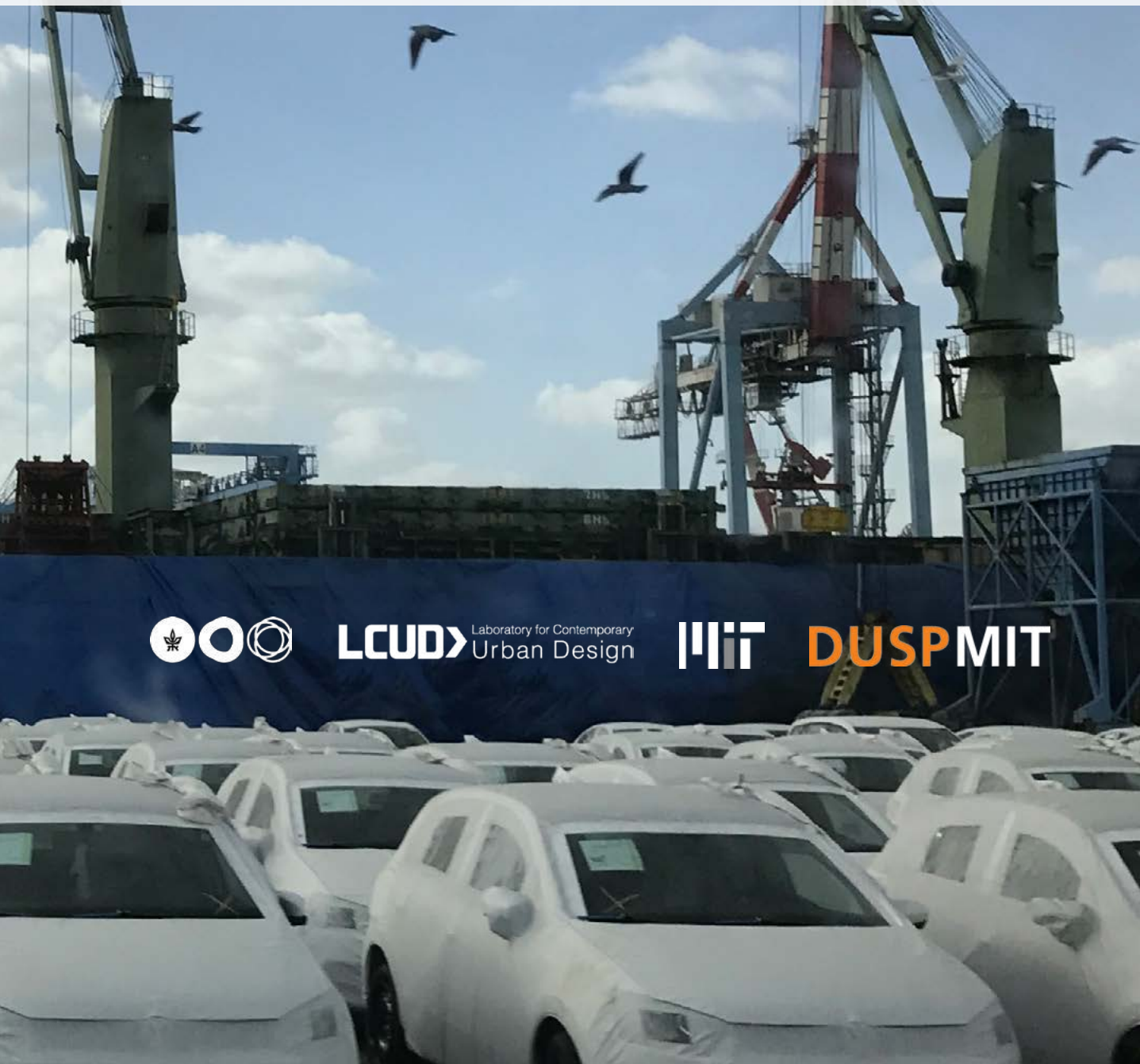
GLOBAL CASE STUDIES:

Lessons for Ashdod from around the World

Max Budovitch | Carlos A Sainz Caccia | Louis Liss | Max Moinian | Zoë Taft Mueller | Zixiao Yin



Global Case Studies: Lessons for Ashdod from around the World
was written and compiled by:

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Preface

For roughly a century, cities have shifted industrial sites to the peripheries of their metropolitan regions and have erected barriers between places of production and places where residents live and go about their day-to-day lives. Technological advances in production methods have made it possible to reconsider the relevance of these barriers and to question whether the preferred location of industrial sites is on the periphery. With several industrial sites – for heavy and light industry, including high tech. manufacturing – and its large port, the most important in all of Israel, Ashdod is poised to exemplify a truly 21st-century relationship between industry and the city.

This study has focused on a few central questions:

- What is the relationship between Ashdod's industrial areas? What should it be?
- What is the current relationship between Ashdod's industrial areas and its housing quarters? How might the two be better integrated? Should Ashdod attempt to mix other uses with industrial uses, or should it strictly separate industrial uses?
- Is heavy industry crucial to Ashdod's economic robustness, and should its importance encourage Ashdod to preserve land for heavy industrial use (e.g., for polluting industries)?
- Where might the links be between Ashdod's circulation network and its industrial areas – for trucks and even bicycles? What should be the relationship between Ashdod's industrial areas and its "Green Belt"?

This study, conducted by students from Tel Aviv University and MIT, aims to understand the spatial effects and dynamics of 21st-century manufacturing, and to recommend policies that respond to these effects and dynamics. During a 10-day workshop in Ashdod and at Tel Aviv University, the students examined and analyzed Ashdod's' industrial sites.

This study includes two parts: the first focuses on the existing conditions of and opportunities for Ashdod's' industrial sites, and was written by Tel Aviv University students guided by Dr. Tali Hatuka; the second focuses on case studies from the world and applicable lessons for the city of Ashdod, and was written by MIT students guided by Prof. Eran Ben-Joseph.

We hope that the conclusions and recommendations of this study will support the city's ongoing efforts to attract innovative manufacturers, traditional manufacturers, and technology start-ups. Adopting a progressive approach to industrial development in the city will cultivate sustainable growth in Ashdod City and in other cities in Israel.

Support for this project is provided by the city of Ashdod, the Department of Urban Studies and Planning (DUSP) at the Massachusetts Institute of Technology (MIT), MIT International Science and Technology Initiatives (MISTI Israel), and the President of Tel Aviv University and the Vice President for Research and Development.

Dr. Tali Hatuka, Urban planning, TAU
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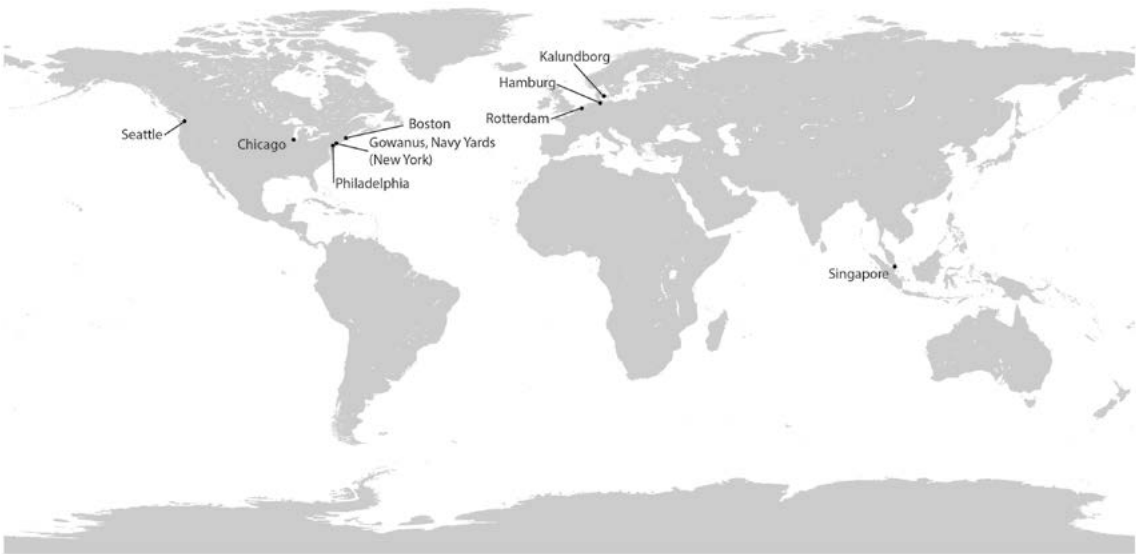


Guide to the Case Studies

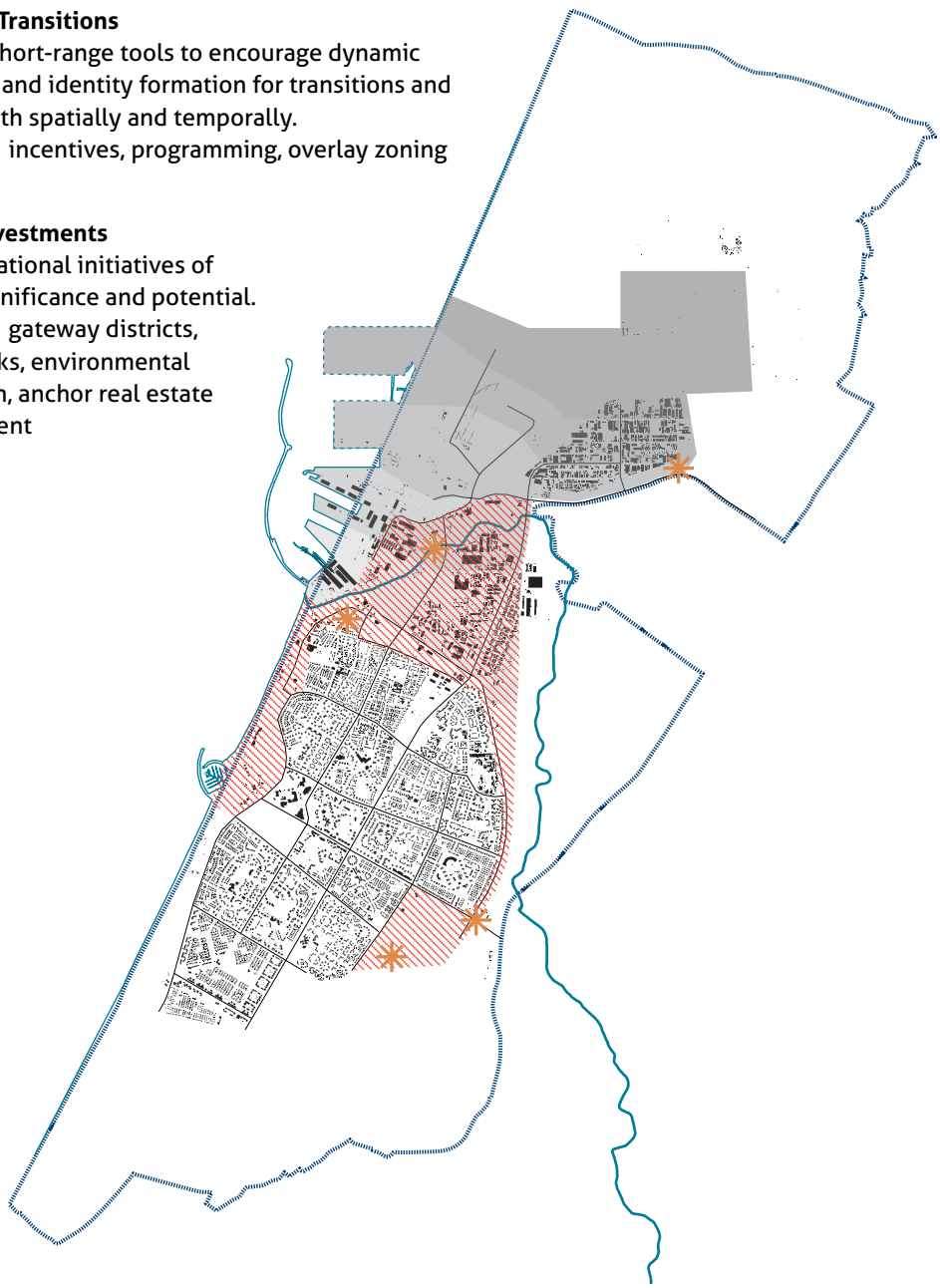
Rooted in the visions developed intensively in Ashdod, we developed case studies that addressed unifying industrial urbanism strategy groupings that could be applied towards a vision articulated and guided by Ashdod's residents and leaders.

STRATEGY GROUPINGS

Strong Foundation
Systemic long-range tools to protect vulnerable groups, manage conflict and establish performance standards.
Examples: circulation and infrastructure networks, base zoning, workforce education

Proactive Transitions
Targeted short-range tools to encourage dynamic clustering and identity formation for transitions and edges - both spatially and temporally.
Examples: incentives, programming, overlay zoning

Anchor Investments
Transformational initiatives of unique significance and potential.
Examples: gateway districts, public parks, environmental restoration, anchor real estate development



STRONG FOUNDATION

Systemic long-range tools to protect vulnerable groups, manage conflict and establish performance standards.
Examples: circulation and infrastructure networks, base zoning, workforce education

Strategic Analysis

A complex project is founded on relevant data collection on existing conditions. The redevelopment of the Brooklyn Navy Yard in New York City relied on extensive community data collection and analysis. This effort included an inventory of buildings for potential adaptive reuse.

The redevelopment of the Gowanus Canal area, also in Brooklyn, New York City, incorporated feasibility studies for environmental remediation, public participation in proposed land use changes, and comprehensive plans to inform the project.

Philadelphia conducted an economic analysis of the city's manufacturing ecosystem to identify areas of comparative advantage.

Kalundborg conducted a thorough inventory of industrial producers with attention to inputs, byproducts and potential swap collaborations between firms.

Base Zoning

Chicago introduced Planned Manufacturing Districts, a special zoning ordinance designed to protect industrial land from residential and commercial speculation. The dispersion of the City's 15 Planned Manufacturing Districts is diversified, attracting firms specializing in anything from online services to steel production.

Boston enacted a zoning ordinance that mandates that the use of a plot with unique environmental attributes must highlight and coexist with those attributes. Moreover, the city has enacted zoning ordinances based on environmental performance standards.

Infrastructure

Singapore has built service networks and extended public transportation systems to trigger the growth of industrial areas and introduce civic activities therein.

Kalundborg has developed physical infrastructure links between productive activities, including rail connections, pipelines and roads.

The Chicago Plan of 1909, while never fully realized, has guided infrastructure projects for over a century, including the riverwalk.

PROACTIVE TRANSITIONS

Targeted short-range tools to encourage dynamic clustering and identity formation for transitions and edges – both spatially and temporally.
Examples: incentives, programming, overlay zoning

Financing

Kalundborg fostered collective buy-in for strategic debt by issuing green bonds, funded by a modest industrial zone infrastructure fee, to deliver symbiotic infrastructure investments.

The Gowanus Canal project in New York City mandates that developers contribute to the funding of park programs. Polluters are also held responsible for the cost of remediation in this historically industrial area.

Overlay Zoning

Boston's Newmarket Industrial District overlay zoning has strengthened protections for existing industries, streamlined permission for new industrial uses, and introduced urban design guidelines to bring coherence and reinforce the identity of the district.

The Brooklyn Navy Yard area has been extensively rezoned to facilitate manufacturing uses that support primary industries that exist in nearby Manhattan.

Programming

Hamburg celebrates its port by hosting different festivals and public activities. Hafengeburtstag (the port's birthday) is celebrated every summer. The Elbjazz and Dockville music festivals are hosted in the port area.

The Brooklyn Navy Yard undertook branding efforts targeting tenants to vitalize commercial and recreational activity along the waterfront.

ANCHOR INVESTMENTS

Transformational initiatives of unique significance and potential.
Examples: gateway districts, public parks, environmental restoration, anchor real estate developments

Sightseeing

The Hamburg port hosts a 13-meter-high viewing tower in addition to several sightseeing parks surrounding the port. These amenities serve as focal points for experiencing the port and its environment.

The Auckland port features several viewing towers that simultaneously serve as dividers between public and functioning port areas and allow for visitors to observe the operation of the port and commercial fishing industries at close range.

Environmental Restoration

Chicago has converted its industrial infrastructure into high-performance landscapes that connect different urban amenities. The industrial riverfront has been converted into a pedestrian riverwalk, connecting the lakefront with the heart of the city, while an industrial rail line has been converted into a 4-kilometer-long bike path connecting several neighborhoods.

The restoration of the Gowanus Canal has included the remediation of water and stormwater systems in the surrounding watershed and the addition of a park that acts as a massive bioswale.

Aligning Social and Physical Strategy

Boston, USA

The Newmarket Industrial District is leveraging their deep roots in the meatpacking and food processing sector to build a dynamic industrial "walk to work" community in the City of Boston. By aligning land use, circulation, brand image and infrastructure investments, Boston has magnified the impact of each and has mobilized them to realize a larger civic vision of a thriving and diverse industrial economy with a strong pride of place.

The City of Boston's approach to strengthening their Newmarket Industrial District is noteworthy predominantly because of the level of coordination and integration between policy and physical interventions. The synergy between different interventions is best understood as the byproduct of deeper strategic work rooted in strong community engagement, local advocacy and place-based problem-solving with key corporate and residential stakeholders.

Zoë Taft Mueller

Background and Challenges

History of the Newmarket Industrial District

The Newmarket Industrial District as it exists now was established in the 1950s and 60s, when the city forced meatpacking and food processing companies to move out of Boston's downtown public markets. This forced relocation was triggered by the markets' designation as historic landmarks and their subsequent transition to touristic sites for the city. The chosen relocation site – Newmarket – initially suffered from a lack of public infrastructure and services but was fundamentally well-suited to industrial activity due to its strategic position. Located adjacent to dense urban neighborhoods, along regional highway and rail corridors and close to the Fort Point Channel, Newmarket is structurally well-suited to multimodal industrial activity. A

little over a decade after the new district was formed, a business association was established to advocate for improved public infrastructure and services. Newmarket is now home to 700+ companies in food processing, distribution, and other light manufacturing. The early identity of the district as a center for food industry has stood the test of time, even as the industries have continued to diversify.

Figure 1 + 2 Industrial Character of the Newmarket District Source: Walk to Work Plan.

Figure 3 Outlined in green is the study area for the Newmarket District Walk to Work Plan. The Newmarket core is adjacent to the northeast. Source: Walk to Work Plan.

Challenges Faced

The primary challenges Boston is facing are (1) real estate pressure on industrial land, (2) the need to protect and expand high-quality local blue collar and lower-education job opportunities and (3) the need to accommodate biotech and advanced manufacturing uses that demand well-connected and amenity-rich industrial areas. Boston's strategies reflect these three core motivations.

Model

Boston's holistic and integrated approach demonstrates the value of tackling large structural and strategic challenges head-on before diving into the more attractive and dynamic district-level pilots.

Structural and Strategic Foundation

At the structural and strategic level, Boston distinguishes itself due to the strength and clarity of the industrial area base zoning framework, the quality and diversity of its

community engagement efforts and its recognition of the need for public infrastructural investment.

Boston's citywide base zoning for industrial areas establishes a geographical logic rooted in two continuums: (1) the degree of dependency on geographically unique maritime industrial land and (2) the degree of pollution permitted. Much of this framework came into existence in the late 1980s, when Boston was witnessing the encroachment of mixed-use waterfront development into waterfront industrial areas. This systematic base zoning framework helps proactively prevent conflicts and protect vulnerable users from market pressure and the encroachment of incompatible uses.

In May of 2011, a broad coalition of community groups released an independently produced report entitled "Concepts for a Walk to Work Community." This report grew out of a four-month public process initiated and facilitated by area non-profits and advocacy groups. It served as a call to action detailing the key opportunities and challenges for the Newmarket District and the adjacent Upham's Corner neighborhood. This independently produced report emphasized the importance of balancing freight and pedestrian connectivity, and it identified key opportunity sites for redevelopment. This plan not only articulated some of the greatest challenges facing the district – congestion, illegal parking, dumping, an impoverished pedestrian public realm – it also articulated a strong mobilizing vision for a "walk to work" industrial neighborhood. By tying these district-level challenges and aspirations to specific catalytic intervention opportunities, this plan deliberately put community groups in a position to advocate for strategic support from the public sector and local corporate actors. And, it seems, the public sector was listening.

Figure 4 + 5 Newmarket District neighborhood context. Sources: Walk to Work Plan, Google Maps.

Begun in February 2012, the Fairmont Indigo Planning Initiative led by the Boston Planning and Development Agency identified short- and long-term strategies to improve the public realm and job access along the 9.2-mile Fairmount Indigo commuter rail corridor. Upham's Corner, a historic neighborhood

business district adjacent to Newmarket, was given special attention through a transit-oriented-development corridor planning effort called Upham's Corner Station Area Plan. The plan's recommendations for the Upham's Corner station area focused on minimizing displacement, protecting existing assets, district economic development, a pedestrian-oriented public realm, wayfinding improvements, and residential densification near the station.

In 2011, Newmarket was designated as an Eco-Industrial Zone. This program of the Boston Redevelopment Authority aims to advance sustainable business development, energy, and environmental goals with the intent of fostering efficiency and synergies among district members. This is a coalition-building effort without monetary incentives.

In 2011, the City of Boston committed $2.2 million in infrastructure spending for roads, sidewalks, lighting, signage and safety for the Newmarket Industrial District. Two years later, in 2013, the regional transit authority opened a new regional commuter rail station in the heart of the district.

Targeted Cultivation of District Identity

This strong structural foundation was then enhanced by the conscious cultivation of district identity through overlay zoning land use and design guidelines along with incentive-based loan programs to help corporate actors rise to the occasion.

From 2012 to 2014, the City of Boston facilitated the establishment of a new overlay zoning district intended to retain and protect the core industry, strengthen district identity, ease permissions, and better accommodate new and emerging industrial uses.

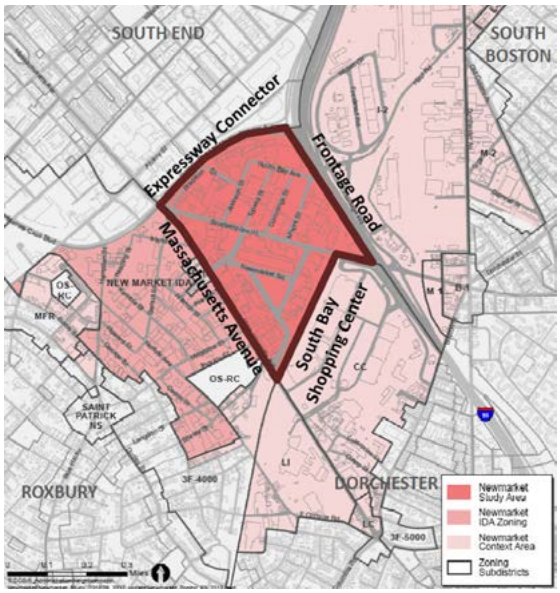


Figure 6 Newmarket District rezoning sub-areas.Source: Boston Planning and Development Agency.

All businesses in the Newmarket Industrial District are also eligible for two city-administered programs that specifically help finance favorable *industrial* development in Boston. The Back Streets Back-up Loan Program provides real estate assistance, workforce training, business assistance and Industrial Lands Analysis. Unlike standard loans, which max out at $150k, this program provides financing specifically for Boston companies in the industrial and manufacturing sectors and can reach as high as $250k. Tax-exempt Industrial Development Bonds are issued to acquire land and construct new facilities, expand/renovate existing facilities or purchase new equipment. Projects eligible for tax-exempt financing are manufacturing facilities that create tangible products, cogeneration or small power facilities for furnishing local energy or gas, and solid waste/resource recovery facilities.

Strategies and Innovation

At a macro level, the most innovative element of Boston's Newmarket Industrial District has been the strategically grounded holistic approach – by aligning land use, circulation, brand image and infrastructure investments, they magnify the impact of each.

At a micro level, there are a few elements worthy of note:

Industrial Area Performance Standards are systematically linked to Boston's strong base zoning framework. These standards set minimum requirements to be met by all manufacturing and industrial uses. They then specify performance standards for light, general and restricted manufacturing zones in order to systematically limit conflicting uses and contain negative impacts. The language conveys a sense of mutual protection for residential and industrial uses rather than portraying industry as a public offender. The use of specific distances helps to ensure that standards are enforceable. However, the lack of specific thresholds for the allowable levels of pollution limits the ability to enforce these standards – they prohibit levels that are "detectable… by human senses without aid of instruments" and of "sufficient quantity or duration to cause significant annoyance or interference with normal activities."

Industrial Area Design Guidelines help to ensure visual order and recognizable district identity through (1) screening and buffering policies to improve the public realm, (2) building line conformity requirements to align buildings with the circulation network, (3) signage regulations to constrain excessive dominance of advertising, and (4) varied FAR and height requirements in response to demand for densification.

Conclusion

While Boston-specific pressures and priorities are evident in a fine-grained analysis of the Newmarket case, the overall framework is very translatable. The power of Boston's Newmarket approach comes from strong community engagement in early strategic goal-setting and timely integration of policy and physical interventions. Boston's zoning also offers a helpful model for how best to differentiate between base zoning and overlay zoning for industrial land uses.

Industrial Base Zoning is characterized by:

- Long-range structural considerations
- Strong and consistent logic that recognizes conflicts and systematically protects the interests of both sides
- Identification and protection of geographic uniqueness
- Environmental impact standards that are specific enough to be enforceable and are rooted in a nuanced assessment of variation among industrial uses

Industrial Overlay Zoning is characterized by:

- Shorter-term experiential considerations
- Focus on reinforcing character, identity and community goals
- Maximum integration with stakeholders, existing assets and available resources
- Coordination with private investments and municipal spending plans
- Simultaneous advocacy for specific catalyst projects and social stewardship programs

Recommendations for Ashdod

Adapt Base Zoning Logic

Adapt Boston's base zoning logic of the two continuums to the Ashdod context.
To establish a maritime industry continuum, Ashdod should:

- Conduct an analysis of geographically unique and indispensable industrial lands.
- Determine what if any threats exist that would limit their long-term productivity and vitality
- Create a tiered system protecting the core and "feeder" areas against potential threats

To establish an environmental performance continuum, Ashdod should:

- Identify existing environmental impact conflicts
- Determine the preferred resolution of these conflicts
- Create zoning to reflect this preferred resolution and grandfather in existing conflicts
- Develop incentives as needed to encourage the reduction of existing conflicts

Targeted District Pilot

Pursue a targeted pilot effort integrating physical and social strategies to achieve a holistic vision in a small area or "district":

- Identify transitional zones where interesting and unresolved relationships exist between industrial, commercial, residential and recreational uses.
- Conduct a stakeholder planning process to identify challenges, opportunities and common vision.
- Pilot an "Overlay Zoning District" to manage the public realm, branding/image, densification and pedestrian environment in service of that vision.
- Dedicate public funding for (1) infrastructure, transportation service and public realm upgrades and (2) industrial development loan/bond programs in service of that vision.

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Port-City Relationship

Rotterdam, NL
Hamburg, DE

Two historic ports that have defined the development and character of their cities. Both Rotterdam and Hamburg are embracing their maritime/industrial heritage and the port's presence in the city's image to drive their urban development.

The ports of Hamburg and Rotterdam pose an interesting set of examples within the European context. They are very large ports close to urban enclaves: Hamburg's port is literally within the city, and Rotterdam's extends along the Rhine delta to the North Sea. Overall, the main challenges both cities are facing with their ports are: 1) Redevelopment of abandoned or decaying areas and brownfields, 2) Development of urban uses along active portions of port areas or with heavy presence of industrial uses, 3) Improvement of the areas between the port and the city (buffers) and 4) Enhancement of the visual connections between the city and the port.

Carlos A. Sainz Caccia

Background and challenges

Rotterdam and Hamburg are the two busiest ports in Europe. Both ports are historically old and have been part of the cities' central areas. They are located along river creeks.

Rotterdam

The Port of Rotterdam is the largest seaport in Europe. It opened in the 14th century and is located by the Rhine–Meuse–Scheldt delta, which creates an intricate system of rivers and water canals opening to the North Sea. Until 2004, it was the busiest port in the world; it has since been overtaken by several Asian cities. It currently moves more than 12

Figure 1 Rotterdam's Port Development. Source: https://www.portofrotterdam.com

million TEUs (twenty-foot equivalent units) in container volume and more than 450 million tons of cargo. The port is operated by the Port of Rotterdam Authority, which was originally a municipal body of the municipality of Rotterdam. Since 2004, however, it has been a government corporation jointly owned by the municipality of Rotterdam and the Dutch State.

Rotterdam used to be the most active port in the world, but after the 1990s, with the growth of the Asian cities, it has fallen below the top 10. This has created challenges and opportunities. While it has lost some of its global importance, some of the port land, especially that closest to the city, is now available for development. The city of Rotterdam has had several waterfront development projects focused on reclaiming some of the shipyard or abandoned industrial land while empowering the active industrial uses that still exist in the area. At the same time, thanks to its geographic conditions, the port has land available to expansion, which makes it the only port in Europe that has the conditions to compete with its Asian counterparts.

Hamburg

Similar to Rotterdam, Hamburg is located by a river creek, the Elbe River, although in Hamburg's case, the city is more than 60 miles upstream. The city is the second largest in Germany, with 1.7 million inhabitants and over 5 million people in the greater metropolitan region. Hamburg is the most important port of Germany and the second largest port in Europe by container traffic. It is a historical port, with more than 800 years of history, and is crucial for the identity and character of the city. Because of its inland location and the development of the city around it, the port of Hamburg has no opportunities to expand into new land (like Rotterdam did); this makes its coexistence with the city a fundamental challenge. The Port covers an area of 7200 hectares located mostly in the borough of Hamburg-Mitte, which also includes most of the city's central core.

Like Rotterdam, some of Hamburg's challenges are the redevelopment of land that is no longer in use, especially in the city center. On the other hand, and different from Rotterdam, Hamburg's port is and will be close to the city

Figure 2 Hamburg Port area and Hamburg-Mitte borough location. Source: Wikimedia Commons

given that it cannot be expanded to new land closer to open waters. This poses a challenge for the active port to coexist with other urban uses.

Strategies and Innovation

Rotterdam

In the last few decades Rotterdam has seen several waterfront redevelopments, but two can be highlighted: *Kop van Zuid* and, more recently, *Stadhavens*. Each of them represents a different approach on how to deal with the city-port relationship.

- Kop van Zuid:

One of the oldest parts of the port, this area started decaying after the port expanded down-water to the west. By the 1980s, the area was a group of brownfields and neighborhoods with several social problems and high unemployment rates. By the 1990s, the city had a "port-out city-in"[1] plan to reclaim the riverfront and create a high-end mixed use development. The plan created new housing units and more than 4 million square feet of offices. Some port heritage markers, such as cranes and buildings, were preserved and now coexist with buildings and infrastructure designed by star architects such as Rem Koolhaas, Renzo Piano and Norman Foster.

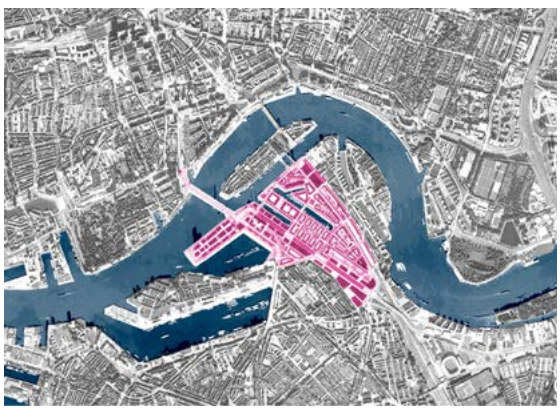

Figure 3 Kop van Zuid Area. Source: https://theportandthecity.wordpress.com

Figure 4 Kop van Zuid Aerial photo. Source: Zairon. Creative Commons

1 Sanchez, J.M.P., (2015). *Port-City governance. A comparative analysis in the European context*, Available at: https://theportandthecity.wordpress.com/category/genoa/.

- Stadshavens:
Stadshavens (City Ports, in Dutch) is a redevelopment project that involves more than 1600 hectares of land, 600 of which is still devoted to industrial uses. Given the massive size of the area and the fact that numerous industries and some docklands are still active, the attempt to remove all non-urban activities was considered unrealistic. Therefore, different from the previous plan, instead of taking a port-out approach, the final goal is direct coexistence between port/industries and urban uses. Only a small share of the project area will be transformed into a new urban area at some point, with the rest remaining as port/industry-related activities. "The development of the Stadshavens area mainly focuses on mixed-use areas, in which the intention is to develop a symbiotic relationship between the port and the urban economy and in the process, establish a link with the surrounding residential neighborhoods"[2].

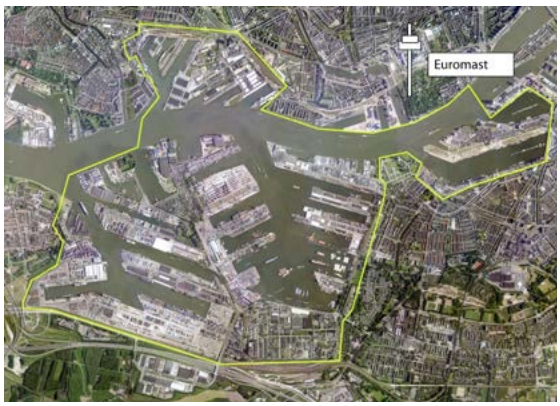

Figure 5 Stadshavens Area. Source: https://theportandthecity.wordpress.com

One of the main projects happening in the area is the location of the RDM Campus on the site of the former Rotterdam Dry Dock Company (Rotterdamsche Droogdock Maatschappij - RDM). The Research Design and Manufacturing (also RDM) campus has been developed with the involvement of the Port Authority of Rotterdam and the municipality of Rotterdam, along with the Rotterdam University of Applied Sciences and Albeda College, which were looking for space to accommodate their practical technical degree programs. It is a campus that hosts businesses and educational institutions with an emphasis on sustainability and that, as a "triangle education, research and enterprise would be able to create new perspectives for the area and lead to innovation in the technical education sector"[3]. What is interesting about this campus is that the Port Authority is involved in its development as a way of connecting the city and port. The Port of Rotterdam, as the owner of the site and the local cultural-historical heritage, worked on the development of a master plan and a business case, and the educational institutions were responsible for the interior development and adaptation.

Figure 6 RDM Campus. Source: https://www.portofrotterdam.com/en/news-and-press-releases/rdm-rotterdam

Today, the RDM Campus hosts research and educational facilities and serves as a base for innovative start-ups and experimental projects by different established companies related to mobility, building technologies,

2 Ibid

3 Ibid

offshore businesses and energy. Students are linked to opportunities, and the surrounding neighbors can use the campus' open spaces and waterfronts while exploring some of the production and innovation happening on the site.

The Port of Rotterdam is not only investing in the physical infrastructure but is now increasingly involved in the site programming. The Port has moved from a landlord role to a developer of its surroundings (Figure 7).

Hamburg

The port of Hamburg has a heavy presence in the city, and it has defined the city's morphology and identity. This relationship is reinforced by a large list of cultural activities that occur in the port area along the year. Among all the activities happening in the port, the "Hafengeburtstag" (the port's birthday), occurring every summer, celebrates the port's maritime activities. Other activities, such as the Elbjazz and the Dockville music festivals, also happen in old and/or active parts of the port. All these activities are seen by the Port Authority as a public relations opportunity to strengthen the public's perception of the port and its importance to Hamburg's everyday life.

	2002	2004	2006	2008	2010	2014
Strategy	Municipality underlines importance of waterfront development in City Ports area, including RDM	*Port Vision 2020*: Municipality and the PoR announce transformation of City Ports as major task	Revised agreement of the PoR and Municipality with goals, phasing and execution strategy for City Ports area.	Development of RDM as a campus location for 'Research, Design and Manufacturing'. Educational institutions form the heart of the campus.	More focus on synergy with port-related RDM activities in education, research and innovation and private port companies.	Creation of a 'showcase' for the RDM Campus and the port in general via cultural and social events.
Event	PoR acquires the disused RDM site and real estate from Baris on behalf of the Municipality.	Privatisation of PoR. Foundation of OMSR. Bankruptcy of last RDM business unit.	OMSR dismantled (2006). New assignment of PoR and Municipality (2007)	Albeda College (AC) and Rotterdam University of Applied Sciences (RU) set up at RDM Campus (2009)	PoR takes over responsibility acquisition of new tenants in campus from RU	New lease contract for principal tenant RU and AC. The PoR takes over activities for conference centre from RU.
	Landlord function → **Beyond the Landlord (Port Developer)**					
Role of Port of Rotterdam Authority (PoR)	Municipal agency and caretaker for RDM.	Caretaker. Defends port interests against OMSR urban development plans (safeguarding space for port activities).	Adopts strategy of AC and RU for development of RDM Campus. Becomes responsible for the planning.	Responsible for the planning and starts realisation of the 'hardware' (real estate and public space, public transport).	Responsible for planning, realisation hardware, and acquisition of new tenants	Responsible for planning, hardware, acquisition of new tenants, marketing and programming of cultural and social events

PoR = Port of Rotterdam Authority
OMSR = Rotterdam City Ports Development Corporation
AC = Albeda College
RU = Rotterdam University of Applied Sciences

Figure 7 Caption Development stages of RDM Campus. Source: Vries, I. M. J. (2014) From Shipyard to Brainyard - The redevelopment of RDM as an example of a contemporary port-city relationship. p. 123

Figure 8 Hafengeburtstag: The port's "birthday party". Source: RadioHamburg

One of the most important challenges in a port-city relationship, according to best practices[4], is the barrier effect that a port has in the urban environment. Some of the recommendations to compensate for the barriers created are:

a. Improve landscape and architectural quality along the edges
b. Integrate buffer zones with green infrastructure
c. Design public spaces next to the port's edges

In addition to these "best practice" general strategies, Hamburg has to address the challenges of the coexistence of port activities and full urban uses. The island of Wilhelmsburg in the southern part of the city includes both port/industrial and residential uses. Planners from the city and IBA (International Building Show) Hamburg, a municipal corporation created to manage all the projects related to this area of the city, are considering the island as a place to build new housing while exploring sustainable alternatives for urban development. Their goal is to expand residential areas through making the neighborhood denser and preventing urban sprawl, while creating socially advantageous conditions and building green infrastructure – all of this while coexisting with the active port and introducing environmentally responsible technologies. "By 2050, Wilhelmsburg is supposed to be energy neutral, meaning that the neighborhood will produce as much energy locally through wind, sun and thermal as it uses in renewable items and in fossil fuels"[5]. Some brownfields from the port are being developed as parks to serve both as green buffers to the port and as viewpoints of the activities in the port. The parks and other green infrastructure, instead of only buffering and isolating the port, function as opportunities to establish visual connection with the port.

Figure 9 Wilhemsburg Island development plan. Source: IBA Hamburg

The Port of Hamburg's 2025 plan also includes the expansion of the already important cycling infrastructure that surrounds and crosses the

4 Sanchez, J.M.P., 2016

5 Schuetze, C., 2011

port. This bike infrastructure serves not just the port users but all the inhabitants of Hamburg. It also allows a different interaction between the port and the people.

Figure 10 Cycling network in the Port. Source: Hamburg Port 2025 Development Plan

Overall, the idea of improving visual connections with the port is a strategy to generate value while improving the physical environment around the port. The Port Authority embraced the idea that the port is also a leisure space that can attract tourists. According to the HPA 2025 redevelopment plan for the port, attractive sights are being identified, developed and integrated. Some are, as already mentioned, located along the cycling routes or the green buffers along the port edges, but others are located near the city's urban waterfront.

Figure 11 Touristic View points in the Port. Source: Port of Hamburg

For example, in 2004, Hamburg built a 13-m-high bright-orange look-out tower, inspired by the port's avian cranes and its nautical periscopes. It was relocated to HafenCity in 2013, where it serves as a 360-degree observation deck to see a panoramic view of both the city and the active port. The tower was funded by the European Union project Waterfront Communities under the EU program Interreg III B North Sea.[6]

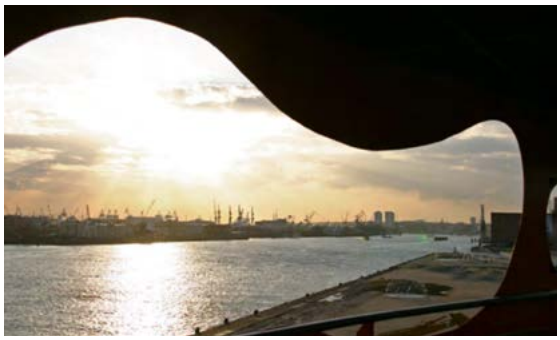

Figure 12 View form the Viewpoint tower in HafenCity. Source: Association Internationale Villes Ports (AIVP) (2015)

Figure 13 Viewpoint tower. Source: Getty Images

The former free-port area, located just inside the city center, was abandoned in the early 2000s and now is known as HafenCity (which literally means "port city" in German). It is being redevelop as a mixed-use district that includes housing, offices, and a brand-new iconic concert hall, the Elbphilharmonie. HafenCity is

6 http://www.hafencity.com/de/infocenter/viewpoint-in-der-hafencity.html

considered the largest redevelopment project in Europe by land mass. The east development of HafenCity had to take into account existing industrial uses to coexist with the new residential and retail activities. To achieve this mix of uses, an agreement between the industrial companies and the housing developers was needed:

- Industries agreed to reduce their night hour activities to reduce noise.
- Apartment projects agreed to settle architectural guidelines for a) interior spaces and b) use of materials that reduce acoustic pollution.
- When advertised in the market, all residential spaces have to disclose the location of nearby industry.

Figure 14 HafenCity aerial picture. Source: Port of Hamburg

Conclusion

The main conclusions from these two case studies are that ports can and should be considered integral parts of their host city. This recognition starts with the city viewing the port as one of its many pieces. Cities may try to ignore the adjacent port, but it will still be there. Instead of looking away, cities should dialogue with their port and its adjacent industries. Green infrastructure, better connections, and better public space in those parts of the city that many perceive as a backdoor are many of the strategies that can be followed. Perhaps the main lesson from Rotterdam and especially from Hamburg is that the port can become an asset of a city, not only economically but also as an everyday element of the cityscape.

Recommendations for Ashdod

Although there are cultural, geographical and even urban differences between Ashdod and the cities of Rotterdam and Hamburg, some lessons can be learned from these examples. Ashdod, like Rotterdam and Hamburg, is dealing with the barrier effect that the port and the industries next to it have on the city. Here are some recommendations based on the discussed cases that can be applied in Ashdod:

- As exemplified in the best practices used in Hamburg, Ashdod needs to work to improve its buffer areas between the city and the port/industries. The Lakhish river is without doubt a crucial environmental asset to be used both as a public space and a green buffer between heavier industrial uses and the highly secured portions of the port.
- Ashdod's development has happened thanks to the economic impulse the port introduced in the region. As is palpable when one stops by the port visitors center, there used to be a strong link between the then small new town of Ashdod and the port. Hamburg has worked very intensely to enhance the visual connection between its port and the city. Hamburg recognizes its port's importance in the city's history and character. In Ashdod, the port is omnipresent, both as part of the city's skyline and as the ocean landscape. The improvement of the Lakhish River surroundings could include viewing points of the port and other areas that reinforce the now lost connection between the port and Ashdod's everyday activities.
- In the industrial areas, especially the areas between the river and the city quarters, some

mixed development should occur. Rezoning the light industrial areas to accommodate urban uses while setting guidelines such as those implemented by HafenCity to mix industry and housing could be an option.

- The port can be involved in planning some of the uses in the areas to be redeveloped. Ashdod, for example, is planning to develop a stadium and residential uses next to the Lakhish river and the port. This area provides the opportunity to involve the current Port Authority and the operator of the future port expansion in order to include uses that serve both the community and the port.

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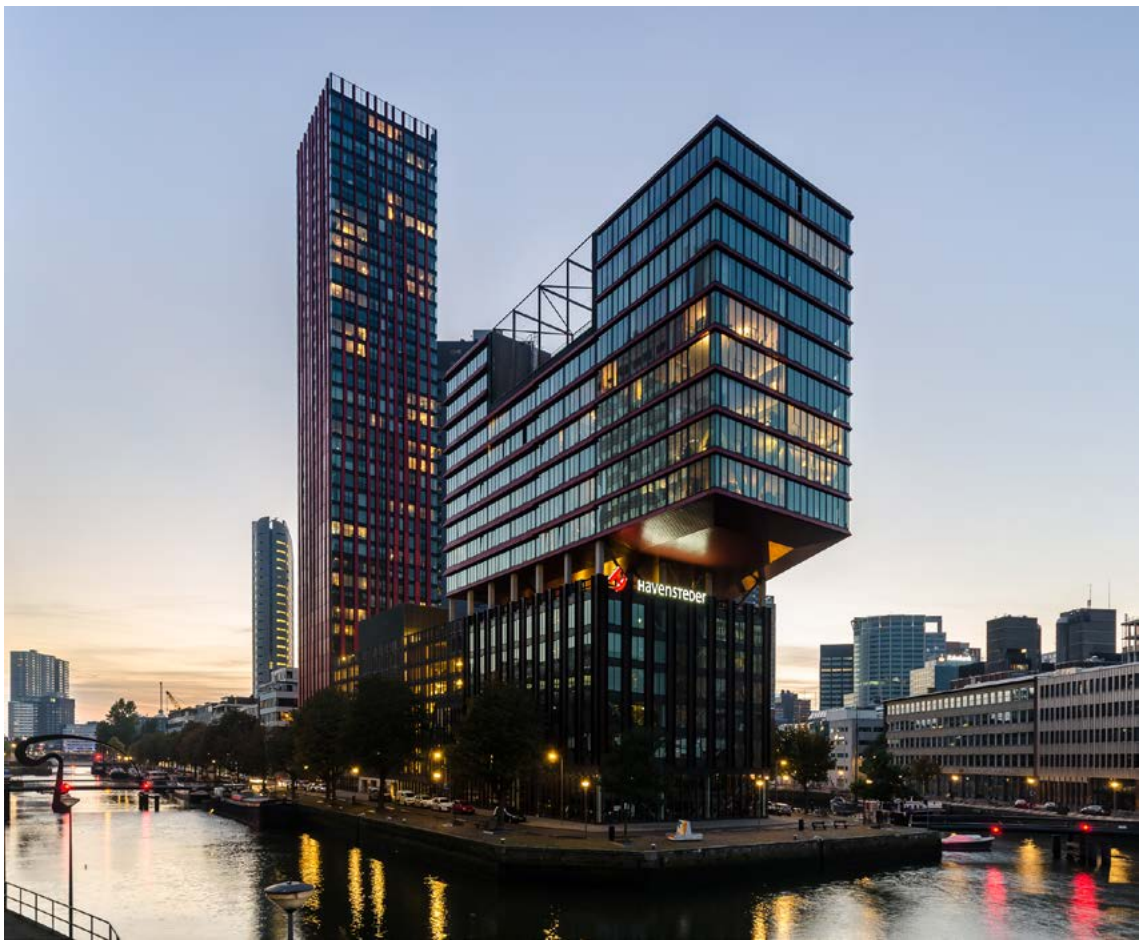

Figure 15 The Red Apple on Wijnhaven island. Source: Przemysław Turlej, CC BY-NC 2.0

Industrial Symbiosis

Kalundborg, Denmark

Kalundborg hosts a significant industrial agglomeration that boasts an economically beneficial symbiosis that has sprung up in a context of effective environmental performance regulation. Through a series of bilateral swaps, an ecosystem has emerged where one firm's waste is another's input. This innovation has occurred organically over decades as the result of close working relationships and a willingness to collaborate.

Louis Liss

Background and Challenges

Just over 100 kilometers from Copenhagen on the west coast of Denmark's Zealand Island, Kalundborg is an unlikely place for a world-famous industrial community where waste is transformed into profit. With less than 50,000 people living in the region[1], at an approximately one-and-a-half-hour drive from the capital, the region has attracted increasingly advanced producers who are joining an "industrial ecosystem" where byproducts from one firm become an input for another. The ecosystem came to exist decades ago

1 (Statistics Denmark n.d.)

somewhat organically, although its expansion has been facilitated by organizations such as the Symbiosis Center. Kalundborg has been the topic of numerous studies evaluating the intersection between its ecological value and economic output, and initiatives to reproduce the symbiosis have launched across the world.

Ashdod could stand to benefit from the experience of Kalundborg. Although Ashdod has a different context as a more populous residential center near the fringe of Tel Aviv with high housing demand in competition for industrial land, the economic fundamentals of Kalundborg could still add significant value to Ashdod's industrial policy. This case study will provide background on Kalundborg's development, highlight the innovative model that has developed, and provide some recommendations that could enable Ashdod to find some of the same value–in both shekels and environmental impact–created in Kalundborg.

According to the UN Environmental Programme and the Symbiosis Center, Kalundborg's industrial ecosystem began in 1961 when the Municipality paid for a pipeline between Lake Tissø and the new Dansk Esso Refinery, which was later purchased by Statoil, the Norwegian oil and gas company. The next key links happened in the early 70s, when the oil refinery began selling its excess gas to Gyproc, which used it to produce its plasterboard products. Soon after, the Asnæs Power Plant connected to the same water supply as the oil refinery.[2] These links later continued to grow piece by piece over the decades, resulting in a relatively complicated system that included both new waste/input connections and new industries.

Figure 1 Kalundborg Aerial. Source: ensia.com

Two key challenges shaped the development of industry in Kalundborg. The first and most important to consider is water scarcity. Since groundwater was relatively scarce in the region, the pipeline to Lake Tissø for the Statoil refinery was a critical piece of infrastructure.[3] This same scarcity has improved the economics of water reuse for other firms. The second key challenge that influenced the formation of the cluster is scarce energy. In the 1970s, an oil crisis led to high prices that drove Kalundborg to look for efficiencies. High oil prices inspired the town to build the necessary infrastructure to leverage excess heat from the power plan as district heating.[4]

Today, there are more than 30 exchanges among several core partners, with many additional participants outside of this core group receiving additional byproducts. Past estimates have suggested that approximately $15 million per year is saved in operating efficiencies, as well as millions of cubic meters of water and many thousands of tons of inputs, such as oil and gypsum. The core partners and exchanges that make up the ecosystem include but are not limited to:[5] [6]

- Statoil, the refinery that began the symbiosis. Statoil uses the Lake Tissø water from the

2 (Francis and Erkman 2001)

3 (Gertler 1995)

4 Id.

5 (Jacobsen and Anderberg 2005)

6 (Kalundborg Symbiosis 2015)

municipal-financed pipeline and sells its excess gas to Gyproc.

- Asnæs Power Station, a coal-powered plant. Asnæs gets gas from Statoil, powers Kalundborg's district heat with its excess, and sells steam to Novo Nordisk.
- Gyproc, a plasterboard manufacturer. Gyproc buys gas from Statoil and receives gypsum from Asnæs, which produces it as a byproduct through emissions scrubbing.
- Novo Nordisk, an insulin producer. Novo taps into the Tissø pipeline, uses steam from Asnæs, and supplies its waste water to Kalundborg Municipality.
- Kalundborg Municipality helped seed the ecosystem and enjoys district heat and water from its industrial partners.
- Bioteknisk Jordrens produces remediated soil from sludge that comes from Kalundborg Municipality.

Model

Some might argue that the thrift enjoyed by ecosystem participants today is nothing new. According to Boons and Janssen, in the 19th century, "waste recovery and exchange between independent firms was widely practiced in the Western world." However, this historical reality has not stopped the "discovery" of the Kalundborg model from gaining significant traction. Boons and Janssen also note that the concept of "eco-industrial parks" evolved from the notion of "industrial ecosystems," first coined in 1977; both concepts have frequently been explained using Kalundborg as the example.[7]

Strategies and Innovation

While the notion of economizing on inputs and waste may not be new, the conditions

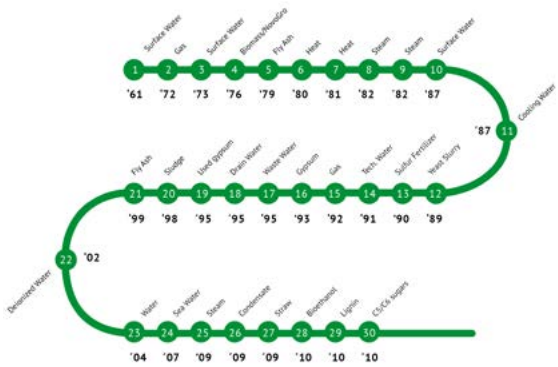

Figure 2 Timeline of various inputs and outputs contributing to the Kalundborg industrial ecosystem. Source: Symbiosis Institute

necessary to encourage such beneficial outcomes are unique. A few innovative elements of the Kalundborg symbiosis are critical to highlight in order to consider how a similar strategy might be embraced in Ashdod. First, rather than being a highly orchestrated strategy, Kalundborg's symbiosis comes from bilateral agreements. Second, the regulatory framework is a material consideration for the emergence of the ecosystem. Finally, there is a definite human factor inherent in such close dependency and cooperation.

- Bilateral Swaps: It is important to recognize that each relationship takes the form of a bilateral agreement between firms. This has allowed great flexibility for the ecosystem to grow organically. According to Jacobsen and Anderberg, the network has grown considerably and is constantly evolving as the market and technology change.
- Regulatory Climate: Getler's germinal thesis on Kalundborg notes that regulation has been a key driver of the innovative efficiencies developed through the ecosystem beyond the " 'low lying fruit' " of strictly economic inspiration. He cites the Danish sulfur dioxide regulations as an impetus for the Asnæs power plant to build a scrubber, the cost of which is offset by the sale of gypsum to Gyproc. Jacobsen and Anderberg note that Danish

7 (Boons and Janssen 2004)

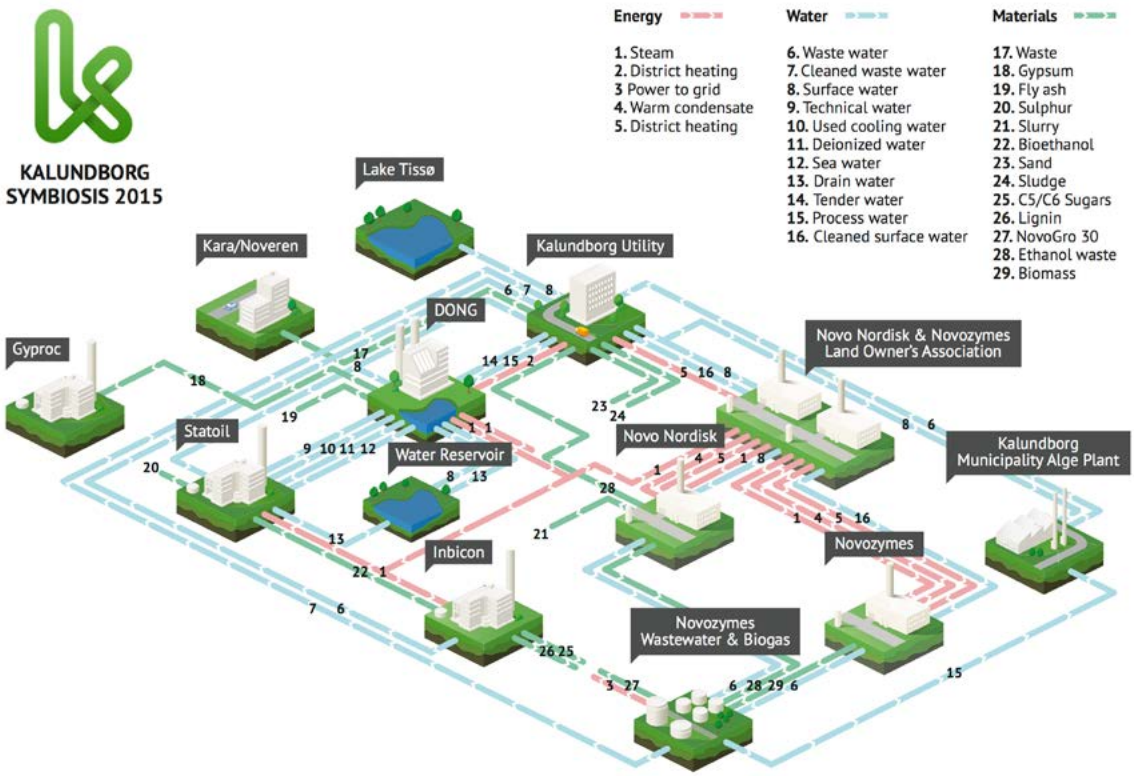

Figure 3 Diagram of Industrial Symbiosis in Kalundborg. Source: Symbiosis Institute

environmental legislation tends to be flexible and performance and negotiation-based rather than fixed on specific technical standards, which has enabled some innovation.

- Human Factors: Key support organizations such as the Environmental Club and the Symbiosis Institute have helped facilitate strong working relationships among members of the ecosystem. There is also anecdotal evidence that "frequent gathering of managers in a local pub" in Kalundborg is one venue where cooperation is facilitated, according to Boons and Janssen. Although economics and regulation provide a scaffolding for the ecosystem, it is certain that it would not exist in the same form were it not for committed people across institutions.

Conclusion

Ashdod's heavy industrial businesses take advantage of the city's strategic port location and will likely continue to be anchors for years to come. While lighter, more-high-value-added industries could be a desirable complement in the long run, it is critical to continue to nurture the contribution of the industries that exist. In Kalundborg, more-advanced industries were introduced over time as the ecosystem grew more sophisticated. By investing in a cleaner tomorrow for today's industries, Ashdod could build a reputation as a sophisticated, competitive industrial hub.

Recommendations for Ashdod

The case of Kalundborg offers several potential lessons for Ashdod. While such close cooperation is unlikely to occur in a sustainable manner in a short amount of time, Ashdod offers some conditions that could make an ecosystem a possibility. Serious resource constraints, including water, land and energy constraints, create a strong incentive for collaboration among the many heavy and nationally significant operations in Ashdod's industrial zone. The city could help play "matchmaker" between firms to nudge some symbiosis with a few potential maneuvers:

- **Conduct an inventory** of key inputs and outputs into major industries in the City. It is not safe to assume that the market has provided close coordination. By gaining a better understanding of each firm's supply chain, the City could find some matches.
- **Create a non-profit servicer** of the industrial area, similar to those that exist in New York City's Industrial Business Zones. A servicer could help identify common needs and collect funds from member industries to implement key support services. This servicer could create a forum for collaboration among businesses and potentially lay the foundation for a network like the Symbiosis Institute in Kalundborg.
- **Determine infrastructure gaps** that could facilitate the exchange of materials between firms. Similar to the Lake Tissø pipeline first financed by the Kalundborg municipality, Ashdod might identify particular rails, new road connections or pipelines that could facilitate material exchange.
- **Consider innovative municipal finance strategies** to implement new ecosystem infrastructure. Given Ashdod's strong fiscal status, the City could use a bond issuance to cover up-front costs of new investment, to be repaid over time by industrial beneficiaries. "Green bond" markets could provide the means to identify motivated investors with a better understanding of potential risk.

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Industrial Ecology on the Brooklyn Waterfront

Brooklyn, New York

The following report looks at the Brooklyn Navy Yard as a robust waterfront that has proved resilient to changing land use and a changing economy. The report traces stages of trial and error. Ashdod can gather insights into adaptive reuse, marketing, and policy tools to revitalize a decommissioned maritime and industrial site.

Max Moinian

Background and Challenges

The Brooklyn Navy Yard has cycled through periods of decline in tandem with changing geopolitical and economic trends. Built in 1802, the Navy Yard operated as a port and ship manufacturing site. During the second world war, it boomed: 70,000 employees constructed warships for the country, working around the clock. The BNY was nicknamed the "Can Do Shipyard." But then it declined. Revitalization efforts failed until they captured and spoke to actual needs rather than desired outcomes. Today, the Navy Yard has transitioned once again to accommodate shifts in the immediate economic and environmental contexts.

The evolution of the Brooklyn Navy Yard is a rich example of port-industrial infrastructure using policy tools to adapt to changing local,

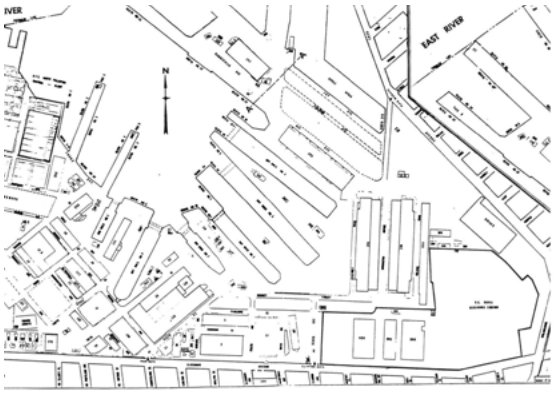

Figure 1: Site Map. The loading bays and waterfront access of the site before redesign. Source: BNY

national, and global needs and trends. This case study will focus on the site's conditions in two main periods: post-WW2 through 1960's decline and 1970's revitalization, and the present day. The first period offers a context similar to Ashdod, while the second period offers innovative policy and development tools that can be applied to Ashdod's physical and industrial planning.

The BNY is on the coast of Williamsburg, facing Manhattan, between the Manhattan and Williamsburg bridges. The BNY has a rich history of maritime industrialism from the mid-20th century to the present day. Its function has adapted to changing needs – at first national, but then local since the 1960's. At the end of WW2, activity at the BNY abruptly went silent – the site had been dedicated to wartime use. Without a plan, the site drowned federal money until it was eventually shutdown in 1966. Mayor Lindsay negotiated purchase of the unoccupied waterfront landmark, and revival efforts began a few years later. His

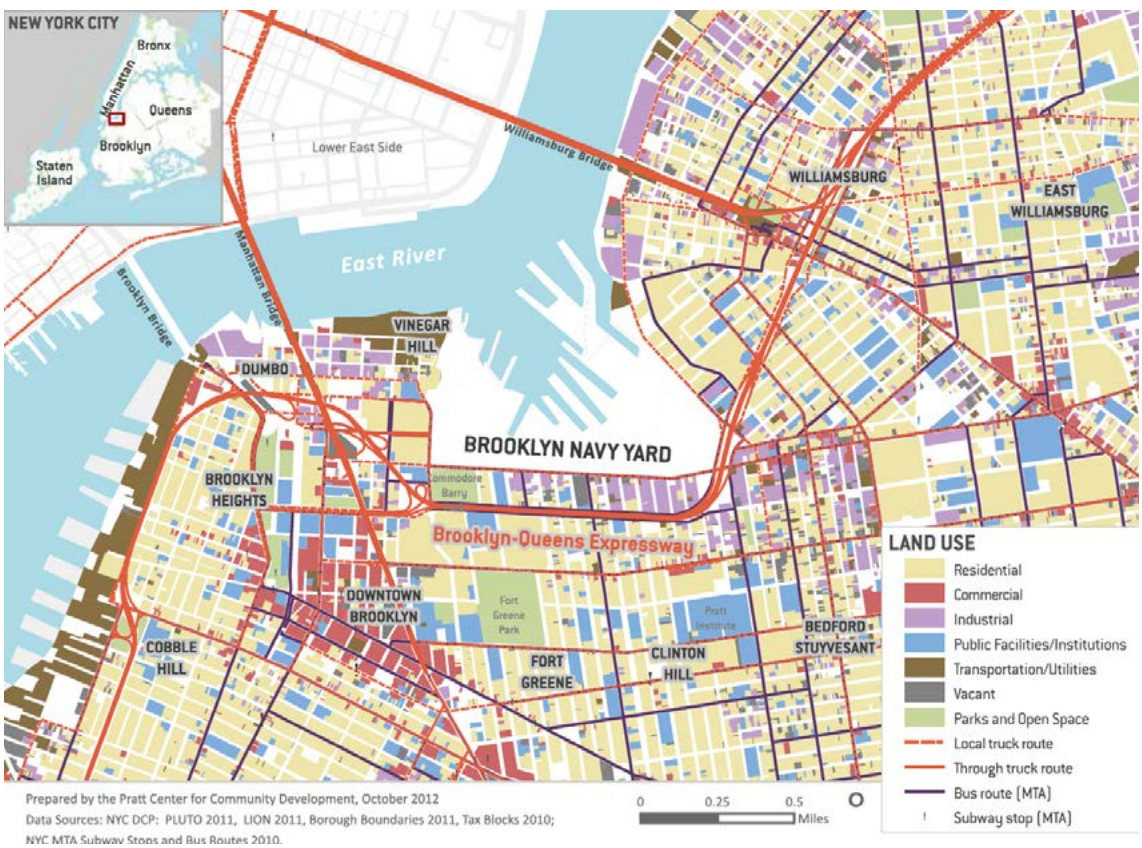

Figure 2: Land Use. Traditional land use and the dense urban context. Source: Pratt Center for Community Development

stated goal was to convert the site into an industrial complex providing 30,000 local jobs.

The first pass at reviving the BNY was carried out by CLICK, a nonprofit agency that obtained a ten-year lease on the land. CLICK's strategy was to value anchor tenants, demolish existing buildings, and model the Navy Yard after desired rather than actual opportunity. However, the "industrial park" failed as soon as an anchor tenant filed bankruptcy – leaving a prevailing attitude that "industry is dead" (Wolf-Powers 2003, 40). CLICK's failure offers three lessons: diversify businesses, find value in the existing built environment, and assess the local context before prescribing foreign success models. Overall, CLICK failed to be flexible and innovative.

New leadership turned the BNY around in the 1980's. By 1998, the area held a 98% occupancy and 3,000 employees. And this happened at a time when the surrounding neighborhoods were still lower income, crime ridden, and largely abandoned. Under the leadership of Richard Aneiro, president of the BNY Development Corporation, 200 small to mid-sized businesses occupied the long-abandoned factory buildings. Aneiro's success lies in innovative thinking, flexible policy, and an emphasis on marketing and networking.

Since Aneiro, the changing local context has urged the BNY to rethink its function once again. Gentrification of adjacent neighborhoods, lack of affordability, and global markets threaten businesses within the BNY and across New York City. Meanwhile, the city, like many cities today, is competing to establish its tech-edge. Today, the Navy yard hosts 5,000 employees on over 4 million square feet of leasable space. Whereas the Aneiro-era BNY offers a parallel urban environment to Ashdod, the current area parallels Ashdod's aspirations in a global context.

The Navy Yard has cycled through major decline twice, with the linked problems of outdated infrastructure, dilapidated buildings, political and community entanglements, pollution, and crime. Additionally, the damages resulting from CLICK's strategy, which drowned public money to demolish valuable buildings and damaged the reputation and faith in the BNY, had to be taken on.

Loose or un-comprehensive land use policy contributed to the site's challenges as well. An effort to free up underutilized buildings by converting land use from strictly industrial to mixed-use had unintended consequences. Due to a booming housing market, mixed-use

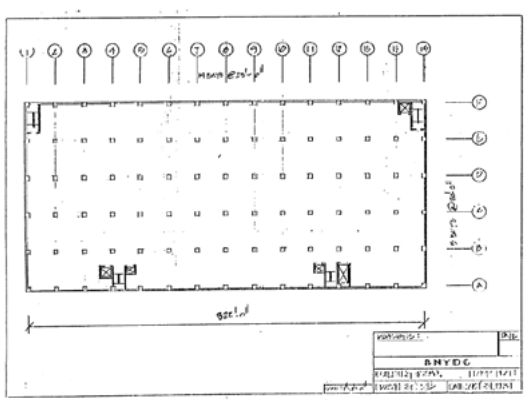

Figure 2.4 Blue prints demonstrate how BNYDC engineers sub-divide large floor plans into small space offerings. (courtesy of BNY)

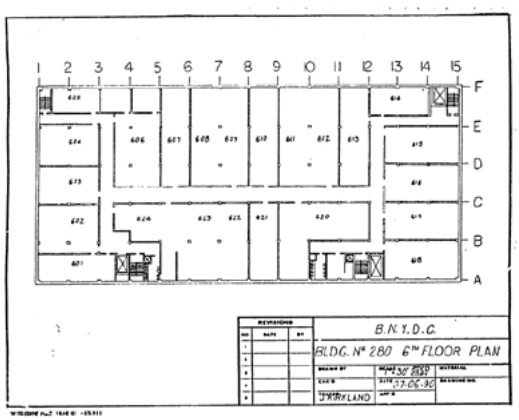

Figure 3: Floor Plans. Original open plans were parceled down to accommodate small businesses. Source: BNY

really meant housing. Factory conversions and new buildings sprang up uncontrollably. Other policies favored finance and white-collar job growth rather than labor and service economies. These policies effectively promoted deindustrialization.

The reach of challenges at the BNY was also global. Innovation in manufacturing techniques altered the uses and needs of factory spaces. Domestic production struggled to compete with overseas production. The BNY needed to preserve the industry through innovative thinking and adapt outdated infrastructure for new use.

Figure 4: Industry on the Water. The visual character of the waterfront is similar to Ashdod's port. Source: BNY

Model

A combination of actors, organizations, and policy from the 1980's to the present day offers a wholesome model of revitalization. The timeframe suggests that success requires iteration, flexibility, and planning. Resiliency through diversification and adaptation has proved to be the main driver of the BNY's success.

The BNYDC flipped CLICK's strategy by assuming that the "market for this space was at that time undefined", meaning that anchor tenants or specific industries did not guarantee success or speak to the community, borough, or city's needs. The corporation started by learning the space. A building inventory was taken to assess suitability based on the following criteria: type, dimension, structural condition, architecture, floor load, floor height, column spacing, internal circulation, reuse potential, and cost to rehabilitate.

Next, the BNYDC subdivided building plans and imagined single-factory spaces to host many small businesses. Rather than seek tenants through commercial brokers, they put out ads in local newspapers, targeting small businesses that could operate without the building and infrastructure standards required by big companies. The BNY at the time lacked adequate parking, funds to renovate buildings or repair streets, strong utility lines, and other types of infrastructure. Small businesses were incentivized not by cheap rent but by tax-free rent in exchange for building out their space independently.

The BNYDC established close relationships with each tenant. They offered business strategy, administrative, and legal guidance. They hosted biweekly lunches for tenants to network with one another. And the benefits were mutual—the BNYDC accumulated contacts of businesses either supporting or supported by existing tenants. They then set out to relocate these businesses in the BNY, effectively establishing an agglomeration economy within the site.

Today, the citywide IBZ program operates as the BNY's main strategic plan.

Strategies and Innovation

The BNYDC era's success lies in creative solutions for adaptive reuse, appropriate phasing of development, marketing techniques, and commitment to tenant security and growth. Rather than adopting start-up incubators or co-working models popular in major cities today, New York took a bet on small business owners who struggled to establish themselves elsewhere in the city. Some action plans and coalitions that contributed to the BNY's growth are outlined below.

The New York City Waterfront Revitalization Program (NYC WRP) of 1982 set out to maximize benefits from economic development, environmental preservation, and public use while minimizing the conflicts among these objectives. By formally assessing the three together, a mediator is effectively set between each of them, allowing for conflict resolution and mutual benefits where possible.

The Brooklyn Navy Yard Industrial Coalition (BNYIC) of 1991 packaged all the businesses on the site as a team to compete against the idea of an anchor tenant. The goal was to bid for national and international contracts and to form joint ventures.

The NYC Comprehensive Waterfront Plan (NYC CWP) categorized four types of active waterfronts to then address each piece uniquely. The categories are natural, working, and redeveloping.

The NYC Waterfront Rezoning Plan (NYC WRP) of 1993 provided urban design guidelines for future development. The plan highlights appropriate contextual scales through regulations on height and bulk and the protection of physical and visual access to the water.

Vision 2020, published in 2011, identifies a "blue network" of improved water quality. The plan proposes ways to reinvent the shoreline for public access and productive use.

The Brooklyn Tech Triangle, established in 2012, influenced the focus on green construction and innovation. The development team includes the Downtown Brooklyn Partnership, the DUMBO Improvement District, and the Brooklyn Navy Yard Development Corporation. The goal is to develop downtown Brooklyn as a hub for the tech-innovation industry but with a focus on light manufacturing. The coalitions operate on the assumption that there will be a severe lack of this kind of space in the city, with increasing unaffordability in Manhattan. While this strategy plays on the global trend of high-tech districts, it is important to note that it is an approach only taken once the area has already grown and been strengthened by its inherent characteristics. Furthermore, the plan is based on an analysis of actual need rather than aspiration.

NYC WRP (1982)
- Waterfront Revitalization Program
- Goal: maximize benefits from economic development, environmental preservation, and public use WHILE minimizing the conflicts among these objectives

Brooklyn Navy Yard Industrial Coalition (BNYIC) (1991)
- Purpose: package all the businesses in the yard as a team in bidding for national/ international contracts; form joint ventures

NYC Comprehensive Waterfront Plan
- 4 types of waterfront: natural, public, working, redeveloping

Waterfront Rezoning (1993)
- Appropriate contextual scale; control height and bulk

- Protect physical and visual access to the water

Vision 2020 (2011)
- Blue Network
- With improved water quality, propose ways to reinvent the shoreline for public access and productive use

Brooklyn Tech Triangle (2012)
- Influenced focus on green construction and innovation
- A development team made up of the Downtown Brooklyn Partnership, the DUMBO Improvement District, and the Brooklyn Navy Yard Development Corporation
- 2012: Speaker Christine Quinn pledged to provide $100,000 towards the project
- Goal to develop downtown Brooklyn as a hub for the tech industry and innovation
- The coalition estimates that there will be a severe lack of commercial and light industrial space in New York City for tech industries in the near future — utilize space in Brooklyn to draw these industries to the borough (2013 study: rents 30-50% cheaper than midtown/ downtown Manhattan)

Today: the number of employees has grown to 6,400, from 3,600 in 2001
- 50% Brooklyn residents
- 35% from communities adjacent to the Navy Yard
- tax incentives to encourage move to / remain at the site

Improvements: transportation (BRT extensions, ferry landings), bike paths, green space, and recreational spaces

Conclusion

Since 2011, employment in the BNY has grown from 3,600 to 6,400 workers, half of whom are Brooklyn residents and 35% of whom are from communities adjacent to the Navy Yard. Tax incentives continue to encourage relocation to or retention at the site. Next improvements include transportation in the form of BRT extensions and ferry landings, bike paths, and green and recreational space. The techniques outlined in this study and the plans mentioned offer creative and productive strategies for Ashdod. In tandem with proper phasing and actors to carry out these strategies, Ashdod can prosper in the same way as the BNY.

Figure 5: Ashdod's untapped waterfront. Parking lots, vacant land, and vacant buildings with the powerful image of a working city – the industrial port – on the horizon. Source: Max Moinian

Recommendations for Ashdod

Diversify the economy: curate tenants not based on highest bidder but best use. Supporting small to mid-sized local businesses allows for growth of both actors and mitigated risk, whereas anchor tenants may have high demands or face detrimental consequences of leaving.

Listen to local and regional needs, not global trends: the manufacturing or "makerspace" model of contemporary industrial urbanism suits the context of Ashdod more than high-tech parks. The key role of the port offers an opportunity in the combination of maritime and land-based businesses.

Be flexible: the resiliency of the BNY during the economic recession is a testament to the strategy employed. Industries that supported other industries in the immediate area held their place in the market.

Support an agglomeration economy: it "makes economic sense to think beyond the highest and best use." Through its connection to a broader network of supporting industry, the BNY was able to capture niche local markets.

Appeal to the creative class: a combination of light manufacturing, entertainment, culture, and affordability leads to innovation and entrepreneurialism.

Establish a development corporation: it is imperative to have a formally organized strategy on multiple scales, and these actors must collaborate with their constituents as well as each other.

Diversify economy
- Curate tenants, not based on highest bidder but on best use
- Support small/mid-sized businesses
- Listen to local and regional needs, not global trends
- Manufacturing/"makers space" model v. hi-tech model
- Combination of maritime and land-based businesses

Be flexible
- Evidence: the resiliency of Navy Yard industries during the recession

"It makes economic sense to think beyond the highest and best use" (Wolf-Powers)
- connection to a broader network of supporting industry

capture niche local markets

Appeal to the creative class
- A mix of light manufacturing, entertainment, culture
- And affordability
- Leads to innovation and entrepreneurialism

Establish a Development Corporation

Figure 6: Ashdod's untapped waterfront. A site with strong potential to be a public access point. Source: Max Moinian

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Figure 7: BLDG 92 Yard Work Gallery. Source: Dave Pinter, CC BY-NC-ND 2.0

Figure 8: Brooklyn Navy Yard - Third Street. Source: Wally Gobetz, CC BY-NC-ND 2.0

Strategic Zoning and Creative Repurposing for Industrial Retention and Connectivity

Chicago, USA

A shift in municipal policy making in 1980s Chicago led to the invention of the Planned Manufacturing District to preserve land for industrial use, while a number of large-scale projects repurposed defunct industrial infrastructure for recreational use.

Chicago, with a metropolitan population of almost 10 million, has been a center of manufacturing and industry since its meteoric rise as a hub for commodity markets and rail handling in the nineteenth century. However, structural deindustrialization and the general decline of American urban centers in the second half of the twentieth century posed an existential threat to Chicago's remaining industrial base. Moreover, in contrast to the city's immense network of parkland and lakefront beaches, a century of industrial pollution had turned the Chicago River into an open sewer. While many blamed deindustrialization on "the market", this case study argues that local politics and policy have great agency in guiding the economic fortunes of a city if the correct balance can be struck between high-visibility civic projects and community development. The legacy of the 1909 Plan of Chicago, which prioritized civic infrastructure as part and parcel of the City Beautiful movement, privileged high-visibility downtown projects, which became the controversial hallmark of the 23-year Richard J. Daley mayoral administration until a change in political climate refocused policy on local development. The fate of Chicago's industrial base, as well as a new wave of high-visibility civic projects, can be understood through the lens of 'downtown' versus 'neighborhood' development logics as realized through public policy.

The development of Chicago's Industrial Corridors, Riverfront, and a newly repurposed freight rail line highlights the primacy of politics in charting the course of public policy. From the mid-1950s through the mid-1980s, Machine politics was built on a network of alliances between politicians and private capital that prioritized large downtown capital projects over neighborhood concerns. Daley's focus on downtown development bumped central land values and vitalized the city's image at a time when American cities were declining. However, increasing gentrification and neglect of the neighborhoods put pressure on the city's industrial base and citizens' livelihoods. After the collapse of the Machine, reformer politicians shifted their focus to neighborhood development. The establishment of Planned Manufacturing Districts (PMDs) in the late 1980s, which protected industrial land from speculative investment, epitomized the turn to neighborhood-centric policies. However, the political imperative to realize large projects such as the Riverwalk and the Bloomingdale Line persists. Balancing neighborhood and downtown development policies is inherent to a city's health and success.

Max Budovitch

Background and Challenges

Chicago's downtown is defined by the Chicago River, which flows west from Lake Michigan for two kilometers before it splits into its North and South Branches. The city's financial, printing, and wholesale industries are located downtown, while several industrial zones radiate outward like spokes along rail and maritime shipping corridors. Daniel Burnham's landmark 1909 Plan of Chicago envisioned riverfront promenades, two ceremonial lakefront piers, a towering civic center, and an island archipelago off the downtown area. From the moment of its publication, the Plan has served as a backdrop for the physical development of downtown Chicago and the city's parklands. Policy for the city's industrial base, however, was not elaborated in the Plan and was generally neglected by politicians.

Chicago started to experience industrial decline as early as 1940, precipitated in part by the growth of the highway system and the trucking industry, which made cheaper suburban industrial land accessible. Upon his mayoral victory in 1955, Mayor Richard J. Daley (who at the time was also chairman of the Cook County Democratic Party and boss of a growing Machine) transferred powers historically held by the Chicago Plan Commission to the Department of Planning in City Hall, which lay comfortably within his political purview. Daley's urban agenda focused solidly on lakefront and downtown residential and civic development. The 1958 Development Plan for the Central Area of Chicago parroted this policy direction, which combined a particular vision for the city's skyline and open spaces with an economic agenda geared towards the growth of the service sector. The resulting downtown gentrification gave the city a beautiful wall of residential towers along the coast. While the John Hancock, Marina, and Sears Towers were touted as successes in Daley's bid to hurtle the specter of post-industrialism, they in fact entailed further neglect of the city's weakening industrial backbone and the economic livelihood of many residents. This trend continued for several decades. From 1977 to 1984, 7,000 manufacturing jobs were lost in the industrial areas along the North Branch of the Chicago River due to residential conversion of industrial buildings.[1]

1 Robert Giloth and John Betancur, "Where Downtown Meets Neighborhood: Industrial Displacement in Chicago, 1978-1987," Journal of the American Planning Association 54 (1988): 284.

Figure 1 The city Daley built: The John Hancock in the foreground (center) and the Sears Tower in the background (right) define Chicago's downtown, while a wall of lakefront residential towers is flanked by an 29-kilometer stretch of coastal park. Source: City of Chicago

An alliance between politics and economic interests enabled and directed Daley's urban policy that prioritized downtown landmark-making over neighborhood development. Informal relationships between policy makers and private citizens with resources created ruling 'regimes', which strengthened the Machine and enabled the exercise of political power. Daley pioneered a particular regime termed the 'growth coalition', which favored the interests of rent seeking, downtown-oriented landowners and investors.[2] The growth coalition that secured Daley's six terms as mayor and realized iconic building projects also put speculative pressure on industrial land in immediate proximity to downtown that hosted 25 percent of Chicago's well-paying industrial jobs.[3]

Over time, both Daley's Machine and his growth coalition weakened as a result of unfavorable federal court decisions and grassroots mobilization, creating room for opponents to advocate for local economic development featuring a 'local-producer strategy' in opposition to Daley's downtown-centric policies.[4] The era of Machine politics largely came to a close at the end of Jane Byrne's administration in 1983, coinciding with a growing chorus of local organizations advocating for local development and job retention programs. This new movement for local employment was led by the Chicago Association of Neighborhood Development Organizations (CANDO) and the Community Workshop on Economic Development (CWED).[5] Other place-based organizations, such as the Local Economic and Employment Development Council (LEED), focused on neighborhood-specific policies, such as employing residents of the Cabrini Green public housing development in the North Branch Industrial Corridor.[6] The reform politician Harold Washington rode this wave of neighborhood protest and drafted the Washington Papers, which advocated for "balanced growth" to distribute benefits throughout the City, thus challenging the real estate interests that guided Daley's administration. While Washington did not immediately follow through on his platform, he came out on the side of policy reforms pushed by CANDO and CWED in the last weeks of his mayoralty and approved Chicago's first Planned Manufacturing District (PMD) in the North Branch Industrial Corridor in 1988.[7]

2 Joel Rast, Remaking Chicago: The Political Origins of Urban Industrial Change (DeKalb: Northern Illinois University Press, 1999) 10-11.

3 Ibid, 15.

4 Ibid, 18.

5 Haley Jordahl, "Zoning for Industry in a Post-Industrial Era: The Legacy and Potential of Chicago's Downtown Planned Manufacturing Districts" (MA thesis, Massachusetts Institute of Technology, 2016), 29.

6 Rast, Remaking Chicago, 28.

7 Donna Ducharme, "Planned Manufacturing Districts: How a Community Initiative Became City Policy," in Harold Washington and the Neighborhoods: Progressive City Government in Chicago, 1983-1987, eds. Pierre Clavel and Wim Wiewel (New Brunswick, N.J.: Rutgers University Press, 1991), 228.

Model

There are currently 26 Industrial Corridors in Chicago containing 12% of the City's land area and ranging in size from 70 to 3,500 acres.[8] The City's 15 PMDs are located within these Industrial Corridors. The first PMDs were approved in the immediate vicinity of downtown, where real estate pressures on industrial land were highest. In the years leading up to Washington's approval of the Clybourn Corridor PMD in 1988, piecemeal zoning changes in the North Branch Industrial Corridor were argued on a lot-by-lot basis as industrial land was converted into lofts. LEED produced a report at the time for the Department of Economic Development on the value of industry, and it lobbied Alderman Martin Oberman of the 43rd ward to stop approving industrial-to-residential zoning changes.[9] These efforts clearly had the desired effect on the Washington administration, which came out in favor of PMDs. These special Districts preserve industrial zoning and can include a buffer of mixed-use zoning, although residential use is prohibited outright.[10] Following Washington's death, Mayor Richard M. Daley approved an additional 14 PMDs during the 1990s.[11]

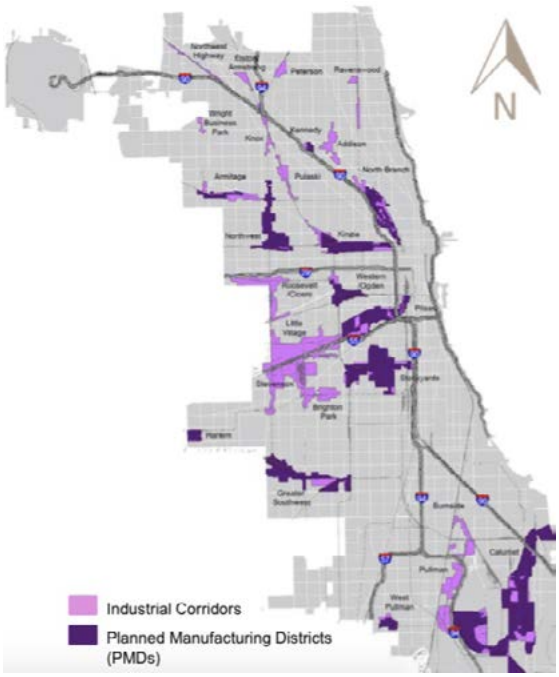

Figure 2 Chicago's Industrial Corridors and Planned Manufacturing Districts. Source: Mayor Emanuel's Industrial Corridor Modernization: North Branch. Community Meeting, Feb 21, 2017.

Figure 3 Goose Island. The Goose Island PMD is situated within the North Branch Industrial Corridor. Source: marketurbanism.com

Planners generally agree that PMDs are justified when industry is healthy, but nearby commercial and residential pressure warrants preserving industrial uses; when structural unemployment can be addressed through encouraging manufacturing; and when industrial nuisances are best dealt with by isolation. All three conditions hold for most of Chicago's industrial land, especially for areas in close vicinity to downtown that are threatened by residential pressures. "Manufacturing" is broadly defined in PMD ordinances as "any production processing, cleaning, servicing, testing, repair, or storage of materials, goods, products, or information".

8 Mayor Emanuel's Industrial Corridor Modernization: North Branch. Community Meeting, Feb 21, 2017.

9 Ducharme, "Planned Manufacturing Districts," 230.

10 Jordahl, "Zoning for Industry," 34.

11 Ibid, 36.

Mixed-use development can be approved in a PMD and, to date, has usually included educational institutions or limited office space. Applications to establish a PMD can be submitted by the Mayor, property owners of land in the proposed PMD, or the Alderman of the ward in which the proposed PMD is located. The PMD application must be approved by the City Council, as opposed to other zoning ordinances, which fall under the competency of the local Alderman. Addressing PMD zoning ordinances and amendments at the city level protects these Districts from the vagaries of local politics and allows the City's industrial land to be managed strategically from City Hall.[12] PMDs must undergo periodic review, at which point strategic zoning changes or public infrastructure improvements may be proposed.

Critique of the PMD model

The PMDs have had debatable success. Their scope to preserve land for industrial uses does not purport to address any larger causes of deindustrialization.[13] The broad definition of "manufacturing" in PMD zoning ordinances means that companies such as Google and Groupon, which do not employ blue-collar workers, can take the place of steel manufacturers and tanneries, as they have done in the North Branch Industrial Corridor PMDs. However, this same flexibility has helped each PMD develop its own competitive advantage, has controlled residential speculation, and has preserved land for non-commercial and non-residential purposes in centrally located areas bordering residential neighborhoods. This has encouraged economically intensive use of these lands, where residents from all 50 City Wards find employment.

Strategies and Innovation

The first Chicago PMDs represented a historic refocusing of urban priorities from downtown to neighborhood development. Moreover, the special PMD approval procedure broke the Aldermanic monopoly on zoning changes, introducing greater stability into the process and ensuring that industrial policy would be implemented on a citywide scale and not within political micro-fiefdoms. As a tool, the PMD creatively uses zoning regulations to prevent residential encroachment on industrial areas in a quickly gentrifying central city. That said, the zoning is not uniform, allowing for a variety of industrial, manufacturing, and commercial uses. Figure 4 below shows the evolving mix of commercial and industrial uses in the Northern Industrial Corridor PMDs up until 2016.

The periodic review process helps PMD zoning respond to evolving conditions and priorities. At the time of writing, the review of the PMDs in the North Branch Industrial Corridor proposed a new zoning configuration that includes a core of industrial and office uses and a buffer of mixed uses that will include affordable housing and require that at least 50% of land use be for employment (see Figure 5).[14] The city proposes to marginally reduce the PMD boundaries to allow for more mixed-use development catering to increased interest in residential and commercial development spilling over from the surrounding neighborhoods. The proposed plan also calls for the optimization of outdated roadway configurations, dedicated bus lanes, and better connectivity through shuttles and bike/ pedestrian paths to mass transit nodes. Finally, connections will be made between the PMD riverfront and adjacent trails. The proposed plan will be financed through

12 Ibid, 20.

13 Ibid, 97.

14 "Mayor Emanuel's Industrial Corridor Modernization: North Branch. Community Meeting," power point presentation, Feb 21, 2017.

Industrial Corridor System Fees collected upon applications for zoning use or size changes, Tax Incremental Financing, state and federal funding (mainly for bike and pedestrian transportation infrastructure), and planned development contributions in the form of open spaces.

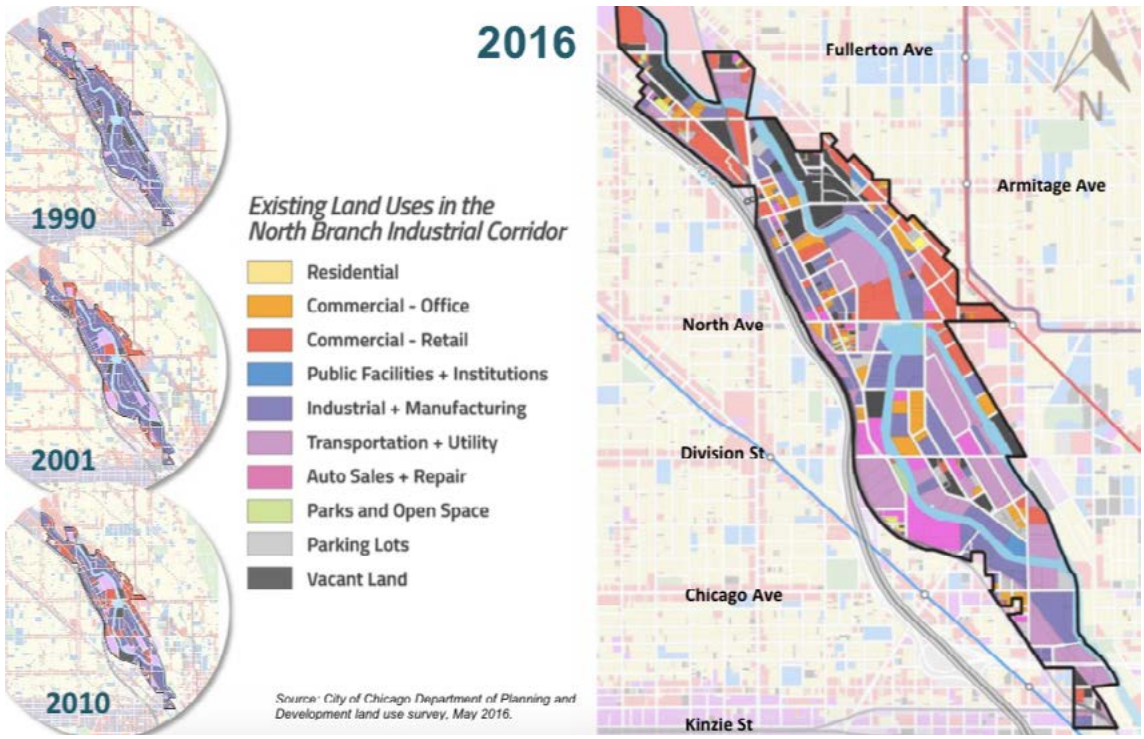

Figure 4 Mix of uses in the North Branch Industrial Corridor. Source: Mayor Emanuel's Industrial Corridor Modernization: North Branch. Community Meeting, Feb 21, 2017.

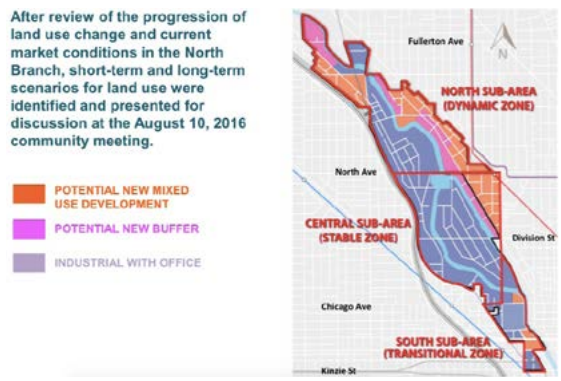

Figure 5 Long term land use scenario in the North Branch Industrial Corridor. Source: Mayor Emanuel's Industrial Corridor Modernization: North Branch. Community Meeting, Feb 21, 2017.

While PMDs have not led to a resurgence of traditional industry, they have retained some older firms while attracting advanced manufacturing and high-tech firms within a flexible zoning framework, as exemplified in the review process described above. Given that the flexible framework and geographic distribution of PMDs allow each to develop its competitive advantage, each District hosts a prevailing sector, as illustrated in Figure 6. This network of PMDs allows firms to relocate from one District to the next in order to best suit their needs without leaving the City. An historic steel manufacturer recently relocated from the North Branch Industrial Corridor to a different PMD on the South side of the City.

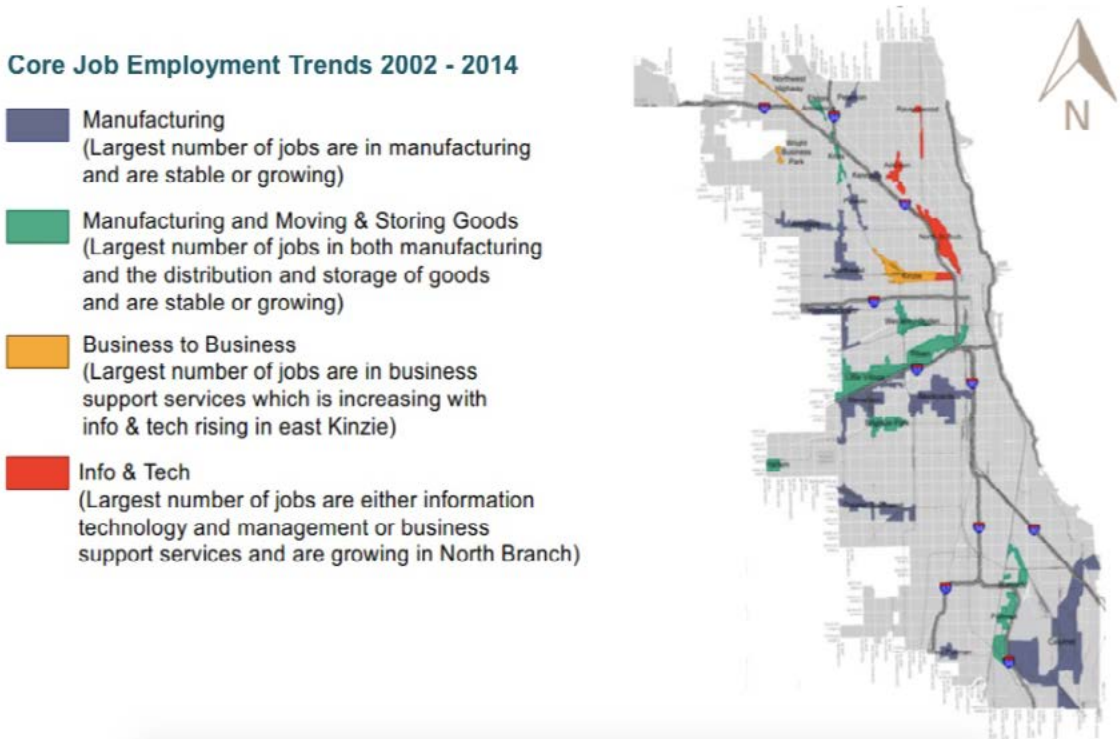

Figure 6 Specialization between PMDs. Source: Mayor Emanuel's Industrial Corridor Modernization: North Branch. Community Meeting, Feb 21, 2017.

In 2016, the North Branch Industrial Corridor still had 20 percent industrial land use. However, the employment figures suggest that IT and Management account for a majority of this.

Use	Percent
Commercial	23%
Transport and Utility	34%
Manufacturing	20%
Vacant	11%

Table 1. Land Use by Percent of Land in North Branch Industrial Corridor, 2016. Source: Jordahl, "Zoning for Industry."

Sector	Current Jobs	Percent Growth
Business Support Services	1,535	+577%
IT and Management	3,128	+261%
Leisure and Hospitality	1,852	+76%
Health and Education	633	+67%
Moving, Storage, Construction, Utilities	547	+18%
Manufacturing	1,029	-41%

Table 2. Employment in North Branch Industrial Corridor, 2002-2014. Source: Jordahl, "Zoning for Industry."

New 'Downtown' Projects

While Mayor R. M. Daley was approving PMDs, he also launched the largest campaign of lakefront and downtown civic construction in the City's history. Daley constructed Millennium Park and the Museum Campus, renovated Navy Pier, installed miles of bike lanes, and began constructing the downtown Riverwalk. His return to big project policy was, like his father's downtown-centrism, criticized for its neglect of neighborhood development, although supporters argued that the City could not survive the 21st century without a grand urban vision embodied in civic projects.[15] The debate on downtown versus neighborhood development has remained hot during the Emanuel administration, which followed Daley's lead in constructing the Riverwalk as well as The Bloomingdale Line bike trail. These projects, however, depart from the mold of Machine-era civic construction, given their relation to systemic urban issues such as ecological remediation, infrastructure repurposing, and connectivity.

The Riverwalk

While the Riverwalk is not directly based on Burnham's vision of Parisian riverside promenades, the civic spirit of the Chicago Plan is clearly evident in the project. The Riverwalk extends for over two kilometers through Chicago's downtown and is divided into four districts defined by the nature of the adjoining urban fabric. Each district contains several thematic segments, bracketed by bridges, with names such as the Marina, the Cove, the Swimming Hole, and the Boardwalk. The 1990s reconstruction of Wacker Drive, a double decker high-speed roadway along the river, was designed to leave a 25-foot build-out envelope for the Riverwalk, which has been completed in stages since the construction of a riverside Vietnam Veterans memorial riverside park in 2005. In 2012, Mayor Emanuel announced plans to complete the full extent of the Riverwalk with a team of designers and engineers. Funding was generated in part through the Transportation Infrastructure Finance Innovation Act (TIFIA) of the US Department of Transportation, which provides credit assistance for infrastructure projects with national significance. The Riverwalk activates a traditionally industrial coastline that had been neglected and inaccessible, and it provides opportunities for further connections to the network of paths in the proposed plans for the Goose Island and Clybourn Corridor PMDs. It also links transportation hubs in the West to the Lakefront in the East.

Figure 7 The Riverwalk. A newly completed segment of the Riverwalk. Source: Chicago Architecture Foundation

Like the Riverwalk, the Bloomingdale Line, also known as the 606 Trail, is a new kind of high-visibility project that serves to connect the City and repurpose defunct industrial infrastructure. The Bloomingdale Line was constructed in 1873 as an elevated industrial rail running on an East-West axis through Chicago's Northwest side. Mayor R. M. Daley had investigated converting the elevated line into a bike trail as early as the mid-1990s,

15 Costas Spirou and Dennis R. Judd, Building the City of Spectacle: Mayor Richard M. Daley and the Remaking of Chicago (Ithaca, NY: Cornell University Press, 2016).

although plans did not materialize until the line was formally envisioned as a trail in the Logan Square Open Space Plan (2002-2004). A local non-profit, Friends of the Bloomingdale Trail, advocated for the project, which has been executed and managed by a myriad of City offices, the Chicago Park District, and the Trust for Public Land, which hosted community design charrettes leading up to implementation. The trail stretches over four kilometers through four neighborhoods, with 80,000 residents living within a ten-minute walk to one of the park's 13 access points. The periodic review of the Clybourn Corridor and Goose Island PMDs recommends further connectivity to surrounding areas, and some have recommended extending the Bloomingdale Line by several blocks to the East in order to link into these PMDs.

Figure 8 The Bloomingdale Line. The 4.3-kilometer trail is pictured from its western terminus adjacent to an active railroad yard looking east towards the lakefront and downtown. Source: wttw Chicago

While the Bloomingdale Trail creatively repurposes an unused piece of industrial infrastructure and provides accessibility through a large swath of residential cityscape, many are concerned about the affect it will have on property values that might push lower income individuals out of adjoining areas. Such concerns always accompany large public infrastructure projects and must be well accounted for in order to help lower-income individuals stay in their homes. Proposals for the neighborhoods bordering the Bloomingdale Line include means tested property tax rebates and increased fees for demolition permits calculated according to the number of units being demolished.[16]

Conclusion

Since the middle of the 20th century, Chicago has faced the historic challenge of retaining land for industrial use, much of which lies in close proximity to gentrifying downtown real estate. This case study demonstrates the primacy of politics and resultant public policy in shaping the image of the city through large public projects on the one hand and in fostering neighborhood development on the other. From the 1950s through the 1980s, Chicago's political establishment has reproduced itself through alliances with downtown real estate interests, realizing many grand projects, while neighborhood development took a back seat. Reform in the late 1980s refocused municipal policy on neighborhood interests, including industrial retention through unique zoning instruments designed to protect industrial land from the encroachment of downtown development. While Planned Manufacturing Districts proliferated during the 1990s, the city has also witnessed, since that period, the largest downtown and lakefront building spree to date, including the Riverwalk and the Bloomingdale Line. The proper balance between 'neighborhood' and 'downtown' development is a universal public policy debate with serious implications for urban citizens' livelihoods and wellbeing in a time of globalization, the erosion of organized labor, and alliances between politics and corporate interests.

16 Leonor Vivanco, "Marchers Take to the 606 Trail to Protest Gentrification" *Chicago Tribune*, May 17, 2016.

Recommendations for Ashdod

Big plans and strategies:

- A broad, long-term guiding vision is critical to locate and realize synergies between different urban interventions and policies.
- Natural assets and reclaimed open spaces can energize a city and complement other types of development.
- Connectivity among different assets such as waterfronts, trails, boulevards, and large parks greatly increases use, accessibility, and programming opportunities.

Zoning for industry:

- Zoning can be used to protect land for industrial use.
- Strategic zoning overlays allow for buffer areas that are compatible with complementary service development.
- Multiple separate industrial zoning districts with distinct review procedures encourages strategic diversification among industrial areas.

Politics and development:

- Local politicians should be careful to balance high-visibility projects with less-flashy but extremely important community development initiatives.
- Grassroots organizations know the pulse of local opinion and should be meaningfully consulted in shaping urban policy.

Social and economic equity:

- The transition from traditional manufacturing to advanced manufacturing can have negative consequences for less-skilled workers and the poor.
- Infrastructure projects and public improvements can price poorer residents out of adjoining neighborhoods. Proper policy should be in place to ameliorate this threat.
- The cost of housing is a key variable in ensuring that blue collar workers can live in proximity to their jobs within the city.

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From Segregation to Integration
Jurong, Singapore

Faced with the challenge of limited land resources and industrial upgrading, Singapore is innovating the planning system and is creating the 'White Site' planning concept to give developers more flexibility in the use of the sites and to encourage participatory industrial upgrading.

Similar to Ashdod, a large portion of Jurong's industry is supported by the port. This brief review examines how Jurong district, which harbors the Jurong port as well as the majority of the industrial sectors in Singapore, pursues innovative methods to use land efficiently and to integrate with adjacent areas to promote sustainable development.

Zixiao Yin

Background and Challenges

An Artificial Island Built for Industry Relocation Jurong Island is an artificial offshore island formed from the amalgamation of seven islands through land reclamation. The islands used to house Malay villages until the 1960s. From the 1970s, the petrochemical industry took over the islands. It was not until the 1980s that the lack of industrial land on the mainland opened the opportunity to form one colossal area for more industrial land. Land reclamation began in 1995, and the island was opened in 2000. The land area increased threefold, from 9.91 km² to 30 km², upon completion in 2000.

Since 1961, Jurong has undergone transformation to become Singapore's first industrial estate. Low hills were leveled and its earth used to fill the swampland. The

first industry in the area was National Iron & Steel Mills (NatSteel). Other early industries included timber, sawmilling, oil-rig fabrication, and shipbuilding and repair.

Figure 1 Planning evolvement of Singapore. Source: "Master plans of Singapore," last modified 28 Jul 2016, https://www.ura.gov.sg/uol/DC/view-maps-plans/master-plans.

Emergence of Residential and Recreational Amenities

During the two decades of building the island, residential and recreational amenities were also developed in the mainland of Jurong to attract workers for the development and expansion of Jurong Industrial Estate, i.e., Jurong East. Its amenities included schools, markets, food centers, malls, community centers and sports complexes.

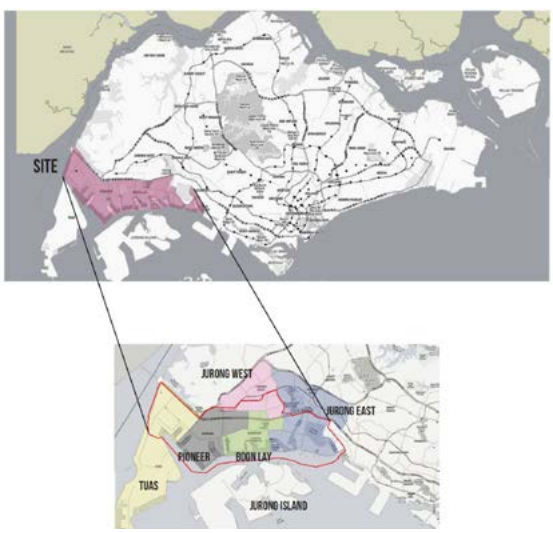


Figure 2 Sub-regions of Jurong District. Source: Jurong Vision 2050, International Forum on Urbanism.2014.

Jurong East has since been developed into a bustling town center that offers an attractive live-work-play environment of housing, employment areas and a host of other facilities. The transport infrastructure is also well-developed, connecting Jurong with other parts of Singapore through buses and a Mass Rapid Transit (MRT) network. The estate has been developed to become a self-sufficient town, and by 1991, the Jurong Town Council was formed to better manage the estate.

From Segregation to Integration

Like most industrial areas, Jurong district has faced the problem of scarce residence and low efficiency of land use. The country has made the strategic plan of integrating the industrial area into the other parts by planning to accommodate 1 million people in Jurong district by 2050 and building a whole sustainable city.

To accomplish this proposal, Jurong Town Corporation (JTC) has to address the conflict between industry's necessity in terms of economic support and jobs and the city's environmental quality. For those industries that produce heavy levels of pollution as well as provide fundamental fiscal support to the country, a general relocation approach is taken. These factories are forced to relocate to the new artificial Jurong Island to create a physical barrier against pollution.

Industrial Pollution and Environmental Retrofit

Although some relocation has occurred, industries with heavy pollution still occupy a large share of land. In the future, retrofitting and mitigation of environmental quality will need to be performed to attract other uses and residential population.

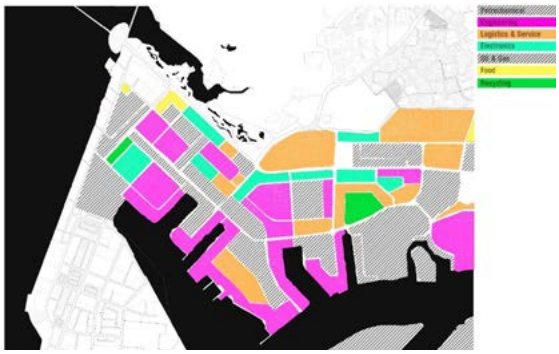


Figure 3 Existing distribution of industries. Source: Geo-industry data is published on https://www.onemap.sg/. GIS analysis by author.

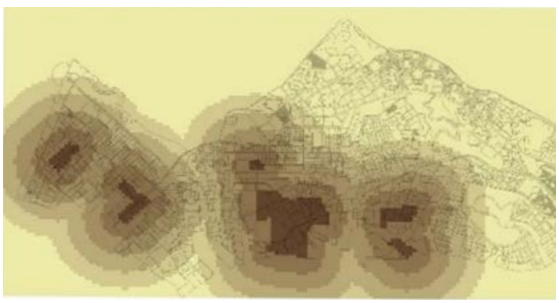
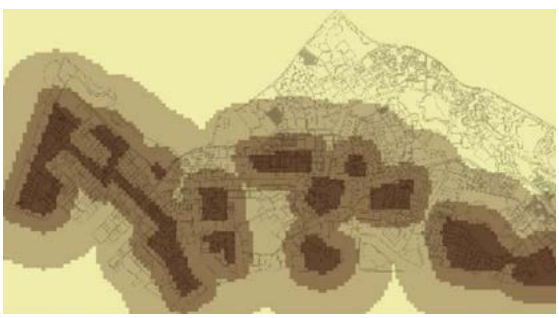


Figure 4 Industrial pollution of Petro industry and Chemical industry. Source: Author.



Adjust to Industry Upgrading and The Emergence of New Industrial Types

As the challenges of environmental sustainability become more pressing, the demand for clean energy has also increased. The clean energy industry has been identified as a key growth industry for Singapore by the Research, Innovation and Enterprise Council (RIEC), and a total of $170 million has been set aside to grow this sector. It aims to realize a value-added contribution of S$1.7 billion as well as create 7000 new jobs by 2015. The CEPO (Clean Energy Program Office) was set up in April 2007 to drive the growth of the clean energy sector. The role of CEPO is to implement and coordinate the various research and test-bedding public programs in Singapore, leveraging the strengths of various government agencies for a comprehensive approach to develop the clean energy industry. In April 2009, the Inter-Ministerial Committee for Sustainable Development (IMCSD) launched a guide called the Singapore Sustainable Blueprint. One of the key recommendations is to develop a Clean Tech Park to promote the new economic growth sectors in clean technology, to draft sustainable urban solutions and to provide a platform for test-bedding of clean technologies. Currently, the key manufacturing sectors that have started shifting to Jurong are the electronics, chemical, bio-medical, and pharmaceutical industries. With the continuing shift of industry sectors, including clean energy, the planning management and zoning regulations will need to be adjusted to adapt to and promote the upgrading of industries.

Model

A Test of the Clean Tech Park to promote industrial upgrading

The CleanTech Park (CTP) development is envisioned to position Singapore as a global test-bed and the preferred site for early adoption of clean technology products and solutions for urbanized settings in the tropics. It will house a community of organizations and companies focusing on the Research & Development of clean/ alternative energy.

A unique advantage of CTP is its close proximity to the Wenya industrial estate, which offers the clean technology industry a complete and integrated value-chain as the downstream manufacturing hub for the R&D companies. To foster better business synergy,

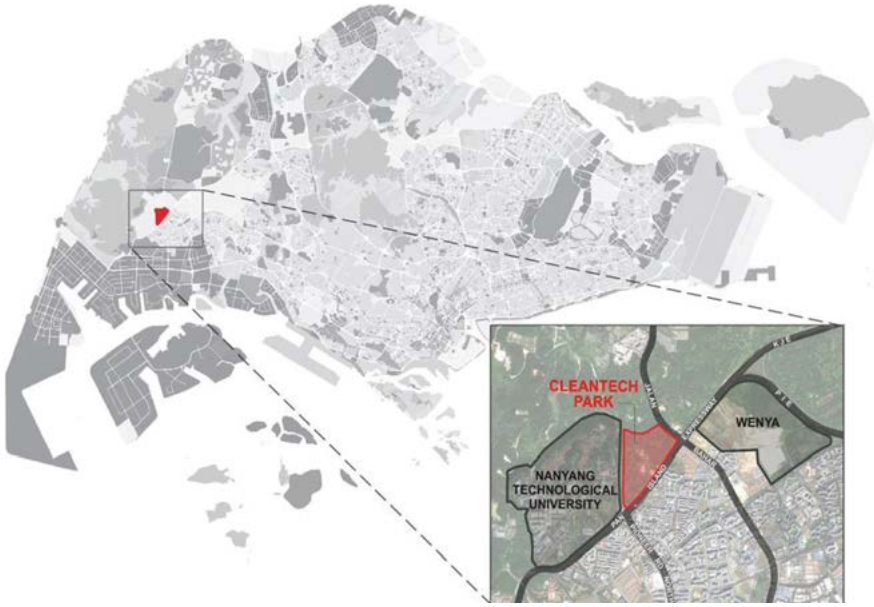


Figure 5 Location of the first Clean Tech Park. Source: Planning and design guidelines of Clean Tech Park. JTC corporation. June 2011.

good connectivity with the surrounding land use needs to be established. Taking into account the existing road network to Nanyang Technological University (NTU), the proposed entrances of CTP are strategically located to allow for convenient commuting. This is further enhanced by a comprehensive covered walkway and cycling path networks within CTP, which will be designed to provide comfortable walking & cycling experience. Connections to the adjacent developments are also identified in the masterplan to allow for integration in the future.

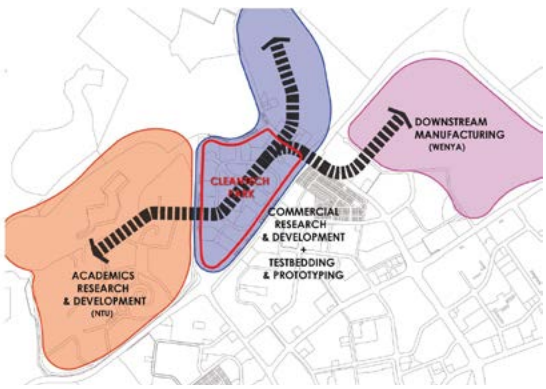


Figure 6 Geographic relationship between CTP and industrial estate. Source: Planning and design guidelines of Clean Tech Park. JTC corporation. June 2011.

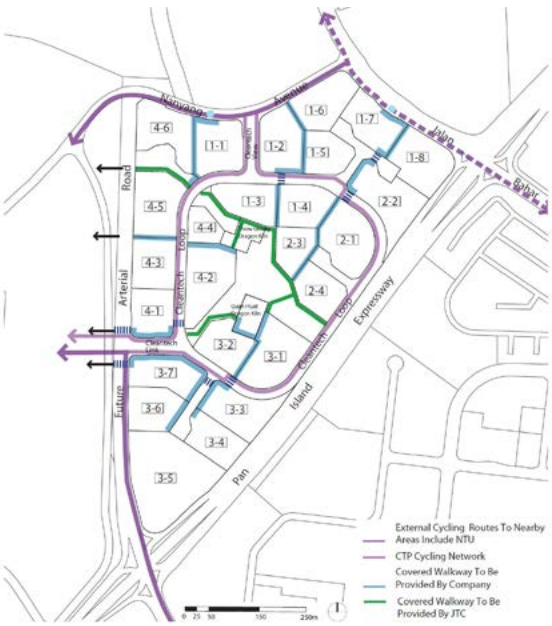


Figure 7 Circulation and transportation system of CTP. Source: Planning and design guidelines of Clean Tech Park. JTC corporation. June 2011.

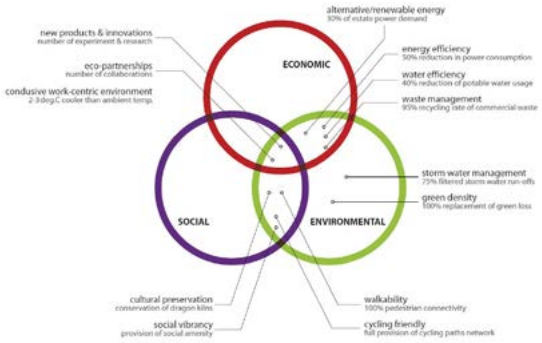


Figure 8 Integrated approach of KPI system. Source: Planning and design guidelines of Clean Tech Park. JTC corporation. June 2011

The specialty of the planning of CTP is that it adopts an integrated approach that looks beyond the convention of master planning, which largely focuses on the physical aspects. As an Eco-Business Park, CTP aspires to be an exemplary development that showcases environmental sustainability through initiatives such as low carbon emissions, high energy efficiency and waste recycling. A set of Key Performance Indicators (KPIs) is established based on a sustainable design framework that comprises social, economic and environmental considerations. These indicators are quantifiable targets that CTP set to achieve at the estate level. Some of these indicators will be translated down to individual parcels, which will be highlighted in the parcel-specific design guidelines. The commitment and participation of the business community is instrumental in realizing CTP's vision collectively. It will be mandatory for individual developers to establish and achieve their own KPIs at the building level to contribute their part to environment sustainability. The participation by the business community will not only foster a stronger community spirit but will also help forge an "eco-friendly" branding for the Clean Tech cluster.

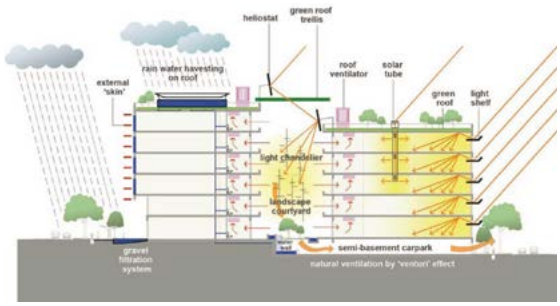


Figure 10 Typology of eco-building in CTP. Source: Planning and design guidelines of Clean Tech Park. JTC corporation. June 2011.

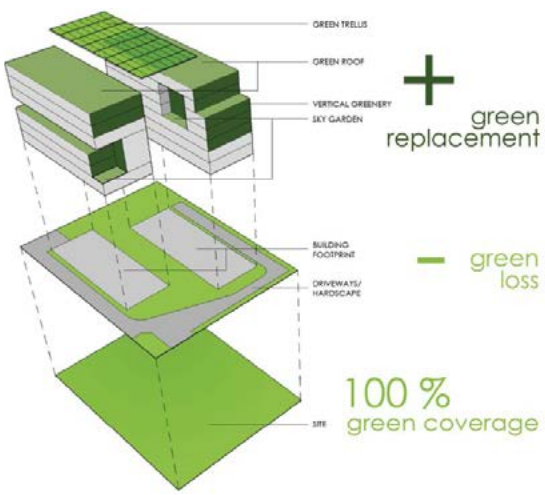


Figure 9 Ecological concept design of CTP. Source: Planning and design guidelines of Clean Tech Park. JTC corporation. June 2011.

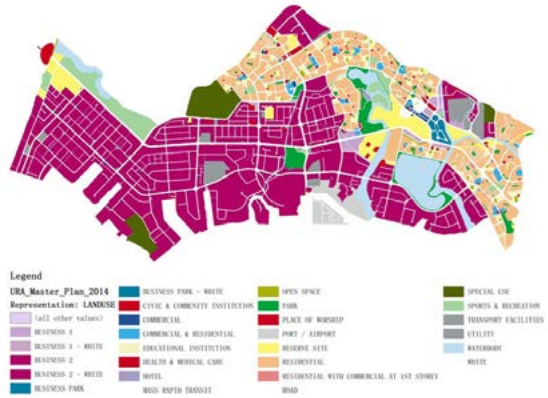


Figure 11 Master plan of Jurong, 2014. Source: "Master plans of Singapore," last modified 28 Jul 2016, https://www.ura.gov.sg/uol/DC/view-maps-plans/master-plans.

Extend the "PUD" Model into Industrial Districts

Singapore has typically used the Planned Unit of Development (PUD) as a basic logic to organize land uses at a larger scale.

Under the PUD scheme, each residential community is organized by a service center in the middle (the blue plots surrounded by the orange residential land), which provides multiple services for the nearby residents. To strenthen the attrativeness of Jurong, JTC has decided to extend the logic of organising residential units to activate the industrial areas. The fundamental strategy is to densify the service network and infrastrucutre network in Jurong. The new service centres will trigger the aglomoraion of clean industries, which will replace the previous heavily polluting industries and thus attract more population and civic activities. The diagram below shows the initiative of using PUD as a trigger to activate the industrial areas.

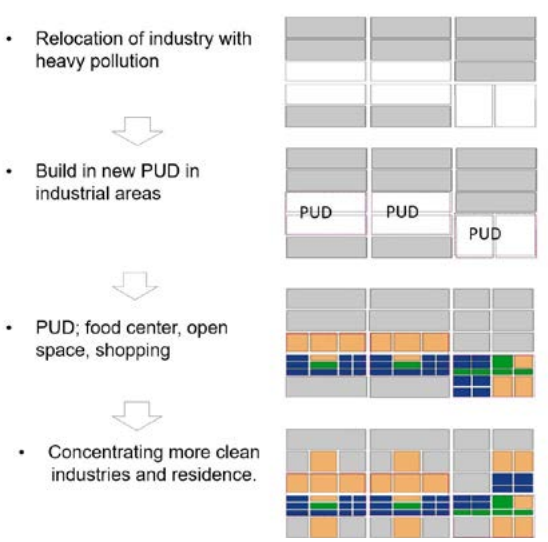


Figure 12 Diagram of Planning Unit Development (PUD). Source: Author

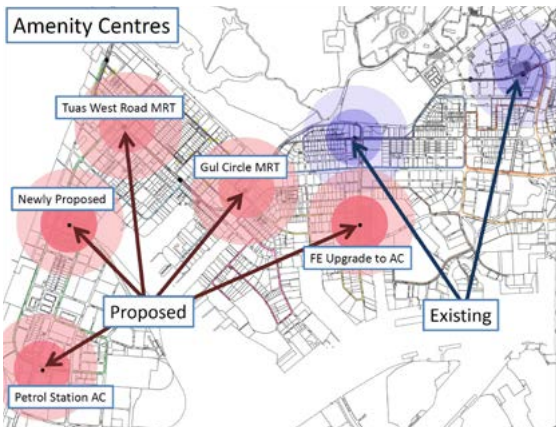


Figure 13 Amenity Centers in plan. Source: Jurong Vision 2050, International Forum on Urbanism.2014.

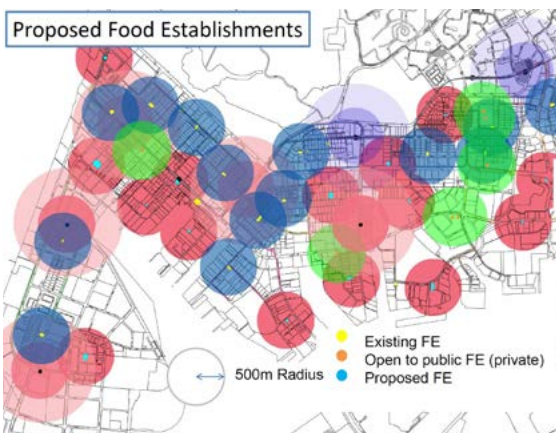


Figure 14 Food establishments in plan. Source: Jurong Vision 2050, International Forum on Urbanism.2014.

Using a parameter of 500 m (the maximum comfortable walking distance), JTC has planned a denser network of amenity centers. These include food establishments, public

transportation stops and other services that are fundamental to integrate Jurong and its industrial quarters in a similar and integral part of the PUD typology that has been applied to residential areas.

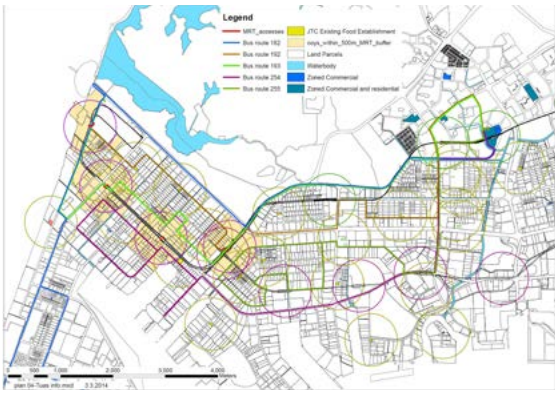


Figure 15 The proposed network of amenities, food establishments and public transportation. Source: Jurong Vision 2050, International Forum on Urbanism, 2014.

Strategies and Innovation

Adjust Planning Guidance to Emerging Industries

As industry in Singapore is increasingly changing, it is important for the planning management system to create the corresponding guidelines to deal with new and emerging types of industries.

As opposed to the traditional industry classification method, where all the manufacturing industries are divided into two classes according to level of pollution, a buffer of at least 50 m is imposed on the industries, such as industrial machinery, shipbuilding and repairing, that are identified as heavily polluting (B-2). Other industrial lands are usually classified as B-1. These include land for warehouse, utilities and telecommunication uses.

E-business activity	Description	Remarks
Telecommunications	Provides voice / data communication services such as data / information transmission, electronic message sending, voice calls and broadcasting services.	Can be located in Business Park, Business 1 and Business 2 developments.
Data farm / data centre	Requires the use of predominantly heavy equipment such as servers to process data. Excludes data processing that can be run on desktop computers or laptops.	
Internet Service Provider	Provides access to Internet and other related services such as web hosting, web site building, etc.	
Software development	Provides software design, customisation and maintenance. Includes software application providers.	
Call centre	Centralised backend support functions that handle a large volume of telephone services primarily targeted at providing information to meet callers' needs. Typically require large spaces for their operations, which compromise specialised technology and equipment.	Can be located in Business Park and Business 1, but not in Business 2 developments.

Figure 16 E-business planning guideline. Source: Building & Construction Authority (BCA) of Singapore. Guide on Construction of Industrial Developments in Singapore. 2010.

Core Media Activity	Description	Examples
Pre-production	Provide creative conceptualisation, scripting, editorial editing, composing and text layout	ESPN Star Sports, SPH
Production	Studio production (including dressing rooms), location production, audio recording, dubbing, media library services, printing press	ESPN Star Sports, MTV Asia
Network Programming	Scheduling, programme management, transmission services, origination playback	ESPN Star Sports, AXN
Post production and distribution	Video editing, digital authoring, audio engineering, format conversion, standard conversion, tape duplication, image and audio restoration, film printing, optical disk media (e.g. mastering and replication), sorting and packaging for print media	CNBC, Walt Disney TV, SPH

Figure 17 Media industry planning guideline. Source: Building & Construction Authority (BCA) of Singapore. Guide on Construction of Industrial Developments in Singapore. 2010.

As the new industries emerged, a new industrial land classification, the business park, was created to specifically sets aside land for non-polluting industries and businesses that engage in research and development (R&D) and high-tech, high value-added and knowledge-intensive activities.
Recently, the planning authority included up-to-date guidelines for E-business and the media industry, including descriptions of core activities and the allowable land types these industries can be located on.

Encourage the Emergence of Industry and Civic Life By "White Site" Zoning Designation
Another innovation of Singapore's planning system to better integrate the industrial sector into civic life is the classification of "White Site". As a sub-sector within the Business Park, it is awarded a quota of 15% in a normal "business park zone" and even more in a "business park white zone".

So, what is special about white site zoning? This planning concept was introduced by the Urban Redevelopment Authority (URA), the planning authority of Singapore, to give developers more flexibility in the use of the sites they bought via the government's sale of sites program. Under these options, developers can respond to the market demand and supply conditions more effectively by instantly adjusting and optimizing the space among different uses. Within the industrial zoning business designation, white sites allow for greater flexibility by allowing the integration of uses such as commercial services such as hotel or even residential uses. This unique designation allows the developer to accommodate more-diversified service infrastructure. The planning guidelines include a clear statement of what is allowed and states clear exclusions for industries that might have a negative effect on attracting the population.

ALLOWABLE USES WITHIN THE 'WHITE' COMPONENT	
S/NO	**BUILDING / UNIT USE (INDEPENDENT USE)**
Subject to Planning Permission and Compliance with DC guidelines	
1	Shop
2	Office (includes bank), commercial school
3	Restaurant
4	Showroom
5	Motor vehicle renting / trading showroom or office
6	Residential (includes staff quarters and serviced apartments)
7	Hotel
8	Child day-care centre, before & after school care, kindergarten
9	Association use, civic cultural & community
10	Sports & recreation facilities, fitness centre
Subject to Special Consideration	
11	Medical centre
12	Light industrial

USES NOT ALLOWED WITHIN THE 'WHITE' COMPONENT	
S/NO	**BUILDING / UNIT USE (INDEPENDENT USE)**
1	General industrial, special industrial
2	Warehouse
3	Workers' dormitory
4	Religious use
5	Bus / MRT depot
6	Petrol station
7	Vehicle park (car / lorry)

Figure 18 Guidelines of White Site planning. Source: Building & Construction Authority (BCA) of Singapore. Guide on Construction of Industrial Developments in Singapore. 2010.

The creation of white sites has encouraged the emergence of clean industry and civic activities. With the elimination of industrial quotas, the developers and lessees of the land are awarded more flexibility to use the land more efficiently in accordance with the market demand.

Conclusion

As a country with very limited land resources, Singapore has long been pursuing innovative methods to use land efficiently and sustainably. Jurong is an especially interesting case, as the port plays an important role for the city both in terms of physical occupation and economic and environmental impact. Jurong and Ashdod are both facing the challenge of integrating the port organically with the majority of the city. Furthermore, the existing structure of the

residential communities that are located at the fringe of the Jurong industrial areas share similar characteristics with the "Quarters" in Ashdod – public services and amenities are centered within the communities.

Based on these similarities, the initiative of extending and densifying the service networks in the industrial areas holds a relevant lesson for Ashdod. The innovation in planning regulations and the creation of a participatory key performance index have turned out to be instrumental to promoting industrial upgrading in Singapore and are well-suited to the new relationship among industrial, commercial and residential areas.

Recommendations for Ashdod

- **Extend the PUD (quarter) method** to build a service network and densified public transportation system in industrial zones. Use these new service centers as triggers to active the industrial areas with civic activities.
- **Build up-to-date zoning classification and industrial guidelines.** Encourage cleaner, tech-intensive and high-value-added industries by making clear guidelines for emerging sectors.
- **Creation of "white sites"** as a transitional step to better integrate the encouraged industries with civic activities. More flexibility is given to developers and land lessees to balance the land use distribution between industry and non-industry sectors. In this case, the industrial areas could be connected organically with the new residents while simultaneously improving the land use efficiency.

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Figure 19 Oil tanks, Jurong Island. Source: Jnzl's Photos, CC BY 2.0

Industrial Planning and Innovation

Philadelphia, USA

Philadelphia has grappled with transitioning from an industrial economy to a knowledge-based economy, struggling with high rates of poverty and a need for inclusive growth. Through a series of thoughtful analyses, the city has laid out a policy for industrial land-use using economic, zoning and community-based tools. By combining sound economic analysis with spatial planning, the industrial corridors of the city are poised for new investment.

Louis Liss

Background and Challenges

Philadelphia presents some important insights for Ashdod. As an economic hub of both Pennsylvania and the East Coast of the United States, economic activity in Philadelphia plays a nationally significant role.[1] As the country's 7th largest metropolitan area, Philadelphia proper makes up the 5th largest city. However, structural and economic changes have presented significant challenges, particularly for industrial areas and lower-income neighborhoods home to lower-skill workers. World-class institutions such as the University of Pennsylvania and major corporations such as Comcast and Aramark have anchored a high-skill economy that has contributed to a

1 (Liu and Katz 2008)

major development boom in Center City, the heart of historic Philadelphia. Some inner-ring neighborhoods have picked up on the rising price pressure from Center City's revitalization, and it has led Philadelphia's leadership to carefully consider its land-use policies, particularly where industrial land that grapples with abandonment coincides with demand for housing and other new amenities. Combined with a pressing need for good-paying jobs at a variety of skill levels, this has led to a complex process that Ashdod could learn from.

By using several policy tools, Philadelphia has generated a thoughtful industrial land use policy that is cognizant of the importance of the city's industrial heritage and legacy, informed by understandings of a future-safe economy and social justice and centered around delivering a higher quality of life for its residents. This case study will focus on three particular aspects: a thoughtful analysis of comparative advantages in manufacturing and industry; a comprehensive rezoning and remapping process; and a case-within-a-case of an area plan that led to innovative industrial revitalization in a relatively isolated industrial pocket.

Model

Economic Analysis of Industry & Land Markets

A key component of Philadelphia is its self-awareness of its industrial land use policies and economic strengths and weaknesses. Completed in 2010, the City's Industrial Land & Market Strategy analyzes key clusters both spatially and economically. Celebrating both legacy industries and the possibility of expanding newer industries, the plan conducts several notable spatial analyses that could be useful for Ashdod.

The first perspective to consider is at a micro-scale. After an industrial economic analysis considering land-use factors, for each industrial sub-district, the strategy considers factors such as dominant sectors, land use shares, parcel size, vacancy, and average building sizes and ages. Such an analysis makes it easy to consider which areas (in rank order) might be most appropriate for different types of industry with disparate land needs.

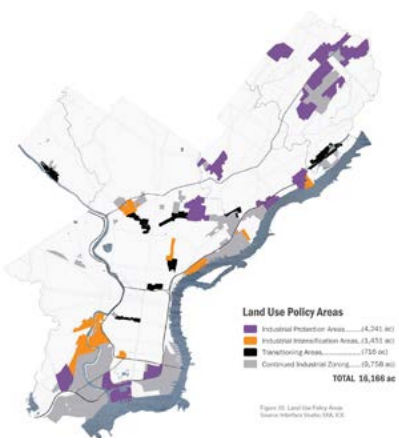

Figure 1 Industrial Land Use Policy Areas. Source: Philadelphia Industrial Development Corporation

Figure 2 Price Pressure and Land Values. Source: Philadelphia Industrial Development Corporation

Another critical viewpoint is a sorting of different industrial areas into broad typologies. Specifically, by analyzing land-use policies, the document sorts industrial areas into "industrial intensification areas," "industrial protection areas," and "transitional areas."[2] These three categories identify core areas that could catalyze further development, fringe areas that are at risk of impingement, and industrial islands in central areas that would likely benefit from alternative land uses. These categories are well-complemented by a land price map showing vectors of price pressure, as shown in Figure 2. For example, the industrial area in the Southwest portion of the city faces price pressure from both Center City and University City from opposite sides.

Overall, the critical understandings developed through the Industrial and Manufacturing Land Use Strategy feed well into the more-specific planning initiatives undertaken.

Rezoning Process

Philadelphia is unique among large cities for undertaking a comprehensive revision of its zoning code, begun by voter initiative and effective in 2012. According to Franklin and Gaston, writing in The Philadelphia Lawyer, the revised code is designed to be easier to use and understand for citizens and the development community. Certain overlays and categories were streamlined, and 60 base districts were consolidated into just 34. Charts and diagrams aid ease of navigation, compared to narrative description. Other generally notable features include more-formalized public outreach

2 (Philadelphia Industrial Development Corporation 2010)

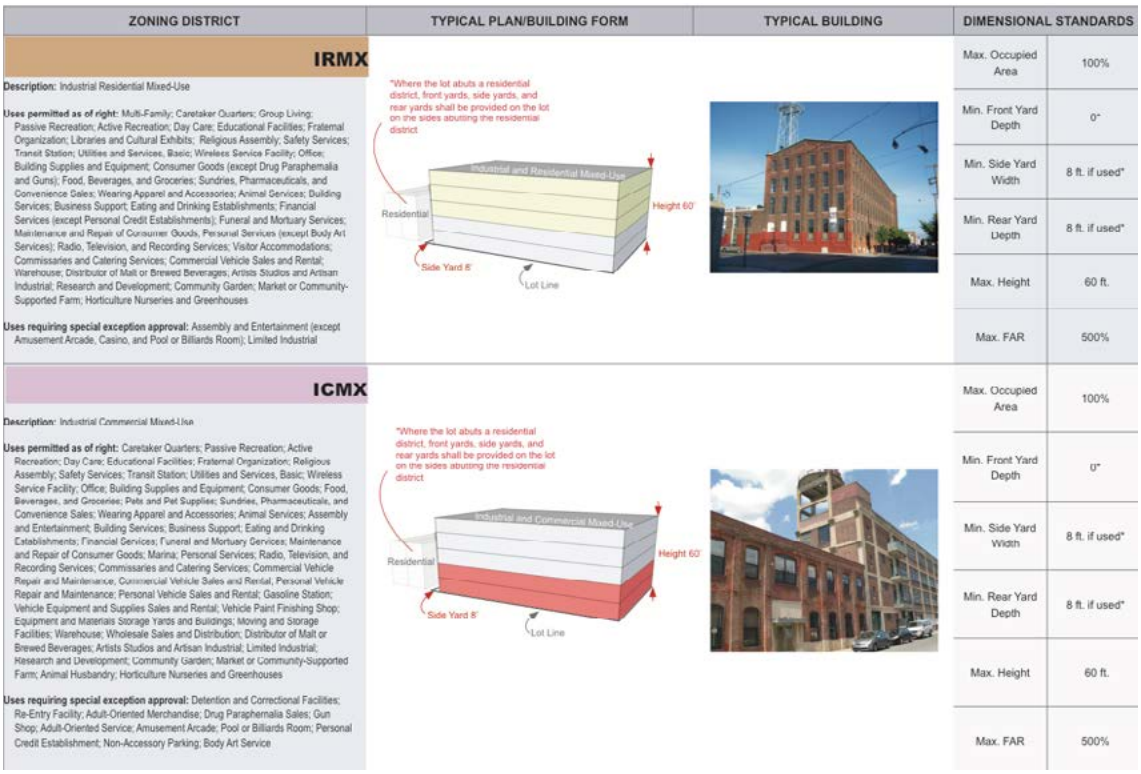

Figure 3 New ICMX and IRMX Zoning Categories from Philadelphia's Zoning Code Quick Reference. Source: Philadelphia City Planning Commission

procedures, including the designation of specific community organizations as interested parties to be notified for land use decisions.[3] It is important to note that the process of remapping districts is happening separately, area by area.

For industrial districts, two new base districts were developed to introduce potential buffer areas between heavier industrial uses that might co-locate lower-intensity industry with residential and commercial uses. The new IRMX category allows lighter uses, such as "Artists Studios" and "Research and Development", in addition to housing, with an FAR up to 5. ICMX, the other new category, has similar light industrial uses and commercial uses, but no residential component.[4] According to Jared Brey of Plan Philly, the IRMX category is already under consideration for changes by members of the City Council. Specifically, there was a concern that a lack of a requirement for non-residential use would allow strictly residential projects to dominate areas mapped with IRMX.[5]

According to a one-year review of the new zoning code prepared by several city agencies, the changes were effective at achieving certain objectives. In particular, indicators of efficiency around the process showed positive progress. By-right permits increased, and variances and special exceptions decreased, highlighting the perception that the new code was easier to use. Remapping was highlighted as a critical next step, which will be informed by both a citywide vision and district level plans through the Philadelphia 2035 comprehensive planning process.[6]

Figure 4 Pennovation Center, a key development in the Innovation District as envisioned by the Lower Schuylkill Master Plan. Source: Pennovation Works

District-Level Planning: Lower Schuylkill

In addition to Philadelphia's intensive city-wise efforts to improve industrial land use, it is critical to consider the level of effort channeled into district-level planning. The Lower Schuykill area of the city–also known as Southwest Philadelphia–is a major industrial agglomeration that is relatively isolated from the city's core and residential sectors. Two

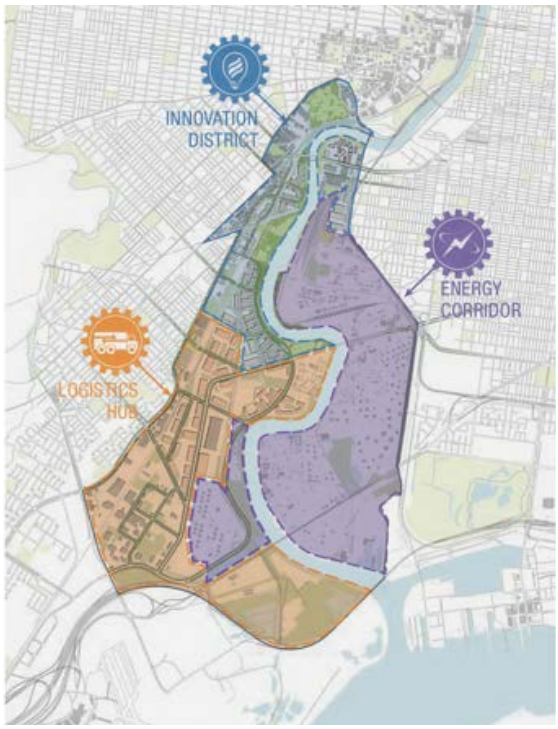

Figure 5 Lower Schuylkill Master Plan Vision for Three Campuses. Source: Philadelphia Industrial Development Corporation

3 (Franklin and Gaston 2012)
4 (Philadelphia City Planning Commission 2014)
5 (Brey 2015)
6 (Philadelphia City Planning Commission 2013)

planning initiatives set out to use the tools envisioned in the manufacturing strategy and in the rezoning, comprehensive plan and remapping strategies at a district scale. At a specific level, these two plans lay out a land use vision and key public investments to build cohesion and value in the most industrial sector of the city.

The first plan, the Lower Schuylkill Master Plan, was published in May 2013 as a collaboration between the city's Department of Commerce, Industrial Development Corporation and City Planning Commission. Of note from this plan is a vision for three "campuses" within the industrial area: an innovation district in the northern section very close to University of Pennsylvania's campus; an energy corridor focused on the existing refinery cluster along 26th Street; and a logistics hub to leverage the connection with I-95 and the Philadelphia International Airport.[7] Built into each "campus" were proposals to densify strategic and complementary uses while simultaneously improving transportation connections and upgrading green infrastructure. The second plan, the 2016 Lower Southwest District Plan, outlined complementary infrastructure upgrades and land-use updates more to inform the remapping exercise.8 According to City Planning Commission Staff, the District Plan was designed to incorporate recommendations from the Master Plan, although focusing on different areas–particularly the peripheral residential areas.

Conclusion

Philadelphia has many lessons to offer Ashdod. Through an admittedly many-stepped process, the city has taken its thinking from land-use strategy to land-use tools and into comprehensive, district-level planning. This high-level outline–strategy, tools, and implementation–could serve as a strong model for Ashdod. With a much more compact industrial area, it is likely that such multi-stage thinking could happen quickly and effectively.

Recommendations for Ashdod

While Philadelphia certainly has a disparate context from Ashdod with a larger supply of available land and potentially less natural resource constraints, there are a few policy and planning approaches that could work well to boost economic promise and the quality of the built environment. Based on Philadelphia's experience, this case recommends the following actions:

- Conduct an economic analysis of Ashdod's industrial and manufacturing ecosystem to identify areas of comparative advantage, similar to Philadelphia's manufacturing and industrial land-use strategy. By aligning economic realty–i.e., which industries have the most potential for growth and reinvestment–with land-use constraints, Philadelphia was able to identify a land-use strategy that is cognizant of external pressures.
- Update the zoning code for industrial uses with the aim of minimizing necessary variances and creating categories that provide for a mixed-use buffer between residential and commercial areas. A pilot area such as the light industrial zone could be remapped first to test the development potential.
- Leverage district-level planning such as Philadelphia's strategic industrial plan that

7 (Philadelphia Industrial Development Corporation 2013)

8 (Philadelphia City Planning Commission 2016)

connects economic strategy and land-use submarkets with zoning interventions and specific supportive investments. By starting with a well-considered picture of how the industrial area ought to be from a land-use and economic perspective, strong new investments could be easily identified.

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Establishing a Unified Front Against Encroachment

Seattle, USA

The case of Seattle's Duwamish Industrial Lands is simultaneously a model and a cautionary tale. Seattle grew up around the Duwamish Waterway as one of the most significant maritime industrial centers on the Pacific Coast of the US and in the last few decades has developed a remarkable array of integrated public policy initiatives designed to protect and enhance maritime industry. However, with the approval of their Stadium Transition Overlay District in 2000, Seattle began struggling with how to bring enforceable specificity to their strategic protections.

Zoë Taft Mueller

Background and Challenges

The Duwamish Manufacturing and Industrial Center (MIC) consists of 4,936 acres of marine and industrial land that has been in active use for over 100 years. Marine industrial continues to be the highest intensity land use for this high-volume west-coast container port. As of now, the land use ratios are roughly 32% commercial, 26% industrial, and 23% warehousing (Steinbrueck, 5).

The adjacent Stadium Transition Area Overlay District (STAOD) was established in the state-protected core of the Duwamish MIC in 2000 after prolonged consideration of alternative sites for two stadiums and an associated

sports entertainment district in the Seattle metro area. The approved STAOD is positioned at the boundary between downtown Seattle to the North and the Duwamish Industrial Lands to the West and South. Per the Seattle zoning code, the stated intent of the overlay zoning is to create a pedestrian connection with downtown to "contribute to a safer pedestrian environment for those attending events" and to permit "a mix of uses supporting the pedestrian-oriented character of the area" while minimizing conflicts with industrial uses and discouraging encroachment on nearby industrial uses to the south.

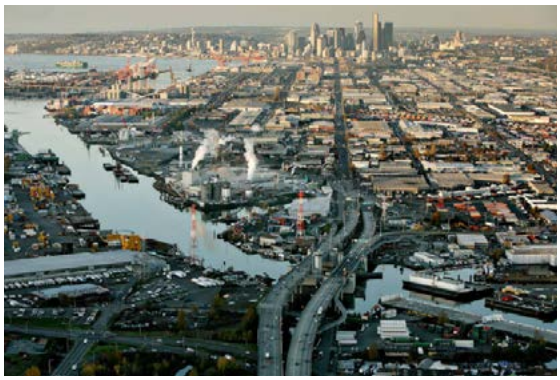

Figure 1 Industrial character of the Duwamish Industrial Lands with Downtown Seattle in background. Source: Paul Joseph Brown via http://duwamishcleanup.org/community-health/clean-air/.

Challenges Faced

The predominant challenge facing Seattle's Duwamish MIC is the risk of real estate pressure from downtown development as well as the stadium district encroaching on important, unique and legally protected core industrial land. Several reports have sounded the alarm:

1999 Duwamish MIC Neighborhood Plan's Executive Summary

"The cumulative impacts of major construction projects, explosive regional growth and seriously congested transportation system have degraded the viability of the Duwamish [MIC] over the past decade. Continued and intensified pressure to redevelop industrial land for non-industrial purposes is the most significant threat to this vital resource. If the [MIC] is to remain viable, it is imperative that Governmental decision-makers become educated on issues affecting the [MIC] and the that all elements of the City and County government take a proactive role in defending the [MIC] from further destabilization."

2012 Report to the Port of Seattle on SODO Arena Proposal

"Unlike commercial and residential uses which can occur in a [sic] many other areas throughout the city and region, industrial uses are extremely limited geographically, and the land, deep harbor access, and logistical resources cannot be duplicated elsewhere-- and are nonrenewable... Conversion to non-industrial uses over time is irreversible, and permanently diminishes the extremely limited land supply in the region available for industrial uses. The interrelated land use and economic impacts were exemplified in development of Safeco Field, which resulted in the displacement of approximately 31 businesses and 763 high wage industrial, manufacturing and warehouse jobs in the Duwamish MIC." (Steinbrueck, p15)

However, despite these impassioned calls to action, in February of 2012, an investor proposed a third 700,000-square-foot arena for 19,000 spectators to be established within the Stadium Transition Area Overlay District south of the existing two arenas. Local officials project that the proposed third arena would substantially increase localized development pressure and traffic congestion that is already interfering with and encroaching upon core industrial use of adjacent land.

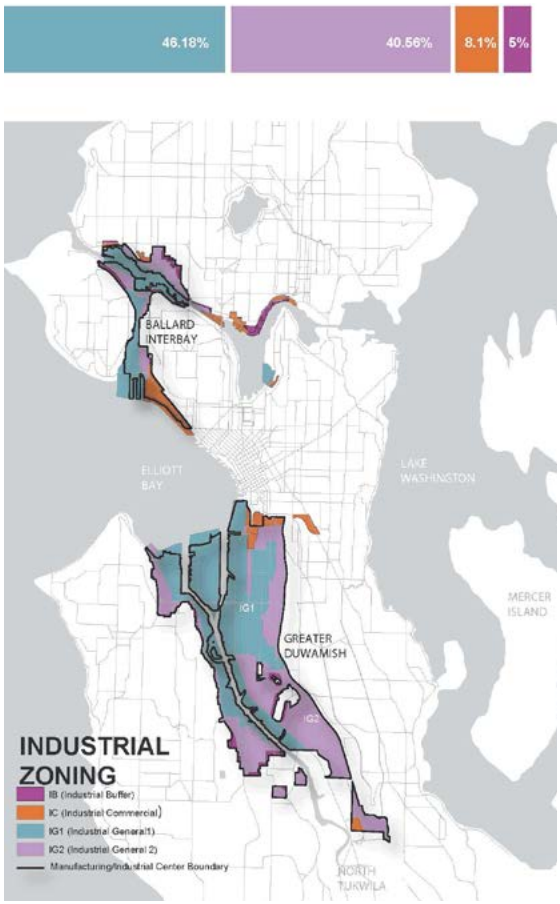

Figure 2 Zoning categorizations for Seattle's industrial lands. Source: City of Seattle Duwamish M/IC Study 2013.

Model

Seattle's base zoning is organized predominantly around the layered protection of geographically unique and economically significant land at municipal, regional, and federal state levels of government.

The state of Washington's Growth Management Act (GMA), established in 1990 and revised in 2009, forces joint strategic planning between port operators and municipal planning departments. Specifically, cities and their ports are required to establish policies and programs that:

- Define and protect the core areas of port and port-related industrial uses within the city;
- Provide reasonably efficient access to the core area through freight corridors within the city limits; and
- Identify and resolve key land use conflicts along the edge of the core area and minimize and mitigate, to the extent practicable, incompatible uses along the edge of the core area.

These policies and programs are intended to have the effect of aligning economic development, transportation, land use and capital investment plans of the city and its port. While conflicts persist, it appears that this forced coordination has helped establish a unified front and a common understanding of the threats to industry.

The Puget Sound Regional Council's 2015 analysis of economic competitiveness for all industrial lands in the region positions each industrial subarea to build on their unique strengths. It also contextualizes district-level planning within national and regional trends and identifies peer cities.

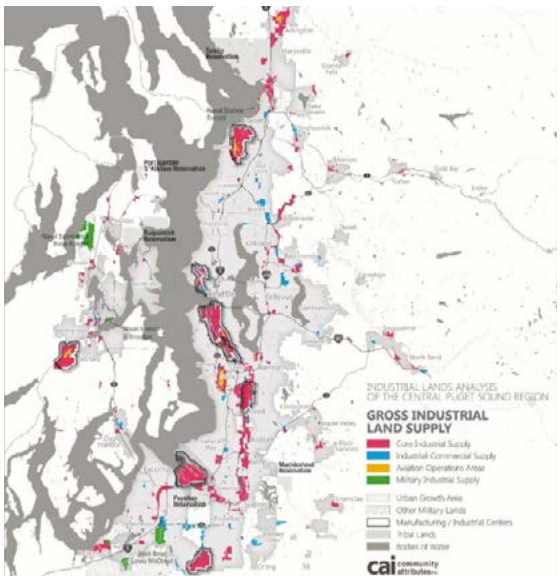

Figure 3 Gross Industrial Land Supply, Puget Sound Region Source: Puget Sound Regional Council 2015 report.

Industries & Employment

Macro Grouping	Industry Grouping	Employment	Percentage of Subarea	Percentage of All Subareas
Construction		6,900	14%	22%
	Builders & Contractors	6,200	13%	
	Heavy & Civil Construction	700	2%	
Manufacturing		21,500	45%	13%
	Aerospace Manufacturing	11,100	23%	
	Electronics & Components	300	1%	
	Food & Bev Processing	1,400	3%	
	Machinery & Transport. Equip.	1,600	3%	
	Metals & Fabrication	2,000	4%	
	Printing & Publishing	2,100	4%	
	Refining, Chemicals & Plastics	200	0%	
	Textiles, Apparel & Leather	800	2%	
	Wood & Paper Products	200	0%	
	Other Manufacturing	1,800	4%	
Transportation Distr. & Logistics		6,600	14%	22%
	Transp., Distr., Logistics	6,600	14%	
Warehousing & Wholesale		8,700	18%	17%
	Warehousing & Storage	400	1%	
	Wholesaling	8,300	17%	
Other Industrial		4,500	9%	18%
	Building & Grounds Serv.	1,400	3%	
	Industrial Services	900	2%	
	Telecom, Broadcasting & Video Prod.	300	1%	
	Utilities	-	-	
	Waste Mgmt. & Remediation	1,000	2%	
	Other Industrial	900	2%	
All Industrial		**48,100**		
Non-industrial		18,900		
Public Sector		8,400		
Total Employment		**75,400**		

Source: PSRC, Washington State Employment Security Department (ESD), CAI, 2012

Figure 4 Employment analysis, Duwamish Industrial Lands. Source: Puget Sound Regional Council 2015 report.

Seattle's local land use framework thus gains strength from its ability to roll up conflicts to higher levels of government for more-tricky issues of enforcement – they can call in the Puget Sound Regional Council based on the agreed-upon Manufacturing and Industrial Center designation, then they can call upon the State of Washington based on compliance with the Growth Management Act, and finally, they can call upon state and national level requirements for "Environmental Impact Assessments." However, while Seattle's vertically integrated strategic approach has a strong internal logic connected to powerful public allies, it lacks some of the specificity and attention to conflict apparent in other more-locally focused models.

Strategies and Innovation

At the municipal level, Seattle has defined three land-use categories that demonstrate early-stage innovation at a more localized scale: the STAOD, the Industrial Buffer zone and the troublesome Industrial Commercial zone.

The STAOD's regulations for creation of a pedestrian environment along key public corridors in the STAOD demonstrate a coordinated effort to establish pedestrian and public realm links within otherwise fragmented and car-oriented urban fabric.

Seattle's Industrial Buffer base zone is underutilized by the city but conceptually has the potential to play a critical role in managing issues of conflicting uses, encroachments, edges and transitions. The recognition that there are natural and human-made elements to the establishment of boundaries is insightful. This same attention to borders, edges and transitions shows up in the language for the designation of industrial areas.

The Industrial Commercial base zone needs further consideration but represents an initial effort to facilitate development of districts that are conducive to advanced manufacturing and biotech land uses. The vagueness of the language, however, betrays a lack of rigor and a corresponding lack of enforceable regulations to govern long-term growth in these areas. Specifically, the Industrial Commercial base zone lacks any constraint on the market-based transition of these areas to non-industrial use because it has no floor area percentage minimum or other such protection for industrial uses competing with higher-rent retail and office uses.

Figure 5 Core Duwamish Industrial Lands. Source: Puget Sound Regional Council 2015 report.

Conclusion

The main lessons of Seattle are:

1. Vertical integration helps establish a unified front
2. Conceptual clarity is insufficient – strength comes from enforceable specificity
3. Do not underestimate the risk of encroachment – give generous buffers and "transition zones" with clear requirements to mitigate conflicts and bleeding boundaries
4. Leverage natural and man-made disruptions to the flow of space in order to reinforce differentiation of incompatible uses – in Ashdod's context, this means giving a land use significance to the Lachish stream, major arterial roads, rail lines and changes in platting patterns.

Lastly, it is worth emphasizing that, while Seattle is currently confronting a substantial challenge to their industrial planning framework, the pre-existence, clarity and consistency of their industrial planning framework across levels of government has put them in a position to guide development strategically even in moments of stress and conflict. Ashdod can learn from Seattle's strategic clarity and can go one step further by ensuring that their strategies are as strong in enforcement as they are in concept.

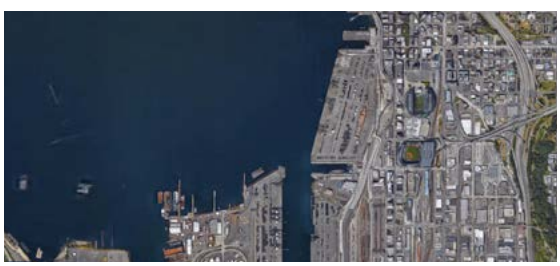

Figure 6 South of Duwamish (SODO) arena district and adjacent port and core industrial operations. Source: Google Maps aerial imagery.

Recommendations for Ashdod

- The vertical integration of policy helped Seattle in two ways: (1) it ensured that a broad coalition would react in a unified front against this kind of encroachment, and (2) it provided a mechanism, via the state and national environmental impact assessment and site selection process, to reinforce weaknesses in local regulations. Ashdod can likewise increase its own enforcement power and ability to deal with local conflicts by working to align its strategy with policy tools at higher levels of government.
- Seattle offers a strong precedent for policy frameworks relating to the public-sector involvement in designation, protection and strategic enhancement of industrial areas. The process for designating industrial land can be found in Seattle's land use code. Regional analysis of industrial sector trends in order to focus industrial policy can be found in the Puget Sound Regional Council's 2015 Industrial Lands Analysis. Both of these could serve as templates for Ashdod.
- For all industrially zoned land, consider requiring that non-industrial uses prove that they have no viable alternative before they are allowed to propose use of protected industrial lands (this would essentially replicate the US Environmental Impact Assessment process at a local level).
- Learn from Seattle's struggles with the "Industrial Commercial" base zone lacking concrete enforcement mechanisms to prevent establishment of large anchor uses with a wide-ranging impact on adjacent properties and districts. The risk of recreational traffic congestion interfering with industrial operations is particularly worthy of note.
- Consider applications for an "industrial buffer" zone in Ashdod's context and adopt this framework's sensitivity to existing disruptions and pattern breaks in the flow of urban space – look for where roads, rail lines, topography

and natural features already disrupt circulation and use that to reinforce a use distinction and guard against encroachment.

- Consider using some of the STAOD pedestrian public realm requirements in the establishment of "stitch streets" linking Ashdod's residential and industrial areas.

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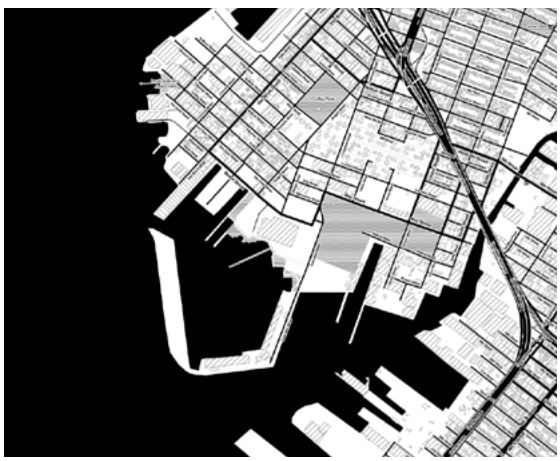
Seattle Zoning Code



Environmental Remediation on the Waterfront

Gowanus Canal, New York

The Gowanus Canal is characterized by a history of tension between economic development and environmental protection. The project offers policy and design ideas to allow for both. It also provides a unique example of environmental restoration of a water system within an industrial zone.

Max Moinian

Background and Challenge

The Gowanus Canal, located in Brooklyn, New York, runs between Carroll Gardens and Park Slope. These neighborhoods today are highly sought-after, primarily low-rise residential areas. The water is still polluted, but local, municipal, and federal policy efforts have significantly ameliorated its quality.

This case study traces the tension between maritime economic development and environmental protection and restoration. The site has subsided due to heavy industry that polluted the water. Concurrently, the immediate area has seen a rise in property value as well as increasing residential and commercial use. The Gowanus is in the midst of a cleaning effort with a goal to return the canal to recreational use – renderings imagine an active beachfront with clear water and restored animal life.

The practice of sustainable industry offers insight for Ashdod.

"In few places do so many crucial urban and environmental issues - waterfront management, the coexistence of housing and industrial space, waste management, highways and other infrastructure, and the future of public housing - come together in so small a place."

Industrial History

The Gowanus was originally a tidal creek with a saltwater marsh, bulk-headed in the mid-19th century to a 100 foot-wide, 1.8-mile-long canal. The canal served the transportation of industrial goods. Industry at the time included coal gas manufacturing plants, oil refineries, machine shops, chemical plants, cement plants, sulfur production, soap manufacturing and a tannery.

A new expressway allowed trucking to supplant shipping in the 1950's, and the canal's use slowed. By the late 1970's, the decline of industry left about half the properties unused and derelict. Currently, adjacent industry consists of concrete plants and warehouses scattered between many parking lots.

Water Quality

The Gowanus was once famous for fishing clams sold as street food. It became severely polluted during urbanization and industrialization. A 1974 test found typhoid, cholera, dysentery, and tuberculosis in a water sample. Today, between 10 and 20 feet of contaminated sediment, including coal tar, mercury, lead, and copper, sits at the bottom of the canal.

The first remediation effort was in 1911, a flushing tunnel that pumped oxygenated water from the Buttermilk Channel. Water

Figure 1 The Gowanus Dredgers Canoe club out on the water. Source: gowanuscanal.org

quality improved but declined again in the 50's when the US Army Corps of Engineers stopped regular dredging. Remediation efforts did not commence again until 1999, when a new pump was established. This pump delivers 200 – 300 million gallons of oxygenated water daily, essentially replacing the canal's entire water body six times. Remediation allowed for the reemergence of some wildlife: geese, crabs, flounder, shrimp, mussels, killfish, and jellyfish. Today, there are 10 CSO outflows that discharge into the canal (3 are strictly stormwater). Sewage and runoff only enter the canal during overflows.

Challenges

Policy changes, high cost of remediation, balancing industry and the environment, and a variety of stakeholders confront the project with many challenges.

Extensive rezoning is still underway in the Gowanus area. The DCP's emphasis on mixed-use use and public access to the waterfront relies on rezoning. The process is lengthy due to the complexity of the site and the priority of public participation.

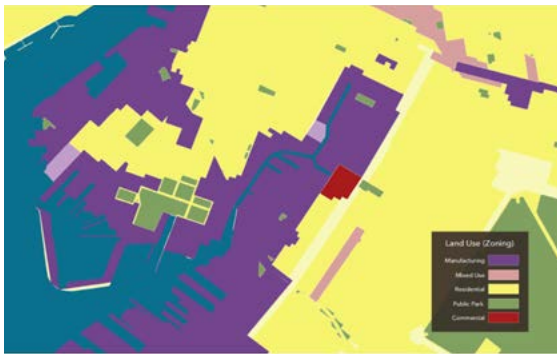


Figure 2 Land Use map shows how current zoning is traditional, with separate functions and few mixed use areas. In order to reclaim the waterfront and situate the city on the canal, more innovative zoning techniques must be employed. Source: gowanuscanal.org

Figure 3 The Canal's original flushing tunnel Source: gowanuscanal.org

Environmental remediation of polluted water bodies, specifically dredging, is an extremely expensive process. The price tag undoubtedly stirs up some polluters' regret. The EPA estimated a cost upward of $500 million over the next 12 years. A second flushing tunnel constructed in 2014 cost the city $160 million.

As expected for a project of this scope, heritage, economic history, and urban setting, many different players have a hand in the canal's future. Environmental stakeholders have stacked into many layers as the project's reach went from the community to the municipal to the national level. While each stakeholder offers resources and perspectives that will strengthen the project as a whole, balance and negotiation become a timely and costly process.

National:
- Superfund
- US Army Corps of Engineers

Municipal:
- Department of City Planning
- Department of Environmental Protection
- NYC Waterfront Revitalization Program

Community:
- Gowanus Canal Community Development Corporation
- Carroll Gardens Association
- The Gowanus Dredgers Canoe Club
- Bridging Gowanus
- Gowanus Canal Conservatory

Model

Community groups began lobbying for clean-up in the 60's – the canal, despite its heavy industrial use, is adjacent to long-established residential neighborhoods. The 1972 national Clean Water Act commenced major efforts. At the turn of the century, various city agencies allotted close to $1 million for studies, comprehensive plans, and open spare pilot projects. The DEP and the Army Corps engaged in a $5 million Ecosystem Restoration Feasibility Study that was completed in 2005. In 2008, the canal was designated a Superfund site. The nomination came from the NY State Department of Environmental Conservation, and the EPA then nominated the site to be on the National Priorities List. This then led to the formation of the Gowanus Community Advisory Group, a coalition of residents and stakeholders with a goal to improve public participation and formalize the community's interests and concerns. The Superfund program then commenced remedial investigation (data investigation and analyses of the site that determine the nature and extent of contamination), a feasibility study (identification of feasible remedies to

contamination), and a proposed action plan by the EPA. The site was organized into three phases for the tasks of remedial design, action, and operation and maintenance.

Efforts for environmental remediation should be categorized as short-term and long-term.

Short-term efforts, as laid out by the Dredgers, encourage people to get out on the water and find recreational use in its current state. The club works to change public opinion with limited resources by offering activities such as canoeing, kayaking, cycling, and clean-up events. Stewardship and education are also important to their mission. This model can be seen elsewhere, as in Friends of the Los Angeles River. These types of small-scale, low-cost and low-impact efforts are important to branding the canal and raising awareness. By drawing locals from the neighborhood, borough, and city to the site, more citizens will become involved with the canal's future and support allocation of public resources. It is important to repair the canal's image while also encouraging the people's right to the space.

Other short-term efforts target the physical environment, such as permeable pavements, bioswales, and innovative open spaces such as the Sponge Park.

Long-term efforts, spearheaded by stakeholders such as the GCCDC, DCP, and EPA look to policy change, collaboration with the private sector, and improving CSO stations and outfalls. It is believed that sustainable development regulations and a strong CSO system could restore the canal to a natural site – clean enough to swim or fish. Additionally, stormwater systems and wetland revitalization could support a wholesome natural ecosystem for the greater area.

Figure 4 Site Axon of D Land Studio's Sponge Park. Source: dlandstudio.com

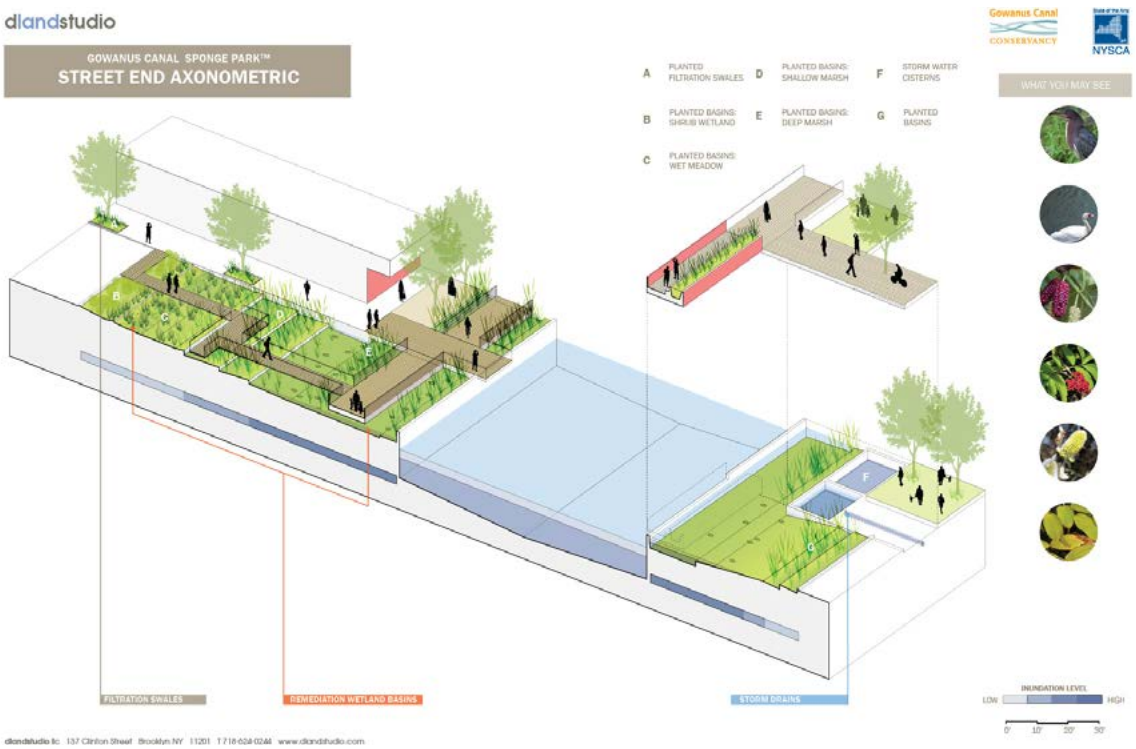


Figure 5 Street Axon of D Land Studio's Sponge Park. Source: dlandstudio.com

Strategies and Innovation

The Sponge Park is a pilot project sponsored by the DEP and designed by D Land Studios, a landscape architecture firm in Brooklyn. The project cost $1.5 million and covers a 2,100-square-foot plot of land. The project will test whether green infrastructure and phytoremediation could substantially improve the quality of the water. The design uses absorbent flood-tolerant plants, sand beds, and soil to retain stormwater runoff and filter out pollutants before entering the canal. The assumption is that stormwater is fairly clean; however, contaminants and pollutants gather on the industrial streets and end up in the canal. The park is an innovation over traditional "gray infrastructure", such as holding tanks and tunnels. The hope is that this model can be scaled up—in fact, the designer holds a patent on the design and a trademark on the name.

Conclusion

Revitalizing the Gowanus Canal is an ongoing labor and cost-heavy project that will continue to require time, processes, and resources. New York City's emphasis on public participation expands these requirements but also provides key insights to what this landscape should be. Currently, major efforts by the Department of City Planning include an outreach workshop to revise land use.

This case study is less an opportunity for direct application and more a cautionary tale. Ashdod must prioritize protection of the natural environment as much as growth. As we learned from the Gowanus and countless other cases in cities around the world, pushing

industry and ignoring the environment are short-term solutions with long-term costs and consequences. The depletion and degradation of natural environments in turn make urban environments less attractive and livable.

Recommendations for Ashdod

Ashdod should devise a **comprehensive natural resources plan** to assess conditions and needs, especially with regard to its natural resources (dunes, the beachfront, the Lakhish and the agriculture land on the East). This plan can look to various Gowanus efforts for specific methods, especially in light of environmental remediation and zoning. Quick, small interventions can be impactful immediately and in the long run. Most importantly, Ashdod should look to New York's dilemma with the Gowanus as a cautionary tale.

Small interventions can also shape larger visions in the interim. Community groups such as the Dredgers can organize constituents, foster interest, and provide insight into best uses in the future. Other interventions offer quick, inexpensive and effective immediate solutions. Lighting, wayfinding, and branding can play a strong role in changing perceptions and use of place.

Figure 6 Ashdod's Lakish Stream adjacent to the rail line and light industrial activity on the port. Source: Max Moinian

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