EXPLORING ZONING FOR ECONOMIC OPPORTUNITIES

IN NEW YORK CITY

A Research Paper

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Master of Regional Planning

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Duxixi Shen

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ABSTRACT

The New York City Zoning Resolution, while historically effective in regulating business locations, suffers from outdated regulations hindering the growth and expansion of local businesses. This study employs text analysis and diverse data sources to identify incongruities between businesses and zoning resolutions, revealing popular nonconforming activities like restaurants and entertainment venues. The analysis reveals the demand for local retail and services has exceeded the planned capacity in commercial and mixed-use districts. The spatial analysis also identifies areas like Bushwick and Park Slope-Gowanus with diverse nonconforming activities in C1 and R6 Districts. Recommendations emphasize the need for a smarter approach to updating uses as well as merging akin classifications to accommodate identical uses and reduce the "red tape" in the zoning regulations. Overall, this project aims to furnish a novel methodology for zoning analysis and provide recommendations to policymakers and planners in the zoning and economic development field.

BIOFIGUREICAL SKETCH

As a Master of Regional Planning student at Cornell University, Ada (Duxixi) Shen has been studying and practicing urban, rural, and regional planning for over seven years. She specializes in spatial data analysis, housing, and economic development with a concentration on urban justice and sustainability. Her vision is to foster a resilient city with thriving neighborhoods.

Before entering graduate school, Ada chose to pursue a professional career and completed a top-rated performance as an economist at the global infrastructure consulting firm AECOM. She provided planning, development, and project operation strategies to developers and governments and received high regard from clients. She also collaborated with different stakeholders during her internships in local city departments in both China and the U.S.

Ada is a social advocate for women's empowerment, rights for minority groups, and the UN's sustainable development goals. She was the secretary of the Organization of Cornell Planners (OCP) as well as the vice president of the Women's Planning Forum (WPF) during her graduate study. In 2016, She spent a month in Sri Lanka as an orphanage school teaching volunteer. Ada likes to record her traveling experience as a vlogger, and has traveled to over 60 cities in the world to experience different urban space, cultures, and local life.

As an international student, Ada has witnessed the power of cities and believes in the potential a city can reach. She wants to apply her educational pursuits and professional experience to connect with communities and grow with cities and regions in the future.

The work is dedicated to my beloved mom,

who has raised me, loved me, and supported me as always.

ACKNOWLEDGMENTS

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LIST OF ABBREVIATIONS

DCP---Department of City Planning
NAICS-------------------------------------- North American Industry Classification System
OSM--OpenStreetMap
POI---Points of Interest
QCEW---Quarterly Census of Employment and Wages
UG ---Use group

CHAPTER 1 - INTRODUCTION

Zoning, which regulates the built environment and the use of land, is one of the most effective planning tools (World Bank, 2015). It has a rather short history for land-use planning starting from 1916 when New York City introduced the pioneering comprehensive zoning regulation known as the "1916 Zoning Resolution."
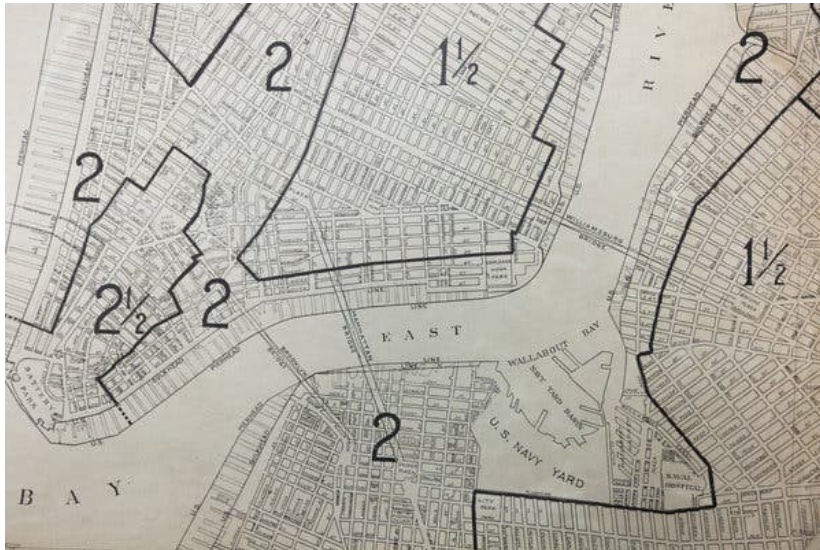
Figure 1-1 A Zoning Map in the 1916 Zoning Resolution: The number represents that the limited height of the buildings in the area could rise to the number times the width of the street that they fronted
(Source: The New York Times)

At that time, New York City was establishing itself as the leading business center of the country with an influx of new immigrants, leading to housing shortages and health and safety concerns. Companies needed office and industrial space to expand. Warehouses and factories started to encroach upon the fashionable stores along Fifth Avenue, prompting concerns from the prestigious department (NYC Department of City Planning, 2018). The turning point arrived with the pioneering Zoning Resolution of 1916. This groundbreaking resolution consisted of a concise 14-page text accompanied by three sets of maps that designated the usage, height, and area specifications for every segment of the city.

With the growing, evolving needs of the city, a more intricate and contemporary zoning resolution was required to replace the existing structure. The 1961 Zoning Resolution ushered in a zoning approach, termed Euclidean zoning, which laid the foundation for contemporary zoning frameworks. It established three main zoning districts: residence, commercial, and manufacturing districts. These were further subdivided into distinct categories, each with unique combinations of uses, bulks, and parking requirements. Influenced by the 1926 New York City Cabaret Law from Prohibition, the Zoning Resolution instituted in 1961 limited the uses of music, entertainment, and dancing. Even though the Cabaret Law was repealed in 2017, the Zoning Resolution still limits these activities.
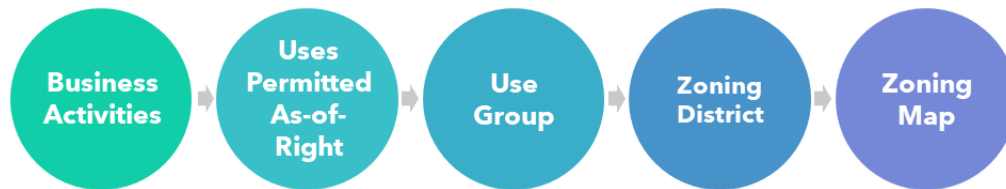
Figure 1-2 The Logic of Regulating the Types of Business Activities by Zoning

Today's Zoning Resolution, based on the 1961 version, regulates the types of business activities within a certain space by specifying different groups of permitted uses for each zoning district (see Figure 1-2). The main logic of zoning codes is that they are formed by use-based rules (Judah Axelrod et al., 2023). In Zoning Resolution, similar uses are grouped together into one Use Group (UG). For example, community centers, settlement houses, and welfare centers are defined as community facilities and grouped in Use Group 4, while retail or service establishments like barber shops, liquor stores, or bicycle sales are classified in Use Group 6. Generally speaking, the higher the number of the use group, the more intense the commercial or industrial nature of the activity becomes (see Figure 1-3). There is a sub-classification under the Use Groups. For instance, UG6A in Use Group 6 refers to *Convenience Retail or Service Establishments*, and UG6B refers to *Offices* (see

Table 1-1). Uses that are not within the permitted use groups in a certain district are called *nonconforming uses*. Different zoning districts (residence, commercial, or manufacturing) allow different use groups. For instance, C1 and C2 Districts seem similar, but C2 can allow Use Groups 7, 8, and 9 while C1 cannot. All of these zoning districts together form the zoning map of New York City.

Permitted Use Groups

	Residential		Community Facility		Retail and Commercial											General Service	Manufacturing	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Residence Districts																		
R1 R2	●		●	●														
R3 — R10	●	●	●	●														
Commercial Districts																		
C1	●	●	●	●	●	●												
C2	●	●	●	●	●	●	●	●	●					●				
C3	●	●	●	●										●				
C4	●	●	●	●		●		●	●	●		●						
C5	●	●	●	●	●	●	●	●	●	●								
C6	●	●	●	●	●	●	●	●	●	●	●							
C7												●	●	●	●			
C8				●	●	●	●	●	●	●	●	●	●	●		●		
Manufacturing Districts																		
M1				●	●	●	●	●	●	●	●	●	●	●		●	●	
M2						●	●	●	●	●	●	●	●	●		●	●	
M3					●	●	●	●	●	●	●	●	●	●		●	●	●

Use Group 1 — Single-family detached residences (ZR 22-11)

Use Group 2 — All other types of residences (ZR 22-12)

Use Group 3 — Community facilities that serve educational needs, such as schools, libraries, or museums, and other essential services with sleeping accommodations, such as nursing homes and residential facilities for special needs populations (ZR 22-13)

Use Group 4 — Community facilities that provide recreational, religious, or health services, such as houses of worship, hospitals, or medical offices, and other essential services without sleeping accommodations (ZR 22-14)

Use Group 5 — Hotels (ZR 32-14)

Use Group 6 — Retail and service establishments that serve local shopping needs, such as food and small clothing stores, beauty parlors and dry cleaners, as well as offices (ZR 32-15)

Use Group 7 — Home maintenance and repair services, such as plumbing and electrical shops which serve nearby residential areas (ZR 32-16)

Use Group 8 — Amusement establishments such as movie theaters and small bowling alleys, service uses such as appliance repair shops, as well as car rental and public parking facilities (ZR 32-17)

Use Group 9 — Business and other services, such as printers or caterers (ZR 32-18)

Use Group 10 — Large retail establishments that serve a large area, such as department stores and appliance stores (ZR 32-19)

Use Group 11 — Custom manufacturing activities such as for jewelry or clothing (ZR 32-20)

Use Group 12 — Large entertainment facilities that draw large numbers of people such as arenas and indoor skating rinks (ZR 32-21)

Use Group 13 — Low coverage or open amusement uses, such as golf driving ranges, and children's small amusement parks, camps (ZR 32-22)

Use Group 14 — Facilities for boating and related activities which are suitable in waterfront recreation areas (ZR 32-23)

Use Group 15 — Large commercial amusement establishments, including typical amusement park attractions such as Ferris wheels and roller coasters (ZR 32-24)

Use Group 16 — Automotive and semi-industrial uses, such as automotive repair, gas stations, custom woodworking and welding shops (ZR 32-25)

Use Group 17 — Light industrial uses that can normally conform to high performance standards, such as appliance manufacturing or contractor yards (ZR 42-14)

Use Group 18 — Heavy industrial uses, such as cement plants, meat or fish preparation, and junk yards (ZR 42-15)

Figure 1-3 Permitted Use Groups for Each Zoning District (Source: NYC Department of City Planning)

Table 1-1 Examples of Sub-classifications Under Use Group 5 to 18

UG5	UG6	UG7	UG8	UG9	UG10	UG11
A. Transient Accommodations	A. Convenience Retail or Service Establishments	A. Transient Accommodations	A. Amusements	A. Retail or Service Establishments	A. Retail or Service Establishments	A. Manufacturing Establishments
B. Accessory uses	B. Offices	B. Retail or Service Establishments	B. Retail or Service Establishments	B. Wholesale Establishments	B. Wholesale Establishments	B. Wholesale or Similar Establishments
	C. Retail or Service Establishments	C. Wholesale Establishments	C. Automotive Service Establishments	C. Accessory uses	C. Accessory uses	C. Accessory uses
	D. Public Service Establishments	D. Auto Service Establishments	D. Public Service Establishments			

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	E. Clubs	E. Accessory uses	E. Accessory uses			
	F. Accessory uses					
UG12	**UG13**	**UG14**	**UG15**	**UG16**	**UG17**	**UG18**
A. Amusements	A. Amusements, Open or Enclosed	A. Retail or Service	A. Amusements	A. Retail or Service Establishments	A. Service or wholesale establishments	A. Manufacturing establishments
B. Retail Establishments	B. Retail Establishments	B. Clubs		B. Automotive Service Establishments	B. Manufacturing establishments	B. Storage or miscellaneous uses, open or enclosed
C. Public Service Establishments	C. Service Establishments	C. Accessory uses		C. Vehicle Storage Establishments	C. Miscellaneous uses	C. Accessory uses
D. Automotive Service Establishments	D. Accessory uses			D. Heavy Service, Wholesale, or Storage Establishments	D. Special uses in M1-5B Districts	
				E. Accessory uses	E. accessory uses	

While the Zoning Resolution of 1961 has continued to serve as the foundation for current zoning regulations, it has been updated with numerous amendments, big and small, to tackle new challenges unforeseen in the 1961 Resolution. Special Zoning Districts were gradually introduced to achieve certain goals based on the unique characteristics of those areas by establishing specific regulations. For example, C2 districts generally prohibit *photographic studios* from UG10, *commercial art galleries* from UG12, and *theaters* from UG13. However, these uses are allowed in C2-5 district in Special Clinton District under certain conditions to promote large-scale development and improve site planning for the needs of residents (NYC Department of City Planning, 2023a) (see Table 1-2).

Table 1-2 Use Groups in C2-5 District within Special Clinton District

UG	General C2 District	C2-5 District within R9 District in Western Subarea C2 of Special Clinton District
1	√	√
2	√	√
3	√	√
4	√	√
5	√	√
6	√	√

7	√	√
8	√ where lumber stores are limited to 5,000 square feet of floor area per establishment	√ where lumber stores are allowed with no limitation on floor area
9	√	√
10		√ only photographic or motion picture production studios
11		
12		√ only art galleries, commercial
13		√ only theaters
14		
15		
16		√ only automotive service establishments
17		√ only scenery construction
18		

(Green Cell: Allowed Use Group; Yellow Cell: Restricted Use Group; Red Cell: Prohibited Use Group)

However, after more than sixty years of amendments, parts of the regulations in the Zoning Resolution have become excessively intricate and lengthy. It also still retains some outdated provisions from the past, including uses like *typewriter stores* or *umbrella repair shops* that are no longer common today.

The complexity of these regulations can pose challenges for businesses seeking suitable spaces to accommodate their requirements. On June 1, 2022, a comprehensive rezoning proposal was highlighted in Mayor Eric Adams' vision of "City of Yes" to create new housing, promote sustainability, and support small businesses and job growth. This project will focus on one of the three projects in the zoning amendment: *Zoning for Economic Opportunity*. It examines how well the NYC Zoning Resolution is applied to the current business types in the city by analyzing the ways that businesses don't conform with regulations. The research questions of the project are:
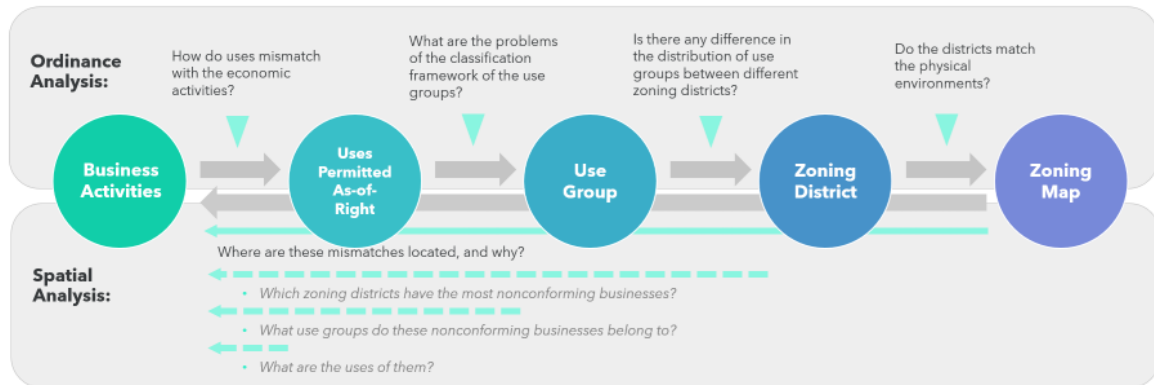
Figure 1-4 Research Framework

Where are the mismatches between business activities and zoning codes, with a special focus on the local businesses in the neighborhoods？

- From text analysis:
  - **Use**: How do uses mismatch with the economic activities?
  - **Use group:** What are the problems of the classification framework of the use groups?
  - **Zoning District:** Is there any difference in the distribution of use groups between different zoning districts?
  - **Zoning Map:** Do the districts match the physical environments?
- From applications:
  - **Zoning Map:** Where are these mismatches located, and why?
  - **Zoning District:** Which zoning district has the most nonconforming businesses?
  - **Use group:** What use group do these nonconforming businesses belong to?
  - **Use:** What are the uses of them?

The analysis of the project will follow the research questions above in Chapter 4. In Chapter 5, I will draw a conclusion and make policy recommendations based on the analytical results.

CHAPTER 2 – LITERATURE

According to the Zoning Handbook of New York City (2018), zoning refers to a law that organizes how land may be used, "which establishes an orderly pattern of development by identifying what may be built on a piece of property." The zoning law regulates building uses, building size in relation to zoning lot, the distance between buildings and their lot lines, required parking, and other requirements (NYC Department of City Planning, 2023d). Zoning for industrial and commercial developments can be dated from the development of industrial parks in the last century, when planners started to make use of economic development theories and organize different types of industries to diversify the economies and risk portfolios of the land (Peddle, 1993).

Theories of economic development emphasize the importance of agglomeration economies, which refers to the benefits received from workers and companies being located near one another (Marshall, 1898). Cluster businesses benefit from input cost minimization, and input specialization, as well as the strong linkages and spillovers within each cluster (Porter, 1998). The other key theory is diffusion effects, which means that surrounding areas gradually grow due to the expansion of central areas and the spillovers of capital, talent, and knowledge(Hagerstrand, 1968). Zoning for economic development preserves space for future economic development by fostering clusters of businesses in specific areas, which harnesses these benefits and promotes economic growth.

Some evidence suggests that zoning can be an effective tool for promoting economic development. For example, some scholars pointed out that land use and zoning could be a response to market failure and economic recovery (Bailey, 1959; Lee, 1981). Zoning amendments, also known as rezoning, achieve this by changing the zoning designation for a group of properties in accordance with a specific land use planning objective for that area (NYC Department of City Planning, 2018). A study by the Brookings Institution (Katz & Wagner, 2014) found that rezoning in innovation districts can lead to economic activities

including job creation, commercial development, and infrastructure investment. The "City of Yes for Economic Opportunity" highlights the need for providing opportunities and flexibility for local businesses to change and grow (NYC Department of City Planning, 2023c). The following analysis in this project focuses on bureaucratic "red tape" in zoning that limits the growth opportunity for local businesses.

However, the effectiveness of zoning for economic opportunities can depend on a variety of factors, including the local economic and political context, the availability of infrastructure and amenities, and the quality of the regulatory framework. For example, a study conducted by the Citizens Budget Commission shows that factors like decision-making processes have impeded zoning and land use progress in New York City(2022). Some scholars like Jepson and Haines examined zoning policies from the perspective of sustainability and resiliency (2014). They evaluated the zoning ordinances of 32 cities in the United States based on the sustainability framework of the "three Es" (Environment, Economy, and Equity), and found that zoning is an important tool of sustainable development, but not the only influence on land development in a community. They used the example of Lawrence, Kansas. Other than zoning and land use codes, the city has a smart growth code regulating civic space, infill development, and streetscape requirements, which affects land development and local economic opportunities.

In addition, some concerned zoning for economic opportunities has unintended consequences, such as gentrification and environmental degradation (Curran & Hamilton, 2012; De Boeck & Ryckewaert, 2020). To address these concerns, some researchers have called for evaluations of current zoning ordinances in each region and advocated policies that prioritize equity, sustainability, and community involvement in the planning process (Jepson & Haines, 2014; ULI, 2022).

Recent evaluation methods on zoning regulations include scoring, case studies, comparative analysis, content analysis, and spatial analysis (Hirt, 2013; National Zoning Atlas, 2022; Y. Zhou et al., 2022). In 2018, Lorenzo-Eiroa proposed rezoning in New York

City through big data to rethink the integral relationship of cities with the environment, health, and public space. Few studies focusing on economic development adopt big data into zoning evaluation. There is a need to conduct further research into the interventions between zoning or land use and economic performance in the field of urban and regional planning (Kim, 2011).

Overall, zoning for economic opportunities can be an effective tool for promoting local businesses, but it must be implemented carefully and with consideration for the needs and concerns of different stakeholders. As the current studies on zoning amendments mainly focus on legislation challenges and policy implementation (Glenn, 1977; Hirokawa, 2012), this project can enrich the discussion on zoning amendments for economic opportunities and also provide a data-led approach to examine, analyze, and develop citywide zoning reforms.

CHAPTER 3 – DATA COLLECTION AND PROCESSING

3.1 Data Source

Table 3-1 Data Sources and Description

Data	Description	Type	Source	Processed	Mapping
NYC Zoning Features	2023 Boundaries of Zoning Districts, Commercial Overlay Districts & Special Purpose Districts With Subdistricts	Shapefile	Department of City Planning (DCP)		√
NYC Community Districts	2023 Boundaries of Community Districts	Shapefile	NYC Open Data	Merged with POI for mapping	√
NYC OSM POI	OpenStreetMap POI in New York City, updated in March 2023	Shapefile	OpenStreetMap(OSM)	Matched with zoning information	√
NAICS Code	2022 North American Industry Classification System	Dataset	U.S. Census Bureau	Matched with zoning information	×

3.2 Points of Interest (POI)

Points of Interest, commonly known as POI, refer to specific geographic locations or sites that hold particular significance, attraction, or importance for various purposes. These distinct points are often the key feature on maps, navigation systems, digital platforms, and travel guides to locate noteworthy and relevant places within a given area. POIs play a pivotal role in enhancing navigation, tourism, urban planning, and location-based services (K. Liu et al., 2020).

More and more scholars have utilized POI data to understand urban environments and address urban issues. By investigating the POIs of specific regions, urban planners can evaluate their land use (Wu et al., 2021), functionalities (Pan et al., 2023), spatial structures (N. Zhou, 2022), and dynamic semantics of urban spaces (Cai et al., 2019). POI data were also used in many other topics, including measuring urban vibrancy (Tu et al., 2020), predicting taxi demand (X. Liu et al., 2020), and estimating property values (Kang et al., 2021).

Currently, there are a variety of POI data sources in different geographic contexts, which are created by different companies, organizations, and communities to emphasize specific attributes and uses. For example, commercial companies like Google, Tencent, and Yelp have their own POI datasets for their products. The OpenStreetMap (OSM) is contributed by the OSM community toward the mapping of POIs. As volunteered geographic information (VGI), some scholars pointed out that there are quality issues in OSM data (Touya et al., 2017). However, as free-source data, it has better open data with up-to-date and localized sources with global reach (OpenStreetMap, 2023).

The POI data in this project is from OpenStreetMap updated in March 2023, which covers the entire New York City area. Each POI contains the information of name, type, and location. There are 222,149 points and 268 types of POI within the NYC boundaries. Among those, I selected all types of POI involving potential business activities that require land, totaling 106 (see Appendix Table A3-1), among which *restaurants* accounted for the largest proportion (see Figure 3-1).
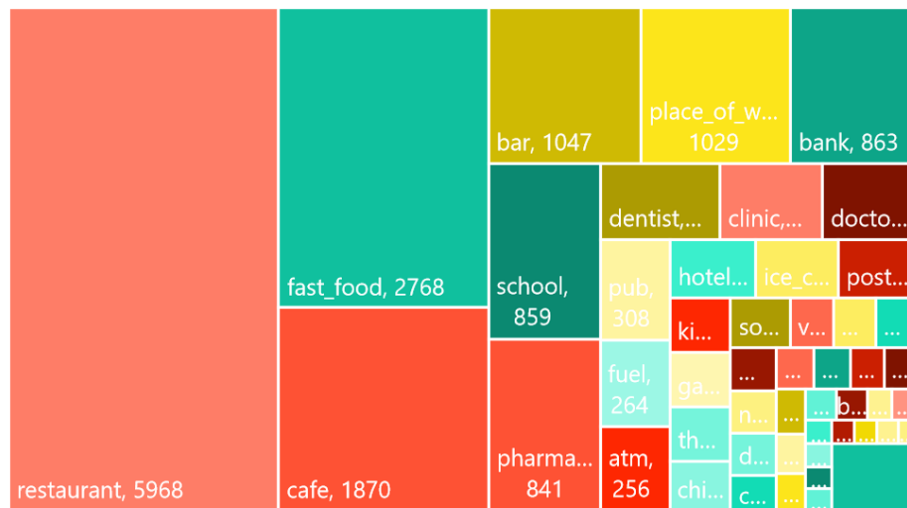

Figure 3-1 Treemap of Counts of Selected POIs by Commercial Types

Each type of POI is paired with zoning uses that best align with it. For instance, the POI type of *acting school* is paired with the zoning use "*trade, or other schools for adults*". It falls under the Use Group 9A and is found in C2, C4, C5, C6, C8, M1, M2 and M3 Districts. Every zoning use matches with one or more Use Groups in the Zoning Resolution with corresponding requirements or limitations. This leads to different permitted Zoning Districts for each POI data. Table 3-2 shows a part of the classification form to bridge the commercial types of POI to the zoning uses, UGs, and districts.

Table 3-2 Example of Commercial Type of POI to Zoning Conversion Table

Type	Zoning Uses	UG	Assigned UG	Limitation	Districts
acting_school	Trade, or other schools for adults	9A	9A		C2 C4 C5 C6 C8 M1 M2 M3
advertising	Offices, businesses, professional including ambulatory diagnostic or treatment health care, or governmental	6B	6B		C1 C2 C4 C5 C6 C8 M1 M2 M3
animal_shelter	Animal pounds or crematoriums	16A	16A		C8 M1 M2 M3
bakery	Bakeries	6C	6C	provided that the *floor area* used for production shall be limited to 750 square feet per establishment	C1 C2 C4 C5 C6 C8 M1 M2 M3
gallery	Art galleries, commercial	6C	POI in R districts → 3A C7 district → 12B Others → 6C		C1 C2 C4 C5 C6 C8 M1 M2 M3
	Art galleries, commercial	12B			C4 C6 C7 C8
	Libraries, museums or non-commercial art galleries	3A			R1–R2 R3–R10 C1 C2 C3 C4 C5 C6 M1
nail_salon*	Barber shops	6A	6A		C1 C2 C4 C5 C6 C8 M1 M2 M3
	Beauty parlors	6A	6A		C1 C2 C4 C5 C6 C8 M1 M2 M3
…	…	…	…	…	…

* For commercial activities unlisted in the Use groups, they are assigned with the most similar use listed in the Zoning Resolution.

The gaps between the zoning uses and the commercial activities appear when assigning use groups and zoning districts to them, which will be discussed later in Chapter 3. Meanwhile, the table can be utilized to make a statistical analysis of what commercial activities are happening in which use group or zoning district, and examine the current situation of the economic activities in New York City.

3.3 NAICS Codes

However, due to the limited types of industries classified by OpenStreetMap, it is hard to cover all the economic activities in New York City. Therefore, North American Industry Classification System (NAICS) codes are introduced here as a supplement to examine the business trend.

NAICS is a fundamental framework for the classification of businesses and industries in North America. It utilizes a hierarchical structure that arranges industries into sectors, subsectors, industry groups, and detailed industries. NAICS codes are updated every 5 years to ensure their currency, precision, and up-to-date categorization. It has been adopted by many scholars for economic study, for example, to sample specific industries (Kile & Phillips, 2009), build macroeconomic input-output models (Ingwersen et al., 2022), and identify industry clusters (Kelton et al., 2008). Therefore, NAICS can be an ideal classification framework for analyzing economic activities.

In the data processing, 1,012 six-digit-level NAICS codes are also paired with the Zoning Use and Use groups with corresponding limitations and requirements (see Table 3-3). In this way, I can examine whether there is a mismatch between the zoning ordinance and the businesses outside the OSM POI data, the detailed analysis of which will be conducted in Chapter 4.

Table 3-3 Example of Commercial Type of POI to Zoning Conversion Table

NAICS Sector	Definition	Zoning Uses	UG	Districts	Limitation
44-45	**Retail Trade**				
442	**Furniture and Home Furnishings Stores**				
4421	**Furniture Stores**				
44211	Furniture Stores				
442110	Furniture Stores	Furniture stores	6C	C1, C2, C4, C5, C6, C8	limited to 10,000 square feet of floor area per establishment
		Furniture stores	10A	C4, C5, C6, C8	
4422	**Home Furnishings Stores**				
44221	Floor Covering Stores				
442210	Floor Covering Stores	Carpet, rug, linoleum or other floor covering stores	6C	C1, C2, C4, C5, C6, C8	limited to 10,000 square feet of floor area per establishment

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		Carpet, rug, linoleum or other floor covering stores	10A	C4, C5, C6, C8
44229	Other Home Furnishings Stores			
…	…			

3.4 Zoning District Information

In order to examine how well the zoning applies to the current commercial activities, the next step is to detect whether the current zoning districts permit the commercial activities within them. The information of zoning features as follows are merged into the attributes of every POI:

- Zoning District
- Commercial Overlay District
  - Areas located in a residence zoning district that allow commercial uses.
- Special Purpose District with Subdistricts
  - Designated by the Commission, each special district has special zoning requirements and/or zoning incentives tailored to distinctive community development needs with special permission or restrictions on specific activities.

Left: Figure 3-2 Zoning Districts of POI #18475   Right: Table 3-3 Attribute Table of POI #18475
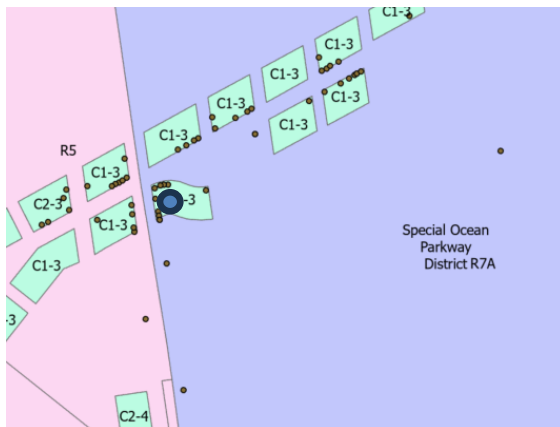
POI ID	18475
Name	M. H. Driving School
Type	driving_school
Zoning District	R5
Commercial Overlay	C1-3
Special District	Special Ocean Parkway District
Sub SD	/
Use group	8B
Conforming Zoning	C2 C4 C6 C8 M1 M2 M3
Status	Wrong

With the zoning information assigned by types (see use group and conforming zoning in Table 3-3), it can be identified whether the POI is with the nonconforming business in each zoning district. For example, POI#18475 represents M.H. Driving School located in the R5, C1-3 Overlay District, and Special Ocean Parkway District. Although

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special purpose districts usually have incentives for commercial activities, Special Ocean Parkway District protects the community landscape and promotes community facilities only. Therefore, in this case, the business type of POI#18475 needs to follow the as-of-right permitted use. It should be in Use Group 8B, which is not allowed in C1-3 zoning. The status would be labeled as *Wrong* to show the business and the zoning do not match. Each POI is manually checked to reduce omissions or misclassification.

CHAPTER 4 – EXPLANATORY ANALYSIS AND FINDINGS

4.1 From Business Activities to Zoning Map: *Gaps from Ordinance Analysis*

4.1.1 From Business Activities to Permitted Uses:

How do uses mismatch with the trend of economic activities in NYC?

After converting the NAICS codes and commercial types of POI to the permitted uses in the zoning resolution, it is easy to find that there are 34 business activities not listed as uses permitted as of right (see Appendix Table A4-1). Popular local commercial spaces including internet cafés, karaoke boxes, nail salons, electronics and appliance retailers like Apple Store, and cosmetics like Sephora are not covered in the listed uses under any use group.

Even if I follow the instruction from the Department of Buildings to assign these new commercial activities with the most similar use in the Zoning Resolution, sometimes it does not work well. For example, the most similar use for cosmetics, beauty supplies, perfume retailers, or nail salons is beauty parlors in Use Group 6A. However, according to the definition of 6A (local retail) and 6C (local service), they should be classified in 6C rather than 6A. I also propose some Use Groups for new commercial activities like meditation centers (6C/9A), schools (6C/9A) including dancing, music, beauty or tutoring schools, ATMs (6A/6C), coworking spaces(6B), and conference centers (6B).
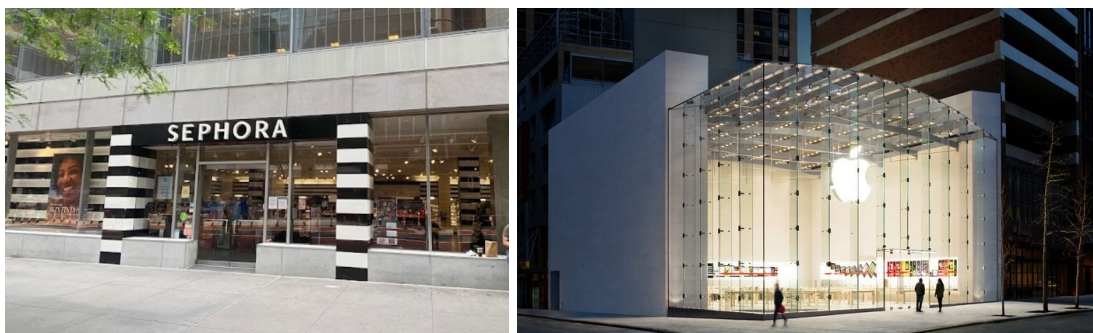
Figure 4-1, 4-2 Businesses That are not listed in the as-of-right uses in Zoning Resolution
(Left: Sephora, Right: Apple Store; Source: Google Map)

There appear to be some gambling POIs on the OpenStreetMap, which is interesting since the government has not made gambling legal in the city yet, although the city is working on the licensure of casinos from the state. So, in this case, the zoning law needs to get prepared and make a way for it in the near future.

4.1.2 From Uses Permitted As-of-Right to Use Groups:

What are the problems of the classification framework of the use groups?

Usually, one business activity under different spatial requirements is assigned to different use groups (e.g. television appliance stores limited to 10,000 square feet of floor area in UG6 vs. unlimited in floor area in UG10), and therefore different zoning districts. However, some uses under the same requirements are found in multiple-use groups or zoning districts. Table 4-1 shows some examples of candy or ice cream stores, banquet halls, billiard parlors, and bicycle rental or repair shops.

Table 4-1 Use group and Zoning Districts for candy or ice cream stores

Business	Use group	Zoning Districts
Candy or ice cream stores	6C	C1, C2, C4, C5, C6, C8
Candy or ice cream stores	12B	C4, C6, C7, C8
Candy or ice cream stores	14A	C2, C3, C7, C8
Banquet halls	9A	C2, C4, C5, C6, C8
Banquet halls	13B	C7, C8
Bicycle rental or repair shops	7B	C2, C6, C8
Bicycle rental or repair shops	14A	C2, C3, C7, C8
Billiard parlors	8A	C2, C4, C6, C8
Billiard parlors	12A	C4, C6, C7, C8

Some uses are similar but classified into different use groups (see examples in Table 4-2). Personal and household goods repair and maintenance has a very complex taxonomy. There are also some outdated and over-detailed uses like umbrella repairs, hat repairs, or typewriter machine rental repairs, which are not common nowadays. Given the impossibility of listing all the commercial activities completely in the zoning law, it is sensible to remove outdated uses and merge similar business activities into one use group.

Table 4-2 Example of Use group and Zoning Districts for similar businesses

Business	Use group	Zoning Districts
Personal and Household Goods Repair and Maintenance		
Household or office equipment or machinery repair shops, such as refrigerators, washing machines, stoves, deep freezers or air conditioning units	16A	C8
Upholstering shops dealing directly with consumers	8B	C2, C4, C6, C8
Shoe or hat repair shops	6A	C1, C2, C4, C5, C6, C8
Musical instrument repair shops	9A	C2, C4, C5, C6, C8
Umbrella repair shops	9A	C2, C4, C5, C6, C8
Bicycle rental or repair shops	7B	C2, C6, C8
Bicycle rental or repair shops	14A	C2, C3, C7, C8
Gun repairs	7B	C2, C6, C8
Boat storage, repair, or painting, including the incidental sale of boats, boat parts, or accessories,	14A	C2, C3, C7, C8
Watch or clock stores or repair shops	6C	C1, C2, C4, C5, C6, C8
Tailor or dressmaking shops, custom	6A	C1, C2, C4, C5, C6, C8
Electronic and Precision Equipment Repair and Maintenance		
Television, radio, phonograph or household appliance repair shops	8B	C2, C4, C6, C8
Typewriter or other small business machine sales, rental or repairs	9A	C2, C4, C5, C6, C8
Household or office equipment or machinery repair shops, such as refrigerators, washing machines, stoves, deep freezers or air conditioning units	16A	C8

Non-depository Credit Intermediation			
Offices, business, professional including ambulatory diagnostic or treatment health care, or governmental	6B	C1, C2, C4, C5, C6, C8	
Pawnshops	8B	C2, C4, C6, C8	
Banks, including drive-in banks	6C	C1, C2, C4, C5, C6, C8	

The restaurant is another typical use with complex regulations. With the Cabaret Law enacted in 1926, the Department of City Planning regulated the eating and drinking establishments into different use groups to restrict music entertainment, gathering, and dancing (see Table 4-3). As the dancing ban was repealed in the amended Cabaret Law in 2017, current classifications for restaurants seem a bit redundant. Hence, uses like this should be updated and simplified to reduce the restrictions, stimulate the application process, and provide more opportunities for local businesses.

Table 4-3 Uses and zoning information of eating or drinking establishments

Zoning Uses	Use group	Rules	Zoning Districts
Eating or drinking establishments, including those that provide outdoor table service or have music for which there is no cover charge and no specified showtime	6A		C1 C2 C3 C4 C5 C6 C8 M1 M2 M3
Eating or drinking establishments with accessory drive-through facilities	6A		C1 C2 C4 C6 C8 M1 M2 M3
Eating or drinking establishments with entertainment, but not dancing, with a capacity of 200 persons or fewer	6C	Permitted in C1-1, C1-2, C1-3, C1-4, C2-1, C2-2, C2-3, C2-4, C3 and C5 Districts, only as provided in Section 73-241	C1 C2 C3 C5
Eating or drinking establishments with musical entertainment but not dancing, with a capacity of 200 persons or fewer	6C		C1 C2 C3 C4 C5 C6 C8 M1 M2 M3
Eating or drinking establishments with entertainment and a capacity of more than 200 persons, or establishments of any capacity with dancing	12A	In C4, C6-1, C6-2, C6-3, and C6-4 Districts, a minimum of four square feet of waiting area within the zoning lot shall be provided for each person permitted under the occupant capacity as determined by the New York City Building Code. The entrance to such use shall be a minimum of 100 feet from the nearest Residential District boundary.	C2 C3 C4 C6 C7 C8 M1 M2 M3
Eating or drinking places, without restrictions on entertainment or dancing	10A	limited to location in hotels	C4 C5 C6 C8

4.1.3 From Use Groups to Zoning Districts:

Is there any difference in the distribution of use groups among zoning districts?

Table 4-4 Use groups permitted in different commercial districts

Districts	Use groups															Gen. Service
	Residential		Community Facility		Retail and Commercial											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Local Retail C1	X	X	X	X	X	X										
Local Service C2	X	X	X	X	X	X	X	X	X					X		
Waterfront Recreation C3	X	X	X	X										X		
General Commercial C4	X	X	X	X	X	X		X	X	X		X				
Restricted Central Commercial C5	X	X	X	X	X	X			X	X	X					
General Central Commercial C6	X	X	X	X	X	X	X	X	X	X	X	X				
Commercial Amusement C7												X	X	X	X	
General Service C8			X	X	X	X	X	X	X	X	X	X	X	X		X

There are eight commercial districts in New York City, from Local Retail C1 to General Service C8. Each allows different uses (see Table 4-4). I counted the businesses in different commercial districts to see whether there was any difference in the distribution of uses among zoning districts. The result is shown in Figure 4-3. As the positioning of C3, C7, and C8(Waterfront Recreation, Commercial Amusement, and General Service) are more like special commercial zoning districts in the city, the business counts in these districts would be much less, compared to C1, C2, C4, and C5 (Local Retail, Local Service, General Commercial, Restricted Central Commercial, and General Central Commercial).
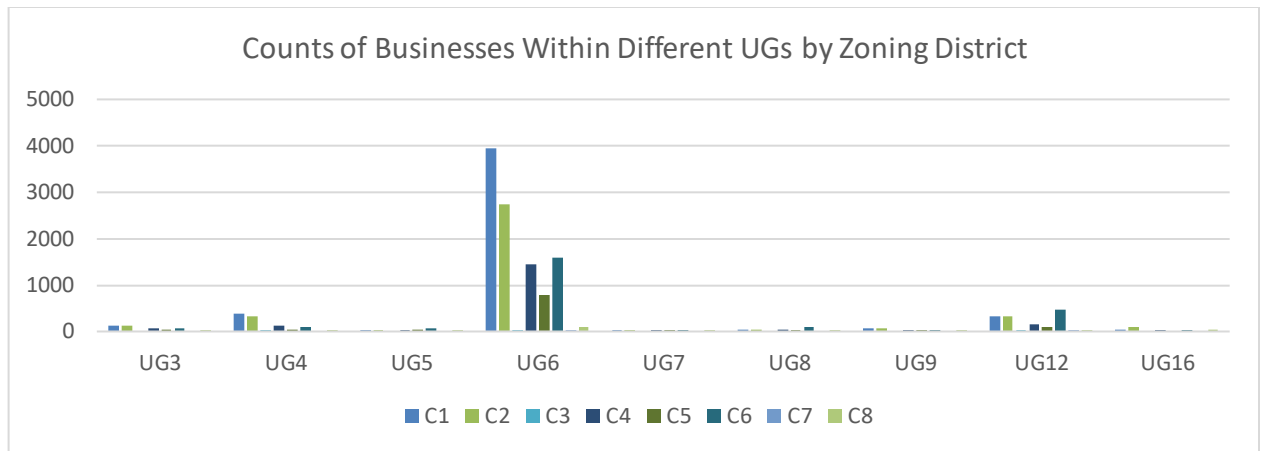
Figure 4-3 Counts of Businesses Within Different UGs by Zoning District
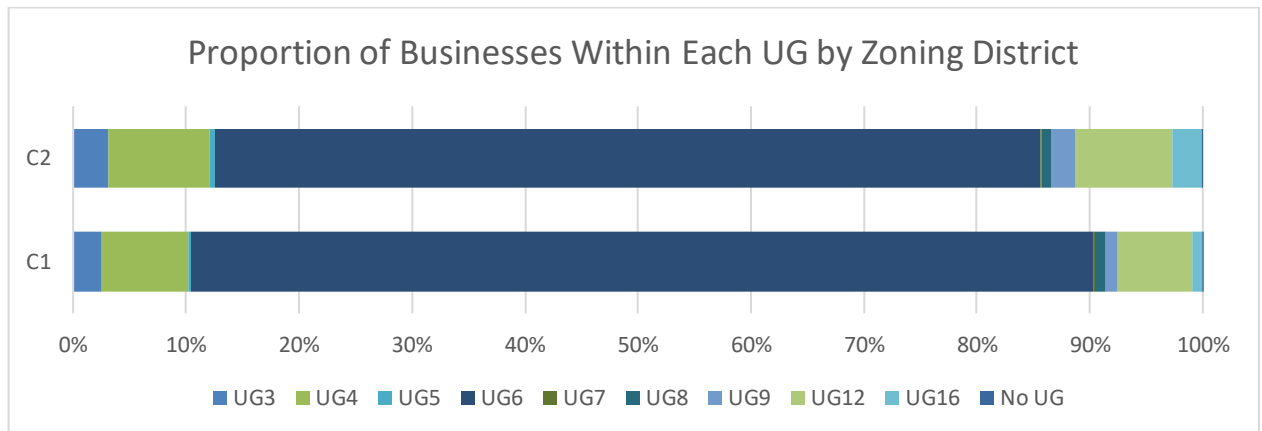
Figure 4-4 Proportion of Businesses Within Different UGs by Zoning District

Since the OpenStreetMap POI focuses more on small businesses (so does the the Zoning for Economic Opportunity proposal), I mainly look into C1(local retail) and C2 (local service) where local businesses mainly happen. While these two districts allow different use groups, the distribution pattern seems similar. C1 and C2 have the most UG6 (retail and service establishments) businesses among all the zoning districts. And they share a very similar proportion of businesses within each UG (see Figure 4-4). C1 has the nonconforming businesses in UG7, 8, and 9 which are only permitted in C2. Therefore, even though C1 and C2 have different focuses in businesses, the gap between local retail and local services has narrowed nowadays. With the effectiveness of C1 and C2 eliminated mostly, similar districts like C1 and C2 can be merged to ease the complexity of the resolution.

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4.1.4 From Zoning Districts to Zoning Maps:

Do the districts match the physical environments?

Figure 4-5 Map of Commercial Districts with Non-aligning Boundaries

Some commercial overlay districts on the zoning map only cover a part of the actual commercial spaces or physical buildings. While zoning boundaries can limit activities and eventually make unwanted uses disappear, situations like this cannot achieve this goal as long as there are still some spaces beneath. This may also make it costly if intending to correct non-complying buildings (see Figure 4-5). The non-aligning boundaries of these districts put the commercial uses across them in the grey zone of being conforming uses.

Figure 4-6 Map of Gateway National Recreation Area with Residential District Boundary

In terms of natural scape, a large portion of Gateway National Recreation Area is found to be mapped as Residence district. While Gateway National Recreation Area is under exclusive federal jurisdiction, the R4 zone restricts the local services for the communities within the area. Zoning codes of PARK or Special Zoning Districts would better allow the current nonconforming activities and support the economic development in the community.

4.2 From Zoning Map to Businesses Activities: *Gaps from Spatial Analysis*

4.2.1 Spatial Distribution of Nonconforming Businesses

Where are the mismatches between businesses and zoning codes happening?
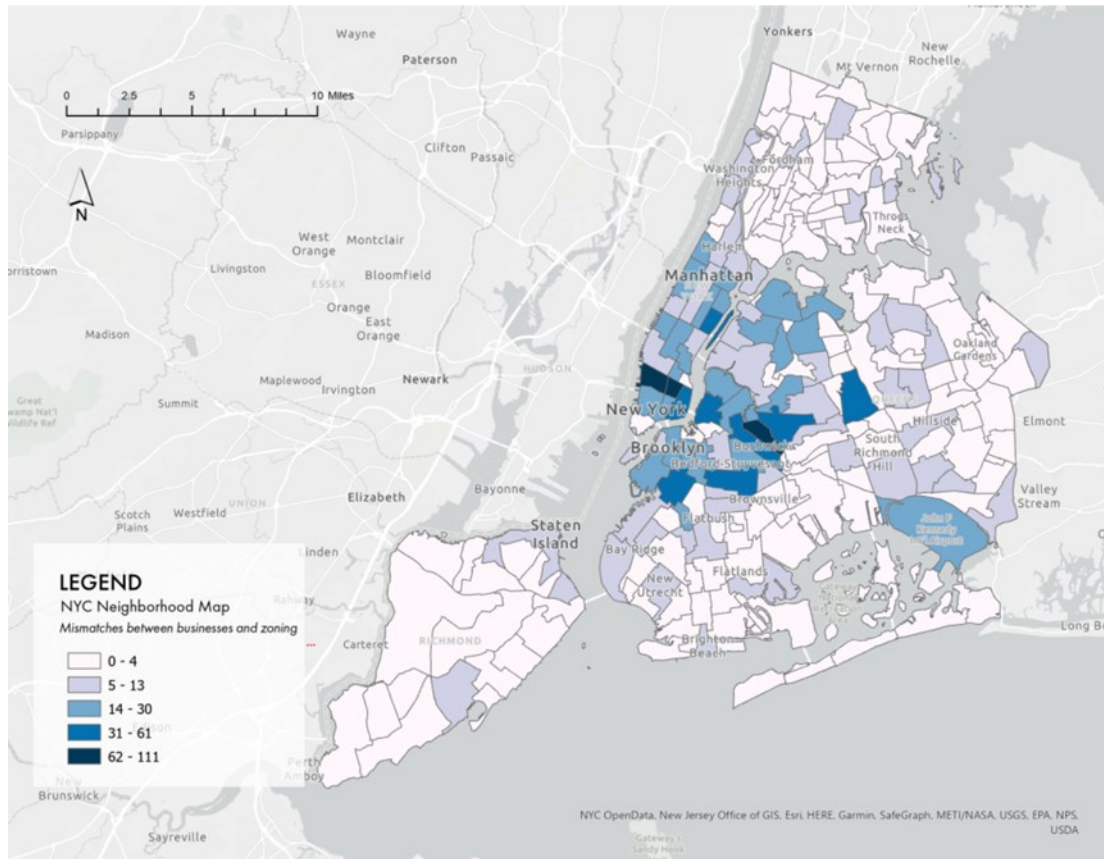
Figure 4-7 Map of Count of Nonconforming Business by Community Districts

The complexity of zoning regulations can make it more difficult and costly for businesses to find space that meets their needs in the city. To understand where the complexity happens citywide, I made a map to calculate the count and the proportion of nonconforming businesses in each neighborhood (see Figure 4-7 & 4-8).
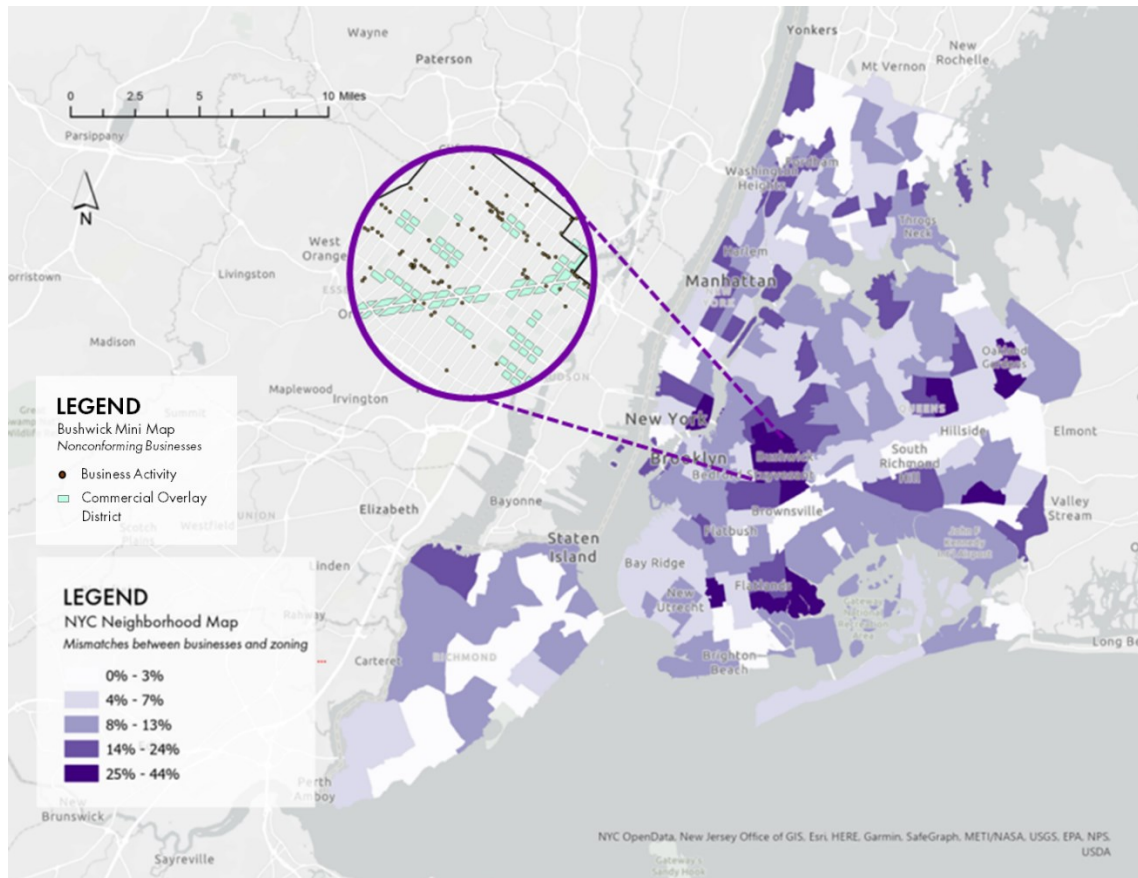
Figure 4-8 Map of Percentage of Nonconforming Business by Community Districts

- West Village, East Village, and Lower East Side in Manhattan

It is shown on the two maps that Lower Manhattan stands out as one of the top neighborhoods with the most nonconforming businesses. Among them, there are 217 eating or drinking establishments including restaurants, café, fast food, and bars (see Table 4-5). The entertainment and musical industry including art centers, studios, theaters, nightclubs, and music venues count as 22 in total, indicating the vibrant art activities in the West and East Village and Lower East Side. Most of the nonconforming businesses happen in residence districts that are outside of commercial overlay districts. For those not allowed in C1 districts like art centers, fuel stations, music venues, and nightclubs, these activities are permitted as-of-right in C2 districts. That is to say, the business types in C1 intend to evolve into types allowed in C2. The difference between these two districts has again been proven to diminish.

Table 4-5 Business Types and Zoning Districts of the Nonconforming Businesses
in Lower East Side, East Village, and West Village

Zoning | Business Type	East Village	Lower East Side	West Village	Grand Total
C1	**1**		**5**	**6**
arts_centre	1			1
fuel			1	1
music_venue			1	1
nightclub			3	3
R6/7/8/10	**110**	**41**	**96**	**247**
arts_centre	2	1	1	4
bar	20	3	12	35
bicycle_rental	1			1
bicycle_repair_s			1	1
cafe	9	5	16	30
fast_food	16	9	2	27
food_court	1			1
ice_cream	2			2
marketplace		1		1
pharmacy		3		3
post_office	1	1	1	3
printer		1		1
pub	4		1	5
restaurant	47	14	58	119
studio		1	1	2
theatre	5	1	3	9
toy_library		1		1
veterinary	2			2
Grand Total	**111**	**41**	**101**	**253**

- Bushwick North, Bushwick South, Ocean Hill, Stuyvesant Heights in Brooklyn

In terms of the Bushwick area in Brooklyn, according to NYC Tourism, it is a neighborhood famous for nightlife and great food, which took over from Williamsburg as the hip neighborhood some years back (NYC Tourism, 2023). It can also be found from Figure 4-6 that many businesses are located outside the commercial overlay districts, going beyond the economic planning in Brooklyn. Table 4-6 shows that eating and drinking establishments: restaurants, bars, café, and fast food are the main nonconforming types in the Bushwick area, located mainly in R6 districts. One possible reason is that 65.4% of the population in Bushwick is Hispanic (NYC Department of City Planning, n.d.-a), bringing vibrant nightlife and food cultures into the neighborhoods. For manufacturing and commercial districts, there

is a daycare center and a school located in the M1 district, which are in the local need but not allowed in the manufacturing districts, and a bicycle repair store in C1 district, which is only allowed in C2 and other commercial districts.

Table 4-6 Business Types and Zoning Districts of the Nonconforming Businesses
in Bushwick North, Bushwick South, Ocean Hill, Stuyvesant Heights

Zoning District	Business Type	Bushwick North	Bushwick South	Ocean Hill	Stuyvesant Heights	Grand Total
C1	bicycle_repair_s			1		1
	hotel		1			1
C2	car_wash	1				1
M1	hostel		1			1
	bar (with brewery)	1				1
	kindergarten	1				1
	school	1				1
M3	place_of_worship		1			1
R5	fast_food			2		2
	restaurant				1	1
R6	animal_boarding		1			1
	arts_centre		1			1
	bakery		1			1
	bar	11	8		3	22
	bicycle_rental		1			1
	cafe	8	10	1	3	22
	fast_food	13	4		1	18
	ice_cream				1	1
	money_transfer	1				1
	nightclub		2			2
	pharmacy	4				4
	post_office			1		1
	pub	2	2			4
	restaurant	51	11	1	16	79
	studio		3			3
	training		1			1
Grand Total		94	48	6	25	173
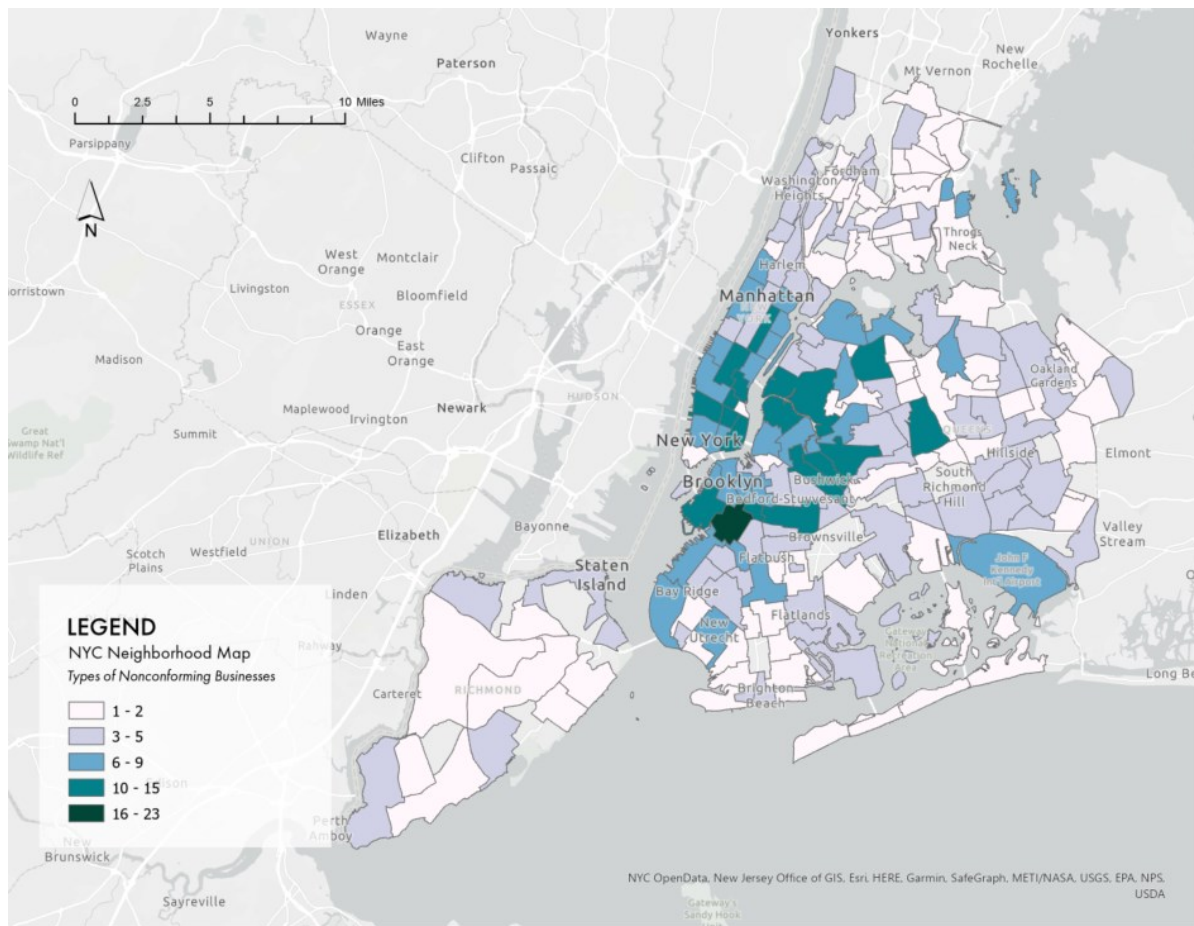
Figure 4-9 Map of Types of Nonconforming Business by Community Districts

- Park Slope-Gowanus in Brooklyn

The neighborhoods of Park Slope-Gowanus have the most diverse nonconforming business types (See Figure 4-9 and Appendix Table A4-2). In 2023, Gowanus became the most expensive area in Brooklyn (also as 5th citywide), and Park Slope became the fifth-most expensive (Troutman, 2023). Famous for vibrant activities like industrial-looking clubs, upstart breweries, hip restaurants, organic food markets, art studios, and picturesque walkways, Park Slope and Gowanus have attracted many young families and the creative class. The most nonconforming activities also align with the needs of these groups (e.g. animal boarding, art centers, dojo, marketplace, music schools, etc.). It is also a classic example of nonconforming businesses in residential districts (see next section).

Table 4-7 Business Types and Zoning Districts of the Nonconforming Businesses in Park Slope-Gowanus

Zoning District	Business Type	Park Slope-Gowanus
C4	animal_boarding	1
M1	Bar (with brewery)	1
M2	kindergarten	1
	place_of_worship	1
R5	acting_school	1
R6	animal_boarding	2
	arts_centre	4
	atm	1
	bank	1
	bar	3
	cafe	12
	dojo	1
	driving_school	1
	events_venue	1
	fast_food	2
	gambling	1
	language_school	1
	marketplace	3
	meditation_centr	1
	music_school	2
	pub	1
	restaurant	15
	theatre	2
	veterinary	1
R7	cafe	1
	car_rental	1
Grand Total		62

4.2.2 Statistical Analysis of Nonconforming Businesses
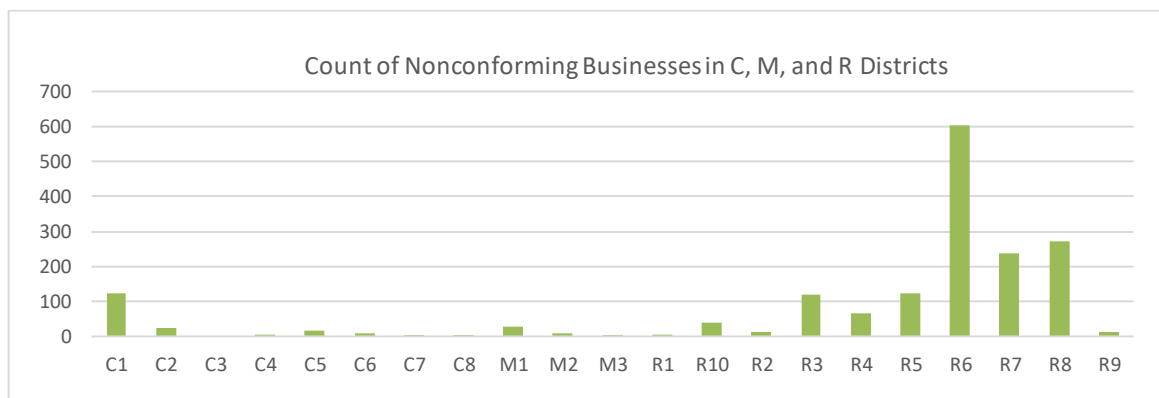
What are these mismatches from the map?

Figure 4-10 Count of Nonconforming Businesses in C, M, and R Districts

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Zoning with the 'Euclidian' style set up a hierarchy of land uses – with housing being the most restrictive, then commercial, and finally manufacturing allowing the most uses in districts (Nelson & Moore, 1993). This creates land use conflicts in districts with restrictions. In Figure 4-10, it is shown that R6 has the most nonconforming businesses. It is possible that as the lowest median-density housing in residential zoning, the ground floor of this type of housing offers an appropriate space for hosting commercial activities. It enjoys a moderate pedestrian flow in the neighborhood, while making its business just right for serving the community (see Figure 4-11).

Left: Figure 4-11 A restaurant located in the R6 district on 6th Ave, Brooklyn
Right: Figure 4-12 Sankey Diagram of Use group Counts of the Nonconforming Businesses in C, M, and R Districts

Most of the nonconforming businesses in residence districts are UG6 (see Figure 4-12). It seems that even though there are Commercial Overlay Districts in residential districts to allow commercial uses in the neighborhoods, the growth of local retail and services exceeds the overlay area. Another possible reason is that there may be a growing number of home businesses and services, which take place in a house or an apartment as a home occupation. Since some of them do not have a proper use as-of-right, they are assigned commercial uses that are not allowed in residence districts.
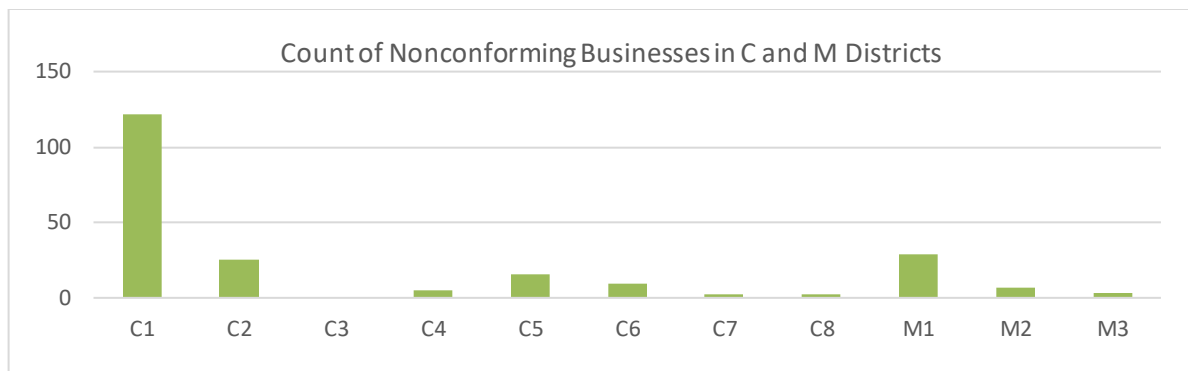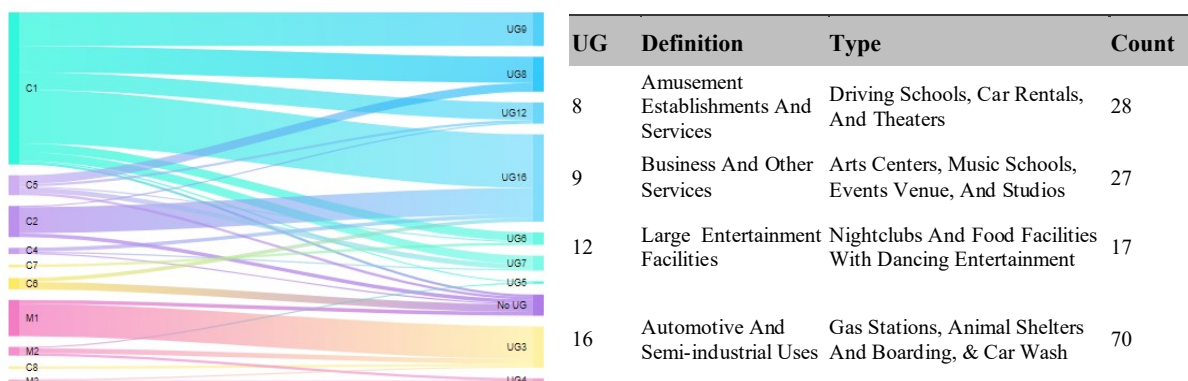
Figure 4-13 Count of Nonconforming Businesses in C and M Districts

When looking into the nonconforming businesses happening within the commercial and manufacturing districts, Figure 4-13 provides the information that most nonconforming businesses happen in C1 Districts where there are the most restrictive regulations on commercial uses. For commercial districts, the top businesses without as-of-right are UG 16, 8, 9, and 12. These uses are related either to music and entertainment or automotive and services (see Table 4-8). Businesses without use groups are another big group contributed both by commercial and manufacturing districts (see Figure 4-14), including activities not only without UG assigned but also needed special permissions like adult establishments (e.g. strip clubs), gambling, and zoos and illegal business in NYC including hostels. These are some of the gaps found in the analysis. In terms of manufacturing districts, community facilities for educational needs in UG3 surprisingly stand out. Since there are mixed-use districts in the manufacturing districts, there shall be a demand for educational facilities like kindergartens or childcare services for these communities.

Right: Table 4-8 Top UG of the Nonconforming Businesses in C, M, and R Districts

UG	Definition	Type	Count
8	Amusement Establishments And Services	Driving Schools, Car Rentals, And Theaters	28
9	Business And Other Services	Arts Centers, Music Schools, Events Venue, And Studios	27
12	Large Entertainment Facilities	Nightclubs And Food Facilities With Dancing Entertainment	17
16	Automotive And Semi-industrial Uses	Gas Stations, Animal Shelters And Boarding, & Car Wash	70

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No UG	Activities needed special permissions or Illegal activities	Strip clubs, Gambling, Zoos, and Hostels	11
3	Community facilities that serve educational needs	Kindergarten, Childcare, Prep School, School And University	33

Left: Figure 4-14 Use group Counts of the Nonconforming Businesses in C and M Districts

4.3 Drawbacks in Statistical Analysis

Certain actions might introduce some errors in the statistical outcomes (see Table 4-9). I followed the Department of Buildings to assign new commercial activities unlisted in use groups with the most similar use listed in the Zoning Resolution, the total of which is 496 counts. As mentioned before, some businesses are only partially covered by the overlay commercial districts, which leads to the grey zone of as-of-right uses.

Although most of the businesses are permitted in the zoning uses, there are 4,426 businesses with additional restrictions in the area, activities, capacity, frontage, or required additional permits. For example:

- Bakeries, floor area used for production shall be limited to 750 square feet per establishment;
- Bars outside M3 districts cannot have breweries inside;
- Eating or drinking establishments under most circumstances are not allowed for dancing and with a capacity of 200 persons or fewer;
- Businesses limited and required By the Board of Standards and Appeals;
- Theaters, with Limited capacity;
- Business or professional office or individual use, no more than 50 feet of linear frontage on Atlantic Avenue
- …

Table 4-9 Counts of Questionable Classification

Status	Count	%
Assigning UG	496	2.47%
Only part of the business in Commercial Overlay Districts	3	0.01%
Restricted	4425	22.06%
Blank UG	11	0.05%

No Zoning Codes	4	0.02%
Encouraged in Special Districts but not allowed in current codes or permitted use groups	20	0.10%

Some activities are encouraged to promote the community needs and the most desirable use of land in their Special Purpose Districts, but I did not find any words in the zoning resolution to explicitly allow these uses, resulting in the classification of *nonconforming* for these businesses.

CHAPTER 5 – CONCLUSION

5.1 Summary

This project makes significant contributions to both academic discourse and professional practice in the fields of zoning and economic development. By employing a combination of text analysis and diverse data sources, this project sheds light on the limitations of the New York City Zoning Resolution, particularly its outdated regulations that impede the growth and expansion of local businesses. The identification of incongruities between businesses and zoning resolutions, with a focus on popular nonconforming activities such as restaurants and entertainment venues, provides a nuanced understanding of the challenges faced by businesses operating within the current regulatory framework.

The analysis also reveals a noteworthy trend where the demand for local retail and services surpasses the planned capacity in commercial and mixed-use districts. The spatial analysis further identifies specific areas, such as Downtown Manhattan, Bushwick, and Park Slope-Gowanus, where the congregation of Hispanics, young families, or the creative class can bring richer cultures and commercial activities of food, art, and well-being services. Diverse nonconforming activities in C1, R6, or M1 Districts underscore the necessity for a more flexible and adaptive zoning approach.

The findings from this project not only advocate for a smarter and more dynamic approach to updating land use classifications but also propose the merging of akin classifications to streamline the zoning regulations. This strategic restructuring aims to accommodate identical uses and reduce bureaucratic hurdles, thereby fostering a more conducive environment for local businesses to thrive.

In conclusion, this project introduces a novel methodology for zoning analysis, integrating text analysis, and spatial analysis to enhance the understanding of the complexities within the current zoning framework in terms of economic opportunities. The findings presented here serve as a valuable resource for policymakers and planners in the zoning and economic development field. In the next section, I will outline policy

recommendations based on these findings, offering valuable insights for planners and policymakers seeking to address the challenges posed by outdated zoning regulations and promote a more vibrant economic landscape.

5.2 Policy Recommendations

5.2.1 Simplifying the Rules of Uses and Use Groups

To address the complexity of the regulations on economic activities, it is important to simplify the redundant and outdated rules and make them more intuitive. One way to simplify the rules is to involve the adoption of a new classification system which can help reorganize the current use groups into more coherent categories. For example, the NAICS Code (North American Industry Classification System) could serve to modernize zoning applications by categorizing businesses of similar sectors together using common sense.

This can leverage several advantages, including the ability to keep pace with the evolving industries by updating the codes every five years in accordance with prevailing trends. Moreover, it is a standard industry classification system widely used in the academic and professional fields, covering nearly all industries in North America. Notably, the NAICS Code has also been adopted in the QCEW (Quarterly Census of Employment and Wages) survey, which meticulously records over 97% of U.S. employment in businesses(U.S. Bureau of Labor Statistics, 2023). The QCEW database is a tool easily accessible and convenient for the government to manage, which can enhance its practicality and effectiveness when integrated with the zoning system.

5.2.2 Allowing Emerging Businesses to Have Proper As-of-Right Uses

After introducing the renovation of the classification system, there are several commercial fields worth noticing when including emerging businesses in the zoning system:

- Popular Local Commercial Spaces

There are some emerging local commercial businesses like internet cafés, electronics and appliance retailers, cosmetics, and nail salons mentioned in Chapter 3. Including them in the as-of-right uses will bring more economic opportunities and make it easier for businesses in trend to find space to grow.

- Automotive Charging Stations

With the growing prevalence of electric cars, nonconforming activities related to car services suggest the need for adjustments in regulations. While automotive charging stations are allowed in the Use Group 7, there are limited commercial districts for UG7 (only in C2, 6, 8, and M districts; see Appendix Table A5-1). Accessory residential off-street parking is limited to be used by residents. Therefore, automotive charging stations should be classified as public parking lots in UG8, which is permitted in most of the commercial and manufacturing districts.

- Gambling & Casinos

While the city is in the process of gaining the licensure of casinos from the state, it is always right to be prepared with the coming industrial policy and make way for it in the near future.

- Home Occupation

While there are some uses allowed as home occupations, including fine arts studios and professional offices, certain businesses like advertising, barber shops, or interior decorators are restricted as home occupations (NYC Department of City Planning, 2023b). It is believed that relaxing the limitation on home occupations while keeping noise/ environmental/sign rules for home occupations can trigger more economic opportunities, especially in the post-pandemic time.

- Music and Entertainment

Establishments or facilities with music and entertainment are the top nonconforming businesses in NYC. With the repeal of the NYC Cabaret Law, the limitation of music and dancing entertainment should be abandoned as long as other rules including light and noise regulations stay the same to protect the residents in the neighborhoods.

- Training Centers and Extracurricular Activities

In the definition of *schools* in Zoning Resolution(NYC Department of City Planning, 2023a, p. 2), schools either refer to an institution providing full-time day instruction, a nursery school or kindergarten, a child care service, colleges or universities in 3A, or Business colleges, trade or other schools for adults in 9A & 16A. As for language, dancing, tutoring, or music schools in our study area, no specific UG was attached. When assumed as UG9 trade schools, these extracurricular Activities would be restricted in R, C1, and C3 districts. Therefore, it is suggested to make it as-of-right in all the commercial districts as a local service.

- Clean and Small Production

Small-scale manufacturing and maker spaces with the business mode of "Front selling, middle producing, and back shipping" have to give up locations near customers and move to industrial areas, otherwise, they would become nonconforming businesses. For example, bars with breweries are classified in Use Group 18, which is only allowed in M3 districts (see Appendix Table A5-2). There are businesses with clean production like this including bakery, craft studios, or 3D-printing which are not only appropriate to locate near residences and other businesses but also benefit from locating near customers and bringing more vitality to the neighborhoods.

In terms of clean production, the R&D (Research and Development) section without pollution within businesses like urban farms or biotech labs under certain conditions in life

science companies also belongs to this category. If permitted in UG6B under C4, C5, or C6 districts, it can allow companies to locate themselves in office buildings, stay close to other institutions, and form a cluster in general commercial areas. Therefore, the zoning regulations should allow clean and small manufacturing located in commercial districts as long as it passes the environmental, noise, or other related standards.

5.2.3 Modifying the Regulations and the Mapping of Zoning Districts

- Commercial District

It can increase the flexibility for businesses to move and expand and foster business agglomeration by merging similar districts to allow the same uses. Making streets with different but similar zoning codes on two sides to have the same uses (e.g. C1&C2) sounds workable, especially in some commercial corridors in Brooklyn, where streets are occupied by the same business activities on both sides with different zoning codes (see Figure 5-1).

Figure 5-1 Court St, Cobble Hill, Brooklyn With Different Zoning Codes on Two Sides of the Street

- Residence District

From the previous analysis, it is easy to find that Commercial Overly Districts cannot always cover the trend of the need for local commercial. One way is to expand the

boundaries of Commercial Overlay Districts in every major local commercial corridor to better serve the communities while ensuring the coverage is reasonable based on the physical environment. However, this may lead to excessive, inefficient, and thus unsustainable workload (see Figure 5-2).

Figure 5-2 Commercial Overlay Districts and Businesses near Fresh Pond

Another way is to form a new zoning rule to allow more commercial spaces in the residential area. The city is proposing a new initiative to allow new and small office/retail/service uses located within 100 feet of an intersection or in a large-scale development by City Planning Commission (CPC) Authorization (NYC Department of City Planning, n.d.-b). As a typical block in NYC is about 264 ft * 900ft, it can almost cover the short sides of a block, which means nearly all the short sides of the existing residence areas, while ensuring the quietness on the long sides of residence areas. Most of the existing nonconforming commercial activities do happen on the short sides/around intersections (see Figure 5-2). In this case, soft regulation may help, as long as it also ensures a pedestrian-friendly and noise-controlled environment for residents.

- Manufacturing District

In terms of manufacturing districts, a district contains every use except residential Use Groups 1, 2, and 3. This leads to a lack of community services and a potential loss of talent. Modernizing the scale of MX (Mixed Use Districts) in manufacturing districts or allowing community services and educational facilities in UG3 to be located in light manufacturing districts (M1) can simply fix the issue. On the other hand, it can also support good jobs while attracting talented workers who would benefit from these services.

- Special Purpose District

Generally speaking, each Special Purpose District would have its development visions and preferred economic activities based on the conditions of each area. However, not all the provisions have listed the businesses they encourage into the as-of-right uses to allow them to go beyond the regular zoning codes. It would be more straightforward to revise the permitted uses in Special Purpose Districts and provide support for the encouraged uses as well as make the regulations more intuitive for people to understand.

5.3 What's next?

With the City of Yes for Economic Opportunity beginning public review in October 2023, the economic zoning amendment is receiving feedback from communities to adjust its proposal for local needs. This provides an opportunity to engage voices from academic and professional spheres, as well as diverse backgrounds, to ensure an inclusive and equitable approach. The policy recommendations in this project can be a valuable reference for addressing the impacts of outdated ordinances and the correspondingly nonconforming businesses.

The policy recommendations presented in this project offer a valuable reference point for addressing the repercussions of outdated ordinances and the resulting presence of nonconforming businesses. As communities provide input and the amendment evolves, the

insights from this research can contribute to shaping policies that foster economic growth and adaptability.

While this research offers valuable insights into the challenges and opportunities within the New York City Zoning Resolution, certain limitations should warrant consideration in future studies (see Appendix). Adopting diverse data sources and a broader scope to include analysis of various industries and zoning regulations like parking and frontage requirements contribute to building a more holistic system for evaluating zoning for economic opportunities. By doing this, it will not only provide actionable insights for crafting more responsive and adaptive zoning policies but also enrich our understanding of the intricate interplay between zoning policies and the diverse economic landscape of urban environments.

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APPENDIX

Tables

Table A3-1 POI Types Related and Non-related in Analysis

Related POI Types			
acting_school	clinic	ice_cream	research_institu
advertising	clothing store	internet_cafe	restaurant
animal_boarding	college	karaoke	salon
animal_shelter	conference_centr	karaoke_box	school
aquarium	courthouse	kindergarten	services
archaeological_s	coworking_space	language_school	shelter
arts_centre	dancing_school	marketplace	shoe_repair
atm	dentist	meditation_centr	social_centre
bakery	doctors	monastery	social_club
bank	dojo	money_transfer	social_facility
bar	drinks	motel	spa
bbq	driver_training	museum	store
beauty_school	driving_school	music_school	stripclub
bicycle_rental	events_venue	music_venue	studio
bicycle_repair_s	fast_food	nail_salon	swingerclub
biergarten	ferry_terminal	nightclub	theatre
boat_rental	food_court	payment_centre	toy_library
bureau_de_change	fortune_teller	pharmacy	training
cafe	fuel	picnic_site	university
cafe;bar	funeral_director	place_of_worship	urgent_care
camp_site	gallery	post_office	vehicle_inspecti
car_rental	gambling	prep_school	veterinary
car_wash	graphic_design	printer	waste_transfer_s
casino	guest_house	prison	works (art studio)
charging_station	hospital	pub	zoo
childcare	hostel	public_bath	
cinema	hotel	radio station	
Non-related POI Types			
aerodrome	flagpole	planter	survey_point
antenna	food_sharing	platform	switch
apartment	fountain	pole	table
artwork	give_box	police	tank
attraction	give_way	polling_station	taxi
beacon	grave_yard	post_box	taxi_point
beehive	hand_sanitizing	postal_relay_box	technical_monume
bell	house	priority	telephone
bench	information	public_bookcase	theme_park (historical)
bicycle_parking	junction	pump	toilets
binoculars	letter_box	pumping_station	toll_gantry
boundary_stone	level_crossing	railway_crossing	tomb
buffer_stop	library	railway_station	torii
building	lighthouse	ranger_station	tower
bus_station	loading_dock	recycling	townhall
bus_stop	lounger	relay_box	track

bus_stop;street_	mailroom	reservoir	traffic_mirror
cannon	manhole	rest_area	traffic_signals
car-sharing	manor	ruins	trailhead
chalet	maritime	Saint_Nicholas_"	tram_stop
chimney	massage_chair	satellite_dish	trolley_bay
clock	mast	service_station	turning_circle
community_centre	memorial	sewer_grate	turning_loop
compass_rose	milestone	shelter	tutoring
compressed_air	mini_roundabout	shower	utility_pole
concert_hall (community center)	mist_spraying_co	sightseeing	vending_machine
crane	monitoring_stati	signal	viewpoint
crossing	monument	site	waste_basket
crossover	motorcycle_parki	smoking_area	waste_disposal
derail	motorway_junctio	speed_camera	wastewater_plant
device_charging_	obelisk	spur_junction	water_tap
district	owner_change	station	water_tower
disused	Pan_Am_Clipper_C	Statue	water_works
disused:pub	parcel_locker	steps	watering_place
disused:restaura	parking	stop	wayside_cross
drain	parking_entrance	storage_tank	wayside_shrine
dressing_room	parking_space	street_cabinet	wifi;telephone;d
drinking_water	payment_terminal (Bitcoin)	street_lamp	windmill
elevator	photo_booth	stroller_rental	yard
environmental_ha	pier	subway_entrance	yes (Unspecific barrier value)
fire_station	planetarium	surveillance	

Table A4-1 Unlisted Businesses in Zoning Resolution and Suggested Use groups

Businesses	Assumed UG
Electronics And Appliance Retailers	6C/ 10A
Cosmetics, Beauty Supplies, And Perfume Retailers	6C
Confectionary And Nut Retailers	6C
Window Treatment Retailers and All Other Home Furnishings Retailers	6C/ 10A
Gambling Industries	15A
ATM	6C
Emergency And Other Relief Services	4A
Home And Garden Equipment Repair and Maintenance	16A
Nail Salons	6C
Diet And Weight Reducing Centers	6C/9A
Other Personal Care Services	6C
Internet Cafe	6C
Karaoke / Box	6C/12A
Meditation Center	6C/9A
MusicSchool	6C/9A

Acting School	6C/9A
Beauty School	6C/9A
Dancing School	6C/9A
Fine Arts Schools	6C/9A
Language Schools	6C/9A
Exam Preparation and Tutoring	6C/9A
Toy Library	3/6C
Waste Transfer	17/18
Zoo	15A
Payment Center	6B/6C
Food (Health) Supplement Stores	6C
SPA And Wellness Centers	6C/9A
Coworking Space	6B
Conference Center	6B
Photo Booth	6C
Bitcoin ATM	6C
Takeout & In-Store Shopping	6C
Home Business / Home Service	6B

Table A4-2 Top 29 Neighborhood with the most diverse nonconforming business types

Neighborhood	Business Types
Park Slope-Gowanus	23
Bushwick South	15
Ridgewood	14
Crown Heights North	13
West Village	13
East Village	12
Lower East Side	12
Carroll Gardens-Columbia Street-Red Hook	11
Forest Hills	11
Gramercy	11
Greenpoint	11
Hunters Point-Sunnyside-West Maspeth	11
Murray Hill-Kips Bay	11
Upper East Side-Carnegie Hill	11
Bushwick North	10
Jackson Heights	10
Midtown-Midtown South	10
Prospect Heights	10
Brooklyn Heights-Cobble Hill	9
Maspeth	9
Airport	8
Chinatown	8
Clinton	8
DUMBO-Vinegar Hill-Downtown Brooklyn-Boerum Hill	8
Fort Greene	8

Hudson Yards-Chelsea-Flatiron-Union Square	8
Lenox Hill-Roosevelt Island	8
North Side-South Side	8
SoHo-TriBeCa-Civic Center-Little Italy	8

Table A5-1 Nonconforming Automotive Charging Station in Different Neighborhoods and Zoning Districts

Neighborhoods	C1	C4	C5
Auburndale	1		
Co-op City		1	
Elmhurst		1	
Forest Hills	1		
Murray Hill-Kips Bay	1		
Turtle Bay-East Midtown	1		4
Upper East Side-Carnegie Hill	1		1
West Village	1	1	
Windsor Terrace	1		
Grand Total	7	3	5

Table A5-2 Nonconforming Brewery Pubs in Different Neighborhoods and Zoning Districts

Neighborhoods	C2	M1	M2	R5	R8
Astoria				1	
Bushwick North		1			
Carroll Gardens-Columbia Street-Red Hook			1		
East Village	1				
Glendale		1			
Greenpoint					1
North Side-South Side		1			
Park Slope-Gowanus		1			
Ridgewood		2			
Grand Total	1	6	1	1	1

Reflections on Research Drawbacks

- Limitation of OSM POI

As for the data source, although OpenStreetMap has better open data with up-to-date and localized sources, the sample size would be smaller compared to Google Maps. In future research, other data sources are encouraged to explore to address the deficiency of a single database.

- Manual Corrections and assumptions

In this project, the use groups of each POI are assigned under the rule of providing it the most flexibility to be conforming. However, due to the complexity of the zoning laws, sometimes it is hard to assign the permitted intuitively. There might also be cases where slight location deviation was found in the POI file. I manually checked each point or business to reduce the possible negative effects caused by inaccuracy or misclassification.

- Focusing on Economic Activities like Small Businesses, Local Retail, And Services

The project mainly discussed the economic activities under the zoning ordinance, with less focus on other regulations including the form of buildings, size of space, parking regulations, frontage requirements, and so on. Also, since the zoning amendment mainly focuses on small businesses and local commercial corridors, the project predominantly centers on local businesses instead of economic activities taking place in the office space. For further research, extending the industrial scope to all kinds of industries in the city could help to build a comprehensive system to evaluate the zoning for economic opportunities.