Resilient DenCity

Integrating
Real Estate
Flood Resilience
&
Urban Design

By:
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The Jersey City Waterfront: Year 2015
Resilient DenCity:
Integrating Real Estate, Flood Resilience and Urban Design

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P5 Research Report
AR3EX320
ExploreLab
TUDelft
Integrating the Real Estate, Flood Resiliency and Urban Design on the Jersey City Waterfront

This report focuses on the relationship between real estate, flood resiliency and urban design on the Jersey City Waterfront. Waterfront communities are increasingly at risk due to climate change and sea level rise. This report outlines how real estate development can be used to make urban waterfronts more flood resilient as well as provide more opportunities for recreation. By weaving together the needs and potential of Jersey City, a bright vision for the waterfront emerges.
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Introduction

0.1 Project Summary

The waterfront has always been a place of change. Whether its soil erosion, sea level rise, advancements in shipping technology, there have always been strong external forces acting on the waterfront. The activity and energy on the waterfront attracts life, which in turn attracts people and investment.

On October 29th, 2012, Hurricane Sandy barrelled into the New York City region and reawakened the importance of the urban waterfront. “Superstorm Sandy” created its own storm of ideas focusing on how to deal with extreme climatic events and the threat of sea level rise. The strongest rebuilding effort came through a federally sponsored program called Rebuild by Design.

Proposals were submitted from offices all over the world, and the finalists were mostly represented by a consortium of Dutch companies. As the title of the initiative states, these projects were primarily focused with integrating urban design and flood resilience (Gendall, 2015). How can flood defence infrastructure also increase the quality of the urban environment? While the approach of this initiative was a large benefit to public space the projects largely ignored the role of private space.

The private real estate market in the New York City region is a tremendous economic engine. While the market is stabilized by a growing demand of people wanting the live and work in New York City it is also being inflated by an increase international investment looking for a stable market to hold assets (Keenan, 2015). This stream of global capital is creating more lucrative luxury development throughout the region.

Could an investigation into the private approach to urban development expose new opportunities to increase flood resiliency and the quality of urban design? Surely the creation of public space has an impact on private space, surely flooding impacts private space and public space, and surely the creation on private space affects the quality of public space.
This report seeks to investigate how the private real estate market influences, and could potentially benefit, flood resiliency and urban design.

0.2 Problem Description

Of all the most high value and high density places effected by Hurricane Sandy, Jersey City has the least developed vision when it comes flood protection as of 2015. Hoboken won $240 million with OMA’s Delay Resist, Store, Discharge, and Manhattan won $320 million with the Big U Project, and The Meadowlands won $150 million with the New Meadowlands Project. At the very least these projects have a strong head start when it comes to building public consensus around a unified vision.

Unlike its flood funded neighborhoods Jersey City is a much purer form of a capitalist city. The city’s real estate market recently transformation from industrial to an office and housing market. This transition has been fuelled by an aggressive use of tax abatements for developers. (City of Jersey City, 2009) This policy attracts growth by reducing property taxes for a fixed period of time for development sites.

Jersey City has significantly increased its growth rate and attracted development with these policies, but it has largely created the banal soulless architecture that can be found all across North America. The tax abatement policy reduces annual property tax revenues by $80 million (McDonald, 2015). While there are significant long term upsides to this approach it leaves the government without the short term financial power to create and maintain iconic public space. The resulting city lacks the robust and diverse cultural richness that makes successful urban areas holistically resilient (Jacobs, 1964).

Jersey City is now at a crossroads, it is faced with the vulnerability to sea level rise and hurricanes, aging infrastructure and a tax policy that that leaves the government without the financial power to invest in a public future. Yet, at the same time it is increasingly becoming a more central location as the New York City Metropolitan region expands. It is well connected to Lower Manhattan through mass transit and is poised to continue to benefit from a “spillover” effect.

The problems and potential of Jersey City are strongly inter-related. This report will look at the three main tension points, the real estate market, flood resiliency and urban design, and then study how they interact. This is a pre-tense to a design proposal that integrates these forces creating a bright vision for the Jersey City Waterfront.
0.3 Research Question

How does the private real estate market interact with flood resiliency and urban design in Jersey City?

Sub-Questions

1. How does the real estate market shape Jersey City?
2. How does flood resiliency shape Jersey City?
3. How does urban design shape Jersey City?

0.4 Research Methodology

The purpose of this research report is to explore the interaction between the real estate market, flood resilience and urban design. In order to understand how these elements interact it becomes imperative to create a model of the environment and study how the model reacts when one of the elements is changed.

In order to create the model each element is studied individually. Chapter One of this report focuses on the real estate market in Jersey City, Chapter 2 focuses on flood resilience strategies, and Chapter 3 focuses on urban quality. Following that there is a Chapter on Smart Blocks, which is the research tool that ultimately interacts with the three elements.

Smart Blocks link urban design and real estate by using wood blocks. A wood block is a very effective way to negotiate between public and private space. This is because private urban space likes to be organized in specific ways, mainly relating to efficient circulation systems that adhere to building codes and do not waste space. Public space has more freedom when it comes to spatial conditions, as it is not as closely bound to the economic laws that govern private space. By moving and changing the amount of blocks on the table it is significantly easier to negotiate between the public and private realms.

Flood resilience is connected to urban design primarily through multi-purpose levees and green infrastructure. This means integrating flood walls with public parks, and creating green and blue areas that collect rainwater. These types of urban inventions help activate waterfront areas during low tide and protect communities at high tide.

Finally the real estate market is linked to flood resilience through density. The more expensive flood defence is the more density is required to create revenue. There is a limit to the amount of density that can be added because if more supply is added then there is demand in the market place, than the project has a higher risk to go bankrupt. A balance point has to be met where the cost of flood defence infrastructure is at a point that the real estate market can absorb those the costs.

The Smart Blocks model works by linking the elements together and assigning values to each of the elements. By changing the values it is possible to see how the different elements effect each other. Ultimately understanding this interaction will help lead to a state of equilibrium in which a level of satisfaction is met in each category.
Chapter 1

Jersey City’s Waterfront Real Estate Market

How does the real estate market affect Jersey City?
1.1 Regional Perspective

Jersey City is part of the larger New York City metropolitan region. While this region is comprised of three states and many different municipalities, the urban system works as a whole. The map on the above shows the income levels of where people live in the New York City region. This reveals some general patterns about the demand for real estate.

The core of the region, Midtown Manhattan, represents the highest demand of real estate. From there the income levels gradient outwards to a more industrial periphery. After that the suburban areas begin where primarily middle class families live and commute to work in the urban core.

The map on the right shows population density information for the region. When compared to income levels we start to see a picture about which locations have the highest land values. These are the areas with the highest income levels and the highest density. One of the locations with high income levels and high population density is downtown Jersey City.

Income Levels in the New York City Metropolitan Area

Population Density in the New York City Metropolitan Area

1. Income Levels Map. Source, American Community Survey.
1.2 Historical Perspective

The Jersey City waterfront has primarily been part of the industrial real estate market, only in the last few decades has it changed into a real estate market that is based on the needs of the service economy.

During the industrial period trade and commerce had a higher priority than recreation and living. This led to cities that were cramped and a waterfront that was off limits to the public. When container shipping was invented in the 1960’s cities moved port areas outside of the city center, freeing up urban waterfronts (Falk, 2007). These former port areas could now be converted into housing, offices, parking, and retail, the backbone of the new service economy.

This transition can be seen in the evidence on the left. By laying historical maps on top of each other, it becomes apparent how the Jersey City waterfront area evolved. It start out as an Island in 1609. During the first industrial revolution bulkheads emerged around Pau-lus Hook and the marsh in the back of Jersey City was drained. Following that land reclamation was used aggressively to accommodate the ever increasing size of ships.

The last image shows Jersey City today. What is interesting is that all of the black still visible in the diagram represents piers and development that previously existed along the waterfront. This shows how the waterfront is shrinking because it no longer supports industrial shipping.

Also the historical population of Jersey City shows evidence of the transition of land use. As Jersey City blossomed into a large shipping port the population of Jersey City also ballooned. The year with high largest population on record was 1930, still larger than the current population of Jersey City.

Following the loss of the shipping and railroad industries the population of Jersey City plummeted. For 50 years, between 1930 and 1980, the population of Jersey City was steadily declining. By the 1980’s Jersey City has started to re-brand itself as a cheaper alternative to Manhattan. By offering Wall Street banking firms like Goldman Sachs, and J.P. Morgan tax incentives, Jersey City has successfully attracted development along the waterfront.

![Historical Population of Jersey City](image)
Industrial Land Use

To

Public Park

Industrial Land Use

To

Residential Land Use
Jersey City Real Estate Markets
Source: City Planning Office City of Jersey City.

1.3 The Present Market
As the historical perspective showed, there has been a growing demand for Jersey City real estate since the 1980’s. This momentum is fueled by the growing service economy. The diagram on the left shows in proportion to one another the amount of space that has been built in each market over the last 20 years in Jersey City. This reveals that the Housing and Office markets are the primary driving force of the local real estate economy, while the retail and parking markets are there to service these primary markets.

1.4 Housing Market Analysis
Housing occupies the most amount of new construction in Jersey City over the last 20 years. From the U.S. Census data listed below some key facts emerge about the housing asset market. First the median home cost is less than New York City but almost double the average of the United States. This shows that Jersey City asset market is catering towards the people that want to invest in Manhattan real estate, but think they can get a better deal in Jersey City.

<table>
<thead>
<tr>
<th></th>
<th>Jersey City</th>
<th>New York City</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Home Age</td>
<td>61</td>
<td>64</td>
<td>37</td>
</tr>
<tr>
<td>Median Home Cost</td>
<td>$304,000</td>
<td>$466,900</td>
<td>$170,100</td>
</tr>
<tr>
<td>Property Tax Rate</td>
<td>$21.95</td>
<td>$6.41</td>
<td>$12.07</td>
</tr>
<tr>
<td>Homes Owned</td>
<td>26.6%</td>
<td>29.4%</td>
<td>57.3%</td>
</tr>
<tr>
<td>Homes Vacant</td>
<td>12.4%</td>
<td>9.1%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Homes Rented</td>
<td>61.0%</td>
<td>61.5%</td>
<td>30.2%</td>
</tr>
</tbody>
</table>

By comparing cap rate, or capitalization rate, between different office markets a picture starts to emerge about how investors feel about Jersey City. What is interesting is that cap rates in Jersey City are about the same as New York, lower than suburban markets and lower than the national average. What this means is that investors are willing to pay a higher price for less return on rent (Geltner, 2013). What this translates to is that investors, feel that the growth potential in these areas is very high, so they are willing to sacrifice revenue now because they are confident that the rent prices will rise faster than the national average over the next few decades.

<table>
<thead>
<tr>
<th>Cap Rates</th>
<th>Jersey City</th>
<th>Northern New Jersey Suburban</th>
<th>New York</th>
<th>US Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A</td>
<td>4 - 4.5</td>
<td>4.75 - 5.25</td>
<td>4 - 4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Class B</td>
<td>4.5 - 5.0</td>
<td>5.5 - 6</td>
<td>4.5 - 5</td>
<td>5.1</td>
</tr>
</tbody>
</table>
Rental price information helps paint a picture about the space market. The table below shows average monthly rent prices. Jersey City is about even with New York City, and much higher than the national average suggesting that the demand for space is high in Jersey City.

<table>
<thead>
<tr>
<th>Type</th>
<th>Jersey City</th>
<th>New York City</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio Apartment</td>
<td>$1,103</td>
<td>$1,088</td>
<td>$661</td>
</tr>
<tr>
<td>1 Bedroom Apartment</td>
<td>$1,153</td>
<td>$1,136</td>
<td>$765</td>
</tr>
<tr>
<td>2 Bedroom Apartment</td>
<td>$1,367</td>
<td>$1,347</td>
<td>$957</td>
</tr>
<tr>
<td>3 Bedroom Apartment</td>
<td>$1,778</td>
<td>$1,752</td>
<td>$1,289</td>
</tr>
<tr>
<td>4 Bedroom Apartment</td>
<td>$2,095</td>
<td>$2,065</td>
<td>$1,490</td>
</tr>
</tbody>
</table>

1.5 Office Market Analysis

Jersey City competes with Midtown Manhattan and Downtown Manhattan in the office market. The diagram on the left shows the relationship between location and demand for office space. Midtown Manhattan is the very center of the urban system, and therefore commands the highest rent prices for office space. There is also by far much more office space in Mid-town than in Downtown Manhattan. This can largely be attributed to central place theory (Geltner, 2013).

While Jersey City’s supply of office space is much smaller than Downtown Manhattan’s it still represents a significant amount. Jersey City’s Office market is the largest in the state of New Jersey.

The caps rates for office real estate asset market show that the Jersey City office market is slightly above New York city meaning that investors still see New York as a better option. Also investors see Jersey city as a better option than the suburban market. From this information we can conclude that investors see the potential of Jersey City primarily in the housing and office markets, with a higher percentage of housing space to office space.
Downtown Jersey City Development Map

- Proposed
- Approved
- Under Construction
- Completed after 1997

Map drawn with information from Jersey City City Planning Department 2014.
1.6 Development Map

The development map on the previous page shows that the property in downtown Jersey City is dramatically transforming. With many projects already completed and many more proposed. This map shows that there is still a lot of available space for development in Downtown Jersey City. The map shows that most of the development has been happening on the waterfront edge which was previously industrial. The more historic residential neighborhoods have largely been untouched by the development process.

1.7 Tax Abatements

Most of the development shown in the map above is driven by the use of Tax Abatements. This is a tax incentive for a developer, reducing property taxes for a fixed period of time. This is similar to the PILOTs system, or Payments in Lieu of Taxes. In a presentation posted on the City of Jersey City’s website titled “Tax Abatements: A Vehicle for Growth and Prosperity” it says that the benefits to using tax abatements are the following:

1. Stabilize Bottom Line for Rental Projects
   Abatements help developers secure financing in the face of high construction costs, environmental remediation and aging infrastructure by locking in future revenues.

2. Stabilize Monthly Payments for Condo Buyers
   Abatements lower early year payments, making the “numbers work” for many buyers. Lower monthly payments encourage home ownership and bring new residents to Jersey City.

3. Stabilize Rents for Commercial Tenants
   Abatements lure long-term commercial tenants, bringing jobs for Jersey City residents and new customers for Jersey City small businesses.

4. Denser Development
   Abatements allow developers to secure financing for larger projects. Philadelphia study found that a 10-year abatement led to 20% denser development. Dense development represents smart growth and limits environmental impact.

5. Wealth Creation
   Rising property values in surrounding neighborhoods have created significant wealth for longtime homeowners, especially low-income residents, seniors and minorities.

6. Employment and Economic Opportunity
   At least 20% of laborers on every abated project are union apprentices from Jersey City hired through a Project Labor Agreement signed by the developer. Commercial office construction has brought thousands of high-paying permanent jobs to Jersey City. New and revitalized neighborhoods have created entrepreneurial opportunities for retail and service businesses.

Each of the slides from the presentation bear the seal of the City of Jersey City, highlighting how City defends its use of the abatement policy. Dean Marchetto, a prolific local architect, describes tax abatements like a priming pump that help get new real estate markets started.

While there are clear benefits to tax abatements, there are also downsides. Tax abatements lower property taxes on new development. The strategy is that these abated properties still pay higher taxes than if the project site had remained vacant, but less if the property was charged at a full rate.

In the United States, local governments get most of their tax revenue from property taxes, and the state and federal governments get tax revenue from income tax. What the tax abatement policy does is increase the tax revenue and the population base at a skewed rate. This means that the annual budget is growing but there is less money in tax revenue per resident. This means that the city is getting poorer now and hoping that in a few decades when the abatements wear off, the city will finally have a larger budget to contribute to public space improvements.
In the meantime these policies make it hard for local governments to find funding for public initiatives outside of the bare necessities to keep the city going. And, because of this lack of funding the government will often try to negotiate deals with the private sector to build public space.

Public space creation or improvements can be negotiated as part of the abatement deal. The developer will be responsible for creating a park or plaza in return for getting a tax discount. Developers are more inclined to keep costs at a minimum when building these spaces (Kayden, 2000). The resulting space and improvements are largely lackluster since they are born out of a process of negotiating for the minimum. While this is a downside, eventually all of the properties will pay property taxes at a full rate, and Jersey City is making a long term investment in its future. But this tax structure leaves itself exposed unforeseen events, like finding tax dollars to rebuild after a hurricane.

1.8 Market Absorption Rate
The development map on the previous page shows that the property in downtown Jersey City is dramatically transforming. With many projects already completed and many more proposed. This map shows that there is still a lot of available space for development in Downtown Jersey City. Historically if the previous information about the demand for Real Estate were further analyzed it suggests that Jersey city has been absorbing around 1000 apartments per year. During the last 3 years the market has been absorbing around 5000 apartments per year. This is mostly due to pent up demand being released into the marketplace following the crisis.

For the purposes of the following Smart Blocks experiments in chapter 4 it is assumed that a new development on the waterfront could absorb 750 apartments per year, leaving 250 apartments per year to be absorbed by existing undeveloped areas.

1.9 Calculating Supply
After analyzing market demands a developer can then start to figure how to supply that demand. The supply side of the real estate system could react by changing the price of space or by adding new space (Geltner et al, 2013). Adding new space essentially means new construction.

If a developer decides to construct a new building then this is the moment that design and economics interact. Most often the developer will play it safe and just supply the space that is demanded. Sometimes they will ask the designer to give the building a look that will appeal to a certain market in order to increase demand. Rarely will the developer ask the designer to improve the overall of the site just by using design (Adams & Tiesdell, 2011).

The stock flow model to the right is a way to understand the interaction between the space market and the asset market. The Stock-Flow model has four axes, which represent four different criteria;
**Stock** is the amount of real estate space that is on the market.

**Price** is the cost to buy property.

**Rent** is the amount of revenue a property generates annually.

**Construction** is the amount of space being added to the market.

The lines that are drawn between these axes represents the relationships of what is happening between these axes. The following is how these four elements interact.

1. **NE Quadrant** - show the relationship between stock and rent. This is basic economics theory which shows that as the stock increase the rent decreases.

2. **NW Quadrant** - shows that the high the price of the property the higher the rent will be.

3. **SW Quadrant** - shows that the higher the price of the land the more construction will happen on that site.

4. **SE Quadrant** - shows that without new construction the stock of an area will diminish since building will be demolished and become abandoned. (Geltner et al, 2013: 26).

The stock flow model tests to see if a real estate project can create an equilibrium among these economic laws. Public space improvements and flood defense infrastructure adds to construction costs. A real estate based design proposal should consider these costs when proposing a density that creates adequate revenue.

1.10 Boom and Bust Cycles

Boom and bust cycles are caused due to an overshoot of supply in the market place and the need for the market to re-adjust itself (Geltner et al, 2013). Since construction and planning take a very long time market cycles tend to come in 10-22 year periods (Gordon, 1997).

David Gordon writes about the effect of market cycles on the Battery Park City Authority on page 251;

> The cyclical nature of the real estate market meant that the window of opportunity for a redevelopment authority was open only for a year or two near the peak of each cycle.

Being able to be ready to build in a boom and finish construction before a bust is essential to not going bankrupt. Some techniques that can reduce the risks of going bankrupt are:

1. Get control of the study area through a tax exempt government agency.
2. Speed up the approval process.
3. Sell as much as possible in the booms.
4. Build project in phases.
5. Start with a small scale project. (Gordon, 1997)

1.11 Designing Markets and Places

When developers become interested in shaping new real estate markets instead of buying into established markets, design becomes critical towards attracting demand. New large developments do not have the benefit of time to evolve, or have heritage value. This makes it harder for designers to create a new development that matches the quality of older more established urban areas.

In this way successful new developments find a balance between designing markets and designing places. Real estate is about figuring out the actual demand for space, and design is about matching the experience of that space to the demand. Below are two lists that explain the benefits of designing markets and spaces.

**Strength of Designing Markets**

1. Makes project more feasible.
2. Reduces risk of bankruptcy.
3. Easier to find investors.
4. Calculates the desired mass of a city correctly.
Strength of Designing Places

1. Shapes the Urban Network
2. Connects Design with Environment
3. Attracts people through nice experiences
4. Incorporates the historical value of a place.
   (Adams & Tiesdell, 2011)

1.12 Financial Feasibility

Large scale development projects are challenging when it comes to generating a positive return on investment. In order to deal with these challenges developers should focus on doing the following. (Gordon, 1997):

1. Generate Demand
2. Manage Supply
3. Create Confidence
4. Reduce Risk

Demand is generated from the price and quality of a product. In order to successfully attract people to invest in a new real estate market it is important to have high quality design at the right price. The relationship between these two factors is of utmost importance when trying to create a successful real estate market.

Phasing is key to being able to manage the supply of real estate. If too much supply is created and the demand can’t catch up, the development runs the risk of going bankrupt. Being able to take advantage of building a lot in market booms, and being able to scale down in market busts is key to being able to sustain long term development (Gordon, 1997).

Creating confidence is about having a good marketing campaign and strong local leadership (Adams & Tiesdell, 2011). Gaining the support of the local government is a great way to accomplish this. Success with large scale development is contingent of having a place promoter. This is a public figure that is heavily committed towards pushing the project forward (Adams & Tiesdell, 2011).

In order to reduce risk it is important to reduce the length of the approval process for development to make it easier to time market cycles. It is also important to delay investing in expensive infrastructure at the beginning of the process, and only pay for them after the consumer is purchasing the product at sustainable rates.

The diagrams on the right show how some large scale waterfront developments were more successful than others. Battery Park City kept capital expenditures low and successfully sold property at a high rate. Other places that were not able to do this went bankrupt.

1.13 Stakeholders

The Jersey City waterfront was commercial real estate for as long as it was industrial. It was a place for ships and piers. It was part of the city. When the waterfront became primarily used for housing and offices, human activity retreated from the water and the piers, since there was no longer any investment to maintain them. Now forgotten, this land is still owned by 9 public and private entities.

The map on the following page explains the parcel that each stakeholder owns. Accompanying that is also a description of each stakeholder. Each of these parties could be approached to provide feedback and potential investment in the project.
Property Ownership Map

Land Owner | % of Ownership
---|---
1. LeFrak & Simon | 44%
2. JCRA | 16%
3. State of New Jersey | 4%
4. EQR | 2%
5. Mack-Cali | 10%
6. City of Jersey City | 8%
7. Goldman Sachs | 3.5%
8. NJ Dept. of Veteran Affairs | 3.5%
9. New Jersey EPA | 8%

Source: New Jersey Tax Maps.
Private Entities - 60% Ownership

1. LeFrak Organization - 44.0% - The LeFrak organization is one of the biggest Real Estate Property Company in the United States. They are the majority stakeholder along the waterfront, and they control the whole area called Newport.

2. Mack-Cali Realty Corporation 10.0% - Mack-Cali Realty Corporation is a publicly traded real estate investment trust (REIT) with holdings throughout the Northeast and New Jersey. The majority of Mack-Cali's holdings are in commercial real estate including class A office space, although in recent years they have increased investment in multi-family residential properties. The company provides commercial real estate leasing, acquisition, management, development, and construction services for their real estate properties.

3. Goldman Sachs – 3.5% - is a financial services company that is based in the Goldman Sachs tower, the largest in Jersey City. They obtained ownership of the land when they acquire the property to build the tower.

4. EQR 2% - This is real estate company that was formed around a pier with a residential condo building on top of it. This would be a difficult acquisition, concessions would have to be made.

Public Entities - 40% Ownership

5. Jersey City Redevelopment Authority – 16.5% - Is a government agency that controls land which is to be used in the process of redevelopment.

6. City of Jersey City 8.0% - The land is controlled by the city council any amendment to this would require and hearing by the council.

7. NJ Environmental Protection Agency 8.0% - This agency took over this site because it was heavily contaminated. This agency is controlled at the State level about would require State approval to transfer ownership.

8. State of New Jersey 4.0% - This governing body is based in Trenton, NJ. Having the political support of the state would be very important towards the feasibility of the project.

9. NJ Dept. Veteran Affairs 3.5% - Another small stakeholder that could easily be absorbed by a larger state agency.

1.14 Conclusions

In conclusion this report found the following about the way the real estate market shapes Jersey City:

1. Development in Jersey City is driven by housing and office markets, housing being the largest market

2. Real estate investors feel that Jersey City has a high growth potential.

3. Jersey City has been undergoing a dramatic transformation from an industrial real estate market to a service economy market during the last 35 years.

4. Jersey City attracts development through tax abatements and PILOTs to make property taxes more competitive than New York City.

5. The land values in Jersey City are some of the highest in the United States.
Chinese ships building a new island in the South China Sea. The ships pump sand from the seabed through floating tubes. The industrial scale through which man can now solve problems is rapidly growing. What can we now achieve with the scalability of our power? Source, Google Earth & The Daily Overview.

Chapter 2

Flood Resilience

How does flood resiliency effect Jersey City?
2.1 Hurricane Sandy

On October 29th, 2012 Hurricane Sandy made landfall in Atlantic City, NJ. The devastation of this event has reawakened the importance of the waterfront in public consciousness. Critical pieces of regional infrastructure in Jersey City were flooded out during the storm, such as the Holland Tunnel and the Path Tunnels. People were trapped inside their apartments for days waiting for the contaminated flood waters to get pumped out of the city. This type of devastation is extremely expensive in dense urban areas like Jersey City, therefore, creating infrastructure that prevents these types of events is important for Jersey City’s future.

Hurricane Sandy was not a very powerful hurricane, only reaching Cat 1 status based on its windspeed. It was a large Hurricane though, covering the entire Northeast of the United States (Fig. 46). Also the path it took, hitting the NYC at a perpendicular angle, increased the size of the storm surge. Finally the event took place during a high-tide with a full moon, further exacerbating the height of the storm surge.

The next page depicts how the floodwaters rose in Jersey City. It is important to note that the high tide during Hurricane Sandy did not just come in and go out. Figure 46 shows how the water found low points in the topography of Downtown Jersey City and required days of pumping to remove.
2.2 Flooding in Jersey City

Jersey City experienced significant flooding during Hurricane Sandy. The diagrams on the next page, provided by Steven’s institute of Technology, show the extent of flooding in downtown Jersey City. After the high tide receded floodwater stayed in low points of Jersey taking days to be pumped out. In a report complied by the City Planning department of Jersey City it outlines how the storm damaged Jersey City. (City of Jersey City, 2014)

1. Flood waters inundated approximately 3,688 acres, or approximately 39% of Jersey City’s land area.

2. 6,515 land parcels in Jersey City experienced some level of storm surge inundation.

3. Residential, commercial, industrial, public and private school, church, and cemetery properties were flooded.

4. On the east side of Jersey City, the USGS measured high water marks at the Exchange Place PATH station at elevation 10.4 feet and 4.1 feet above ground, and at elevation 11.9 feet in Liberty State Park.

5. As of June 26, 2013, FEMA inspectors had approved damage claims by housing owners for 1,567 properties, and damage to tenant contents in 793 rental apartments, and approved $11,546,768.99 in housing related claims.

6. There was a loss of $12,337,900 in tax ratable properties due to Sandy related damage.

7. The emergency room at the Jersey City Medical Center was inundated. City Hall was flooded.

8. There was a loss of $12,337,900 in tax ratable properties due to Sandy related damage.

9. There was flood damage to three PSE&G substations in Jersey City. Power failure affected residents, businesses and government. 75% of Jersey City’s population lost power, which was not restored for many residents for more than a week.

10. In the week following Sandy, temperatures dropped and residents without power were without heat. The power failure also disabled traffic signals and necessitated an emergency driving ban for public safety reasons.

11. 15,000 tons of debris was removed from Jersey City streets by the Jersey City Incinerator Authority.

12. The storm surge overtopped tide gates that protect the City’s combined sanitary and storm sewer outfalls from infiltration at high tide. Flood water entered the combined sewer system through catch basins in city streets, which provided entree to any low lying buildings with insufficient backflow protection.

13. There was damage to NJ Transit’s Hudson Bergen Light Rail (HBLR) system in Jersey City from wind and flooding, including catenary impacts, damage to all electrical substations, signals, and other systems.

14. The PATH passenger train system that connects Jersey City with Manhattan, Newark, and Hoboken was swamped. The entire PATH system was out of service for two weeks after Sandy. A link to the World Trade Center was out for four weeks, and service to Hoboken was not restored until three months later. On average 241,725 passengers are dependent on the PATH system during weekdays.
Hurricane Sandy Flooding In Jersey City. Source, Stevens Institute of Technology.
Income Levels in Flood Zones

This diagram shows the relationship between the real estate market and flood resilience. The high income levels can also be considered high demand areas. This diagram exposes places where people want to live but are prone to flooding.

Regional income levels in Flood Zones Diagram. Source: Vincent Marchetto.
2.3 Flood Resilience Strategies

In June of 2013, almost a year after Hurricane Sandy, the New York City Department of City Planning published a report highlighting different strategies to deal with the many different conditions of the New York City shoreline. The report classifies rebuilding strategies into 5 main categories, Site, Reach, and Other. These strategies work to produce a catalogue that makes it easier for people and communities to choose the strategy that works best for them.

Site strategies are mainly for low density waterfront communities. These strategies are focused on protecting a single property from flooding. This can be done by dryproofing or elevating a building. More out of the box ideas include floating structures, which can deal with flooding but not with wave action.

Reach Strategies are for high density areas, places where it becomes easier to protect a whole community instead of individual properties. This can include building floodwalls and hard infrastructure. Or depending on the area restoring wetlands and bringing back the resilience that nature offers. Ultimately a combination of the strategies could lead to a comprehensive solution.

The Other strategies are not so much about physical interventions but more about how communities can organize themselves so they can be ready in case disaster hits. This can be done by setting up an insurance system, managing land uses in flood prone areas, having an emergency management department setup, etc. These strategies do not work independent of the other two.

By identifying ways to protect a community from flooding it makes it easier to figure out the best strategy for a specific site. When the cost of these interventions are compared it makes it significantly easier understand the feasibility of each strategy. Some places will benefit from the cheapest solution while others are better off making a long-term investment in their future.
For more information about Flood Resilience and Multi-Purpose Levees please see the P5 Research Report by Mattia Tintori
For more information about Stormwater Management please see the P5 Research Report by Matteo Ferrarese:

GREEN NETWORK:
A COMMON SOLUTION TO MULTIPLE PROBLEMS

2.3 The Cost of Flood Resilience

Below are general costs for flood defence infrastructure. With this information it is possible to compare it to the revenues that are created from real estate development. Theoretically if the real estate revenues are higher than the cost of flood defence than the project should be feasible. By creating a model in which the volume of infrastructure could be analysed one could start to get a total of the costs.

<table>
<thead>
<tr>
<th>Name of Project</th>
<th>Country</th>
<th>Years</th>
<th>Floodwalls</th>
<th>Costs Floodwalls ($m)</th>
<th>Movable parts Cost ($m/m)</th>
<th>O&amp;M Costs ($m/m/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maeslant barrier</td>
<td>NL</td>
<td>1989–1997</td>
<td>360</td>
<td>852</td>
<td>1.15</td>
<td>2</td>
</tr>
<tr>
<td>Nieuwe Waterweg barrier</td>
<td>NL</td>
<td>1965–1969</td>
<td>110</td>
<td>81.7</td>
<td>0.15</td>
<td>1.2</td>
</tr>
<tr>
<td>Maasland barrier</td>
<td>NL</td>
<td>1989–1997</td>
<td>852</td>
<td>81.7</td>
<td>2.37</td>
<td>1.2</td>
</tr>
</tbody>
</table>

2.4 Flood Resilience Conclusions

The following conclusions help explain flood resilience relationship with real estate and urban design:

1. Public and private property experienced significant flooding in Downtown Jersey City during Hurricane Sandy.

2. There are a range of proven strategies that prevent flooding for various different waterfront conditions.

3. There are a variety of ways the waterfront edge can be designed to protect against storm surge and also provide recreational space for the citizens of Jersey City.

4. Park systems can also be used to absorb rainwater, decreasing the risk of flash flooding and preventing combined sewer overflows.

5. Hard Infrastructure costs are high, much higher than an individual municipality could fund through its own tax base.
Chapter 3

Urban Design

How does the urban design shape Jersey City?

The Benidorm Waterfront by Carlos Ferrater & Partners.
Chapter 1 shows how understanding the real estate market makes projects financially feasible. Chapter 2 explains how to make communities safe from flooding. This chapter will explain how to make places more friendly to humans. How can real estate be shaped to maximize human comfort. And how can dikes be designed in a way that enhances the relationship between people and the water. By integrating real estate and flood resilience with urban design the aim have a proposal that maintains a high quality of life for the people that live, work and play there.

This chapter will introduce a few perspectives from prominent scholars and urban theorists on what makes a quality urban environment. Ultimately seven distinct methods are introduced that work to produce high quality urban places. While these methods are distinct they are not removed from each other. Each method is interrelated to the other.

3.1 Urban Quality through Social Diversity

Sociology is the study of human behavior. Naturally it makes sense that studying human behavior would be an appropriate way to judge the quality of urban design. Cities harbor human life and the level at which they achieve this task is a great way to understand if a city has quality. By interviewing and observing people sociologists try to understand the city through the eyes of its users.

In his lecture on the final day of InDeSem 2015, TU Delft professor, Michel Reidijk, claimed that “…making a place a better place to be, or a more interesting place, or a place more worthwhile to live in, is why we would like to intervene in the built environment.” This is a typical mantra of a sociologist, cities are ultimately for people (Gehl, 2010), and so cities should be designed in a way that increases human happiness (Montgomery, 2013). Contemporary urban design theory, which Reidijk addresses, is deeply rooted in the polemical work The Death and Life of Great American Cities by Jane Jacobs.

Jane Jacobs was inspired to write about the quality of the urban environment out of a reaction to modernist planning and the work of people like Robert Moses. Her book tries to offer a glimpse into how the form and layout of a city affect human social structures. Jacobs argues that modernist planning simplifies urban design to a point where it fails to capture the complexities that real working cities need to be able to function in a healthy way (Jacobs, 1961). One of the biggest contributors to a lack of diversity modernist planning idea of single-use zoning. By segmenting the city into places where people only work, or people only shop, or people only dwell, the modernist city was creating places that lack the cultural richness that makes people feel comfortable.

Diversity in the urban environment is paramount to producing happy and healthy urban communities. In order to promote diversity in cities Jacobs highlighted 4 conditions that should be included in every urban design (Jacobs, 1961;148):

1. The district, and indeed as many of its internal parts as possible, must serve more than one primary function; preferably more than two. These must insure the presence of people who go outdoors on different schedules and are in the place for different purposes, but who are able to use many facilities in common.

2. Most blocks must be short; that is streets and opportunities to turn corners must be frequent.

3. The district must mingle buildings that vary in age and condition, including a good proportion of old ones so that they vary in the economic yield they must produce. This mingling must be fairly close-grained.

4. There must be a sufficiently dense concentration of people, for whatever purposes they may be there. This includes dense concentration in the case of people who are there because of residence.

Creating a dense soup of social activity is what Jacobs claims high quality urban design is all about. Diversity of people also means a diversity of jobs and a diversity of buildings. Diversity makes cities more resilient and allows people to live richer lives. Another sociologist, William H. Whyte detailed how people use public spaces, and what
makes them successful.

In his documentary, “The Social Life of Small Urban Places” William H. Whyte (1980) talked about how the design of spaces has a social effect on people. He claimed that the highest quality spaces had a diversity of the following:

1. **Seating** – William H. Whyte said the following (1980: 6.01): “This might not sound like an intellectual bombshell but people like to sit where there are places to sit.” Move-able chairs and other types of seating are a great way to attract people to public spaces. Whyte claims that for every 30 sq. ft. of space there should be 1 linear foot of seating. (Falk, 2003; Whyte, 1980; Gehl, 2010; Duany, 2000).

2. **Connection to the Street** – Connection to the street helps attract people and keep places safe (see also Falk, 2003 ; Duany, 2000).

3. **Good Daylighting** – Understanding the impact that daylight and shadows have on the public realm is important towards creating a high quality space. Direct sunlight is not necessary but indirect light is (Whyte, 1980) (Gehl, 2010) (Duany, 2000) (Kriken, 2010).

4. **Places to Eat** – Street vendors attract people. This type of interaction helps activate urban spaces and increase social activity (Whyte, 1980) (Duany, 2000).

5. **Strong Connection with Water** – People really like being able to touch and interact with water. It also helps cool people and places down. Water has a nice white sound to it which helps muffle the sound of traffic and other people’s conversations (Whyte, 1980) (Falk, 2003).

6. **Street Trees** – Street trees help shade the street and they absorb water and filter air. Trees are very important in making a public space feel comfortable (Whyte, 1980) (Gehl, 2010) (Duany, 2000) (Kriken, 2010).

7. **Attractions** - Great spaces always have points of attraction, they can be street performers, public art, or even crime scene and accidents (Whyte, 1980), (Falk, 2003) (Gehl, 2010) (Duany, 2000).

Another strategy for creating diversity is to make small parcels and attract a lot of small developers instead of larger parcels which attract large big box developers. This was done in IJburg, NL where a finer grained urbanism was achieved by using smaller parcels (Tiesdell & Adams, 2011) (Gordon, 1997). The photo below shows how a modern development can still create the architectural diversity that can be found in historic urban districts.
This section will look at 2014 US Census data from the area to gain a better understanding of the mix of people that make up Jersey City.

<table>
<thead>
<tr>
<th>Race</th>
<th>Jersey City</th>
<th>New York City</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>34.9%</td>
<td>44.5%</td>
<td>74.2%</td>
</tr>
<tr>
<td>Black</td>
<td>26.1%</td>
<td>25.1%</td>
<td>12.6%</td>
</tr>
<tr>
<td>Asian</td>
<td>23.9%</td>
<td>12.9%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>14.3%</td>
<td>11.8%</td>
<td>4.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Family Population</th>
<th>Jersey City</th>
<th>New York City</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>95453</td>
<td>3063393</td>
<td>115226802</td>
</tr>
<tr>
<td>Family Households</td>
<td>58076</td>
<td>1843819</td>
<td>76595548</td>
</tr>
<tr>
<td>Non Family Households</td>
<td>37377</td>
<td>1219574</td>
<td>38631254</td>
</tr>
<tr>
<td>Household Size</td>
<td>2.57</td>
<td>2.62</td>
<td>2.61</td>
</tr>
<tr>
<td>Married Population</td>
<td>42.9%</td>
<td>42.7%</td>
<td>51.4%</td>
</tr>
<tr>
<td>Single Population</td>
<td>57.1%</td>
<td>57.3%</td>
<td>48.6%</td>
</tr>
</tbody>
</table>

The table above helps to give some general information about the social qualities of the people living in Jersey City. This area is one of the densest in the country and it is also on the younger side of the national average. Density is an important part of creating social diversity.

These tables show that due to the younger population more people are single in Jersey City than the national average. It is quite similar to New York City which is statistical evidence that Jersey City and New York City are really part of a larger metropolis of the Tri-State region. Culturally Jersey City is made up of four major ethnic groups, the ethnic mix in this area is significantly higher than most of the United States which also contributes significantly to the quality of social diversity.

The conclusion is that Jersey City has all the ingredients to have a city that has a high quality of social diversity. It is one of the densest places in the United States and there is no dominant racial group. There is also a mix of profession suggesting a robust and diverse economy, which also makes for strong and resilient communities.

Jersey City’s population is younger compared to the national average, and is similar to New York City where young people are attracted to the hustle and bustle of the city and then settle in suburban communities to raise children. Jersey City has a high level of social diversity.

The sociological approach to understanding urban quality is very pragmatic. It states that good quality design increases the social quality of human life. If there is one flaw with this way of thinking it is that cities might not actually be just about people.

### 3.2 Quality through Identity

Urban places can achieve quality just by the way they look, even if they are not necessarily comfortable to interact with. The stark identity of architecture and urban form can make places memorable. Kevin Lynch explored this in his book, The Image of the City.

A city that has a good balance of iconic buildings and simple background buildings is a recipe for high urban quality. Kevin Lynch, an urban planner and environmental physcologist examined how elements of a city work together to create an image in user minds (Lynch, 1959). Jane Jacobs was interested in observing the behavior of people, while Lynch was interested in asking people questions to understand the mental impression form leaves people with. Lynch believed that a structured and easy to interpret urbanism was a sign of high quality design.

According to Lynch there are five elements of a city that structure the mental image of a city (Lynch, 1959):

- **Paths** - They may be streets, walkways, transit lines, canals, railroads.
- **Edges** - They are the boundaries between two phases, linear break in continuity: shores, railroad cuts, edges of development, walls.
- **Districts** - Districts are the medium-to-large sections of the city, conceived of as having two-dimensional extent.
Nodes - They may be primarily junctions, places of a break in transportation, a crossing or con-
vergence of paths, moments of shift from one structure to another.

Landmarks - They are usually a rather simply defined physical object: building, sign, store, or mountain.

Lynch conducted a sociological study of three American cities in order to understand the mental image that citizens have of the city that they live in. By understanding how real urban form shapes the way the human mind interprets a city, Lynch believed that designers could use this understanding to create more memorable urban environments. An example of how positive identity can increase the quality of a city can be seen from Frank Gehry’s Guggenheim Museum Bilbao.

In the 1990’s the city of Bilbao decided to spend $228 million on an art museum to try and rescue the declining city’s economy. This incredibly risky project ended up paying off due in part to the strong identity of Frank Gehry’s architecture. The museum now produces 800,000 non-Basque region tourists a year compared to less than 100,000 before the building was completed (Plaza, 2007). The museum was so successful that it paid back its investors within seven years (Plaza, 2007).

Other successful landmarks and icons produce similar results for cities. The Eiffel Tower or Statue of Liberty might not be a comfortable place to spend time, yet their incredibly strong visual identity attracts people and ultimately raises the quality of an urban area. Architectural identity is achieved when an idea is clearly materialized, architecture acting as an agent for communication.

Kevin Lynch also studied Jersey City in his book, Image of the City, which was published in 1959. Even though Lynch’s book was more than 50 years ago, some of the problems about Jersey City’s lack of identity still exist till this day. Below is a statement by a Jersey City resident in 1959 that was given as part of Lynch’s research:

It’s much the same all over...it’s more or less the same down the streets, it’s more or less the same thing...I think we usually find our way around. Where there’s a will there’s a way. It’s confusing at times, you may lose some minutes in trying to find a place, but I think eventually you get where you what to go. (Lynch, 1959; 31-32)

To this day Jersey City suffers from chronic architectural banality. The memorability of places in Jersey City is low. Interestingly the most memorable part of Jersey City then and now, is the view of the New York City skyline, as evidenced in the quote below.

The most common response to the question of symbolism was nothing in the city at all, but rather the sight of the New York City skyline across the river. Much of the characteristic feeling for Jersey City seemed to be that it was a place on the edge of something else. (Lynch, 1959; 29)

Today, Jersey City is a much more liveable city than during the industrial period, but it still lacks a strong identity. Good urban design and beautiful architecture with a strong identity can attract people and investment to Jersey City.

Sometimes quality, doesn’t come from “star-chitecture”, or architects and urban designers at all. Sometimes urban quality emerges out of a long process of evolution.

3.3 Quality through Evolution

Another method of creating architectural quality is through the sub-conscious process of evolution (Alexander, 1964). Christopher Alexander argues that the lack of quality found in modernist city planning is due to the fact that people have started consciously designing buildings. Here he describes the unselfconscious system (Alexander, 1964: 26:

In the unselfconscious system the individual is no more than an agent. He does what he knows how to do as best he can. Very little demand
is made of him. He need not himself be able to invent forms at all. All that is required is that he should recognize misfits and respond to them by making minor changes. It is not even necessary that these changes be made for the better. As we have seen, the system, being self-adjusting, finds its own equilibrium, provided only that misfit incites some reaction in the craftsman. The forms produced in such a system are not the work of individuals, and their success does not depend on any one man’s artistry, but only on the artist’s place within the process.

According to Christopher Alexander the quality of our built environment severely diminished with the invention of planners and architects. Designers have to compete in a marketplace and therefore they use design as a way to stand out and abandon the evolution process. Therefore the forms are never able to achieve the quality of something that has been continuously made and improved over hundreds and thousands of years (Alexander, 1964). This can easily be seen when the qualities of an evolution-based building is compared to a modern building designed by a single architect.

The Mousgoum hut, found in Cameroon, is depicted above is an excellent example of how high quality emerges from a long process of evolution. On page 30; in Notes on the Synthesis of Form, Christopher Alexander describes the Mousgoum hut:

The hemispherical shape of the hut provides the most efficient surface for minimum heat transfer, and keeps the inside reasonably well protected from the heat of the equatorial sun. Its shape is maintained by a series of vertical reinforcing ribs. Besides helping to support the main fabric, these ribs also act as guides for rainwater, and are at the same time used by the builder of the hut as footholds which give him access to the upper part of the outside during its construction [and maintenance].

This type of radical and efficient form is a perfect example of very high quality design. This type of complexity packed into such simplicity could only have come about through an unselfconscious process (Alexander, 1964). This is level of quality would be impossible to achieve through consciously trying to understand social behavior or consciously setting up scientific evaluations.

In his essay the City is Not a Tree, Alexander directly addresses the evolutionary approach to city planning. He claims that the modernist city structures the urban fabric in a hierarchical structural “tree” areas really social structures and urban environments are structured as a “semi-lattice” (Fig. ?) He writes the following:
In simplicity of structure the tree is comparable to the compulsive desire for neatness and order that insists the candlesticks on a mantelpiece be perfectly straight and perfectly symmetrical about the center. The semi-lattice, by comparison, is the structure of a complex fabric; it is the structure of living things, of great paintings and symphonies.

Creating complex semi-lattice structures is very complicated and cannot be done with a single human mind. These structures require the collective thinking of large groups of people over a long period of time. That is why semi-lattice designed cities are typically born out of an evolutionary process.

Christopher Alexander’s theories on evolutionary design and planning make a clear point at the way quality can emerge. Evolution has the ability to produce wonderful architecture without architects playing a role in the process. While this information is insightful a purely evolutionary process happens to slowly to deal with the modern day demands for space. One way to help speed up this process is to make design and real estate markets more competitive.

3.4 Quality through Competition

Competition, in a more economic sense, but also social, is a proven way to increase the quality of products and services. Theoretically, competition creates the following.

1. Lower costs and prices for goods and services
2. Better quality
3. More choices and variety
4. More innovation

(Stucke, 2013)

Quality emerges from a competitive process when there is a strong market demand and there are a lot of competing parties. The competitive process forces these parties to innovate, or try and beat each-other on price. Through this competitive process the consumer usually ends up with a higher quality and cheaper product.

In cases where there is weak market demand, such as a recession, quality is reduced in order to bring the price down to an affordable level. This tactic is very short-term thinking, and will have long-term consequences. This quote from David Gordon highlights an instance of this (Gordon, 1997: 261):

The developer cut costs to the bone to offer small condominium apartments at the lowest possible price and sold hundreds of units in a sluggish market. Unfortunately, the high rise form of the project and its mediocre design caused a political controversy that eventually resulted in dismantling the redevelopment agency.

Game theory is a major method used in mathematical economics and business for modeling competing behaviors of interacting agents (Borries et al, 2007). What game theory explains is that by mathematical modeling an environment and being able to score users based on certain outcomes, they create a platform where a competition can take place (Maas, 2007). Competition in urban environments encourages interaction and incentivizes improvement.

In design, competition is a driving force of quality. Many of the world’s most prestigious buildings were designed through a competitive process. This practice, while questionable, does produce quality. The fact that 1,700+ architect firms submitted designs for the new Guggenheim Helsinki probably improved the quality of the final design that will ultimately be constructed on the site.

Logically, competition can simulated by a computer. An example of that are cellular automata. The image below shows what is called Conway’s Game of Life. This is a binary system where a pixel in the grid is either on or off. Then rules are applied to the system like if two adjacent pixels are turned on then the pixel turns on, or if 3 adjacent pixels are on then the pixel turns off. After the pixels are chosen that will start on, and the rules are defined then many generations are simulated. What we end up seeing looks very much like the life cycles of cellular life (Wolfram, 1986).
Theoretically it is possible to simulate competitive forces in the built environment with a logic system that is similar to cellular automata. Some architectural experiments have already been made. While the final design for this project did not use cellular automata, this section leaves the door open for future experiments where the computer work with the competitive forces that shape the city.

### 3.5 Quality through Heritage

Historical buildings give people a sense of belonging. People’s roots are directly connected to the familiar scenes of the city in which they dwell. A building that successfully attracts cultural significance can appreciate in value over time, unlike most buildings which lose value over time.

The price of rent in old buildings tends to be cheaper than new buildings. Older building stock, mixed with new construction creates economic diversity which in turn helps create social diversity. Jane Jacobs talks about this:

> Cities need old buildings so badly it is probably impossible for vigorous streets and districts to grow without them. By old buildings I mean not museum-piece old buildings, not old buildings in an excellent and expensive state of rehabilitation—although these make fine ingredients—but also a good lot of plain, ordinary, low-value old buildings, including some rundown old buildings. (Jacobs, 1961; 156)

Sometimes the weathered or worn in look and feel that a building adds to its charm and the object acquires quality out of the simple fact that it is old and you cannot make old things.

Not surprisingly, given the industrial history of the Jersey City Waterfront, all of the remaining historic sites are former pieces of infrastructure. Little was preserved of the waterfront as it constantly evolved to accommodate larger and larger ships. Despite this constant reconstruction some significant heritage sites on the waterfront have survived. The map on the following marks the position of the following sites.

The conclusion is that while Jersey City has a rich industrial past and the design of the waterfront does little to celebrate it. All of the major historically significant sites are in disrepair and are not open to the public. Re-opening these sites could be a major opportunity for a project on the Jersey City waterfront.
Historic Sites on the Jersey City Waterfront

1. Hoboken Terminal
   Built 1908
   Still in Use

2. 6th Street Embankment
   Built 1902
   Abandoned 1994

3. Hudson and Manhattan Railroad Powerhouse
   Built 1908
   Abandoned 1929

4. The Morris Canal
   Built 1836
   Abandoned 1924

5. Central Railroad of New Jersey Terminal
   Built 1889
   Abandoned 1967
Description - The 6th Street Embankment is a former elevated rail line that runs for a half-mile along Sixth Street in Downtown Jersey City. The embankment is as high as 3 stories above the ground level in some places. The embankment was built circa 1902. The bridges that connected each stone segment have been demolished. Since being abandoned in 1994 a dense forest has started growing on the platforms. This helps add much needed green into downtown Jersey City.

Current Status - The embankment is currently going through a preservation process by The City of Jersey City. There is a coalition of residents that are trying to preserve the embankment and turn it into a public park.

Hoboken Terminal

Description - The station was constructed and owned by the Delaware, Lackawanna & Western Railroad and designed in the Beaux-Arts style. This is a major transport hub that includes Trains, Subways, Ferry Service, Bus, and Taxi. The station has an iconic tower and a stunning waiting room.

Current Status - The station was restored to its original condition in 2005 after years of disrepair. This is the only major heritage site on the waterfront that is still in use as a working piece of infrastructure. The station suffered severe flooding during hurricane Sandy, leaving the transportation hub out of service for months.
**Description** - This building is the most architectural artifact found on the waterfront. Built and 1908, and operating as a powerhouse only until 1929 (Wikipedia, 2015). This building first powered the PATH trains that connected Jersey City to Manhattan through tunnels. The Historical Society of Jersey City makes it known that the completion of this building and the path system was so important at the time that the President of the United States, Theodore Roosevelt, was the one that first activated the powerhouse.

**Current Status** - The building is currently undergoing a renovation to keep it from further deteriorating. The building is heavily damaged and contaminated, and its iconic smokestacks have recently been removed and destroyed.

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**Description** - The Morris Canal was the first major piece of infrastructure built on the Jersey City Waterfront. Completed in 1836 this canal went all the way to Pennsylvania to pickup coal. The canal lost its relevance when the railroads became a more feasible way to transport freight.

**Current Status** - Currently a shabby and under used park borders the canal. In 2009 an proposal for the canal was put forward but nothing has happened since then, and there has been no money raised to implement the
Central Railroad of New Jersey Terminal

**Description** - The current terminal building was constructed in 1889 but was abandoned in 1967. Before the PATH subway trains that went under the Hudson River this terminal served as a major access point to New York City. This was the point that people would get off the railroad and board ferries bound for New York City.

**Current Status** - The terminal is on the New Jersey Register of Historic Places and incorporated into Liberty State Park. Parts of the Terminal like the rail platforms are completely abandoned. And green has taken over these areas. The image of the industrial ruin being taken over by nature evokes a feeling of time.
3.6 Quality through the Natural Environment

The quality of a place can also be attributed directly to the natural landscape that the city is set within. A view of the ocean or of rugged mountains can be an escape from the hustle and bustle of the city. There are many examples of cities that use untouched nature to enhance the quality and value of the built environment. Vancouver is a great example of how preserving views of the natural environment leads to a higher quality city.

Unfortunately most of the natural landscape that existed in Jersey City has been erased due to its previous use as a heavy industrial port. One of the reasons why the New York City area became such a thriving metropolis was because of the abundance of life and resources that early settlers found in the region. Below is a picture from the Mannahatta project which tried to re-imagine the untouched natural past of New York City. Perhaps a proposal for the Jersey City Waterfront could bring back the value of the natural landscape.

![Natural Environment of New York City. Source, Mannahatta Project.](image)

Part of what made Vancouver’s vertical experiment both unique and desirable was the way it accommodated residents’ biophilic needs. The City’s new downtown was shaped to a large extent by the local obsession with views. Despite its dark winters, almost nobody in the city wants to face south, where the sun occasionally appears through the rain clouds. Vancouverites instinctively turn their gaze north and west: to mountains, rain forest, and ocean—in other words, to nature’s rugged complexity. Any construction that threatens to block views to the North Shore mountains is met with outrage. City planners have responded with bylaws that shape the skyline, creating a series of “view corridors” through the downtown that allow for unimpeded mountain views from various vantage points to the South.

![Natural Environment around Vancouver. Source, www.city-data.com](image)

The picture above shows the dramatic natural background which helps make Vancouver such a great place. In his book Happy City, Charles Montgomery explains how the natural environment plays a role in urban design of Vancouver:


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While there might not be much natural landscape left in Jersey City views of the Hudson River, and the NYC skyline provide value for Jersey City real estate. A proposal for the Jersey City waterfront should be sensitive to these view-sheds. Below is a picture of what the New York City skyline looks like from the Jersey City Waterfront.

3.7 Quality through Connectivity

Penn Station in New York City is probably one of the ugliest places in New York City, yet due to the fact that it is highly connected to so many places it is always full of people. Sometimes urban quality emerges out of the people themselves instead of the architecture and design. There are people performing live music, people wearing everything type of fashion imaginable, connectivity attracts diversity, since everyone needs to get around (Whyte, 1980).

Jan Gehl wrote about this in his book Cites for People. He claimed that one of the most common things people do in successful public spaces is witch other people. The best spaces are where there are, “People watching people watching people” (Gehl, 2010). Connectivity creates activity and activity creates quality.

The business model for Facebook is to sell advertising space on their web platform while offering its services free to the user. The large user-base which increases the value of the advertising space. Business today is all about generating traffic. Great places generate traffic and this traffic produces new revenue streams.

Jersey City is a very transit oriented community as can be seen from the table on the right. Due to its history as a thriving port Jersey City has more transit infrastructure than most cities in the United States.

<table>
<thead>
<tr>
<th>Commute Mode</th>
<th>Jersey City</th>
<th>New York City</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto</td>
<td>33.8%</td>
<td>22.7%</td>
<td>76.1%</td>
</tr>
<tr>
<td>Carpool</td>
<td>7.4%</td>
<td>5.0%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Mass Transit</td>
<td>46.0%</td>
<td>55.6%</td>
<td>5.0%</td>
</tr>
<tr>
<td>Bicycle</td>
<td>0.5%</td>
<td>0.8%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Walk</td>
<td>8.5%</td>
<td>10.3%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Work at Home</td>
<td>2.9%</td>
<td>3.9%</td>
<td>4.3%</td>
</tr>
</tbody>
</table>

There is relatively zero biking in Jersey, which is surprising for a place that is flat and very dense. In a community like Jersey City cycling could play a much larger role, which would help improve the quality of the urban environment. Benefits would include but not limited to, less need for parking, less noise in the city, less air pollution, safer streets, savings for residents on gas, and a healthier lifestyle.

Jersey City also depends on the automobile more than New York City. This is an area where Jersey City can improve. The map of the next page helps to explains transit in Jersey City.

Mass Transit Options:

Hudson Bergen Light Rail - This is a tram line that runs along the coast of NJ. This connects the NJ communities of Bayonne, Jersey City, Hoboken, and Weehawken.

NY Waterway Ferry - This is a public transit service that brings people between NYC and NJ.

Water Taxi – This is a private ferry service that brings people between NYC and NJ.

Path Trains - These are the most critical pieces of transportation infrastructure in the region. These trains connect people in Jersey City to the NYC Subway system. This is the main link to New York City and proximity to PATH stations significantly increases real estate value.

NJ Transit Bus – The main terminal for these bus is Hoboken Station and bus lines run throughout Jersey City.

NJ Transit Commuter Rail – This rail service can be picked up at Hoboken Terminal which is at the border between Hoboken and Jersey City. This station services all points west including Newark International Airport.
Downtown Jersey City Transit Map

- Stations
- 5 Min Walking Radius
- Hudson Bergen Light Rail
- NY Waterway Ferry
- NJ Transit Commuter Rail
- Path Trains
To assemble or disperse ties the more people will join them. Work to strengthen the invitations to invite longer stays in life and work together. Allow life from inside the buildings to interact with the outdoor people who pass by there.

Design city space in order that it is inviting and safe for security.

Integrate various functions in cities to ensure versatility, experiences as well as interact with other people on their way.

Carefully locate the city’s functions to ensure shorter distances is possible between them and a critical mass of people and events.

Several general city planning make up a crucial prerequisite to change zone between buildings and city, between built and unbuilt; here is where life from both inside and outside can be present in order to connect the city in a faster but sustainable way.

The integration of a green mobility (as Jan Gehl intended for car traffic is needed to ensure the city a prosperous public space.

For more information about Public Spaces please see the P5 Research Report by Cosimo Conserva:

RESILIENT DENSITY

JERSEY CITY WATERFRONT: TOWARDS A HUMAN PUBLIC REALM
3.8 A More Complete Understanding of Quality

A holistic view of quality is “Striving to capture the full value of a potential project, not only the short term financial gains, also the long-term cultural, social, and sustainable values” (Adams & Tiesdell, 2013).

By creating a built environment that is more sensitive to human life, people are able to embed their city with cultural value more easily. Probably the most important way to build resilience into a community is to create places that people care about. To recap this report identified 7 ways that urban design can achieve high quality;

1. Quality can come through social diversity.
2. Quality can come from a place that has a strong identity.
3. Quality can emerge out of a long process of evolution.
4. Quality can emerge out of a competitive process.
5. Quality can come with age and sentimental attachment.
6. Quality can come from the natural landscape of an urban area.
7. Quality can emerge from well-connected places.
Chapter 4

Smart Blocks

How do real estate, flood resilience, urban design interact?
In order to be able to understand the relationship between real estate, flood resilience, and urban design it became important to develop a tool that could deal with this complexity. The purpose of the tool was not only to understand these relationships but also use this understanding as a way to design. This was the genesis of the idea for a tool that would later be called Smart Blocks.

4.1 Rutgers Block Workshop

The idea to use blocks to deal with the complexity of the Jersey City Waterfront site came from a workshop at Rutgers University with Professor Tony Nelessen. An image of the workshop can be found above. During the workshop graduate students used wood blocks as a way to quickly test urban form. While this made it easy to shape space the blocks used for this workshop were more or less random. This made it difficult to be able to make calculations about how much space, etc, the blocks were representing. It was concluded that if the blocks were made specifically for the purpose of working on the Jersey City waterfront then a much more accurate model of proposed development could be created. Values could be per-assigned to the blocks and the entire composition could be totaled in real-time allowing more information to be available during the design process.

Another take away from the workshop was that the map of Jersey City could be more dynamic. For the workshop tracing paper was placed on top of a map of the waterfront. On this tracing paper parks and roads could be noted. But if one wanted to change the tracing paper it required the removal of all the blocks which is very inconvenient. From this it was concluded that projecting a base-map around the blocks would make the map much more dynamic. The roads and parks could even update on autonomously as the blocks were moved. Traffic flows, wind information, and shadows could also be projected and updated in real-time with the use of a projector.

Also a last note, 1:400 scale was unnecessarily large and the scale of 1:1000 would be easier to work with.

4.2 Why Use Blocks?

Designing cities, buildings, and environments is a very creative process and requires many different types of thinking. Psychologists classify thinking into two main categories, convergent thinking and divergent thinking (Guilford 1956). Convergent thinking is solving problems that have a single answer. Divergent thinking is about working with problems that have infinite solutions (Guilford 1956). The human brain has a wonderful ability to think divergently, while the computer can think convergent at speeds significantly faster than the human brain. When it came time to create a tool to work with density on the Jersey City Waterfront I thought it was important to be sensitive to the thinking ability of both the human and the computer.

Blocks by their very nature engender divergent thinking. When you give someone a set of white blocks and ask them to make a composition, it’s clear that there is not one right answer. The person has to try to project meaning onto what they made, try to create understanding and value from the spatial relationship between two blocks. This is thinking. Blocks stimulate thinking easier than most objects, which is why they are the preferred toy through which to teach children how to think divergently. Here is an excerpt from a scientific
While both types of thinking are important in the design process, divergent thinking is necessary for the initial creative spark. Convergent thinking plays a role in the later stages of the creative process when the idea has to be engineered into reality.

Unfortunately divergent thinking is a skill that is hard to find in today’s society. Ken Robinson, an expert in creativity and education, clearly lays this out in his lecture on May 24th, 2009 to the RSA. He makes it clear that divergent thinking is something that humans are born with but modern education systems educate people out of their ability to think divergently. According to a study 98% of kindergarten students scored at genius level for divergent thinking. As these same children were tested as they aged they continually scored lower and lower on the test.

There is a very clear correlation to Alexander’s theory about the semi-lattice vs. the tree and convergent vs. divergent thinking. The divergent city is a great city and people can easily make divergent cities with blocks.

In conclusion, blocks are a great way to fundamentally connect with people’s inner creativity and divergent thinking. By allowing the computer to take over convergent tasks people will feel inclined to focus on being creative. Enabling creativity is the same as empowering people, blocks were used because they have an uncanny ability to make people think.

4.3 Walmart and the Bar Code

Today Walmart is the world’s largest company with over 11,000 stores in 27 countries, under a total 71 different brands (Fran, 2010). While the ethics of its business practices may be questionable, it is still interesting to understand how Walmart became such a large company. This enormous big-box chain came about due to a technological breakthrough, the bar code. Smart Blocks, like Walmart, uses bar codes to facilitate making faster business decisions.

In 1973 Walmart introduced the bar code system into its stores, which gave it a big advantage over its competitors. This system provided a feedback loop allowing Walmart to see the sales from its stores in real-time. This allowed Walmart to make more accurate predictions as to how much to order from its manufacturers. Having greater control and flexibility over the supply allowed Walmart to run a more efficient business than its competitors, which only made orders on a weekly basis (Lewallen, 2004).

Having more information at the time of the decision making process will always help people make the more sensible decision. By concentrating the decision-making to a few people in a headquarters office, the bar code system gave Sam Walton, the founder of Walmart, the ability to make decisions at a rate that normally was done by thousands of store managers. In that way Smart Blocks gives its users the power to design large urban areas intelligently and quickly. Facilitating the creation of multiple configurations that can be compared to each other.

4.4 Smart Blocks Real Estate Process

Following the Rutgers workshop the following processes where developed to make a set of blocks which could hold real estate information.

1. Setup up a quality multi-criteria evaluation of spatial quality with the community through an online survey.
2. Setup a NPV model for real estate for specific location.
3. Set a space quality tolerance factor through negotiation between stakeholders.
4. Hold block workshops with stakeholders in which the software aids users to find solutions.
that above both the target are above NPV Factor and the Spatial Quality Factor.

5. Design agreed on by stakeholders.

4.5 Smart Blocks Design Quality Process

**Diversity** - Use a diversity of block shapes and uses attached to the blocks.

**Identity** - Organize blocks in a way that creates a balance between landmarks and context buildings.

**Competition** - Create a common scoring system and make the exercises competitive.

**Evolution** - Repeat the process many times, with different stakeholders and different citizens, and see what common trends come out of the process.

**Natural Landscape** - Measures facade surface area with views to determine which designs take advantage of the view.

**Connectivity** - The projector can map potential traffic models in between the blocks based on agent based models.

**Heritage** - Heritage sites can be designated and buildings with views of them, or in close proximity can be increased in value.

4.6 Block Inventory

The block inventory for the first trials of Smart Blocks was kept at a simple five blocks. On the left are an example of more complex and diverse block inventory from an urban planning game called Play the City.

Below is the list of the block sizes that were chosen for this experiment. These block sizes represent typical building types that are found in this area of Jersey City. They represent the following:

<table>
<thead>
<tr>
<th>Block</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Office Tower</td>
</tr>
<tr>
<td>2</td>
<td>Residential Tower</td>
</tr>
<tr>
<td>3</td>
<td>Skinny Tower</td>
</tr>
<tr>
<td>4</td>
<td>Double Loaded Corridor Slab</td>
</tr>
<tr>
<td>5</td>
<td>Four Row Houses</td>
</tr>
</tbody>
</table>

Every location is different and block can represent buildings and or pieces of buildings. When it comes to making blocks the most important thing is that the amount of rent-able space inside the blocks can be calculated and the shape of the block is designed so it can easily interact with other blocks.

If the system was to be expanded additional blocks could be added to the inventory, such as school blocks, hospital blocks, etc.
4.7 Net Present Value Calculation

Another equation aimed at forecasting project feasibility is Net Present Value or NPV. The NPV measures the value of a real estate venture at a specific time. The equation takes into consideration the effect of time, such as inflation and land appreciation rates. This equation compares costs to revenues over time and if the NPV is below zero it means it is not a feasible project, whereas if it is zero and above it is a feasible project. Maximizing the NPV of a project is the primary concern of a developer. Below basic elements of an NPV calculation are explained in greater detail:

**Revenues** - Revenues are the income streams from a project. This typically comes in the form of rent and sale of real estate. The graphs on the left help explain the relationship between revenues and costs. Making sure these large scale waterfronts are profitable ventures is not easy. Some have been known to be successful, like Battery Park City while others like the London Docklands were financial failures.

**Costs** - Costs are the total cost of the project to the investor. This includes the cost to purchase the land, lawyer fees, application fees, professional services, construction, and management. In the case of waterfront development, resiliency infrastructure is an added cost.

**Discount Rate** measures the importance of cash in the beginning of the project. This number is essentially measuring the interest rate on the loan that the developer has on the building. Being able to generate larger amounts of revenue earlier in the process makes a real estate venture less risky.

**Inflation rate** is the rate at which more currency is added to a capital system typically this happens at a rate of 2%. If the rate of inflation fluctuates higher or lower than 2% it will have consequences in economy.

**Appreciation Rate** is the rate at which land grows in value over time. On average this is typically the same as the rate of inflations but in localized situation these can change with changes in market demands.
4.8 Smart Blocks Software Model

**Demand** - Demand represents the desire for space in the rental market and in turn the desire for real estate assets in the asset market (Geltner et al., 2013). In order for revenues be higher than costs for flood defense demand for a specific area must be high. Demand also works with design quality as higher quality design can attract more demand.

**Supply** - Supply is the amount of space that is constructed on a given development. Ideally the supply would match the demand. Supply interacts with design quality as the design may limit the amount of supply that can be made. Zoning laws are an example of this. Designs need to balance accommodating a demand in the marketplace and making sure that the product is made with a high quality.

**Design Quality** - Design quality interacts with supply and demand. First the design responds to what the market wants but and the same time can influence demand. Design has the power to change demand, which is why there is a give and take between the two elements. Design quality also influences supply because if the demand is too high or too low it might now make a comfortable human habitat.

**Revenues** - The development strategy for flood defense is designed to actively create revenues through real estate sales. If the city built new land for development, they would make revenues off land sales, and future taxes. Private developers could make revenues off selling space in the asset market, or through rent in the space market.

**Costs** - Besides the normal construction costs for development, this strategy has added costs for flood protection infrastructure and land reclamation. To cover these costs developments typically have to be in places with high land values and be able to bear high density urban environments.

**Net Present Value** - Once it is possible to understand the revenues and costs for a particular design the overall value that the project creates can be calculated. This value is called the Net Present Value and it can be used to compare various configurations. Ultimately the methodology used to design flood defense instructure should rank different configurations based on their NPV and the quality of the urban design.
Final Smart Blocks Prototype

The during the research period of this thesis, the most advanced prototype built to work with Smart Blocks is identified on the left. The vision for the project was to be able to embed data into the wood blocks. If the location and identity of a block could be known, then a lot of information could be processed that relate to the modeled urban environment. The following is a list of the data that this report identified that successfully could be displayed in real-time when working with Smart Blocks:

**Basic Calculations**
- FAR
- Lot Coverage
- Net Present Value
- Construction Years
- Population Added
- Number of Buildings
- Total Area of Each Use
- Average Building Height

**Complex Calculations**
- Tax Revenue Added
- Agent Based Traffic Modeling*
- Wind Modeling*
- Shadows*

*Tested by the MIT MediaLab CityScope Project

The prototype used a 3D scanner to identify blocks and a projector to overlay information on the blocks. Establishing an effective and simple link between multiple blocks and a computer is the most difficult challenge. The link used for this prototype still needs to be improved in order to have a product that could be sold on the market.

This prototype successfully closes the feedback loop and creates a real experience where data is updated in real-time as people interact with the blocks. While this experience is primitive when compared to the forms that can be generated by sophisticated 3D modeling software, it allows people to envision a new and intuitive way that they could interact with the computer. Perhaps blocks could be a new form of digital interaction through where people could more easily understand and shape urbanism.

Philips Innovation Award

Smart Blocks was a finalist in the Philips Innovation Award. This is the largest student entrepreneur award in the Netherlands. Smart Blocks was top five out of more than 150 teams competing for the prize.
<table>
<thead>
<tr>
<th>ONE</th>
<th>[4]</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWO</td>
<td>[7]</td>
</tr>
<tr>
<td>THREE</td>
<td>[14]</td>
</tr>
<tr>
<td>FAR</td>
<td>0.36</td>
</tr>
<tr>
<td>COV</td>
<td>0.02</td>
</tr>
<tr>
<td>SPA</td>
<td>0.98</td>
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<tr>
<td>NET</td>
<td>0.51</td>
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<td>COSTS</td>
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<tr>
<td>CONSTR</td>
<td>2.6</td>
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</tbody>
</table>
5

The Experiments: Smart Block Results

The following are the density studies that were completed to answer the research question. Each experiment starts with a question and ends with a conclusion. By adjusting the amount of density and watching the NPV change one can figure out a strategy for the best way to deploy density on the site.
### Scheme Name: First Try

#### Scheme Question: Can the blocks produce appropriate looking urban form and a positive Net Present Value?

#### Date: 2/12/14

#### Location: TU Delft ExploreLab

#### Participants: Vincent Marchetto

---

#### Observations:
Blocks were intuitively placed on the table and were post-scanned. This was aimed to understand what data basic urban form would generate. Form came from creating higher densities around PATH stations and maximizing sunlight and views.

#### Conclusion:
This experiment was a success. A NPV positive project was produced, and the composition of blocks look urban. This technique now can start an optimization phase to try and improve the data collected from this experiment.

---

#### Table: Scheme Details

**Input**
- Building Keep Rate: 2%
- Professional Fee Rate: 0.15%
- Average Apt Size: 1,100 sq. ft.
- Annual Commercial Absorption Rate (sq. ft.): 500,000
- Annual Retail Absorption Rate (sq. ft.): 60,000
- Ratio of Retail to Condos: 0.8
- % of Retail in Ground Floor: 0.7
- Apartment Rental Rate: 34

**Residential Information**
- Residential Absorption Rate (Units): 750
- Network Density (%): 0.51
- People per Apt: 1.5
- Cost of Infrastructure ($): 2,000,000,000
- Area of Site (sq. ft.): 10,029,69
- Building Construction ($): 7,503,905,400
- Annual Apartment Sq. Ft. Leased: 825,000
- Yearly Population Added: 1,125
- Total Apartments: 16,587.03
- Total Residential Build-Out Years: 22.12
- Yearly Rent Income: 22,440,000
- Annual Commercial Income: 161,700,000
- Total Commercial Build-Out Years: 22.1
- Total Commercial Sq. Ft.: 11,520,000
- Total Commercial Dollars ($) 20,070,438,200
- Total Commercial Volume: 0
- Total Residential Units (sq. ft.): 18,245,735
- Total Residential Dollars ($) 12,717,450,000
- Total Residential Volume: 0
- Total Residential Build-Out Years: 22.12
- Total Residential Rates ($): 980
- Total Residential Floors: 88
- Total Retail Rates ($): 400
- Total Retail Floors: 28
- Total Retail Dollars ($) 24,000,000
- Total Retail Sq. Ft.: 1,265,781
- Total Retail Build-Out Years: 21.1
- Total Retail Dollars ($) 19,970,000
- Total Retail Floors: 6
- Total Retail Floors: 6
- Total Office Floors: 6
- Total Office Floors: 6
- Total Office Sq. Ft.: 3,649,147
- Total Office Floors: 6
- Total Office Floors: 6
- Total Office Dollars ($) 24,000,000
- Total Office Sq. Ft.: 11,520,000
- Total Office Dollars ($) 19,970,000
- Total Office Floors: 6
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- Total Office Floor...
**Experiment 2**

**Scheme Name:** Increase Density

**Scheme Question:** What happens when the density from experiment 1 is increased?

**Observations:** The Total Storey (St) was increased from Experiment 1. The NPV for the developers decreased and increased for the city. The LVFAR was decreased to help balance the different. Also the % of Retail in Ground Floor was adjusted.

**Conclusion:** The increase in density also increased the land value which had a negative impact in NPV. Also the longer building period creates a longer time lag between start and when the project turns positive.

---

**Inputs**

- **Area of Site (Sq. Ft.):** 10,029,693
- **Cost of Infrastructure ($:)** 2,000,000,000
- **Network Density (%):** 0.51
- **Residential Absorption Rate (Units):** 750
- **Average Apt Size (Sq. Ft.):** 1,100
- **MPL Area (Sq. Ft.):** 1,735,212
- **Residential Rate ($):** 980
- **Commercial Rate ($):** 500
- **Retail Rate ($):** 400
- **Land Value per FAR ($) per Acre:** 1,200,000,000
- **People per Apt.:** 1.5
- **Professional Fees Rate (%):** 0.15
- **Annual Commercial Absorption Rate (Sq. Ft.):** 500,000
- **Annual Retail Absorption Rate (Sq. Ft.):** 60,000
- **% of Retail in Ground Floor:** 0.7

**Totals**

- **Total Residential Sq. Ft.:** 17,113,005
- **Total Commercial Sq. Ft.:** 7,360,000
- **Total Ground Floor Sq. Ft.:** 1,813,864
- **Total Sq. Ft.:** 26,286,873
- **Total Open Space (Sq. Ft.):** 6,480,616
- **Total Gross Dollars ($) Total Develoapable Land (Sq. Ft.):** 8,294,481
- **Total Building Volume (Cu. Ft.):** 0
- **Total Residential Buildout Years:** 14.72
- **Total Commercial Buildout Years:** 19.65
- **Total Residential Buildout Years:** 20.74
- **Total Construction Years:** 21
- **Total Commercial Buildout Years:** 14
- **Total Retail Buildout Years:** 10

**Costs**

- **Total Land Value ($):** 3,803,040,118
- **Development Costs ($):** 10,869,307,348
- **Professional Fees ($):** 921,687,030
- **Building Construction ($):** 6,144,580,200
- **Annual Commercial Income ($):** 1,078,000,000
- **Annual Apartment Income ($):** 1,078,000
- **Annual Commercial Income ($):** 250,000,000
- **Annual Retail Income ($):** 24,000,000
- **Total Construction Years:** 21

**Density Calculations**

- **FAR:** 3.17
- **Lot Coverage (%):** 0.22
- **Spaciousness (%):** 0.78
- **Network Density (%):** 0.51
- **Average Building Height (Stories):** 14.22

---

**Graphs**

- **City Annual Cash Flow**
- **Developer Annual Cash Flows**

---

**Date:** 3/12/14

**Location:** TU Delft ExploreLab

**Participants:** Vincent Marchetto
**Scheme Name:** Towers Only  
**Scheme Question:** What happens when high-rise density is maximized?

**Observations:** The towers only scheme significant changes the lot coverage. The NPV is better than Experiment 2 but still lower than Experiment 1.

**Conclusion:** This scheme does better than Experiment 2 due to the fact that it requires less ground floor blocks.

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<thead>
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<th>Input</th>
<th>Value</th>
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<tr>
<td>Area of Site (sq. ft.)</td>
<td>10,929,690</td>
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<td>Cost of Infrastructure (dollars)</td>
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<tr>
<td>Network Density (%)</td>
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<td>People per Apt.</td>
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<td>Professional Fee Rate (%)</td>
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<td>Annual Commercial Absorption Rate (sq. ft.)</td>
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**City Observations**

<table>
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<th>City</th>
<th>Observation</th>
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<tbody>
<tr>
<td>City Name</td>
<td>City</td>
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<tr>
<td>City NPV</td>
<td>NPV=5B</td>
</tr>
<tr>
<td>Developer NPV</td>
<td>NPV=0</td>
</tr>
</tbody>
</table>

**New Present Value of Scheme**

- T=0: NPV=0  
- T=5: NPV=1B  
- T=10: NPV=2B  
- T=15: NPV=3B  
- T=20: NPV=4B  
- T=25: NPV=5B  
- T=30: NPV=6B  
- T=35: NPV=7B  
- T=40: NPV=8B

**City Annual Cash Flow**

- T=0: NPV=0  
- T=5: NPV=1B  
- T=10: NPV=2B  
- T=15: NPV=3B  
- T=20: NPV=4B  
- T=25: NPV=5B  
- T=30: NPV=6B  
- T=35: NPV=7B  
- T=40: NPV=8B

**Developer Annual Cash Flows**

- T=0: NPV=0  
- T=5: NPV=1B  
- T=10: NPV=2B  
- T=15: NPV=3B  
- T=20: NPV=4B  
- T=25: NPV=5B  
- T=30: NPV=6B  
- T=35: NPV=7B  
- T=40: NPV=8B
**Scheme Name:** Max NPV @ T=30

**Scheme Question:** Can the computer pick a combination of blocks that yields a higher NPV?

**Date:** 7/12/14  
**Location:** TU Delft Explore lab  
**Participants:** Vincent Marchetto

**Observations:** The NPV of this scheme is higher at T=30 for the developers than any of the other experiments. The NPV of Jersey City is close to the low end of this range. This scheme also has a nice mix of buildings, but with a favoring towards the row house, which far out numbers the other blocks. In this scheme the rowhouse is used to create a long human scaled shopping street. The high-rise density is then clustered in places close to transit.

**Conclusion:** This scheme makes more money sooner by building less density. Also it makes more of a profit by using a lot of rowhouses, since low-rise is cheaper to build per sq. ft. We see the lot coverage restriction now plays a vital role helping the developer successfully avoiding a solely low rise scheme. The lot coverage restriction now plays a vital role in defining the amount of open space in the masterplan.
Observations: The NPV of this scheme is higher at T=40 for the developers than any of the other experiments. The NPV of Jersey City is close to the low end of this range. This scheme also has a nice mix of buildings, with a favoring towards the rowhouse which far out numbers the other blocks. In this scheme the rowhouse is used to create a long human scaled shopping street. The high-rise density is then cluster in places close to transit.

Conclusion: This proves that the evolutionary problem solver is working. This scheme again favors maximizing the amount of low-rise it can build before hitting the lot coverage limit.
Experiment 6

Scheme Name: Max NPV @ T=50

Observations: This scheme again increases the Total Sq. Ft. from the last experiment.

Conclusion: This scheme makes more money sooner by building less density. Also it makes more of a profit by using alot of rowhouses, since low-rise is cheaper to build per sq. ft. we see the lot coverage restriction successfully avoiding a solely low-rise scheme. The lot coverage restriction now plays a vital role in defining the amount of open space in the masterplan.

Date: 9/12/14
Location: TU Delft ExploreLab
Participants: Vincent Marchetto
Scheme Name: Group Collaboration
Scheme Question: How does that smart block system work as a collaborative project.

Observations: This scheme incorporates a large park in the middle of the commercial tower by exchange place, and a large mixed use tower on the Southern edge of Lefrak’s property. Also the laser-cut models of the existing buildings are starting to make their way into photos. It would look better if they were painted dark grey or black.

Date: 9/15/14
Location: TU Delft ExploreLab
Participants: Vincent Marchetto, Mattia Tintori, Cosimo Conserva, Matteo Ferraese

Conclusions: This scheme is on the low-end for density. In order to be more optimized it should be re-visited and about 5 million sq. ft. should be added, maximizing the use of low-rise.
For this experiment phasing was considered. The project was broken down into 7 4-year phases. The photos on the left document each phase. The NPV analysis below show how the City’s NPV slowly grows over time as it sells off parcels of land in a continuous process. The developer’s NPV is broken up into phases. What this analysis illustrates is the risk level diminishes over time. Each phases trending less risky. This is highlighted by the yellow line. This makes sense as more the development is closer to completion the more amenities are available to the residents.
**Scheme Name:** Masterplan Test

**Scheme Question:** How do the blocks with pre-defined parcel sizes instead of just using a site outline?

**Date:** 9/2/15

**Location:** TU Delft ExploreLab

**Participants:** Matteo Ferraese, Mattia Tintori, Cosimo Conserva, Matteo Ferrasse

**Observations:** This scheme makes the most amount of money out of any scheme for the city, while maintaining a fairly high rate of return for private investors. Also the parcel sizes that were designed in plan fit well with the blocks. This ensures that the lots can support compositions of buildings with efficient floor plans.

**Conclusion:** This scheme produces an urban form that creates defined human scaled streets while creating higher densities around transit and in locations that have park and waterfront views. The entire ground plane is free from cars, relying on a network of bike lanes, transit, walkways,绿道，and paved shopping streets. Automobiles are serviced by a subterranean road network. The network of parks retains runoff and the waterfront promenades protect the city from storm surges. The scheme is financially viable and produces a profit of $2.6B over a period of 30 years.

**NPV**

- **NPV = 0**
- **NPV = 1B**
- **NPV = 2B**
- **NPV = 3B**
- **NPV = 4B**
- **NPV = 5B**
- **NPV = 6B**

**Developer Annual Cash Flows**

- **T = 0**
- **T = 5**
- **T = 10**
- **T = 15**
- **T = 20**
- **T = 25**
- **T = 30**
- **T = 35**
- **T = 40**

**City Annual Cash Flow**
Chapter 5

The Master Plan Design

How can flood resiliency, real estate, and urban design be combined to create a design for the Jersey City Waterfront?
### 5.1 Smart Blocks to the Final Design

The final massing for Resilient DenCity was heavily influenced by Smart Block Experiment 8. The scheme concentrated development around transit stops at Exchange place, Newport and Hoboken station. Also the design balanced commercial, retail, and housing development based off of historic demands for in each respective real estate market. The blocks served as base, and were re-interpreted as building a public spaces. This made it significantly easier to make a design that was based on a smart approach to real estate financing, while at the same time creating interesting urban spaces, and covering the cost of flood defence infrastructure.
5.2 The Layers of Resilient DenCity

1. Public Spaces

A pedestrian street that serves as a retail network for the project connects Hoboken Station to Exchange Place station. Jersey City has a lack of pedestrian only streets, and this street would add a new urban character to downtown Jersey City.

2. Density

The Density for this project is designed to maximize feasibility, and urban quality. There is higher density around an office hub to the South a more low-rise neighborhood residential neighborhood in the middle of the project and higher density to the North near the Hoboken Transportation Hub.

3. Automobile Circulation

Automobiles have limited access in the plan, just enough to allow access to parking garages underneath the buildings, as to preserve space for parks and pedestrian areas. Also the network helps get rid of the dead ends that make vehicular mobility around the site cumbersome.

4. Green/Blue Network

A green/blue network through the plan helps store stormwater during heavy rainfalls and works to prevent Combined Sewer Overflows which are currently polluting the Hudson River. The network also provide a variety of recreational park space throughout the project.

5. Reclaimed Land + Dike

93ha of land is reclaimed behind a dike. The sale the of the land pays for the dike. The dike completely protects all of downtown Jersey City from flooding.

6. Existing City

The existing waterfront of Jersey City is a decaying industrial landscape that does not serve the needs of a 21st century city. Ultimately a new waterfront can enhance the city and keep is safe from flooding.
Jersey City Waterfront Masterplan. By: Vincent Marchetto
Urban Samples

1. Morris Canal
2. Paulus Hook
3. Harismus Cove
4. Newport
Morris Canal Neighborhood

FAR 2

This neighborhood is the least dense area of the proposed design. It features a wide “marina” area, an iconic pedestrian bridge that provides access to the waterfront park on the dike, and a floating hotel. The hotel could be moved inside the dike during storms and the winter and spread out in the Hudson River during the summer.

Paulus Hook Neighborhood

FAR 9

This neighborhood is the most dense of the proposed development. It features slender residential towers and large office buildings. This area would be the “Financial District” of the waterfront, building off the concentration of office buildings that already exist in the area. There is also an area where the canal gets bigger and forms a water square offering a variety of recreation spaces.
Harismus Cove Neighborhood
FAR 4

This neighborhood is a residential district that offer a water square and a variety of housing types. This variety creates rental apartment and condos, helping to accommodate people with mixed incomes in the same neighborhood. This helps create the diversity that Jane Jacobs says is fundamental to creating good urban places.

Newport Neighborhood
FAR 5

This is a dense residential neighborhood that is an extension of the Newport development that is owned and controlled by the LeFrak Organization. It features public spaces, small parks, and a promenade on the waterfront dike. This new development provides amenities that the existing Newport development lacks.
The Pedestrian Street

The Green/Blue Network
The Jersey City Seawall
Overall Goal

Direct the future growth of Jersey City in a way that solves its current and future problems.

Flood Resilience Goals

1. Protect the city from future flooding due to storm surge
2. Prevent Combined Sewers Overflows during flash flooding

Urban Design Goals

2. Fine grained urban design related to the human dimension (Lynch, 1959)
3. Create density around existing transit stations
4. Promote biking as a mobility option
5. Increase opportunities where people can interact and enjoy the water.
6. Create a strong identity for Jersey City
7. Restore all the heritage sites on the existing waterfront into working spaces that people can interact with.
8. Make room for public art projects along the waterfront (Falk, 2002)
9. Enforce the social diversity of Jersey City (Jacobs, 1961)
10. Create recreational park spaces where people can interact with nature in the city.
11. Create pedestrian areas where people can experience the city without cars.

Real Estate Goals

1. Get control of the study area through a tax exempt government agency (Gordon, 1997).
3. Build project in phases.
4. Start with a small scale project
5. Speed up the approval process
6. Build commercial real estate in market booms and build infrastructure in market busts.
7. Maximize the value of the view of the New York City skyline.
8. Minimize start-up capital needed to get the project started (Gordon, 1997).
9. Make sure developers have a share of equity in the project (Gordon, 1997).

Design Project Summary

Resilient DenCity is a prototype for dense urban waterfront development. The world is rapidly urbanizing, and the sea levels are rising. Urbanization increases the demand for urban land, especially in waterfront areas. But, sea level rise makes these areas less safe as they become increasingly flood prone. By building private space on the waterfront, cities can create projects that are financially feasible and also protect the existing city from flooding.

The design proposal synthesises the 3 elements of the report, real estate, flood resilience, and urban design into an integrated vision for the Jersey City Waterfront. This design serves to treat private and public space as inter-related instead of just focusing on flood resilience in the public realm.

The goals on the left strongly are influenced by the research done for this project. Many elements of the design serve more than one goal. For instance the green/blue network creates park spaces and collects rainwater during flash flood events. Also the private real estate shapes and defines a network of pedestrian areas. By carefully weaving together the layers of the city a rich urban quality can emerge.

Hopefully this vision for the future waterfront can be an inspiration for what can be achieved when communities, companies, and citizens work together. This project would be one of the largest and most ambitious projects in the United States, and it would be difficult to see it through to completion. By overcoming the difficulties Jersey City has the ability to protect itself from flooding and create a rich new urban area.

Sincerely,
Vincent Marchetto

Make no little plans...
-Daniel Burnham, 1907
5.1 Road Map for the Future

**Step 1**  
**Develop Concept** – This is an exploratory and research based phase that tries to find a concept that can meet the project goals.

**Step 2**  
**Feasibility Study** – Full-scale engineering study of the project area $250,000. This study will legally allow politicians to support this project. This study would last around three months.

**Step 3**  
**Creation of the Jersey City Waterfront Redevelopment Agency** – Out of agreement with The Port Authority of NY/NJ, The State of New Jersey, The City of Jersey City, and several private land owners. This agency will have access to tax-exempt bond financing (Keenan, 2013).

**Step 4**  
**Acquisition of Waterfront Properties** – In order to receive funding for the project it is important for an entity to have complete control over all the properties (Gordon, 1997).

**Step 5**  
**Financing** – This would be obtained through various measures the most conventional methods are described below:

1. Government grants providing start-up capital for the project.
2. Bonds against future revenues
3. Bonds against the cost of flood insurance
4. Project revenues from the sale or leasing of space and PILOTs. (Keenan, 2013)(Gordon 1997)

**Step 6**  
**Contract Planning and Engineering Professionals** – This would be done through and RFQ and RFP process. The selected firm must demonstrate sufficient experience with urban waterfront design.

**Step 7**  
**Make a Public Announcement** – This would make it allowed the general public to start to take a position on the project and it would notify them about public workshops and meeting where they could get involved.

**Step 8**  
**Smart Blocks Workshops** – This could be done with Smart Blocks and it would help create a common understanding of what is value about the waterfront and how the community of Jersey City could use it to maximize everyone’s benefit.

**Step 9**  
**Design** – An urban planning practice will be contracted to create the legal masterplan for this development. This document will specify how much each developer is allowed to build on specific sites. It is important to distribute density and capital in an efficient way.

**Step 10**  
**Environmental Review Process** – After the design is completed it must be submitted for an environment impact review. This is one of the longest and biggest obstacles for the project. This project could pass the environment impact review if the following of two options happened:

1. The project is deemed to cause environmental damage and is required to offset the damage by rebuilding wetlands in another location in the Hudson River Estuary.
2. The project is deemed to be contaminated therefore cleaning up the site will constitute enough of a positive environmental impact.

**Step 11**  
**General Approval** – This would also be a lengthy process and would have to be approved by the city Council of Jersey City and the State of Jersey. There are ways that the approval process can be expedited (Gordon, 1997).

**Step 12**  
**Contracting** – This would be done in accordance with a legal RFQ and RFP process this would be for engineering services and for the General Contractor of the project.
**Step 13** Construction of Land Fill and Seawall – This could be completed in as little as 5 years and as long as 15 years depending on the funding available for construction.

**Step 14** Establish Site Developers – This would be done in an RFP process where developer would have to compete for lots. Ideally lots would be broken up into smaller parcels to attract a larger amount of smaller developers and ultimately create a finer grained city.

**Step 15** Construction of Real Estate – This would be done in accordance with zoning codes specified in the redevelopment plan. This would be done in phases the help weather the boom and bust cycles of the market.

**Step 16** Marketing – This would include advertising and listing in local real estate brokerages. An onsite marketing and leasing facility should be setup which contains promotional material for the project as well real estate brokers that could lease apartments to people. Also a strong online and social media campaign should be established.

**Step 17** Sale and Leasing of Space to Consumers – This would start before the completion of a project in order to revenue streams as soon as the building comes online.

**Step 18** Maintenance of Seawall and Infrastructure – a tax structure would have to be in place on the residents of Jersey City to maintain the seawall, the added population of 26,000 people on the waterfront would significantly help reduce the tax money required per resident.
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