

Giving Berth:

A Study on Tying Up in Victoria Harbour

Hong Kong Project Center, 2017



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ABSTRACT

This project, completed at the WPI Hong Kong Project Center, evaluated preferred and practical locations in Victoria Harbour for marine activities and harborfront infrastructure. We surveyed current infrastructure and created criteria to analyze areas of the harbor for potential use in pleasure vessel mooring, berthing, and marine recreation. Interviewing government officials helped clarify regulations and processes for modifying the waterfront. By researching development plans, we better understood the city's vision for the harbor. Our team assisted Harbour Business Forum and Designing Hong Kong in their efforts to promote a centralized authority for managing the harborfront. We recommended area-specific changes to waterfront infrastructure and identified how to achieve these improvements.

EXECUTIVE SUMMARY

Situated between Hong Kong Island and the Kowloon Peninsula, Victoria Harbour is undoubtedly the centerpiece of Hong Kong. This body of water plays a key role in the region's economic and social wellbeing. Cargo shipping has largely moved from the inner harbor to the western harbor. This has caused both the government and private interests to pursue the establishment of Victoria Harbour as the cultural heart of the city for both working and leisure purposes (Urban Land Institute [ULI], 2005). The harbor has enormous potential as a regional hub for pleasure boating and marine recreation. Unfortunately, the infrastructure created for cargo shipping has never been updated to serve other types of vessels. This project evaluated both current infrastructure and possible adaptations that could be made to existing areas of the harbor for pleasure boating and marine recreation.

METHODS The goal of this project was to identify and evaluate feasible and desired locations for tying up pleasure vessels, as well as the necessary infrastructure to do so. We also sought to define the process involved in making changes to existing infrastructure. We identified four main objectives to accomplish this goal.

1. Analyze current relevant harbor infrastructure;
2. Evaluate existing and planned cultural features and attractions along the waterfront;
3. Understand government policies and jurisdiction regarding waterfront development;
4. Identify locations and develop suggestions where the improved state of mooring in Victoria Harbour can better facilitate access to the harborfront.

To accomplish these objectives:

1. Made observations along the waterfront to observe the current condition and access to the harbor, and the infrastructure that currently exists in each sub-district.
2. Researched developmental plans to determine future changes along the waterfront.
3. Conducted interviews with various government agencies and private interests to understand the state of waterfront management and use.
4. Created criteria to quantify the demand, feasibility, and connectivity of areas for possible marine infrastructure implementation.

Lastly, we prepared an interactive map of landing steps, bollards and other marine infrastructure, with accompanying pictures, for delivery to our sponsors and other organizations. The pictures detailing waterfront infrastructure provides context on the current conditions of Victoria Harbor and may help organizations determine which locations to promote harborfront-related modifications.

FINDINGS We identified waterfront areas that lack infrastructure for tie up space, as well as the modifications necessary to make them suitable places to berth. Additionally, we interviewed government officials and private interests to understand the rules, regulations, and common practices when modifying marine infrastructure.

1. Most waterfront areas are not suitable for berthing space.

From the waterfront observations and the marine infrastructure criteria, the team found that some areas could accommodate vessels with modifications, while other locations were deemed unsuitable for tie up space. This is due to the configuration of the seawall and other aspects such as water exposure and barriers between the seawall and land. Interviews with officials from government departments and private interests helped us determine possible marine infrastructure modifications, such as floating pontoons for berthing and event space.

2. EKEO can serve as a model program for future development agencies.

Many government organizations must work in cooperation with one another to make modifications to the existing waterfront. The Energizing Kowloon East Office has provided a successful model within the Hong Kong government for how to facilitate interdepartmental cooperation, thereby accelerating improvement of waterfront areas via their work in Kwun Tong and Kai Tak. One of the strategies that EKEO uses is coordinating meetings between all involved government agencies in order to resolve interdepartmental conflicts. Another strategy is Quick Win Projects, projects who cost does not exceed HK\$30 million, as it requires a shorter and less costly approval process and can help gain public support for future projects. Finally, EKEO facilitates connections between private developers and government departments to waive land premium fees associated with development plan modifications.

3. Modifications to the waterfront must abide by legal regulations.

An order from the Director of Marine prohibits berthing along most of the seawall. Lifting these orders is unlikely due to associated liability and potential for berthing abuse. Abuse of these facilities for commercial exploitation occurs in other areas around Hong Kong. If an organization addresses liability and other concerns, the Director of Marine can temporarily lift berthing orders under special permission.

Solutions involving floating pontoons must address The Protection of the Harbour Ordinance (PHO). Fortunately, the Marine Department considers landing pontoons to be vessels; the PHO does not usually apply to a registered vessel, as long as the Director of Marine permits it.

4. Calm water is a rarity in Hong Kong and should be used to connect people to the harbor.

Victoria Harbour lost many of its natural inlets due to extensive land reclamation, which made calm water areas a rarity. In the past, inlets have provided shelter for berthing vessels. A majority of the harbor is exposed to open water, which is prone to wind and waves, as well as wakes from passing marine vessels. The Director of Marine views unattended boats, especially those in the presence of open water, as a hazard. Thus, calm water areas should be utilized to create land to water interfaces, as safety is one of the government's greatest concerns.

A majority of the waterfront is comprised of vertical seawalls, which are typically 4 to 5 meters tall to withstand typhoon conditions. Vertical seawalls reflect wave impacts, and the resulting agitation makes much of the harbor's open water unsuitable for small vessel berthing. Additionally, boats need two points of contact to tie up to the seawall, but many bollards are inadequately spaced for this purpose. As a result, the seawall would need modifications in order to accommodate the berthing of pleasure vessels.

5. To maximize utilization of sheltered waterfront, the government should ensure that any new infrastructure is capable of facilitating multiple uses.

Floating berthing pontoons allow boaters to berth and disembark regardless of the fluctuating tide level and provide a protective barrier between the boat and the seawall. Temporary and multi-use structures could increase the chance of gaining government approval, so these pontoons also facilitate recreational marine events, such as the New World Harbour Race and the Dragon Boat Festival.

Partially sheltered areas could be further protected using floating wave attenuators, which help reduce waves in an area and create a safe space for boaters to tie up. These structures are used to effectively protect both vessels and the shoreline in other places around the world.

RECOMMENDATIONS Creating a globally recognizable harbor that entertains both work and leisure requires efficiency and interdepartmental cooperation regarding waterfront management. Many projects currently pursued in calm water areas do not make use of the city's maritime resources. Integrating safe solutions and policy change into future waterfront modifications will ensure proper liability and usage. Moreover, the government should consider innovative waterfront solutions that parallel successful infrastructure in other harbors around the world. We have identified a number of areas in the harbor for improvement and recommended governmental changes to facilitate development.

Recommendations for Future Tie Up Space

We have identified six locations within the harbor to make modifications to improve the land-to-water interfaces. We recommend that developers follow the adaptations for these areas, which are in early stages of development.

1. Implement a floating wave attenuator to create protected water and add continuous landing steps to increase berthing and landing space in Yau Tong Bay.
2. Implement floating pontoons and allow small vessels to berth along China Merchants Wharf Pier in Kennedy Town.
3. Modify the rubble mound seawall and add bollards to allow for berthing in Tsuen Wan Riviera park.
4. Implement floating pontoons and landing steps for short-term berthing as well as a floating attenuator for potential overnight berthing in the Wan Chai Former Cargo Handling Basin.
5. Create landing steps and an event viewing area to supplement development plans and possible watersport area in North Point.
6. In order to best utilize what little calm water is available in the harbor, developmental plans should focus on land-to-water accessibility in Kwun Tong.

Recommendations for Improved Waterfront Management and Communication

There is room to improve efficiency within the government regarding modifications to the waterfront. We recommend the following changes to the government to expedite improvements to the waterfront.

1. Establish an overarching Harbourfront Authority involving representatives from the major harbor advocacy groups and governmental departments that oversee regulations and developments regarding the waterfront. This body would have the power to standardize the development process and make decisions on the harbor as necessary.
2. Encourage private developers to invest in projects that are oriented for public use and enjoyment through monetary incentives such as the waiving of land premium fees.

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GLOSSARY

Bollard: Short, vertical posts embedded in the top of the seawall to attach mooring lines and anchor vessels in position along the seawall.

Breakwater: A structure built to protect an area of the sea from rough waters.

Caisson: A precast concrete chamber used in seawall construction in Hong Kong.

Floating Wave Attenuator: Non-permanent floating structure which can protect an area of water from wave activity.

Hinterland/ Urban Hinterland: The area behind the coast; inland areas which are close to the water.

Junk: Traditional large Chinese sailboat/fishing boat.

Landing Step: Act as an interface for the transfer of passengers and cargo between a vessel and the land. Use is restricted only to those vessels actively loading or unloading.

Mooring: A permanent structure to which a vessel is secured.

Pier: Raised structure that projects from the shore over the water. Typically constructed to provide access to the water.

Rubble Mound Breakwater or Seawall: Constructed from layers of stone that form a sloped barrier to wave activity. Partially absorbs the energy from wave impacts.

Sampan: Small, flat-bottomed traditional Chinese fishing boat. Most walla-wallas in Victoria Harbour are sampans.

Seawall: A structure built abutting against the coastline to retain reclaimed soil or protect the shoreline from wave erosion.

Swing Mooring: Simple type of mooring which consists of a rope and buoy attached to a stationary anchor on the seabed.

Vertical Breakwater or Seawall: Vertically faced structures embedded into the seabed that are typically constructed from concrete. Reflect nearly all of the energy of wave impacts back into the harbor.

Wave Absorption Seawall: Vertical seawall with specially shaped concrete forms that absorb the energy of waves that impact, reducing wave agitation inside the harbor.

1.0 INTRODUCTION

Victoria Harbour plays a key role in the economic and social wellbeing of Hong Kong. Every year, over 400,000 large working vessels and passenger boats navigate these waters (Marine Department, 2011). All of this traffic passes through a body of water with an area of just over 16 square miles (41 square kilometers), making Hong Kong one of the busiest seaports in the world (CEDD, 1995). In 1999, the Legislation Council passed the Protection of the Harbour Ordinance, which ceased the approval of any new land reclamation projects. The city has since begun to reevaluate its goals for Victoria Harbour (Urban Land Institute [ULI], 2005). Recent shifts in the operation of the port have dramatically changed attitudes about who are the harbor's main stakeholders. Much of the land adjacent to the waterfront in Victoria Harbour is now suitable for redevelopment. Plans for these areas must be designed to satisfy the needs of those who live, work, and play alongside it.

The Hong Kong government recognizes that Victoria Harbour has the potential to be the cultural heart of the city, and several initiatives have been proposed and carried out to increase ease of access to the waterfront. The primary focus of these projects are to increase access to the waterfront from the urban hinterland. Comparatively, very little has happened to unlock the harbor's potential as a destination for pleasure boating and water recreation, which would require improved access to the land via the water. Inner Victoria Harbour lacks adequate public mooring and berthing space, which would serve both pleasure vessels and small commercial craft such as launches and water taxis.

Access to the harbor for non-commercial boaters is limited to landing steps. Many pleasure vessels cannot even use the currently available infrastructure due to physical constraints. Even if they could be used, these facilities are not intended for any purposes other than the active loading and unloading of passengers and cargo; there is essentially nowhere in the harbor where tying up and disembarking from a pleasure vessel is permitted. Lastly, there are large areas of the seawall where mooring infrastructure is either poorly maintained or simply nonexistent. Jurisdiction of existing tie-up spots is complicated, as a lot of interdepartmental communication is required to achieve progress regarding waterfront development.

Our group observed and analyzed the land-to-water interface of the inner harbor. We collected information on the presence of suitable infrastructure, as well as any other factors that would affect the feasibility of berthing around the harbor. We identified where boaters would like to be able to tie up, and which current regulations could make it possible to allow mooring at these spots. Interviews helped us understand which governmental departments are in charge of

the regulation, management, and operation of mooring spaces. Our research identified preferable locations for, and clarified the restrictions on, berthing and mooring in the harbor. Furthermore, our work allowed us to make recommendations to our sponsors regarding locations for marine infrastructure modification, as well as to help inform them about infrastructure implementation processes and regulation.

2.0 BACKGROUND

This chapter discusses the research we have conducted in order to understand the cultural and legal context of our project and the problems we aim to solve. We collected information on Victoria Harbour's history and usage, as well as the state of its transportation systems and infrastructure, including piers and landings.

2.1 History of Victoria Harbour

Hong Kong has struggled to keep up with its rapidly growing population. The waters of Victoria Harbour were once home to tens of thousands of boat dwellers, whose junks and sampans occupied much of the useable mooring space. After these floating communities reached their peak in the 1970s, there was a steady population decline as low-cost public housing became available and space in the harbor was consumed by land reclamation projects (CNN, 2010). For over a century, the government has carried out land reclamation in parts of Victoria Harbour to create more useable land and to accommodate the growing needs of the city for housing, transportation, infrastructure, and commercial space. By 1995, 60% of Hong Kong's population lived on reclaimed land (Yim, 1995), and over half of the harbor's open water between Hong Kong Island and Kowloon Peninsula was lost to reclamation projects (Figure 1). "In 1841, the distance between Hong Kong Island and Kowloon Peninsula was approximately 2,300 meters but today it has shrunk by 60 percent to 920 meters," (Kam Ng, 2006). By 2004, the city halted land reclamation projects in Hong Kong and began to reevaluate its goals for Victoria Harbour. As a compromise, however, phases of the Central Reclamation, the Wan Chai Development, and the South-east Kowloon Development were exempt and allowed to continue to completion (Urban Land Institute [ULI], 2005).

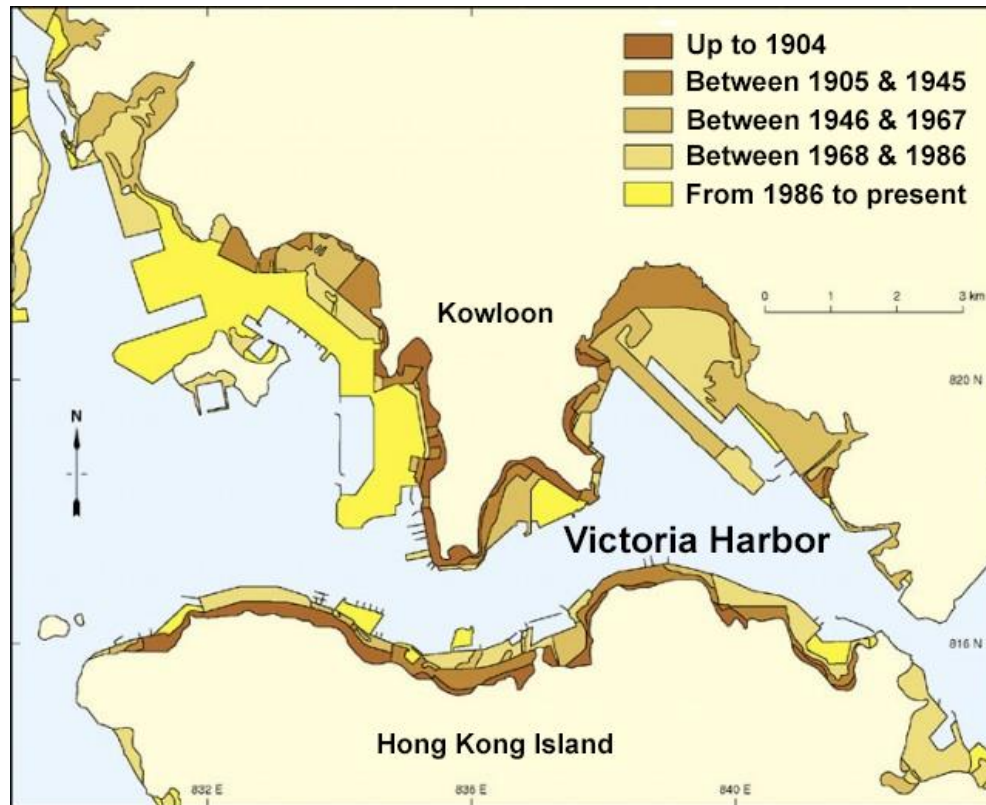


Figure 1: Victoria Harbour Reclamation (Chan, 2013)

The current goals of Hong Kong’s Town Planning Board offer a dramatic departure from the attitude that drove earlier harborfront projects. Rather than expanding the land and compromising the city’s maritime assets, the new vision is to “Bring the People to the Harbour and the Harbour to the People” (ULI, 2005, p.7). The Planning Board intends to make the harbor’s 73 kilometers of waterfront more visually appealing and more open and integrated with surrounding districts (ULI, 2005, p.7). Furthermore, members of the Legislative Council have pushed for the Government to adopt new ideas regarding Victoria Harbour’s planning and management. The Legislative Council want to implement a tourism-based harborfront plan that would increase the convenience of water transport and better suit the needs of residents and tourists alike. This plan would revitalize harborfront areas with the aim of bolstering the local economy while utilizing a public-private partnership for construction and management (Saushing, 2011).

In order for the harborfront to be more accessible for both tourists and residents, the authorities need to identify preferred areas for vessel berthing space. This will allow tourists and residents to better utilize the harbor by promoting greater use of water transportation and water recreational activities. The locations and maintenance for the infrastructure necessary for

berthing need to comply with local regulations and satisfy the needs of local businesses, residents, tourists, and boat operators.

2.2 Harbor Management and Guidelines

Several organizations and governmental agencies are in charge of the management of the harbor. They offer several resources to aid in carrying out harbor-related projects, including a planning guide for present and future harbor improvement.

2.2.1 Harbor Advisory and Management Organizations

The Harbour-front Enhancement Committee (HEC) and the Harbour Business Forum (HBF) are driving forces behind many of Victoria Harbour's revitalization projects. Both organizations offer a body of knowledge and expertise on how to modify and improve the harbor to better suit people's needs. The HEC advises the government, but has no executive powers, while the HBF focuses on gathering input from public and private businesses on how best satisfy their needs (ULI, 2005, p. 8). Government departments like the Development Bureau, the Leisure and Cultural Services Department, and the Marine Department deal with the legality and implementation of suggestions from these advisory boards.

The Harbour Unit (HU) of the Development Bureau focuses on coordinating harborfront initiatives and oversees harbor revitalization projects. HU provides support and insight to the Harbourfront Commission on harborfront related developments and projects (DEVB - Planning and Lands Branch, 2016). The Leisure and Cultural Services Department (LCSD) coordinates community events and deals with the allocation of land for parks, cultural events, and recreation areas. LCSD ensures that areas remain vibrant and usable for the residents and visitors of Kowloon and Hong Kong (Leisure and Cultural Services Department, n.d.). The Civil Engineering and Development Department (CEDD) is a government organization that deals with infrastructure development and has both land and marine departments. In particular, the CEDD is in charge of reclamation and development projects, and owns and operates landing steps (CEDD, 2016). Finally, the Marine Department ensures boater safety within the harbor by enforcing local and international marine laws. They license vessels and track ship movements throughout the harbor (Marine Department, 2016).

2.2.2 Harborfront Guidelines

HEC's Harbour Planning Guidelines describes the future goals for Victoria Harbour. These guidelines outline focus areas that harborfront planning organizations must consider in order to best accommodate stakeholders' needs. These focus areas include: Land Use Planning,

Urban Design, Landscaping, Physical Linkage, Land Formation, Harbour-Front Management, Sustainable Development, and Temporary Land Uses.

The Land Use Planning section of the Planning Guidelines discusses the traits necessary for land developments to be beneficial to all. Section (a) of Land Use Planning states that “uses to promote vibrancy and diversity and to enhance public enjoyment... are encouraged to be developed along the harborfront areas” (Harbour-front Enhancement Committee [HEC], 2007, p. 6). Improving access to the waterfront will increase cultural value, promote vibrancy, and encourage tourism-related ventures within the harbor. Furthermore, section (e) states that “public space for recreation and leisure uses should be created wherever possible” (HEC, 2007, p.7). Thus, HEC recognizes that open space, like parks and boat mooring, must be set aside for people’s enjoyment.

The Guidelines also suggest how urban developments should be planned in order to maintain a cohesive and vibrant waterfront. The visibility of the harbor is of utmost importance to urban planners and visitors. For example, Figure 2 shows how buildings should be strategically placed to create vistas of the harbor and to the hills so that visitors and residents alike can enjoy the harbor’s beauty. For an action plan to be successful, it is important to keep in mind that any developments along the coastline must maintain this descending pattern. This eliminates the possibility of large dry storage racks along the waterfront.

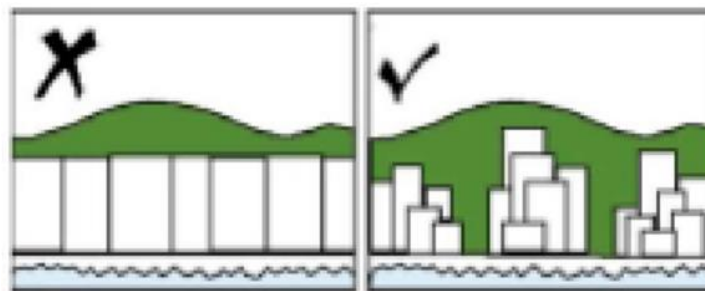


Figure 2: Guidelines on a Scenic Harborfront (HEC, 2007)

HEC’s guidelines also encourage the physical linkage of harborfront areas to create a “traffic-free environment” and to ensure continuous and easy access to pedestrians. Having this advantage could increase the popularity of an area. Figure 3 shows the emphasis placed on maximizing harbor accessibility via land. The guidelines also promote harborfront access via water by “integrated planning of an efficient public transport infrastructure, including marine-transportation...” (HEC, 2007, p.17). In order to satisfy these goals, we must first consider the implementation of improved waterfront infrastructure to support marine-transportation.

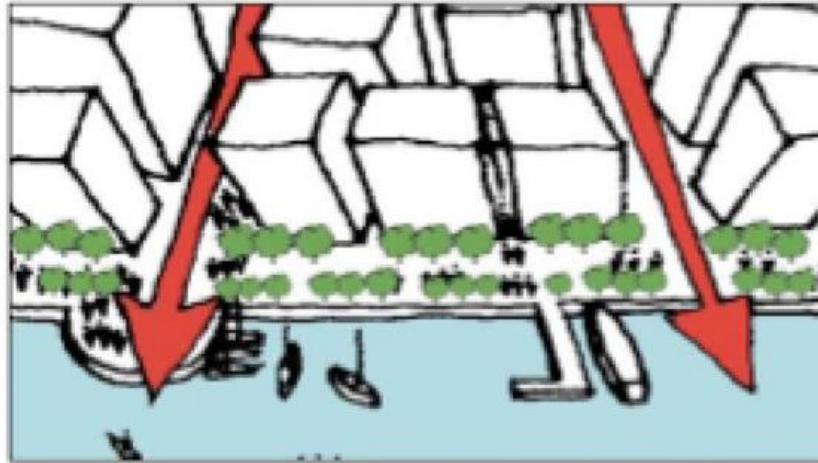


Figure 3: Harbour Accessibility via Land (HEC, 2007, p.17)

In the Land Formation chapter, HEC refers to some of Hong Kong's legislation for guidelines on land reclamation. Hong Kong has carried out many projects involving land reclamation during the past century in order to accommodate the growing population and economic needs (ULI, 2005). However, in order to maintain the harbor's image as an international icon, the government has put in place laws to preserve the remaining space in the harbor. If a project involving reclamation is to be pursued, the harbor must be "protected and preserved as a special public asset and a natural heritage of Hong Kong people" (Development Bureau, 2004). Additionally, Citizen Envisioning@Harbour (CE@H), an organization comprised of university engineers, architects, urban planners, and environmental professionals, organized a panel to discuss harborfront-related land reclamation concerns. After hearing testimony from over forty academics and activists, CE@H concluded that, "A public participatory process should be established in parallel with the administrative and legislative processes as a triple safeguard to the integrity and functionality of the harbour shoreline" (Ng, 2006). Thus, land related development and reclamation projects should consider the interests of both the public and the government. By doing so, these projects will preserve Hong Kong's iconic waterfront.

The Harbour-front Management section states that, "the Government should work closely with the local community, District Councils, tourism, organizations, relevant stakeholders and the public on the management of the Harbour..." (HEC, 2007, p.19). Following these guidelines, this project will involve input from the public and those affected by harborfront development. Thus, the government will likely support this and any project that caters to the needs of all possible stakeholders. Furthermore, it is necessary to evaluate proposals based on long-term benefits and short-term cost analysis of the project. The guidelines discuss the rules regarding the sustainability of a project and what regulations it must uphold in order to gain

support from any governing bodies. These guidelines include a proposal for the creation of underground roads to alleviate traffic. In the short-term, this project is expensive and it may take many years to reap the economic benefits. However, since the project would include immediate and long-term environmental, social, and cultural benefits for the waterfront areas, it is likely that land reclamation will be granted for project implementation. A plan such as this may also benefit waterfront businesses as it allocates more space for public use and walkability rather than for mass transportation, which will allow more people to frequent the areas.

The Temporary Land Use section discusses the importance of increasing public access to the harborfront. It is important to understand that a temporary plan to enhance the accessibility can be used as a stepping-stone towards the implementation of a long-term sustainable solution. If a pilot plan proves to be successful, the city will likely grant more access to similar areas for the same project. Section (e) supports the idea of utilizing temporary developments as a way to evaluate the best possible proposals for waterfront enhancements (HEC, 2007).

2.3 Victoria Harbour Infrastructure, Activities, and Demographics

A wide variety of boats are used in Victoria Harbour, including pleasure craft, ferries, launches, government vessels, and container ships. The proposed project focuses primarily on addressing lack of waterfront infrastructure and tie up space in the harbor for pleasure craft. This section contains an overview of the facilities that are currently available, and identifies the parties responsible for their maintenance.

2.3.1 Victoria Harbour Vessels

According to the International Harbour Masters Association (2016), a harbormaster must enforce the harbor's maritime laws and regulations, ensure nautical safety, oversee port operations, and perform various maritime services. Hong Kong requires all private and commercial boaters to register their vessels with the Director of Marine. As of 2015, there were 1,905 private and 58 government-owned moorings around Victoria Harbour (Port of Hong Kong Statistical Table, 2015). In the same year, there were 9,456 registered Class IV (pleasure craft) vessels in Hong Kong, which is significantly more than the 371 registered Class I (commercial) vessels (Hong Kong Marine Department, 2016). Class I vessels, such as ferries and launches, have private docking space regulated by the city, while Class IV vessels, such as auxiliary powered yachts and cruisers, do not. Class IV vessels are forced to look elsewhere for short-term docking and must compete for limited mooring space in local marinas such as Tai Chung Hau, Aberdeen, and Lan Nai Wan Village. There are spaces for commercial and government boats in the inner harbor between Hong Kong and Kowloon, but there are few options for privately owned pleasure craft.

In addition to private boating access, properly provisioned mooring space along the seawall could enhance an area's ability to host events using a vessel such as a floating stage. Large events can utilize many of Hong Kong's waterfront areas and promenades. To circumvent this issue, several cities around the world make use of floating stage platforms to host performers, while crowds and stadium seating can be set up on the land, effectively increasing the space available (Property NSW, 2015). Such platforms provide additional space for events while potentially avoiding violations to the Protection of the Harbour Ordinance, as they can be put in place using bollards and anchors and removed after the event. Figure 4 shows a stage undergoing transport in Darling Harbour, Sydney, Australia.



Figure 4: Barge stage transported in Darling Harbour, Sydney Australia (Dickens, 2009)

Victoria Harbour is also home to many on-water events including the annual Hong Kong Boat Festival, the Hong Kong Dragon Boat Carnival and BeerFest, the Harbour Swimming Race, regattas, and sailboat events (Hong Kong Dragon Boat Carnival, 2017). The Dragon Boat Festival is rich in history and tradition, drawing in locals and visitors from around the world (Figure 5). Viewers can enjoy Dragon Boat races and water competitions held alongside waterfront promenades with stretches of straight coastline. The three-day festival attracts nearly 160,000 visitors and 4000 paddlers from many countries (Hong Kong Extras, 2016). It is

important to ensure that there is proper spectating room to accommodate these crowds in order to continue the success of these events.



Figure 5: 2015 Hong Kong International Dragon Boat Races (Shutterstock, 2015)

2.3.2 Infrastructure

Victoria Harbour has several different types of landing facilities for public and private passenger craft. One of the landing facilities commonly found around the harbor is public landing steps, used by both ferries and by leisure-craft boaters (Figure 6). The Civil Engineering and Development Department (CEDD) builds and maintain these facilities. Public landing steps built along the seawall are designed like staircases leading to berthing areas. Some well maintained landing steps provide short term access to the shore, while others require maintenance in order to meet regulations (Task Force on Water-Land Interface, 2012).



Figure 6: Public Landing Steps (Task Force on Water-Land Interface, 2012)

There are 50 public piers and landing steps in Victoria Harbour, with 22 of these landing facilities found on Hong Kong side of the harbor and 28 found on the Kowloon side (Figure 7, Task Force on Water-Land Interface, 2012). Typically, people spend an average of 1-12 minutes berthed at these locations. “According to the regulations, a local vessel should not generally lie alongside piers or landings for any time longer than is reasonably necessary for the embarkation or disembarkation” (Task Force on Water-land Interface, 2012). Furthermore, private boaters and shuttling companies use landing steps to disembark passengers. Some underutilized landing steps are chained up or have signs posted prohibiting use. However, as boating traffic increases, the demand for additional tie up space is rising. The Task Force on Water-land Interface (2012) outlines key harborfront locations for new landing facilities and strives to refurbish and better utilize the current waterfront infrastructure. Determining how to manage and better utilize these locations will help to increase the accessibility of Victoria Harbour.



Figure 7: Landing Facilities in Hong Kong (Task Force on Water-Land Interface, 2012)

A few areas have undergone redevelopment to increase accessibility to the city, one of which is the old Kai Tak Airport. After it closed, the airport site was converted into a large cruise ship terminal, along with the Kwun Tong Promenade and eight new residential sites (Task Force on Kai Tak Harbourfront Development, 2016). The renovations made to this pier have opened it

up to large cruiseliners. Figure 8 shows the short term, daily docking space implemented for cruiseliners. This space was not developed with smaller, private watercraft in mind. Although this area has the ability to take in thousands of people from these cruise liners and attracts a large number of visitors, there are no mainstream water shuttle systems in place to transport these passengers to other sites in the inner harbor. There is a need for places where small watercraft can tie up for a short period of time or where passengers can disembark from these small vessels.



Figure 8: Kai Tak Cruise Terminal (Kai Tak Cruise Terminal, 2016)

2.3.3 Ferry Services and Transport

Ferry services are one of the public's main modes of transport between Hong Kong Island and Kowloon. The Star Ferry acts as means of transportation to navigate around the inner harborfront areas. Unfortunately, the Star Ferry's limited destinations do not contribute to a fully connected and publicly accessible harbor (Figure 9). The other ferry services that exist, such as First Ferry, offer travel to limited areas. These services will need to adapt and seek new locations as the harborfront continues to grow and evolve.



Figure 9: Star Ferry Route (The Star Ferry Company, 2013)

2.3.4 Other Transport Services

Separate from ferry services, there are also small, informal operations that offer transport and other motorboat services to passengers and vessels in the harbor. Similar in function to water taxis, these boats are locally known as launches or walla wallas. Unlike a ferry service, there is little to no coordination between launch operators. There is also no system to request their services other than direct contact.

In the past, walla wallas were ubiquitous; in the 1960s, approximately 200 of these small motorboats operated on a daily basis carrying people to and from boats and places of interest along the harbor (Lui, 2000). Four distinct groups of passengers used these motorboat services. During the day, walla wallas' main business came from the transportation of workers and crew to and from cargo ships, while at night they carried passengers who needed to cross the harbor after mainstream ferries shut down. They also catered to newspaper couriers who needed to cross before the ferries opened in the morning and early commuters who wanted to catch trains out of Tsim Sha Tsui (Lui, 2000).

In the 1970s, the opening of the cross-harbor tunnel, as well as economic recession, caused many walla walla operators to go out of business. Over the next few decades, the more successful operators bought larger and higher-capacity launches, gradually evolving into ferry services themselves, while those who were less successful gradually became outdated and irrelevant. By 1999, there were only 21 small-scale walla wallas in the entire harbor. Today, those few walla wallas and small launch operators who are still in business transport people to piers to go fishing or to participate in other water activities.

2.4 Lessons from Other Harbors

To develop a better understanding of harbor renovations, our project team researched other successful harbor systems around the world. Examining the changes made to these harbors will help us draw parallels regarding possible implementations within Victoria Harbour. The two harbors we focus on, Marina Bay and Boston Harbor, showed improvements to their respective areas both economically and socially.

2.4.1 Marina Bay, Singapore Case Study

In 2007, Mark Goh, an Urban Redevelopment Authority member and the head of the Marina Bay Development Agency, delivered a presentation to Hong Kong's Harbour Business Forum with regard to urban waterfront development (Goh, 2007). This presentation included the plans and rationale for Singapore's future waterfront in areas like Marina Bay and the Singapore River. The developments in Singapore are examples of what could happen in the calm water areas of Victoria Harbour.

In the past, Singapore's waterfront was used primarily for trading, warehousing goods and dealing with international commerce, such that, "by the 1860s, three quarters of all shipping businesses in Singapore was done [in the Singapore River]" (Goh, 2007). Eventually, as Singapore's population and business grew, its government decided to clean up the waters, reclaim land and repurpose the waterfront for the public's enjoyment. Similar to Singapore River, Victoria Harbour played a vital role to Hong Kong shipping industry in the 1960s and is currently undergoing redevelopment projects to repurpose the waterfront for public enjoyment

Reclaimed land surrounding Marina Bay is becoming the city's new center of activity. Goh's speech on the waterfront plans included factors such as vibrancy, zonal planning, connectivity, public enjoyment space, reliable public facilities, and water-based activities. Similarly, Hong Kong must also take into account these factors when planning a successful waterfront.

Paralleling the guidelines set forth by the Harbour Enhancement Committee, Goh planned to preserve the city's vibrant skyline and to ensure building purpose variation. In doing so, he designed a skyline filled with buildings of different heights, with lower-story buildings on the waterfront backed by high-rise buildings. Figure 10, taken along the Singapore River, shows low-rise buildings along the waterfront. The intent was to "have activity generating uses on the ground floor to ensure that the area is lively at the street level" (Goh, 2007). New waterfront developments must follow these guidelines to avoid a high concentration of the same zoning purposes in any one area. Furthermore, Goh wanted to bring people to the waterfront during all

times of the day. Thus, he allocated space for commercial and residential uses, as well as the integrated public parks along the waterfront for the public's leisure and enjoyment.



Figure 10: Singapore River Waterfront

In order to promote public connectivity and ease of access to the waterfront, Goh configured “a comprehensive network of reliable utilities, road and rail transportation system.” Figure 11, adapted from Singapore’s street directory website (Street Directory Marina Bay, 2017), displays the transportation routes around the waterfront area. A continuous bus route travels around the bay, with stops at each major attraction. It also continues up the Singapore River, making it easy for people to explore different waterfront attractions. The Marina Bay area has access from three different MRT lines to the water. There are also river cruise taxis and water taxis, allowing easy access for people to cross the inner bay area and travel up the river. A promenade and open space encompasses the bay for those who wish to walk or bike. There is also access to Singapore’s MRT stations from many points along the waterfront, further enhancing the connectivity of the area.

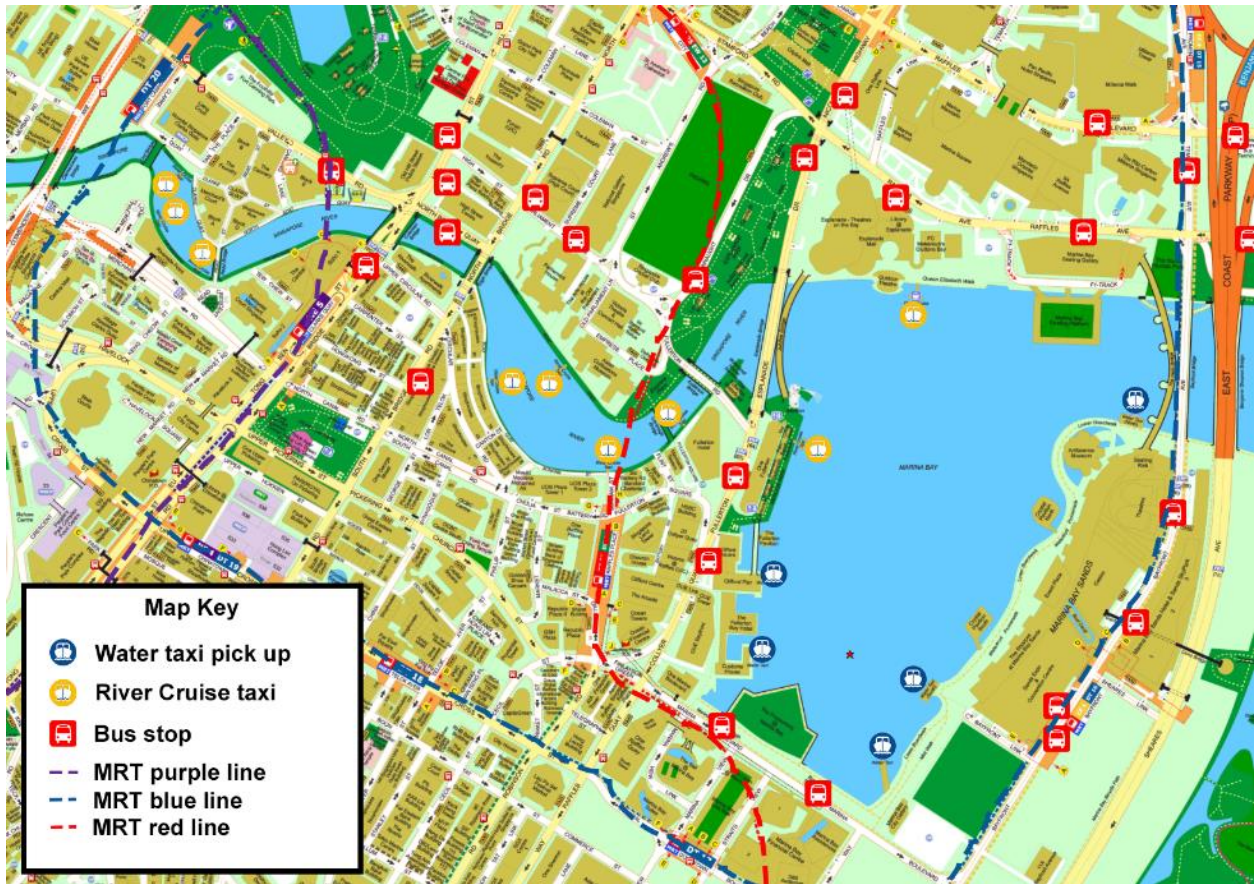


Figure 11: Marina Bay Connectivity (adapted from Street Directory Marina Bay, 2017)

The implemented bay design allows for viewing of water sports and competitions from the additional stadium seating along the waterfront, as well as additional stadium seating along the waterfront. Figure 12 also displays the location of the Marina Bay Seating Gallery, which faces the inner part of the bay. This seating is used to spectate events such as Marina Bay New Year’s Eve Countdown, as well as international competitions like “F1 Powerboat Races and sporting activities like wakeboarding and dragon boating” (Goh, 2007; Yee, & Ng, 2008). The event pontoon can be removed at any time to host other water related activities that require more space within the bay.



Figure 12: Marina bay floating pontoon and grandstands (Marina Bay Street Circuit Grandstand, 2012)

Much of the waterfront infrastructure allows easy access to the bay via watercraft. Floating pontoons are used as additional space along the waterfront. These temporary floating devices range in size and structure, from larger, more long-term term event rafts, to smaller rafts that increase boat tie up space and access to the Marina Bay from the surrounding waterfront areas. Figures 13 and 14 show the utilization of these floating docks alongside some of the waterfront restaurants and attractions, thus, becoming a more water-friendly area. Vessel owners utilize landing steps here for quick drop-off of passengers to the area.



Figure 13: Marina Bay Infrastructure



Figure 14: Marina Bay Waterfront Infrastructure

Marina Bay and the surrounding reclaimed developments are very similar to the current shape and design of many of the areas of Victoria Harbour. Sheltered waters by Kai Tak, Kwun Tong, and Wan Chai are all areas that could potentially replicate the developments Singapore has made stemming from their city's waterfront and reclamation plans.

2.4.2 Infrastructure Advancement in Boston, Massachusetts

In the late 1990s, Boston underwent an infrastructure project, called the Big Dig, to improve traffic flow within the city. A 3.5-mile section of elevated highway that ran through downtown Boston was rerouted into a tunnel dug underneath the previous roadway. One major side effect of the project was increased ease of access between parts of the city previously separated by a six-lane highway; in its place, there are now 27 acres of parkland. Figure 15 shows before and after views of part of the Big Dig site in downtown Boston. The previous highway running through the city is shown in the photo on the left, and the new greenway is shown in the photo on the right. The Harbor is in the forefront of Figure 15, while the Charles River is in the back.

The largest improvement was in access to the city's waterfront. The city's focus has shifted towards the water, and further planned open space use in the harbor, including putting in "new docks for water taxis and a new "Cultural Connector" boat, [to] make this area a truly urban water park area," (City of Boston, 2014). The city government has seen that increasing

mobility between the land and the water along the city's shoreline has both cultural and economic benefits.



Figure 15: Downtown Boston's, before (left) and after (right) the "Big Dig" (Flint, 2015)

Victoria Harbour is vital to Hong Kong's economic well-being, and the development of a tourism-centric, easily accessible harborfront will support the local economy. Projects such as the Wan Chai Bypass parallel the Big Dig, and if handled properly, Hong Kong can see similar benefits to property values and to businesses that rely on tourism.

2.4.3 Water Taxis in Other Cities

Canada's Victoria Harbour, located in the province of British Columbia, has a seasonal on-demand water taxi service. Water taxi passengers can call a dispatch to request transportation between any of the fifteen designated spots around the harbor (Victoria Harbour Ferry, 2013). This idea could be adapted to suit Hong Kong, as it combines the on-demand convenience of a taxi with the organizational advantages of a service with set pick up and drop off locations. Other cities, such as Seattle, have services called water taxis but still have set routes and schedules. Water taxis depart from the busier West Seattle location frequently throughout the day, but only depart from the Vashon Island pier during commuting hours. The water taxis accommodate

people with bicycles, and similar to many of the transportation services in Hong Kong, passengers can pay for their Seattle water taxis using pre-paid ORCA cards (Washington State Department of Transportation, 2016). During the summer of 2014, the transportation company Uber experimented with on-demand boat services in Boston Harbor, where users could request a ride to locations throughout the harbor using the Uber app. While it was very popular, the services only intent was to be a short-term demo and was discontinued at the end of the summer (Lauren, 2014). A similar Uber service in Istanbul, initially intended as a publicity stunt, became so popular that it was made permanent (Kang, 2015).

3. METHODOLOGY

This project evaluated preferred and practical locations in Victoria Harbour for marine activities and harborfront infrastructure. This chapter discusses various methods our team used to achieve our objectives. We compiled observations, research, government regulations, and future harborfront plans for our sponsors to develop strategies to improve waterfront accessibility. To achieve this goal, we identified four objectives:

1. Understand government policies and jurisdiction regarding waterfront development;
2. Analyze current relevant harbor infrastructure;
3. Evaluate existing and planned cultural features and attractions along the waterfront;
4. Identify locations where the current state of mooring in Victoria Harbour can be improved to better facilitate access to the harborfront, and develop suggestions for doing so.

To understand the current organizations in charge of seawall development, we interviewed relevant government officials, representatives from a pilot government agency, and an invested stakeholder representative from Royal Hong Kong Yacht Club. In preparation for these interviews, we reviewed marine laws, harbor development plans, and recorded observations on areas of the waterfront. Finally, we compiled a map of desirable and feasible locations for marine activities and additional mooring along the waterfront. Recommendations for each area of the waterfront incorporated the information gained from interviews, future development plans, and current waterfront infrastructure.

3.1 Clarify Government Policies on Harborfront Developments

We interviewed government officials to identify who oversees harbor-related developments. These interviews provided valuable insight on government policies, land ownership, and why boaters could or could not land and dock at certain locations.

3.1.1 Review Marine Provisions and Guidelines

In order to develop strategies to improve harborfront infrastructure, it was necessary for us to gain an understanding of Hong Kong maritime laws. After speaking with our sponsors, we found that different sets of Hong Kong legislation overlap regarding the waterfront line. Our group researched laws posted by the Hong Kong Maritime Law Association (Hong Kong Maritime Law Association, 2017) which is overseen by the Judiciary of the Hong Kong Special Administrative Region of the People's Republic of China. Additionally, we consulted the Port Works Design Manual regarding the design and considerations for marine works, including

piers, reclamation, seawalls and breakwaters (Civil Engineering and Development Bureau [CEDD], 2002).

3.1.2 Zoning

We consulted resources from the Town Planning Board (TPB), the Planning Department, and the Outline Zoning Plan (OZP) to identify the zoning in each area. By reviewing zoning types and their respective regulations, we were able to determine the permitted types of infrastructure in each zone. We identified zones that permit development of waterfront infrastructure through comparison of the OZP with documents on the TPB’s website. Figure 16 displays an example of TPB’s zoning map as well as a key explaining what each color represents.

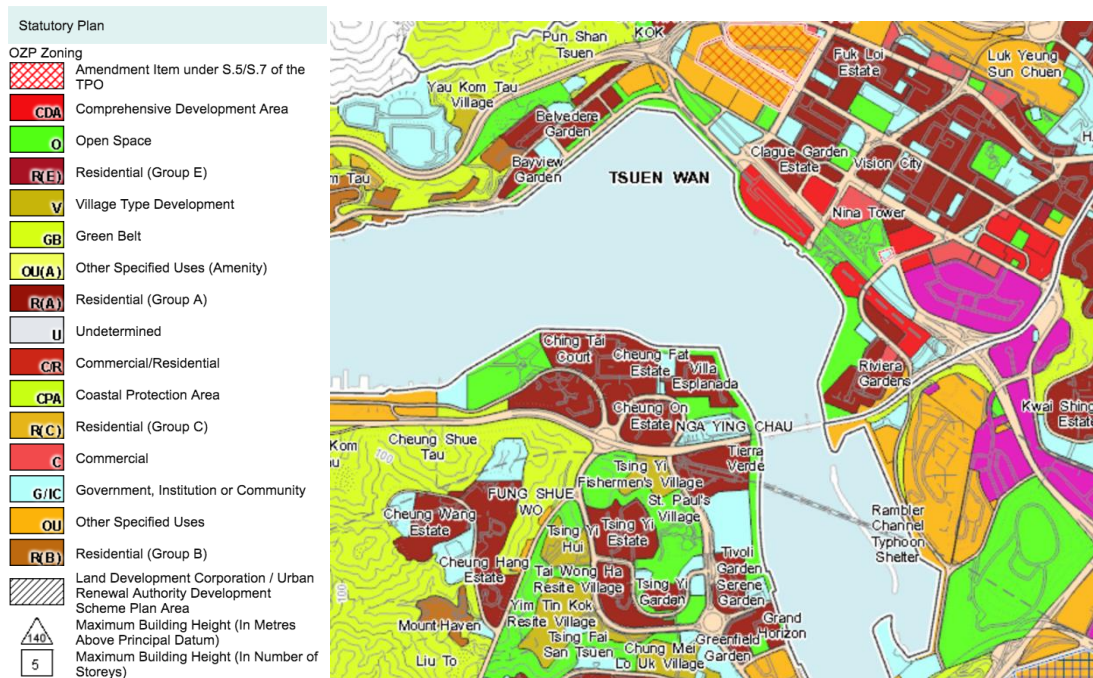


Figure 16: Zoning Plan Example and Key (Town Planning Board [TPB], 2017)

3.1.3 Consultation with Harbor Officials

To understand potential legal limitations regarding waterfront infrastructure and ownership, we contacted officials from Hong Kong government agencies including the Harbour Unit of the Development Bureau, the Marine Department, the Civil Engineering and Development Department, the Leisure and Cultural Services Department, and the Planning Department. Consulting these key officials helped us direct our research and keep our proposals consistent with government legislation.

Identifying Interviewees

During the first meeting with our sponsors, Paul Zimmerman directed us to several government agencies in charge of harbor-related development and regulations. We interviewed Larry Chu, Assistant Secretary of the Harbour Unit and Emily Som, the Secretary of the Task Force on Water-land Interface from the Harbour Unit of the Development Bureau. The Harbour Unit deals with planning and implementation aspects of Victoria Harbour's revitalization and development initiatives, as well as assisting the Harbourfront Commission (Development Bureau, 2017). We asked them a number of preliminary interview questions. In turn, they helped us organize questions for each government department. Meeting with the Development Bureau helped us determine which representative from each department would be most beneficial and able to answer our questions. We used these contacts moving forward with our other interviews.

We interviewed Adrian Chan, a Senior Marine Officer from the Marine Department. He is responsible for the navigational safety of vessels that are involved in or affected by marine projects, public or private. We consulted Chan for his knowledge regarding berthing regulations, jurisdiction of the Director of Marine, and regulations pertaining to floating vessels. Additionally, he helped direct some of our questions that were better suited for other departments.

We also interviewed Pierre Wong from the Civil Engineering and Development Department. Pierre Wong is part of the Port Works Division, which is responsible for planning and implementing projects related to marine works. His department primarily focuses on the construction, improvement, maintenance and reconstruction of piers and landing steps.

We also conducted an interview with Mei Ling Wong from the Planning Section of the Leisure and Cultural Services Department. The Planning Section works with District Councils to provide leisure and cultural facilities to provide for the local community. They also manage most waterfront promenades.

We also interviewed W. P. Chan, the Director of Planning for the Planning Department. This department formulates monitors and reviews the land use. They are in charge of studies to determine future land use to provide social and economically appropriate facilities to meet the needs of the public.

Royal Hong Kong Yacht Club

We also set up an interview with Mark Bovaird, General Manager of the Royal Hong Kong Yacht Club. The RHKYC operates the majority of pleasure craft around Victoria Harbour. The government consults them on many projects in the area. Mr. Bovaird discussed demand for

boating access to certain locations and the feasibility of modifying the seawall. We used this information to help shape our analysis of suitable areas around the harbor.

Energizing Kowloon East Office (EKEO)

Due to the quick success of the projects in Kowloon East, we set up an interview with Frank Wong and Vivian Lai from EKEO. This organization is in charge of facilitating development projects in Kwun Tong and the Kai Tak area. The specialized agency has members from various departments that oversee every aspect of the projects, including design, approval and development. The purpose of this interview was to understand the methods they use in Kowloon East to get such quick developmental success and see how these processes may apply to other waterfront related projects.

Interview Script Preparation

Based on our background research, field observations, and suggestions from our sponsors, we drafted a preliminary set of interview questions for each department. Further feedback from our sponsors, interviewees, and from Mr. Chu helped us finalize our interview questions, outlined in Appendix B, along with an interview preamble to read to each subject at the beginning of the interview. We made use of photographs that we had taken during our observations to supplement our inquiry. We also felt that it was important to give examples of existing successful and vibrant harbors in other parts of the world in order to show the potential of Hong Kong's waterfront. Interview summaries can be found in Appendix E.

3.2 Analyze Harbor Infrastructure

We used three main sources to identify key elements of the harborfront infrastructure:

- On-site observations
- Relevant past WPI projects
- The interactive map and database of Victoria Harbour, published by the Harbour Business Forum (HBF) in conjunction with Designing Hong Kong, and landing step maps provided by the Civil Engineering and Development Department (CEDD)

We used these resources to evaluate existing landing and docking sites. By utilizing the resources mentioned above, we were able to gather most of the information necessary to evaluate each waterfront neighborhood.

3.2.1 Survey Waterfront Infrastructure

While on site, we walked along the accessible parts of the waterfront, which we broke down into 21 neighborhoods spanning 73 kilometers. We observed the location and accessibility

of bollards, landing steps, and nearby attractions. We compared inaccessible areas with developmental plans. Such observations helped us to evaluate whether these locations were appropriate places for people to dock their pleasure crafts or where festivals and celebrations could be held using floating event vessels. Appendix A shows the checklist we used to guide our collection of data for each location.

As we walked along the waterfront, we recorded data in areas where there were bollards, landing steps or public piers. We noted whether there was signage attached to the seawall that indicates ownership and management of each pedestrian area, which helped us decide who to contact about the ownership of each piece of infrastructure. Furthermore, we observed the types of seawall and the number of accessible and inaccessible bollards in each area. Inaccessible bollards included bollards with a barrier, such as a fence or glass wall, that would prevent boaters from tying up or disembarking. Descriptions of current marine infrastructure can be found in Appendix D.

Additionally, our team recorded available attractions in the area, such as nearby restaurants, recreational areas, parks, bars, event spaces, and landmarks. We also looked at zoning maps of Hong Kong and Kowloon to determine the guidelines governing each waterfront area.

We noted the distance between the waterfront area and various modes of transportation, such as the MTR, public buses, and ferry services. Access to public transport is considered convenient if the walking distance is less than 400 meters (McCormack, Giles-Corti, & Bulsara, 2007). However, the city plans to increase this distance to 500 meters (Zimmerman, 2017). Having this advantage could increase the popularity of an area. Access to public transportation would encourage boaters to disembark and travel inland to surrounding attractions.

In addition to our observations, the team photographed infrastructure such as bollards, landing steps, fences, and any construction sites that could affect future visitation to waterfront areas. These pictures served as points of reference as we carried out other areas of our project, particularly during our interviews with government organizations and sponsor meetings. After making these on-site observations, we reflected on whether each of these locations could better serve to provide public access to the waterfront.

3.2.2 Research Relevant Past IQPs

Our sponsors have worked with other IQP teams in the past regarding other aspects of Victoria Harbour. We referenced one of these projects as we researched locations for future landing steps and bollards. We focused on the “Pedestrian Connectivity along Victoria Harbour”

project from 2016. This project discussed walkability along the harborfront and mapped out obstructions and detours (Bosworth, Bozeat, Ing, & Yu, 2016). These maps gave us a better understanding of where to look for harborfront projects and suitable tie-up space. By utilizing these data and the information provided by our sponsors, our team was better able to choose areas of focus along the waterfront.

3.2.3 Interactive Maps and Databases of Victoria Harbour

Our group made use of Harbour Business Forum's interactive harbor map, which contains data on existing waterfront features including, landing steps, designated neighborhood zoning, and on-water fairways, as well as photos of specific areas that had been inaccessible to our group when we were on site. Fairways are designated routes within the harbor for boating traffic, which prohibits mooring and anchorage in these zones. In order for our group to develop strategies to increase accessibility of areas of the harbor by boat, it was necessary that any recommendations should accommodate these existing fairways. Additionally, we were able to identify specific sections of the water designated for shipping and cargo, which made those areas ineligible for our project.

We also used maps provided by CEDD to confirm the locations of the landing steps. Each pier or landing step is marked with a number, which allowed us to identify and reference the specific location of each landing step, which we then used to look up additional information on the site. These maps helped show areas that needed improvements increase marine event space and tie-up space in Victoria Harbour.

3.3 Future Harborfront Projects and Developments

Upon our arrival in Hong Kong, our sponsors informed us that there are several harborfront-related developments underway. Our group researched harborfront development plans provided and approved by the Development Bureau. We used these plans to determine if each project, when completed, would create desirable locations to tie up for personal leisure or watercraft-based entertainment. We examined whether the existing plans could be modified to improve waterfront infrastructure within the harbor. Our final suggestions to our sponsors consider both the current and future states of the various harborfront districts.

3.4 Develop Suggestions to Improve Harbor Accessibility

In addition to identifying the most suitable locations for improved mooring space, we also examined possible modifications to existing infrastructure at those sites and suggested the possible addition of new mooring infrastructure. Each waterfront area contains a unique combination of characteristics that influence their suitability for future tie up space. We created

criteria to quantify the potential demand for visiting each destination, the feasibility of implementing or modifying waterfront infrastructure, and the connectivity of each area to the surrounding city. We considered cultural points of interest such as restaurants and large, accessible event spaces in our criteria. We identified relevant areas using information from our sponsors, interviews, previous IQPs, future development plans, and 21 on-site observations.

DEMAND The presence of attractions within 500 meters of the waterfront influenced our set of criteria for demand. OpenRice was used to determine the number of restaurants and bars in each area, and distances to retail space, event space, outdoor areas, and museums were measured in Google Maps (OpenRice, 2017; Google Maps, 2017). Other site-specific characteristics and cultural amenities were factored into each area's potential for marine use.

FEASIBILITY We used our observations, photographs, input from interviewees, and Harbour Business Forum's interactive map to determine the feasibility of implementing or modifying waterfront infrastructure in each area.

CONNECTIVITY The presence of public transportation within 500 meters helped determine an area's accessibility. It is vital that both boaters and the public have easy access between the water and the rest of the city. Distance to transport services such as the MTR, buses, and ferry services was measured using Google Maps (Google Maps, 2017).

The three categories of criteria were evaluated using a weighted points system, outlined in Appendix C. Scores were normalized into coefficients between 0 and 1 to standardize the comparison of locations. The area's overall suitability for marine related modifications utilized the average values of these coefficients. We represented the results of this analysis using graphs, which allowed for easy comparison of the merits of each area. We identified the highest-ranking locations and carefully considered development plans and necessary modifications. We made recommendations for future tie up space for the highest-ranking areas; however, we also selected some areas based on site-specific factors.

3.5 Summary

In conclusion, this project team evaluated preferred and practical locations within Victoria Harbour for marine activities and mooring infrastructure. To accomplish this goal, we developed a further understanding of who controls harborfront development and various aspects that would affect future visitation. We also surveyed the waterfront for current marine infrastructure, nearby amenities and modes of public transportation. From these findings, we compiled data and created a map of locations where bollards and landing steps would increase

the accessibility of the harbor for its users. We also used our data to make suggestions for space along the waterfront that could be used for marine activities.

4. FINDINGS AND ANALYSIS

This section contains our principal findings based on our objectives of analyzing harbor infrastructure, evaluating planned waterfront projects, researching jurisdiction over the waterfront, and identifying locations suitable for improved marine infrastructure. Our findings are broken into two main themes, which are followed by further discussion.

4.1 Understand government concerns and policies regarding waterfront development

Finding 1: Due to the liability and safety concerns, governing bodies are reluctant to implement marine infrastructure.

Many departments are hesitant to consider modifications to waterfront areas to avoid any possible public endangerment. The Hong Kong government has always placed a priority on public safety; Mr. Chan stated that the Marine Department does not want to be held liable for incidents that might occur resulting from changes to the Director's orders. For each area with lifted berthing restrictions, there would need to be a presiding public or private authority to regulate use and to assume liability. The RHKYC was cited as an example of such an authority. The yacht club does not have the problem of unwanted private or commercial use of its docks because RHKYC actively monitors dock use and can be held liable for any incident involving vessels that use its facilities.

The main concern of the Leisure and Cultural Services Department is also public safety. During our correspondence with an LCSD official, we cited examples of seemingly well-maintained landing steps closed to the public. The official stated, "the closing of the landing steps is for the sake of public safety" (LCSD, 2017). The caution-motivated closure of landing steps and the installation of barriers around Victoria Harbour has made it increasingly difficult for the public to access and enjoy the water.

Finding 2: Government responsibilities regarding the waterfront are decentralized and often overlap between departments and bureaux.

Six departments spanning four bureaux have primary jurisdiction over Hong Kong's waterfront. Cooperation across these departments is vital to the success of any project that aims to achieve modifications to the waterfront, the seawall, or the orders of the Director of Marine. At times, it is not clear where the boundary between different sets of policy, and the authority of these departments overlap. The need for cooperation between and authorization from these departments has led to a decentralized process for new waterfront development.

The Marine Department made it clear that their main responsibility was the licensing of vessels, and other departments are in charge of other aspects of waterfront use. In our correspondence with CEDD, they stated that the Marine Department decides whether there is a need for new waterfront infrastructure. Both departments provided information regarding necessary approvals and additional requirements that are taken into consideration when dealing with waterfront-related uses and developments. Table 1 outlines some of these interdependencies, and requirements and how they relate to various uses of the waterfront.

Table 1: Interdepartmental Dependencies and Requirements for Marine Related Waterfront Use

Intended Action	Department	Necessary Prior Approval	Additional Requirements and Actions
Vessel berthing	Marine Department	-Land owners (LCSD, private, etc.)	-Assurance of public safety -Assignment of and responsibility for liability -Safety of vessel (involving seawall/fenders/weather/waves) -Safety of event (if related to event) -Management to prevent abuse
Vessel permits	Marine Department	-None, however certain uses may require approval from the transport department	-If class I-III, must pass Local Vessels Safety Survey -Class IV must apply for permit and pass inspection
Zoning change	Planning Department	-Lands Department -Land owner/manager	-Public and political support -Payment of land premiums to the Lands Department
Infrastructure construction or upgrade	CEDD	-Department which is requesting change -Land owners	-Payment of land premiums to CEDD
Public event involving park or promenade	LCSD	-Marine Dept. (if involving use of the seawall)	-Assurance of public safety

Finding 3: Legal concerns must be addressed before the existing use of the waterfront can be change.

If sections of the waterfront become available for berthing, it will be important to consider the potential political conflicts it may cause. The Director of Marine authorizes signage along the seawall. The director has the authority to grant exceptions to individual vessels or organizations, but these orders are unlikely to be fully lifted due to concerns including liability and dwell time. Even after projects gain approval from stakeholders on the land side, concerns of the Marine Department would still need to be addressed before any changes to orders could be made (Chan, personal communication, 2017).

When asked about the modification of orders set by the Director of Marine to allow berthing along the seawall, Mr. Chan expressed his concern regarding the inherent potential for abuse. The Marine Department has the authority to patrol the harbor and issue summonses to boat owners who violate their orders. Due to the large size of the harbor, vessels that violate berthing restrictions typically do not get caught unless a resident files a complaint. The Marine Department does not monitor the harbor for these types of violations. Mr. Chan gave the example of Aberdeen, where vessels commonly anchor adjacent to the seawall permanently in order to circumvent the orders of the Marine Department. These permanent stationary vessels are set up to function as shops and restaurants and provide services to other residents of the harbor. Despite repeated efforts to remove them, the loose regulations do not explicitly prohibit this action. Mr. Chan mentioned, “In Hong Kong, when there is a commercial opportunity, it will be exploited” (Chan, personal communication, 2017).

In some cases, pontoons may be considered land reclamation, which would violate the Protection of the Harbour Ordinance. This decision depends on the amount of time these structures spend in one place and how they are affixed to the seafloor (Chan, personal communication, 2017). Implementation is more likely if the public shows a desire or need for pontoon infrastructure.

The Marine Department considers a landing pontoon to be a Class II vessel, which is “any vessel, other than a Class IV [pleasure] vessel, which is permitted to carry not more than 12 passengers” (Transport and Housing Bureau, n.d.). Therefore, landing pontoons must be approved by the Marine Department’s Local Vessels Safety and Survey Section (LVS). Each vessel must satisfy the requirements laid out in the Merchant Shipping (Local Vessels) Ordinance, Chapter 548 of Hong Kong’s general legislation (Marine Department, 2009). This document lays out the required conditions for safety and other qualifications that a vessel must meet to be allowed to operate within Hong Kong. Mr. Chan stated that once the Marine Department approves a vessel, it is free to use any of the available public anchorages within the harbor.

Finding 4: Models exist within the Hong Kong government for rapid improvement of waterfront areas.

Energizing Kowloon East Office (EKEO) is a multidisciplinary agency that has drawn up a conceptual master plan for the area encompassing the former Hong Kong International Airport, Kai Tak, as well as the surrounding industrial area in Kwun Tong. Although this organization has only existed since 2012, it has already done much to improve the area. EKEO an example of how a single authority can manage development efforts with greater success in less time.

One of the methods that EKEO uses to expedite the approval process for development plans is holding meetings that include all of the involved government parties. Bringing these parties together to discuss and resolve issues and interdepartmental conflicts provides the opportunity to eliminate bureaucratic inefficiencies and fast-track planning approvals.

EKEO also completes “Quick Win” projects. These projects require a less rigorous approval process, as there is no need to apply for funding through the government because the cost does not exceed HK\$30million. Instead of trying to redevelop the entire area all at once, the project is partitioned into smaller, more attainable projects such as the Kwun Tong promenade and the area underneath the Kwun Tong Bypass. If these small projects are successful, it will be easier to gain backing from the government and stakeholders for similar future projects in the same area.

Another important tool which EKEO has made use of is the waiver of Land Premiums. Land Premiums are fees paid to government agencies to assess structural modifications and legal implications to development plans. When existing land lease agreements need changes to permit future developments, private developers pay land premiums to the Lands Department, the Civil Engineering and Development Department, and any other department involved in approving site-specific modifications to the lease contract. In order to expedite developments for pedestrian connectivity, EKEO has persuaded the leasing authorities to waive premiums for private developers on the condition that they follow EKEO’s plans. This lowers the risk involved in being the first to develop, and it encourages developers to work together to improve the overall area.

Much of EKEO’s success is due to their ongoing efforts to address conflicting public interests. Solutions that cater to the interests of all involved are ideal. It is easier to gain approval from all areas of the government if there is broad public support. For waterfront-related developments, designers should plan to accommodate uses such as the berthing of vessels and

water recreation, as well as aesthetics. Thus, solutions that co-allocate space can address varying needs.

4.2 Current harbor infrastructure and future modifications

Finding 5: Pleasure vessels cannot berth along existing seawalls.

According to Mr. Chan, most of the seawall along the harbor is not built for berthing pleasure vessels. Rather, the seawall was originally designed to accommodate large cargo ships. Leisure vessels are unable to tie up at existing bollards due to their spacing and a lack of fenders, ladders, and adjacent landing steps.

Due to extensive land reclamation, few natural inlets remain in the harbor to provide protection from wind and waves. For boaters to tie up safely, they must rely on man-made protection. Smaller pleasure craft captains only want to moor in sheltered water, and the Marine Department considers it unsafe to moor pleasure vessels outside of protected areas (Bovaird, personal communication, 2017). Wave conditions are one of the greatest concerns of both the Marine Department and the RHKYC. In addition to natural tidal activity, high-speed ferries, barges, and other commercial watercraft in the harbor generate substantial wakes. These waves are almost completely reflected by vertical seawalls, which “can lead to wave agitation in the harbour, affecting port operation and navigation,” according to *The Guide to Design of Seawalls and Breakwaters* from CEDD’s Port Works division (CEDD, 2003). High wave activity is especially a problem in the waters off the north coast of Hong Kong Island, between the ferry terminals and the western point of the island. Some areas of the harbor have a rubble mound seawall that helps to absorb these waves; however, this configuration makes it difficult to install marine infrastructure. Areas that have no protection from wind and waves are not suitable for future tie up space, as boats can be damaged easily and berthing is difficult even under ideal conditions. Such locations include the waterfront near Sun Yat Sen Memorial Park and the West Kowloon Cultural District.

Finding 6: New methods to increase tie up space and improve the land to water interface must be pursued.

Several solutions exist to create an accessible and safe water-to-land interface. Mr. Bovaird from the RHKYC discussed solutions that may be possible in certain areas to make safe berthing possible. He indicated that berthing alongside piers or vertical seawall is not feasible, because those structures are too high to disembark passengers from normal pleasure vessels. There has to be a proper way to reach the land, which means there must be landing steps.

However, sailboats, unpowered vessels, or any boat with a pointed bow cannot easily use the standard landing steps used in Hong Kong.

Pontoons fixed to the seawall adjacent landing steps can make locations suitable to berth and disembark from pleasure vessels, a technique commonly used by the yacht club. Floating pontoons rise and fall with the changing tides. The pontoons utilize cleats, rather than large bollards, which are suitable for smaller boats to tie up. The pontoon creates a barrier between the vessel and the seawall, protecting it and vessels berthing alongside it from harm.

Floating pontoons are also commonly used for other waterfront activities; they are typically installed for short periods of time in order to facilitate events such as dragon boat races. Desirable locations for event pontoons would include areas with an expanse of open space on land for spectators to sit and watch the entertainment. These pontoons must typically also be in sheltered water areas with access provided by adjacent landing steps. Because these pontoons are installed for such short periods, they may be tied up to bollards rather than being fixed to the seawall. The presence or absence of a sufficient number of adequately spaced bollards should be a factor in the selection of locations for these events. For some activities, the profile of the coastline is also important; areas with straight coastlines are preferable for hosting dragon boat and rowing races because they allow spectators to watch from the entire length of the raceway. Figure 17 shows how pontoons can be utilized and tied up to bollards for water events, in this case a swimming race.



Figure 17: Floating Pontoon Tied Up to Bollards (Zimmerman, 2017)

Another way to increase boating access could be to create designated public mooring space in areas such as the Kwun Tong Typhoon Shelter and the former Wan Chai Cargo Handling Basin. Walla wallas or taxi services could supply boaters with reliable transport between their moored vessels and landing steps. Currently, boats are allowed to anchor anywhere that is not an active fairway and does not interfere with the safety and use of other boats; this is inefficient compared to a planned mooring arrangement (Winn, 2013).

Mr. Bovaird suggested that newly provisioned mooring areas could be protected using floating wave attenuators. He stated that the club has recommended implementing these attenuators in Wan Chai to create a water sports area. Attenuators can be installed in other partially protected areas in need of mooring space, such as Yau Tong.

Finding 7: Demand is a primary focus when identifying areas for marine infrastructure implementation.

The intent of Hong Kong's government is to make Victoria Harbour a vibrant space for both working and leisure. Future demand will be greater where boaters have the opportunity to tie up and visit bars, restaurants, and other attractions along the waterfront (Zimmerman, personal communication, 2017). However, current demand from boaters for additional tie up space is minimal. The inner harbor currently lacks available public tie up space, so boat owners have not considered it as an option. Berthing along the seawall is restricted due to both marine department orders and a lack of infrastructure, so boaters moor elsewhere.

The Royal Hong Kong Yacht Club is the only yacht club with berthing facilities in inner Victoria Harbour. Our discussion with Mr. Bovaird gave us a better understanding of where the demand lies within the harbor. Many of the members of RHKYC are not interested in cruising around the harbor; they want to take their boats to the outlying islands. He said the majority of the interest for tying up would come from boaters from outside the harbor who come in for races or other big events. Thus, demand fluctuates in accordance with the racing schedule. If Victoria Harbour becomes more accommodating of leisure uses, it will attract more boaters for day-to-day use.

Another aspect of demand comes from waterfront activities. The government is working to create a continuous promenade around Victoria Harbour, and many developmental proposals would supplement these promenades with restaurants and other attractions. Currently, many of these plans are in the very early stages of their development. This makes tying up in these locations less desirable. Mr. Zimmerman noted that once these developments are completed,

there would be places that people want to take their boats, but they just do not know it yet (Zimmerman, personal communication, 2017).

Finding 8: Demand, feasibility, and connectivity determine the suitability of future tie up space.

In order to determine which areas may be suitable for future tie up space, we considered the demand for visiting each destination, the feasibility of implementing or modifying waterfront infrastructure, and the connectivity of the area. In order to compare different neighborhoods, we quantified our criteria, detailed in Appendix C. Demand is the desirability of boaters to visit the area, and so we took into account nearby cultural amenities, retail spaces and outdoor areas. Connectivity is the distance from the waterfront area to the closest public transportation stop. Feasibility is the ability to implement marine infrastructure in certain areas. This included evaluating areas for aspects such as type of water exposure and seawall. Site-specific scores on the individual categories of criteria can be found in Appendix G.

The scores in each category were normalized to a maximum possible value of 1.0 and then averaged to obtain an overall rating. Normally, areas that ranked overall highest received recommendations. However, other areas receive recommendations based on site-specific factors. Appendix H contains a complete list of area criteria graphs.

Wan Chai and Kwun Tong had high overall rankings (Figure 18). The large number of existing and future attractions in these areas make them highly desirable to the public. The existing seawall and water conditions in these areas would be accommodating for the berthing of vessels with the addition of proper marine infrastructure. Both of these areas are either currently or will be well connected to the rest of the city via MTR, bus routes, ferry piers, and continuous promenades. The accumulation of these factors make these areas desirable and feasible locations for improved marine infrastructure to allow accessibility to the area by boat.

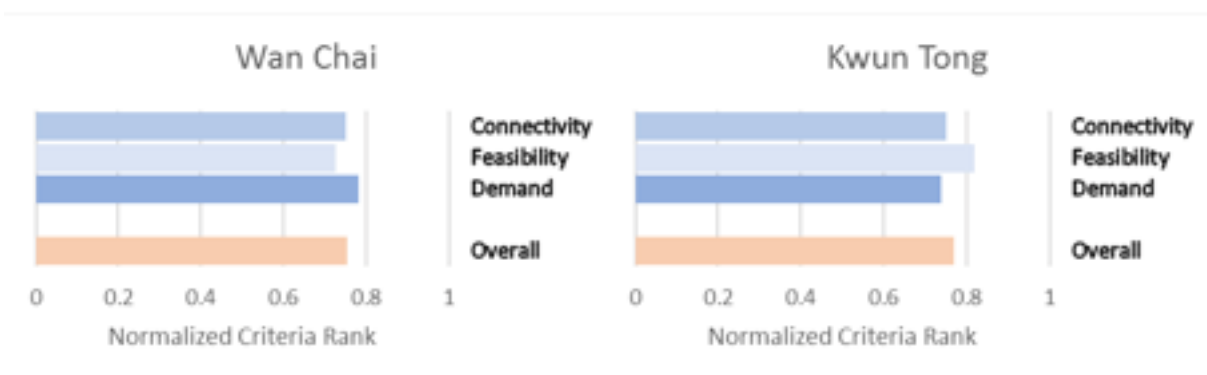


Figure 18: Wan Chai and Kwun Tong criteria fulfillment graphs

North Point has a high connectivity ranking while its feasibility and demand rankings are lower (Figure 19). North Point is well connected with MTR, bus, and ferry stations all within 500 meters of the waterfront; in addition, the area will be accessible by foot once a harborfront boardwalk is created. However, North Point has low demand because it is a residential area with few cultural amenities, retail spaces and restaurants. The area’s feasibility is low because the waterfront is exposed water, but its straight coastline makes it ideal for dragon boat and rowing races. Thus, North Point’s site-specific characteristics make it a possible area for future marine infrastructure modifications.

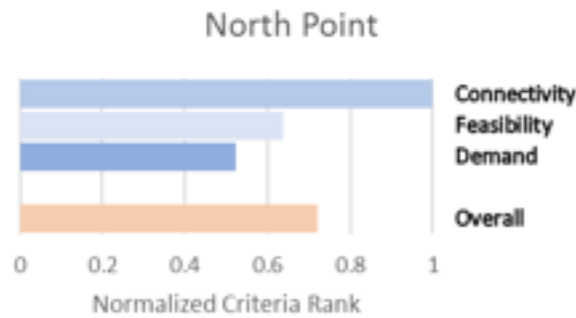


Figure 19: North Point criteria fulfillment graph

Sham Shui Po has low rankings for connectivity, feasibility and demand, making it an unsuitable area for marine infrastructure modifications (Figure 20). The lack of transportation within 500 meters of the waterfront makes this area poorly connected. Sham Shui Po ranks fairly well for feasibility because cargo ships currently use this area’s seawall to tie up, so infrastructure is already in place. The area also ranks low for demand because Sham Shui Po lacks nearby amenities and its future plans include housing developments.

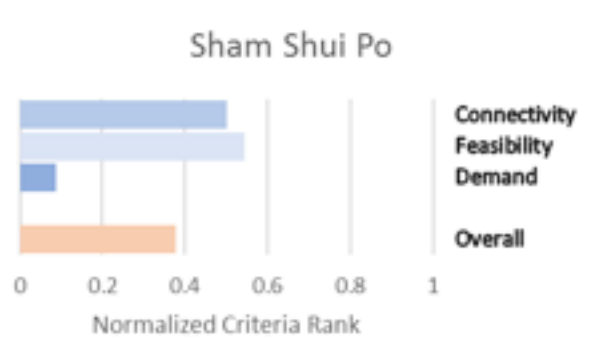


Figure 20: Sham Shui Po Criteria fulfillment graph

After making observations of marine-related infrastructure and consulting existing harbor infrastructure maps, our team compiled the data on an interactive map using Google My Maps (Google, 2017). Boaters and other interested parties can use this map to find information on the current state of infrastructure within the harbor. The compiled data includes, landing steps, bollards, piers, pictures, fairways, calm water areas, and desirable destinations. Individual layers outlining the data can be found in Appendix I.

We identified Kennedy Town, Wan Chai, North Point, Tsuen Wan, Kwun Tong, and Yau Tong as areas for future tie up space, indicated by the green lines on the map (Figure 21). These six areas have ample attractions, accessible public transportation, or development plans that would increase the area’s feasibility or desirability. The yellow lines indicate areas with large or unapproved development plans to take place in the far future, and immediate effort should not be made to increase tie up space. Organizations should reevaluate the suitability of these locations for marine infrastructure implementation once development plans are complete. The black lines indicate areas that are not recommended for future tie up space. These areas have exposed water and poor desirability, feasibility or connectivity. Finally, the unmarked areas are privately owned or cannot be considered for public use, like cargo working areas or military piers. A full list of area findings can be found in Appendix F.

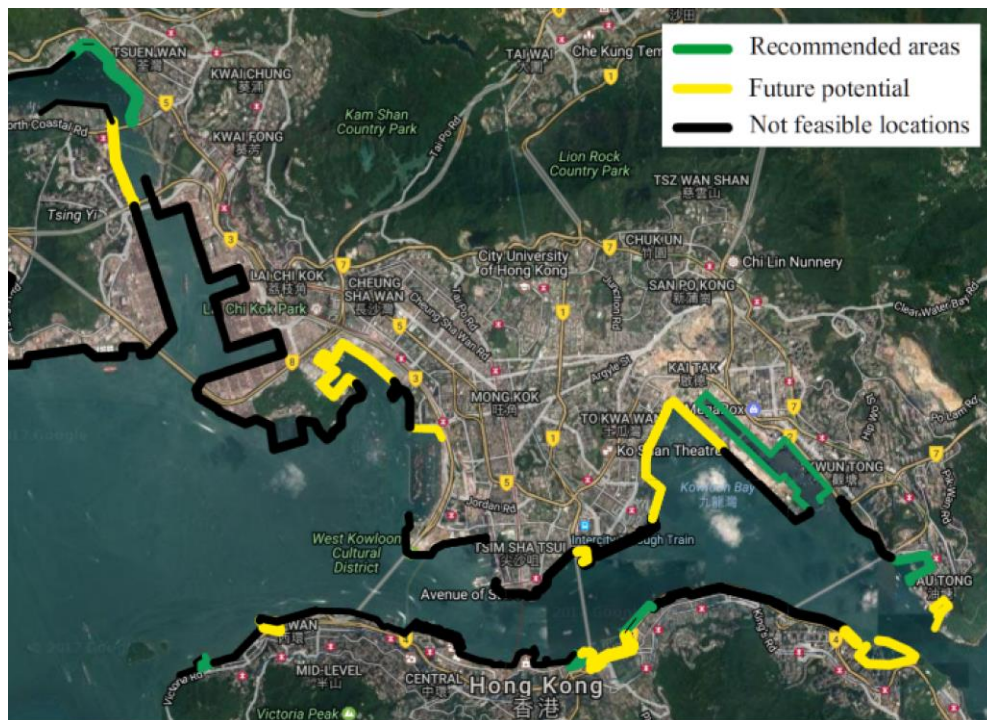


Figure 21: Recommended tie up location map layer

Kennedy Town is one of the suitable locations for future tie up space. This area contains the China Merchants Wharf Pier and the former MTR Temporary Works Area. These areas are currently inaccessible to the public, but they are both slated to be redeveloped for public use. Figure 22 shows the waterfront development plans for Kennedy Town as proposed by the Planning Department. Area A is government land that will be converted to a waterfront promenade with park and pier areas. The piers will be reserved for small boats and structures in the area will provide new food and beverage options. The large pier in Area B, China Merchant Wharf Pier, provides some protection from exposed water within this area. The Planning Department has development plans to create docking space for cruise ships and large vessels on the outside of the Pier. Finally, Area C is government-owned land operated by the LCSD and will be reserved for sports and recreation. See Appendix F.1 for details.



Figure 22: China Merchants Wharf Pier Future Plan (China Merchants Godown, Wharf & Transportation Co., Ltd., 2017)

We identified **Wan Chai** as recommended location for future tie up space due to nearby attractions and development plans. The Golden Bauhinia Square in Wan Chai features a promenade and food and beverage options in the adjacent convention center. The nearby Former Wan Chai Public Cargo Working Area is being reimagined as a Water Sports and Recreation Precinct by the Wan Chai North Urban Design Study. Some have proposed the implementation of a barge pool, while others would use the space for dragon boat races, sailing and rowing; the final plans are still under discussion. A representative of the Planning Department stated that “various marine supporting features/facilities such as landing steps, bollards, berthing facilities,

wave attenuation, etc. are proposed along the whole stretch of the waterfront,” (Chan, personal communication, 2017). See Appendix F.6 for details.

North Point's development plans and straight coastline make this area a suitable location for future tie up space and watersport venue. The addition of a two-kilometer boardwalk along the water, which will connect Oil Street and Hoi Yu Street, will improve access to this area. CEDD is currently conducting a study to determine the feasibility of the creation of the boardwalk. This project is only in its second stage of development, but studies to assess the social, economical, and environmental need for a continuous boardwalk have been completed (CEDD, 2017). North Point's waterfront is also a suitable area for water sports due to its 600 meter stretch of straight coastline, which could host dragon boat and rowing races (Google Maps, 2017). See Appendix F.8 for details.

Tsuen Wan is a suitable area for future tie up space due to its development plans and area connectivity. The area is undergoing redevelopments to create a vibrant promenade that will allow residents and visitors to enjoy the waterfront (Task Force on Harbourfront Developments in Kowloon, Tsuen Wan and Kwai Tsing, 2015). The Tsuen Wan West Bayside also has easy access to the Tsuen Wan West MTR Station, making the area accessible for boaters to travel inland. See Appendix F.12 for details.

Kwun Tong's existing infrastructure and nearby amenities make the area suitable for future tie up space. There are 24 bollards present in the space between the promenade barrier and the water along the Kwun Tong Promenade. The barrier is transparent glass with removable panels at some spots along its length. These sections could provide access to berthing infrastructure along the seawall. The park space behind the promenade has both cultural attractions and dining options. See Appendix F. 19 for details.

We identified **Yau Tong Bay** as an area for future tie up space due to its development plans for land and water. Although the land surrounding Yau Tong Bay is currently undeveloped, development plans will create a public-use oriented, accessible, and vibrant harbor area. A Planning Department study also identified this area for the addition of landing steps, as it will have waterfront-adjacent attractions after development is finished (The Government of Hong Kong Special Administrative Region, 2015). See Appendix F.20 for details.

Victoria Harbour has the potential to be both the economic and cultural heart of the city. Bars, restaurants, museums, and parks should line the waterfront, bringing people together to appreciate all that the harbor has to offer. Hong Kong was not built for easy harborfront access; in the face of the rapid developments occurring across the city, an emphasis should be

placed on design that makes it quick and easy to reach the harbor. Additional tie up space will make the inner harbour more attractive as a pleasure boating destination, bringing in boaters from both Hong Kong and other areas around the world for sightseeing, events, and attractions.

In order to allow for the creation of tie up space in these locations, it is necessary to facilitate effective communication and decision making within the government and shift the focus of infrastructure developments in sheltered water areas towards maritime-related uses. Infrastructure modifications will also increase the access of the general public to the water; a landing pontoon for pleasure boaters can also be used for watersports such as kayaking, rowing, swimming, and dragon boat racing. Improving waterfront infrastructure and bringing the people to the harbor will make Hong Kong more vibrant and accessible for all.

5. CONCLUSIONS AND RECOMMENDATIONS

The goal of this project was to evaluate preferred and practical locations in Victoria Harbour for tying up vessels and for marine activities. To understand the causes of these problems and what can be done to improve waterfront accessibility, our team made waterfront observations and conducted interviews with government agencies and stakeholders.

Currently, responsibility over the regulation of the seawall and waterfront infrastructure is distributed across various governing organizations. The responsibility of each governing body of the harbor can be unclear, thus there is a need for an increase in communication. Each agency claims only a fraction of the responsibility over waterfront infrastructure and harbor management. Additionally, we learned about the processes for obtaining approval for waterfront infrastructure projects.

A thorough survey of waterfront infrastructure, a review of development plans, and interviews with the RHKYC management helped outline the demand and feasibility of tying up along the seawall. We conclude that the current seawall and infrastructure are not suitable for berthing pleasure vessels. Many of along the waterfront have access to public transportation and feature many attractions to visitors, but areas in open water are not feasible for marine infrastructure implementation.

We identified Yau Tong, Kennedy Town, Tsuen Wan, Wan Chai, Kwun Tong, and North Point as areas suitable for future tie up space. The recommendations made in this report should help Designing Hong Kong and Harbour Business Forum develop better strategies for improving tie up space around Victoria Harbour.

5.1 Recommendations for Future Tie Up Space

For the following six infrastructure modification and implementation recommendations, the Marine Department must recognize a need for the new infrastructure. Organizations can establish this need and show how modifications will benefit the public by holding area studies or surveys. Once the Marine Department approves each plan, CEDD will carry out and maintain the changes, while the Marine Department will manage their use. Finally, the Planning Department is in charge of future development plans. Private developers and organizations can give input to the Planning Department to shape the plans.

Recommendation 1: Implement a floating wave attenuator to create protected water and add continuous landing steps to increase berthing and landing space in Yau Tong.

Yau Tong is a blank slate for waterfront modifications. Current development plans from the Planning Department call for the seawall to be rebuilt; developers in this area should further adapt these plans to facilitate the use of leisure craft. We recommend that the government permits installation of floating wave attenuator to create a semi-permanent breakwater to further shelter Yau Tong's water.

We recommend the addition of continuous, front-facing landing steps around the seawall. Boats can use continuous landing steps to dock Mediterranean Style, where the bow of each boat faces the steps and the stern anchors using a mooring. Various sized boats can use this type of interface, as the steps increase in height from below the water to the top of the seawall. Boats can also use them as typical landing steps, to disembark passengers and goods. These steps would also not require land reclamation, as they can be dug out from existing land or integrated into the development plans for this area.

Recommendation 2: Implement floating pontoons and allow small vessels to berth along China Merchant Wharf Pier in Kennedy Town.

We recommend that developers of the China Merchant Wharf Pier include floating landing pontoons along the inner pier and against the seawall. These floating pontoons would serve as a barrier between the pier and boats docking alongside it. Pontoons would create a land to water interface in this area that would allow access to the area by boat and the public to access the water for recreation.

Recommendation 3: Modify the rubble mound seawall and add bollards to allow for berthing in Tsuen Wan Riviera Park.

We recommend that the CEDD removes the rubble mound seawall. After removing the rubble mound, CEDD could install a specially designed wave absorbing vertical seawall similar to that found in the Wan Chai Bypass project. Additionally, CEDD should install bollards along the seawall. The addition of bollards would permit vessels to access this area as well as create additional event space when utilized to tie up even-oriented pontoons.

Recommendation 4: Implement floating pontoons and landing steps for short-term berthing as well as a floating attenuator for overnight berthing in Wan Chai.

This small area of water in Wan Chai, just west of the Royal Hong Kong Yacht Club, is currently under development. Upon the approval of the Marine Department, the yacht club should work with the city to install floating pontoons for pleasure vessel berthing. The addition of these pontoons would allow boaters to disembark and leave their boats tied up for a short time. The addition of landing steps is necessary to facilitate these pontoons.

The Marine Department and CEDD should conduct a collaborative study to evaluate the feasibility of using a floating wave attenuator to further protect this area from waves. The Marine Department requires continuous monitoring of new harbor infrastructure for one full year before they allow broader-scale implementation. The attenuator would overlap with the RHKYC breakwater at the mouth of the sheltered area. Mr. Bovaird suggested that the additional berthing space could also provide overnight storage for recreational vessels used in weekend-long maritime competitions hosted within the harbor.

Recommendation 5: The government should better utilize calm water areas in Kwun Tong.

We recommend that plans continue for the Kai Tak Fantasy development as the plans include parks, sports facilities and many other amenities and attractions along the waterfront. EKEO should halt their musical fountain project, and reallocated funds should go to projects that are more conducive to land-to-water accessibility

Recommendation 6: Create landing steps and an event viewing area in North Point.

The Planning Department should modify their plans to include provisions to create landing steps along the boardwalk. This would increase accessibility for boaters in this area. Developments in this area should facilitate these events and their spectators by including features that maximize the public's ability to view the water, such as an elevated promenade or a tiered sitting area.

5.2 Recommendations for Improved Waterfront Management and Communication

Recommendation 7: Establish an overarching Harbourfront Authority involving representatives from major harbor advocacy groups and governmental departments that oversee waterfront regulations and management.

Hong Kong lacks a standardized process pertaining to waterfront-related development plans. By addressing conflicting interests, liability concerns and physical separation of these organizations, the government can become more effective in progressive decision making regarding waterfront development. The existing harbor-related forums such as HBF and HFC only have the power to advocate for development of the harbor. The proposed waterfront authority should be responsible for making decisions on a harbor-wide basis that are in line with the best interest of the harbor and people. The government should form a new committee to make decisions and establish policy pertaining to the waterfront. While keeping in mind the interests of the people and stakeholders, this organization would:

- Have the authority to make decisions regarding development and allocation of funds for waterfront developments.
- Create a standardized process that addresses liability for a vessel to receive berthing permissions.
- Create a standardized process that streamlines the regulatory requirements and liability concerns across all departments for modifying waterfront and marine-related infrastructure.
- Schedule regular meetings with all stakeholders to:
 - Establish a more transparent relationship between government and stakeholders.
 - Address the concerns and viewpoints of the general population and controlling bodies.
- Establish enforcement policies for berthing throughout areas of the harbor.

In order to streamline the establishment of a Harbourfront Authority, its members should come from existing departments within relevant areas of the government. There should be representatives from bodies such as the Marine Department, LCSD, CEDD, and the Harbour Unit of the Development Bureau. The Authority could be structured as a committee, with members acting as representatives of their respective agencies, or as a standalone body with dedicated officials.

Recommendation 8: Waive land premium fees for private developers and provide monetary incentives for public-oriented waterfront development projects.

We recommend that the Lands Department create standardized processes for waiving land premium fees for private developers wishing to pursue waterfront related projects benefiting the people. By lowering administrative costs for publicly focused developments along the waterfront, private developers will be more willing to invest their time and money in such projects. Additionally, we recommend that projects oriented toward benefiting the majority of stakeholders receive financial incentives from the government. By reducing costs for private developers to pursue projects benefiting the people of Hong Kong, they will be more likely to invest their resources in these sorts of projects. The funds could come from Hong Kong's large budget surpluses that have occurred for the past eight consecutive years (South China Morning Post, 2015). Reallocation of funds should benefit the whole of Hong Kong's population. The harborfront is a primary area to invest in as it is Hong Kong's iconic feature and has been relatively untapped for its potential.

5.3 Recommendations for future research

Recommendation 9: Conduct further research to assess stakeholder views regarding proposed infrastructure changes.

In this project, we identified and evaluated infrastructure such as wave attenuators, public moorings facilities, floating pontoons, and water facing landing steps to increase harbor accessibility. Another project could assess stakeholder's views on proposed infrastructure changes. The project team would speak with government departments, private developers, watercraft users, and the general public regarding their opinions on the infrastructure modifications. Their findings would supplement our project and substantiate our recommendations, as well as narrow down the recommendations to see where Designing Hong Kong and Harbour Business Forum should focus their efforts.

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APPENDIX A: CHECKLIST FOR MOORING SITE PHYSICAL OBSERVATIONS

1. What neighborhood is this site in?
 - a. Does this site have a specific name or nearby landmark?
 - b. Who owns up to the fence in this area?
 - c. Is this in a breakwater area?
2. Accessibility: reaching this district via land.
 - a. Access to public transportation
 - i. Is there an MTR station within 500 meters?
 - ii. Is there a bus stop within 500 meters?
 - iii. Is there a ferry pier in this district, if so, who maintains and operates it?
 1. Where is the ferry service?
3. Pedestrian access:
 - a. Is the route to this location free of walls, gates, or other obstructions?
 - i. Is this a designated harborfront promenade or park?
4. Infrastructure along the seawall:
 - a. What type of seawall is present (straight or slanted)?
 - b. What material is the seawall made of? (concrete, rubber, wood, etc.)
 - c. Are there bollards present along the seawall?
 - i. How many bollards are present?
 - ii. How many bollards are directly accessible (with no obstruction from land)?
 - iii. How many bollards are inaccessible, or behind a fence?
 - iv. How far is the bollard from the fence?
 - v. Who owns/manages the bollards?
 - d. Are there landing steps along the seawall?
 - i. Does it have an identification number?
 - ii. Is there any presence of algae on the landing steps?
 - iii. Are they currently in use?
 - iv. Who owns/manages the landing steps?
5. Obstructions to the water:
 - a. Is there anything separating the land from the water?
 - b. How far setback is the fence from the seawall?
 - c. Is there any construction in the area?
6. Are there any development plans in this area?

- a. What attractions are near this location?
7. Reflections after viewing the location:
- a. What changes, if any, would need to be made in order to make this site useable as a mooring or landing?
 - b. Would this location be able to host an event?
 - c. Does the team believe it may be suitable for expansion and use as a longer-term mooring?
 - i. Why do we think this would be a suitable location?

APPENDIX B: IN- PERSON INTERVIEW QUESTIONS

B.1 Development Bureau Interview Questions

1. What is your position and responsibilities at this organization?
2. What projects are you currently working on?
3. Who oversees harborfront-related development?
 - a. If not, do you know who is?
 - b. If so, can you tell us more about these responsibilities?
 - c. (Repeat question with landing steps, piers, the seawall)
4. What are the government's long term goals with regard to boats in the harbor?
5. What would motivate the government to allow more watercraft along the seawall?
6. In this picture, the thick fence on the outside is owned by the Leisure and Cultural Service Department, while the landing steps are maintained by CEDD. The space in the middle with the bollard is unmarked. Who maintains the land in between and the bollard?

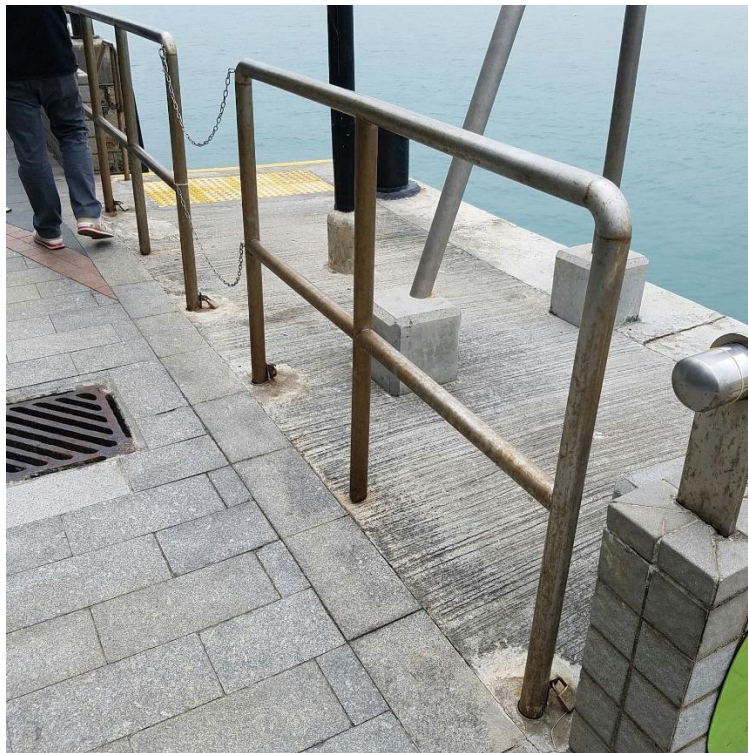


Taken in Sun Yat Sen Memorial Park

7. If a bollard falls on the water side of the fence, whose job is it to maintain the bollard?
8. Why are the bollards and some landing steps unused?



Quarry Bay Promenade Landing Step



Quarry Bay Promenade Landing Step

9. What regulations apply to new harborfront infrastructure?
 - a. Inserting new bollards
 - b. Removing rocks from seawall to create more useable seawall space



10. What legal concerns are there for waterfront related infrastructure?
 - a. Who does liability fall onto for waterfront related problems?
11. We noticed some areas use temporary floating docks (see picture below).

B.2 EKEO Interview Questions

1. Can you please briefly describe your responsibilities within EKEO?
2. Can you briefly describe how EKEO works in respect to the Hong Kong government? Do you have full control over what you are allowed to develop?
3. What stages must a project at EKEO must go through, from conception to implementation?
 - a. For example, the Fly the Flyover project?
4. What were the biggest problems you have encountered during waterfront related development projects which EKEO has carried out?
 - a. What suggestions would you have for the planners of future projects in order to avoid these problems?
5. What is the process for proposing and carrying out changes to the seawall, such as the construction of additional bollards and landing steps?
 - a. Is this process different for EKEO than the rest of Hong Kong?
6. Has EKEO considered the implementation of additional berthing infrastructure, such as bollards, landing steps, or floating pontoons, in order to facilitate the use of the harbor for leisure boating and water sports activities?
 - a. Do EKEO's interests extend only to the water's edge, or are you also involved in the administration of aquatic and maritime events?
7. Does authority over activities and events involving the water-land interface in harborfront areas which it has redeveloped?
 - a. Which other government entities would be involved in these activities and events?
8. Has EKEO considered the use of barges, or other similar vessels, to facilitate events by expanding the space available? Figure 1 depicts a barge stage in Darling Harbour, Australia.
 - a. What would the process be to get approval for such a vessel to tie up using bollards along the seawall?



Figure 1: Barge stage being transported in Darling Harbour, Sydney Australia (Clyde Dickens, 2009)

9. It has been proposed that a swimming pool barge should be implemented in the Water Sports and Recreation Precinct of the Wan Chai waterfront development. Has EKEO considered anything like this for future development plans?
10. What are your views on an organization such as the Harbourfront Authority, which would be in charge of overseeing waterfront infrastructure related developments? (A centralized authority to avoid the need to get approval from many different departments)
11. Is there anyone else you think it would be beneficial for us to talk to?

B.3 Royal Hong Kong Yacht Club Interview Questions

1. Where do boaters currently visit in the harbour?
2. What types of attractions do boaters look for when tying up?
3. What infrastructure do you recommend for boats to tie up along the seawall?
4. Where do you think boaters would be most likely to visit in the harbor if there was adequate berthing facilities?
5. Of these locations, which ones are feasible, in terms of waves, depth, weather conditions, waterfront infrastructure, or any other condition you may consider when tying up?
6. How long do the floating docks last?
7. What is the cost and maintenance of these structures?
8. We saw this facility utilizes floating pontoons. Are these generally well-liked by your boaters, and would they feel safe using these if they were in public locations around the harbor?

APPENDIX C: CRITERIA TO DETERMINE FUTURE TIE UP LOCATIONS

C. 1 Demand

1. Attractions: all within 500 meters of waterfront
 - a. Retail space (malls)
 - i. 2 pt. per mall (up to 2 malls)
 - b. Restaurants/bars (current/future)
 - i. 0 pt. 0
 - ii. 1 pt. < 15
 - iii. 2 pt. 15 - 30
 - iv. 3 pt. > 30
 - c. Promenade/park/outdoor recreation area
 - i. 1 pt. If the area has one of the three area types
 - ii. 2 pt. If the area has two of the three area types
 - iii. 3 pt. If the area has all three area types
 - d. Museum within 500 meters of waterfront
 - i. 1 pt. For one museum
 - ii. 2 pt. >1 museum
 - e. Small public event space (current/future)- an event takes place in the venue at a least once per year
 - i. 1 pt. For each space (up to 3 points)
 - f. Large public event space (current/future)
 - i. 0 if a large event cannot be held
 - ii. 3 if a large event can be held
 - g. Possible water event space (rowing, dragon boats, power boats, etc.)
 - i. 1 pt. Leisure water activities
 - ii. 3 pt. Competition space

C. 2 Feasibility

2. Accessible infrastructure currently in place (piers, landing steps, bollards)
 - i. 1 pt. For at each thing (only 1 pt. per category)
- b. Type of seawall: vertical, rubble, or natural
 - i. 0 pt. Natural
 - ii. 1 pt. Rubble (rubble mound that can be removed)
 - iii. 2 pt. Combination (combination of vertical and rubble)

- iv. 3 pt. Vertical
 - c. Fence type (would it require modifications?)
 - i. 2 pt. Barrier-free or frangible
 - ii. 1 pt. Metal fence
 - iii. 0 pt. Concrete and metal fence
- 3. Water exposure (rough water, sheltered, or breakwater)
 - a. 2 pt. Breakwater
 - b. 1 pt. Sheltered water
 - c. X - Not considered if rough waters
- 4. Interfering with fairway (or ferry routes)
 - a. 2 pt. > 500 meters from fairway
 - b. 1 pt. 100 - 500 meters from fairway
 - c. X - Not considered if inside a fairway

Total: X/11

C. 3 Connectivity

- 1. Nearby an MTR station (less than 500 meters)
 - a. 1 pt. < 500 meters
- 2. Nearby a bus stop (less than 500 meters)
 - a. 1 pt. < 500 meters
- 3. Nearby a ferry pier (less than 500 meters)
 - a. 1 pt. < 500 meters
- 4. Accessible by foot (current/future)
 - a. 1 pt. Continuous promenade to adjacent neighborhoods

Total: X/4

APPENDIX D: WATERFRONT INFRASTRUCTURE AND ZONING

Our team researched a variety of waterfront infrastructure to better understand how land-to-water interfaces work. The following contains a summary of rules and guidelines from the Civil Engineering and Development Department that are specific to waterfront infrastructure in Hong Kong.

D.1 Breakwaters

A breakwater is a structure built to protect an area of sea from rough waters. They are constructed as barriers to prevent waves from getting into an area where vessels are moored. In Hong Kong, breakwaters are typically used to create typhoon shelters or to prevent erosion of the shoreline. Breakwaters can be categorized into three different types: rubble mound, vertical, and composite. (CEDD, 2003). The type of wall for each area is chosen based on cost, usage, and amount of allowable wave activity.

Rubble mound breakwaters are constructed from layers of stone which form a sloped barrier to wave activity. Rubble mound breakwaters have the advantage of partially absorbing the energy from wave impacts due to their shape (CEDD, 2003).

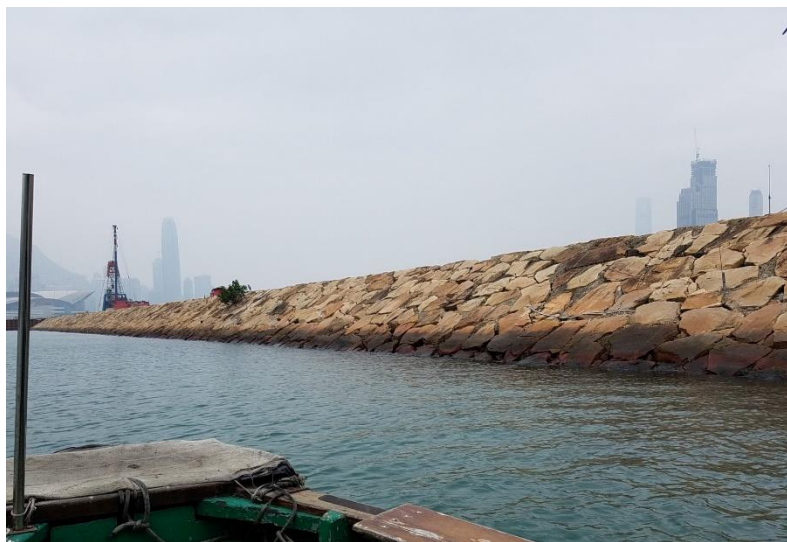


Figure D-1: Causeway Bay Typhoon Shelter

Vertical breakwaters are comprised of vertically faced structures embedded into the seabed that are typically constructed from concrete. It is not recommended to build these breakwaters in deep water, as their strength is not suitable to withstand the pressure of deep-water wave activity. Vertical breakwaters reflect nearly all of the energy of wave impacts, leading to increased turbulence in the harbor. Vertical breakwaters also require more

maintenance than rubble mounds, however when built at the right depth these structures are readily able to provide berthing space for vessels (CEDD, 2003).

A composite breakwater is constructed using features from both rubble mound and vertical breakwaters. An underwater rubble mound is laid down and then vertical structures are placed on top. This building technique is used for breakwaters in very deep water when a rubble mound would require too much rock or when a vertical breakwater would not withstand the force of the waves. This type of structure is more wave reflective than absorbent but can provide additional berthing space on the sheltered side.

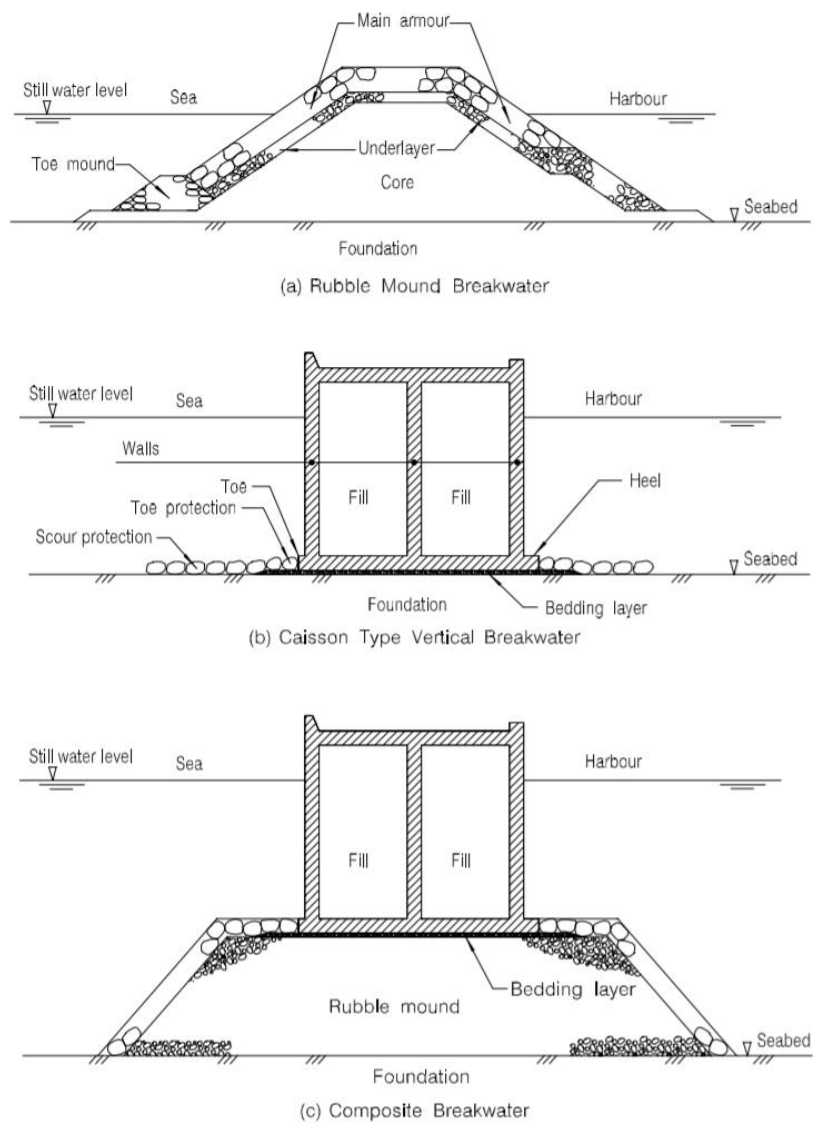


Figure D-2: Type of Breakwaters (CEDD, 2003)

D. 2 Seawall

A seawall is a structure built abutting against the coastline to retain reclaimed soil or protect the shoreline from wave erosion. Similar to breakwaters, seawalls may be vertical or sloping. Sloped seawalls are typically constructed in rubble mound configuration, although they may also be constructed using concrete or stone so that the sloping surface is flat. The former configuration is much more common in Victoria Harbour. These walls are very similar to sloped breakwaters, and they share the advantages of simple construction and partial absorption of wave energy. They reduce the effective usable width of the harbor because they extend horizontally into the water, so they are not suitable for narrow channels. Berthing and mooring facilities have to be provided separately for seawalls with a sloped configuration.



Figure D-3: Sloped Seawall with Recurve and Rubble Mound Seawall in Tsing Yi

Vertical seawalls can readily provide marine frontage for vessel berthing and cargo handling (Figure D-4). Bollards can be readily added to most types of vertical seawall, either during construction or after-the-fact. Unfortunately, typical vertical seawalls suffer the same wave amplification effects as vertical breakwaters.

This can be mitigated via the use of wave absorption structures (Figure D-5), which have been used in the recent Wan Chai Bypass reclamation project. Specially shaped concrete forms absorb the energy of waves that impact them in order to reduce wave agitation inside the harbor



Figure D-4: Vertical Seawall in the Causeway Bay Typhoon Shelter



Figure D-5: The wave absorbing seawall constructed at the harbour-front near the Central Piers (CEDD, 2012)

D.3 Tying Up Infrastructure

In many areas of the harbor, there is inadequate tying-up infrastructure. These elements are necessary to allow vessels to stay for an extended period of time. Typically, a vessel that is berthed along the seawall must be attached at a minimum of two points to restrict its movement and prevent it from being damaged or causing damage to other vessels or the seawall. The two main interfaces for tying up in the harbor are bollards and fringing pontoons.

Bollards have traditionally been the main type of tying-up device in inner Victoria Harbour, particularly for large shipping vessels. Bollards are short, vertical posts embedded in the top of the seawall for the purpose of attaching mooring lines and anchoring vessels in position. The majority of bollards in the harbor are constructed using a steel collar that is embedded into the seawall, into which reinforced concrete has been poured (CEDD, 2004). An example of a typical bollard can be found in Figure D-6.



Figure D-6: Bollard along Central and Western District Promenade

The other common method of tying up along the seawall in the inner harbor involves the use of fringing pontoons. These floating structures allow pleasure craft and sailboats to make use of the seawall, and they can also be used to facilitate events and water-based recreation.

The Royal Hong Kong Yacht Club uses pontoons which are attached to both the seawall and the seabed on a semi-permanent basis, however similar configurations exist which allow pontoons to be easily brought in and dismantled for daily or weekly use. These have been used to facilitate the loading and unloading of dragon boat rowers in Kwun Tong and as a starting platform for swimming events in Central.

Only small changes need to be made to the seawall, and they do not require reclamation. Figure D-7 shows how the RHKYC attaches their pontoons to the seawall using a vertical rail; this is only attached to the vertical face of the wall and does not impact the seabed.



Figure D-7: Fringing pontoons operated by the RHKYC

D. 4 Landing Steps and Piers

Landing steps act as an interface for the transfer of passengers and cargo between a vessel and the land. Each landing step is equipped with one bollard to either side of it to facilitate safe and effective use; however, most passenger or cargo-carrying vessels choose to use their engines to push the front of the boat against the concrete base of the steps, providing a stable pathway for people or cargo to be moved on or off the vessel. It is common for landing steps to feature rubber or plastic fenders for the prevention of damage to both the steps and to the vessels using them. Boats that typically use these structures are similarly equipped. The incremental height of the stairs allows boats of all sizes to access these structures at any point in the tide. As they are essentially active thoroughfares between the water and the land, use of landing steps is

understandably very short-term, with access restricted only to those vessels actively loading or unloading people and cargo. Landing steps are used for a wide variety of vessels, ranging from ferries that transport hundreds of people at a time, to walla wallas that hold approximately 1-5 people and offer informal on-demand transport services in the harbor.



Figure D-8: Landing Steps Along the Tsing Yi Promenade

A pier is a raised structure that projects from the shore over the water. Piers are typically constructed for the purpose of providing berthing space or access to the water. In order for a location to be considered for pier development, it must meet certain guidelines. First, the location must provide an adequate depth of water to encompass the structure so that boats can maneuver properly. Piers should not be developed in areas that are exposed to high winds, waves or currents for the safety of passengers and ease of berthing. When choosing a location, it is also important to consider, “accessibility of the site, phasing, and programme of the developments in the vicinity of the piers, road networks and... covered walkways” (Civil Engineering Office, Civil Engineering Department, & The Government of the Hong Kong Special Administrative Region, 2004). This means that the area accessible to public transportation and in an area of the city where people would want to go. Lastly, piers should be furnished with fenders in areas where boaters intend to berth to protect piers’ structural integrity and avoid damaging vessels. Piers built in Hong Kong are designed for an expected lifespan of fifty years. The intended longevity of the structure means that the developer will achieve “greater overall economy...by choosing simple robust concepts and appropriate reliable construction procedures,” (CEDD, 2002). Development of new piers may not be possible due to the Protection of the Harbour

Ordinance, which forbids land reclamation. For a new pier to be built, a developer must demonstrate that there is “a compelling, overriding and present need, no viable alternative, and minimum impairment” (Harbour-front Enhancement Committee, 2004). Repurposing or improving existing piers for longer-term public use may be the only option.



Figure D-9: Public Pier in Central

Development of new infrastructure is complicated by the Protection of the Harbour Ordinance, which forbids land reclamation. For anything that extends over the water to be built, a developer must demonstrate that there is “a compelling, overriding and present need, no viable alternative, and minimum impairment” (Harbour-front Enhancement Committee, 2004). This means that non-permanent solutions are the only feasible option for the time being.

D. 5 Zoning

This section discusses the type of zoning in Hong Kong. Each type of zone must abide by a different set of restrictions. We focused our research on areas that are adjacent to or contain sections of the seawall.

Hong Kong Outline Zoning Plans

There are nineteen distinct zone types. A majority of the sections of land adjacent to the seawall fall under the categories of Open Space, Commercial, Other Specified Uses, or Comprehensive Development Area. An analysis of waterfront area zoning helped us to determine if areas are feasible locations for potential tie up space or waterfront infrastructure.

The designations relevant to this project are largely covered under the terms: Marina, Marine Related Infrastructure, and Pier.

Table D-1 shows the types of infrastructure permitted in each zone designation. Zoning regulations that permit marina developments also allow the implementation of marine-related infrastructure, including: “landing steps, floating pontoons, lighthouses, buoys, etc. that are directly related to the normal operation of marine activities,” (TPB, 2012). In order to be approved, plans must follow the criteria found in the Town Planning Board’s Master Schedule of Notes (TPB, 2011).

Red areas in the OZP are designated as Comprehensive Development Areas (CDA). According to TPB, a zone designated as a CDA is “intended for comprehensive development/redevelopment of the area for residential and/or commercial uses with the provision of open space and other supporting facilities...” (The Planning Board, 2011a). The guidelines governing these areas are designed to be sufficiently broad to foster a variety of uses and potential rezoning schemes. If development project proposals or organizations show an underlying need for certain attractions, such as parks or promenades, then CDA zones can be rezoned as Open Space and used to increase waterfront accessibility.

Table D-1: Permitted Infrastructures by Zone

Zone type	Permitted (pending approval of TPB)		
	Piers	Marina	Marina Related Infrastructure
Comprehensive Development Areas	X		
Open Space	X	X	X
Commercial		X	X
Other Specified Use		X	X
Recreation	X	X	X

Green areas in the OZP are zoned as Open Space. The government recognizes that land in Hong Kong is in high demand, but also recognizes the need for land to be set aside to meet the needs of people for recreation and leisure (Planning Department, 2015b). A majority of the land along the waterfront is zoned as Open Space. The Planning Department's Recreation, Open Space and Greening guidelines contain the standards for Open Space zoning. These guidelines help to outline each provision regarding proper Open Space development and demonstrate what is permitted in each Open Space zone. According to the Town Planning Board, "This [open zone] is intended primarily for the provision of outdoor open-air public space for active and/or passive recreational uses serving the needs of local residents" (The Planning Board, 2011c). If it can be demonstrated that new waterfront infrastructure will benefit the general public, these areas should be targeted for such developments. Another set of guidelines pertaining to Open Space development is the Public Open Space in Private Development (POSPD) Design and Management Guidelines, published by the Development Bureau. POSPD guidelines set provisions for Open Space developers to ensure proper design and management while aligning with community needs. These guidelines serve as a point of reference when developers plan Open Space projects, such as promenades. In particular, promenades must have a minimum width of 15-20 meters in order to serve as a public Open Space, which applies to areas like The Promenade and Laguna Verde Promenade in Hung Hom (Development Bureau, n.d.).

Light red areas are zoned for commercial use. These areas are primarily intended for "commercial developments, which may include uses such as office, shop, services, place of entertainment, eating place and hotel..." which makes these locations potential areas that the public would want access to (The Planning Board, 2011b). Commercial areas attract large numbers of visitors, and so this can help us identify places where there may be a demand for future tie up space.

White-lined areas are designated as Urban Renewal Authority Development Scheme Plan areas. This land falls under the Ordinance of the Land Development Corporation of the Planning Department. Legislation Council has published a comparison of the various ordinances regarding these areas (Planning, Environment and Lands Bureau, 1999).

Orange indicates areas zoned for Other Specified Uses. According to the TBP this zone is allocated for "a combination of various types of compatible uses including commercial, residential, educational, cultural, recreational and entertainment uses" (The Planning Board, n.d.). Other Specified Uses zones help to locate marina-related infrastructure and piers, which is useful to see where vessels, both commercial and leisure, can currently land or tie up.

APPENDIX E: INTERVIEW SUMMARIES

Interviewee: Adrian Chan, Senior Marine Officer

Department: Marine Department

Context: Interview questions sent over email

Date: 06 Feb. 2017 and 08 Feb. 2017

The Marine Department is the main governing department for Victoria Harbour. This agency regulates tie up space for boats around the harbor. Currently there is limited tie up space in Victoria Harbor because ordinary seawall is not built for the berthing of a vessel. There are many components that determine whether or not an area is appropriate for long term berthing including demand, public safety, navigational safety, public order, permission, among others. Many areas are not built with infrastructure that would allow for boaters to tie up long term. The Director of Marine decides where boaters cannot berth along the seawall, which usually stretches the entire harborfront. The Marine Department views an unattended boat as a hazard, and this should not be allowed. This shows that there is no motivation within the department to move toward to allow berthing along the seawall. Another reason that an unattended boat is a hazard is due to wind and wave conditions. The Marine Department states that there would need to be provisions to the seawall in order to make this safe. These changes though would need to be studied before being improved. Changes to allow for more mooring could take a long time to be approved and implemented.

The Marine Department also does not see a demand from boaters to create more tie up space. They believe that boat owners should have their boats reside close to where he or she lives. This is difficult because there is only one yacht club currently in the harbor, and it is at capacity. From the government's point of view, it can only provide space where it would benefit the public and local stakeholders.

Context: In-person interview/discussion

Date: 16 Feb. 2017

From a technical standpoint, berthing is not an issue. With proper boating accessories like fenders and rope, berthing is essentially possible anywhere in the harbor. However, a majority of the harbor's waterfront has signage preventing vessels from berthing. These signs are not reflective of particular ordinances or legislation, but rather orders of the Director of Marine. Under the current system, vessels and event pontoons can apply for temporary berthing

permissions to tie up at specific locations for a predetermined amount of time. Thus permit will only be allowed if proper planning and liability has been addressed by another organization or agency. This temporary berthing avoids any infringement on the Protection of the Harbor Ordinance which prevents land reclamation.

Concerns regarding public berthing space:

Chan brought up Aberdeen to show an area that has been facing abuse of this berthing system. When vessels are allowed to berth, it brings up the issues such as who can berth, how long can someone berth, are people allowed to use their vessels as a commercialize the waterfront? The current legal battle over stationary vessels in Aberdeen makes the Marine Department reluctant to change the current provisions for temporary public berthing.

Additionally, it was noted that, unlike many successful leisure harbors, Victoria Harbour has to share its water with cargo and industrial ships. The designated fairways for these large vessels could become highly trafficked if the harbor was more open to public berthing. If the harbor was to eventually become more open to this concept, areas that are far away from these fairways are more favorable to alleviate congestion in the inner harbor.

Other notable findings:

- Anything that casts a shadow on the seabed is considered land reclamation, if it is not a temporary vessel.
- Relocation of a pontoon on a day to day basis is not reclamation. If you wanted to leave a vessel for longer, you would need to consult the Department of Justice.
- If there is no sign along the section of a seawall, there is no order there from the Director of Marine.

Interviewee: Pierre Wong

Department: Port Works Division of the Civil Engineering and Development

Context: Interview questions sent over email

Date: 10 Feb. 2017

The Port Works Division of CEDD creates and maintains waterfront infrastructure, including landing steps and piers. This department does not have jurisdiction over seawall management, rather it builds and maintains infrastructure upon the Marine Department's

approval. Mr. Wong was not able to answer many of the questions asked during this interview because they were not under his department's jurisdiction. Rather, he advised us to speak with the Marine Department, LCSD, and other departments. In particular, this showed that there is a disconnect between departments, and it is unclear of who approves the modification of waterfront infrastructure. CEDD is strictly concerned with the maintenance of the infrastructure and does not have control over the fence or seawall areas.

Interviewee: General Manager of Royal Hong Kong Yacht Club, Mark Bovaird

Attendees: Allison Holmes, Sarah Ma, Connor Ross, Andrew Rottier, Fiona Waters

Context: In person interview

Date: 14 Feb. 2017

Demand:

Members of the yacht club who have moorings at RHKYC do not typically want to tie up in the harbour; they prefer to take their boats to areas such as Sai Kung, Lei Yue Mun, Po Toi and Lamma Island. The distance between Hong Kong Island and Kowloon is too short for people to use personal watercraft to cross to the other side, find somewhere to tie up and disembark. Thus, it is extremely rare for people to sail across the harbour to go to restaurants or bars for the night. The demand for 'tie up' space would likely be higher if it was overnight, since people might come in from different areas to watch races and other big events. The interest for boaters to stay overnight in Hong Kong Harbour may well be there if suitable modifications are made to allow this to take place easily in certain locations.

Mr. Bovaird stated that the available space in the Causeway Bay typhoon shelters may possibly be increased by between 20% and 30% through the reorganization of moorings, and the use of new technology for 'fore and aft' mooring materials. There is high demand for marina mooring space; yacht club members would be much more likely to upgrade the size of their boat or buy more boats if there was ample space to moor. There is also demand at present from individuals who do not own boats, but who would like to, if there was anywhere to put the boat. Furthermore, Mr. Bovaird stated that there may well be demand for overnight public berthing in the harbour for these people who would be cruising in from Sai Kung Clearwater Bay, Discovery Bay or elsewhere. The cargo basin near the Club is very small for use as an additional public berthing area, but Kowloon Bay has much more space for possible berthing.

Changes to be made:

The Royal Hong Kong Yacht Club has been consulted on many of the government's proposals involving the harbour and the waterfront. RHKYC suggested that the developmental area in the Wan Chai former cargo handling basin should be used for public sporting facilities. This would benefit the general public as well as people coming in from surrounding areas if suitable landing and support facilities were provided. The RHKYC also proposed the addition of support facilities to the Causeway Bay typhoon shelter for refueling and trash disposal. Currently boaters moored in the typhoon shelter have to refuel in Aberdeen.

A possible solution to ease the lack of moorings in Victoria Harbour would be to establish a streamlined water taxi service. Water taxis would be able to transport boaters to and from landings after they moor or anchor. This would also reduce the need for waterfront infrastructure to be added to the seawall. A water taxi system is something that has been widely talked about for Victoria Harbour; there would definitely appear to be an interest in this service. This would also help make the waterfront more accessible for the general public.

Mr. Bovaird stated the need for barrier free access (to accommodate people with disabilities). This would allow an open interface between the land and the sea, making it more desirable for boaters to come to the seawall. It is difficult for boaters to find convenient spots to drop off passengers, and even harder to keep the boat alongside. He presented this idea based on other places around the world, particularly Australia. This shows that there is plenty of potential in Victoria Harbour and that best practices from other parts of the world should be pursued.

Feasibility:

The seawall is not built for boaters to tie up. Unless a boater is in a super yacht, the seawall will be too high for boaters to be able to tie up or disembark. The biggest problem is wave activity. The vertical seawall reflects the waves from the side of it. This is largely a problem in western Hong Kong because of the marine traffic in this area. The solution that the RHKYC suggested was the addition of floating fringing pontoons (pontoons attached to the edge of the seawall) in the cargo basin. These floating pontoons technically go against the Harbour Protection Ordinance, but a case could be made that these are necessary for the good of the people to use it for sporting activities. An additional proposal the RHKYC suggested was to create a year round sheltered area by reducing the power of the waves via the use of a floating wave attenuator. These are used around the world and work to help reduce the energy and impact of waves. With this also only being a semi-permanent structure, permission may be given to

allow it in the harbour to protect the ex-cargo handling basin in Wan Chai and make it a year round usable area.

The use of two bollards to tie a pontoon or boat up is not feasible because of wave activity. Pontoons need to be anchored to the seafloor and have bumpers or some sort of barrier between the boat and the wall. Especially with the growth of barnacles, boats are subject to damage under the conditions present along Victoria Harbour's vertical seawalls.

Removing and modifying existing rubble mounds is not feasible to suggest because they require a great deal of work and are high cost. Rather, any newly installed breakwaters could be designed with the outer portion as rubble mound with the inner portion designed to be more boat friendly to increase options for 'tie up' space.

The feasibility of the floating pontoons vary based on the way they are made and the amount of stress they are subjected to. The best designed and constructed floating pontoons can last upwards of 20 years in favorable conditions.

Royal Hong Kong Yacht Club in Shelter Cove utilizes swing moorings to increase mooring space. Nearby Hebe Haven Yacht Club are about to start testing a swing moorings accompanied with a pontoon, which can increase the tie up space by nearly 30% if employed throughout the mooring field. However, in order for the Marine Department to approve this arrangement, it would need to monitor the installation by video camera for one full year to see how the arrangement holds up during typhoon season.

Interviewee: Mei Ling Wong

Department: Planning Section of the Leisure and Cultural Services Department

Context: Interview questions sent over email

Date: 15 Feb. 2017

The Leisure and Cultural Services Department provides and maintains leisure and cultural facilities for the local community. This department works closely with the District Councils. The main priority of LCSD is to create areas that look out for the public's safety. Many of the waterfront promenades along Victoria Harbour are maintained by LCSD. LCSD maintains the fence, but has no jurisdiction over the seawall. For areas not designated for berthing, LCSD sees no reason for a fence to be removed or modified because the fence ensures public safety.

There are also many landing steps around Victoria Harbour that are chained off or closed to the public. LCSD addressed the closing of certain landing steps around the harbor with, “the closing of the landing step is for the sake of public safety.” Public safety and liability is a common theme when addressing infrastructure near the waterfront. There is little interest within the department to modify fences to allow an easier interface between the land and the water, which makes creating additional tie up space increasingly difficult.

Interviewee: Ms W. P. Chan, Director of Planning

Department: Planning Department

Context: Interview questions sent over email

Date: 16 Feb. 2017

PD is primarily responsible for forming, monitoring and reviewing land use and developmental plans. These development plans follow guidelines that determine certain land and site requirements, infrastructure guidelines, and provide social and economic facilities that meet the public’s needs.

PD gave us a brief overview of the Wan Chai development plan in regards to the inclusion of berthing infrastructure. Because of the way that the land is zoned, certain types of infrastructure is always permitted in the developments plans. The Planning Department does not decide on what infrastructure is needed, rather they implement it into the plans if it is approved for that zone. This site in particular will maintain existing ferry services, although they plan on relocating the ferry pier. This department is not directly responsible for any maintenance or management of the land along the harbor, but rather are in charge of provisions regarding existing and future development plans.

Interviewees: Frank Wong, Deputy Head at EKEO, Vivian Lai, Senior Placemaking Manager at EKEO

Department: Energizing Kowloon East Office

Context: In person interview

Date: 16 Feb. 2017

EKEO works closely with existing government organizations and departments in order to foster cooperation for development projects. They begin their planning process with a tentative, non-statutory Master Concept Plan to outline their general intentions for the area. They develop this using input from various stakeholders, public, government, and private. They move forward with this plan by compartmentalizing the master plan and first pursuing those projects which can be achieved with less than \$30 million HKD, also known as “Quick Wins,” because such projects do not need to go through the full vetting process for government funding. These projects are used to demonstrate to the public and other stakeholders that EKEO is capable of accomplishing what they set out to do in an effective manner; this makes it much more likely that they will garner public support for other, larger projects, making them much more feasible.

They facilitate compromises between private developers and the Lands Department, such as the waiving of land premiums for development of elevated walkways which would align with their theme of Enhancing Connectivity in Kowloon East.

One of the important attributes of EKEO is that they have the authority to call multi-department meetings, at which real discussion can occur. Less-empowered advocacy groups do not have the clout to achieve this, and consequently are not as able to get as much done.

Another issue that was addressed during the meeting was the need for co-usable space. Projects that allow for space to be repurposed to benefit the needs of more groups of people are more likely to gain backing from the government for funding. In order to develop spaces that adequately satisfy the demands of various groups of people, EKEO holds surveys to understand the demographic needs of the area. These surveys are typically conducted synchronously with current developments undergoing the build process to prepare for the next round of government funding.

Other notable findings:

- There are more considerations to be made than simply space and seawall infrastructure
- There is sufficient space underneath the Kai Tak bridge for small boats, watersports, and water recreation vessels to pass through.
- There is a problem with small vessels in the Typhoon Shelter with dumping their sewage into the water.
- Mr. Wong and Ms. Lai liked the idea of creating a Harbourfront Authority, however, mentioned that people are sensitive to the word authority.

APPENDIX F: AREA FINDINGS

Each neighborhood was subdivided based upon the type of waterfront activity and locations of landmarks such as parks, promenades, and cargo working areas. The development of additional public waterfronts and promenades could increase the number of visitors to each of the areas, making them more desirable to visiting boaters in search of tie-up space. A discussion of observations and relevant waterfront projects for each area can be found in the following section.

F.1 Kennedy Town and Shek Tong Tsui

The primary zoning for the waterfront in this area is Open Space or Other Specified Uses (Figure 19). We divided Kennedy Town into four sections from west to east. All of these areas are close to bus stops, but access to the MTR system would require walking more than 500 meters.

The first section of Kennedy Town is located along the Kennedy Town Temporary Recreation Ground, a designated park and promenade operated by the Leisure and Cultural Services Department. The inland area is zoned primarily for commercial purposes. A fence separates the vertical seawall from the land. There are no bollards along this promenade, but there is one publicly accessible landing step at its western end.

The next section of Kennedy Town is the China Merchants Wharf Pier and the former MTR Temporary Works Area. This area does not currently have direct pedestrian access to the water. A security fence along the concrete block seawall separates the road from the pier area. The water is also exposed to passing marine traffic. The area is zoned primarily as Open Space and Other Specified Use.

In the New Praya Kennedy Town Road area, several hotels and restaurants face the harbor; however, the road separates these establishments from the water. There are no bollards or landing steps in this area, but there is a small pier in this area. Neither this small pier nor China Merchants Wharf Pier are publicly accessible. The Home Affairs Department maintains a 100-meter section of promenade adjacent to the Kennedy Town Bus Terminus. This path ends at the

publicly accessible Western Public Cargo Working Area Landing No. 1. No other mooring-related infrastructure is present.

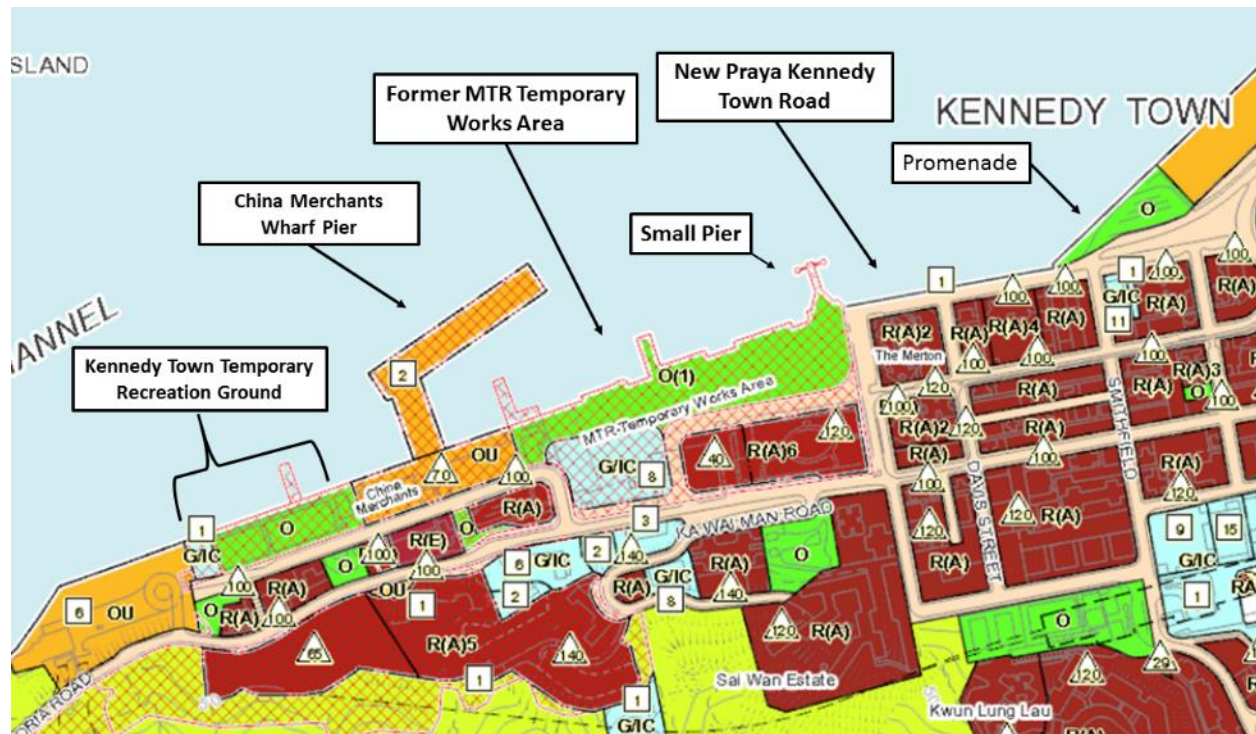


Figure F-1: Kennedy Town Zoning Map (Town Planning Board [TPB], 2017)

The last portion of Kennedy Town is a former section of the Western District Public Cargo Working Area (WPCWA). This section has been set aside for use by barges as they hauled away construction debris. Since this project, the area was declared as unleased government land. The area is fenced off from the public. It has been proposed that this area should be opened up for public use. As it was formerly a cargo working area, there are bollards present along the seawall as well as at least one landing step (WPCWA Landing No.1).

Several development projects are in progress in Kennedy town to make the area more vibrant. Figure 20 shows the waterfront development plans for Kennedy Town as proposed by the Planning Department. Area A is government land that will be converted to a waterfront promenade with park and pier areas. The piers will be reserved for small boats and structures in the area will provide new food and beverage options. The park portion will be reserved as green space for leisure and family activities, as well as weekend markets and small events. Privately owned land in area B will be set aside for a warehouse portion and pier portion. The warehouse has the possibility of being converted to a boat club, and its developer is required to connect promenades in Areas A and C. The large pier in Area B will be set aside for large vessels, such as yachts and cruise ships. Finally, Area C is government-owned land operated by the LCSD and

will be reserved for sports and recreation. Areas A, B, and C will be rezoned as Open Space (Task Force on Harbourfront Developments on Hong Kong Island, 2015).

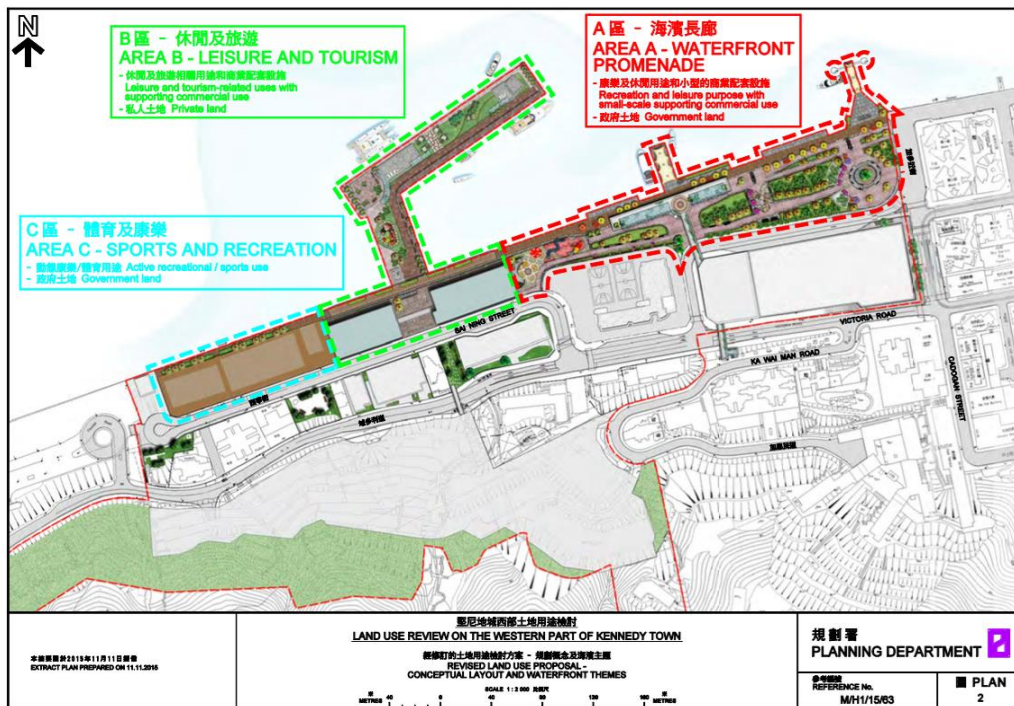


Figure F-2: Waterfront Development Plans for Kennedy Town (Task Force on Harbourfront Developments on Hong Kong Island, 2015)

F.2 Shek Tong Tsui:

Shek Tong Tsui is comprised of two different parts: the Instagram Pier and the Western District Public Cargo Working Area, owned by the Marine Department, and the Western Wholesale Food Market, under private ownership. No observations were made at the Western Wholesale Food Market due to our lack of authorization to enter the area. The Cargo Working Area has numerous equally-spaced bollards and no fence along the seawall; there are ladders present, but not landing steps. This area is currently zoned as Other Specified Uses (Figure F-3). The seawall in the cargo working area is vertical, but personal boats cannot moor there because it is an active commercial shipping facility. The seawall in its current state is also too high to accommodate all but the largest yachts. In order to use the bollards and/or the piers, one would first need to obtain permission from the Marine Department. There is no MTR in the immediate vicinity, however there are multiple bus routes that make the area accessible.

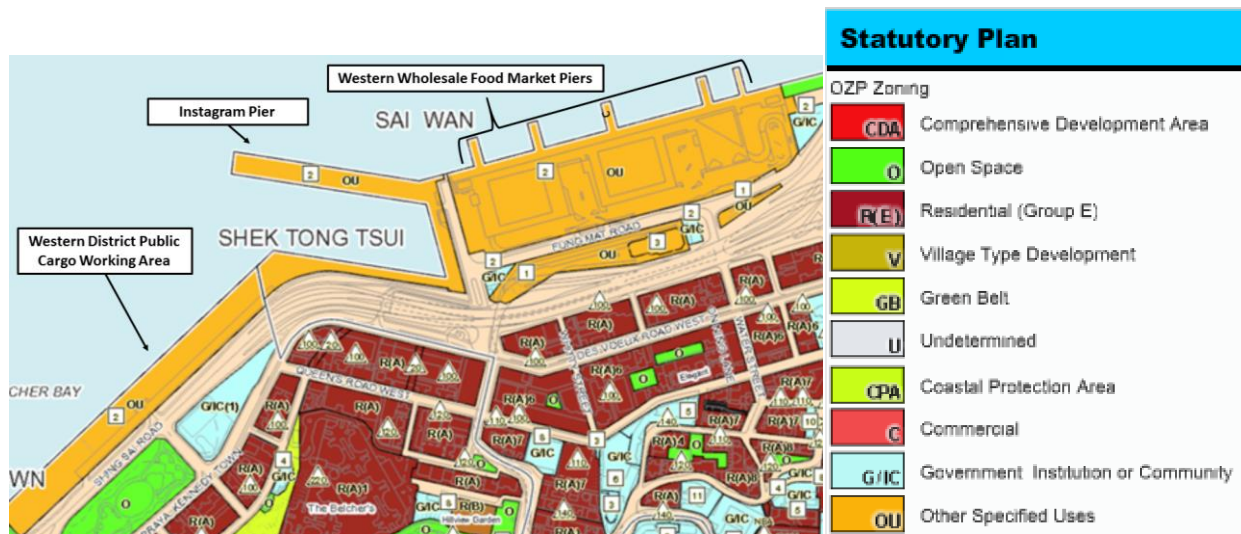


Figure F-3: Shek Tong Tsui Zoning Map (Town Planning Board [TPB], 2017)

The Conceptual Master Plan (CMP) for the Western Harbourfront involves the revitalization of portions of Kennedy Town and Shek Tong Tsui. The CMP can be broken into three sections (Figure F-4): the Piers, the Inner Harbor, and the New Praya.



圖7.4：規劃範圍節日空間佈局圖

Figure F-4: Future Allocation of Space from Development Projects for Kennedy Town (Task Force on Harbourfront Developments on Hong Kong Island, 2014)

The area behind the Western Wholesale Food Market (WWFM) will become public space for leisure activities. The four piers behind WWFM, currently only accessible to market operators, are idle for most of the day. In 2013, the Central and Western District Council (C&W DC) decided that it would move forward with the Harbourfront Enhancement and Revitalisation (“HEAR”) project as the area’s Signature Project Scheme (SPS). The C&W DC believed that increasing the vibrancy, accessibility, and connectivity of the waterfront would benefit the community as a whole. The area and piers behind the WWFM will be accessible to the public. Figure F-5 shows how the piers will be improved and how leisure zones, such as a Tai-chi court, a jogging trail, and children’s playground, will be implemented. Private leisure craft and water taxis will be able to use the piers to disembark passengers. With these improvements, the C&W DC identified two complementary outcomes that should follow a “community involvement programme” and increased public attention to the waterfront. The C&W DC will sponsor non-profit organizations that will run activities in the new Open Space and aim to increase public engagement. Furthermore, this revitalization project will promote the wellbeing and vibrancy of Victoria Harbour (Central and Western District Office, & Home Affairs Department, 2013).



Figure F-5: Plans for Seawall Developments Next to the Wholesale Food Market (Task Force on Harbourfront Developments on Hong Kong Island, 2014)

The inner harbor area will be used for cultural purposes. Figure F-6 shows how the CMP plans to create an amphitheater on land as a place to watch performances on a floating stage.

This area will follow the vision for Victoria Harbour as being a vibrant and accessible area for the public's enjoyment.

The current Praya in Kennedy Town is a stretch of roadway with no pedestrian or water access. The CMP plans to redevelop it into a publicly accessible open space and promenade, filled with sports facilities and places for people to jog and ride bicycles, as well as an Infiltration Garden and an Urban Beach Plaza. Along with the piers and inner harbor area, this redeveloped space will provide a continuous pedestrian linkage with Sun Yat Sen Memorial Park, effectively recreating the Central and Western Promenade which existed in the late 19th century.



Figure F-6: CMP Amphitheater Project Plan (Task Force on Harbourfront Developments on Hong Kong Island, 2014)

F.3 Sai Ying Pun

Sai Ying Pun is a neighborhood in Central and Western Hong Kong. The waterfront is currently zoned as Open Space and the land behind the area is residential (Figure F-7). The waterfront was divided into two sections. Both of these locations are not directly accessible by MTR, but do have bus routes nearby.

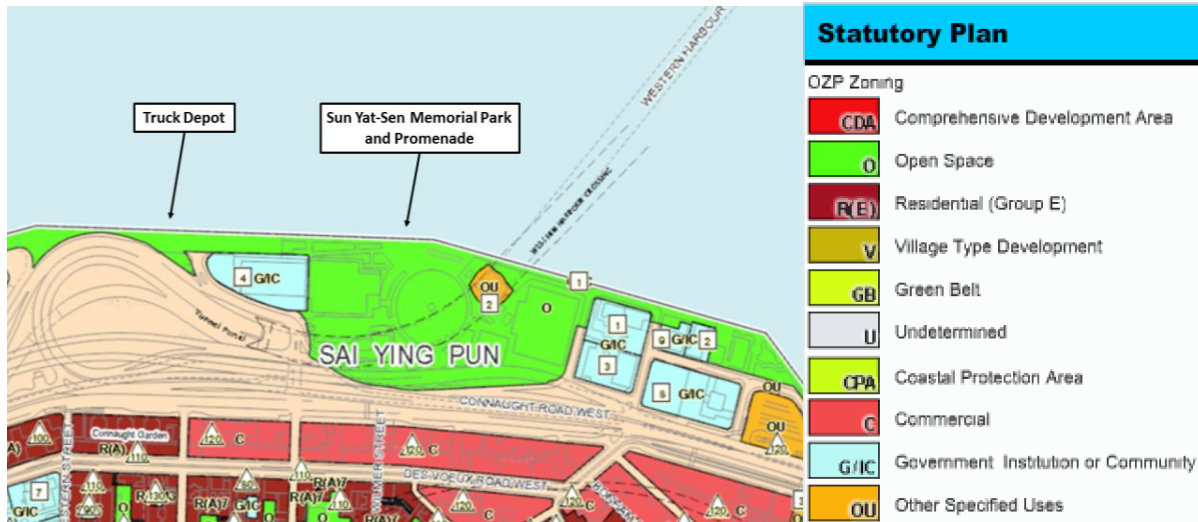


Figure F-7: Sai Ying Pun Zoning Map (Town Planning Board [TPB], 2017)

The first designated area is Sun Yat-Sen Memorial Park, which is a park and promenade maintained by the Leisure and Cultural Services Department. The promenade is separated from the vertical seawall by a barrier; there are breaks in the concrete portion of the barrier around each bollard, however they are still barred from public access by a waist-height railing. There are three bollards near the entrance of the park, but none along the remainder of the seawall. The bollards that are present are inaccessible due to the fence. There is one public landing step within the park. Boat traffic from the adjacent high-speed ferry routes causes increased wave activity which would make berthing difficult; thus, this is an unsuitable location for future tie up space.

We discovered that the area past the western end of the promenade is currently under lease as a truck depot, although it is unclear who is in charge of maintaining this site. There is a tall chain-link fence surrounding the land that is set back approximately two feet from the vertical seawall, preventing public access to two bollards. There are holes in the fence where it was clear that someone had gained access to the water side, perhaps with the intention of accessing vessels which were using the bollards. There are no landing steps here. There is accessibility to bus routes in the area.

F.4 Sheung Wan

The Sheung Wan section of the Central and Western District Promenade, maintained by the Home Affairs Department, has a fence that is set back approximately one foot from the water. There is one publicly accessible landing step and two obstructed bollards along this stretch of seawall. We did not make any more observations in this area because it is within a

high-traffic area frequented by large ferries, in which ferry routes can be seen in the top left corner of Figure F-8. This area is primarily zoned as Open Space and Other Specified Uses.



Figure F-8: Sheung Wan Zoning Map (Town Planning Board [TPB], 2017)

F.5 Central

Central is one of the busiest parts of Hong Kong, forming the business and political heart of the city. This sub-district can be divided into five different sections due to the variety of coastline uses. We divided Central into Pier 1 and the surrounding area, Piers 2-8, Piers 9 and 10, a government-owned pier, and the Central and Western District Promenade.

Pier 1 is operated by the government and has a high barbed wire fence to prevent public access. The surrounding area is maintained by the Home Affairs Department. There is one landing step along this stretch of seawall, which is maintained by CEDD. There are no public bollards in this location, and the high volume of marine traffic generates significant wave activity. This section of seawall is easily accessible via MTR, bus, and ferry. Figure F-9 shows that this area is zoned for government use. The seawall at this location is vertical.



Figure F-9: Central Zoning Map (Town Planning Board [TPB], 2017)

Pier 2 through Pier 8 are owned and operated by private companies and government organizations. There is no public berthing access because this is a Commercial zone, and the surrounding land is zoned as a CDA and Other Specified Use. These piers are working boat areas and are inaccessible to the public.

Piers 9 and 10 are public piers maintained by CEDD. The land surrounding this area is also zoned as Other Specified Use. These piers each have six landing steps along the side with twelve total bollards. However, these piers are not for tying up long term; they are solely for disembarking passengers and some cargo. This area also features a promenade adjacent to temporary event space; it does not fall within 500 meters of a bus or MTR, but it is very close to several ferries, particularly the Star Ferry.

The government pier is surrounded by a fence and is currently completely closed off to the public. There is also a railing separating the bollards from the promenade. There are also landing steps and fenders in this area.

The Central and Western Promenade is zoned as Open Space. The buildings in this area are primarily commercial, and we did not observe any bars, restaurants, or other attractions that would bring people to the area.

The Central Urban Design Study discusses various plans to make the Central waterfront more vibrant for its users. The study separates the waterfront and hinterland into eight different sites with two possible concepts for each site. The map can be found in Figure F-10. In particular, we believe that sites 1, 6, 7, and 8 will be most relevant to this project.

In 2009, the Public Policy Research Institute of the Hong Kong Polytechnic University surveyed “members of the relevant professional groups, academic institutions, government departments and the general public to facilitate more in-depth discussions on the refined urban design concepts” (Planning Department, 2011, p. 14). The study found that people supported the implementation of an office and hotel concept at sites 1 and 2. The chosen concept also proposes that additional space for retail shops and restaurants should be added to Central Piers 4 to 6. Furthermore, at site 3, people prefer the idea that there should be a larger landscaped deck for visitors to enjoy the view of Victoria Harbour. The landing steps at site 6 should be opened to the public. The proposal includes a continuous promenade that spans two kilometers of the waterfront. A cycle track will be integrated into this layout, along with a large area of open space. The open space may include small eateries, water features, and spots to enjoy the view. Elevated and underground walkways will connect the waterfront promenade with the hinterland and will provide easy access to land transportation (Planning Department, 2011).

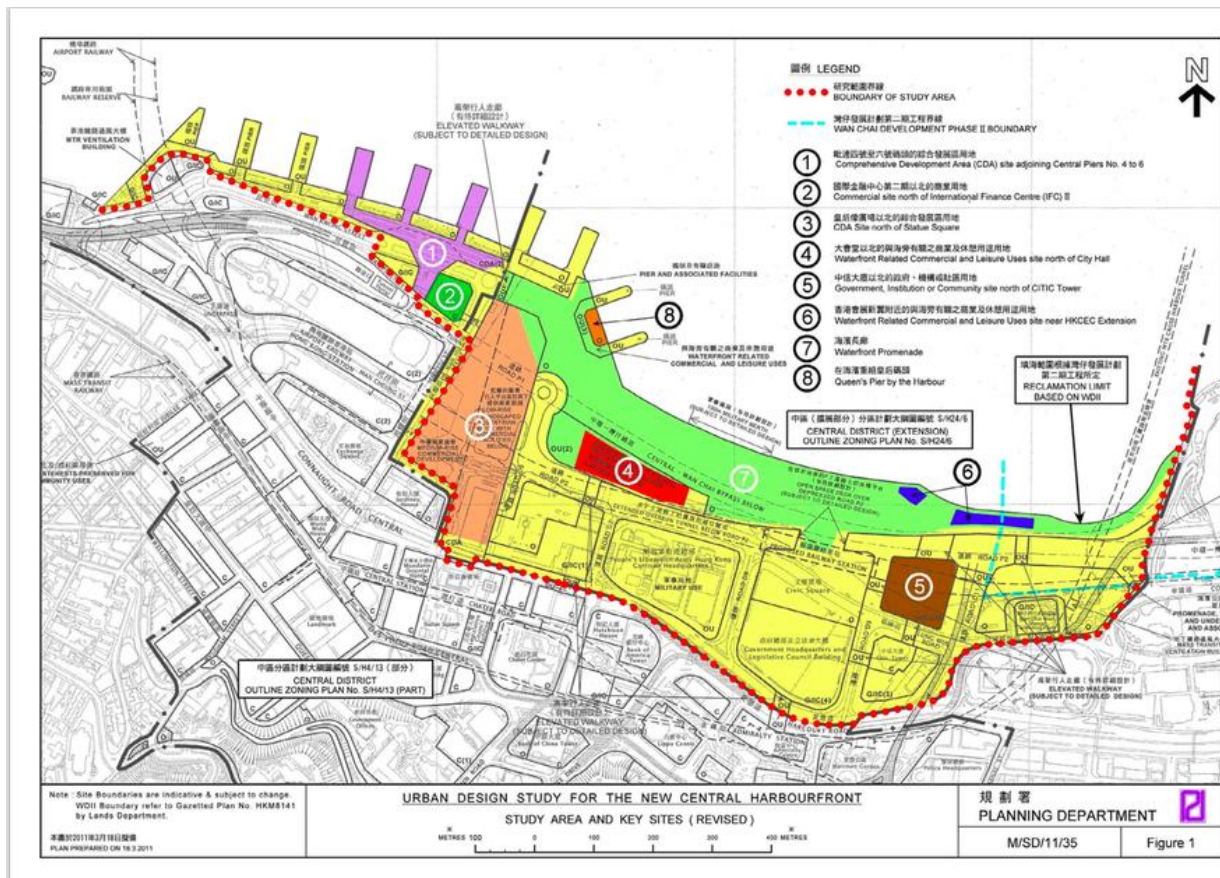


Figure F-10: Development Sites for the Central Urban Design Study (Planning Department, 2017)

Site 8 includes the reassembly of Queen’s Pier, which will be completed in the next few years. Due to Central’s reclamation efforts in 2007, the historic Queen’s Pier was removed and salvageable parts were stored on Lantau Island. Queen’s Pier will be reassembled between piers 9 and 10 near Hong Kong’s observation wheel and temporary event site. Figure F-11 shows how the new pier will discontinue the use of two landing steps on piers 9 and 10, but will provide open space for leisure activities and additional public landing space. Furthermore, the tuck shop at the old location of Queen’s Pier will serve food and beverage (Task Force on Harbourfront Developments on Hong Kong Island, 2016a).

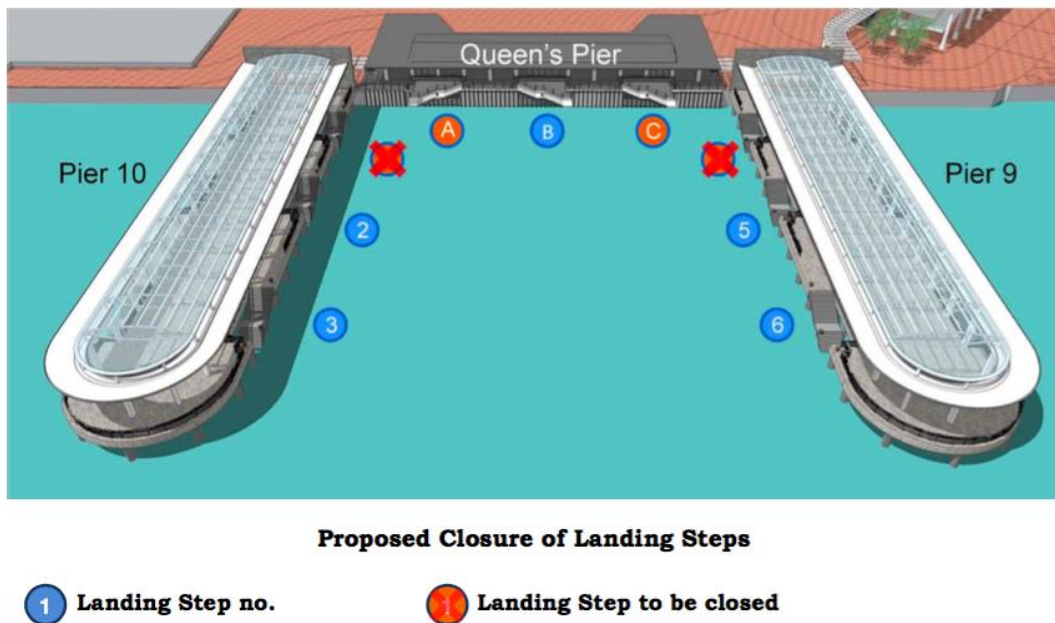


Figure F-11: Queen’s Pier on Reconstruction (Task Force on Harbourfront Developments on Hong Kong Island, 2016a)

F.6 Wan Chai

Currently, the majority of the waterfront in Wan Chai is completely inaccessible due to ongoing construction related to the Central-Wan Chai Bypass project, which affects areas both east and west of the convention center. The only currently accessible sections are well established and unlikely to change. These sections are Golden Bauhinia Square in front of the

Convention Center, and the area around the new Wan Chai Ferry Pier. The Wan Chai temporary promenade terminates at the western edge of the Square; there are sitting-out areas along the water and fine dining in the Convention Center. The new Wan Chai Ferry Pier has a viewing deck on top; however, the only land-water interfaces in the area are in constant use by the ferry. Other than the section used by ferries and government vessels, neither area has any general-purpose mooring or berthing infrastructure. The waterfront between these areas and to the east of the ferry pier is blocked due to construction. There is very poor connectivity to other areas of the waterfront, but the Star Ferry and the bus terminus near the Convention Center serve as access from the other areas. The Wan Chai MTR station is over 500 meters away.

Wan Chai North Urban Design Study discusses proposals and ideas to increase the vibrancy and accessibility of the waterfront for public enjoyment. The study aims to add diversity to the area by implementing various activities and allowing for the public to enjoy the space. In doing so, Wan Chai North is split into five different precincts, with the pierside, water sports and recreation, and typhoon shelter precincts being most relevant to this project. The pierside precinct will involve open space for festive events and performances. The water sports and recreation precinct will utilize the space from the old Wan Chai Public Cargo Working Area. The Urban Design Study proposes to develop the Wan Chai Basin to make it more usable for both large and small-scale events. Some proposed the implementation of a barge pool, while others would use the space for dragon boat races, sailing and rowing, and the final plans are still under discussion. Finally, the Typhoon Shelter precinct will be revitalized to bring back the area's historical culture and significance. The proposal may re-introduce water taxis and floating restaurants to the waterfront, as well as sampans to connect people to the breakwater. The two other precincts will include open space for markets, celebrations and eateries to engage the public (Task Force on Harbourfront Developments on Hong Kong Island, 2016b). Figure 21 shows that the Wan Chai waterfront is zoned as Open Space and much of its inland is zoned as Other Specified Uses.

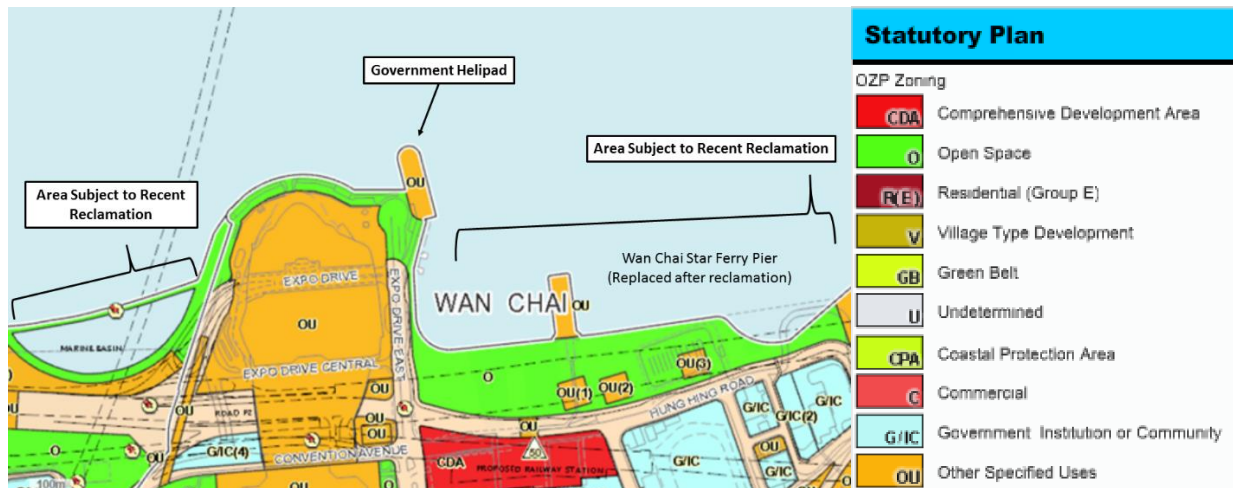


Figure F-12: Wan Chai Zoning Map Figure (Town Planning Board [TPB], 2017)

F.7 Causeway Bay

Causeway Bay is currently undergoing construction and developments, rendering it mostly inaccessible to foot traffic. The construction and Island Eastern Corridor Highway obstruct the walkable parts of the waterfront, and so we were only able to access the Causeway Bay Typhoon shelter.

The Causeway Bay Typhoon shelter is formed by a rubble mound breakwater, which currently provides no additional berthing space for the area (Figure F-13). Walla wallas use the single set of landing steps to transport people to their vessels in the typhoon shelter. The seawall along the inner edge is sloped, but it is made of stone blocks instead of rubble. There are 6 water-facing landing steps leading into the typhoon shelter along this wall, and although there are no existing bollards, there are several mooring eyes (staple-shaped metal bars affixed to the wall to attach ropes) along the wall; all of the mooring features along the back edge of the seawall were obviously rusted and not maintained. The seawall adjacent to both the yacht club and to the ongoing construction is vertical. At the eastern edge of the shelter, there were several harbor pilot boats, which were attached to the seawall via small bollards. These bollards looked well-maintained, but they are currently in use.

The Task Force on Harbourfront Developments on Hong Kong Island has proposed that the typhoon shelter be revitalized and that “marine mooring efficiency should be taken into consideration in the revitalisation of the Causeway Bay Typhoon Shelter” (The Urban Design Study for the Wan Chai North and North Point Harbourfront Areas, 2016).

Continuing east along the seafront, there are plans to drastically modify the waterfront areas beneath the Island Eastern Corridor. Figure F-14 shows the Planning Department's proposal for this area, including the creation of food courts, hotels, designated water bus areas, floating vessels to hold entertainment, and a temporary temple. The water buses and bus routes will increase the area's accessibility. The nearest MTR is the Tin Hau Station, which is located inland of Victoria Park, and is further than 500 meters from the waterfront. Upon completion, a continuous promenade in Causeway Bay will connect Wan Chai and North Point.



Figure F-13: Causeway Bay Typhoon Shelter Round Mound Breakwater

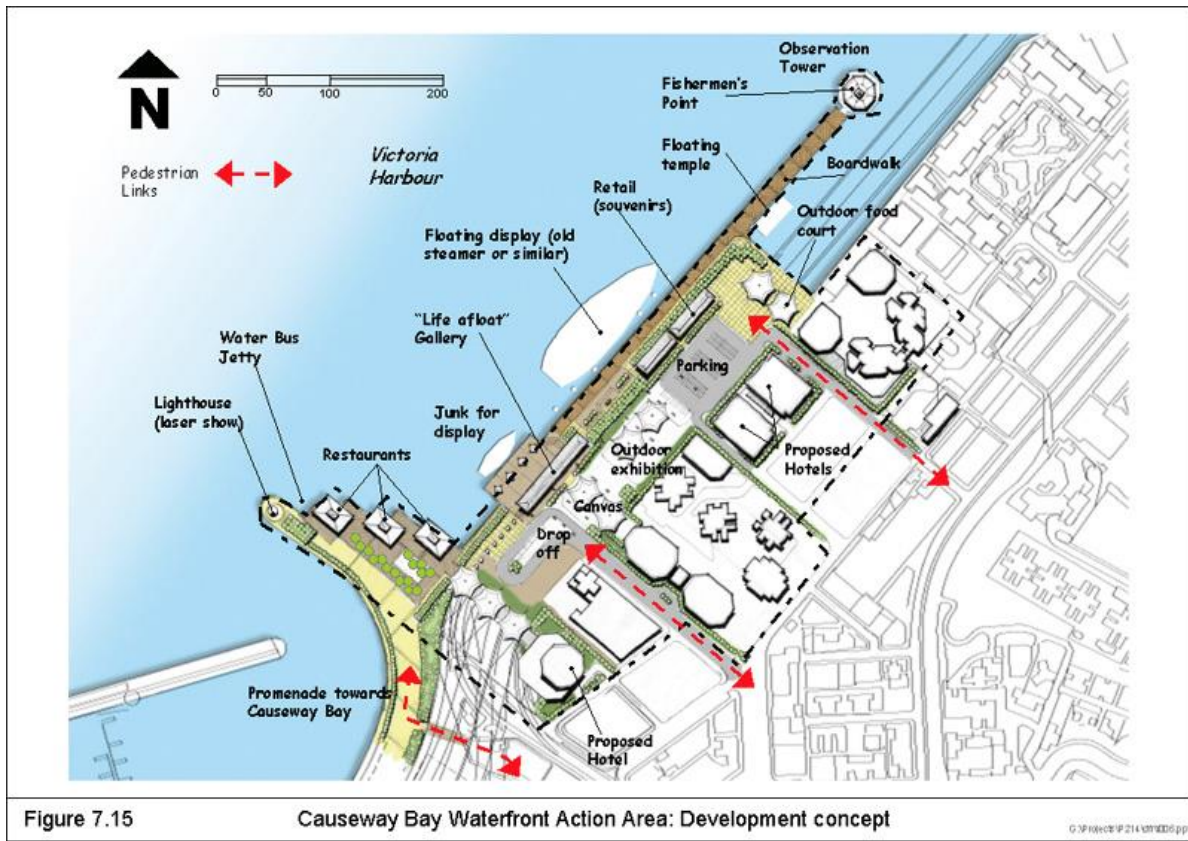


Figure F-14: Causeway Bay Waterfront Development Plans (7 Action Area Plans, n.d.)

Almost the entire seawall in Causeway Bay is zoned as Open Space, except for one small section that is designated for government use inside of the typhoon shelter. Victoria Park is designated Open Space, while the area behind the new Causeway Bay development plans is zoned as Commercial and Residential (Figure F-15).

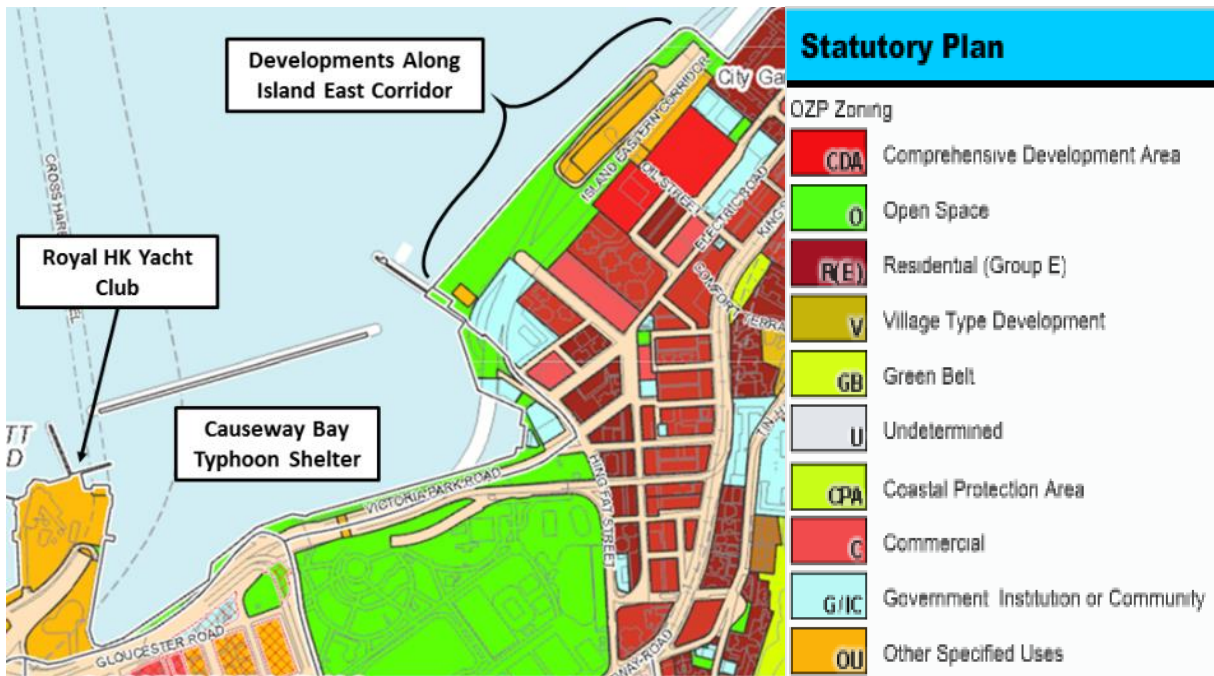


Figure F-28: Causeway Bay Zoning Map (Town Planning Board [TPB], 2017)

F.8 North Point

The waterfront in North Point runs under the Island Eastern Corridor Highway and is thus largely inaccessible. There is MTR and bus access to the immediate area. Small, sporadic sections of promenade alongside the residential areas line the waterfront; however, there are no bollards present. Every area that was not a ferry pier or a construction site had a fence along the water. The Tong Shui Road Pier, one block from the North Point Ferry Pier, has two sets of landing steps with five accompanying bollards adjacent to the steps.

The addition of a two-kilometer boardwalk to connect Oil Street and Hoi Yu Street will improve access to this area (Figure 22). Since its proposal in 2012, the plan has undergone a community engagement study. The community views the boardwalk as a way to increase patronage at restaurants in the area and to create a more vibrant harborfront. CEDD is currently conducting a study to determine the feasibility of the creation of a boardwalk. This project is only in its second stage of development, but studies to assess the social, economical, and environmental need for a continuous boardwalk have been completed (CEDD, 2017). Figure 23 shows North Point's zoning.

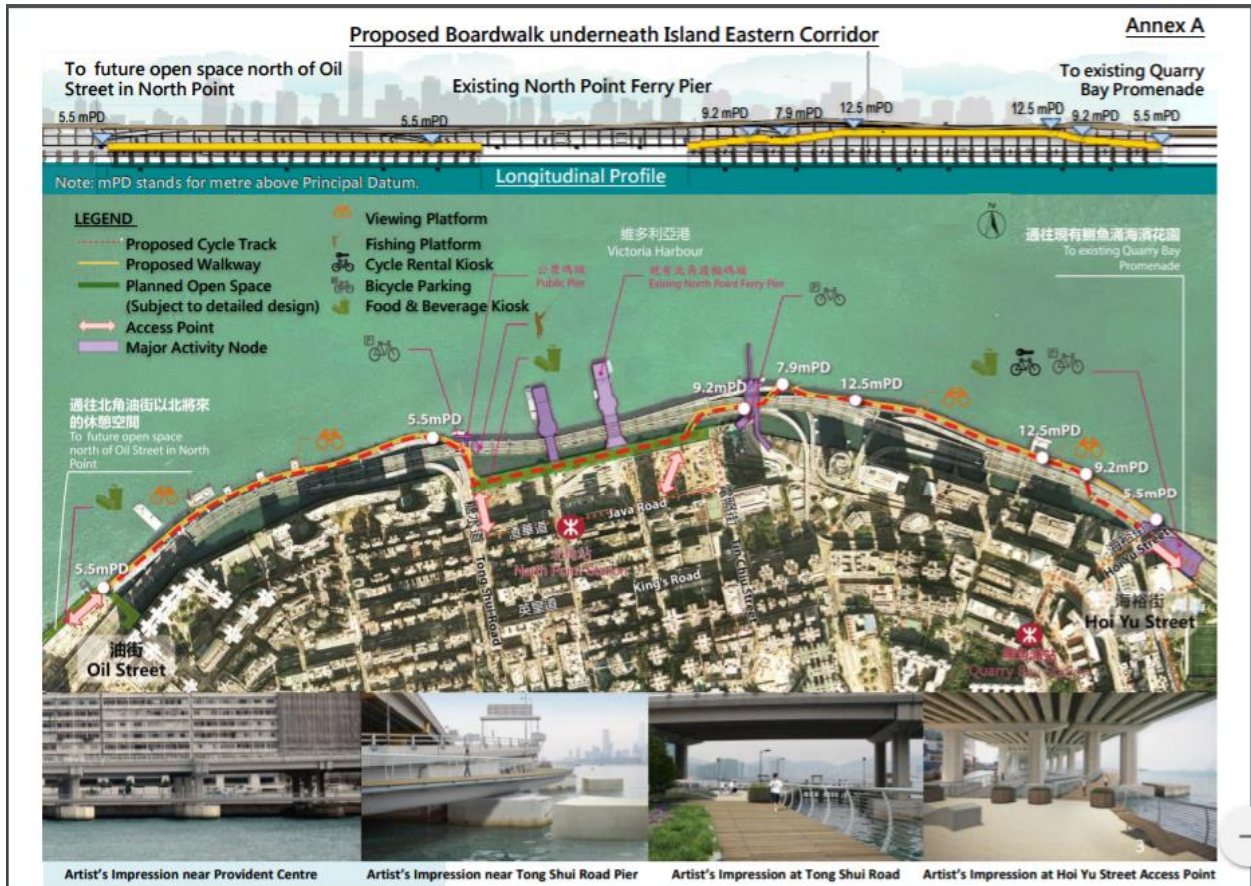


Figure F- 29: CEDD North Point Boardwalk Proposal (CEDD, 2017)

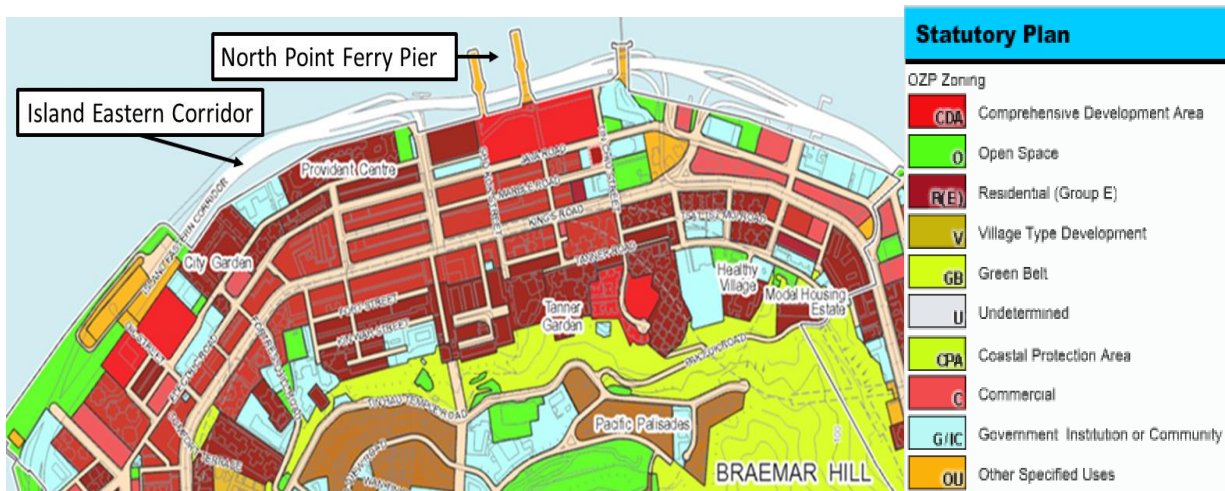


Figure F-30: North Point Zoning Map (Town Planning Board [TPB], 2017)

F.9 Quarry Bay

The waterfront in Quarry Bay is primarily occupied by Quarry Bay Park. This park is split into two parts, separated by the Island East Corridor. The waterfront side of the park includes a long stretch of promenade that is connected with Shau Kei Wan. The promenade will be connected to the boardwalk being developed along the North Point seawall, forming a continuous route for exercise and walking. Figure F-18 shows that the majority of this park is zoned as Open Space, while some sections are zoned for Other Specified Uses. Additionally, the waterfront side has a food stand, the Sir Alexander Grantham Fire Boat Exhibit, and open event space. The other side of the park, located across the highway, contains walking paths and recreational sporting facilities. The waterfront is only accessible through highway overpasses at either ends of the promenade.

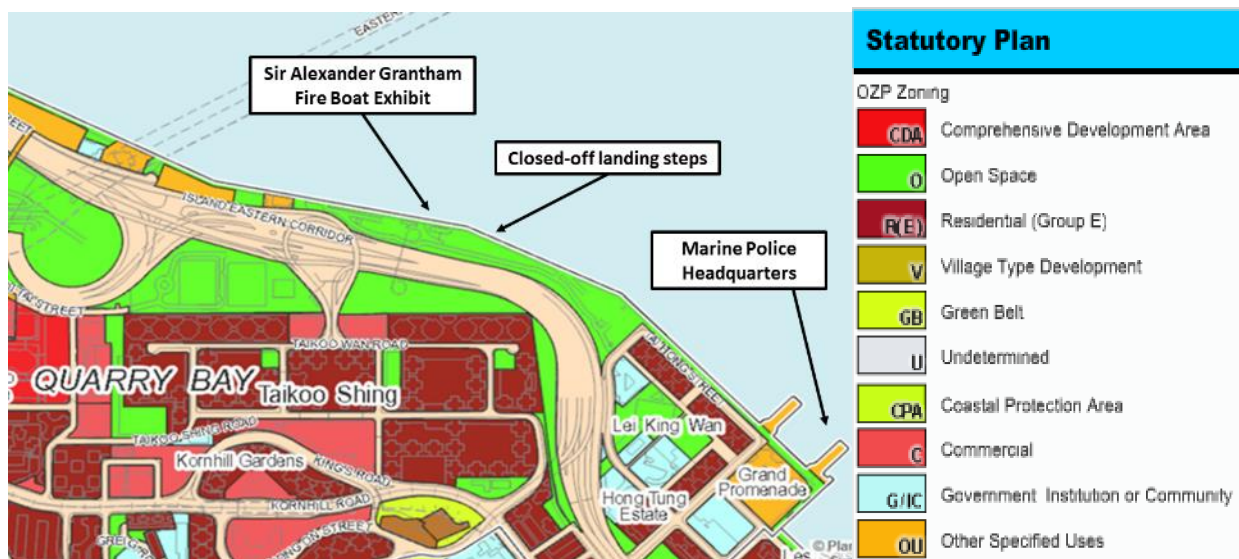


Figure F-18: Quarry Bay Zoning Map (Town Planning Board [TPB], 2017)

The vertical seawall has some infrastructure that faces the water along the promenade. There are no bollards, and the one landing step is blocked from public access, but one of the landing steps is barred from public use (Figure F-21). We later discovered that this set of landing steps is not in CEDD's list of public piers, despite the fact that it is well-maintained and recorded in HBF's database in the past. The park area is maintained by the LCSD. After speaking with Pierre Wong from the CEDD, we found that the landing step has been closed because [insert reason after interview response].

Unfortunately, there is a lack of connectivity to the area. The nearest MTR stations are Quarry Bay Station and Tai Koo Station, both of which are located across the highway and more

than 500 meters away. Public buses and tramways are located on the same street as the MTR entrances, therefore access to the waterfront is limited.

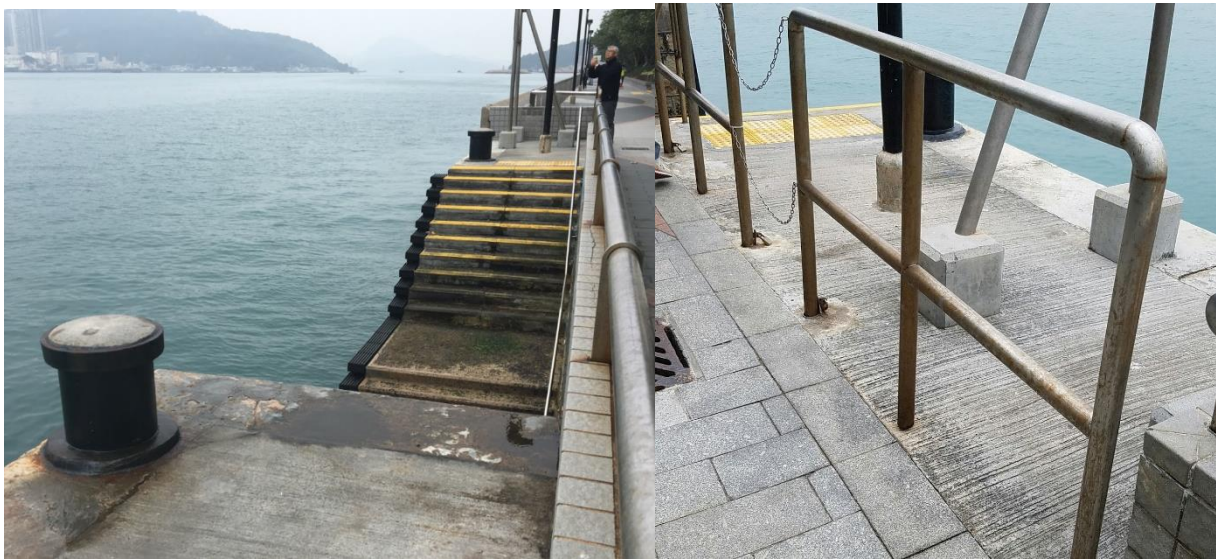


Figure F-19: Obstructed landing step in Quarry Bay

F.10 Shau Kei Wan

The Aldrich Bay area of Shau Kei Wan contains two sections: the continuation of the Quarry Bay Park Promenade and the Shau Kei Wan Typhoon Shelter. The promenade links to the Sai Wan Ho Ferry Pier, while the area behind the waterfront promenade contains western style restaurants, a park with both recreational and cultural amenities, and commercial shopping centers. The other section of Aldrich Bay contains the typhoon shelter, which continues the promenade after a short inland detour. The Aldrich Bay Park, hotels, and the Hong Kong Museum of Coastal Defense are nearby. The entire waterfront promenade and the park are zoned as Open Space, while the end of the walkable section of the promenade is zoned for Other Specified Uses (Figure F-20). The areas behind are mostly residential and commercial. Furthermore, there is a CEDD-owned landing step, with accompanying bollards. The rest of the vertical seawall contains a barrier at the water's edge, which is shown in Figure F-21.

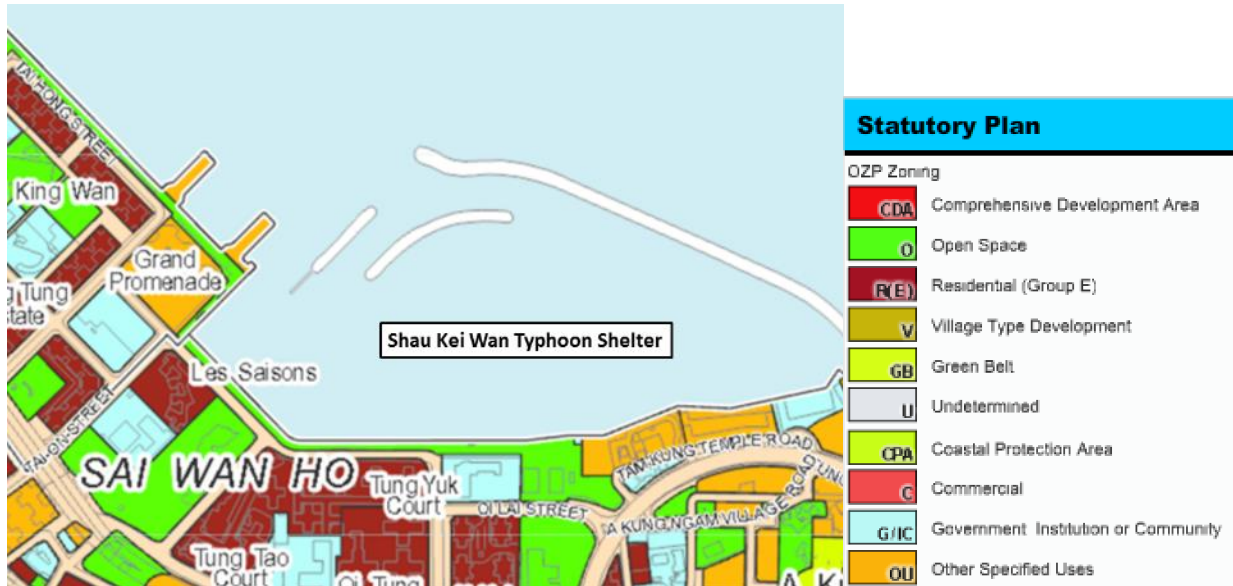


Figure F-20: Aldrich Bay Zoning Map (Town Planning Board [TPB], 2017)



Figure F-21: Aldrich Bay Promenade Waterfront

The Shau Kei Wan Typhoon Shelter contains seven landing steps. Walla wallas primarily use these landing steps to transport boat owners to and from their vessels moored inside the shelter. Figure F-22 shows that there is well-maintained vertical seawall, as this area is frequented by boat owners. There are no bollards along the seawall in this area. The waterfront

here is maintained by the Leisure and Cultural Service Department. Furthermore, there is an MTR station located approximately 500 meters from the inland promenade detour and bus stops located in even closer proximity.



Figure F-22: Shau Kei Wan Typhoon Shelter Waterfront

F.11 Tsing Yi

Starting at the western side of Kowloon, the waterfront in Tsing Yi that falls within Victoria Harbour is maintained by the LCSD. Figure F-23 shows that most of the waterfront is zoned as Open Space, while the inland area is primarily residentially zoned. We broke Tsing Yi into two different sections: the Tsing Yi Promenade and the Tsing Yi Northeast Park, which are connected by a continuous promenade. The seawall is primarily concrete, but it also contains some rubble mound sections. Both sections contain a fence denying access to the seawall. Each section is also easily accessible by public transportation, with an MTR stop and bus stops within 500 meters. Other than the park and the Maritime Square mall containing restaurants and shopping, there are few other attractions in the area.

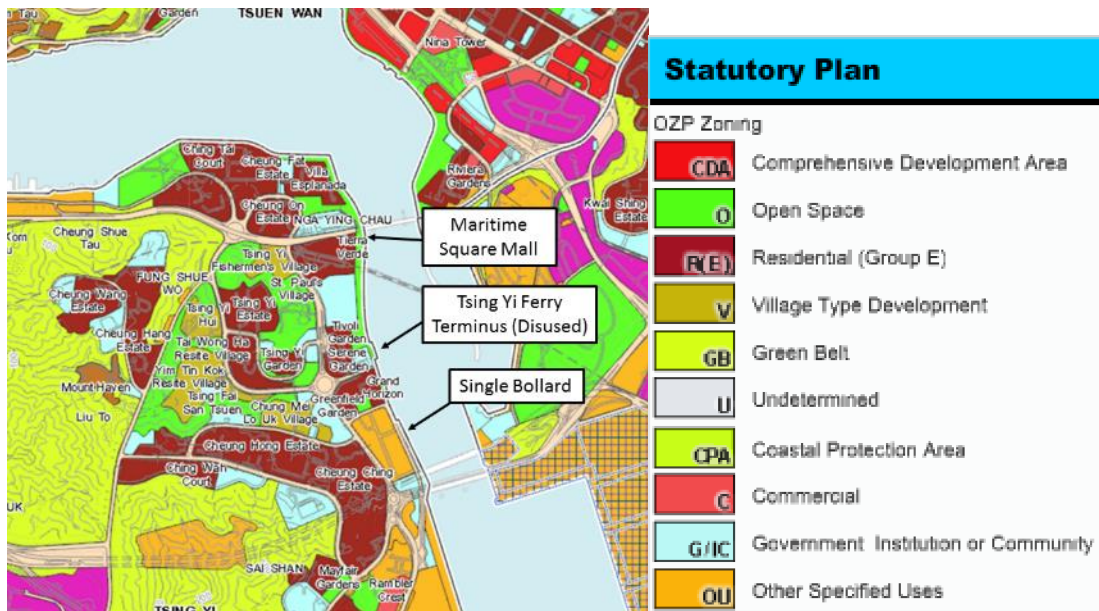


Figure F-23: Tsing Yi Land Zoning (Town Planning Board [TPB], 2017)

Along the Tsing Yi Promenade, there is no access to the one fenced off bollard which is not associated with a landing step. The nearby Tsing Yi Ferry Pier is no longer in use, although it features several bollards and one large set of landing steps which are not blocked from public access. There are also five other landing steps around this promenade, but all of them are poorly maintained and have a large amount of algae and other debris on them.

F.12 Tsuen Wan

The Leisure and Cultural Services Department maintains the continuous waterfront promenade in Tsuen Wan. A large portion of this promenade is adjacent to the Tsuen Wan Riviera Park, where a section of seawall is locked up. The entire waterfront in this area is zoned as Open Space (Figure 24). A fence separates the vertical seawall from the wide waterfront promenade. The twelve bollards along the seawall are not readily accessible. There are also four sets of landing steps. This area has access to an MTR station and bus station.

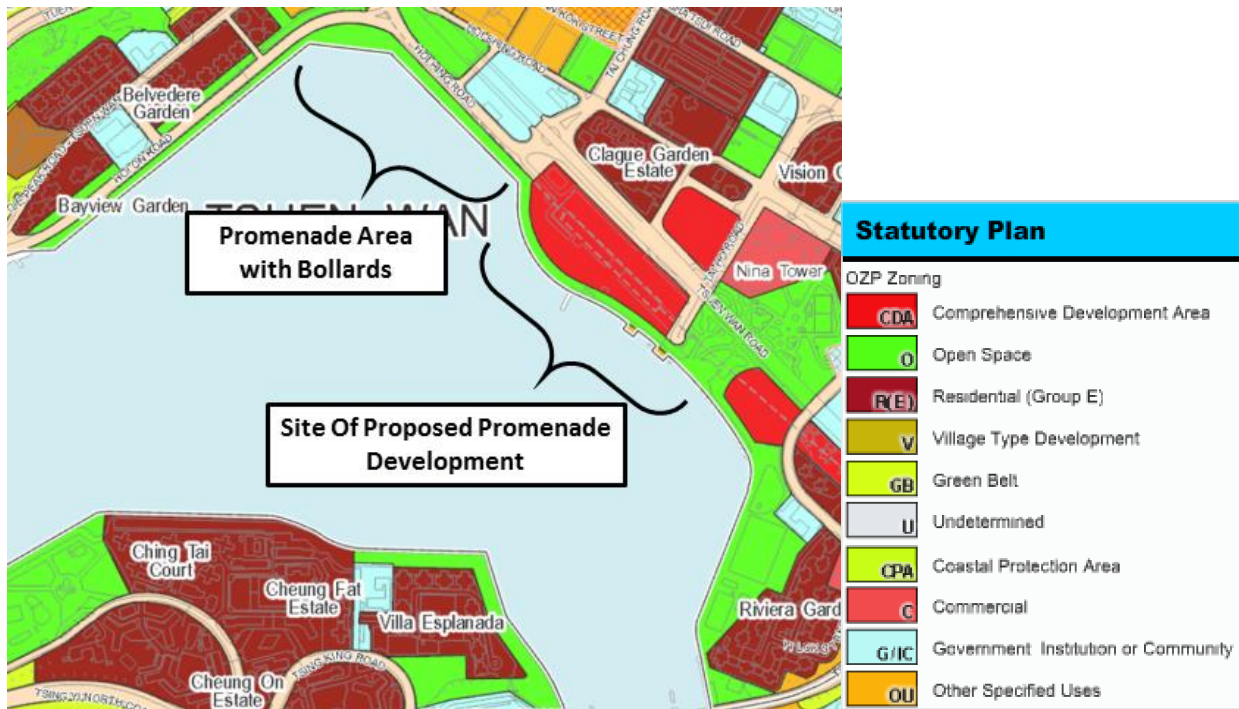


Figure F-24: Tsuen Wan Zoning Map (Town Planning Board [TPB], 2017)

Tsuen Wan is undergoing redevelopments to create a vibrant promenade that will allow residents and visitors to enjoy the waterfront. The Tsuen Wan West Bayside is located near the Tsuen Wan West MTR Station, which will allow for easy pedestrian access to the waterfront promenade. The promenade plans include a walking trail, playground, tennis courts, amphitheater, as well as a wide walkway for daily commuters and space for a cycle track (Figure 25). After the promenade's completion, the LCSO will manage and maintain the area and its amenities (Task Force on Harbourfront Developments in Kowloon, Tsuen Wan and Kwai Tsing, 2015).

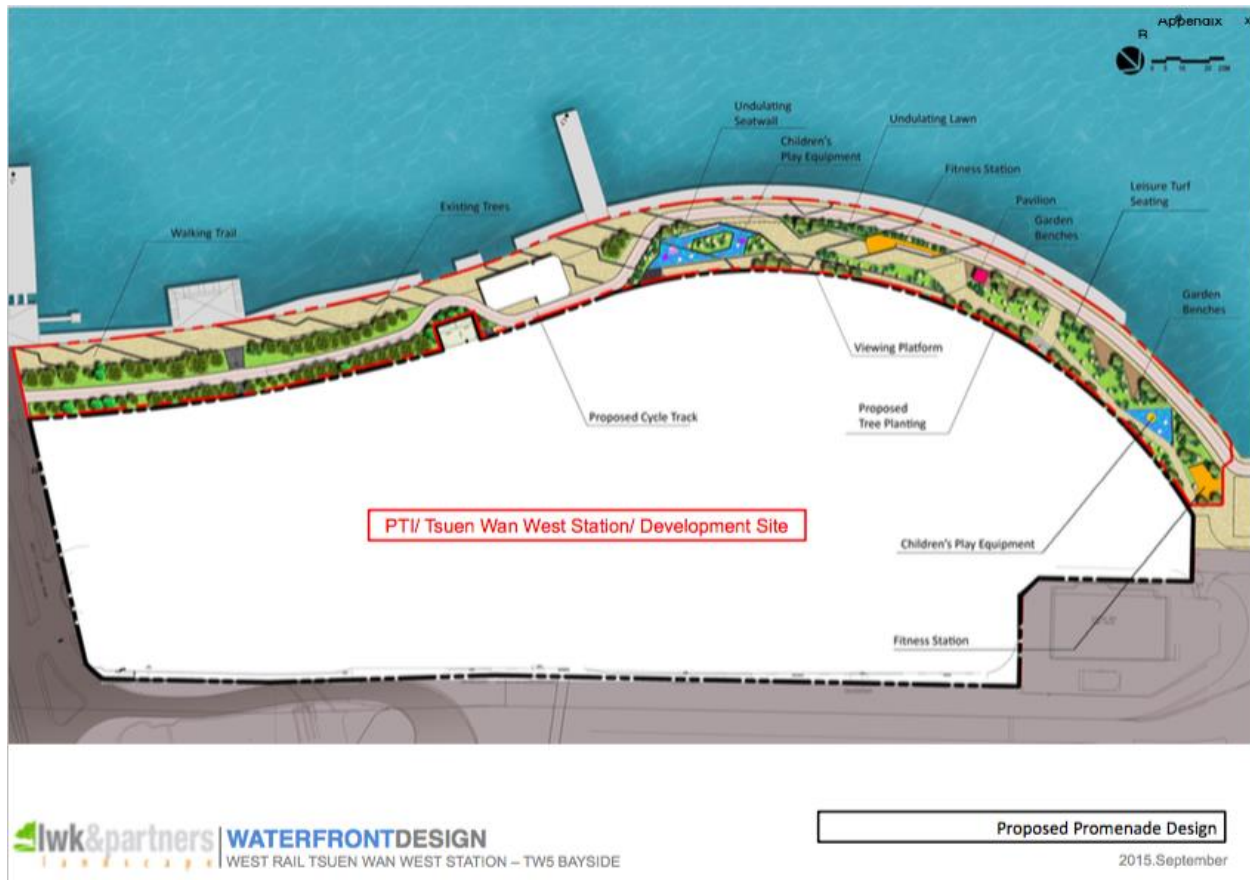


Figure F-25: Tsuen Wan West Development Plans (MTR Corporation Limited & LCSD, 2015)

F.13 Sham Shui Po

Waterfront areas in Sham Shui Po are currently inaccessible to the public. The area is a CDA (Figure F-26). The developmental plans, created by the Planning Department, discuss the reallocation of zoning. Due to this location’s accessibility by public transportation, the government claimed that “the site was considered suitable for development for a commercial and residential waterfront promenade and government institution or community use” (Planning Department, 2016). A continuous promenade will connect the commercial and residential waterfront areas. Plans for the commercial area include restaurants and shopping. The government also plans to add a publicly accessible pier to the commercial area; however, the plans do not state whether the public can use this pier for tying up for an extended period of time. This location also has access to buses and an MTR station.

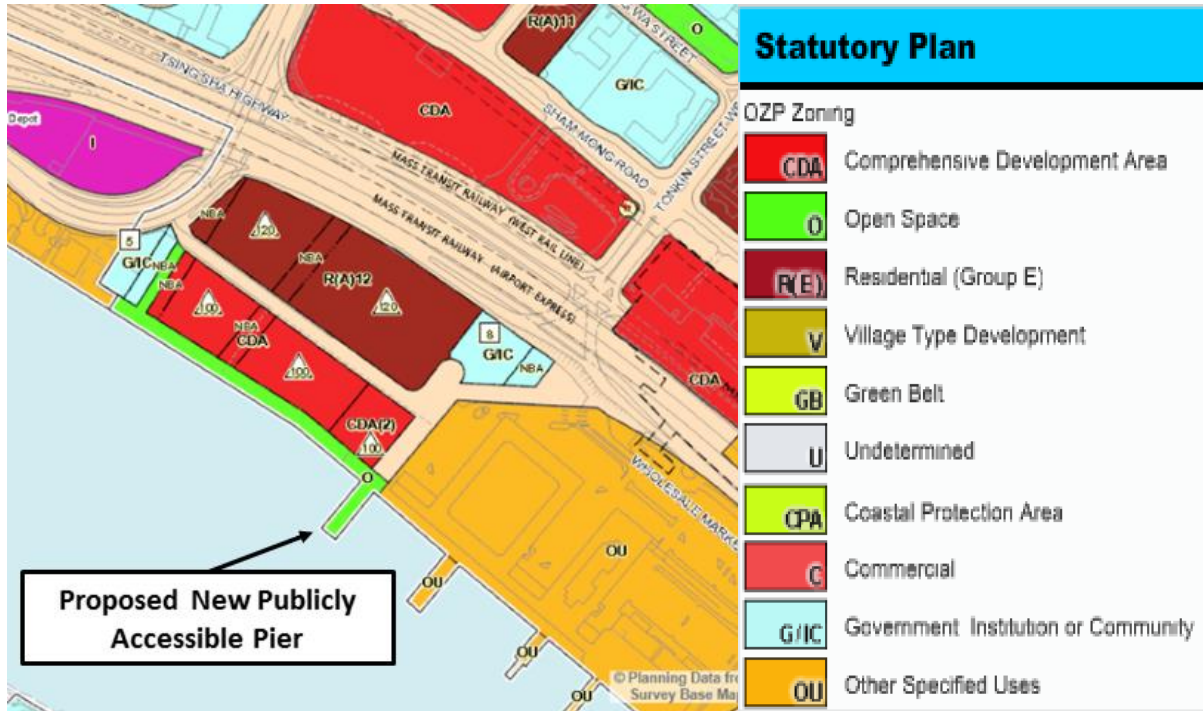


Figure F-26: Sham Shui Po Zoning Map (Town Planning Board [TPB], 2017)

F.14 West Kowloon

Due to the construction in West Kowloon, our observations were limited to Nursery Park. This park contains new green space and a waterfront promenade. A fence separates the walkway from a rubble mound seawall. The rubble mound seawall continues past the promenade to form a breakwater (Figure F-27). There is a vertical seawall inside the breakwater area. The berthing space in this breakwater area is designated for public use (Task Force on Water-land Interface, 2012b), and most of the vessels within the shelter appeared to be launches or small ferries. West Kowloon is primarily zoned as Other Specified Uses, Commercial and Residential (Figure F-28).



Figure F-27: Breakwater Area in West Kowloon

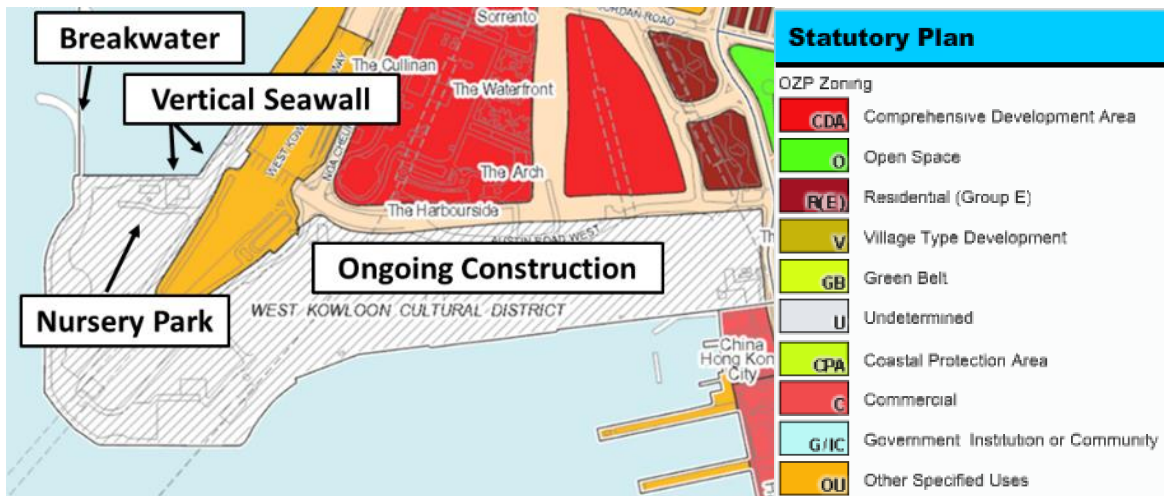


Figure F-28: West Kowloon Zoning Map (Town Planning Board [TPB], 2017)

When fully developed, the West Kowloon Cultural District will offer a variety of attractions to the waterfront including 23 hectares of publicly accessible Open Space. Two of the major projects being developed in this area are the Xique Center and Artist Square Development Area (ASDA). The Xique Center will be a center for Chinese opera performances and productions, while the ASDA will have the M+ museum, the Lyric Theater Complex and many other entertainment and dining options. To make these developments more accessible, Figure F-29 shows the Artist Square Bridge that will serve as a pedestrian walkway over the highway to connect the ASDA and MTR Kowloon Station (West Kowloon Cultural District Authority,

2016). Contracts between the Palace Museum and West Kowloon Cultural District Authority, to create the Hong Kong Palace Museum, intend to bring more culture and visitors to the area. The WKCD plans to hold many festivals, concerts and many big events in this area.



Figure F-29: Artist Square Bridge Connecting the ASDA and MTR Kowloon Station (West Kowloon Cultural District Authority, 2016)

F.15 Tsim Sha Tsui

Much of TST is currently undergoing major reconstruction. This area is primarily zoned as Open Space, Commercial and Other Specified Uses (Figure F-30). One prominent tourist attraction, The Avenue of Stars, is undergoing a revitalization project and is projected to reopen in 2019. The ferry piers are within active fairways, so we will disregard them as potential tie up space.

Restaurants, commercial shopping centers, and the Mody Road Garden Park are found along the eastern waterfront. A number of other attractions are located near the waterfront including the Hong Kong Museum of Art, Health Education and Resource Centre, the June 4th Museum, and The Clock Tower. The area is within 500 meters of the TST MTR stop, bus stations, and the Star Ferry. Along the waterfront near the ferry piers, there is a two story harbor viewing area where people can watch the nightly light shows or the Chinese New Years firework show. Boats berthed along the central section of the seawall could potentially interfere with the

visibility of the harbor. Thus, potential areas for additional berthing space are narrowed down to the east and west sides of the TST waterfront.



Figure F-30: Tsim Sha Tsui Zoning Map (Town Planning Board [TPB], 2017)

F.16 Hung Hom

Hung Hom is on the southeast peninsula of Kowloon. We looked at four different sections along the waterfront: Hung Hom Promenade, The Promenade, Tai Wan Shen Park, and Laguna Verde Promenade. LCSD maintains both the Hung Hom Promenade and the Tai Wan Shen Park, while the other two sections are privately owned. All of these areas have concrete block seawall.

The Harbour Grand Kowloon Hotel complex is adjacent to The Promenade, and its buildings have ground-level upscale food and beverage options. A fence separates the promenade and the seawall. The promenade has one set of landing steps and two piers. One of the ferry piers is locked up and no longer in service, while the other one is an active ferry stop operated by the Hong Kong and Kowloon Ferry Service. This area is easily accessible by ferry and bus, but does not have an MTR station within walking distance. Figure F-31 shows Hung Hom's zoning.

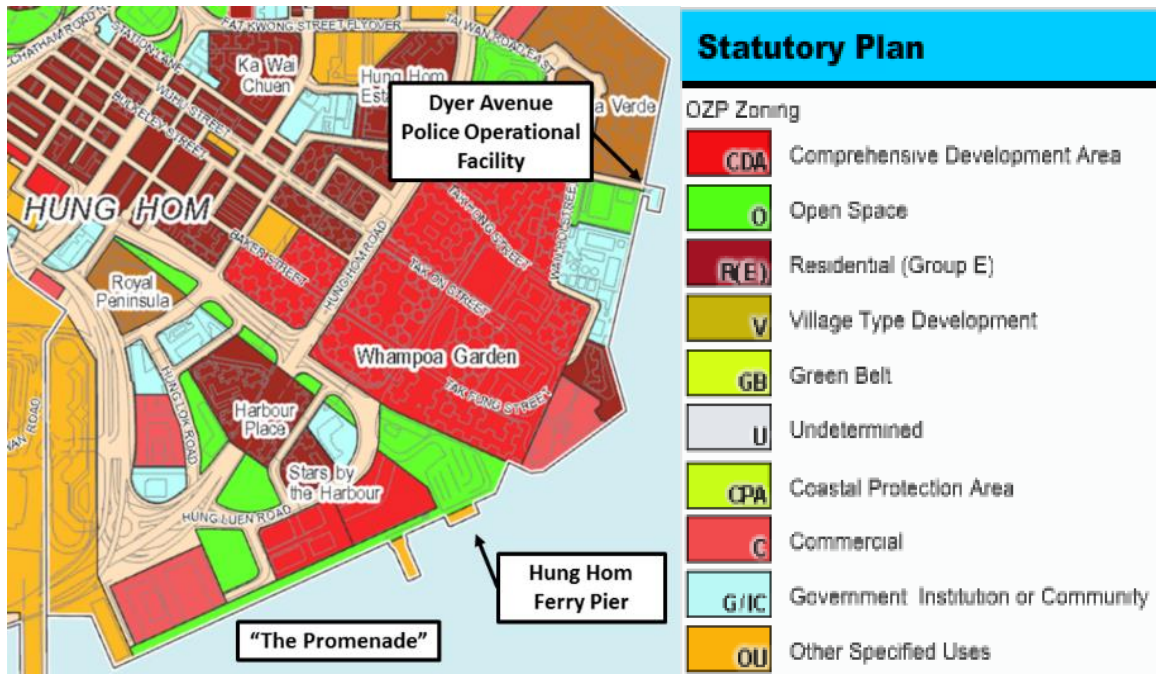


Figure F-31: Hung Hom Zoning Map (Town Planning Board [TPB], 2017)

The Promenade, privately owned and maintained by the Whampoa Property Management Ltd (WPML), has a concrete block seawall with rubber bumpers. A fence separates the promenade and seawall, and no bollards exist on either side of this fence. The single private landing step is inaccessible to the public and its use requires special permission by WPML. This promenade is close to an MTR and a bus stop. The buildings along this promenade are residential with restaurants on their lower levels overlooking the harbor.

The Tai Wan Shen Park includes a narrow promenade with a fence along the seawall. There is a vertical seawall, but there are no bollards or landing steps present. Figure F-32 shows that there was a government police facility with floating docks in the water, but there is no public access to this area.



Figure F-32: Dyer Avenue Police Operational Facility in Hung Hom

Laguna Verde Promenade is a privately owned promenade near the To Kwa Wan Typhoon Shelter. There are no landing steps, piers, or bollards in this area, and a fence separates the seawall from the promenade. There is MTR and bus access to this area. The buildings near the promenade are primarily residential high rises, but a mall, school, and restaurants in the base of these buildings provide vibrancy to the area.

The Planning Department has proposed development plans to improve the vibrancy of Hung Hom's waterfront area and to increase the ease of access from the land to the waterfront. The proposal includes a continuous promenade connecting the existing promenade in Tsim Sha Tsui East to that of Laguna Verde. There will be seating to look at the view and small eateries along the promenade for visitors to enjoy. The plans will also enhance the vibrancy of the area by planting trees and incorporating local art around the waterfront, as well as follow harborfront guidelines by building low-rise structures so that everyone can enjoy the view (Hung Hom District Study, 2006).

F.17 To Kwa Wan

The majority of the waterfront in To Kwa Wan is inaccessible to pedestrians due to ongoing construction. The entire Open Space portion below Hoi Sham Park (Figure F-33) is temporarily inaccessible due to current plans to expand the park. Multiple buildings extend to the water's edge, decreasing the amount of accessible waterfront and preventing the use of the area for leisure. Hoi Sham Park is accessible, and has multiple areas to sit and enjoy views of the

harbor; however, there is no seawall or mooring infrastructure due to its natural coastline. This area is only accessible by bus or foot, and the zoning for this area is shown in Figure F-33.

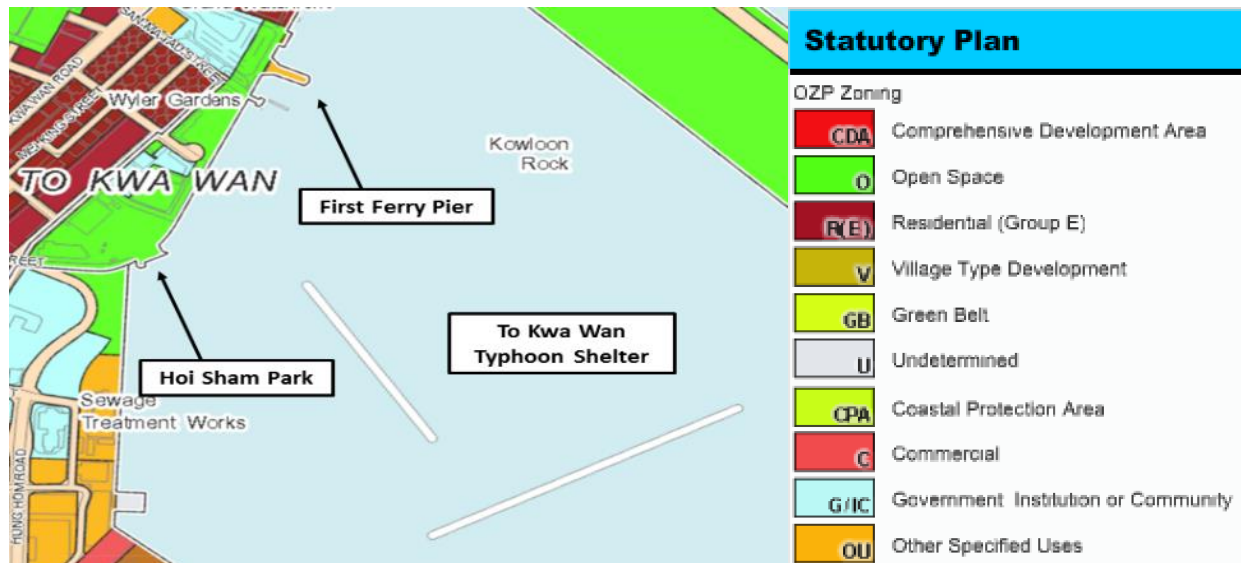


Figure F-33: To Kwa Wan Zoning Map (Town Planning Board [TPB], 2017)

Future plans show that Hoi Sham Park will undergo an extension project. This will increase the park area and add direct waterfront access by creating a 20 meter wide promenade connecting the current Hoi Sham Park to Chi Kiang Street. The Hoi Sham Park will be used for both active and passive leisure space, including a tennis court, foot path and children’s play area (Task Force on Kai Tak Harbourfront Development, 2013).

A short promenade that runs along the To Kwa Wan Vehicle Inspection area has a straight seawall, but does not contain landing steps or bollards. This promenade does not have access to nearby attractions or to the MTR, so bus is the only mode of accessible public transportation. The promenade terminates at a First Ferry Pier, which has public access to landing steps. This section of waterfront falls in the To Kwa Wan Typhoon Shelter, which should make this a safe place for boats to tie up.

F.18 Kai Tak

There have been many initiatives to repurpose Kai Tak after the airport was moved to Chek Lap Kok. Much of this area is under construction and is inaccessible for observations. Parts of the neighborhood have recently been transformed into a berthing area for large cruise ships, the Kwun Tong Promenade and Typhoon Shelter, and eight residential sites. However, there are many more projects that are currently in preliminary design stages, including the Kai Tak

Fantasy, piers near the ex-fire station, and Cycle Track Network. The Kai Tak Fantasy (Figure F-34) will transform the area into a “world-class tourism, entertainment, and leisure hub” (Energizing Kowloon East Office, 2015). Kai Tak Fantasy focuses on the walkability and vibrancy of the area, with an emphasis on large areas of open space for the public to enjoy. Furthermore, the pier adjacent to the old fire station recently re-opened to allow weekly ferry services to Kwun Tong Public Pier and may be approved for future water activities (Kai Tak Office, 2016). Kai Tak is currently zoned as Open Space and Other Specified Uses (Figure F-35). The plans to transform the entire old Kai Tak airport into publicly usable space will increase the area’s vibrancy and accessibility.



Figure F-34: Kai Tak Future Developments (Energizing Kowloon East Office, 2015)

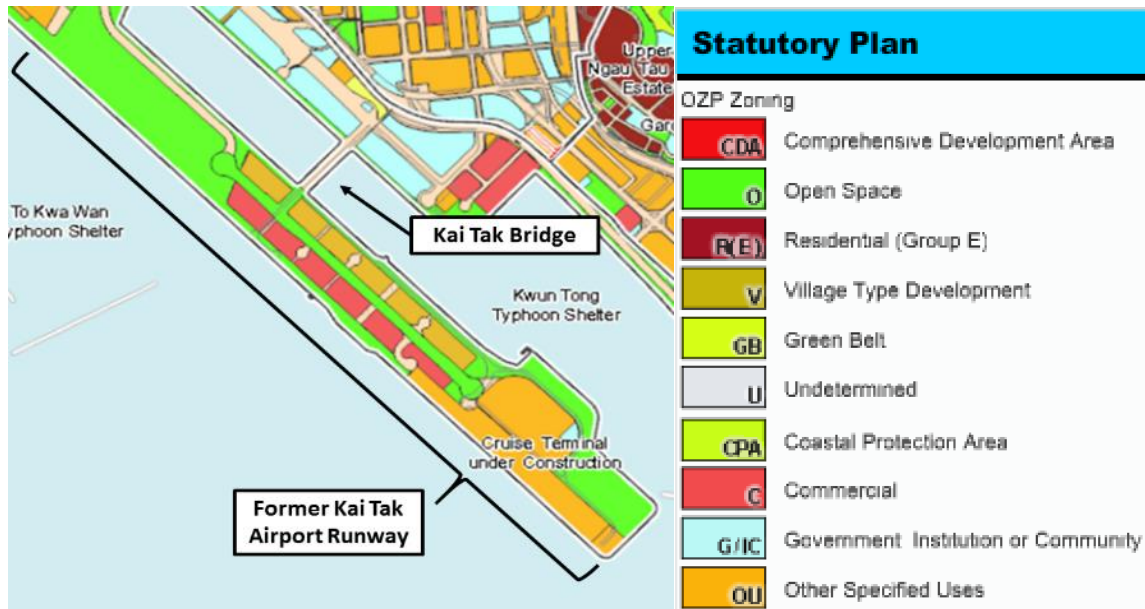


Figure F-35: Kai Tak Zoning Map (Town Planning Board [TPB], 2017)

F.19 Kwun Tong

The vertical seawall along the entire length of the Kwun Tong Promenade supports 24 bollards in the space between the promenade barrier and the water. The transparent glass barrier includes several two-meter long removable sections; utilizing the removability of these fences can provide access to berthing infrastructure set up along the seawall. The promenade itself is well-equipped with public amenities, and the park space behind it has attractions such as playground equipment, sculptures and other art, public utilities, and dining options. Both the promenade and space underneath the flyover are suitable for hosting events. The active Kwun Tong Ferry Pier as well as the Kwun Tong Public Pier, which have four sets of landing steps and accompanying bollards, lie just past the southeast end of the promenade.

The waterfront in Kwun Tong is zoned as Open Space with the exception of commercially-zoned piers underneath the highway and a small section in the typhoon shelter. Most of the inland area is zoned for Other Specified Uses (Figure 26).

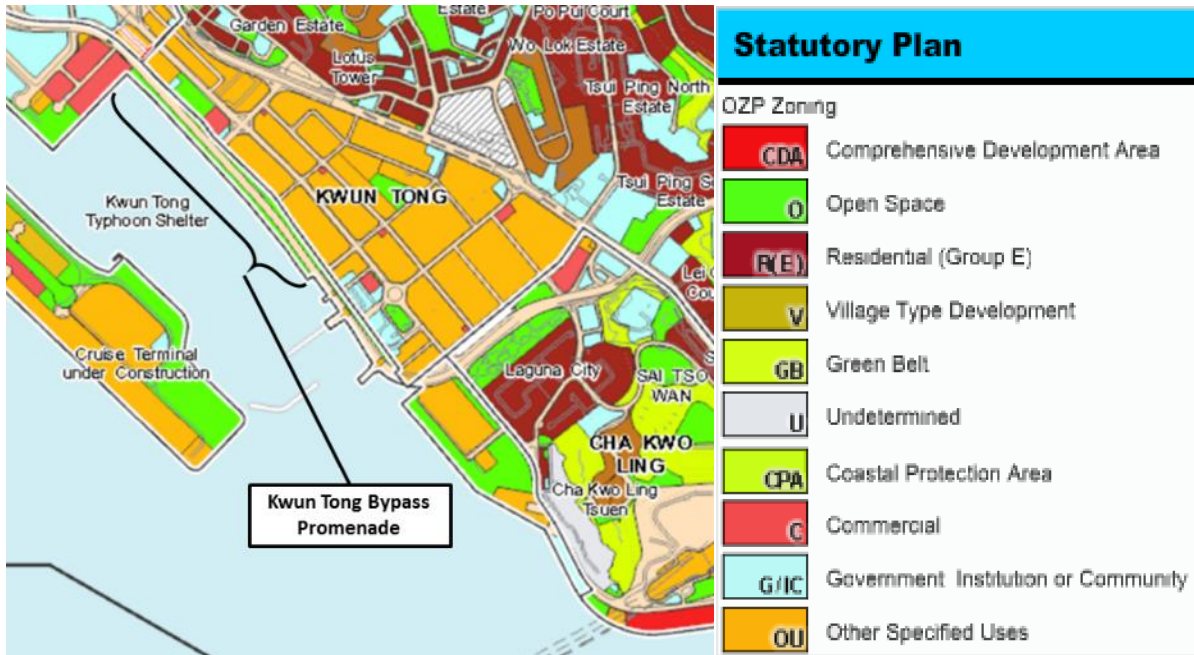


Figure F-36: Kwun Tong Zoning Map (Town Planning Board [TPB], 2017)

The Energizing Kowloon East Office (EKEO) has planning jurisdiction over Kwun Tong and helps to facilitate and manage the area’s waterfront development projects. Along the edge of the Kwun Tong Typhoon Shelter, the approved plans include development of a promenade and a musical water and light show (Figure 27).

Other plans for the area include additions to the promenade that “[provide] a platform for staging various community activities, for example, the Kwun Tong Festival and charity walk,” (Signature Project Scheme Projects of Kwun Tong District, Yau Tsim Mong District, Tuen Mun District and Yuen Long District, 2016). This promenade is close to a previous EKEO development, Fly the Flyover Operation, that developed waterfront and unused areas for art and performance uses. According EKEO, the venue catered to the needs of the community and professional institutes that “shared the same view that a vibrant waterfront was one of the key elements of Energizing Kowloon East,” (Energizing Kowloon East - Fly the Flyover Operation - EKEO, 2016).



Figure F-37: Musical Foundation and Light Show Promenade Plan in Kwun Tong (Legislative Council Panel on Home Affairs, 2016)

The MTR and bus station are both within 500 meters of the waterfront. EKEO is considering developments of additional MTR lines or monorails that would have routes connecting parts of Kai Tak to Kwun Tong; however, none of these plans have been approved yet (Energizing Kowloon East Office, 2016a). The conjunction of existing entertainment venues, future developments catered towards entertainment and leisure, and connectivity of this area make this location a good potential area to consider enhancement of waterfront infrastructure.

F.20 Yau Tong and Cha Kwo Ling

The waterfront surrounding Yau Tong Bay is currently desolate and undeveloped, and other than some cargo working operations, the seawall is not currently in use. There are poorly maintained bollards along the entire length of the vertical seawall. The land adjacent to the water on the north side of the bay is unoccupied, with the exception of a single large industrial building at the area's northwest corner. Access to the MTR and buses are quick and easy, although there are not currently any attractions nearby other than auto-repair shops and industrial facilities. This area is not very pedestrian friendly; the sidewalks along Cha Kwo Ling Road and Ko Kai Road are narrow and often blocked by debris. Although it is not a typhoon shelter, the water in the bay is still sheltered under normal conditions, making it safer for boats to tie up, should there be a reason for them to visit.

Yau Tong is a Comprehensive Development Area that is subject to an ongoing study to determine zoning. The study plans to create a commercial and residential area, as well as a waterfront promenade by “[phasing] out industrial uses” (Planning Department, 2015a). The goal

of developments along the water here is to create a public-use oriented, accessible, and vibrant harbor area. The study also identified this area for the addition of landing steps, as it will have waterfront-adjacent attractions after development is finished (The Government of Hong Kong Special Administrative Region, 2015). Decisions regarding land use will be made in the future.

The Planning Department has proposed a waterfront promenade for Yau Tong Bay that would connect with the Yau Tong Promenade and would serve similar community purposes. The proposed addition of three sets of landing steps along the Yau Tong Bay Promenade would increase the area’s accessibility (Planning Department, 2015a).

Cha Kwo Ling is a sub-district of Yau Tong that is currently undergoing similar restoration processes. Current projects are transforming the area from a CDA to a predominantly Residential and Open Space zoned area. Furthermore, the proposal to create a continuous promenade, which would connect to the Yau Tong Bay Promenade, will increase the accessibility and connectivity of the area.

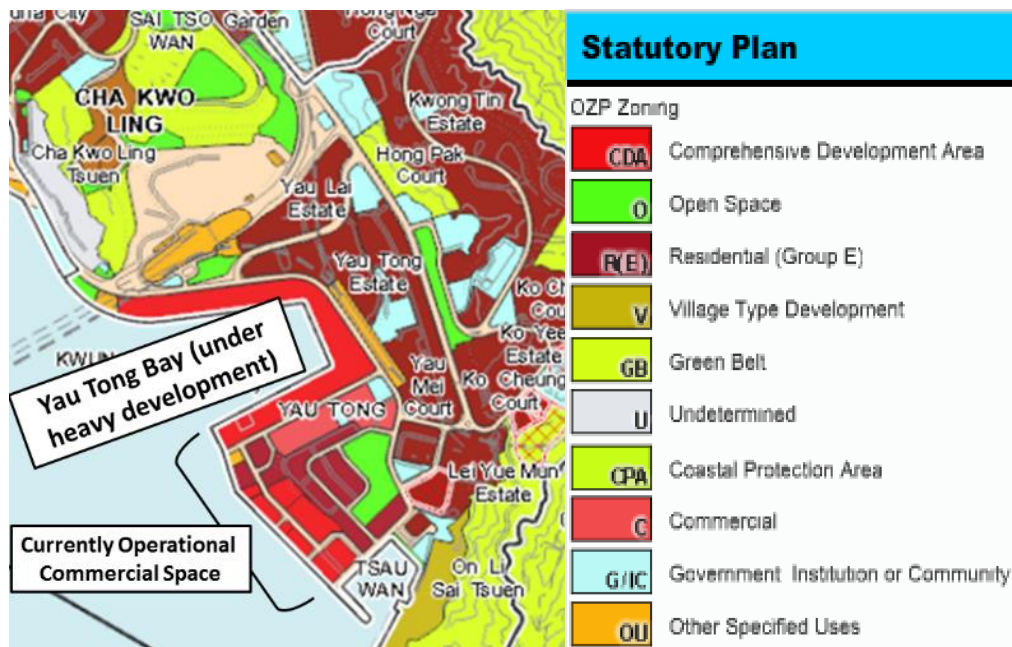


Figure F-38: Yau Tong and Cha Kwo Ling Zoning Map (Town Planning Board [TPB], 2017)

F.21 Lei Yue Mun

This sub-district on the eastern part of Kowloon Island is the easternmost location in Victoria Harbour. This area is a fishing village known for its seafood restaurants. This area currently does not have accessibility for observations. Lei Yue Mun has water quality problems due to insufficient plumbing, so the government has developed a plan to put a proper sewage

system into place (Task Force on Harbourfront Developments in Kowloon, Tsuen Wan and Kwai Tsing, 2016). Furthermore, the government is proposing to install a public landing facility in order to make this area more accessible for residents and visitors. The area's breakwater makes it safe for boats to enter and tie up. There is no MTR access to this area, but there are bus routes and ferry piers close to this area. Figure F-39 shows the zoning for Lei Yue Mun.

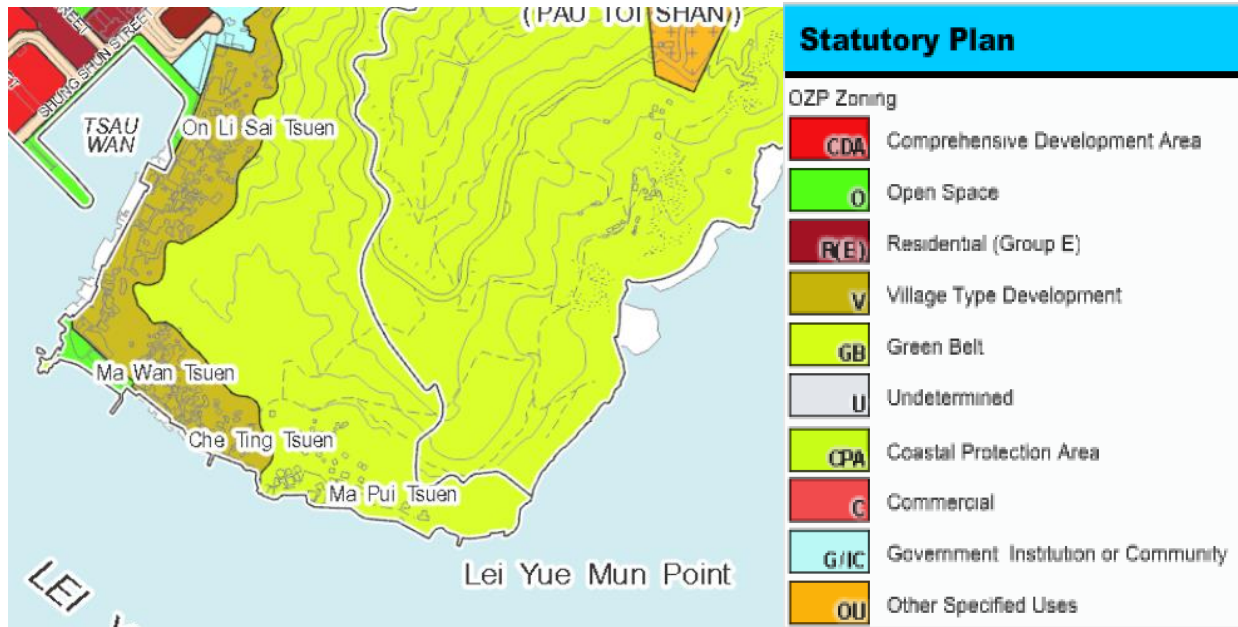


Figure F-39: Lei Yue Mun Zoning Map (Town Planning Board [TPB], 2017)

APPENDIX G: CRITERIA RANKINGS BREAKDOWN

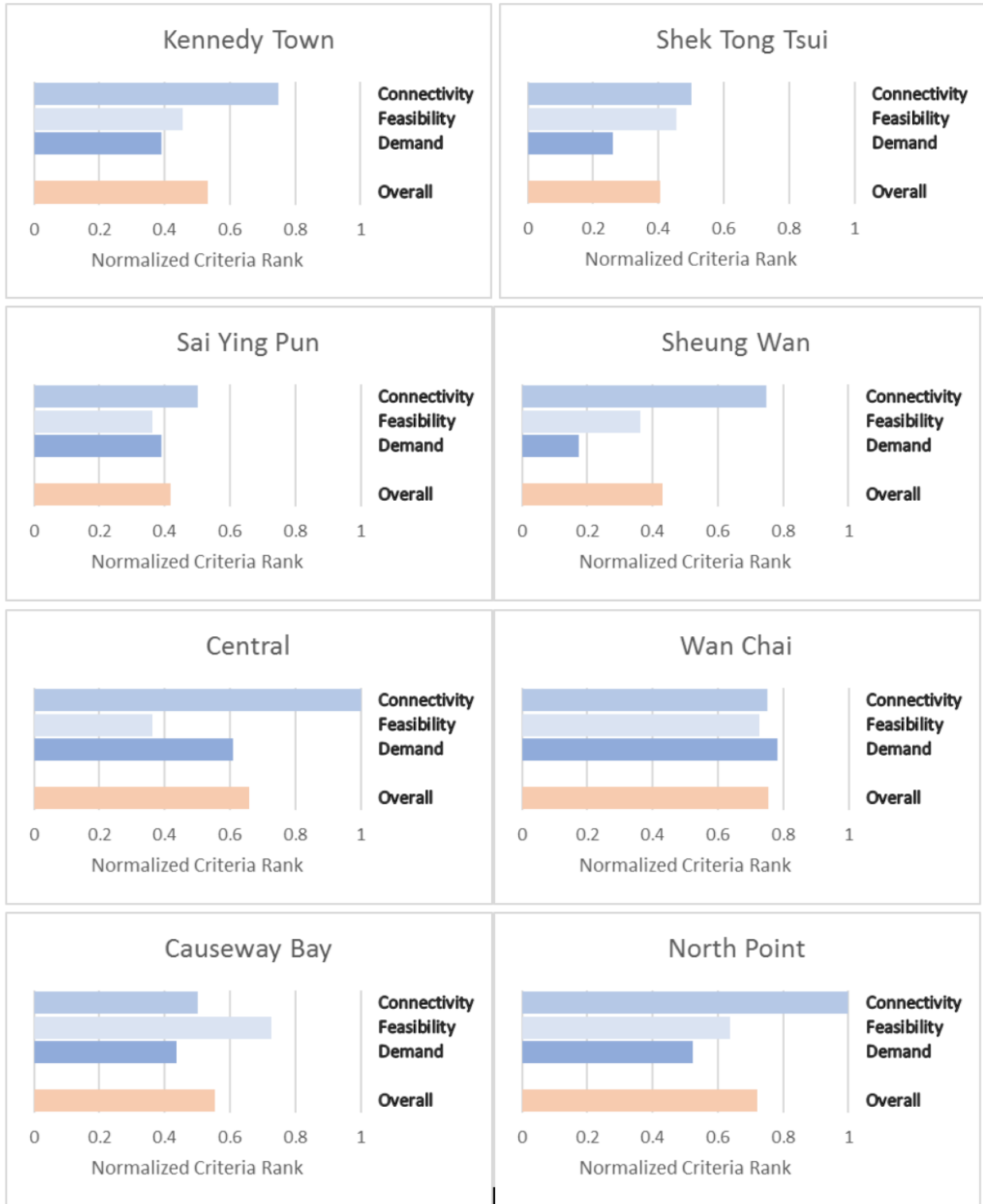
G.1 Kowloon Area Rankings

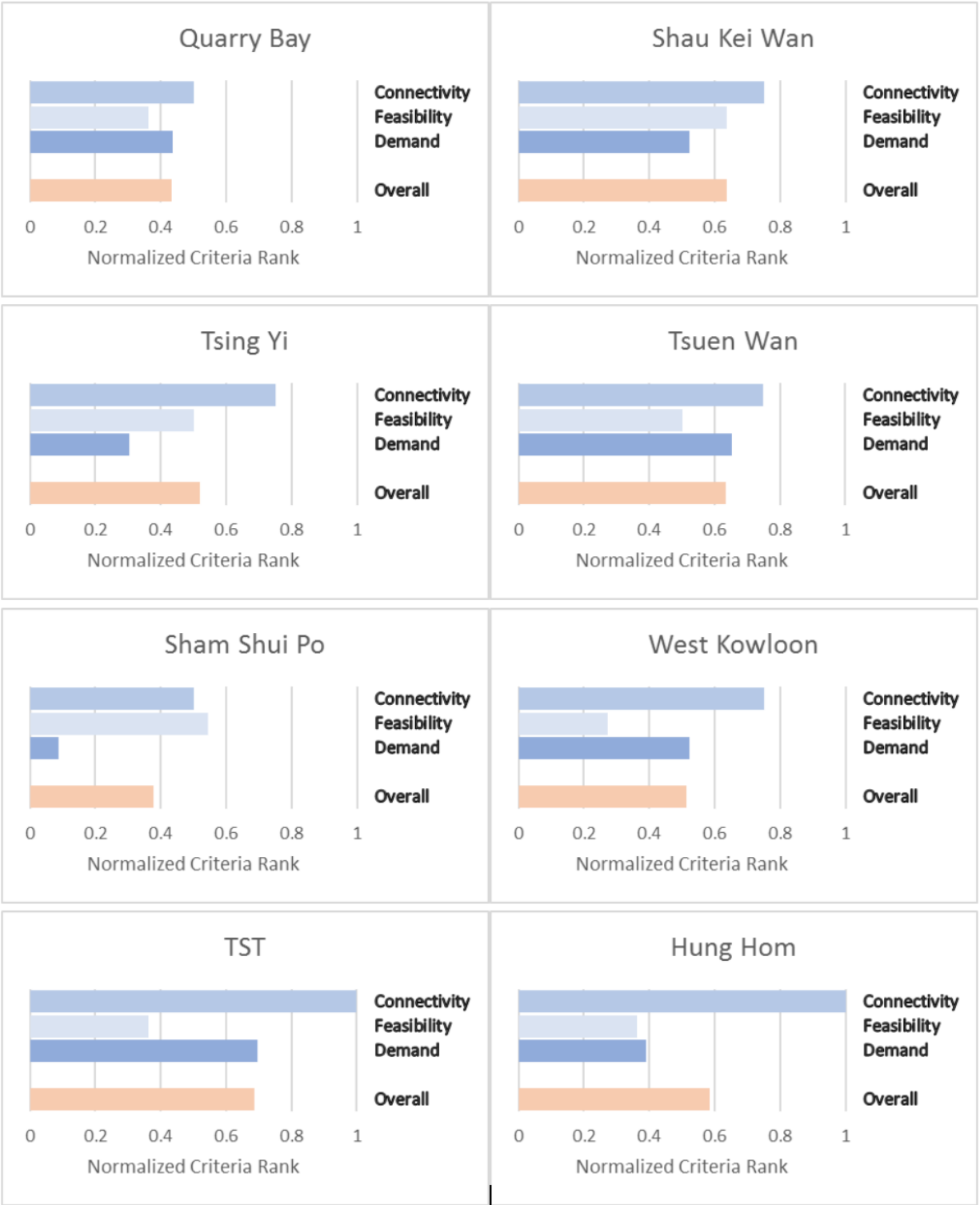
	Tsing Yi	Tsuen Wan	Sham Shui Po	West Kowloon	TST	Hung Hom	To Kwa Wan	Kai Tak	Kwun Tong	Yau Tong	Lei Yi Mun
Demand (23 pt.)											
Retail Space	2	4	0	2	4	4	2	0	2	4	0
Restuants/Bars	2	3	1	3	3	1	3	1	3	1	1
Outdoor recreation area	3	3	1	2	2	3	3	3	3	3	1
Museums	0	0	0	0	2	0	0	0	1	0	0
Small events space	0	2	0	2	2	1	2	2	2	1	0
Large event space	0	3	0	3	3	0	0	3	3	0	0
Water event space	0	0	0	0	0	0	0	3	3	1	0
Total	7	15	2	12	16	9	10	12	17	10	2
Percentage	0.3043	0.6522	0.0870	0.5217	0.6957	0.3913	0.4348	0.5217	0.739130435	0.4348	0.0870
Feasibility (11 pt.)											
Accessible infrastructure	3	3	2	1	2	2	2	3	3	1	2
Type of seawall	2	2	3	1	3	3	0	3	3	3	3
Fence type	1	1	1	1	0	0	1	1	2	2	0
Water exposure	0.5	0.5	1	0	0	0	2	2	2	1	2
Fairway	2	2	1	1	1	1	2	2	2	2	2
Total	5.5	5.5	6	3	4	4	5	8	9	8	7
Percentage	0.5000	0.5000	0.5455	0.2727	0.3636	0.3636	0.4545	0.7273	0.8182	0.7273	0.6364
Connectivity (4 pt.)											
MTR	1	1	1	1	1	1	0	0	1	1	0
Bus stop	1	1	0	1	1	1	1	1	1	1	1
Ferry pier	0	0	0	0	1	1	1	0	0	0	1
Accessible by foot	1	1	1	1	1	1	1	1	1	1	1
Total	3	3	2	3	4	4	3	2	3	3	3
Percentage	0.75	0.75	0.5	0.75	1	1	0.75	0.5	0.75	0.75	0.75
Average Total %	0.5181	0.6341	0.3775	0.5148	0.6864	0.5850	0.5464	0.5830	0.7691	0.6374	0.4911
Overall	0.5181	0.6341	0.3775	0.5148	0.6864	0.5850	0.5464	0.5830	0.7691	0.6374	0.4911
Demand	0.3043	0.6522	0.0870	0.5217	0.6957	0.3913	0.4348	0.5217	0.7391	0.4348	0.0870
Feasibility	0.5000	0.5000	0.5455	0.2727	0.3636	0.3636	0.4545	0.7273	0.8182	0.7273	0.6364
Connectivity	0.7500	0.7500	0.5000	0.7500	1.0000	1.0000	0.7500	0.5000	0.7500	0.7500	0.7500
*These areas were not considered as tie up space because they fall in open water											

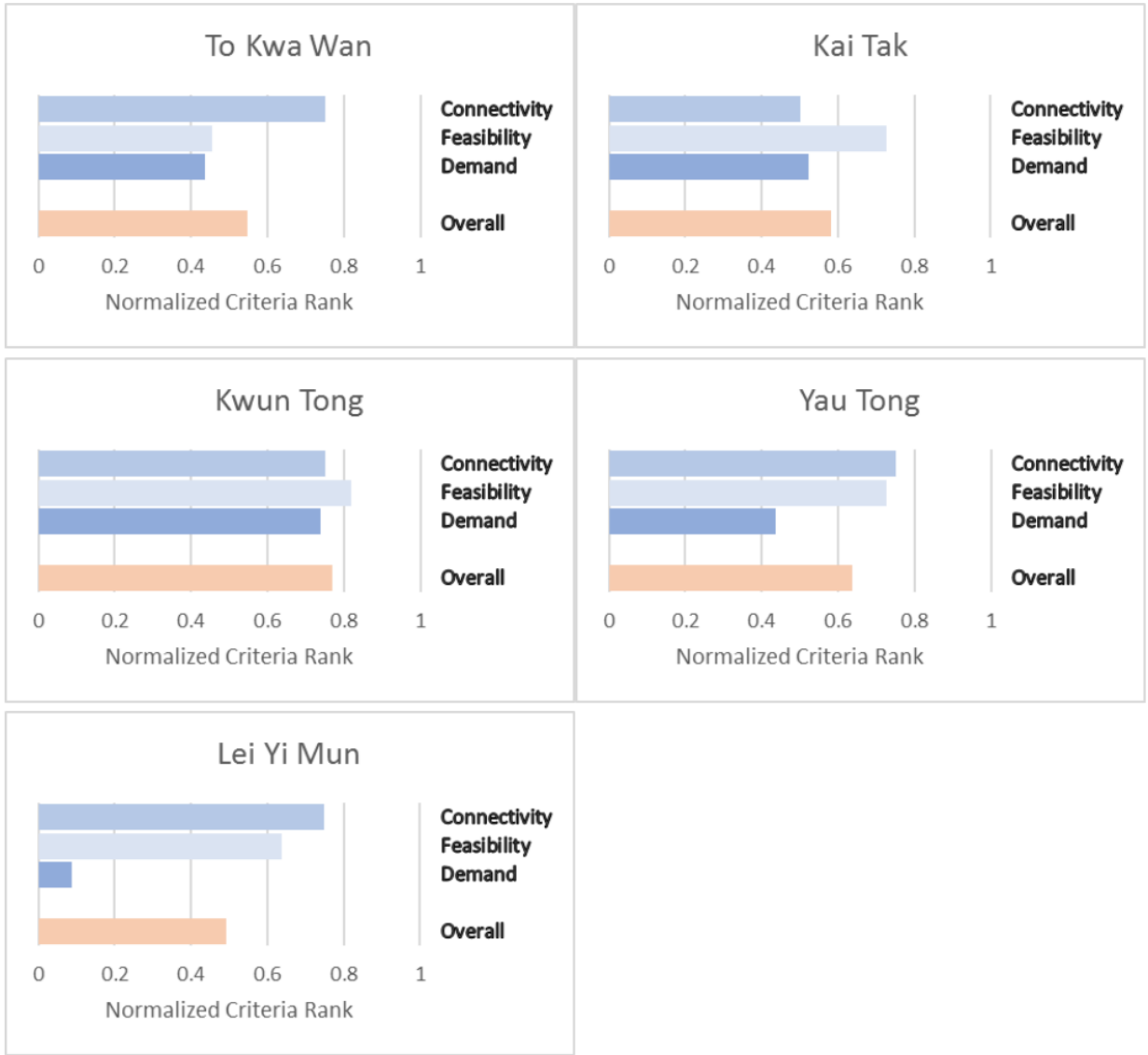
G.2 Hong Kong Area Rankings

	Kennedy Town	Shek Tong Tsui	Sai Ying Pun	Sheung Wan	Central	Wan Chai	Causeway Bay	North Point	Quarry Bay	Shau Kei Wan
Demand (23 pt.)										
Retail Space	4	2	0	0	4	4	4	4	2	4
Restuants/Bars	3	3	2	3	2	3	3	3	2	3
Outdoor recreation area	1	1	3	1	2	3	3	1	3	3
Museums	0	0	0	0	1	0	0	0	1	1
Small events space	1	0	1	0	2	2	0	1	2	1
Large event space	0	0	3	0	3	3	0	0	0	0
Water event space	0	0	0	0	0	3	0	3	0	0
Total	9	6	9	4	14	18	10	12	10	12
Percentage	0.3913	0.2609	0.3913	0.1739	0.6087	0.7826	0.4348	0.5217	0.4348	0.5217
Feasibility (11 pt.)										
Accessible infrastructure	3	2	0	2	3	2	1	3	2	1
Type of seawall	3	3	3	3	3	3	3	3	3	3
Fence type	0	1	0	0	0	2	1	2	0	0
Water exposure	1	0	0	0	0	1	2	1	0	2
Fairway	1	1	1	1	1	2	2	1	1	2
Total	5	5	4	4	4	8	8	7	4	7
Percentage	0.4545	0.4545	0.3636	0.3636	0.3636	0.7273	0.7273	0.6364	0.3636	0.6364
Connectivity (4 pt.)										
MTR	1	0	0	1	1	0	1	1	0	1
Bus stop	1	1	1	1	1	1	1	1	1	1
Ferry pier	0	0	0	0	1	1	0	1	0	0
Accessible by foot	1	1	1	1	1	1	0	1	1	1
Total	3	2	2	3	4	3	2	4	2	3
Percentage	0.75	0.5	0.5	0.75	1	0.75	0.5	1	0.5	0.75
Average Total %	0.5319	0.4051	0.4183	0.4292	0.6574	0.7533	0.5540	0.7194	0.4328	0.6360
Overall	0.5319	0.4051	0.4183	0.4292	0.6574	0.7533	0.5540	0.7194	0.4328	0.6360
Demand	0.3913	0.2609	0.3913	0.1739	0.6087	0.7826	0.4348	0.5217	0.4348	0.5217
Feasibility	0.4545	0.4545	0.3636	0.3636	0.3636	0.7273	0.7273	0.6364	0.3636	0.6364
Connectivity	0.7500	0.5000	0.5000	0.7500	1.0000	0.7500	0.5000	1.0000	0.5000	0.7500
		*These areas were not considered as tie up space because they fall in open water								

APPENDIX H: AREA CRITERIA FULFILLMENT GRAPHS







APPENDIX I: DELIVERABLE MAP LAYERS

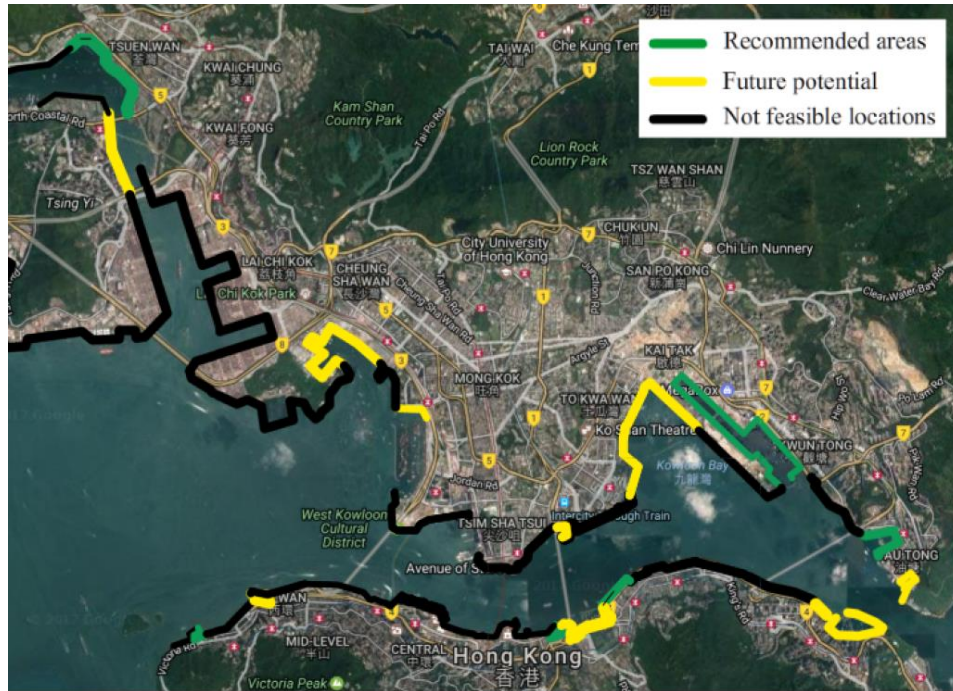


Figure I.1 - Recommended Areas, Areas to Consider, and Unincluded Areas (Google, 2017)

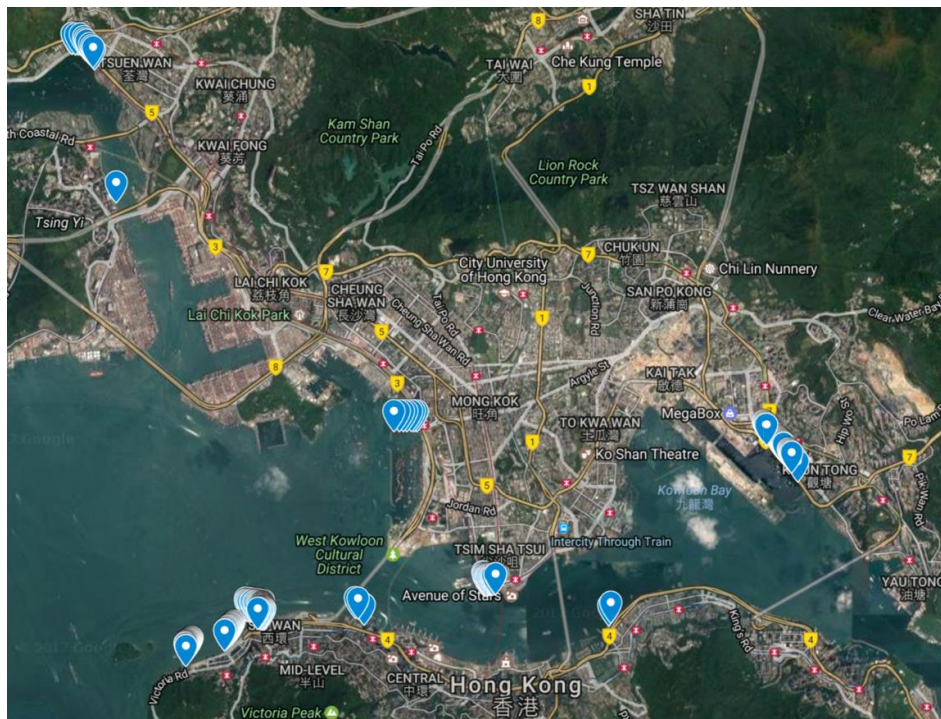


Figure I.2 - Map of Existing Bollards (Google, 2017)

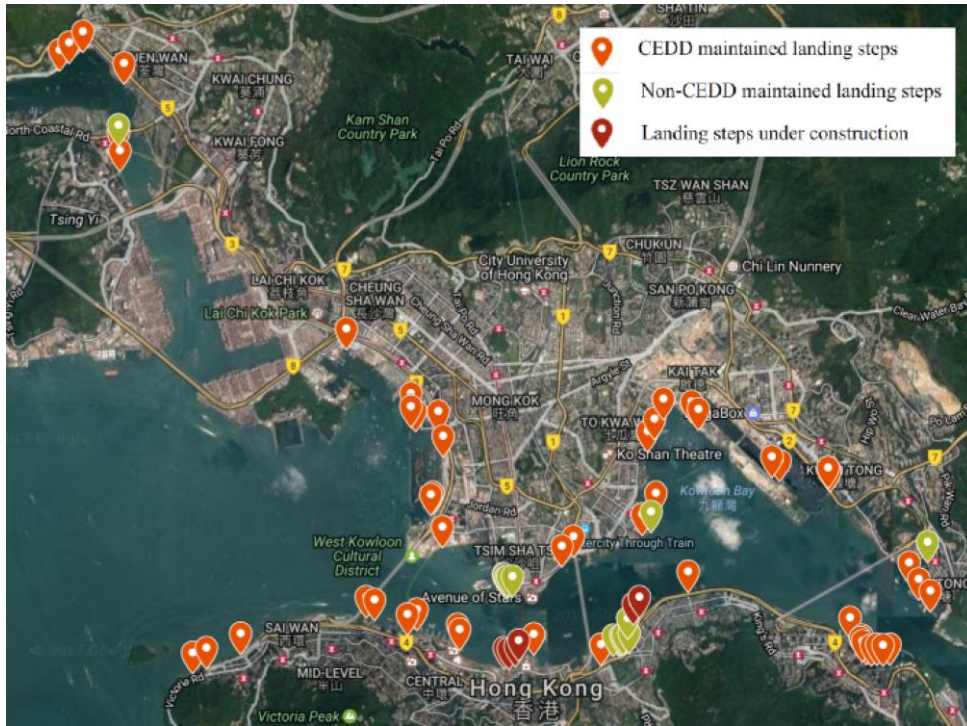


Figure I. 3 - Map of CEDD Maintained Landing Steps (Google, 2017)

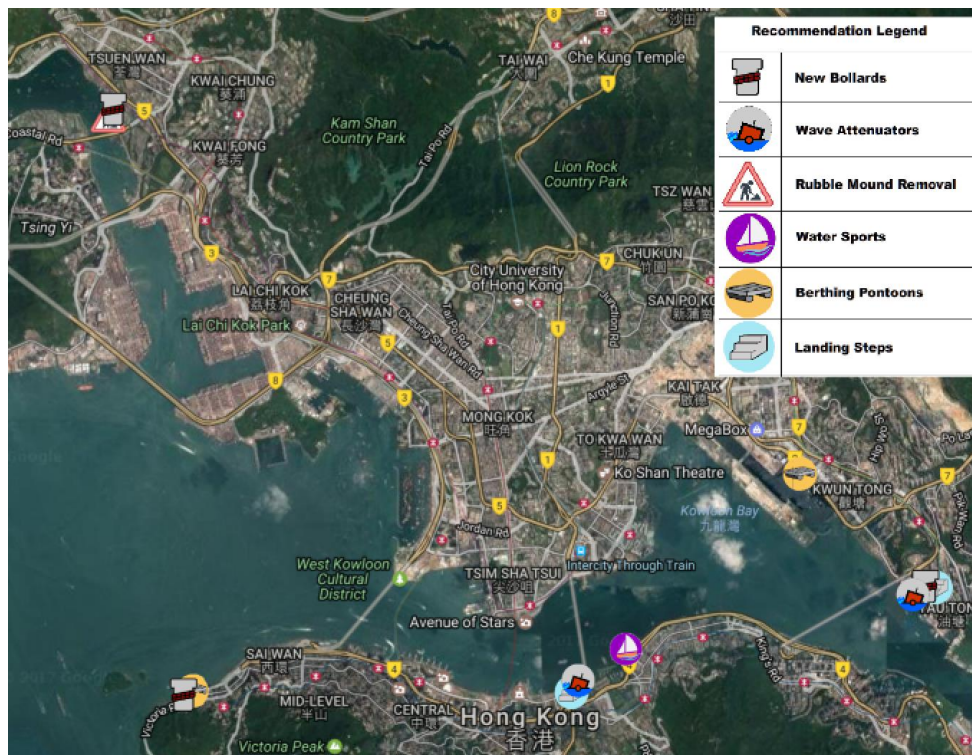


Figure I.4 - Map of Infrastructure Modification Recommendations (Google, 2017)



Figure I.5 - Map of CEDD Maintained Ferry Piers (Google, 2017)

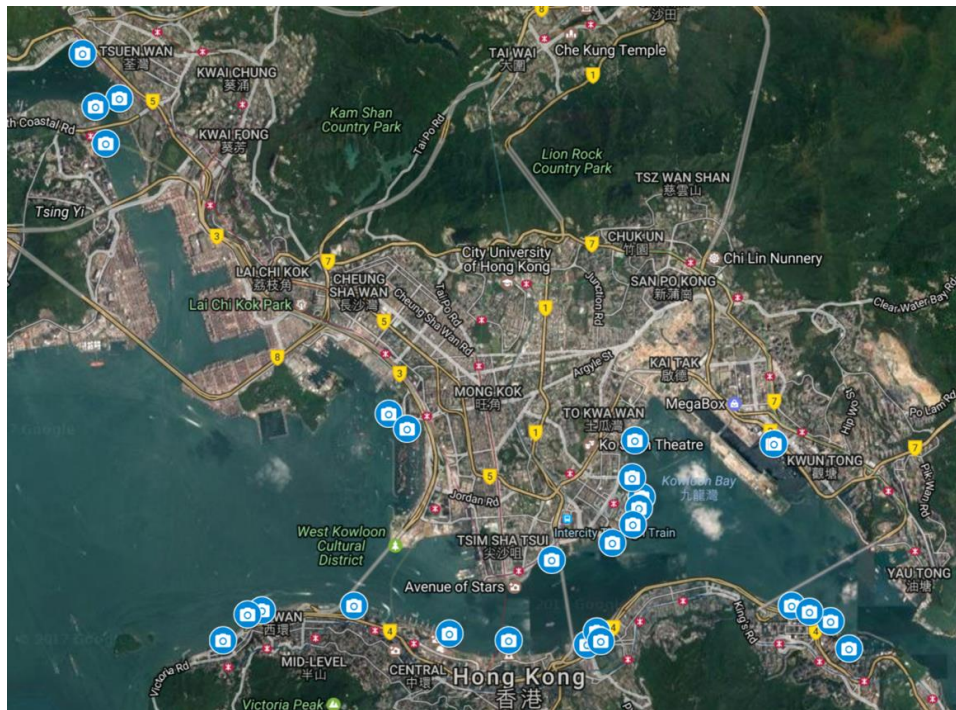


Figure I.6 - Photos of the Waterfront (Google, 2017)

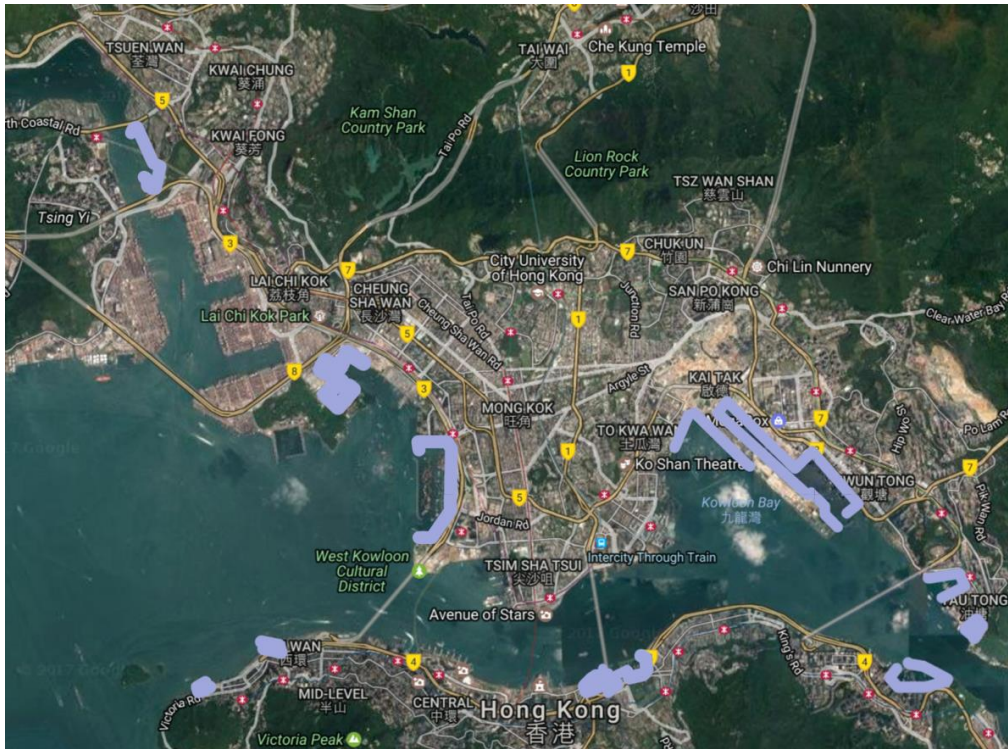


Figure I.7 - Map of Calm Water Areas in Victoria Harbour (Google, 2017)

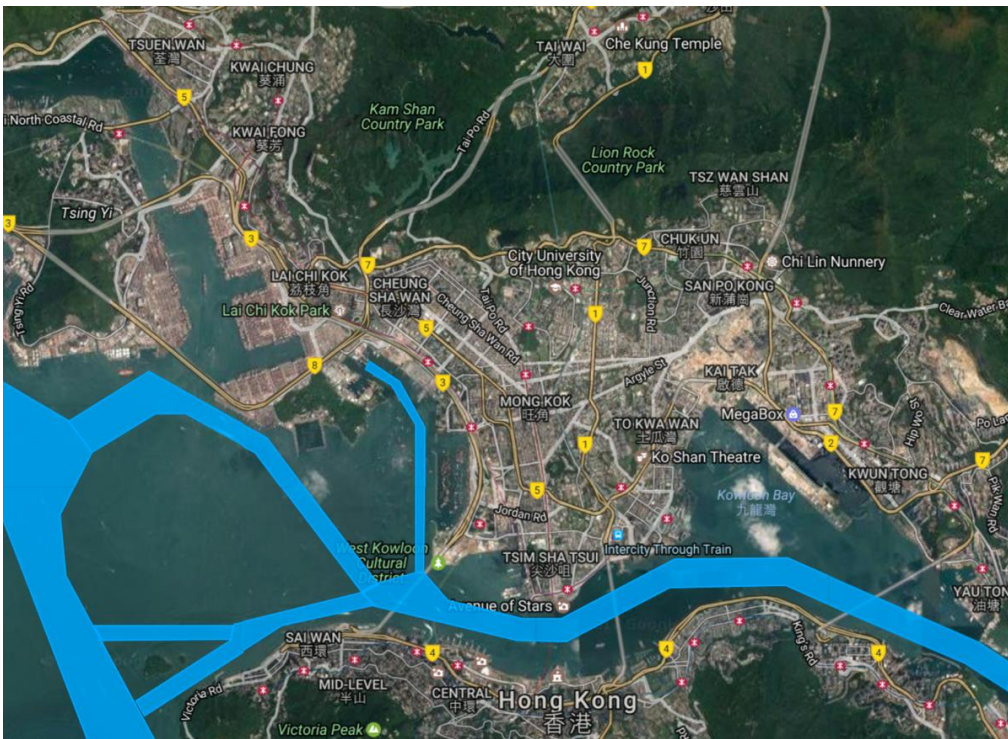


Figure I.8 - Map of Fairways in Victoria Harbour (Google, 2017)