



The local socio-economic impact of improved waterborne public transportation. The case of the New York City ferry service

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ARTICLE INFO

Keywords:

Accessibility
Urban transformation
Gentrification
United States of America
Waterfronts

ABSTRACT

This paper looks into the recent actions of the New York City government to connect its five boroughs over water and the consequential impact on the socio-economic conditions of local coastal neighborhoods. The predictions from the Comprehensive Citywide Ferry Study (CFS2013) are contrasted with actual data and observations of the transformations that have taken place in the direct surroundings of a selection of ferry terminals, both in terms of spatial changes, as well as economic growth or decline.

The paper starts with an illustration of how different modes of waterborne transportation steered urban transformation processes and coastal land uses over time. Next, the paper explains the rise of the NYC ferry network as a contemporary answer to a growing demand for public transportation that connects coastal neighborhoods. A comparative analysis between a selection of ferry landings reflects upon the impact that improved accessibility has on neighborhoods' spatial, social, economic, and environmental conditions. The paper studies several parameters, including the neighborhoods' property prices, employment rates, daily commutes, development interest, demographics, and tourism.

What distinguishes this paper from other studies is the direct link between the quantitative data and the social, economic and environmental characteristics of the surroundings of the ferry landings. Instead of providing a mere technical analysis, the paper studies the transformation of neighborhoods in proximity to the ferry stops and reflects upon hypothetical future impact of new ferry stops. A link is made between the quantitative results of existing studies to a case analysis of the concerned neighborhoods. Whereas the methodology used in this paper is a combination of both a theoretical and an empirical analysis of New York City's waterfront, the main goal is to provide a theoretical contribution by notion of a case study approach.

1. Introduction

1.1. Introduction to the paper

Cities are increasingly looking at ways of how to expand their public transportation facilities. Introducing a ferry network is a popular contemporary option for coastal cities (Cheemakurthy et al., 2017). By introducing a ferry as a new form of public transportation, strategic waterfront locations are connected by a pleasant form of traveling. While the construction of a ferry terminal can be managed with only limited spatial impact on the waterfront, the socio-economic impact on its surrounding neighborhoods can be extensive. Enhanced accessibility to an area can trigger better maintenance of public space, increase property prices, create more commercial facilities, etc. This paper investigates the impact of the reinstatement of water as an important transportation infrastructure on the ferry terminals' surrounding neighbor-

hoods. The question is raised whether there is a causal relationship between increased waterborne transportation and coastal socio-economic transformation, displacement, and gentrification. Using New York City as a case study, this paper investigates the impact of a ferry network on two neighborhoods: Red Hook and Brooklyn Heights/Cobble Hill, both located in Brooklyn. To gain insights on these matters, several elements are explored, including property prices, employment rates, median household income, commuting times, development interest, demographics, and tourism. To increase the probability that the ferry landing is the source of impact, the data that are gathered are of a radius of maximum 1.6 kilometers (1 mile) around the ferry landings. By comparing the predictions of the Comprehensive Citywide Ferrystudies (a study by the New York City government that predicts the impact of ferry networks and landings) with the recent data and ongoing transformation processes of those two neighborhoods, the aforementioned potential causal relationships are investigated. The paper ends by exploring

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the hypothetical impact of the planned ferry route to Coney Island, New York, on the social, spatial, and economic configuration of Coney Island Creek.

The methodology used in this paper is a combination of both a theoretical and an empirical analysis of New York City's ferry network and waterfront transformation, but the main goal is to provide a theoretical contribution by notion of a case study approach.

1.2. Accessibility versus Gentrification

In an effort to replace the use of cars by a more efficient and sustainable form of commuting, new and expanded forms of public transit are implemented in cities worldwide. Whereas the intentions are to enhance a neighborhood's livability and to add comfort for the local stakeholder, enhancing accessibility entails other consequences for the neighborhoods in question as well, especially when they have thus far been rather secluded from the city center. Neighborhoods that are less accessible often remain under the radar for larger redevelopment projects or private investments. They are not as appealing for residents with strong financial capital, or for young families who commute to work. When accessibility to these neighborhoods suddenly increases, it will attract new types of stakeholders, changing the identity of these neighborhoods drastically (Schreurs, 2022). Noorlander saw this happening in a formerly remote neighborhood in Amsterdam, where, after the introduction of a new bridge " [s]ocial tensions are emerging between the new social, cultural and economic stronger and dominant new residents and the 'old' social economic lower class residents" (Noorlander, 2018). In New York, the same is happening. In Williamsburg (Curran, 2007), for instance, every time a shift in accessibility took place (e.g. the construction of the Williamsburg Bridge in the early 20th century, the announcement of the closure of the L-train for maintenance after Super Storm Sandy, the introduction of a shared bike system, and the arrival of two ferry terminals), the neighborhood drastically changed as well.

Plenty of research has been done on how enhanced accessibility triggers the increase of property prices, displacement of lower-income inhabitants, and consequentially causes gentrification. Revington states that improvements in transit for people without cars can affect land values, because it provides accessibility to places that are valued by developers and investors (Revington, 2015). Similarly, Dawkins and Moekel argue that accessibility is one of the most dominant features that trigger gentrification (Dawkins and Moekel, 2016). It is a difficult exercise to find a balance between adding value and livability to a secluded neighborhood, and the extent of socio-economic changes that it triggers.

Because of their industrial history, waterfront neighborhoods in a city like New York are generally more accessible by vehicle, and less by existing public transportation networks such as the subway or the bus. Since 2017, New York has therefore significantly expanded its ferry network, to serve strategic areas on its 930 kilometers of coastline. According to Walker's research (Walker, 2012), successful ferry transit needs to answer to seven preconditions: the ferry has to (1) operate with a high frequency, (2) have its landings located in very high density neighborhoods, (3) have quality landside access and be part of a larger network of public transportation, (4) be free from competition from nearby bridges or tunnels, (5) navigate over a direct path, (6) have few major terminals instead of many little ones, and (7) operate with affordable pricing. Walker specifies that New York's Staten Island Ferry answers to all of these preconditions. However, as the New York City ferry network continuously expands, more and more small terminals are implemented, some of which are no longer located in high density neighborhoods or are less connected to the existing subway and bus services. The question that arises is how the implementation of a ferry terminal, and the increased accessibility by waterborne transportation affects these formerly secluded neighborhoods and their ongoing social and economic processes.

2. New York City's waterfront

2.1. New York City's waterfront: a history

Over history, waterfronts have played a crucial role in coastal cities' spatial, social and economic transformation. Because of complex interplays of unique spatial conditions, development (dis)interest, complicated landownerships, (in)accessibility, and several other factors, waterfront neighborhoods have often transformed at a different pace and at a different scale compared to the inner city. New York is one of those cities with a vibrant history of coastal transformation processes, defining its overall social and economic processes.

New York's unique coastal transformation already started with its initial inhabitants. The Lenape tribe lived predominantly in proximity to the water to fish, for the oyster reefs, and to travel or transport goods by boat. After the first Dutch explorers discovered the land in 1626, multiple European settlements established along the coastline and were quickly connected by a first ferry service (Bone et al., 1997). The water surrounding New York has continuously been used for transporting both goods and people. Manhattan's first wharf was already completed before 1650, which is relatively early compared to other important port cities on the East Coast, such as Boston (U.S. National Park Service n.d.) and Charleston (Butler, 2020). At a later stage, New York's waterfront has functioned as a strategic location for war effort as a military base. Around 1810, the arrival of steam ships and the importance of the cotton industry made New York a most important port city (Tremante, 2000).

To connect the city to more inland agricultural areas, the Erie canal was dug in 1825, making New York the trading capital of the nation (New York State gov n.d.). Waterborne transportation was the predominant mean of conveyance at the beginning of the 19th century, with all the significant industries developing in proximity to the coastline. During these centuries of significant economic development, the spatial and economic transformation of the land was based on the possibilities of waterborne transportation.

During the course of the 20th century, transportation methods for industries have gradually shifted from ships to trains and trucks, making a prime waterfront location no longer essential for industrial growth. This has resulted in a decline of waterfront land value and a rapid abandonment of the industries' coastal locations. Many cities in America have known a similar significant industrial decline over the course of the 20th century (Levinson, 2006). During the ongoing industrial decline, transportation by vehicle has been rising. A combination of severe industrial decline and the construction of large infrastructures along the coastline (Caro, 1975) has largely disconnected urban life from the water, which created a stagnation in urban transformation on New York's waterfront between the 1950s and the 2000s.

While in other large American cities - like Boston and Baltimore - post-industrial waterfronts at this time were completely redeveloped into popular centers of commerce and tourism by large investments (del Rio, 2018), New York's waterfront remained in a state of limbo (Silber, 1996). Where before, the city's waterfront and its multiple forms of transportation has continuously functioned as a pioneer in urban development, innovation, and economy, 20th century New York largely developed as if it were a non-coastal city. Hosted by building vacancy, the waterfront gradually became home to artists, immigrants, homeless people, and other marginalized social groups (Cotter, 2019). At this time, "notions like personality, authenticity and spontaneity made their appearance in the domain of public life" (Sennett, 1978).

Today, in the 21st century, a new episode in waterfront development is written. The vast amount of available and rather cheap post-industrial land has provoked a renewed interest of real-estate developers, which currently defines the transformation of the waterfront of New York City. Large investment projects are replacing significant portions of the former industrial waterfront and repurpose them for (often high-end) residential and recreational land uses.

2.2. New York City's waterfront: the future

Additional to the affordability of post-industrial land and a pressing housing demand, the shift in waterfront development was partially triggered by Mayor Bloomberg's effort to reclaim the water for the city's benefit. In 2011, Bloomberg introduced his Vision 2020: Comprehensive Waterfront Plan for New York (NYCgov 2011). In this plan, he repeatedly referred to the water as New York's 'sixth borough', and he stated that he wanted to make New York "again [...] known as one of the world's premier waterfront cities" (Rovzar, 2011). In the decade after the publication of this Comprehensive Waterfront Plan, a significant change has taken place regarding waterfront development, coastal planning, and waterborne transportation. After several private ferry initiatives in the 2010s, the city's own NYC Ferry Service initiated in May 2017 to solve the waterfront's inaccessibility by public transport. The ferry is a rather affordable, luxurious, and convenient mode of transport between neighborhoods (often located in different boroughs) that were thus far separated by water.

Since the introduction of the NYC Ferry Service, connecting strategic waterfront locations, a huge impact is visible on the surrounding urban fabric. The property values in close proximity to a ferry landing rose instantly, while a trend of new recreational developments and commercial activities is visible at the newly accessible neighborhoods. The following chapters investigate the impact that is posed on the adjacent coastal urban land when waterborne public transportation is ameliorated, and if there is a causal relationship between the construction of a ferry terminal and changes in the socio-economic conditions of its surroundings.

3. NYC Ferry network

3.1. Comprehensive Citywide Ferry Study (CFS)

The New York Government (both of city and state) invests a lot of means and workforce into studies, looking at how to enhance spatial, social, economic and environmental development. Regarding transportation, studies have been conducted over the past decade on the impact of car-based transportation and parking (NYCplanning 2013), bus rapid transit (NYC Department of Transportation 2013), light and heavy rail transit (Hochul, 2022) (on New York State level), transit accessibility (NYCplanning 2021), and mobility in general (NYC Department of Transportation 2018). Regarding the recent increase in coastal developments, several studies are done regarding resilient architecture and adaptive strategies in flood areas (NYCplanning 2013) and studies on coastal climate resiliency (NYCEDC and NYC Mayor's Office of Resiliency 2019). But additionally, in terms of waterborne transportation the city has invested in feasibility studies, since increased coastal accessibility is indispensable in light of the contemporary high-end waterfront investment plans. In 2011, the New York City Economic Development Corporation (NYCEDC) introduced the Comprehensive Citywide Ferry Study (CFS2011) (Berry et al., 2011), a feasibility study for the implementation of ferry services throughout New York. The study consisted of the analysis of areas eligible for a ferry landing, focusing on their demographics, workforce, commute and water conditions, and suggested possible ferry routes and predicted their impact on the selected areas. This study highlighted that introducing waterborne transportation between the boroughs would lower fuel consumption and congestion rates, meaning reductions in both travel time and cost for commuters, an expansion of the labor market, and less traffic accidents.

With the publication of the 2011 Comprehensive Citywide Ferry Study, the already operative East River Ferry (Fig. 1) – operated by NY Waterway – was analyzed, looking into its popularity and its effect on the neighborhoods surrounding its ferry stops. The East River Ferry makes a loop between Manhattan, upper Brooklyn and Queens, with stops at Wall Street/Pier 11, Dumbo, South Williamsburg, North Williamsburg, Green Point, Hunters Point and East 34th street. This early project of the ferry as an alternative mode of transportation and commuting proved

to be a success during the first years of its operation. To respond to this positive result, the NYCEDC had a team of experts update the study in 2013 (CFS2013, 2013) (Berry et al., 2013) to anticipate a future expansion of the ferry network. In the report of the Comprehensive Citywide Ferry Study of 2013, the remaining eligible sites of the CFS2011 are compared with the average results of the stops on the East River Ferry route during its operation over the preceding two years. The CFS2013 report starts with an illustration of the socio-economic impact of the East River Ferry between 2011 and 2013, highlighting its success.

Since the introduction of the East River Ferry, property values within 1.6 kilometers (1 mile) of a ferry landing increased with an average of 1.2%; while property values within 200 meters (1/8th of a mile) of a ferry landing increased with a whopping average of 8%. In 2013, a total increase of 0.5 billion dollar of residential property value could be noted within a 200-meter radius of the seven East River Ferry stops. Additional to the rise in property value, a remarkable growth in residential and commercial building surface was established. Within a 400-meter radius (1/4th of a mile) of a ferry terminal, the surface of residential floorspace increased with an average of 7%. Also, the surface of retail space within that same radius increased by 4.2% between 2011 and 2013 (Berry et al., 2013). This outcome of both increased property value and the development of new projects and land uses convinced the city government to initiate more ferry routes, the first of which have been opened in May 2017.

After the pilot project of the East River Route, a second important route is the South Brooklyn Route. Implemented in 2017 as a first extension of the pilot project, this new route connects Wall Street to five additional stops to its south, all located in Brooklyn. The first stop after Wall Street is the landing in Dumbo, followed by Pier 6, Red Hook, Sunset Park, and Bay Ridge. The stops were selected following the recommendations of the 2013 Comprehensive Citywide Ferry Study.

The next two paragraphs illustrate the two stops on the South Brooklyn Route after Dumbo: The Pier 6 and Red Hook terminals. Although these two stops are on the same route, they exist of very different conditions, which allows to contrast different spatial, social and economic notions. To investigate whether a ferry terminal indeed triggers socio-economic growth, a comparison is made between Pier 6 and Red Hook's initial analyses in the CFS2013 report, and their actual impact on the surrounding urban environment after implementation.

3.2. Pier 6/Atlantic stop, Brooklyn

Following the predictions of the CFS2013 report, terminal BBP Pier 6/Atlantic (nowadays named Atlantic Avenue) became a permanent ferry stop on the South Brooklyn Route (Fig. 2). On this route, Pier 6 is located between Dumbo to its north (which is also part of the East River Route) and Red Hook/Atlantic Basin to its south.

The CFS2013 report highlighted that, in terms of demographics at that time, the direct environment of Pier 6 was already home to an extremely wealthy population. In the decade between 2000 and 2010, the annual median income doubled to \$128.405 per household, compared to the average of \$51.270 for all of New York City. A clear shift is also visible in ethnicity of the inhabitants. In 2000, people living in Brooklyn Heights (the neighborhood adjacent to the ferry landing) were predominantly Black (41.8%), compared to 31.1% White people. In 2020, however, the percentage of Black inhabitants has decreased to 20.3%, compared to 52.1% of White inhabitants (NYU Furman Center 2019). With almost no unemployment in 2010, the area around Pier 6 is a most valuable neighborhood for New York's economy and welfare. The 6.348 people who commute to Manhattan on a daily basis, might seem to indicate a large number of potential users for a ferry service. However, public transportation by subway and bus was already well-established in the area before the arrival of the ferry, providing commuting times that barely exceed traveling by car. Moreover, commutes to Manhattan by ferry add three to eight minutes to the journey, compared to traveling by bus or subway.

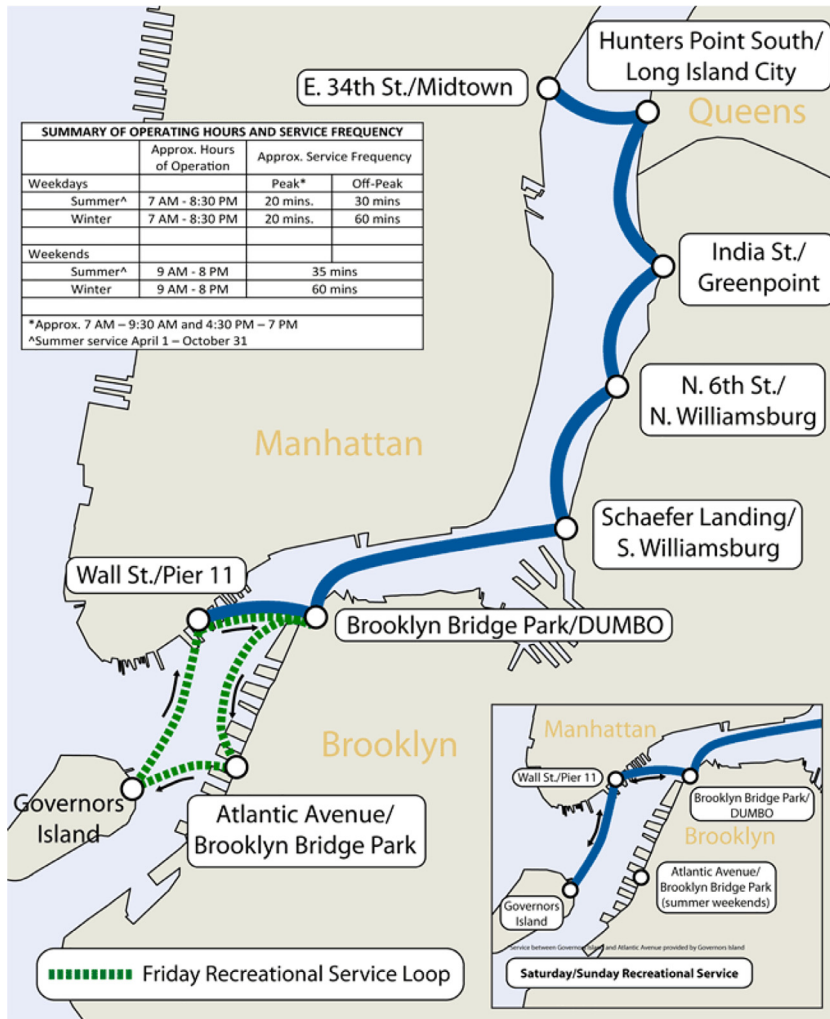


Figure 1. 2011 East River Route, operated by NY Waterway and studied in the CFS2013.
 Source: Image courtesy of NY Waterway (NYWaterway.com).



Figure 2. (left): South Brooklyn Route as initiated in May 2017.
 (right): South Brooklyn Route as operative in July 2022.

Source: NYC EDC (website: www.nycedc.com/nyc-ferry-south-brooklyn-route).



Figure 3. The Piers of Brooklyn Bridge Park (Pier 6 Ferry Terminal at the bottom of the image).

Source (web): www.moso-studio.com.

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When the first route, the East River Ferry Route, was initiated in 2011, a stop was already implemented at Pier 6, named the Atlantic Avenue/Brooklyn Bridge Park Ferry Terminal. However, the Atlantic Avenue Terminal only operated in summer weekends as a recreational stop, providing a connection between Manhattan and Brooklyn Bridge Park. As part of the East River Ferry Route, the terminal at Pier 6 aimed to attract an inflow of people from other neighborhoods for leisure and recreational purposes, instead of an outflow of commuters. In other words, the main initial stakeholders for this ferry stop were tourists and visitors, not local inhabitants.

This becomes visible in the actual landing's spatial implementation: the terminal mainly focuses on the redeveloped recreational and commercial facilities at Brooklyn Bridge Park at its north (Fig. 3). After the redevelopment of Pier 1 and Pier 6 for recreation in 2010, Brooklyn Bridge Park gradually expanded over the following years, adding Pier 2 (2014), Pier 5 (2017) and Pier 3 (2018) to the park. Since 2017, the large recreational stretch of waterfront is bordered on both north and south side by a ferry terminal. Before entering the Pier 6 ferry terminal from the mainland, you are obliged to cross a section of the Brooklyn Bridge Park. The design of the public space directly adjacent to the landing is in function of the ferry. The added benches and commercial facilities anticipate the waiting time for travelers and provide a pleasant experience.

Based on Walker's conditions for a successful ferry network (Walker, 2012), the Pier 6 terminal answers to all of the local elements that are required. It is operated at a high frequency, is located in a very high density neighborhood, has other forms of public transport within walking distance, has limited competition of car accessibility, and navigates over a direct path to the favorable ferry terminal in lower Manhattan.

Comparing the statistics of average daily riderships in the third quarter of 2017 (NYC Ferry 2017) (start of operation) and 2019 (NYC Ferry 2019) (last year before Covid-19), we see that the stop is somewhat increasing in popularity, with a daily average of 322 riders in 2017 and 429 riders in 2019. In both years, weekend days have between 51% and 54% more travelers than weekdays, which can be explained by its recreational intent.

During the decade after the initial 2011 Comprehensive Citywide Ferry Study, annual median household income in the area around Pier 6 has risen even further. The rent prices in the neighborhood have increased more intensively than in the rest of Brooklyn, going from an average of \$1600/month in 2011, to \$2260/month in 2020 (NYU Furman Center 2019). Community and action groups in Cobble Hill, one of the neighborhoods next to the Pier 6 landing, were already fighting the construction of high-rise residential towers to counter ongoing gentrification and obstruction of views and greenery before the ferry terminal became a permanent part of the South Brooklyn Route (Gould and Lewis, 2016). Since the local property values were already exceeding New York's average before the introduction of the ferry, and other means of public transit in the area are excellent; the ferry has most likely not been the cause of a drastic socio-economic shift in the area. However, the ferry terminal makes the southern part of the Brooklyn Bridge Park more accessible for travelers from Manhattan and South Brooklyn, generating a larger inflow of visitors for recreational purposes, which might contribute to a further increase in revenue of tourism. But since these were ongoing processes, we cannot assume a clear causal relationship between the implementation of the ferry terminal at Pier 6 and the area's clear process of gentrification and social displacement.

3.3. Red Hook stop, Brooklyn

Compared to the Pier 6 landing, Red Hook has a different logic. Both in the CFS2011 and in the CFS2013, the area of Red Hook in South Brooklyn has been investigated as a potential site for a ferry landing. On first sight, the statistics of the CFS2013 report do not clearly explain why Red Hook has ultimately been chosen as a preferable location for a ferry terminal. Compared to average East River Ferry landings, Red Hook only had 1/40th of the population density within a 400-meter radius from the ferry landing (NYCplanning 2010). While the labor force and actual employment were also extremely low in Red Hook at the time: only 1 person was employed in Red Hook for every 54 people in proximity to the East River Ferry stops. Additionally, only 151 people within the 400-meter radius from Red Hook's stop were employed in Manhattan at the time of the study. Which is 11 times less compared to, for instance,

South Williamsburg (a stop on the East River Ferry Route), where 1694 inhabitants commute to Manhattan on a daily basis (Berry et al., 2013). Red Hook neither has significant touristic or recreational activities. Additionally, the main attraction in Red Hook, the IKEA, has already been served by its personal ferry service to Manhattan since 2008.

Based on the available data, we can assume that Red Hook has been selected by two decisive criteria: (1) the prior increase of median household income in the neighborhood, and (2) the planned private real-estate developments in the near future.

When analyzing the median household income in Red Hook, a drastic shift is visible between 2000 and 2010. In 2000, the median annual income within a 400-meter radius around the ferry landing was \$34,352 per household, a little below the average New York income of \$38,293 per year. In 2010, however, the median income for the same area in Red Hook had almost doubled, reaching \$74,219, far above the average for New York, which was \$51,270 in that year. Especially the amount of very high incomes increased, with 5 times more families who have an annual income over \$100,000. This remarkable increase suggests a recent inflow of wealthier families into Red Hook, which implies the first signs of gentrification for the neighborhood. The second factor that may have contributed to the decision of a ferry landing in Red Hook are the planned redevelopments of multiple warehouses and industrial buildings to expensive lofts and condominiums. In 2013 (at the time of the second CFS study) three large developments – located in close proximity to the ferry stop – were in the design stages and by 2017 (at the time of the implementation of the ferry landing) they were under construction. Following a population-growth in New York City of nearly 20% in 30 years (the population has increased from 7.3 million to 8.8 million inhabitants (U.S. Census Bureau n.d.)), there is more demand for housing, which partially explains the recent trend of densification of the city's waterfront in general. For the real-estate sector, a ferry to Manhattan within walking distance can increase listing prices for these condominiums. The Red Hook condominiums have eventually been sold for prices ranging between 1.5 and 4 million dollars (Elliman 2022).

These two observations – the inflow of wealthier families and a densification of the waterfront – are most likely the decisive factors for the introduction of a ferry stop in Red Hook. The ferry anticipated the growing residential and retail interest in the neighborhood and reduced the commute to the financial district of Manhattan from approximately 75 minutes by bus and subway, to 20–30 minutes by ferry (walking and waiting time included). In reality, however, 2020 statistics show that eventually, the ferry is the least used mean of transportation for Red Hookers. The car remains the most preferred mode of transport for their commutes (NYC Ferry 2020).

Since April 2006, the Atlantic Basin also functions as the Brooklyn Cruise Terminal, the sole location in New York City where large cruise ships can dock. In the CFS2013, no mention was given of the cruise terminal as a motivation for the ferry landing. However, today, the ferry has become an important mode of transportation for the cruise ships' tourists to visit Manhattan.

The spatial impact of the Red Hook ferry landing onto its direct environment is minimal. In the existing Atlantic Basin, no dredging was required and the ferry terminal is constructed as a floating dock (Fig. 4). The basin and its surroundings are an industrial waterfront zone, completely fenced from the neighboring residential area. Minimal interventions have been made to redesign the surrounding area to create a proper and pleasant waiting area, as was done at the Pier 6 terminal. The Red Hook landing is merely inserted into the existing industrial situation, without adding additional commercial facilities, restrooms, or greenery. Few seats and timetables on the floating dock are the only facilities at the terminal. A combination of temporary fences, arrows, and orange cones direct the traveler over a large concrete surface towards the ferry landing.

The limited available numbers show that between the CFS2013 report and the year 2020, the number of inhabitants in Red Hook has decreased, while the median household income has increased. This in-

dicates a form of gentrification, displacement, and shift in demographics. However, statistics simultaneously show that the ferry is a highly underused mean of transportation for the community. Lower-income families in the Red Hook Houses (public housing of the New York City Housing Authority) are located closer to bus and subway stops, while high-income families seem to prefer cars over the ferry, since Red Hook is efficiently connected to lower Manhattan by the Hugh L. Carrey Tunnel.

In terms of Walker's conditions for a successful ferry, Red Hook only answers to the frequency in operation. In contrast, it is not surrounded by a very high density neighborhood, is not close to other means of public transportation, and it is challenged by a highway and tunnel to Manhattan nearby.

It can be assumed that in the case of Red Hook, the ferry neither triggered its ongoing gentrification. The gentrification in Red Hook was already happening in the background (by plans of redevelopment and gradual shifts in inhabitants) and is stimulated by multiple different factors. However, in contrast to the landing on Pier 6, the Red Hook terminal does not have the intention to attract external visitors into the area, but to answer to a growing demand of commuters and new types of residents.

3.4. Conditions and motives for a ferry stop

Comparing the data of the Comprehensive Citywide Ferry Studies with the actual developments of ferry routes and landings shows that the location of the first ferry terminals was mainly decided based on a high level of potential, already present on-site, preferably within a 400-meter radius. This 'potential' can have different meanings, among which: (1) a recent intensive increase in labor force and actual employment in Manhattan and Brooklyn (and therefore a high number of potential commuters), (2) a recent shift in demographics, especially with a remarkable increase of median annual household income, (3) concrete plans for redevelopment and future implementation of residential, retail, commercial, and/or recreational facilities, and (4) existing qualitative recreational and commercial facilities with current low accessibility from and to Manhattan. In the former two examples, the ferry hosts the outflow of people from the area around the terminal, for instance to commute to work. The latter two examples are strategies to improve an inflow of external visitors to increase the area's revenue and popularity. A supplementary condition for a ferry location is the technical feasibility of construction of the ferry terminal. Most of the eligible sites have available bulkheads or existing piers and sufficient water-depth. The application of a floating dock without additional dredging is highly favorable because of its cost-effectiveness.

Based on the first output of the East River Ferry (statistics of 2011–2013), the ferry as new mode of public transportation seemed highly successful. The East River Ferry Route remains the most popular and most used ferry route until this day. In 2017, the route had an average of 7,990 riders per day (third quarter, weekend days) (NYC Ferry 2017), while in 2019, this number had already risen to 13,130 people per day (NYC Ferry 2019). The South Brooklyn Ferry Route went from an average of 2,930 riders per day during the same period in 2017 to 4,289 per day in 2019. The COVID-pandemic has caused a fall in these numbers for 2020 (NYC Ferry 2020), but in 2021, a clear recovery became visible again (NYC Ferry 2021).

Based on the available information, we can state that the initial NYC Ferry Service did not mean to trigger the start of gentrification processes, yet to enhance areas that are already economically, recreationally, and/or residentially qualitative. However, currently, the NYC ferry network is still expanding, and reasonings for ferry locations vary. Ferry landings are still predominantly proposed to increase areas that are already valuable socio-economic destinations, often in an ongoing process of gentrification. However, in some cases, ferry terminals are proposed in smaller neighborhoods, with lower density and with lower-income families who do not necessarily work in Manhattan. This raises

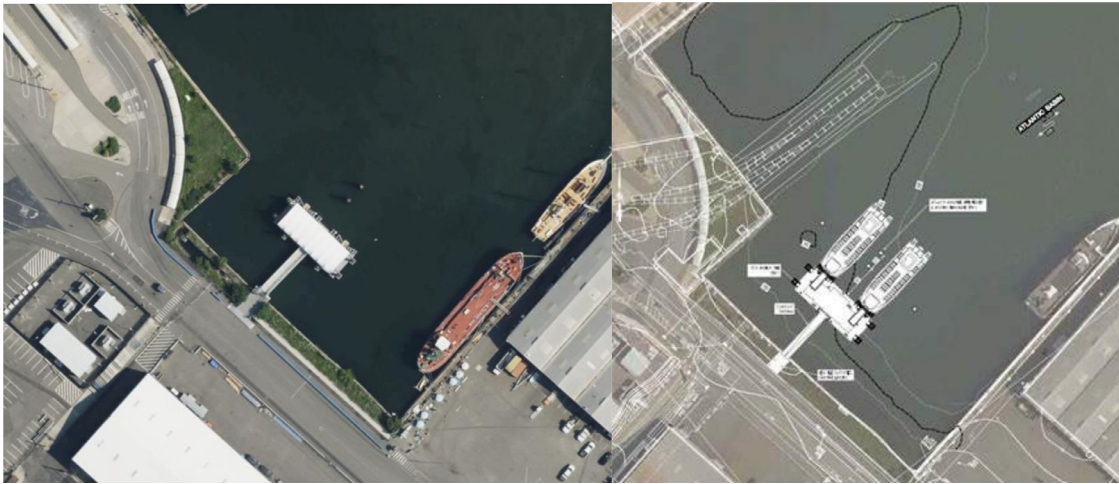


Figure 4. (left): Red Hook, Atlantic Basin landing as proposed in 2017.
(right): Red Hook, Atlantic Basin landing as operative in 2022.

Source: Image courtesy of website Bklyner (website: www.bklyner.com).

the question what will happen to more vulnerable coastal areas as the NYC Ferry Service increases their accessibility. Will the increased accessibility magnify the negative effects of imperative social displacement on the city's waterfronts? Will this generate a boom in property prices, so significant that initial inhabitants and small-scale entrepreneurs are irrevocably out-priced?

The following chapter explores a ferry landing that is planned to open in the year of writing (2022) and has been subject to a lot of backlash: the terminal at Coney Island Creek.

4. The Coney Island Creek ferry stop: A blessing or a curse?

At the time of writing (summer 2022), the New York City Ferry Service has seven operational ferry routes^a. One additional route is – after a year of delay - planned to open late 2022: the Coney Island Route (Fig. 5). NYC Ferry writes on their website that “[t]he Coney Island route will connect communities in Coney Island and Bay Ridge to Wall Street/Pier 11” (NYCFerry 2022). Although this description indicates a focus on the local communities, it is fair to assume that the real ambition is to facilitate the trip to the Coney Island Amusement Park, which the peninsula is most known for.

4.1. Coney Island: a situation

Coney Island is a peninsula in the south of Brooklyn that is famous for its amusement park, beach, and aquarium. For over a century, the entertainment business in this area has attracted millions of visitors per week. As a result, Coney Island has historically functioned as a motive to invest in innovative public transportation to carry the millions of visitors to the far south of the city.

Because of its rather remote location, the island became a vacation resort for the wealthy New Yorker during the 19th and 20th century. Around this time, investors and project developers constructed hotels and resorts in Coney Island to make profit out of holiday facilities. Their business-model was clearly based on the resorts' commercial value, but

was simultaneously linked to the first development of railway systems. In order to make the peninsula more easily accessible for their audience, the investors were also in charge of constructing railroads and introducing a connection by steamboat ferry to Manhattan at the end of the 19th century. More attractions were added on the island to stimulate more railway transportation. The destination of entertainment became a stimulation for people to use the public transport system and vice versa. At the turn of the 20th century, Coney Island had the largest amusement park area of the United States. A steamboat ferry and four separate railways entered Coney Island by this time, each constructed by a different developer (Denson, 2011). However, over the course of the 20th century, the amusement business lost a lot of its glamour and large portions were replaced by housing developments. Today, only part of the initial railways is still running to Coney Island and the steamboat ferry disappeared a long time ago. A trip from Manhattan easily takes 1.5 hours. That is why, in terms of accessibility, a ferry connection seems like a viable alternative to reduce the travel time to little over half an hour, and add to the experience of entertainment for the visitors.

Most of the political or investment interest for Coney Island has repeatedly focused on its entertainment business and accompanying facilities. Strengthened by the approval of the 2009 Coney Island Comprehensive Rezoning plan (NYCplanning 2009), real-estate investors regained significant interest in the surroundings of the amusement park to build high-rise residential buildings to sell for profit. The original residential neighborhoods on the Coney Island peninsula - such as the area around Coney Island Creek (Schreurs, 2022) - have been existing in the shadow of the amusement park and its surroundings. These neighborhoods suffer from high unemployment and poverty rates, are badly accessible by public transportation, and are located in vulnerable flood zones (NYU Furman Center 2019).

4.2. Coney Island Ferry Stop

The Coney Island Route has been under construction for several years. As explored earlier in this paper, locations for ferry landings that are selected in the Comprehensive Citywide Ferry Study, are often based on existing potential. In the case of Coney Island, the two main 'potentials' of the area, that might have been a reasoning behind the ferry landing, are the inflow of external people to improve accessibility to the existing commercial and recreational facilities, and to enhance future projects that are currently in the pipeline. Real-estate agents are already using the future ferry route in their public advertisements. To sell

^a The aforementioned (1) East River Route and (2) South Brooklyn Route, the (3) Rockaway Route, connecting Manhattan with the beaches in the south of Brooklyn, the (4) Astoria Route which connects Manhattan with upper Brooklyn and Queens, the (5) Soundview Route going from Manhattan to The Bronx, the (6) St. George Route, connecting west Manhattan to Staten Island, and the (7) Governors Island Shuttle Route, a recreational weekend connection between Manhattan and Governors Island.

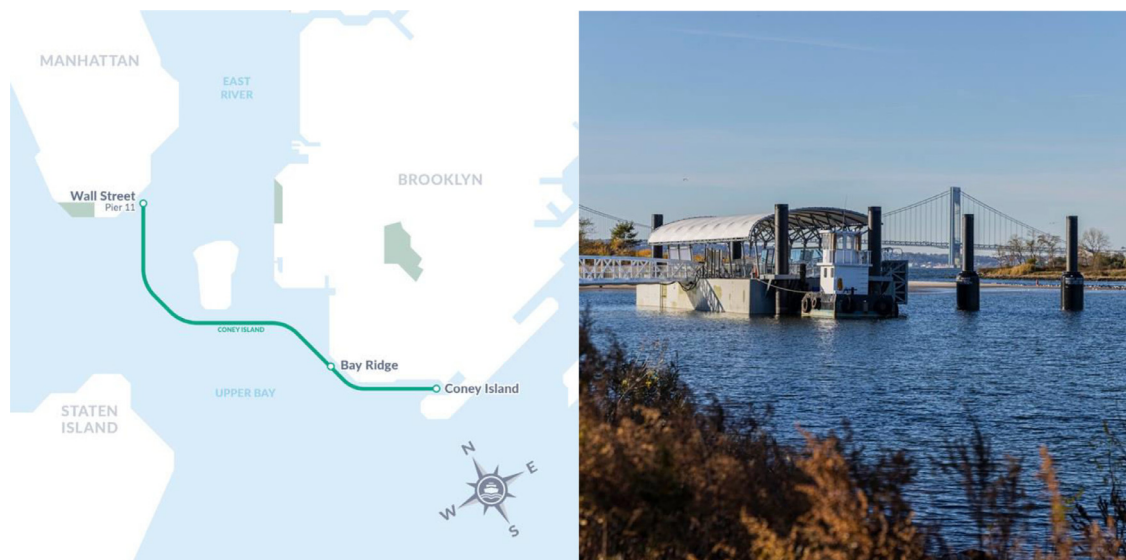


Figure 5. (left): Proposed Coney Island route by NYC Ferry.
(right): Landing constructed at Coney Island Creek.

Source: NYC Ferry (website: <https://www.ferry.nyc/routes-and-schedules/route/coney-island-route>) Source: Image by Hiroko Masuike for The New York Times.

their new high-end luxury apartments on Coney Island, advertisements state: “Ferry to Manhattan Coming Soon!” (Freytas-Tamura, 2021).

The other stops on the Coney Island line - Bay Ridge and Wall Street Pier 11 - are already part of other ferry routes, making Coney Island the only stop where constructions were needed to add a landing. Remarkably, the landing is constructed on Coney Island’s north shore, at Coney Island Creek, and not at the popular touristic beach, boardwalk and amusement park on the south shore. In the reports of the CFS2013, both Beachside and Creekside are initially mentioned as possible locations for the ferry landing. Only the Creekside seemed a viable option, as the beach is too shallow for the ferry to dock and radical dredging was needed to construct the landing at this location. In reality, the north shore of Coney Island Creek neither proved to be a good solution. The dredging, for instance, can only take place in the latter half of the year to protect the natural habitat of winter flounder and horseshoe crabs (Parks, 2021). Additionally, toxic materials were released in the water of the Creek during dredging, infuriating local inhabitants and health organizations. In April 2022, the NYCEDC and its contractors were fined \$70.000 for violating state environmental laws while building the Coney Island ferry terminal (State of New York 2022).

4.3. Predicted socio-economic impact for the Coney Island Creek

General concerns of local inhabitants, organizations and professionals regarding the ferry being located on the Creekside, instead of on the Beachside, are mainly based on environmental arguments. They fear increased pollution of the water and a disruption of biodiversity and wildlife in the Creek.

At the same time, there is a potential social threat as well (Schreurs, 2022), since Coney Island Creek is a rather vulnerable area. The median household income (\$42,780) is 41% under the average for New York City (\$72,930), generating a poverty rate of 25.6% in Coney Island, compared to 16% citywide (NYU Furman Center 2019). The area is simultaneously vulnerable to the rising sea level and climate change, with 86.4% of its properties being at direct risk of flooding (Risk Factor, nd.). The area of Coney Island Creek has remained in the shadow of the amusement park, staying under the radar for large investments, making current gentrification and displacement minimal. This makes the area all the more vulnerable when large top-down interventions are introduced.

Constructing a ferry landing on the Creekside creates a clash between the actual location of the ferry stop and the reason behind it. The Comprehensive Citywide Ferry Study originally focused on the demographics and characteristics of the area that is located within a 400 to 800 meters radius of a landing. However, the walking distance between the Coney Island stop and the amusement park is approximately two kilometers. Compared to Walker’s preconditions (Walker, 2012), the Coney Island Creek neighborhood is not of very high density and is not connected to other forms of public transportation. Coney Island is the final destination of the ferry line. Its primary goal is to increase public transport for an inflow of visitors to the popular amusement park and beach, which largely misses its target because of the far distance.

Locating the landing on the north shore of the peninsula will have important socio-economic implications for the neighborhood of Coney Island Creek. A first (minor) impact on Kaiser Park and its local users is the removal of the fishing spot and the disruption of fishing activities because of the noise and turbulence of the catamaran. The ferry will also discourage use of the water for sports and recreation. A more dominant impact will be the increased influx of people. Because of its peninsular nature, the neighborhood of Coney Island Creek only has very limited foot traffic at present. Having the landing located on the north shore and its destination on the south shore will inevitably increase the number of pedestrians in the area. The renewed inflow of visitors will likely generate a market for commercial shops, while Kaiser Park will have an increase of users as a waiting area for passengers. Since accessibility increase is one of the significant features of gentrification (Dawkins and Moeckel, 2016), a serious impact on this already vulnerable neighborhood can be assumed, influencing the prices of the local housing market. Thus far, the neighborhood of Coney Island Creek is not in a significant process of displacement or gentrification, but the increase in market value by the beneficial accessibility to Manhattan and enhanced local economic conditions will have a different impact on the inhabitants. Most of the families in Coney Island Creek are tenants: especially the families living in houses that are rented on the private market are most vulnerable to fluctuations in property prices. Interviews conducted by the author suggest that many of the inhabitants have chosen this area for its affordability. Therefore, an increase in property prices would inevitably cause social displacement. In contrast, many families live in subsidized public housing projects, several of which are located in proximity to the new ferry landing. For them, increased accessibility and

pedestrian passage might be beneficial. During interviews, inhabitants of these housing projects often complained about poor mobility, especially concerning the distance to public transportation and their connection to Manhattan. The ferry connection might eliminate these obstacles for them. Additionally, the external maintenance of the public space around the ferry stop will enhance their living conditions without the risk of displacement, since NYCHA^b houses are rent-stable subsidized housing. For the smaller local businesses, increase in property value is less beneficial. At the moment, businesses around Coney Island Creek are mainly car-oriented, since vehicular accessibility is very high in the area, because of the direct connection to the Belt Parkway. However, residential buildings are of higher value than buildings for manufacturing or industry, meaning an imminent risk to shift a building's land use when the interest in the housing market of Coney Island Creek increases.

The ferry landing at Coney Island Creek has a goal of serving an inflow of visitors to the large amusement park and enhancing the overall accessibility of the remote peninsula. The area of Coney Island Creek is already threatened by multiple other factors, including pollution, flood risks, low education and unemployment. The ferry will, to some extent, serve the local inhabitants by increasing the accessibility to Manhattan. But by introducing the Manhattan - Bay Ridge - Coney Island ferry line into this low-income neighborhood, it will mostly threaten the stakeholders with a significant inflow of new visitors, in combination with an already emerging investment interests because of a pressing housing demand in the city. The shift from predominantly car-based traffic to public transportation can trigger an increased external interest for the area, both in terms of recreation, as in terms of investment.

5. Conclusions

Studying the initial predictions for the ferry network and several cases of actual implementation of ferry stops in neighborhoods indicates that a ferry connection is not an unequivocal strategy. In the Comprehensive Citywide Ferry Study report of 2011, the initial East River Ferry route is considered a success story, based on the economic growth and increase in income of the neighborhoods adjacent to the terminals in the first operative years of the ferry. In reality, when studying the CFS2013 and the actual implementation of extra ferry lines, it becomes clear that locations for the terminals are largely selected based on the neighborhood's ongoing process of gentrification, a high existing interest for investment, local recreational and touristic qualities, or for redevelopment projects that are already in the pipeline. Therefore, it is questionable if the ferry is indeed the trigger of new socio-economic growth, or the consequence of anticipated growth.

During the past decades, New York City's waterfront has been rapidly redeveloping because of a growing interest in repurposing its post-industrial land for residential or recreational uses. Often, these projects are public-private partnerships, with large financial investments from the private sector. The issue that many of these new waterfront projects struggle with, is their generally low accessibility by public transportation. Because of their former industrial land-use, coastline neighborhoods are mainly accessible by boat and vehicle. Public transportation such as subway lines often do not reach coastal areas. As a result, the contemporary redevelopments of these neighborhoods have largely been dependent on buses and cars. However, following the city's plans to connect its five boroughs over water, the NYC ferry service has gradually been implemented in New York, increasing the accessibility of these coastal areas drastically.

Even though many of the neighborhoods around ferry landings are undergoing a process of gentrification, this is almost never triggered by a sole element. It is argued that increased accessibility is the main feature of gentrification (Dawkins and Moeckel, 2016), but it is most likely a combination of different elements that causes the socio-economic

growth in waterfront neighborhoods in New York, since the ferry remains a rather slow and infrequent form of public transport. By the implementation of the ferry, these already desired locations are additionally enhanced in terms of accessibility, and therefore also in terms of property value and amount of residential and commercial building surface. Based on the criteria for selecting these initial locations for ferry stops, a causal relationship between the arrival of a ferry and gentrification cannot be simply claimed. Even if the ferry landings were not introduced in these areas, redevelopment and enhancement of these post-industrial waterfronts would likely have taken place.

At Coney Island Creek, the first large-scale real-estate developments are already popping up. The gentrification that will arise in this area will be triggered by a combination of this increase in interest by project developers, the affordability and availability of the land in this remote area, the potentials of a location close to the beach, and the prospects of increased accessibility by a ferry service.

However, based on the study of actual implementation of ferry locations, and further expansion of the ferry network, it becomes clear that a landing generates different effects within different contexts, regardless of the initial reason for implementation. At Pier 6, the aim was to increase public transportation to a site, already qualitative in terms of tourism and recreation, a strategy that is applied in numerous other ferry locations as well (e.g. Dumbo, South Williamsburg, and Long Island City). At Red Hook, the strategy was to answer to the ongoing process of local redevelopment and gentrification. At Coney Island, the ferry is introduced to serve the already popular destination area of the amusement park. The decision to locate the ferry landing on the Creekside of Coney Island is circumstantial, based on technical matters, yet the impact on the local conditions will be significantly more drastic than when the terminal would be located on the beachside. While the other observed neighborhoods with ferry stops were already undergoing a strong process of gentrification, the area of Coney Island Creek is only in the primal stages of a growing development interest. A ferry connections will potentially magnify the effect and increase the pace of redevelopment in the area.

The ferry service in New York started with connecting high potential areas over water. The network answered to all conditions that are needed to make it a success story according to Walker, providing terminals at very high density neighborhoods, serving badly accessible post-industrial sites, connecting to the local subway network, with terminals located in strategic locations, mainly at popular destinations in Manhattan and Brooklyn.

In the meantime, the success of the ferry as a pleasant, luxurious, and efficient mode of public transport is clear, and the network is expanding rapidly. This time, however, terminals do not limit to places with high potential or tourist attractions. Smaller or lower-income neighborhoods are included in the ferry's network, which brings along some issues. Not all coasts are suited to host a ferry landing, as they require dredging or significant structural interventions. Dredging the soil at the bottom of the water of post-industrial areas risks the surfacing of industrial pollution. Additionally, the ferry's operating hours are limited to the daytime, making alternative modes of public transportation still necessary. A ferry can have a significant effect by speeding up processes of gentrification, changing the socio-economic configuration of a neighborhood.

Because of their historic industrial importance, waterfronts of coastal cities worldwide have often developed with waterborne traffic as an important factor. This translates into waterfronts with piers, bulkheads, and sufficient water depth. In light of the industrial decline of the past decades, a new identity is needed for many metropolitan coastal neighborhoods. Because of densification and city growth, these rather affordable locations are often used for building residential towers or waterfront public parks. The core issue with these new developments is their accessibility. In a city like New York, subway lines do often not reach the coastline. A ferry service is a popular new mode of transportation to make these neighborhoods more easily accessible to the public. In the wake of cities' industrial decline, many post-industrial waterfronts

^b NYCHA: New York City Housing Authority.

(often considered less desirable) have gradually been claimed by lower-income families and small businesses. When these neighborhoods are made more accessible, they fear to become more desired. In that case, what starts as an added value to already popular coastal areas, can turn into a trigger of gentrification for lower income neighborhoods.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

This paper is part of an ongoing research project, conducted by Dr. Gitte Schreurs, in cooperation with Profs. Drs. Kris Scheerlinck and Maarten Gheysen. The research project is funded by FWO (Fonds Wetenschappelijk Onderzoek Vlaanderen) and conducted at the University of Leuven, KU Leuven, in Belgium.

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