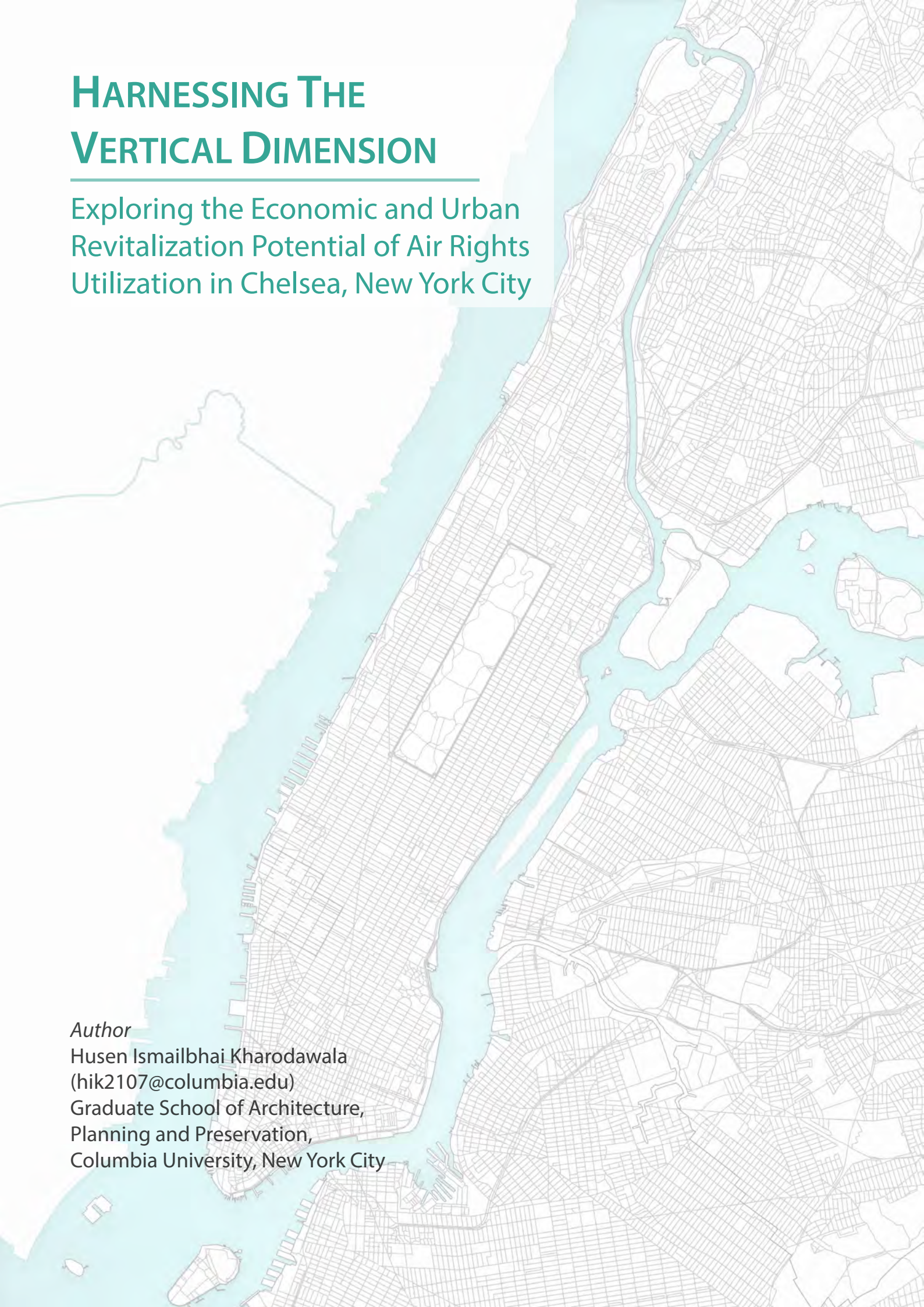
Harnessing The Vertical Dimension

Exploring the Economic and Urban Revitalization Potential of Air Rights Utilization in Chelsea, New York City



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Source: New York City Planning Department's PLUTO (Primary Land Use Tax Lot Output) dataset

Abstract

New York City, an ever-evolving metropolis, faces the challenge of optimizing limited land space to accommodate its growing population. In this pursuit, the city has recognized the significance of air rights, which grant the legal authority to construct above existing structures. These rights have become pivotal instruments in fostering regulated development and urban growth. Recognizing their potential, this research thus delves into the urban revitalization potential of air rights utilization in Chelsea, a dynamic neighborhood in West Manhattan. Employing Geographic Information Systems (GIS) as a primary tool, the study aims to uncover patterns, identify trends, and explore transformative possibilities.

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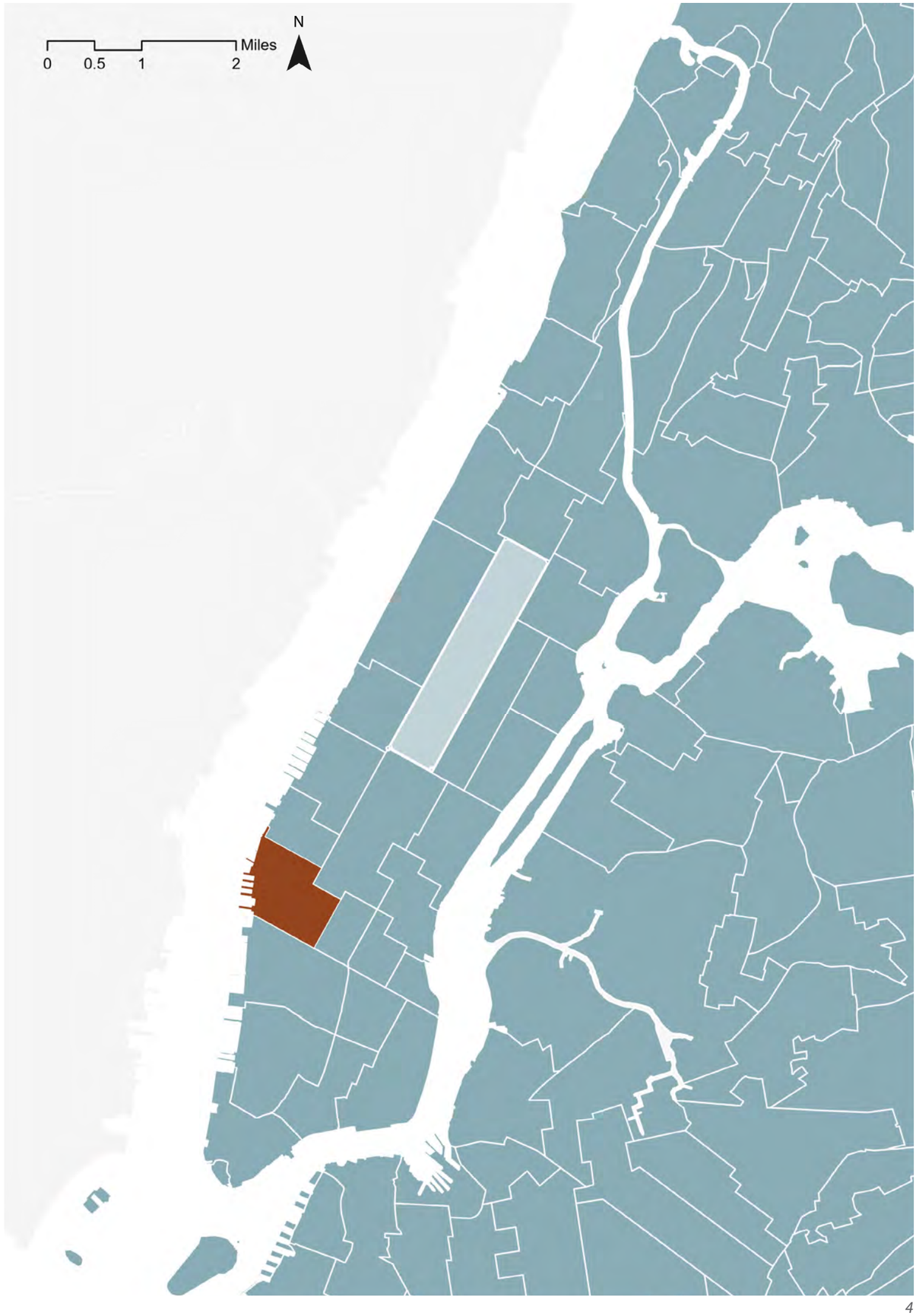
Introduction

Chelsea, New York City

Chelsea's untapped air rights represent a substantial opportunity for expansion and urban revitalization. The inefficient use of air rights can lead to underutilization of valuable space, missed economic opportunities, and limited development potential in urban areas. Air rights essentially refer to the unused space above a property. When a building is shorter than its maximum allowable height, this untapped potential can be transferred to nearby developments. This process helps balance growth in neighborhoods by ensuring that areas with underutilized lots contribute to the expansion of new projects, preventing excessive density in limited habitable spaces.

The regulation of building height is governed by the floor to-area ratio (FAR), indicating the maximum square footage that can be constructed on a site relative to its lot size. Various factors influence a building's FAR, including its location (zoning district, proximity to wide or narrow streets), the building's purpose (commercial, residential, community, or manufacturing), and the provision of public benefits, such as affordable housing units or public outdoor spaces. This intricate system aims to manage urban development while considering the diverse needs and characteristics of different neighborhoods in the city.



Background

Problem Identification

The value of air rights, is substantial in urban areas like Chelsea, where space is at a premium. When these air rights remain untapped or underused, it translates to missed opportunities for vertical expansion, hindering the city's capacity for growth and development. Moreover, the presence of "the High Line", an urban park built on a historic freight rail line has been projected as both a success story and a potential hindrance in the utilization of air rights.

The linear park itself doesn't directly impede air rights utilization, but its presence and popularity have influenced the surrounding area's development dynamics. While the High Line has brought significant social, cultural, and economic benefits to the neighborhood, its presence has, in some ways, created challenges for maximizing the use of available air rights, considering the high population density of the neighborhood. due to the constraints imposed by its surrounding regulations and property value dynamics. This inefficiency often leads to a scarcity of available space for essential urban needs like housing, commercial properties, or community facilities. It can also cascade negative consequences, including:

1. Economic Stagnation:

Underutilized air rights hinder the potential for residential housing, increased property values, tax revenue generation, and job creation, ultimately impeding the neighborhood's economic vitality (Furman Center for Real Estate and Policy, 2022).

2. Limited Infrastructure:

Vacant or underutilized plots can contribute to a sense of neglect and disrepair, detracting from the neighborhood's aesthetic appeal and potentially fostering a decline in property values (New York City Department of Planning, 2020). Thus, limiting the availability of adequate infrastructure to meet the needs of the evolving population.

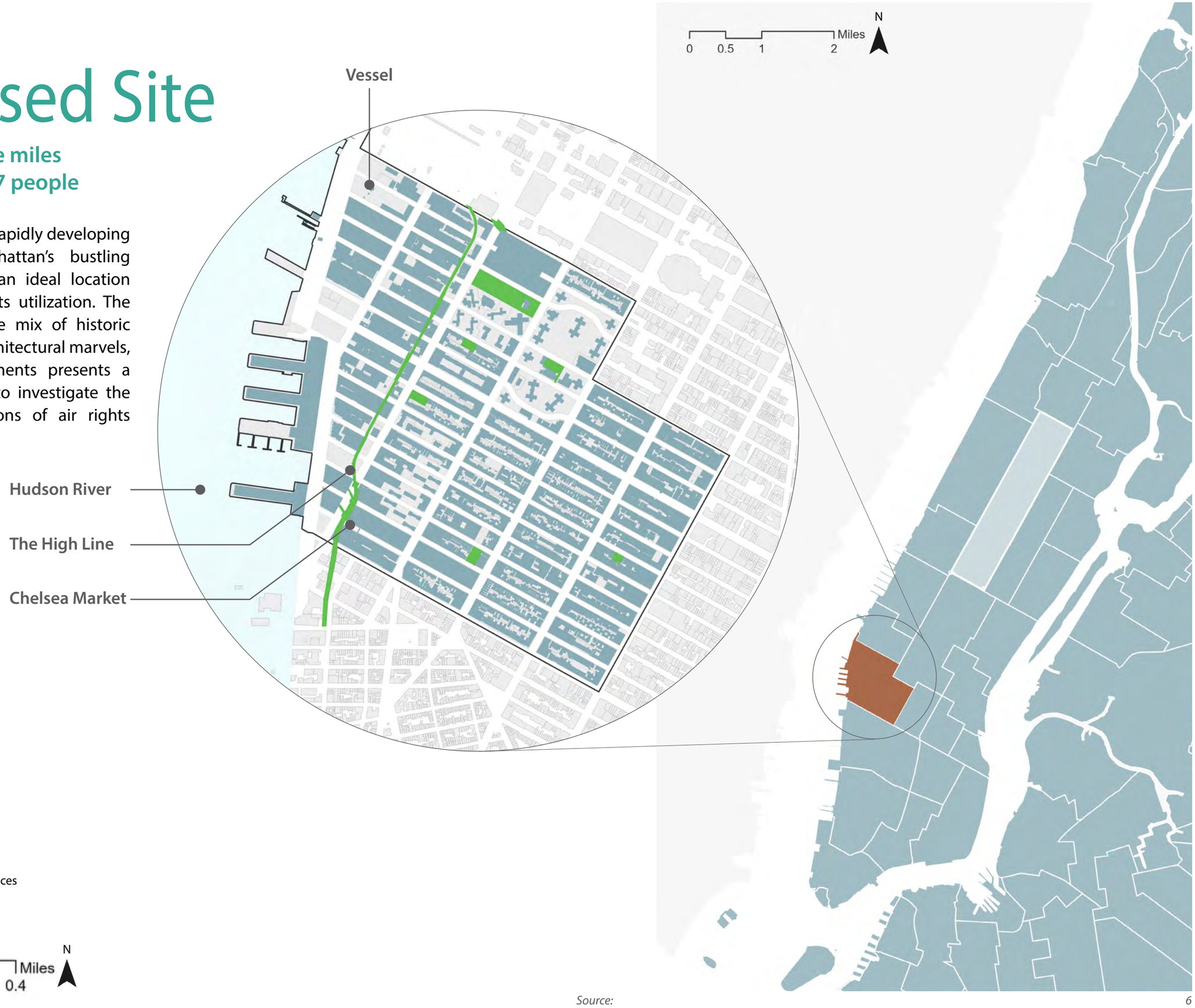
3. Missed Opportunities for Innovation:

The potential for creative and sustainable air rights developments remains largely unrealized, limiting Chelsea's ability to adapt to changing needs and trends and embrace innovative approaches to urban development (Urban Land Institute, 2019).

Proposed Site

Area: **0.774 square miles**
Population: **47,867 people**

Chelsea, a vibrant and rapidly developing precinct within Manhattan's bustling West Side, serves as an ideal location for examining air rights utilization. The neighborhood's diverse mix of historic landmarks, modern architectural marvels, and trendy establishments presents a compelling backdrop to investigate the multifaceted implications of air rights development.



Source:

Data

Type of Data & Sources

Spatial Data:

- Land Use
- Zoning data
- Borough Boundaries
- Neighborhood Boundaries
- Cencus Tracts
- Building Foot Prints
- FAR (Floor Area Ratio)
- Public Park & Open Spaces
- Public Transportation
- Subway Locations

Non Spatial Data: Demographic Data:

- Population Density
- Median Income

Retrieved from data source:
census.gov
Land Use : Map PLUTO
Zoning : ZOLA NYC
Built FAR & Total permissible FAR : Map PLUTO
Population density & Median Income : American Community Survey
New York Borough Boundaries & Building Footprints Point data : NYC Open Data
New Jersey Borough Boundaries: NJ Open Data
New York Census Tracts : Tiger Line data

To address the research questions and conduct a comprehensive analysis, a diverse range of secondary data sources will be utilized:

1. Municipal Art Society of New York (MASNYC):
City Wide Air Rights Map will provide insights into the availability of unused development rights based on the amount of floor area permissible on a zoning lot. It shall enable us to better understand the development potential in the identified neighborhood.

2. New York City Department of Finance (DOF):
Property tax data will provide detailed information on parcel ownership, assessed values, and building characteristics, enabling the identification of potential sites for air rights development.

3. New York City Department of Planning (DCP):
Zoning maps and land use data will provide insights into the building regulations and morphological patterns of the area including permitted development density, existing land uses, and potential constraints on air rights utilization.

4. New York City Department of Buildings (DOB):
Building permit data will reveal historical trends in air rights utilization, the types of developments constructed using air rights, and the associated information.

5. New York State Department of Transportation (NYSDOT):
Transportation data will provide information on the location and capacity of transportation infrastructure, including subway lines, bus routes, and major roadways, enabling the assessment of accessibility and its influence on air rights development.

6. US Census Bureau:
Demographic data, including population density, and median income levels, will provide insights into the population characteristics of the potential user base for air rights development and help assess the demand for different types of projects that could benefit from the appropriate provision and utilization of air rights.

(Note: If required the project may use other relevant datasets from NYC Open Data and MapPluto amongst other data sources.)

Spatial Units of Analysis

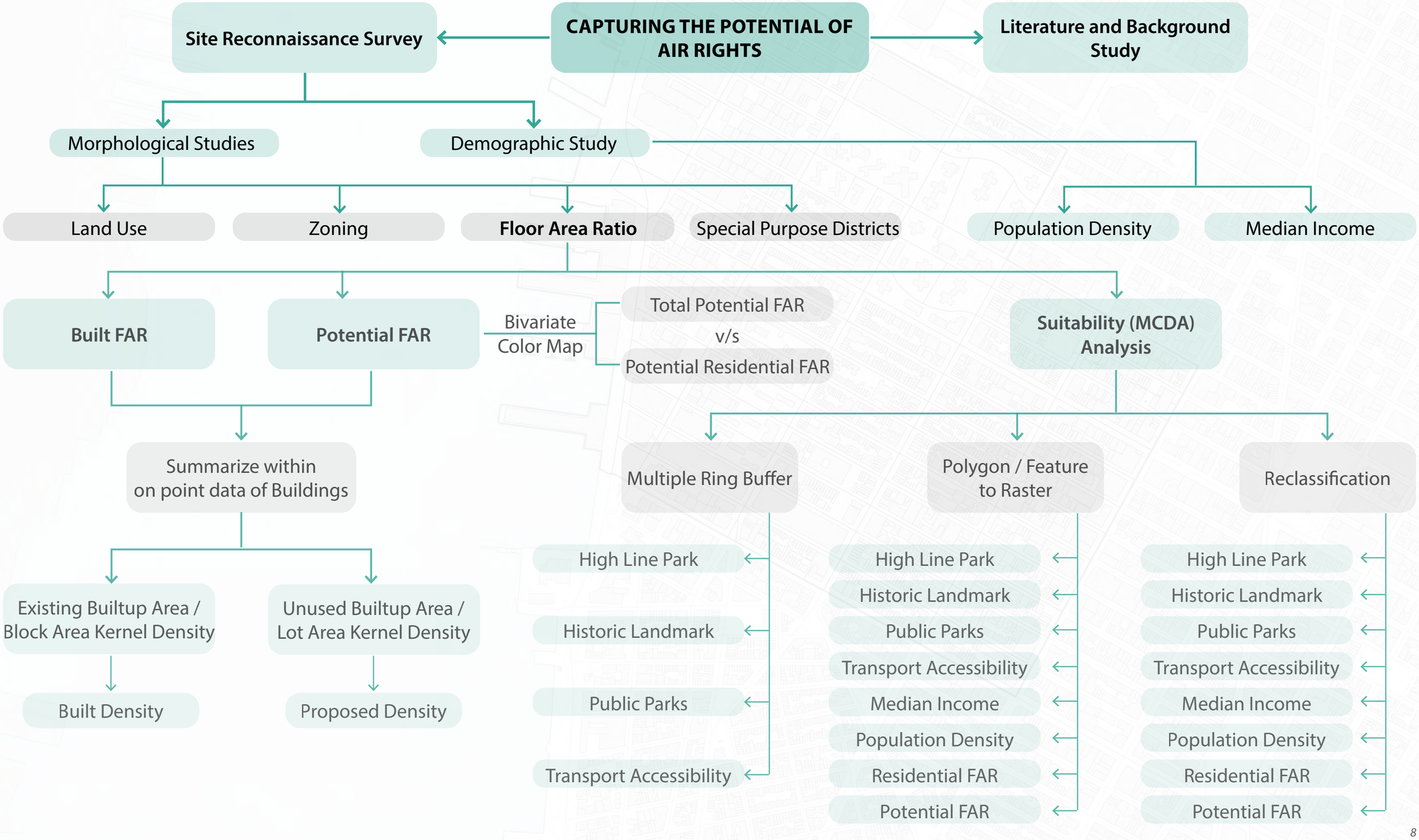
GIS analysis will be employed to examine air rights utilization patterns and their relationship to various spatial factors within Chelsea. The following spatial units of analysis will be considered:

1. Individual Parcels:
Analyzing air rights utilization on a parcel-by-parcel basis will provide granular insights into the micro-level factors influencing development decisions, such as property ownership, zoning regulations, and existing building characteristics.

2. Neighborhood Blocks:
Aggregating data to the block level will reveal broader trends and patterns of air rights utilization across the neighborhood, enabling the identification of spatial clusters and potential disparities in development activity.

3. Transportation Infrastructure:
Examining the relationship between air rights utilization and proximity to major transportation infrastructure, such as subway stations and bus routes, (within the context of the proposed site) will provide insights into the role of accessibility in influencing development decisions.

Methodology



Research Questions

1. *What **factors have influenced** the historical patterns and current trends of air rights utilization in the neighborhood?*

2. *What is the **current extent and spatial distribution** of air rights utilization and How has the spatial distribution of air rights utilization **changed over time in Chelsea**?*

3. *What is the relationship between air rights utilization and proximity to public amenities Open Spaces and transportation infrastructure in Chelsea?*

4. *What are the **potential spatial implications of increased air rights utilization** in Chelsea in terms of land use patterns, urban density, and neighborhood character?*

Existing Built Form

Varied Urban Character

The architectural landscape of Chelsea showcases a rich diversity. It features a mix of brownstones, pre-war buildings, modern apartments, and converted industrial spaces, accommodating a diverse community. Tenth Avenue hosts three to five-story walkup residential buildings, while the avenues and midblocks are adorned with expansive loft buildings. A few high-rise buildings stand prominently near West Chelsea, notably within the Fulton. Complementing these are smaller-scale garage and auto-repair facilities interspersed with open surface parking lots, contributing to the varied built environment of the area.

1. Auto-Related Uses

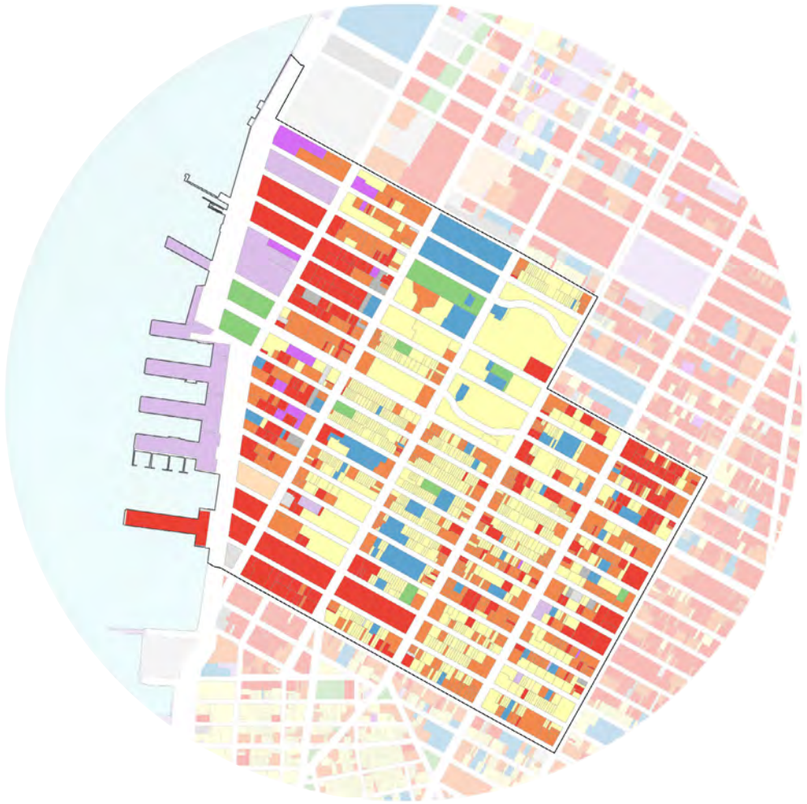
2. Three to five story walk-ups

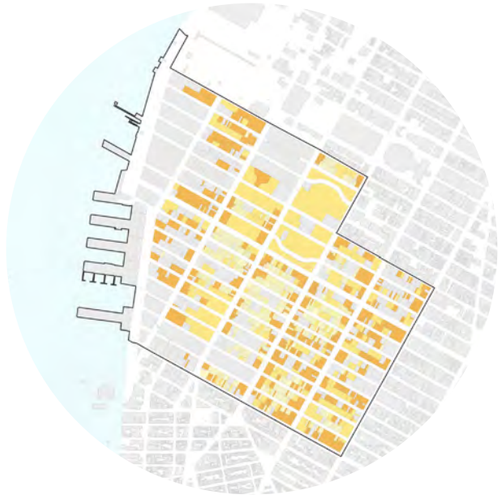
3. High-streetwall loft buildings

4. High Rise Towers

Analysis

Landuse Map





Residential Landuse

Commercial Landuse

Mixed Use Landuse

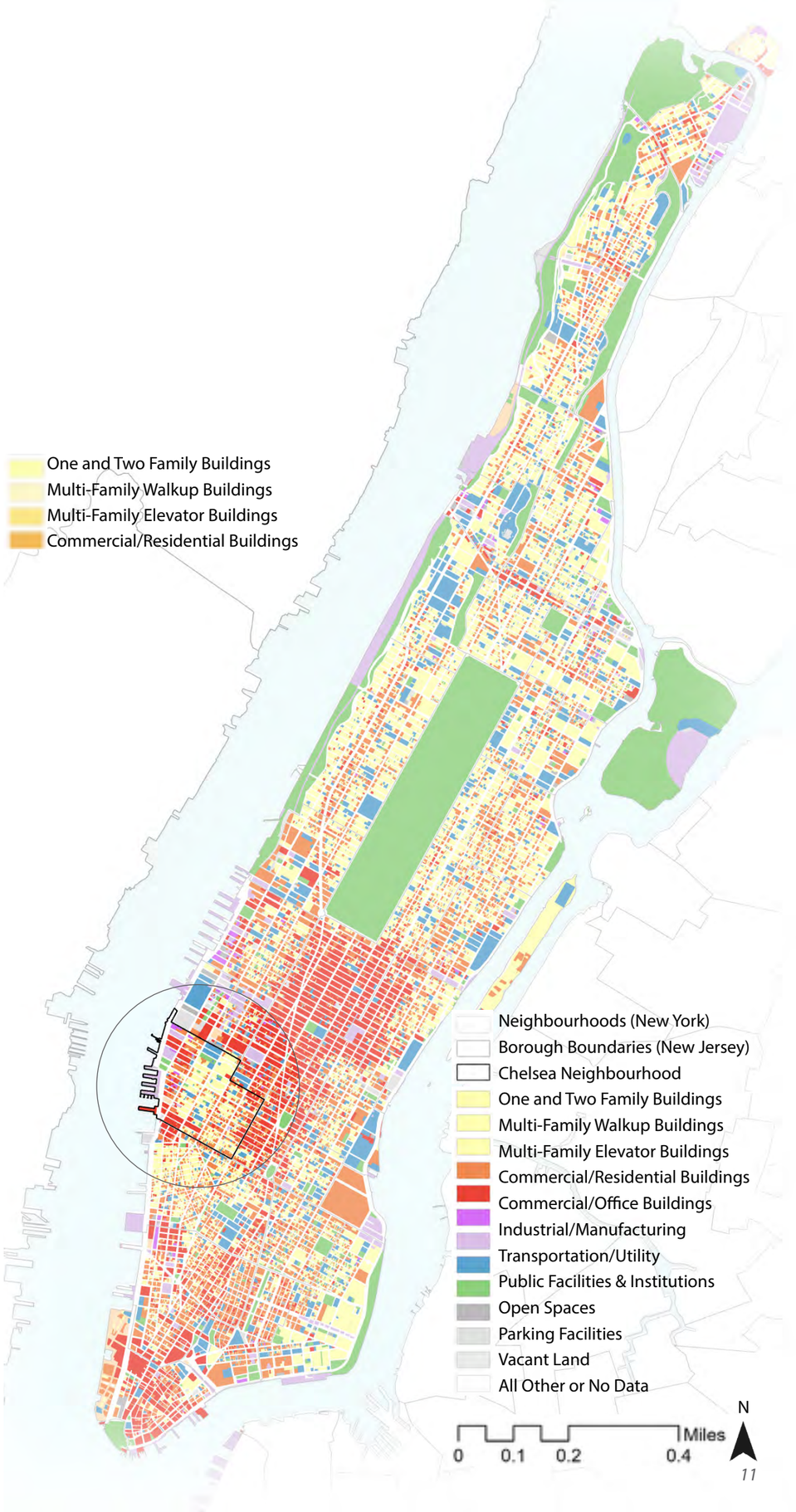
Residential Area: 56%

Commercial: 17.2%

Mixed Use: 16.8%

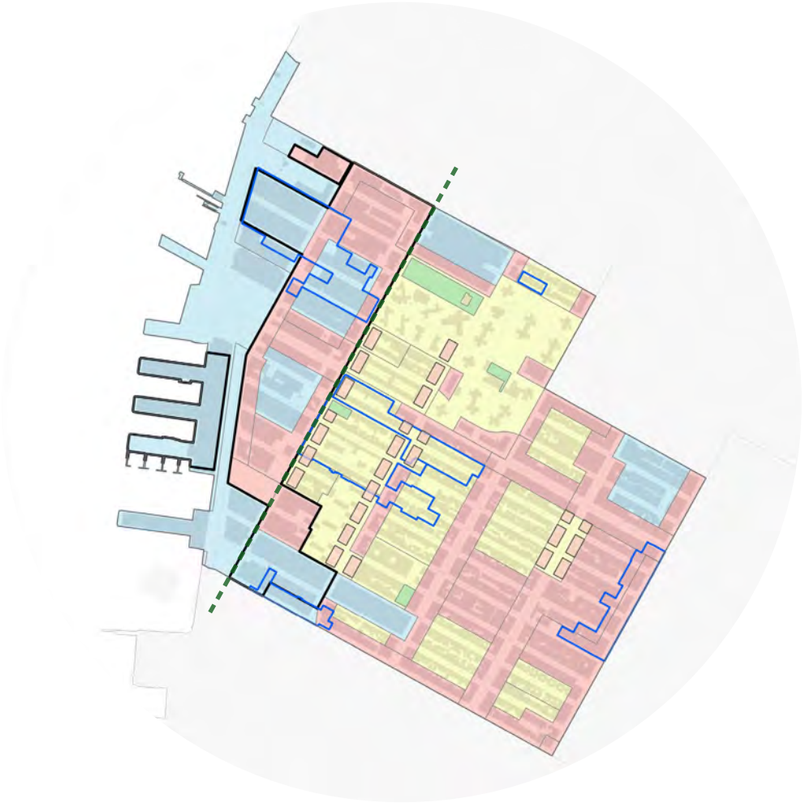
Chelsea is an area in transition. Residential use is heaviest to the east of Tenth Avenue within the Chelsea Historic District and in the Fulton and Chelsea/Elliot Houses. Additional residential use, a result of the 1999 rezoning, can be seen along the West 23rd Street corridor between Tenth and Eleventh Avenues. Manufacturing uses, especially in the central and southern portions of the area, have in large part given way to auto-related uses, including auto-repair, parking, and vehicle storage. A significant number of commercial uses, primarily in the form of art galleries and museums, have located on the midblocks and along Eleventh Avenue.

Source: New York City Planning Department's PLUTO (Primary Land Use Tax Lot Output) dataset

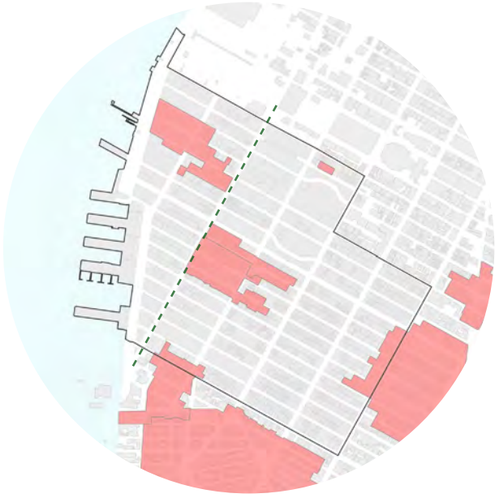


Analysis

Zoning & Factors Influencing Historical Patterns



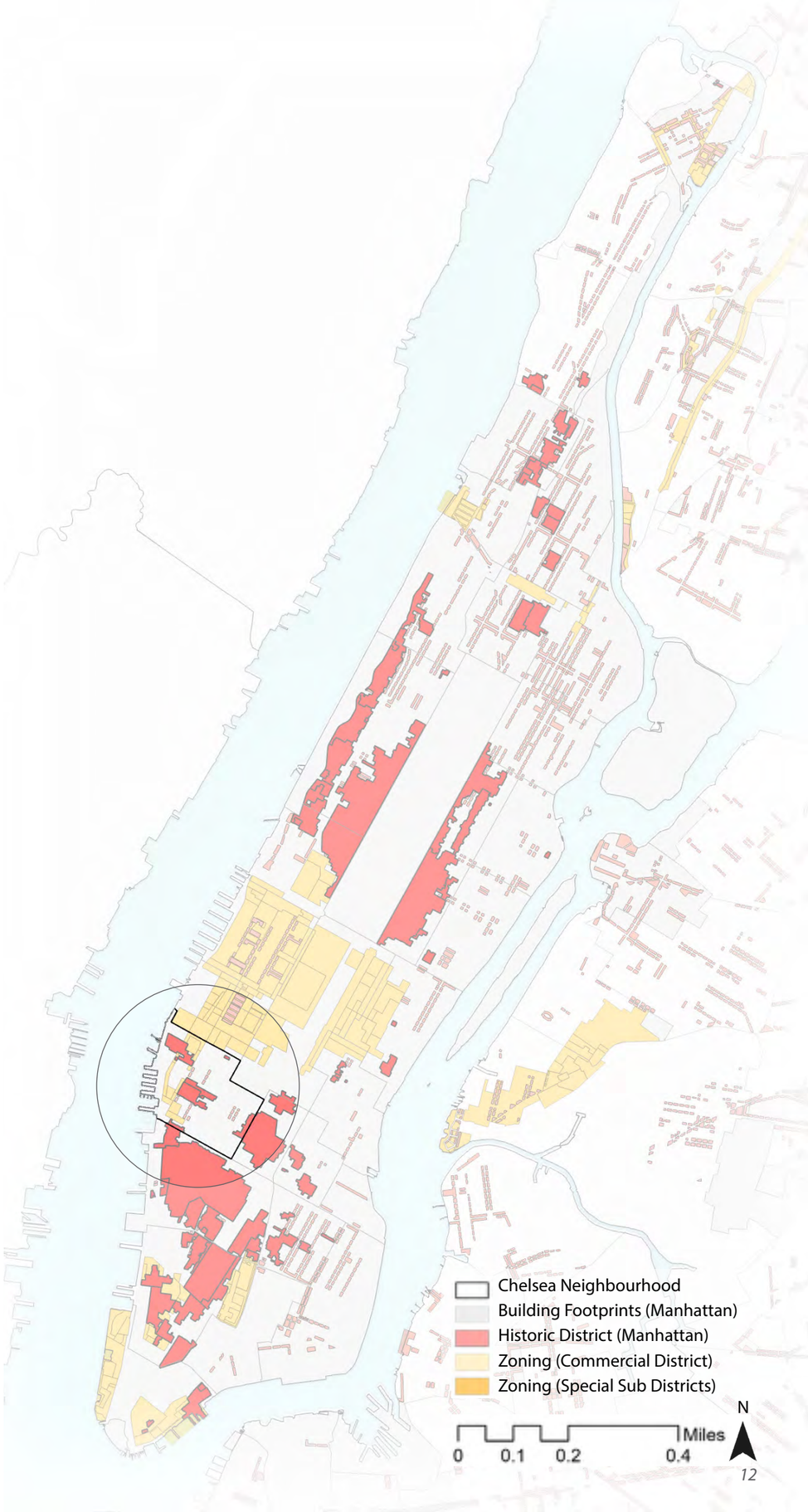
Residential zoning in Chelsea lies east of Tenth Avenue, encompassing the Chelsea Historic District, Chelsea/Elliot Houses, and Fulton Houses. West Chelsea predominantly hosts light manufacturing and commercial zones (M1-5), with a FAR of 5.0. Development near the High Line follows strict rules to protect park views.
Rezoning established a 100-foot-wide High Line Transfer Corridor (HLTC), enabling property owners to transfer development rights to designated sites, preserving historic character and regulating nearby building FARs. Tenth Avenue development near the High Line adheres to controls enhancing park connections and preserving views, light, and air. While these regulations aim to preserve Chelsea's character and historic structures, they can restrict flexible development rights utilization. Balancing preservation with efficient use of rights poses a challenge. Finding harmony between zoning preserving Chelsea's character and facilitating strategic development is vital for a dynamic and sustainable Chelsea, optimizing available development rights. Negotiating these complexities within the zoning framework is crucial for balanced urban growth and development in the neighborhood.



Historic District

Special Sub District

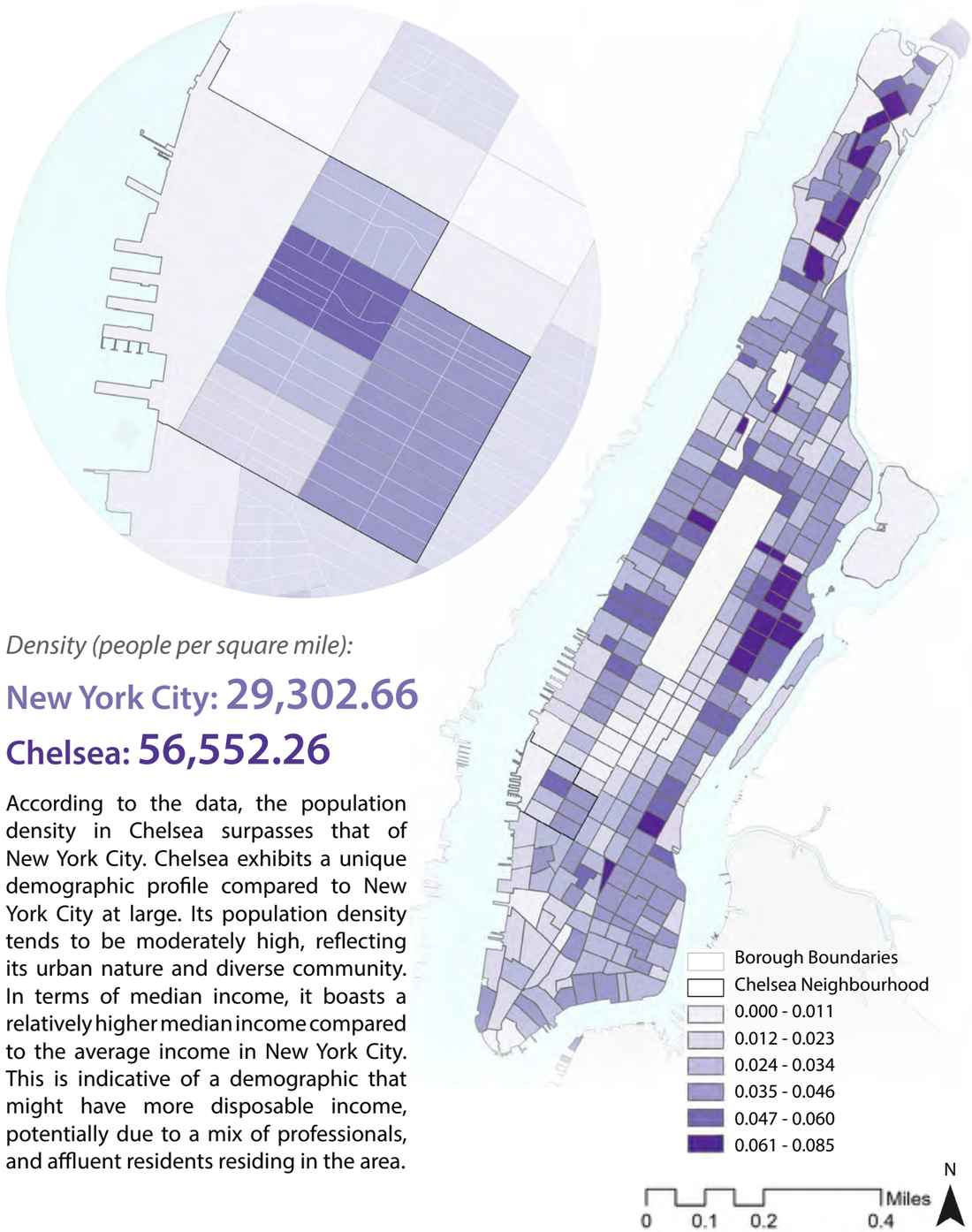
Commercial District



Source: New York City Planning Department's Zoning data

Analysis

Population Density



Density (people per square mile):

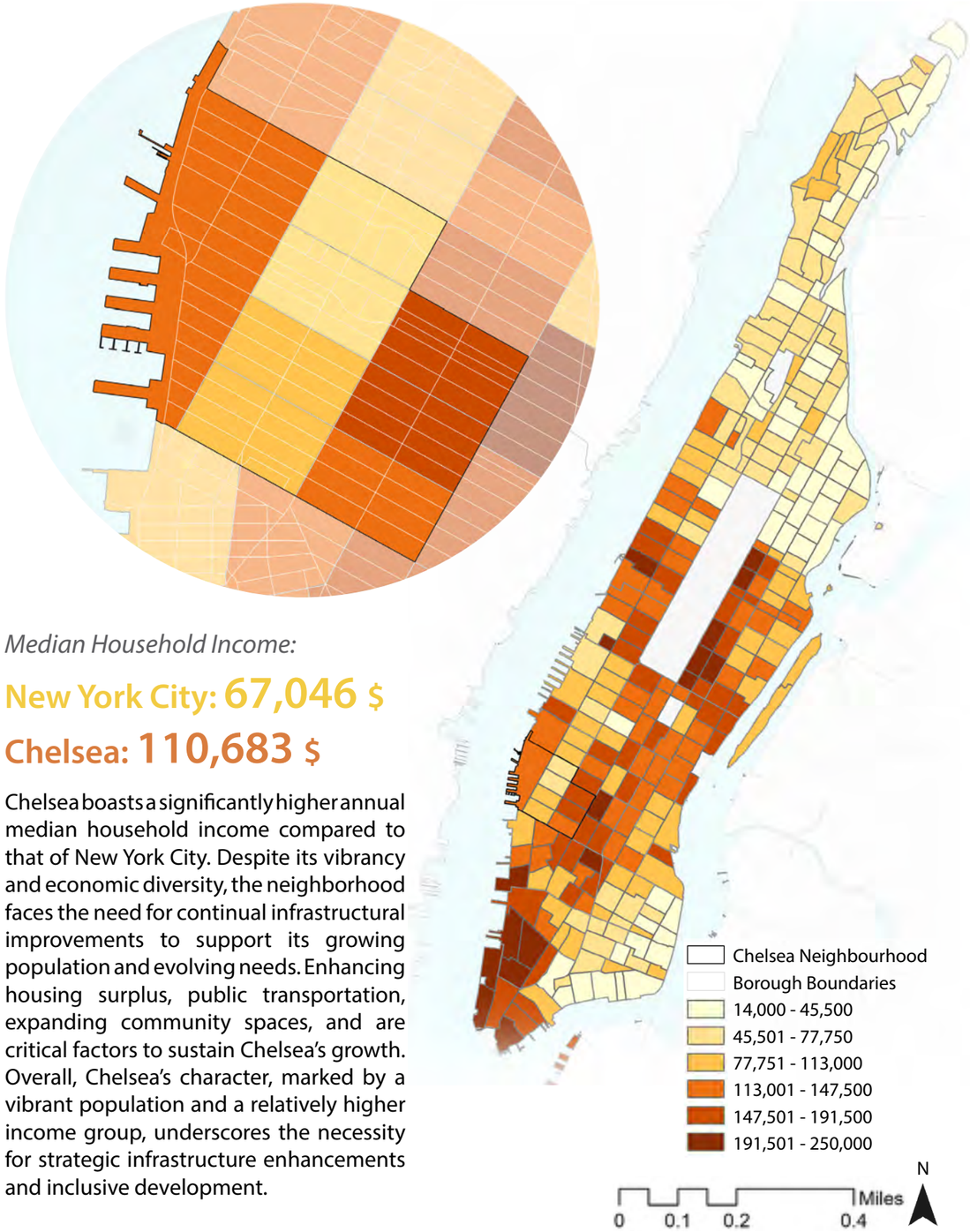
New York City: 29,302.66

Chelsea: 56,552.26

According to the data, the population density in Chelsea surpasses that of New York City. Chelsea exhibits a unique demographic profile compared to New York City at large. Its population density tends to be moderately high, reflecting its urban nature and diverse community. In terms of median income, it boasts a relatively higher median income compared to the average income in New York City. This is indicative of a demographic that might have more disposable income, potentially due to a mix of professionals, and affluent residents residing in the area.

Source: United States Census Bureau's American Community Survey (ACS)

Median Income



Median Household Income:

New York City: 67,046 $

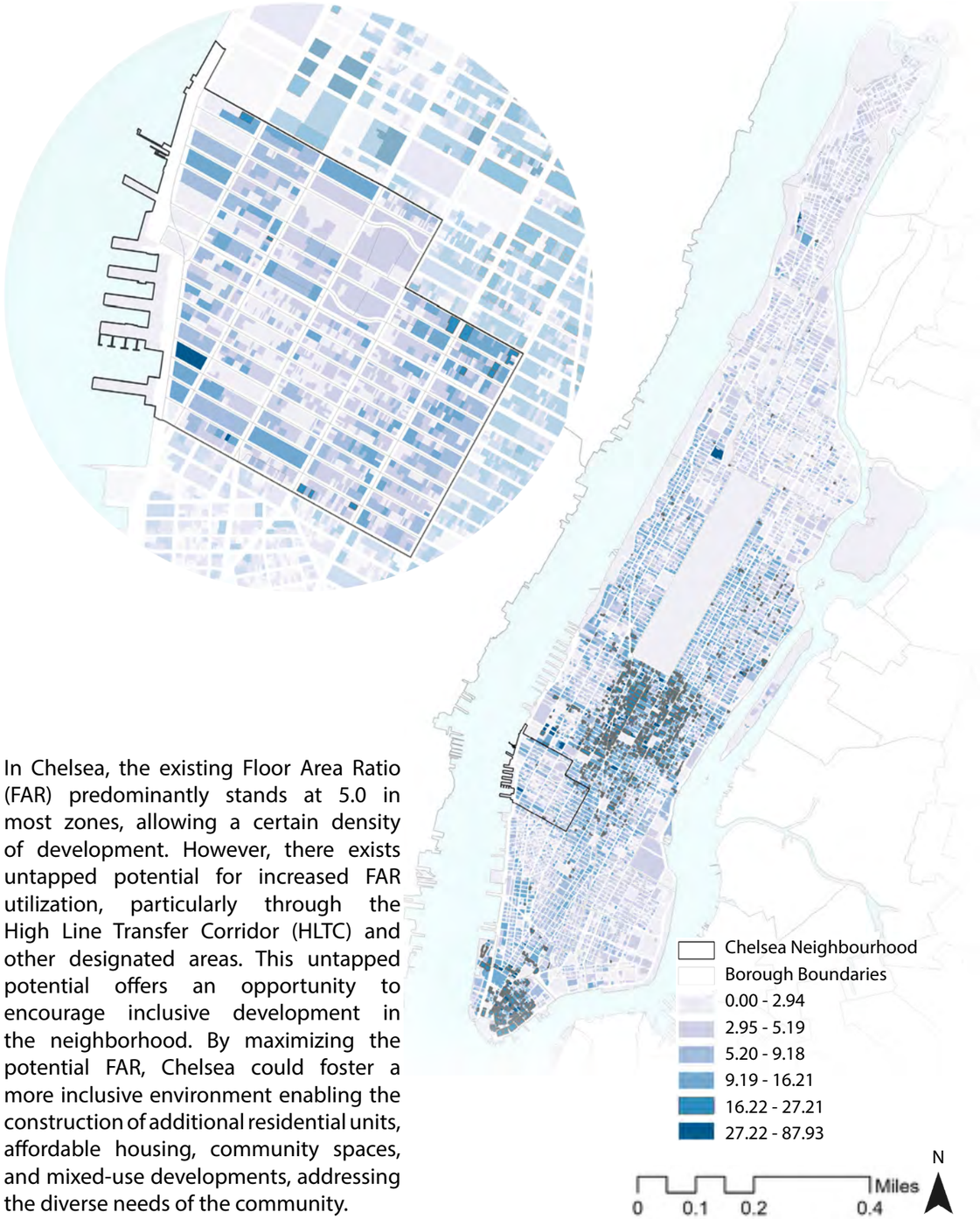
Chelsea: 110,683 $

Chelsea boasts a significantly higher annual median household income compared to that of New York City. Despite its vibrancy and economic diversity, the neighborhood faces the need for continual infrastructural improvements to support its growing population and evolving needs. Enhancing housing surplus, public transportation, expanding community spaces, and are critical factors to sustain Chelsea's growth. Overall, Chelsea's character, marked by a vibrant population and a relatively higher income group, underscores the necessity for strategic infrastructure enhancements and inclusive development.

Source: United States Census Bureau's American Community Survey (ACS)

Analysis

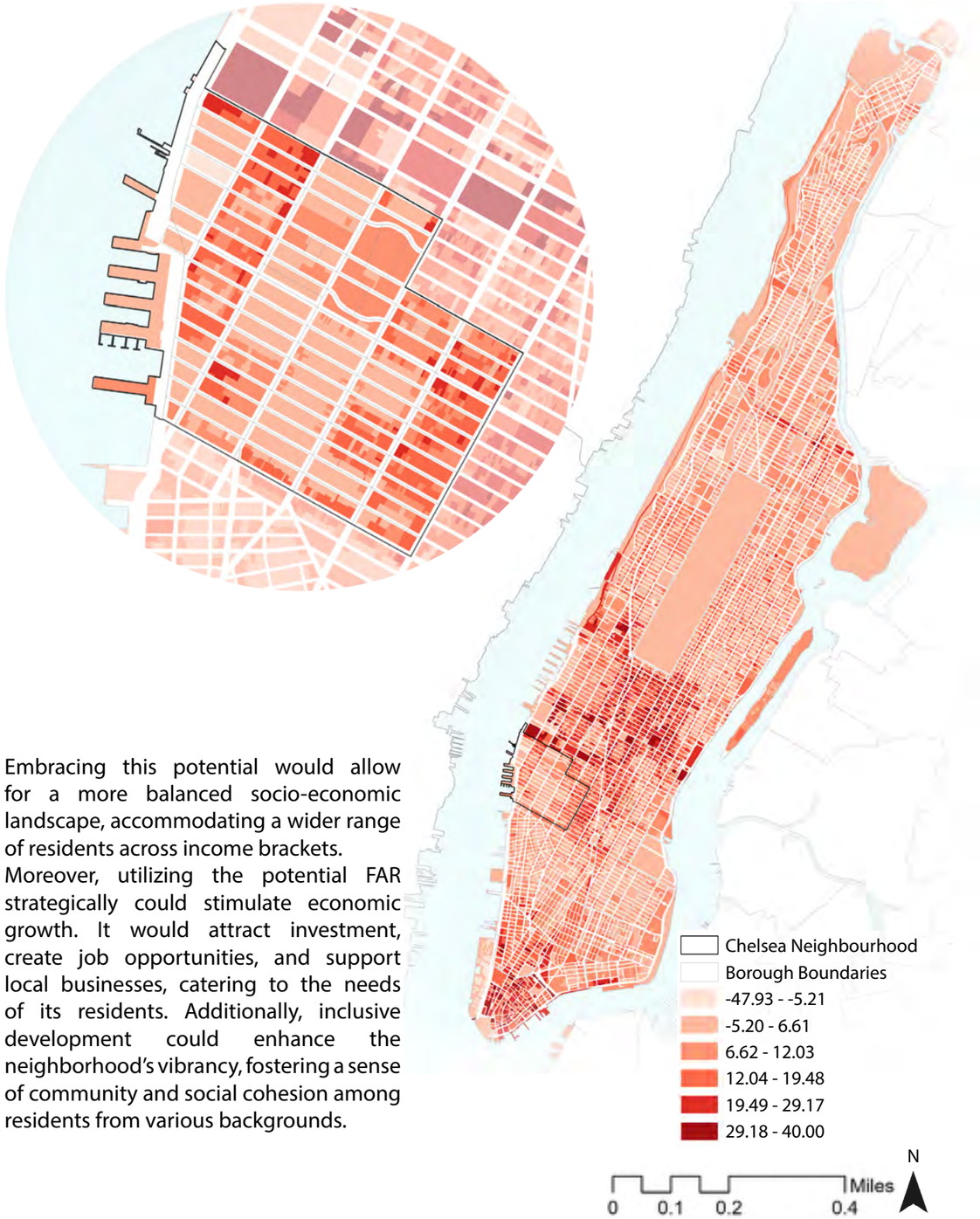
Built FAR



In Chelsea, the existing Floor Area Ratio (FAR) predominantly stands at 5.0 in most zones, allowing a certain density of development. However, there exists untapped potential for increased FAR utilization, particularly through the High Line Transfer Corridor (HLTC) and other designated areas. This untapped potential offers an opportunity to encourage inclusive development in the neighborhood. By maximizing the potential FAR, Chelsea could foster a more inclusive environment enabling the construction of additional residential units, affordable housing, community spaces, and mixed-use developments, addressing the diverse needs of the community.

Source: New York City Planning Department's PLUTO (Primary Land Use Tax Lot Output) dataset

Potential FAR



Embracing this potential would allow for a more balanced socio-economic landscape, accommodating a wider range of residents across income brackets.
Moreover, utilizing the potential FAR strategically could stimulate economic growth. It would attract investment, create job opportunities, and support local businesses, catering to the needs of its residents. Additionally, inclusive development could enhance the neighborhood's vibrancy, fostering a sense of community and social cohesion among residents from various backgrounds.

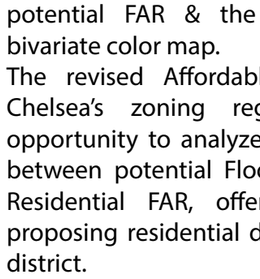
Analysis

Potential FAR and Residential FAR

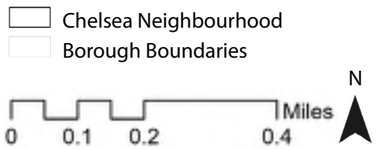
Analyzing the spatial relationship between potential FAR & the residential FAR using bivariate color map.

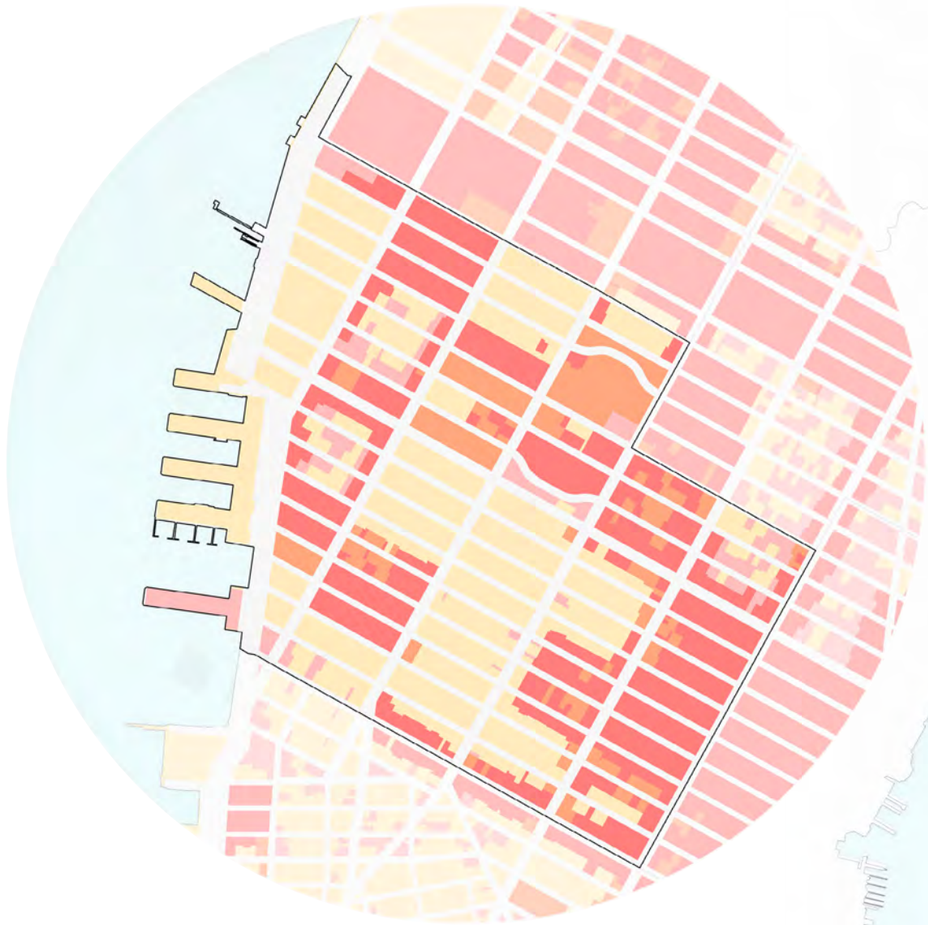
The revised Affordable Housing Section in Chelsea's zoning regulations presents an opportunity to analyze the spatial relationship between potential Floor Area Ratio (FAR) and Residential FAR, offering a framework for proposing residential developments within the district.

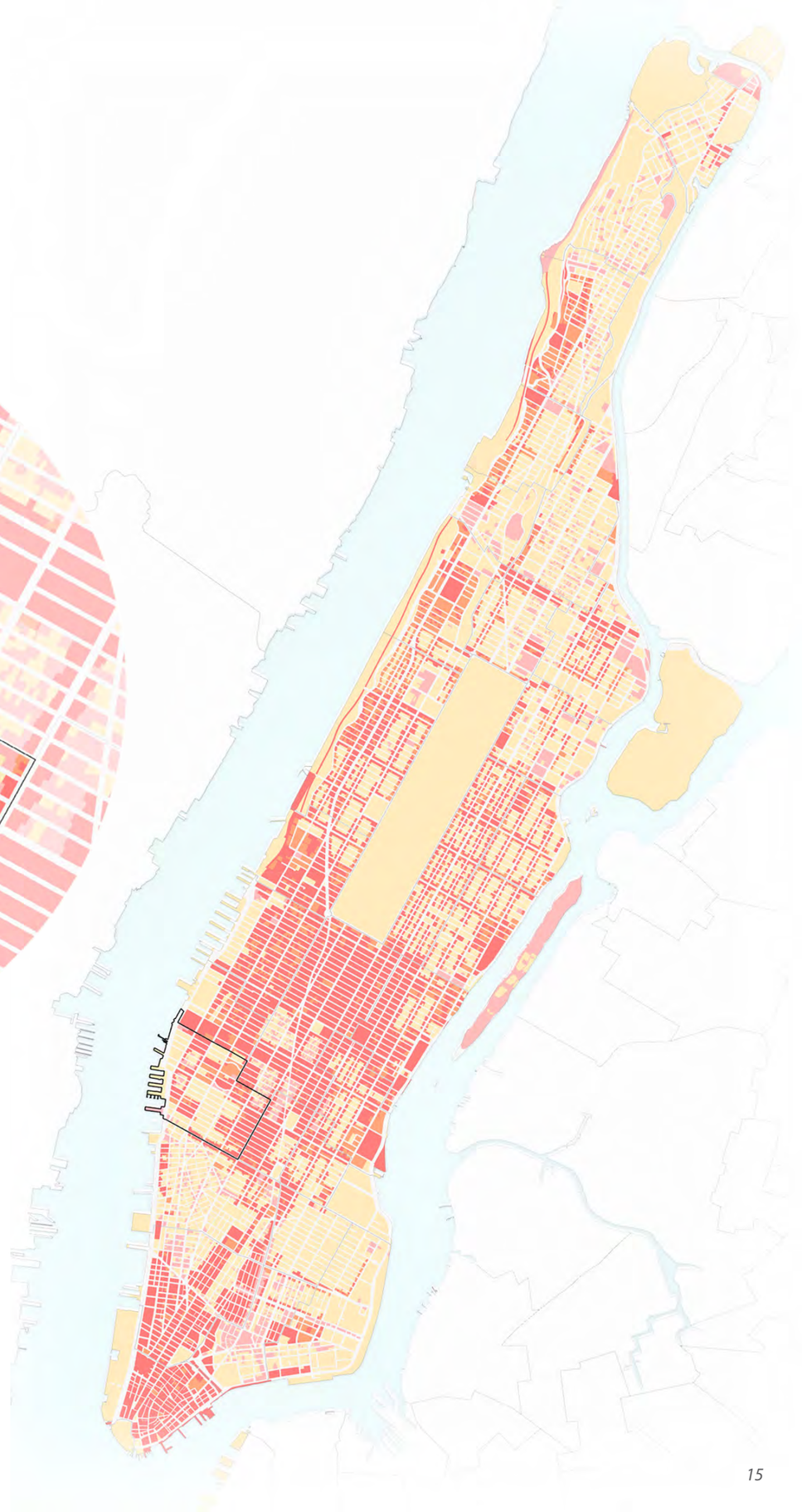
The potential FAR, particularly through the incentivized Affordable Housing Fund and Tiering of inclusionary housing bonuses, allows for increased density in exchange for providing affordable housing. Understanding this relationship entails examining areas where additional FAR can be allocated for residential development, especially in locations conducive to inclusive housing projects. This intersection serves as the foundation for proposing housing projects that align with the district's goals of fostering affordable housing while leveraging the benefits of the revised zoning provisions in Chelsea. Proposing residential developments should focus on strategically utilizing the increased FAR, specifically targeting areas where both the potential and Residential FAR converge.



Most Desirable development site (High Density High FAR)

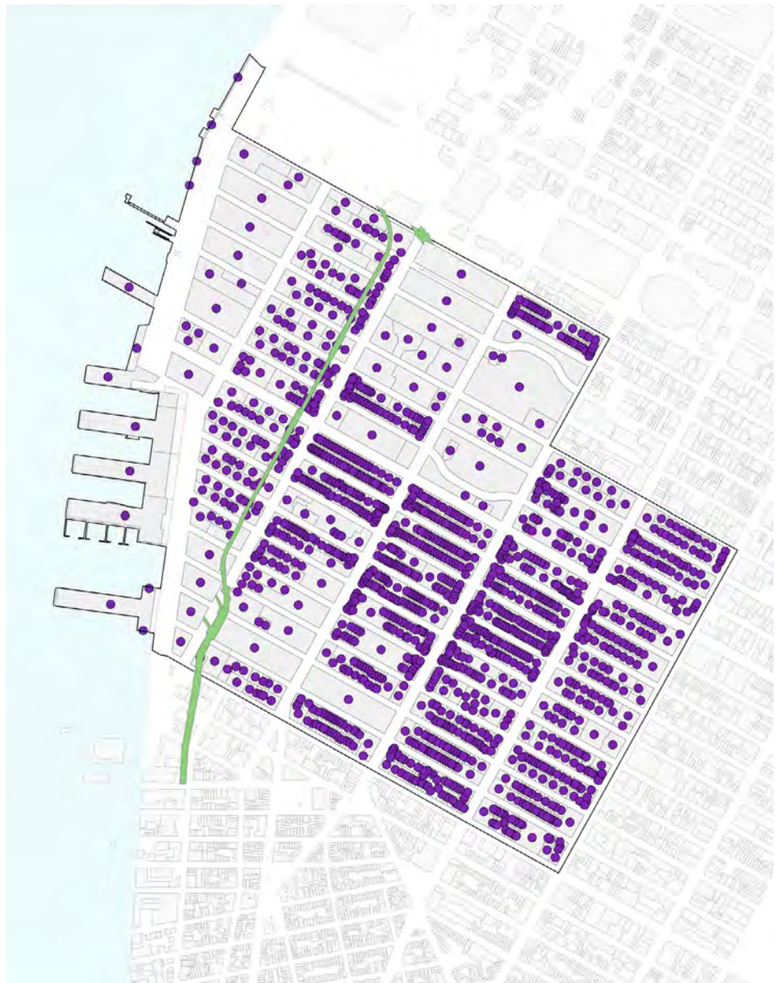




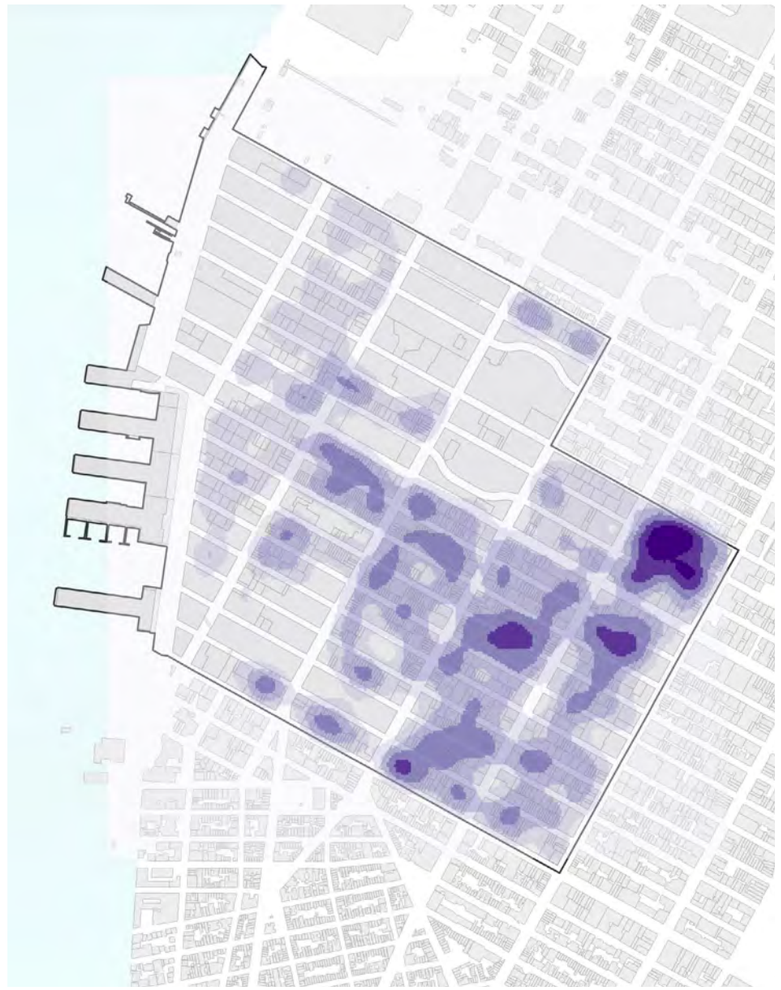


Analysis

Buildings Point Data

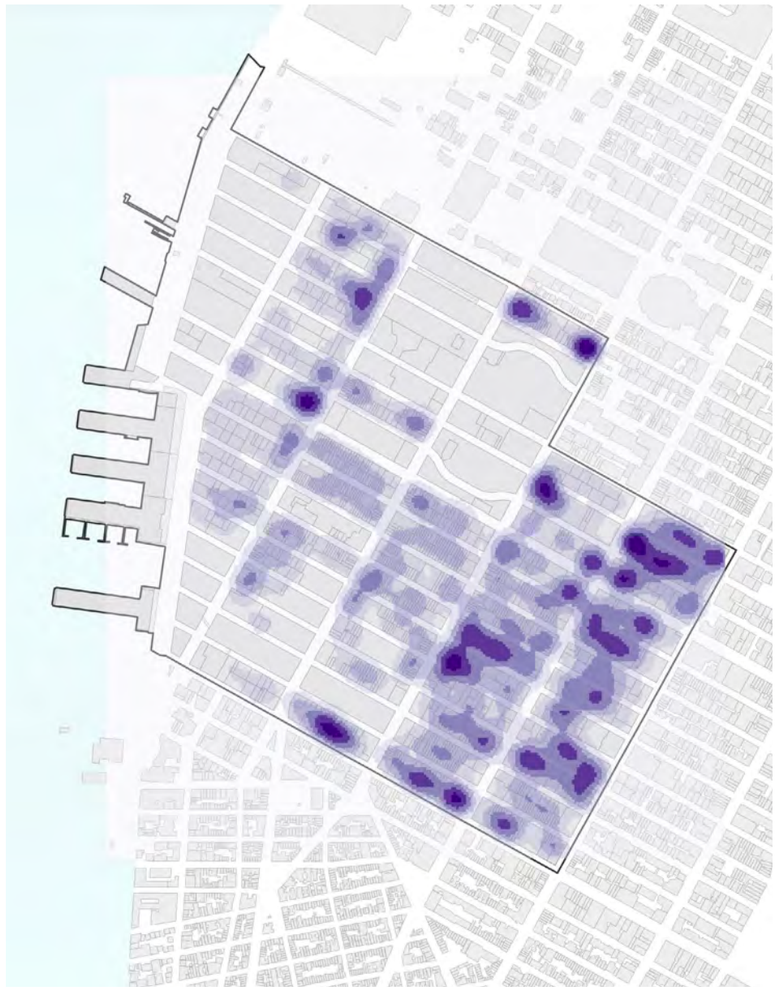


Existing Built Density



Utilizing "summarize within" feature, a block level analysis was conducted to derive existing built-up area per block by summarizing existing built-up area of the total lots within it. This process was then repeated to calculate potential built-up area per block based on the balance Floor Area Ratio (FAR) remaining unused. Kernel density maps were then generated for existing and potential built density.

Proposed Built Density



Anticipated findings suggest the potential built density map for Chelsea showcases a more even distribution compared to the existing built density map. Unlocking full FAR potential thus promises balanced urban growth to develop visually cohesive surroundings, and improved accessibility to amenities. This analysis highlights the transformative impact of maximizing FAR for a harmonized and sustainable Chelsea.

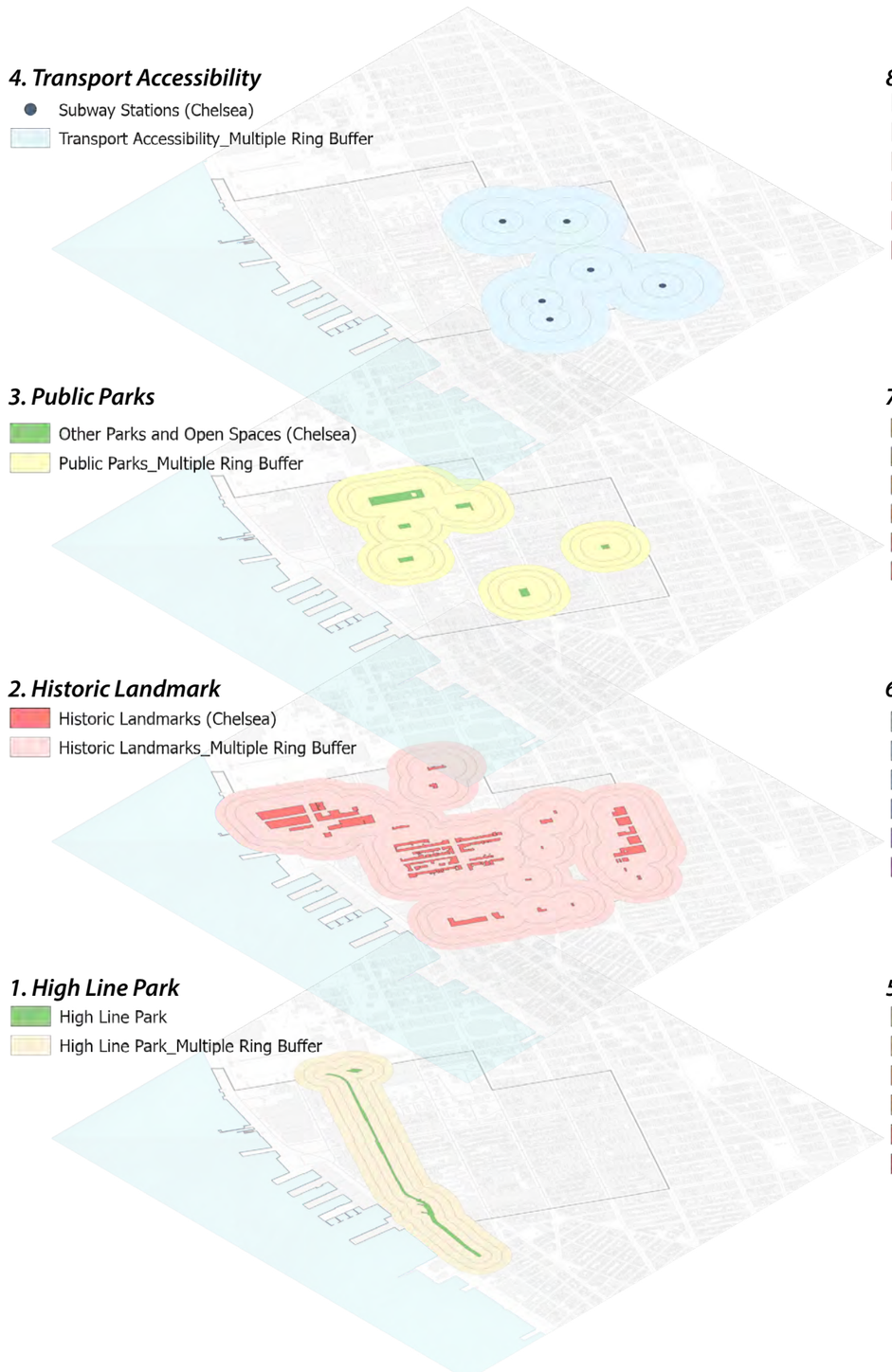
Source: The PLUTO (Primary Land Use Tax Lot Output) dataset, available through the NYC Department of City Planning

Suitability Analysis

1. Multiple Ring Buffer

Multiple Criteria Decision Analysis (MCDA):
Conducting a thorough suitability analysis for proposing inclusive housing in Chelsea involved employing the Multiple Criteria Decision Analysis (MCDA) method. Eight variables were considered: Potential FAR, Potential Residential FAR, Population Density, Income Density, Transit Accessibility (Subway Station), Public Parks and Open Spaces, Historic Landmark Sites, and the High Line Park.

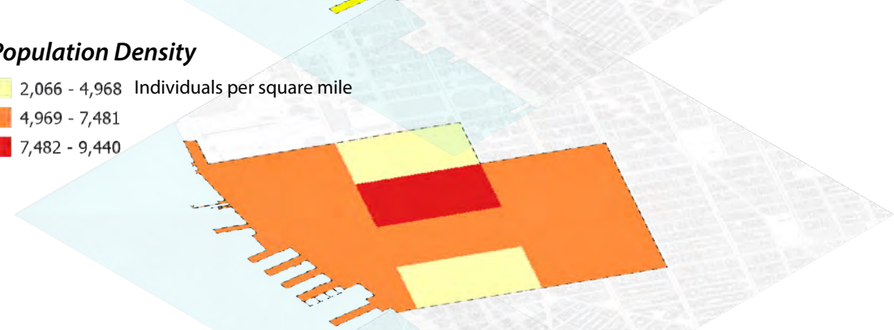
1. Multiple Ring Buffer
Buffers were applied to certain variables. For example, Historic Districts had buffers at 300m, 450m, and 600m, while Transit Accessibility considered buffers at 300m, 600m, and 900m. High Line Park and Public Parks/Open Spaces had buffers at 150m, 300m, and 450m.

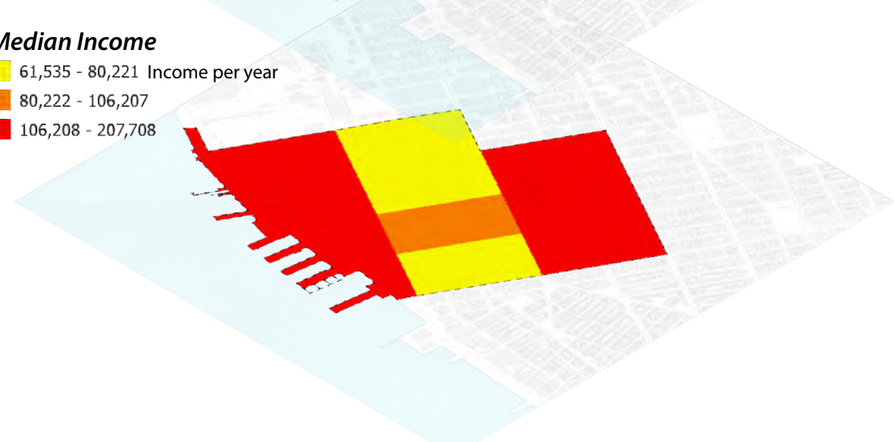


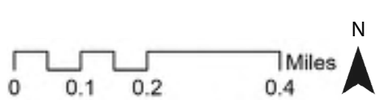
Suitability Analysis

2. Polygon / Feature to Raster

Conversion from polygon to raster was employed for the choropleth graduated color maps of Potential FAR, Potential Residential FAR, Population Density and median income whereas for buffer zones conversion from feature to raster was employed, aiding in their integration into the scheme of things required for the weighted overlay analysis.



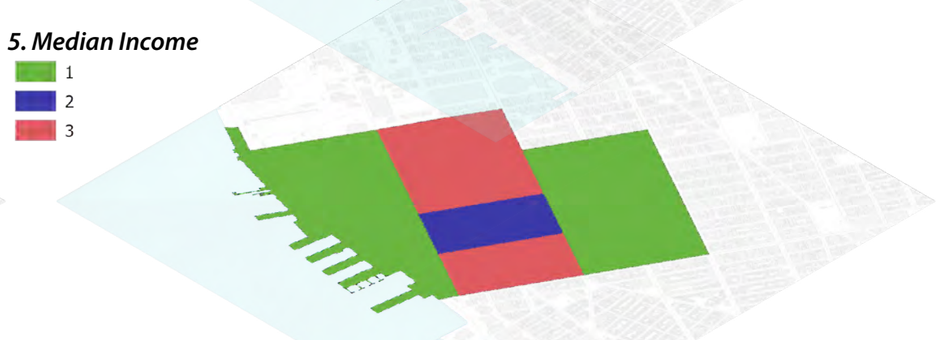


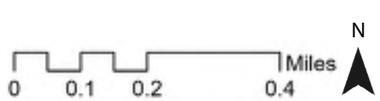


Suitability Analysis

3. Reclassification

Reclassifying variables based on their values prioritized areas closer to parks, subway stations, and the historic district. This approach aimed to identify the most suitable sites for inclusive housing, considering the weighted importance of each variable.





Suitability Analysis

Description of Variables

Potential FAR (30% Weight):
Represents the potential for increased floor area, crucial for accommodating growth and development in Chelsea. Given the highest weight, it reflects the paramount importance of maximizing space for diverse uses, including housing and community infrastructure.

Potential Residential FAR (30% Weight):
Similar to Potential FAR, this variable specifically focuses on the potential for increased residential floor area. Given the same weight as Potential FAR, it underscores the critical role of housing development in shaping Chelsea's future.

Population Density (10% Weight):
Identifies areas with higher population concentrations. With a moderate weight, it ensures consideration for density but avoids overemphasis, allowing for a balanced approach to community growth.

Median Income (10% Weight):
Importance: Reflects the economic diversity of the population. Balancing the social fabric, this variable ensures that housing developments cater to a range of income brackets, contributing to a socially inclusive community.

Transit Accessibility (6% Weight):
Importance: Proximity to transit hubs, especially subway stations, is crucial for residents' mobility. Though not the highest weight, its inclusion recognizes the significance of accessible transportation in fostering a well-connected and sustainable community.

Public Parks and Open Spaces (6% Weight):
Importance: Access to green spaces is vital for community well-being. Given a moderate weight, this variable emphasizes the importance of recreational areas in enhancing residents' quality of life.

Historic Landmarks (6% Weight):
Importance: Highlights the cultural significance of historic sites. With a balanced weight, it ensures that Chelsea's heritage is respected and considered in the development process.

High Line Park (2% Weight):
Importance: Recognizes the constraints around development within or adjacent to the High Line Park due to preservation considerations. Given the lowest weight, it acknowledges the restrictions while still considering the park's impact on site selection.

The differential weighting of these eight criteria reflects a nuanced approach in site selection, considering the multifaceted aspects of Chelsea's growth, development potential, community well-being, and cultural preservation.

4. Weighted Overlay

These are the three identified suitable locations for inclusionary housing development.

Weights were assigned based on their significance, with Potential FAR and Potential Residential FAR given the highest weightage at 30% each. Population Density and Median Income followed at 10% each, while Transit Accessibility, Public Parks and Open Spaces, and Historic Landmarks were weighted at 6% each. The High Line Park received the least suitability weightage of 2% following development restrictions around it.

Suitable Locations

Proposed Inclusionary Housing Development Sites

The analysis revealed three potential locations for inclusive housing, strategically positioned to optimize Potential FAR, Potential Residential FAR, and other key factors. The prioritization of sites near transit hubs, green spaces, and historic landmarks ensures that proposed developments align with community needs and enhance overall livability. This MCDA method, thus proves instrumental in streamlining decision-making, offering a data-driven approach to identify the most suitable locations for inclusive housing developments in Chelsea.

1. Parking Lot Site:

Location: The identified parking lot site is strategically situated in the heart of Chelsea, adjacent to bustling commercial and residential areas.

Characteristics: This underutilized space, currently serving as a parking lot, offers a significant footprint for potential redevelopment. Surrounded by mixed-use buildings and conveniently located near public transportation hubs, the site is ideal for inclusionary housing.

Potential Development: The parking lot's large footprint provides ample space for a multi-story residential complex with ground-level retail spaces, enhancing the vibrancy of the neighborhood. Its proximity to transit ensures accessibility for residents, contributing to sustainable urban living.

2. Vacant Plot:

Location: Nestled within a predominantly residential area of Chelsea, the vacant plot stands as an open canvas for transformative development.

Characteristics: The vacant plot, marked by its open space amid residential buildings, presents an opportunity to contribute to the community's housing needs. Its current state as an undeveloped space calls for purposeful planning.

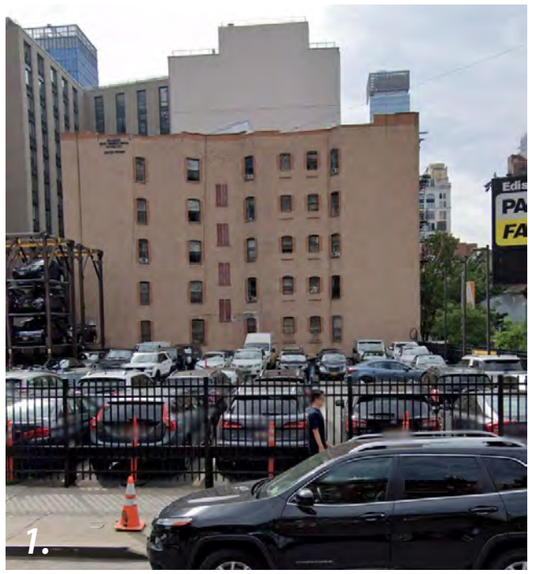
Potential Development: The vacant plot holds potential for a thoughtfully designed residential complex, integrating green spaces and communal amenities. Its central location within the neighborhood allows for seamless integration into the existing fabric while addressing the demand for inclusive housing options.

3. Single-Storey Motor Garage:

Location: Located on a prominent street corner in Chelsea, the single-story motor garage occupies a considerable footprint.

Characteristics: With a large on-ground structure, the motor garage represents an underutilized space in the context of the neighborhood's vertical development potential.

Potential Development: The single-story motor garage site offers the opportunity for a transformative vertical development, potentially accommodating multiple stories of residential units.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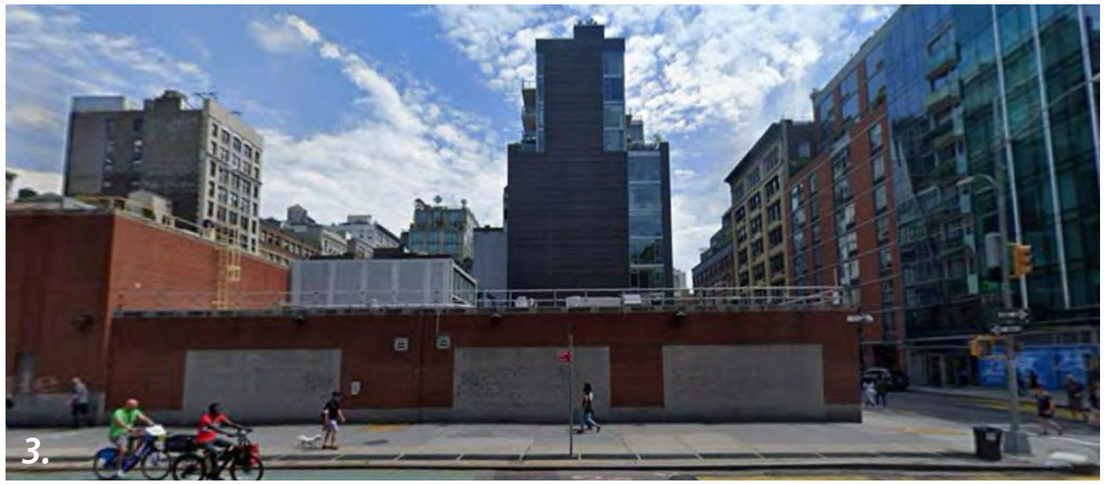
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Adhering to zoning regulations and design aesthetics, the redevelopment could enhance the architectural diversity of the area while meeting the growing need for inclusive housing. In each case, these identified sites hold distinct characteristics that make them conducive to redevelopment for inclusive housing. The potential developments aim to contribute not only to housing solutions but also to the overall urban fabric and community well-being in Chelsea.

Inferences

Conclusion

In conclusion, the exploration of Chelsea's urban development journey reveals a multifaceted narrative. The analysis commenced with a focus on air rights, showcasing the potential for efficient use and the associated challenges. The underutilization of air rights prompted a deeper dive into the inefficiencies and the subsequent impact on Chelsea's urban landscape.

The narrative expanded to address the intricacies of land use in Chelsea, emphasizing the varied built character and the challenges posed by underutilization of air rights. The High Line, a prominent feature, emerged as a focal point, influencing development strategies and zoning regulations.

Further scrutiny into the residential zoning, development controls, and the High Line Transfer Corridor shed light on the regulatory landscape shaping Chelsea's built environment. The nuanced analysis extended to population density and median income, providing insights into the socio-economic fabric. In tandem, the "summarize within" feature facilitated a comprehensive assessment of built density.

Further, leveraging Potential Residential FAR and Potential FAR data, a dynamic bivariate analysis map visually revealed areas ripe for residential development, aligning with broader development prospects.

The discourse then shifted to a detailed examination of the MCDA method in GIS, offering a systematic approach to identify optimal sites for inclusive housing. The selection criteria, ranging from Potential FAR to Historic Landmarks, highlighted the importance of a balanced, inclusive, and culturally sensitive urban development strategy.

In synthesizing these discussions, the conclusion underscores the significance of a holistic and data-driven approach to urban planning. The proposed sites for inclusive housing align with Chelsea's growth objectives, emphasizing sustainable development, cultural preservation, and community well-being. This narrative encapsulates a journey from inefficiencies in air rights to a forward-looking, inclusive urban vision for Chelsea.

Recommendations

Drawing from the multifaceted exploration of Chelsea's urban landscape, several recommendations emerge to guide future development strategies. First, a focus on optimizing air rights utilization is crucial, encouraging innovative approaches to vertical growth and space efficiency. Secondly, strategic land use planning should adapt zoning regulations to accommodate a mix of residential, commercial, and green spaces while preserving the diverse built character of West Chelsea. Prioritizing inclusive housing development, especially in identified sites like parking lots, vacant plots, and underutilized structures, is pivotal to meeting the community's diverse housing needs. Preserving Chelsea's cultural heritage demands a delicate balance, necessitating zoning regulations that safeguard historic landmarks while accommodating growth. Leveraging advanced GIS technologies for ongoing spatial analysis ensures data-driven decision-making in urban planning. Engaging the local community through participatory forums fosters collaboration and ensures resident input in shaping the neighborhood's trajectory. Lastly, incentivizing the creation of affordable housing units within new developments remains crucial for promoting a diverse and inclusive Chelsea.

End Note

Limitations

Data Limitations: Data Availability: Dependency on available secondary data might limit the depth and granularity of the analysis.

Spatial Scale and Resolution: The analysis might be constrained by the scale and resolution of available spatial data.

Temporal Scope: Historical data availability might be limited, affecting the depth of analysis concerning changes in air rights utilization over extended periods

Methodological Constraints: The choice of spatial analysis techniques might have inherent limitations or assumptions. For instance, the chosen buffer analysis might oversimplify spatial patterns or not capture certain nuances of development concentration accurately.

Regulatory and Policy Factors: The analysis might not fully encompass the complexity of regulatory challenges and policy dynamics related to air rights utilization.

External Influences: External factors beyond the scope of the analysis (e.g., economic fluctuations, unforeseen events, or market trends) might impact the outcomes and recommendations.

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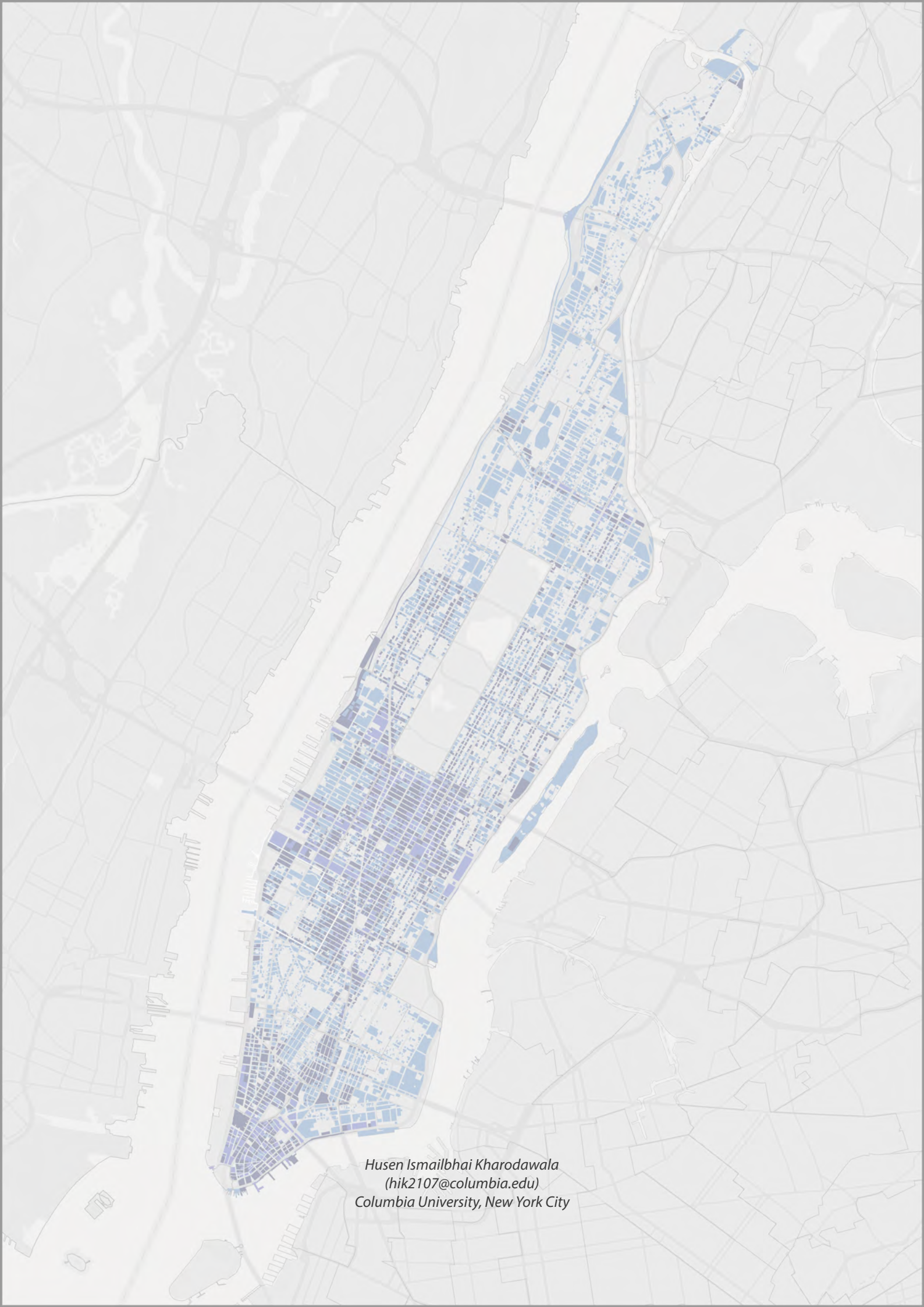
Appendix

Variables for MCDA Suitability Analysis

Buffer Analysis + Feature to Raster	*Reclassify*	*Weightage*
1. High Line Park (2% Weight)		
150 feet	1	1
300 feet	2	2
450 feet	3	3
2. Historic Landmarks (6% Weight)		
300 feet	1	3
450 feet	2	2
600 feet	3	1
3. Public Parks and Open Spaces (6% Weight)		
300 feet	1	3
450 feet	2	2
600 feet	3	1
4. Transport Accessibility (6% Weight)		
300 feet	1	3
600 feet	2	2
900 feet	3	1

Buffer Analysis + Feature to Raster	*Reclassify*	*Weightage*
5. Median Income (10% Weight)		
61,535 - 80,221 Income per year	1	3
80,222 - 106,207	2	2
106,208 - 207,708	3	1
6. Population Density (10% Weight)		
2,066 - 4,968 Individuals per square mile	1	1
4,969 - 7,481	2	2
7,482 - 9,440	3	3
7. Potentital Residential FAR (30% Weight)		
-0.01 - 0	1	1
0.01 - 4	2	2
4.01 - 10	3	3
8. Potentital FAR (30% Weight)		
-16.0 - 5.0	1	1
5.0 - 12.6	2	2
12.6 - 30.0	3	3



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