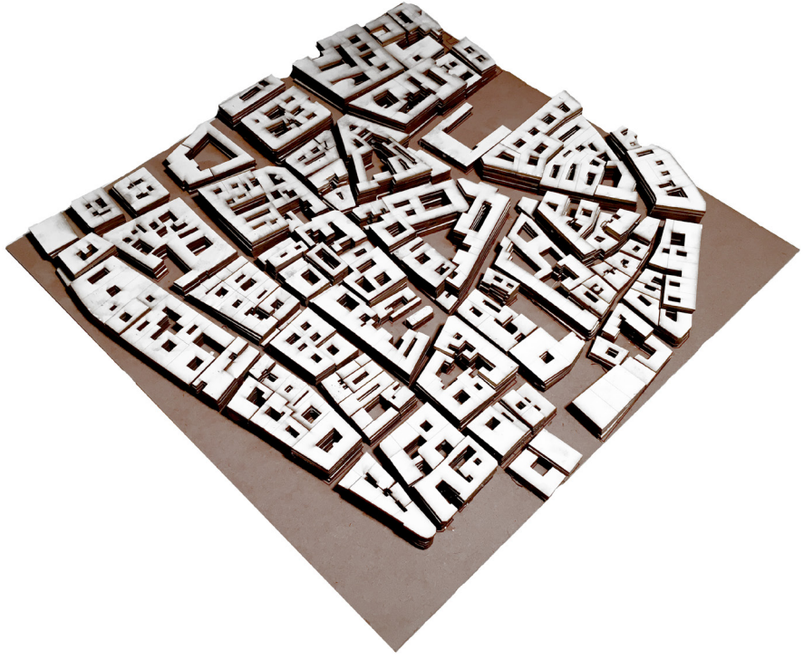
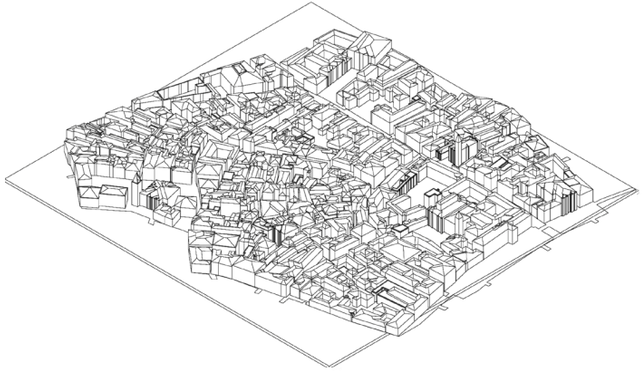


FIGURE GROUND

AERIAL VIEW

VIEW OF THE CITY



3D AXONOMETRIC VIEW

FIGURE GROUND

AERIAL VIEW

VIEW OF THE CITY

3D AXONOMETRIC VIEW

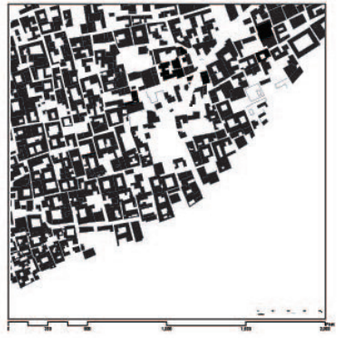
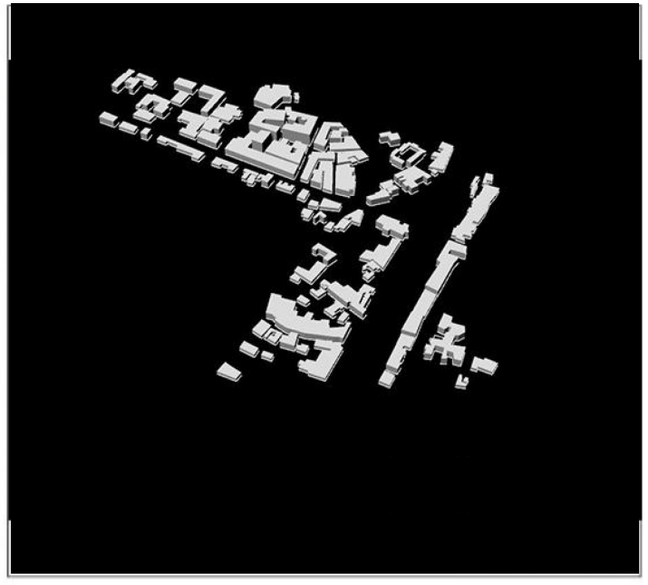


FIGURE GROUND

AERIAL VIEW

Al-Gourna
Egypt

VIEW OF THE CITY



3D AXONOMETRIC VIEW

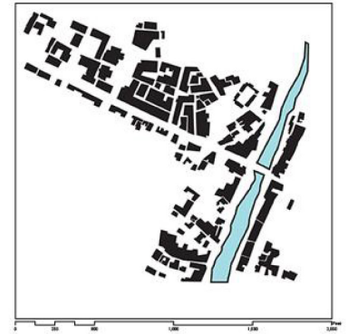
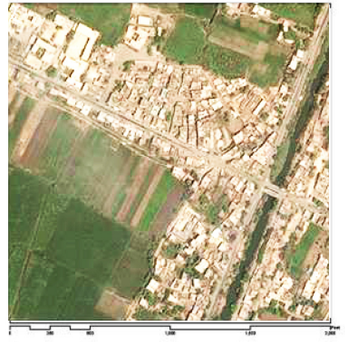
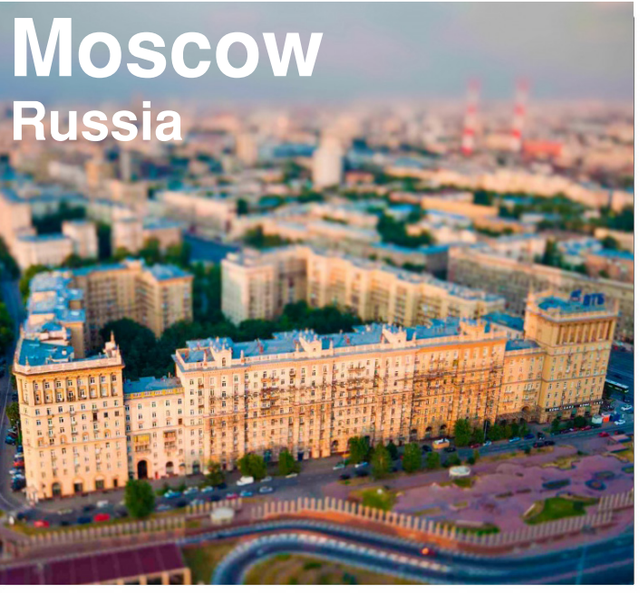


FIGURE GROUND



AERIAL VIEW

Moscow
Russia



VIEW OF THE CITY

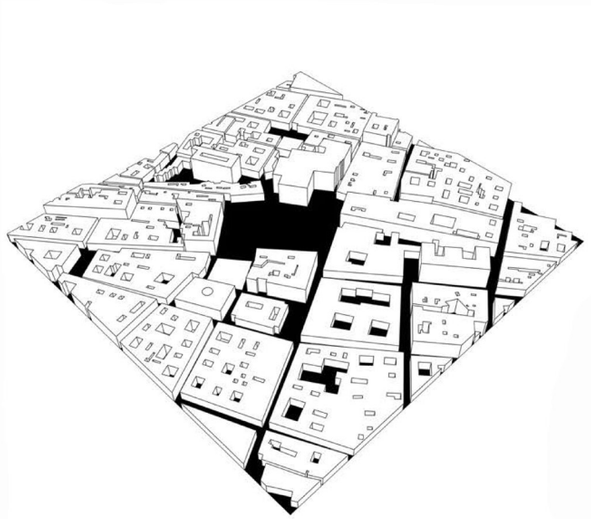
3D AXONOMETRIC VIEW

FIGURE GROUND

AERIAL VIEW

Cusco
Peru

VIEW OF THE CITY



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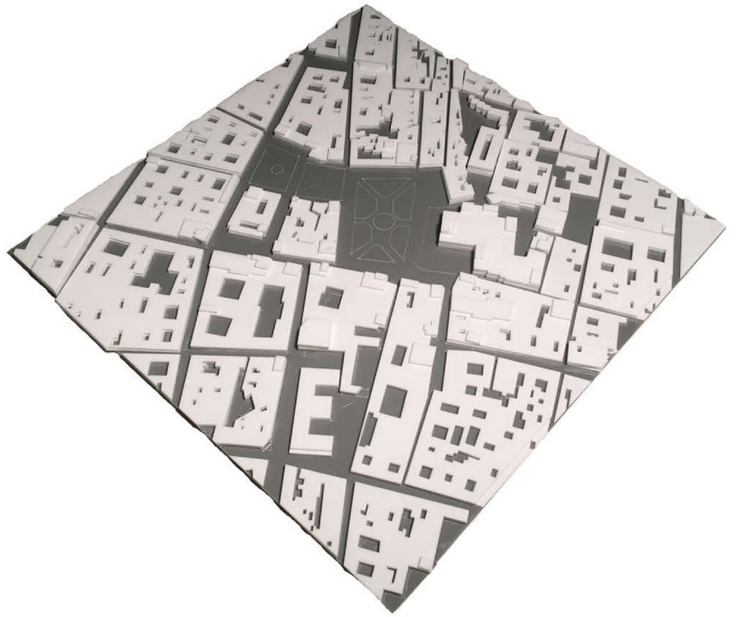
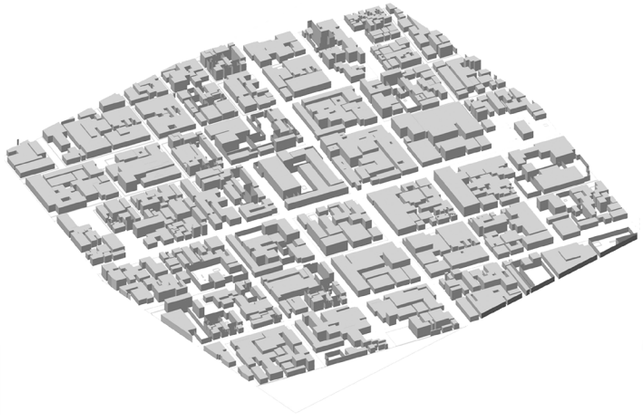


FIGURE GROUND

AERIAL VIEW

Jaipur
India

VIEW OF THE CITY



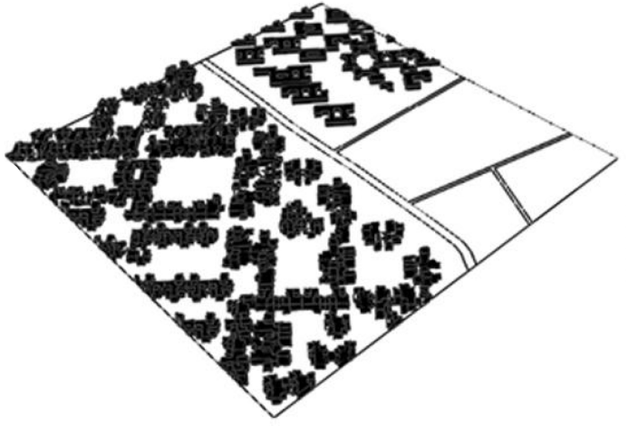
3D AXONOMETRIC VIEW

FIGURE GROUND

AERIAL VIEW

New Delhi
India

VIEW OF THE CITY



3D AXONOMETRIC VIEW

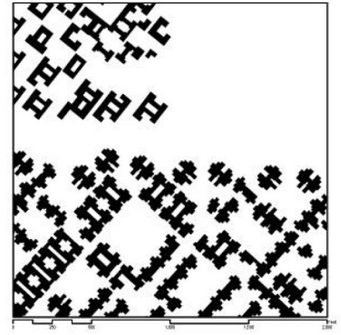


FIGURE GROUND

AERIAL VIEW

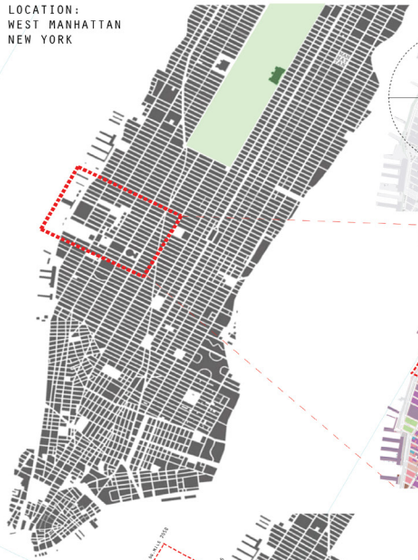
DESIGN PROCESS

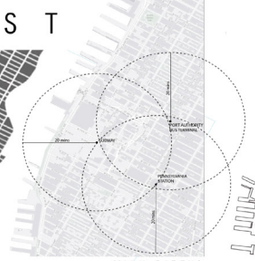
Climate Analysis Mapping
Public Space Evaluation
Planning and Design Intervention
Post-Intervention Evaluation

LOCATION

MIDTOWN WEST

LOCATION:
WEST MANHATTAN
NEW YORK

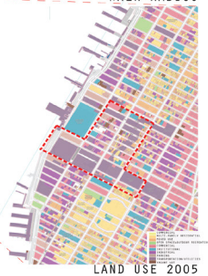


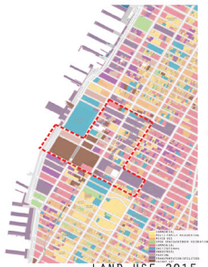

WALK RADIUS

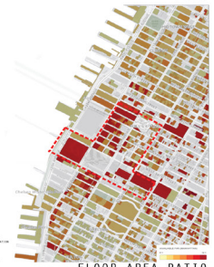

LAND FILL

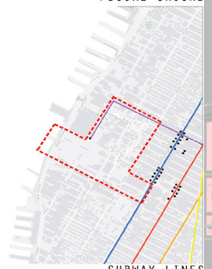

FEMA

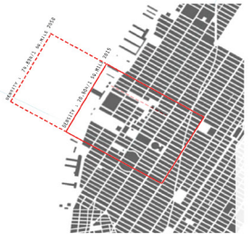

FIGURE GROUND


LAND USE 2005


LAND USE 2015


FLOOR AREA RATIO

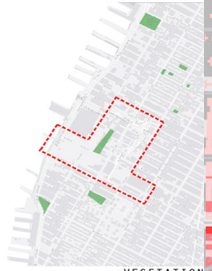

SUBWAY LINES



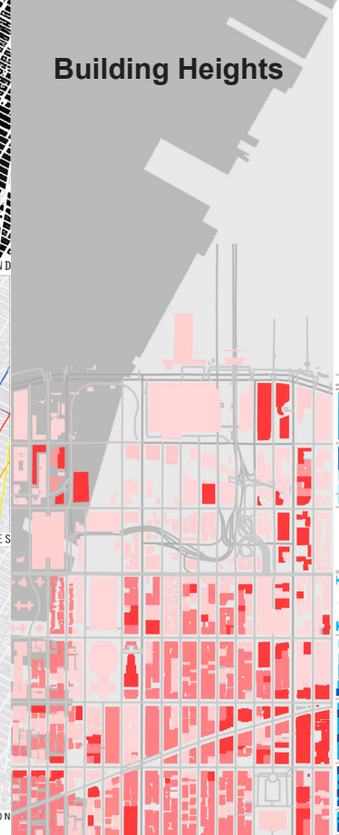

DENSITY


PIPILINE PROJECTS

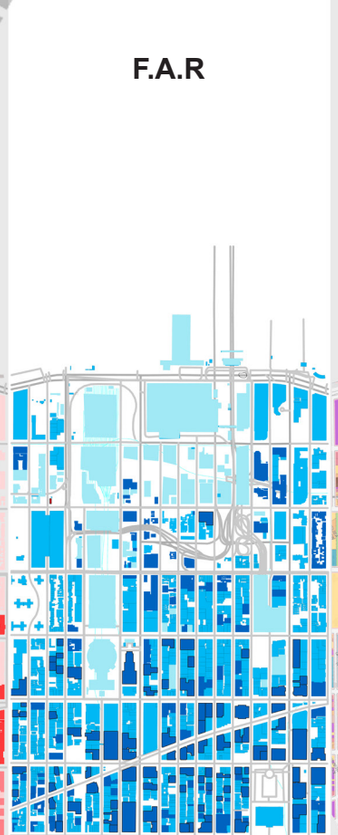

TRAFFIC


VEGETATION

Building Heights

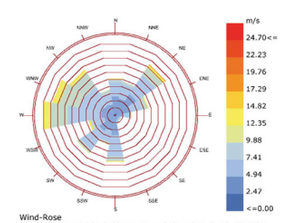


F.A.R

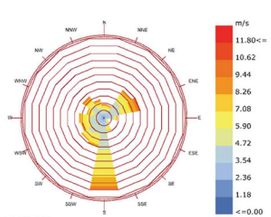


Land Use

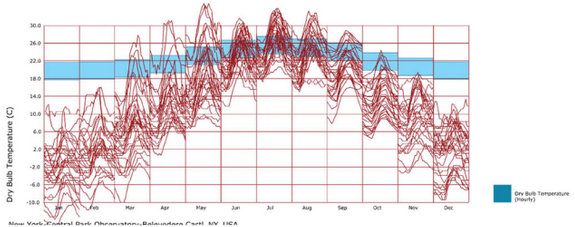
Culture Map



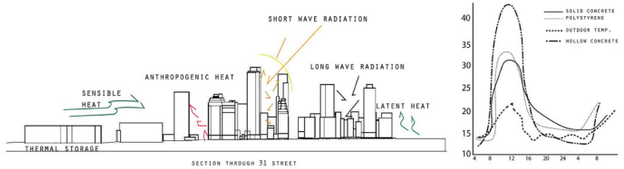
Wind-Rose
New York-Central Park Observatory-Belevedere Castl_NY_USA
15 OCT 1:00 - 21 MAR 24:00
Hourly Data: Wind Speed (m/s)
Calm for 1.58% of the time = 60 hours.
Each closed polyline shows frequency of 1.2%. = 45 hours.



Wind-Rose
New York-Central Park Observatory-Belevedere Castl_NY_USA
15 APR 1:00 - 21 AUG 24:00
Hourly Data: Wind Speed (m/s)
Calm for 1.87% of the time = 58 hours.
Each closed polyline shows frequency of 1.9%. = 57 hours.



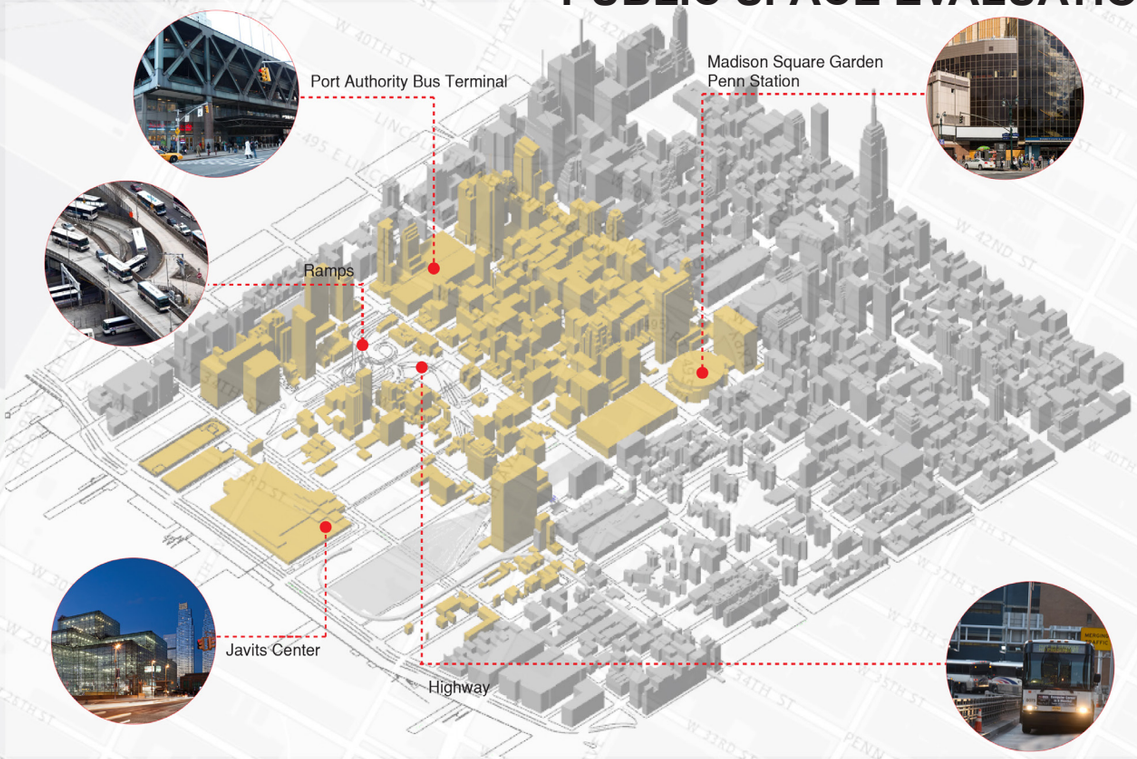
New York-Central Park Observatory-Belevedere Castl_NY_USA



THERMAL STORAGE - HEAT FROM UNDERGROUND SYSTEMS, GROUND.
ANTHROPOGENIC HEAT - TRANSPORTATION, ROADS.
LATENT HEAT- WATER BODIES.
SENSIBLE HEAT - VERTICAL AND HORIZONTAL AIR FLOW, SUMMER WINDS

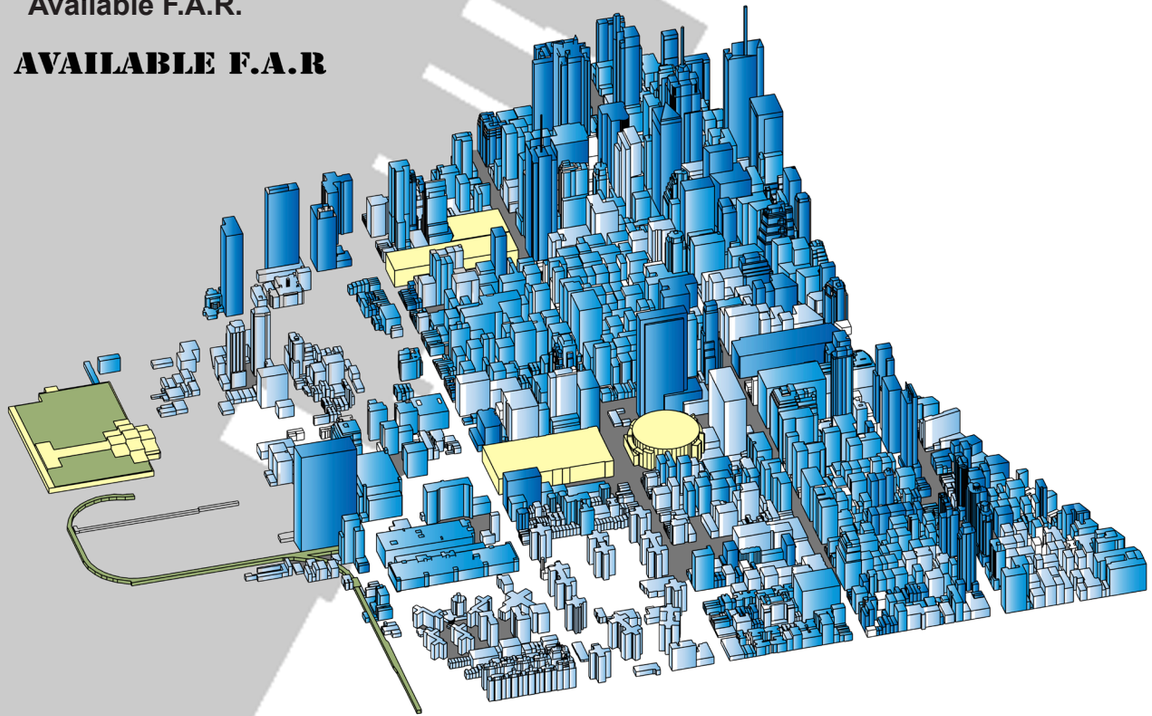
PLANNING AND DESIGN INTERVENTION

PUBLIC SPACE EVALUATION



Available F.A.R.

AVAILABLE F.A.R



Eco-District Protocol

Imperatives

Equity Climate Resilience

Priority Areas

Health& Wellness

Mobility & Connectivity

Livability

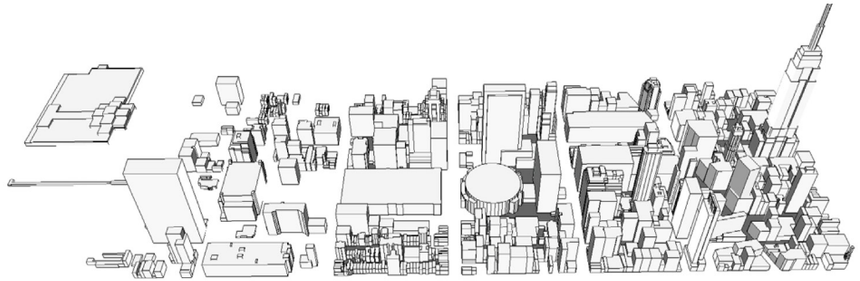
Prosperity

Ecosystem Stewardship

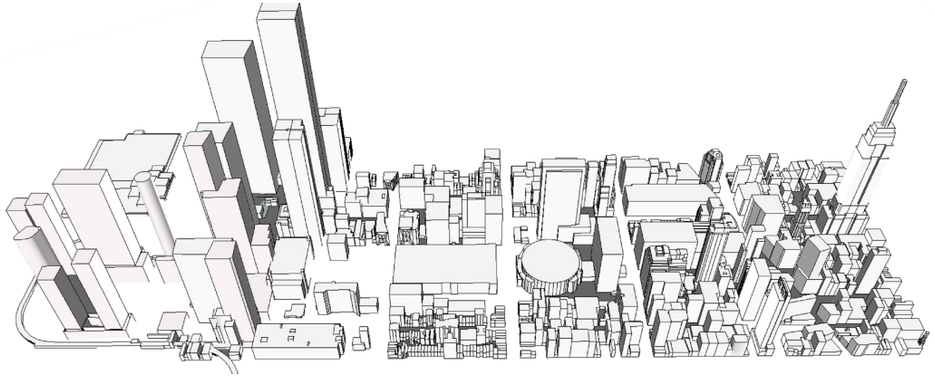
Climate protection+Resouce Efficiency

Eco-District Projects

Shaped by Climate Responsive Design

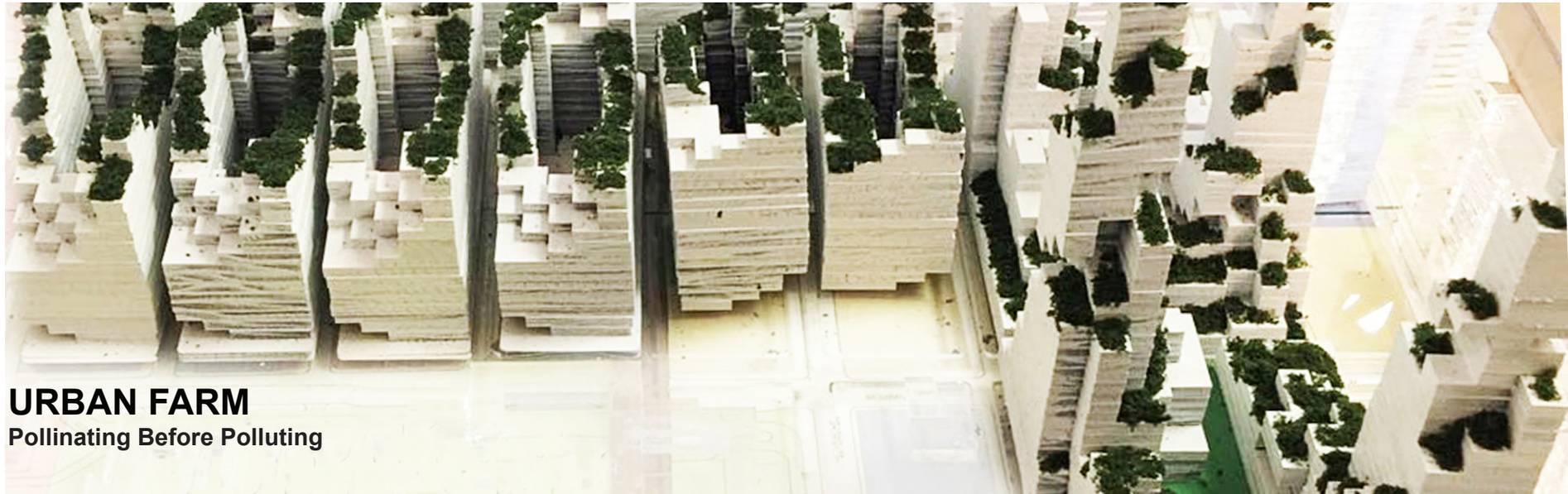


Existing Built Up of Midtown West Manhattan



Expected Built Out of Midtown West Manhattan (Pipeline)

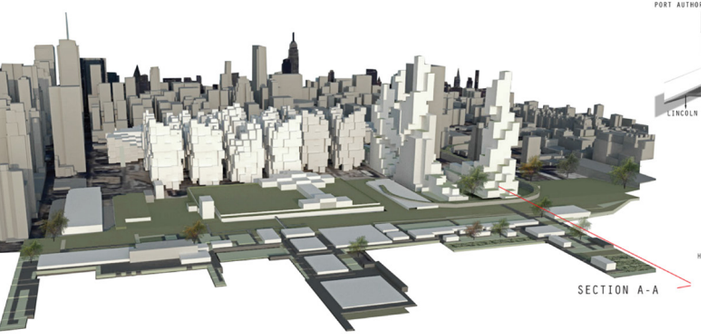
URBAN AGRICULTURE



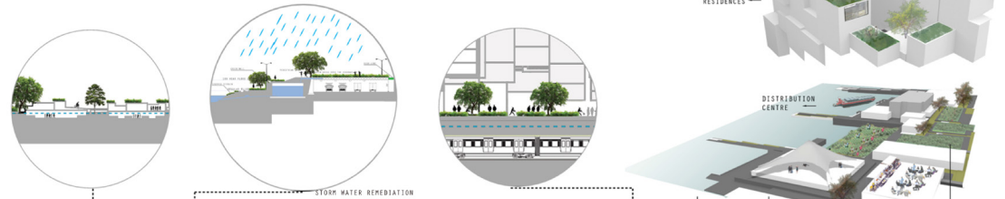
URBAN FARM

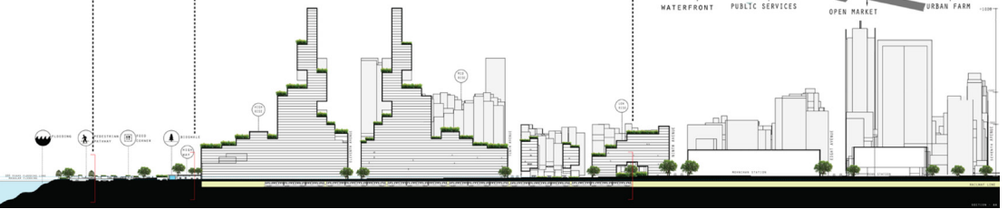
Pollinating Before Polluting

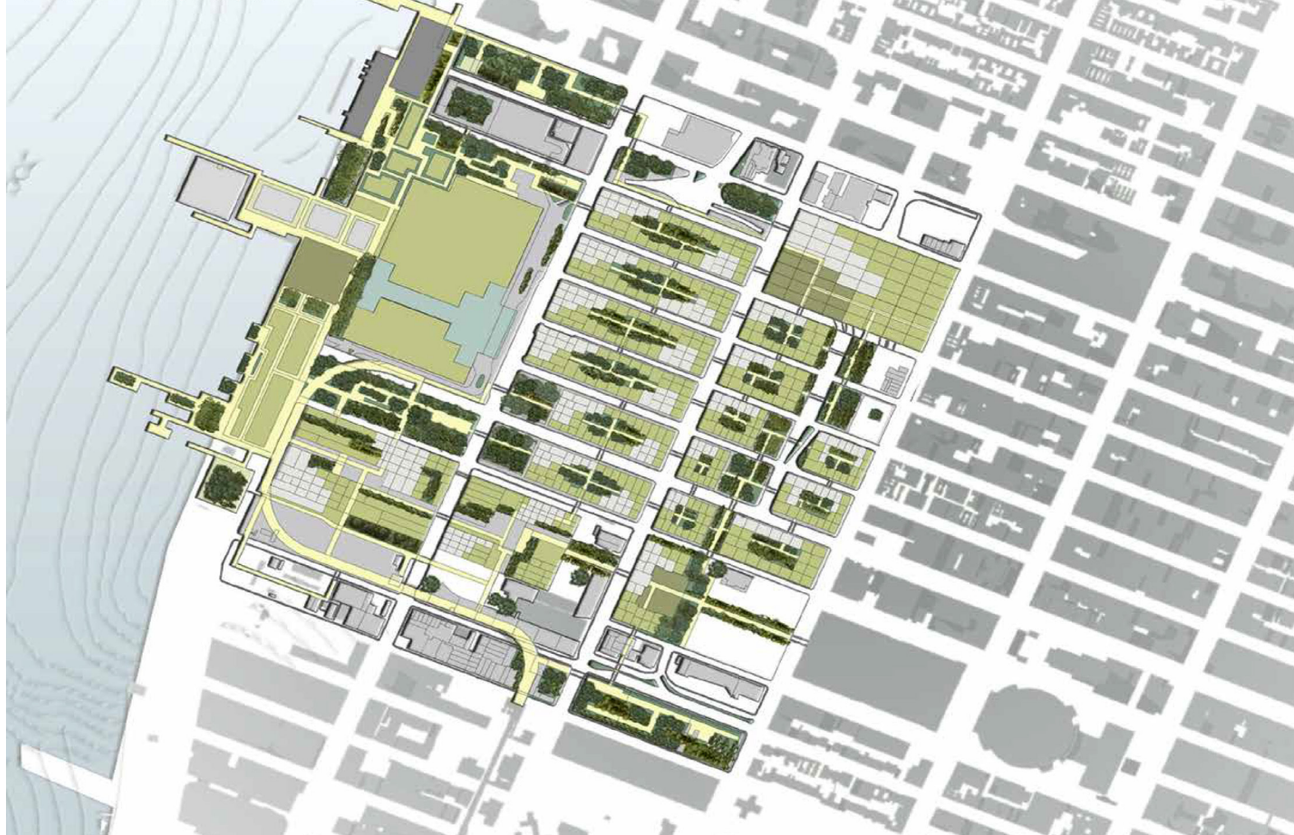
URBAN FARMS _MICRO CLIMATE



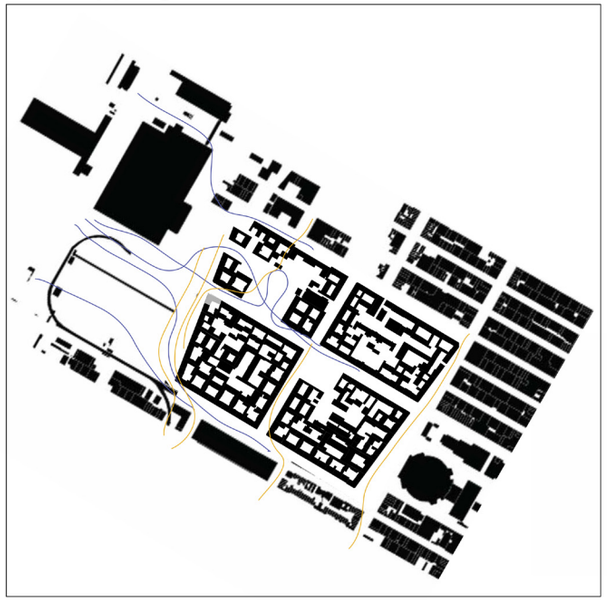
SECTION A-A



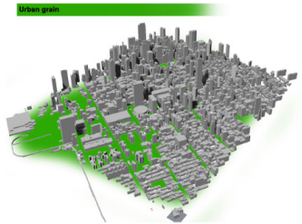




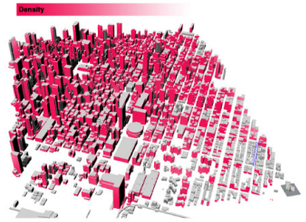
Overlapping Berlin to Manhattan

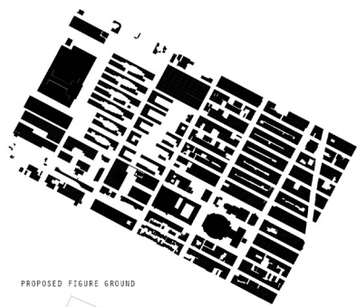


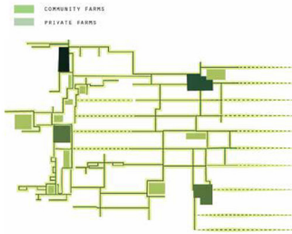
Urban Grain

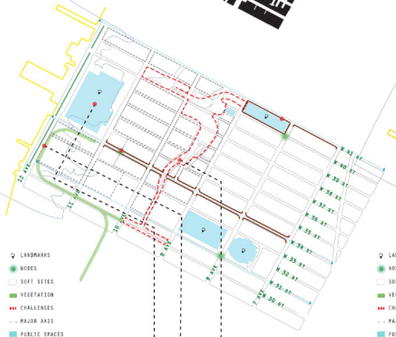


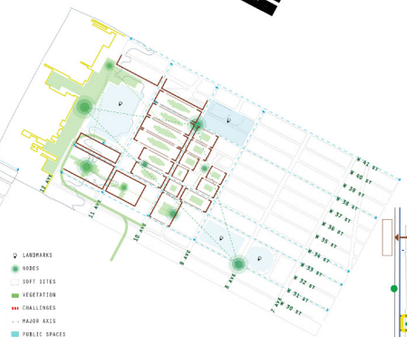
Density

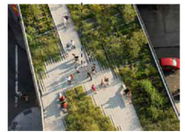


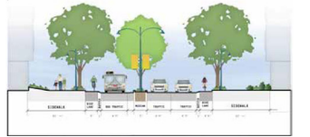




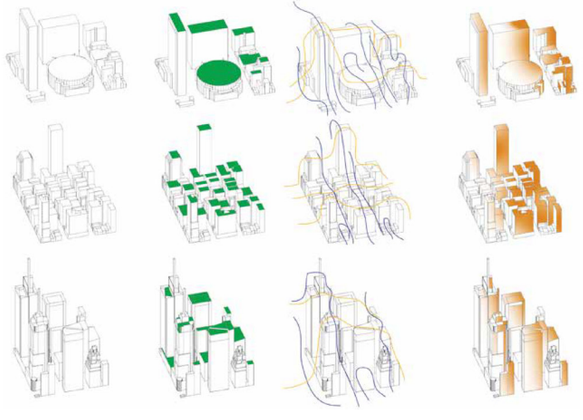




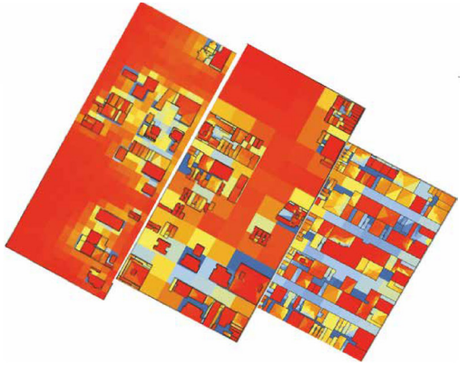




BLOCK ANALYSIS



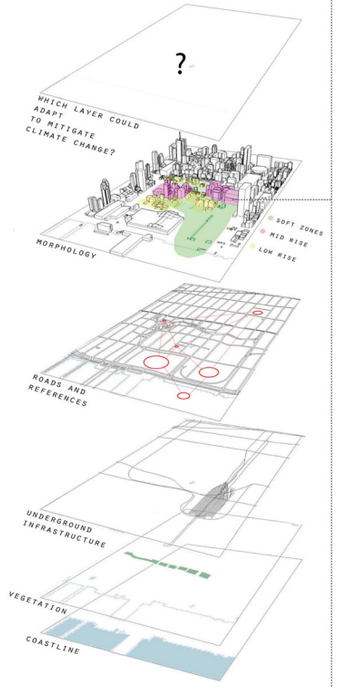
NEW YORK
BLOCK STUDY

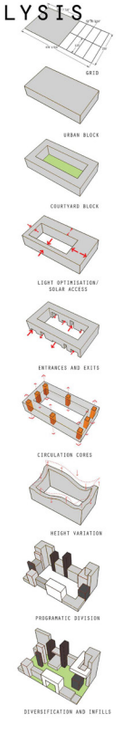


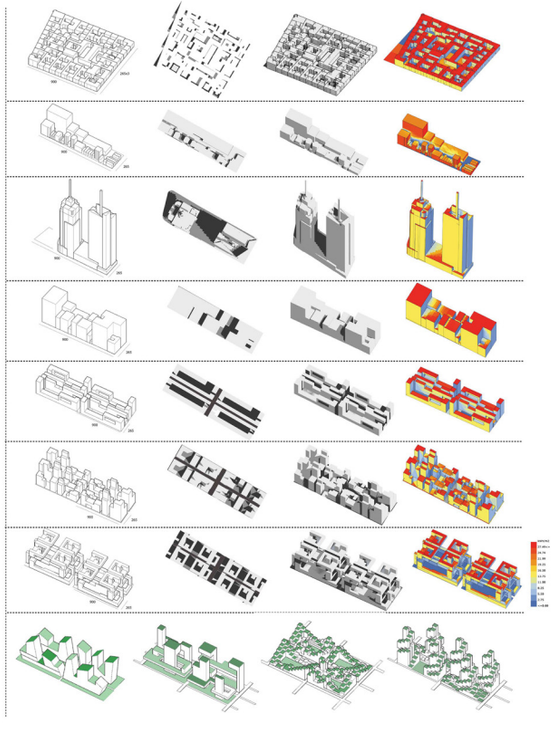
SOLAR RADIATION MAP OF DISTRICT
(TOP VIEW)

DISTRICT ANALYSIS

04 MID TOWN WEST ANALYSIS





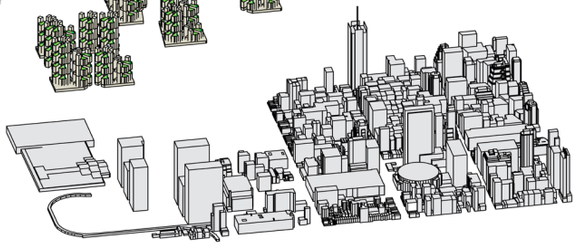


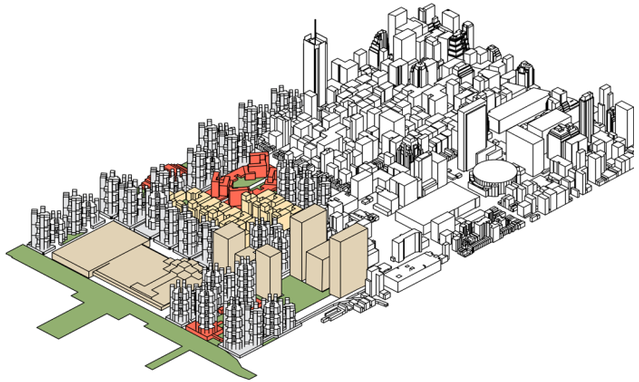
PUBLIC SPACES

RESIDENTIAL AREA

GREEN PATH

MIXED USE TOWERS

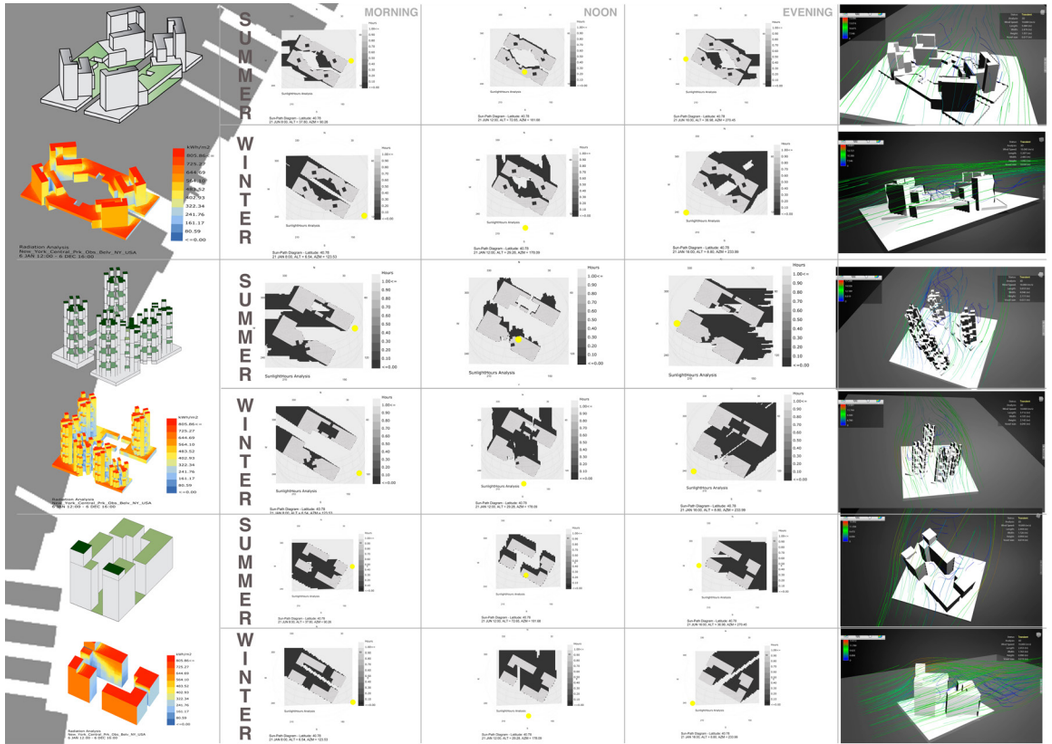




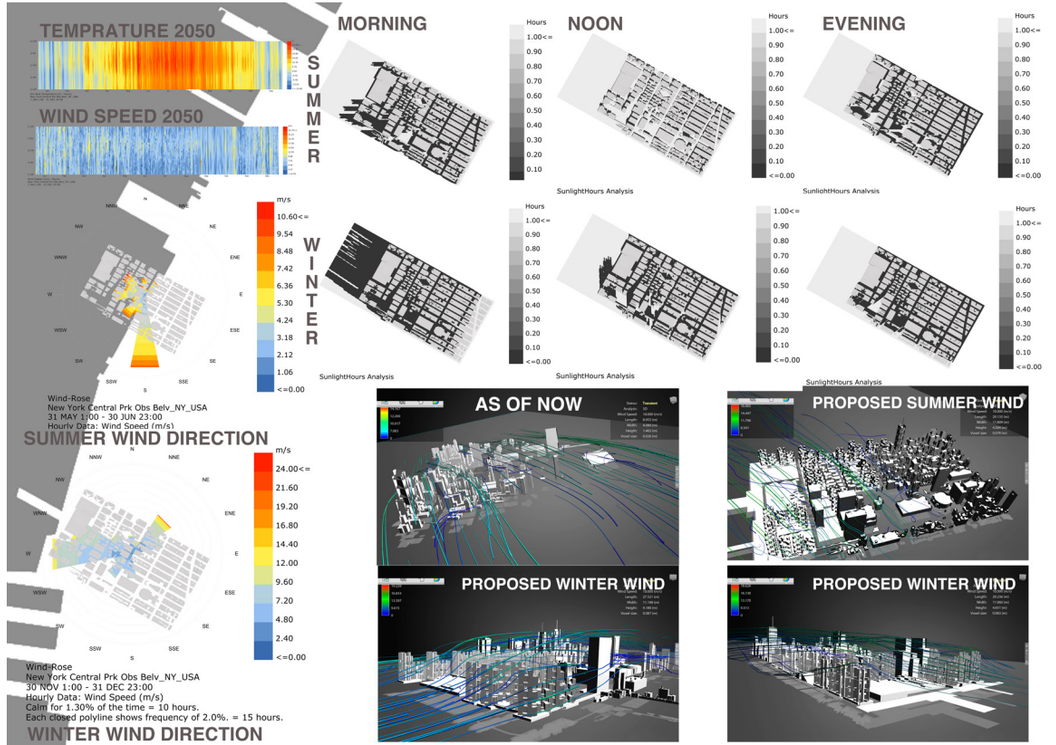
EXISTING FIGURE GROUND

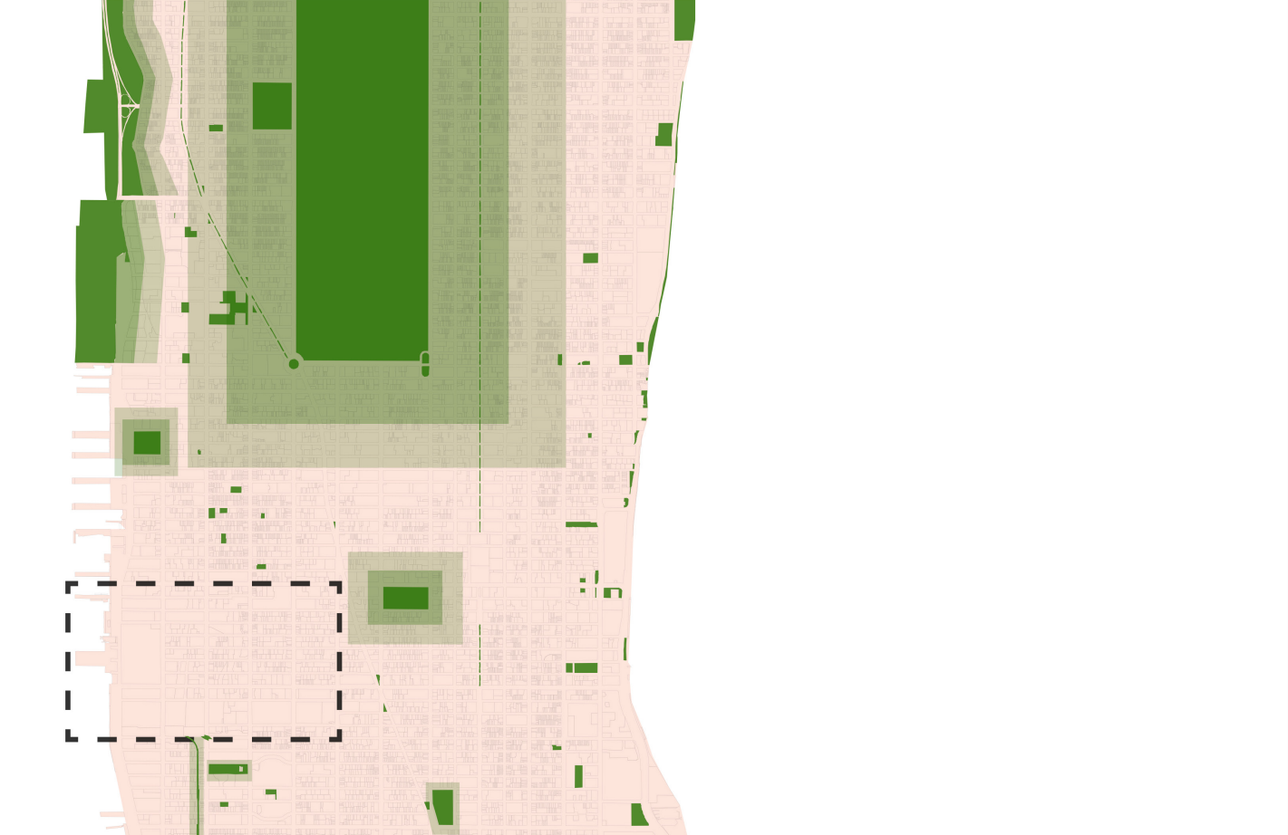
PROPOSED FIGURE GROUND

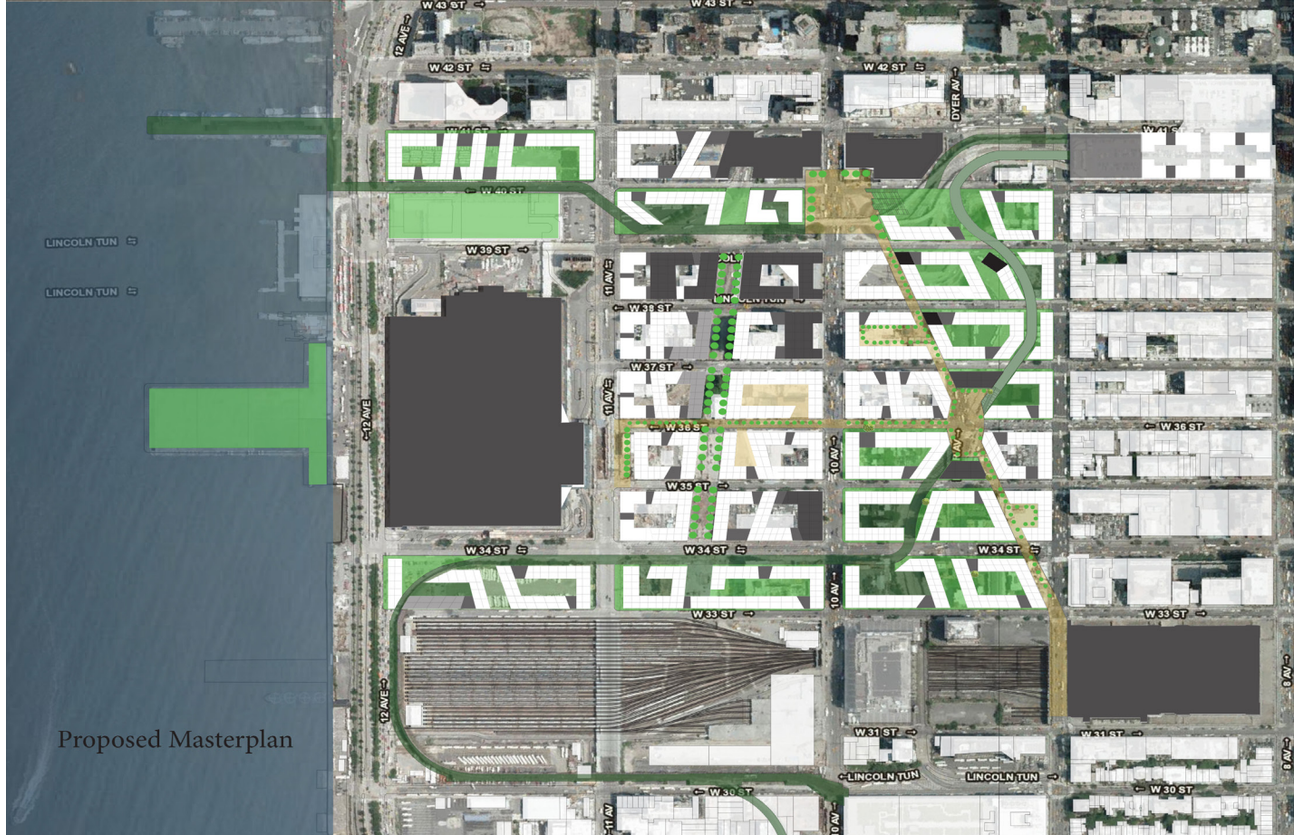
BLOCK ANALYSIS



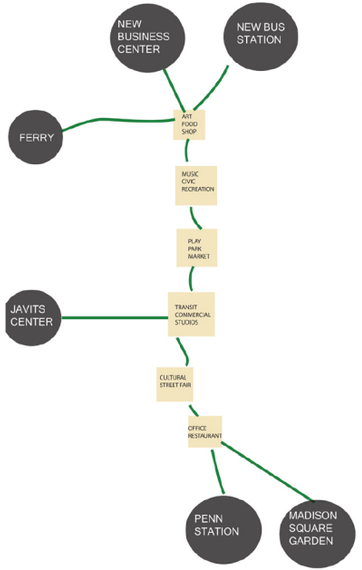
DISTRICT ANALYSIS

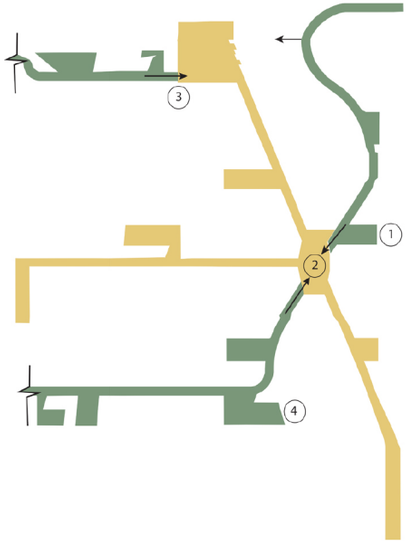





W 43 ST
W 42 ST
W 39 ST
W 38 ST
W 37 ST
W 35 ST
W 34 ST
W 33 ST
W 31 ST
W 30 ST
12 AVE
11 AV
10 AV
DYER AV
LINCOLN TUN
Proposed Masterplan

CONECTIVITY ANALYSIS

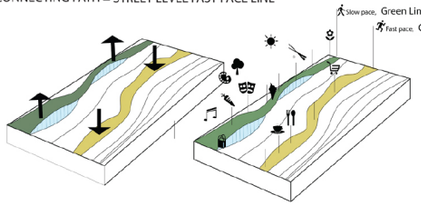




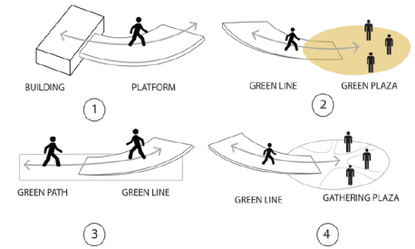
COMBINATION OF COMPRESS AND DECOMPRESS SPACES

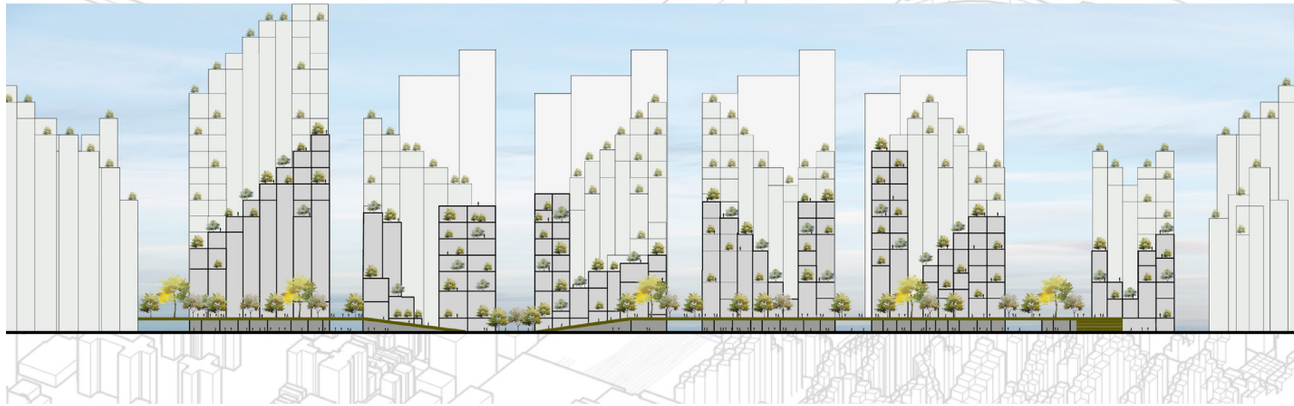
GREEN LINE = ELEVATED SLOW PACE LINE

CONNECTING PATH = STREET LEVEL FAST PACE LINE



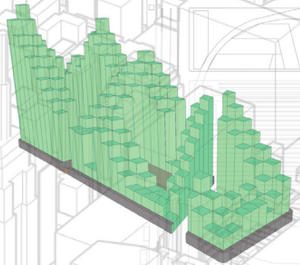
MASS POINT WITH 4 SPACES



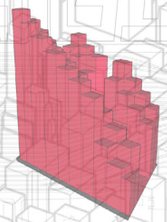


BUILDING TYPOLOGIES

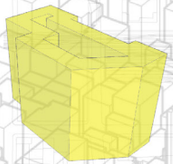
BUILDING TYPOLOGY



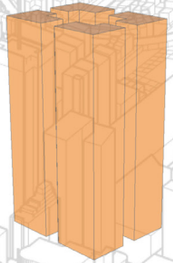
A. Buildings with Podiums



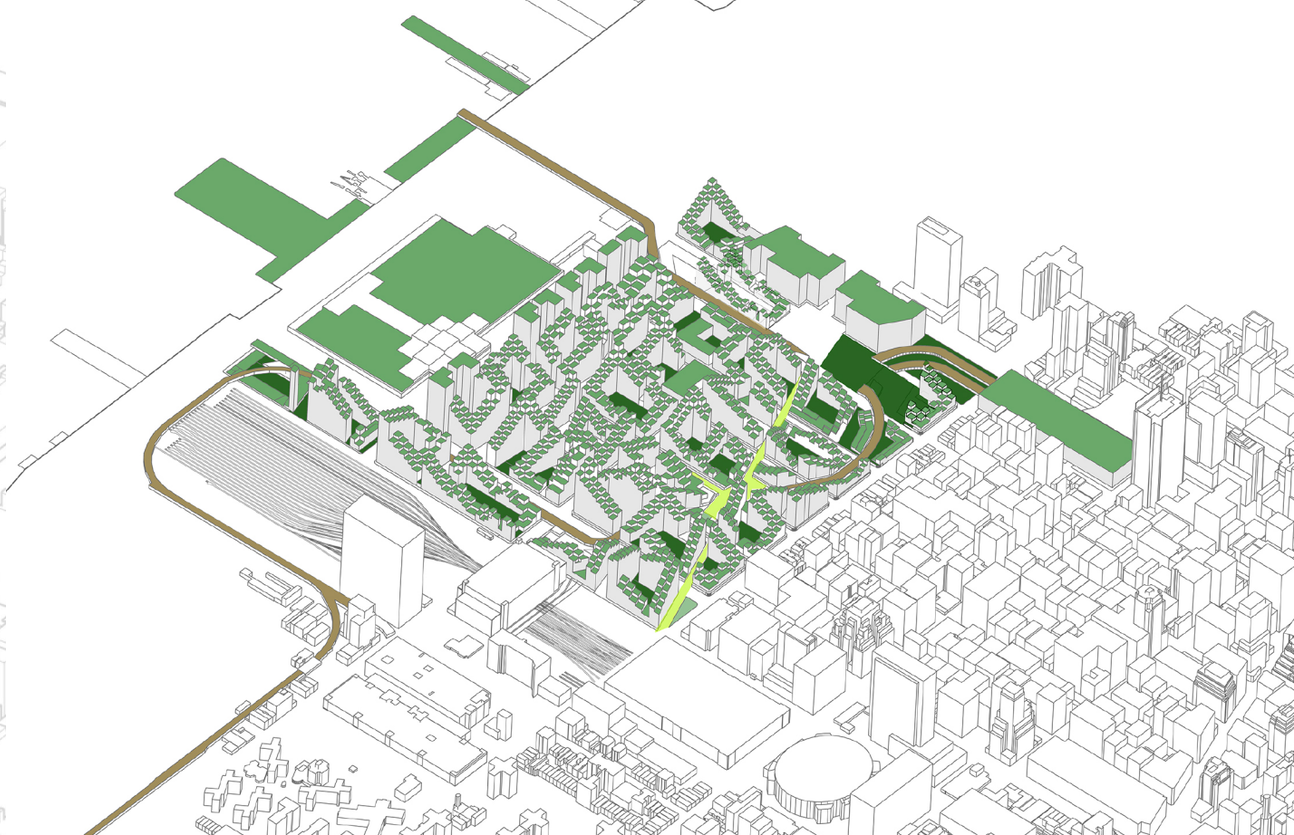
B. Buildings

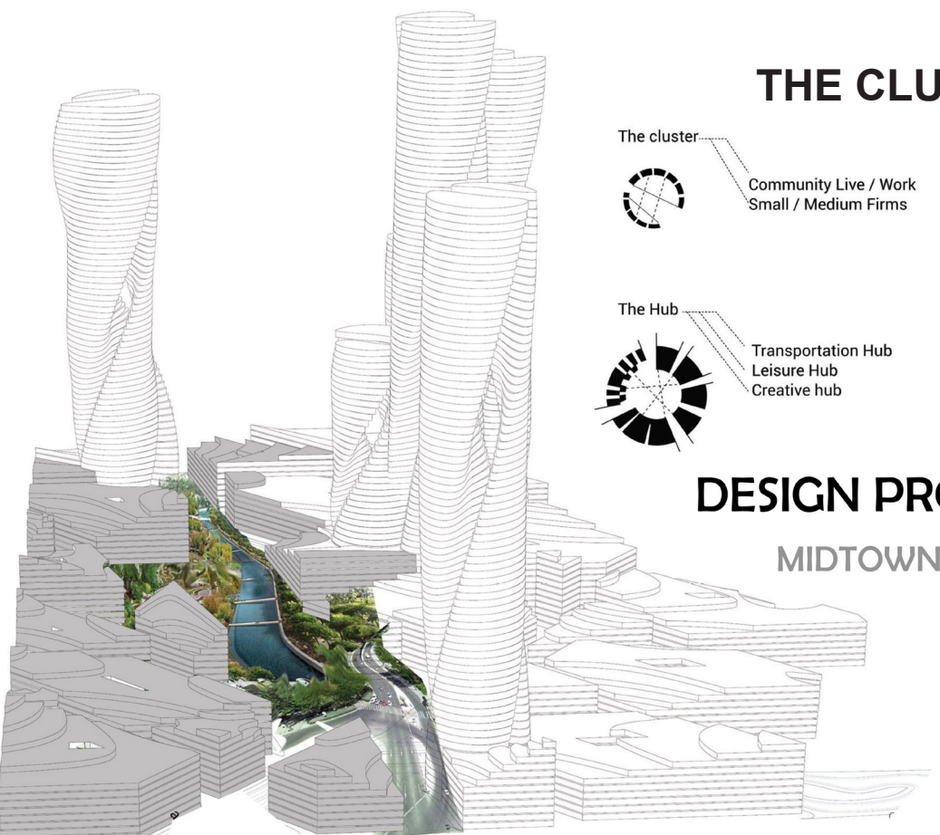


C. Civic Buildings



D. Towers





THE CLUSTER

The cluster

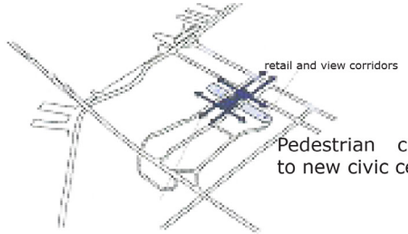
Community Live / Work
Small / Medium Firms

The Hub

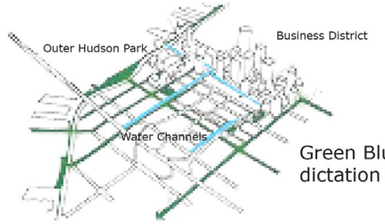
Transportation Hub
Leisure Hub
Creative hub

DESIGN PROPOSAL

MIDTOWN WEST

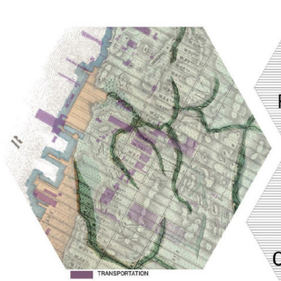


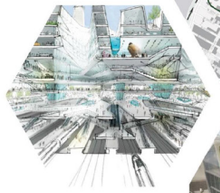
Pedestrian connection to new civic centers

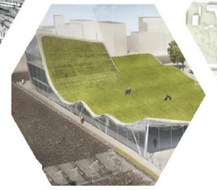


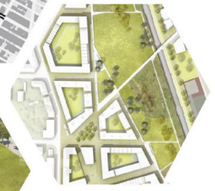
Green Blue Infrastructure dictation district grid

Preservation of sunlight and views by wide spacing urban form









PASSENGER

RESIDENTS

LINGER

LEISURE

CLEAN

CREATIVE

COMFORTABLE

A drivers perspective around Dyer Avenue

accomplishment
saturation
tensed
joy
Removed
Strained
traffic
pollution
tensed
slow zone
Disconnected
chaos
turbulence
destination
Restricted
Confused
Bounded
encased
congestion
attain
access
business

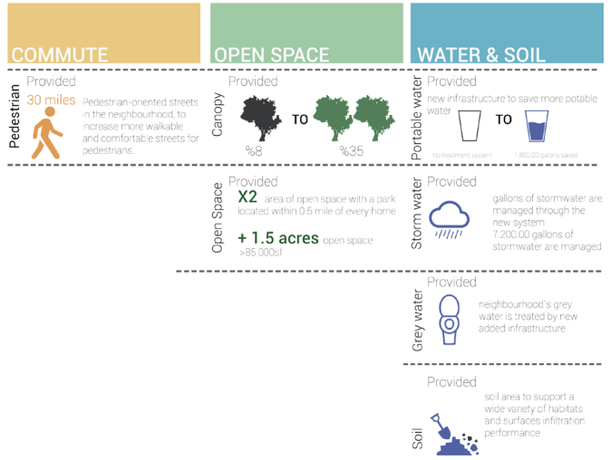
CONCEPT

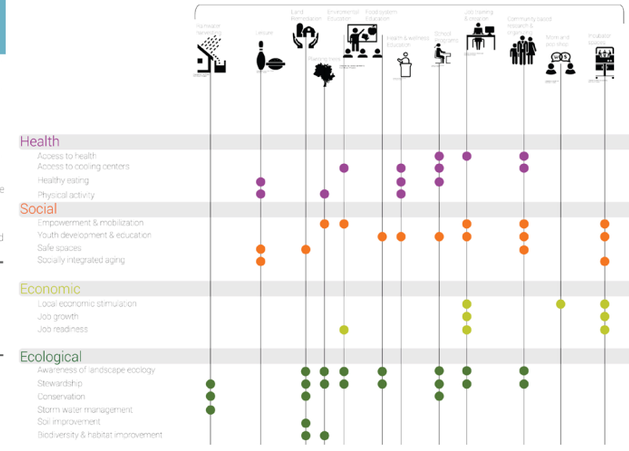
MIDTOWN WEST

A pedestrians perspective in Hudson yards

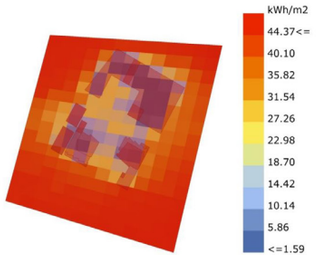
overwhelmed
Dangerous
Pollution
Invisible
Visibility
Voyeuristic
Invisible
lost not found

Objectives	Aspects	Action Plans and Strategies	Operation and Spatial Scale	Climatic Impact Scale
Bioclimate + urban heat island + urban air ventilation + air quality situation	Albedo	Cooling of building material and pavement	Material and surface-level intervention	Meso- and micro-scale
		Cooling of roof and facade		
		Water retention paving		
	Vegetation	Planting greeneries	Material and surface-level intervention	
		Parks and open spaces	Landscape/land use planning-level intervention	
		Green corridors	Landscape/land use planning-level intervention	
	Shading	Building geometric design	Building design-level intervention	Micro-scale
		Shelter design	Building design-level intervention	Micro-scale
		Street orientation	Urban planning/zoning-level intervention	Meso- and micro-scale
		Building height/Street width ratio	Building design-level intervention	Micro-scale
		Trees along both sides of streets	Landscape/land use planning-level intervention	Micro-scale
	Ventilation	Air path	Urban planning/zoning-level intervention	Meso- and micro-scale
		Building ground coverage and building bulks	Urban planning/zoning-level intervention	Meso- and micro-scale
		Building height/Street width ratio	Building design level intervention	
		Street orientation	Urban planning/zoning-level intervention	Meso- and micro-scale
		Layout of building dispositions	Urban planning/zoning-level intervention	Meso- and micro-scale
		Open spaces and greenery areas	Landscape/land use planning-level intervention	Meso- and micro-scale

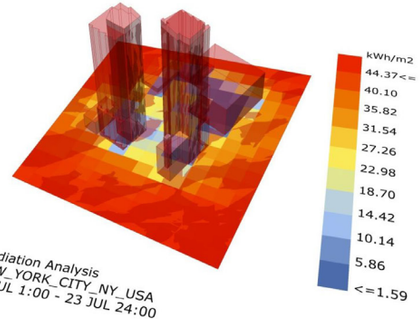




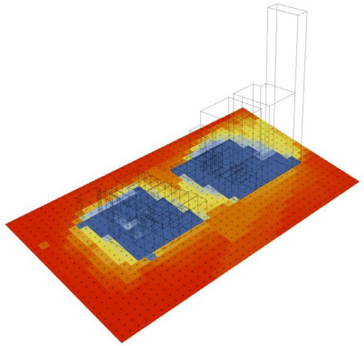
UTCI ANALYSIS
Universal Thermal Climate Index

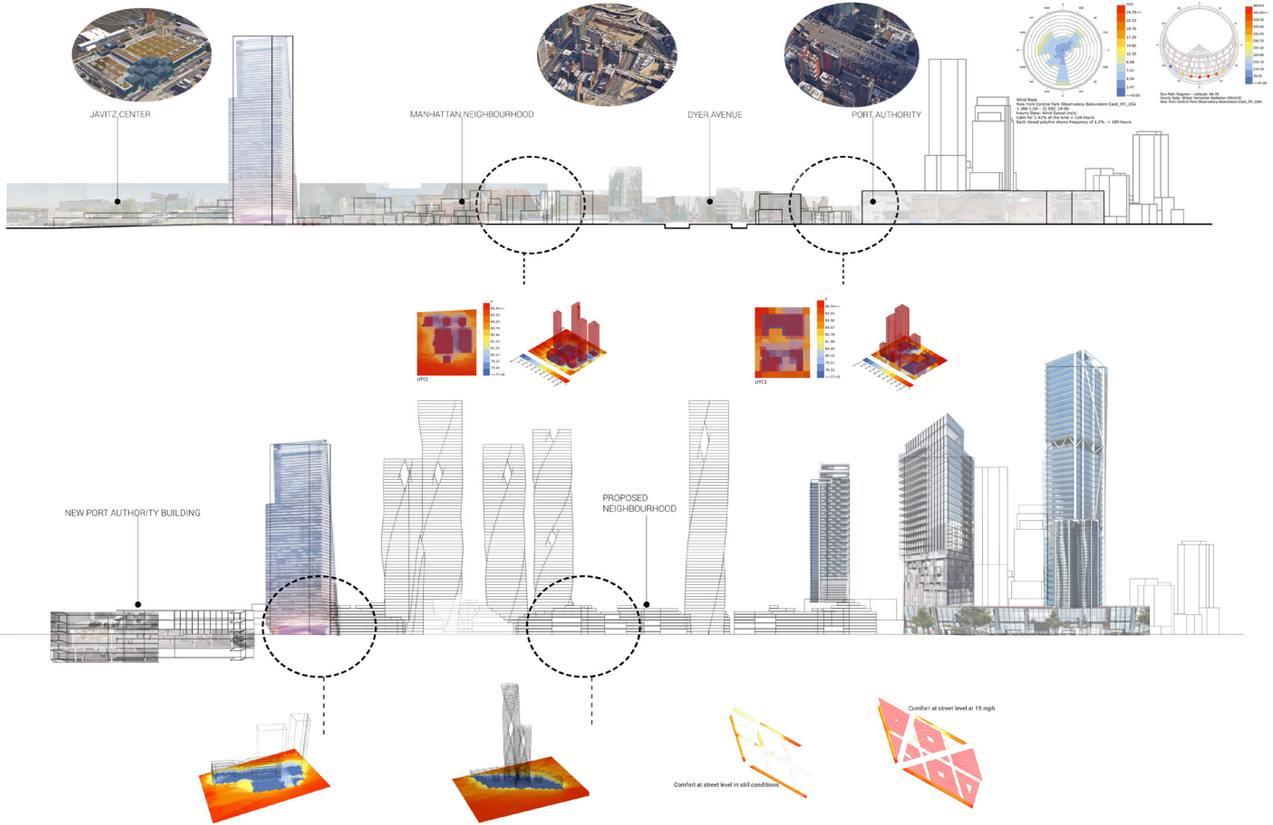


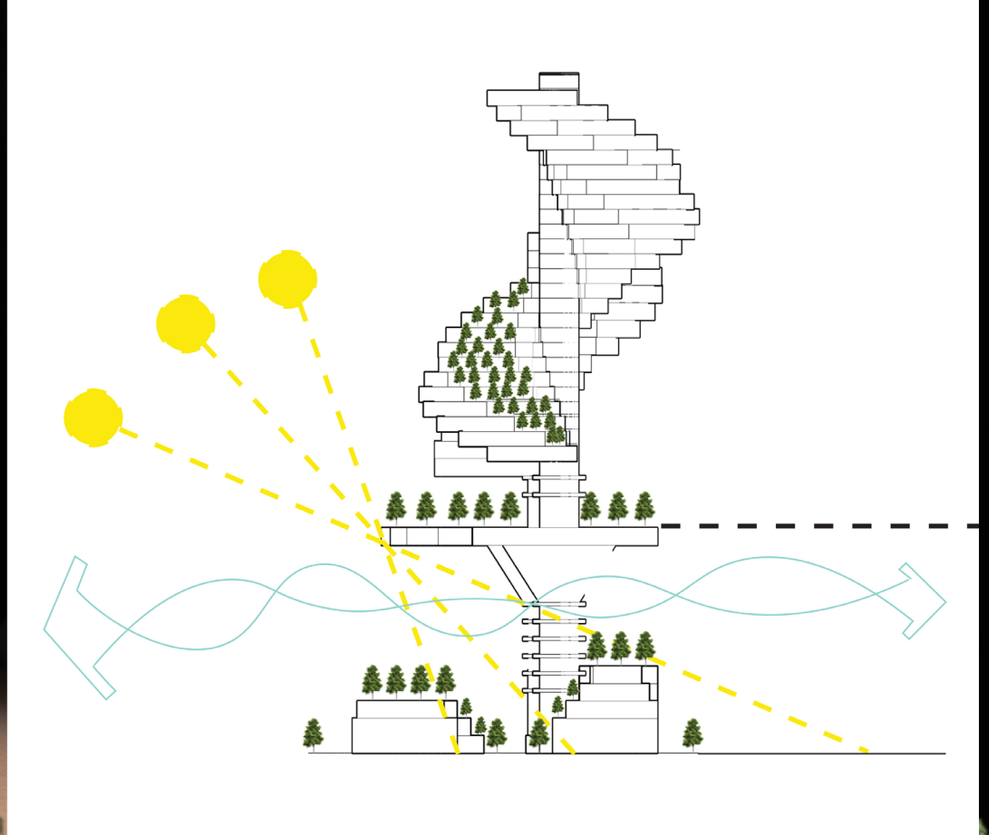
Radiation Analysis
NEW_YORK_CITY_NY_USA
17 JUL 1:00 - 23 JUL 24:00



Radiation Analysis
NEW_YORK_CITY_NY_USA
17 JUL 1:00 - 23 JUL 24:00



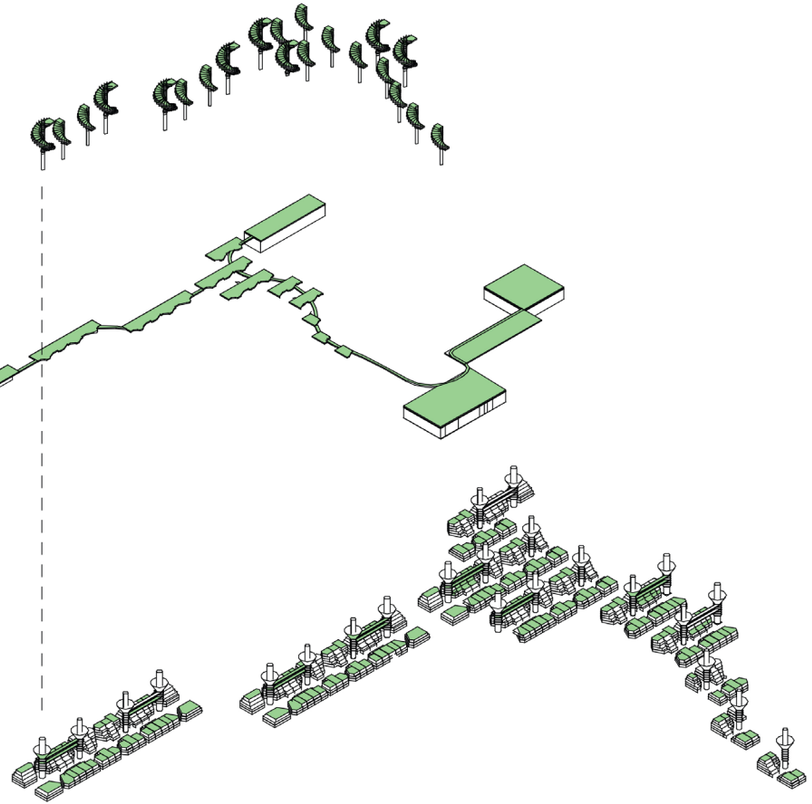


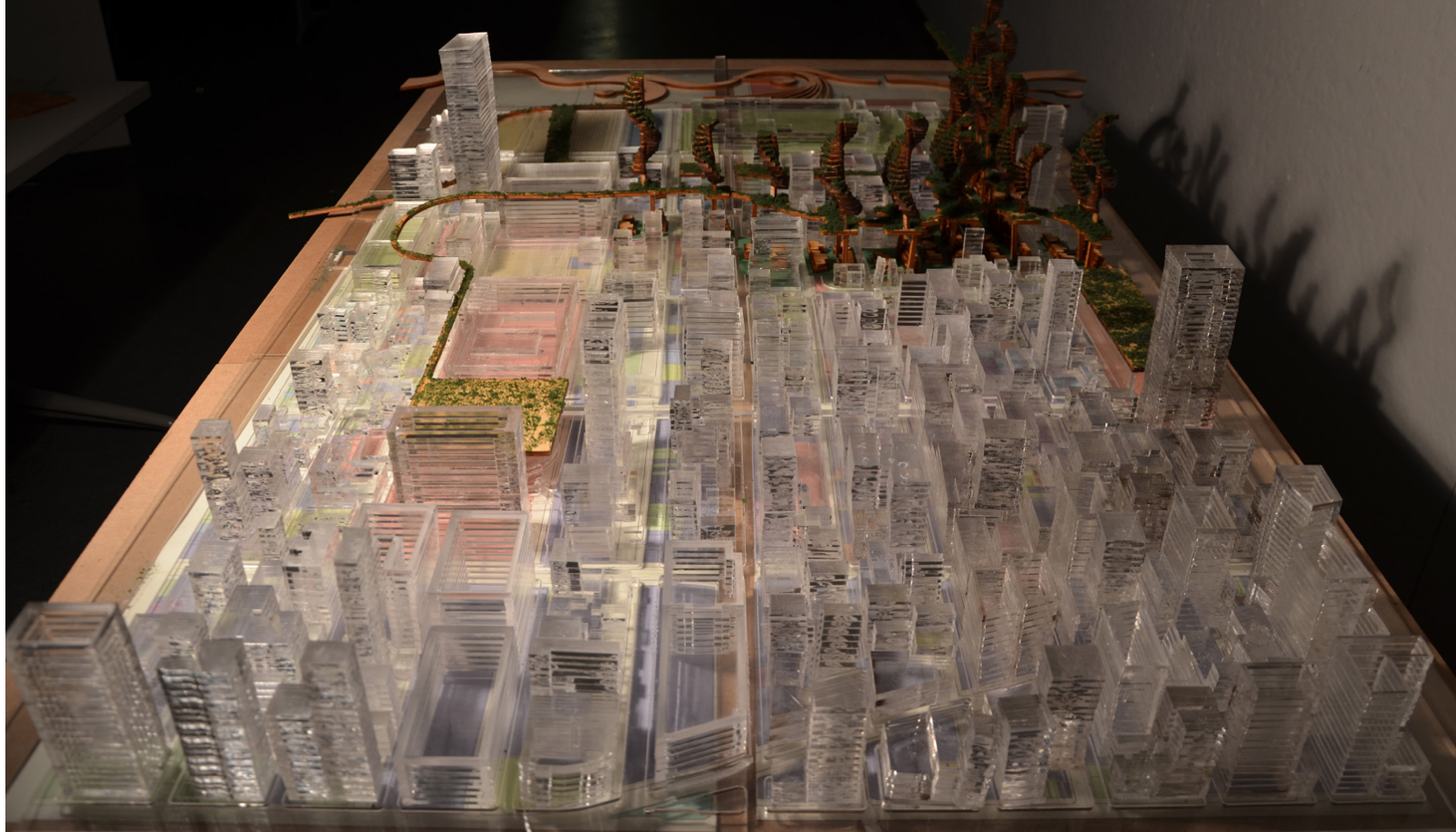


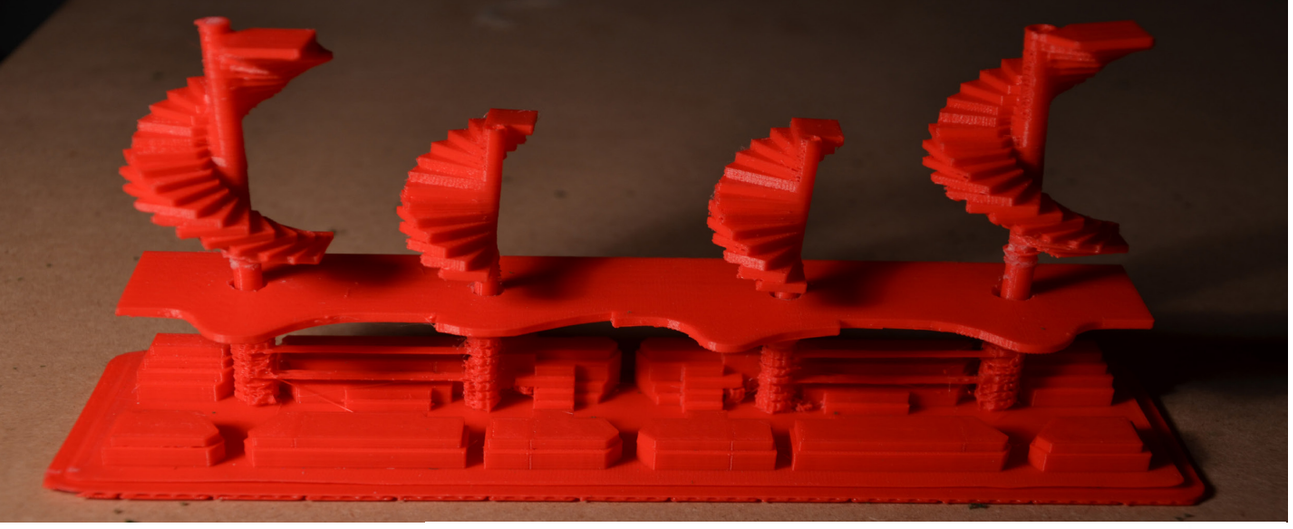
CITY
- DENSITY

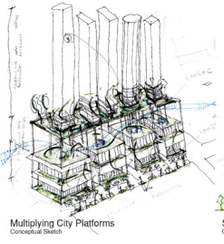
PILOTI
- GREEN NETWORK

VILLAGE
- FLEXIBLE

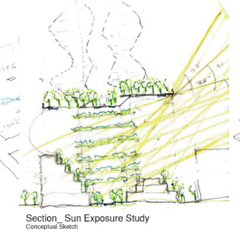




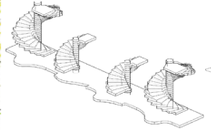


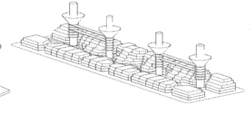


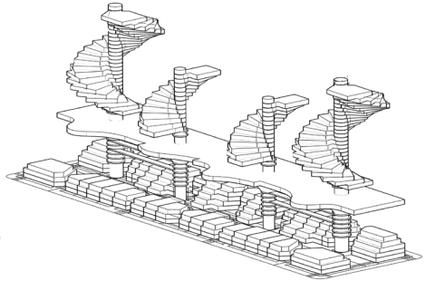
Multiplying City Platforms
Conceptual Sketch

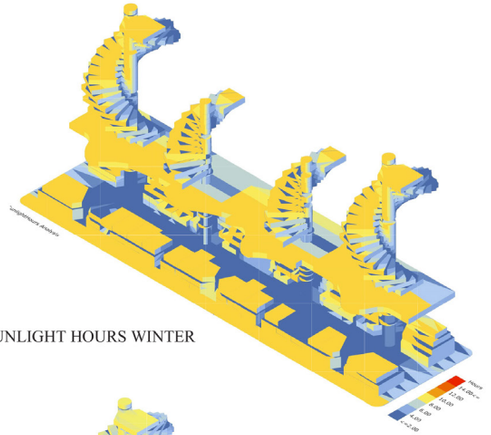


Section_ Sun Exposure Study
Conceptual Sketch

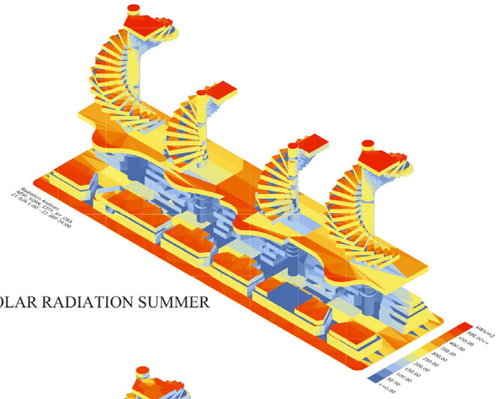




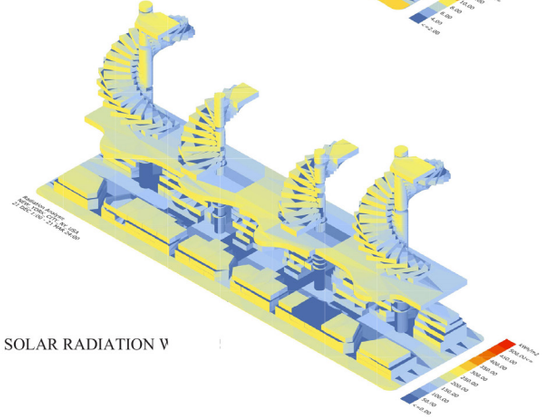




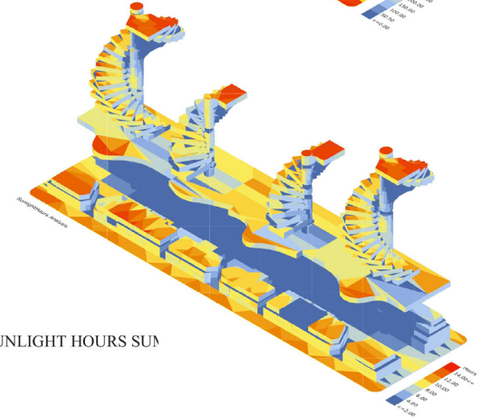
SUNLIGHT HOURS WINTER



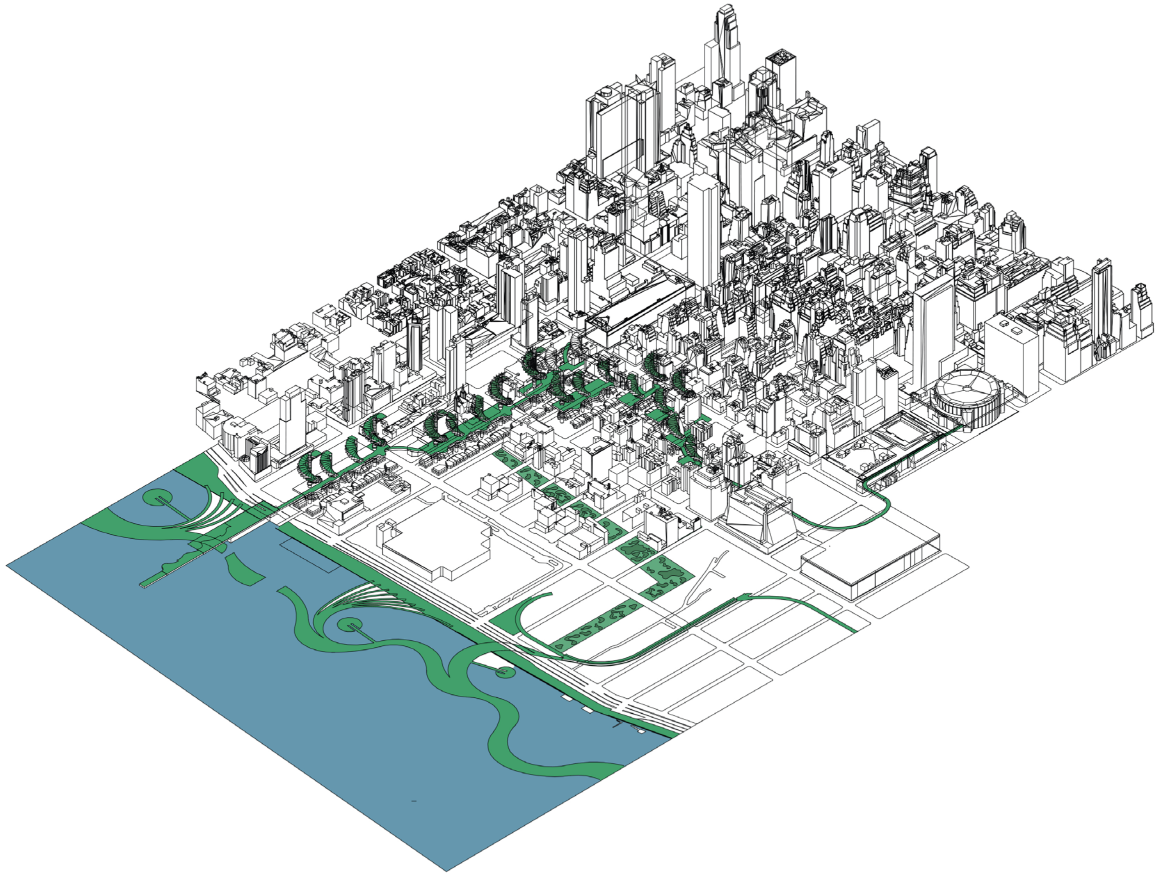
SOLAR RADIATION SUMMER

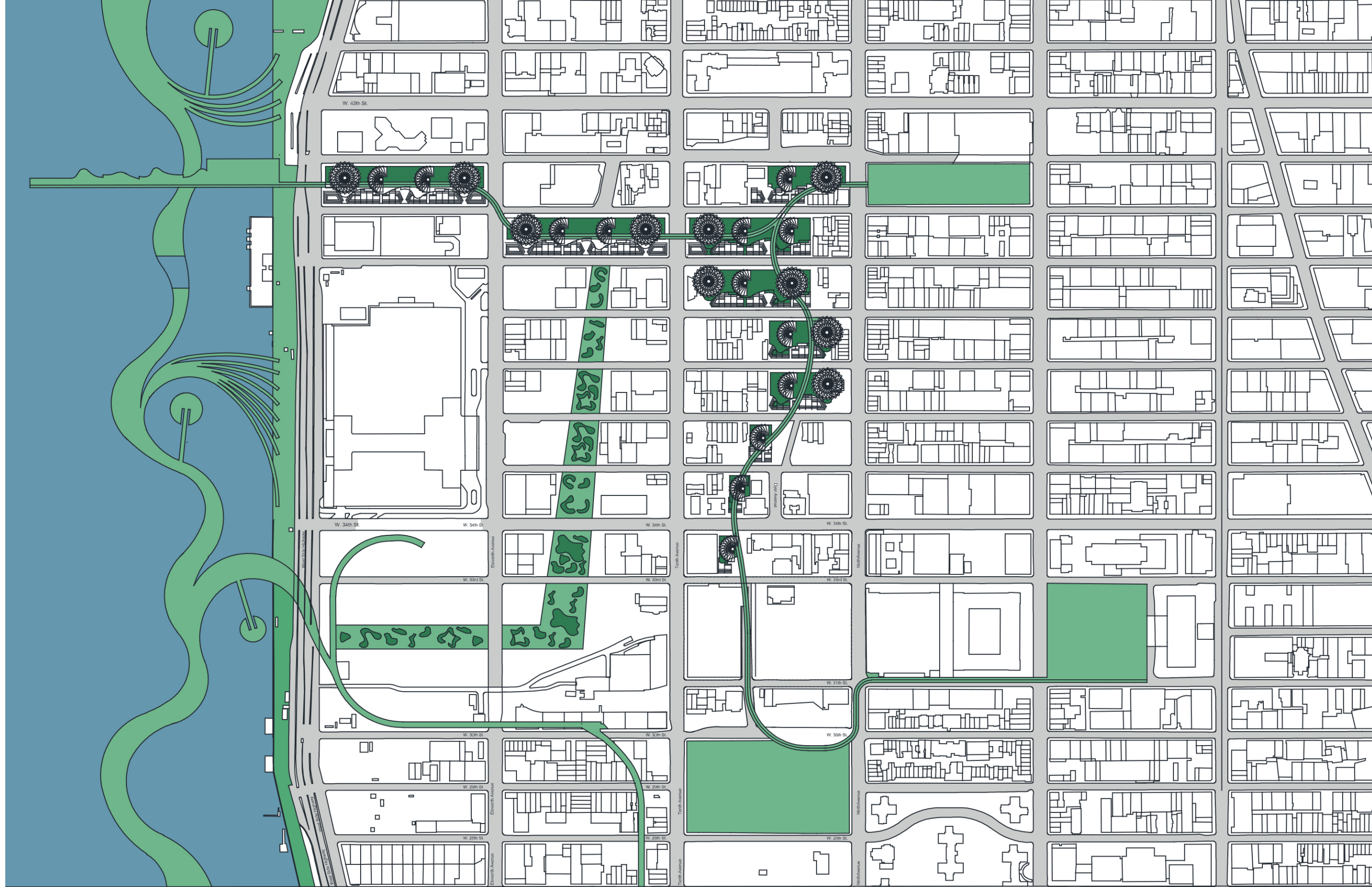


SOLAR RADIATION W

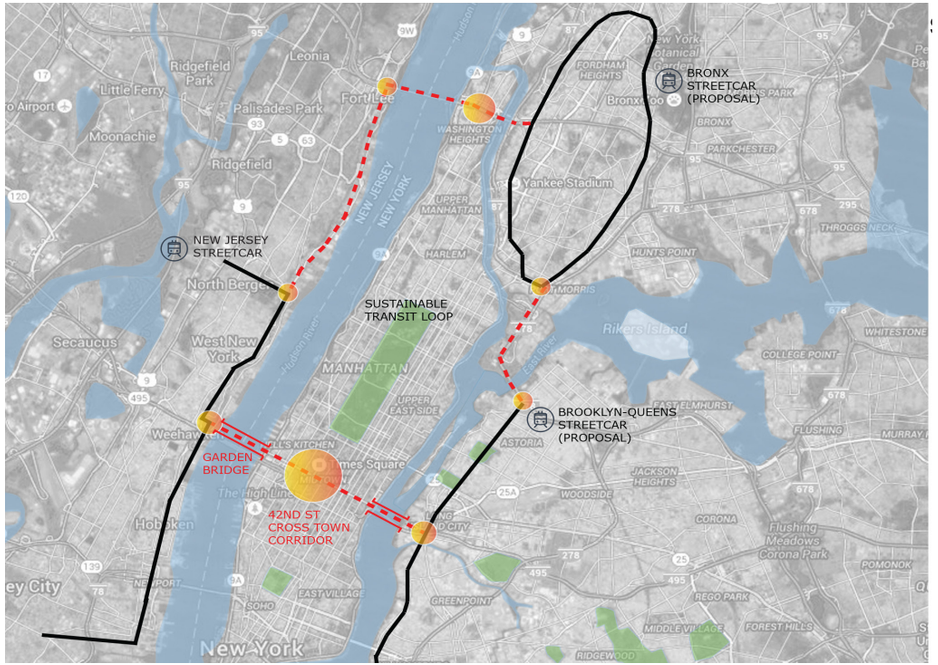


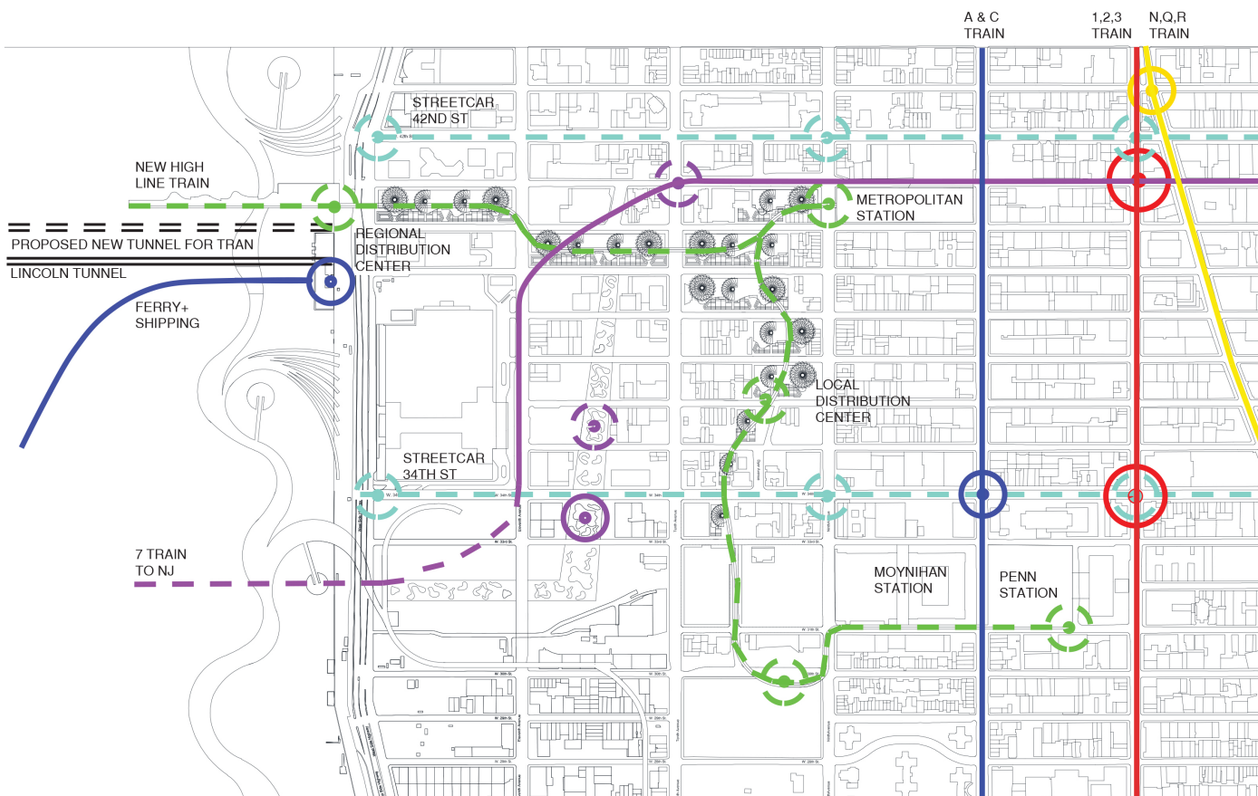
SUNLIGHT HOURS SUI




W. 42th St.
W. 34th St.
W. 33rd St.
W. 31th St.
W. 30th St.
W. 29th St.
W. 28th St.
West Side Highway
Eleventh Avenue
Tenth Avenue
Dyer Avenue
NinthAvenue

REGIONAL SUSTAINABLE TRANSIT LOOP





Courses Faculty

Jeffrey Raven, FAIA, LEED BD+C

Director, Graduate Program in Urban + Regional Design | Associate Professor

Students

Soujanya Krishnappa

Abhishek Akula

Ana Llopis Esbri

Farcia Soares

Loren Mendoza

Namrata Patel

Oyku Arda

Pooya Amin Javaheri

Sanketa Kadam

Seda Haksoz

Sherif Abdellatif

Sudha Vasu

Vinay Nandish

Hatice Sarac

This **design jury** drew from diverse faculty and active professionals leading global practices based in the New York City Metropolitan area.

Thanks to Chris Mackey, Building Scientist, Payette Architects

Celine Armstrong, President ASLA-NY Chapter, Pier55

Albert Wei, KPF

Laura Jay, C40 Cities

Cynthia Barton, Program Manager, NYC OEM

Amanda Slaughter, KPF

Illya Azaroff, + LAB architect

Daniel Windsor, Perkins Eastman

Ilana Judah, FXFOWLE

Nicolas Ryan, Perkins Eastman

Shiva Ghomi, Perez APC

Andrew Heid, NO ARCHITECTURE

Mattia Leone, Università di Napoli Federico II

Eugene Kwak, NYIT

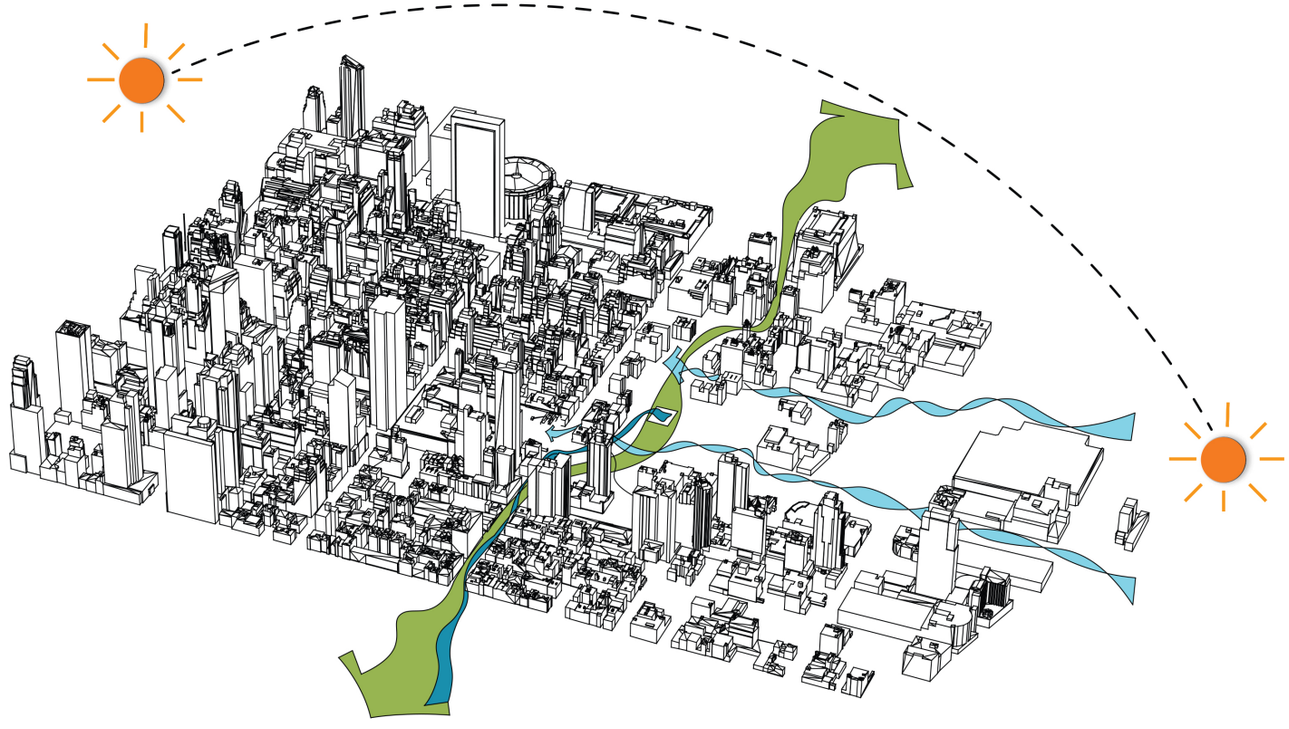
Beyhan Karahan, NYIT

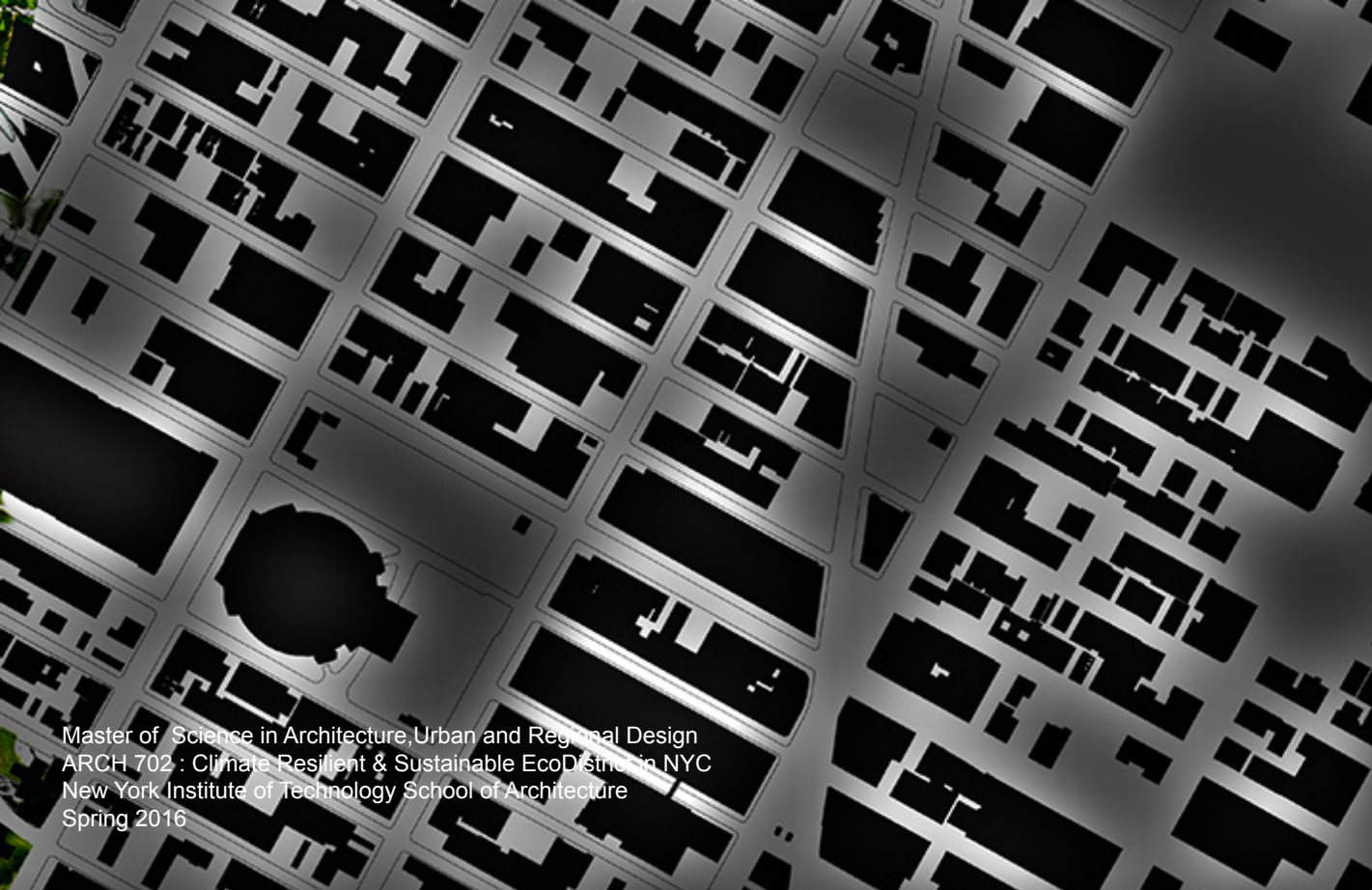
Mike Nolan, NYIT

Tobias Holler, NYIT

Michael Schwarting, NYIT

Michael Esposito, Faculty - NYIT Graduate Urban Design / Atelier Ten





Master of Science in Architecture,Urban and Regional Design
ARCH 702 : Climate Resilient & Sustainable EcoDistrict in NYC
New York Institute of Technology School of Architecture
Spring 2016