CYCLING FOR COMMUTING IN HONG KONG: AN OBSERVATIONAL STUDY

An Interactive Qualifying Project
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ABSTRACT

This project was sponsored by The Education University of Hong Kong with the goal of assessing the feasibility of cycling for the first and last mile journey of commutes in two selected locations in Hong Kong. A comparative study was conducted by interviewing cycling advocates and transportation officials from three selected cities in the United States and in Hong Kong. Observations were made at our two selected locations, Science Park and Tin Shui Wai, and we found that Science Park has good cycling infrastructure; while the cycle tracks in Tin Shui Wai are underutilized and disconnected. Additionally, we surveyed commuters at each location to gain an understanding of the public perception of cycling. Our research suggests that a bike share program, improvements to infrastructure, and cycling education programs would encourage more commuters to cycle for a portion of their commute in Hong Kong.

EXECUTIVE SUMMARY

Cities around the world are increasingly plagued by issues like air pollution and traffic congestion. Hong Kong is no exception. With 7.2 million citizens, congestion and pollution are major problems, especially in Kowloon and Hong Kong Island. Currently, 12.3 million commuting trips are made each day in Hong Kong, but only 0.5% of those trips are made by bike. Of that small percentage, 97% of cycling commuting occurs in the New Territories (Transport Department of Hong Kong, 2004). The roads and public transit are stretched to capacity and yet the city of Hong Kong has made little effort to promote cycling, ostensibly because of concerns about safety on congested streets. Encouraging citizens to cycle is a way to combat these problems. Staying active by traveling by bicycle will also help reduce obesity, and air and noise pollution.

The Education University of Hong Kong asked that we perform an observational study in Hong Kong as well as a comparative study with cities in the United States. Our project goal was to assess the feasibility and limitations of using cycling for the first and the last mile of commuting in Hong Kong. In order to create a set of recommendations to promote cycling, we assembled and analyzed data for two selected study areas - Tin Shui Wai and Science Park. In these areas, we surveyed the public about commuting habits and observed the existing cycling infrastructure. We interviewed transportation officials and other important figures affiliated with Hong Kong cycle advocacy groups. For our comparative study, we studied cities in the United States that have implemented successful cycling promotion programs. We created recommendations for our sponsor by understanding the cycling culture in Hong Kong as well as making comparisons to successful case studies in the United States.

Methodology

To complete our goal, the team developed three research objectives:

- Objective 1: Assess best practices used in the United States to promote biking at the beginning and end of commuting trips.
- Objective 2: Evaluate the current policies, programs, and practices regarding biking and commuting by bike in Hong Kong.

- Objective 3: Evaluate the feasibility and desirability of promoting biking at two selected locations in Hong Kong.

Our team's methods involved discussion with both the public and key stakeholders in Hong Kong and in the cities we studied from the United States. This kept the public at the center of our recommendations while also including input from experts with knowledge of cycling. We used the following methods to complete our three objectives:

- Interviews with representatives from cycle advocacy groups and transportation departments in each of the three U.S. cities we studied.
- Interviews with a Hong Kong Legislative Councilor, Science Park's sustainability assistant manager, the communications manager for a bike store in Science Park, and the district councilor of Tin Shui Wai.
- Interviews with representatives from cycling advocacy groups in Hong Kong such as the chairman of the Hong Kong Cycling Alliance, and the director of Bike The Moment.
- Structured observations of the cycling infrastructure at the selected sites: Science Park and Tin Shui Wai.
- Surveys of residents at Tin Shui Wai and employees at Science Park to assess commuting habits and opinions about cycling.

Findings and Analysis

In our studies of United States cites, we found that developing infrastructure, cycling education programs, and distinguishing between commercial and residential areas are all important aspects of cycling promotion. In Portland, 75% of residents who own a bike and ride infrequently are 'very' or 'extremely' concerned about safety while riding (People for Bikes, 2016). Interviewees stated that one of the most effective ways to improve peoples' safety is to improve the cycling infrastructure by adding bike lanes, cycle tracks, or subways and bridges for cyclists. Cycling education programs have also been successful in promoting cycling. Programs like the Safe Routes to School program in Portland and Better Street Week in Austin encourage people of all ages to use existing cycling facilities and cycle safely. In residential areas, community involvement is one of the most important factors in encouraging biking. In

commercial areas, programs like Bike Austin's "Bike to Work Day" encourage people who would not normally cycle to add it to their commute by offering free coffee at workplaces around the city.

Science Park is a commercial area with 634 companies and over 12,000 employees. In Science Park, much of the necessary cycling infrastructure is already in place. The Tolo Harbour Cycling Track runs between University station and Science Park. University station is the closest public transit station to Science Park, and it is where many of the employees exit to complete their commute to work. We made observations along this track and found that it was easily bikeable and needs only a few small improvements. There are also existing bike racks on both ends of the cycle track. Cycling between Science Park and University station takes approximately 8 minutes. We also surveyed 200 people at Science Park in an effort to understand their commutes and opinions about cycling. The most common mode of transportation between the MTR station and work for employees is the bus. This bus takes approximately 7-9 minutes and departs every 10 minutes. This makes cycling a time-competitive option to taking the bus.

Tin Shui Wai is a highly populated residential area in the New Territories. Tin Shui Wai has many elements of essential cycling infrastructure, but is lacking in many areas. There is an extensive network of cycling tracks; however, they are very disconnected and inconvenient to use. The track is also congested with pedestrians. This creates a dangerous environment for both cyclists and pedestrians. Most of the people we surveyed in Tin Shui Wai are concerned with their safety while cycling; only 15% of people are comfortable cycling on roads. Many people in this area also do not have access to a bike or do not know how to ride a bike. About half of the commuters we surveyed in Tin Shui Wai take a bus or light rail to get to the MTR station, and this trip generally takes less than 15 minutes. If people felt safer and more comfortable cycling, this trip could be replaced by cycling.

Conclusions and Recommendations

After completing our research, we recommend that:

Recommendation #1. **We recommend that Hong Kong Science and Technology Parks Corporation and the Hong Kong Department of Transportation implement a bike share program between University station and Science Park.**

Easy access to an affordable and time-competitive transportation cycling option is key to encouraging people to cycle as a part of their commute. This program would address many of the concerns that Science Park employees have in regards to cycling.

Recommendation #2. **We recommend that the Hong Kong Department of Transportation improve the subway under Science Park Road and install additional signage along the Tolo Harbour Cycle Track.**

Improving cycling access to the subway under Science Park Road between Science Park and University station would make it much easier for cyclists to get to and from work. This is the only major problem with the current infrastructure. Improving signage would help cyclists navigate, especially for their first cycling trip, which would encourage them to continue cycling in the future.

Recommendation #3. **We recommend that the Hong Kong Department of Transportation improve the cycling infrastructure in Tin Shui Wai by connecting existing cycling tracks.**

It is currently difficult to cycle in Tin Shui Wai because the cycle tracks are so disconnected and cyclists must dismount frequently. Connecting the existing cycle tracks, especially at major intersections, would make it much easier and safer for cyclists to commute to the MTR station.

Recommendation #4. **We recommend that the Yuen Long District Council create a cycling education program in Tin Shui Wai to promote cycling as a safe mode of transportation.**

Cycling education programs have been very successful at promoting cycling in the United States. This program would teach children as well as adults cycling policies and safe cycling practices.

Recommendation #5. **We recommend that The Education University of Hong Kong continue our research at Science Park and Tin Shui Wai, as well as other areas in Hong Kong.**

We have provided our observation sheet, assistive guide, and all methods and surveys associated with analyzing a site's bikeability. Bike share programs and cycling education programs could not only be implemented at our two selected sites, but in other analyzed areas

throughout Hong Kong. The results of this research can be used by the Hong Kong Department of Transportation to assists in planning cycling infrastructure.

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1. INTRODUCTION

With growing concern about climate change, urban congestion, pollution, and increasing levels of obesity, many cities around the world have made major efforts to encourage commuting by bicycle. Cities around the world such as London, Portland, Austin, New York City, and Hangzhou have invested heavily in new infrastructure and educational programs to encourage biking. As a result, the numbers of people commuting by bicycle have increased dramatically in these cities in recent years. These problems exist in Hong Kong as well. Hong Kong is home to approximately 7.2 million people. Congestion and pollution are major problems in Hong Kong, especially in Kowloon and Hong Kong Island. The congestion is demonstrated by the average car speed during morning commutes in the different regions of Hong Kong. The average commuting speed in the New Territories is approximately twice as fast as that in Kowloon and Hong Kong Island (Transport Advisory Committee, 2014). Currently, 12.3 million commuting trips are made each day in Hong Kong, but only 0.5% of those trips are made by bike. Of that small percentage, 97% of cycling commuting occurs in the New Territories (Transport Department of Hong Kong, 2004). The roads and public transit are stretched to capacity and yet the city of Hong Kong has made little effort to promote cycling, ostensibly because of concerns about safety on congested streets.

Faculty in The Department of Social Sciences at The Education University of Hong Kong conduct research in areas of urban form, travel studies, excess commuting, sustainable transport development, and climate change. Commuting by bike is a sustainable transportation method which helps reduce pollution in congested cities where people use motorized vehicles to commute.

The Education University of Hong Kong asked that we perform an observational study in Hong Kong as well as a comparative study with cities in the United States. In order to create a set of recommendations to promote cycling, we surveyed the public about commuting habits and the feasibility of cycling. We also collected data about these locations in interviews with government officials and other important figures affiliated with Hong Kong cycle advocacy groups. We created recommendations for our sponsor by understanding the cycling culture in Hong Kong as well as making comparisons to successful case studies in the United States.

2. BACKGROUND

In this chapter, we examine the background literature available to help us evaluate the feasibility and limitations of using cycling as a first and last mile journey for commuting in Hong Kong. *First mile and last mile* are technical terms used in transportation fields to designate short legs of commutes between a major transportation hub and home or a workplace. The literature review serves to give an overview of the nature of the problem, barriers to solving it, and solutions offered elsewhere.

2.1 Cycling in Hong Kong

Cycling is not encouraged as a transport mode in the urban areas of Hong Kong due to the well-developed road network, comprehensive public transport system, heavy road traffic, and limited road space (Legislative Council of Hong Kong, 2011). The Hong Kong government has paid relatively little attention to promoting cycling as part of its overall transport policies, ostensibly out of concern for road safety as a result of traffic density and congestion (Lee, 2013).

The majority of Hong Kong residents tend to use the following modes of transportation to commute: motorcycle, private car, taxi, franchised bus, special purpose bus, public light bus, ferry, tram, and railway (Transport Advisory Committee, 2014). Figure 1 displays the percentage of weekday daily passengers' mode of transportation. The majority of these modes of transportation cause congestion in a city, which can be indicated by the car journey speed. The lower the car speed, the more congested an area is (Transport Advisory Committee, 2014). Figure 2 displays the trend of regional average car journey speeds in Hong Kong Island (HKI), Kowloon (KLN), and the New Territories (NT) on normal weekdays between the years of 2003-2013. As shown, the congestion is a problem primarily in Hong Kong Island and Kowloon. Furthermore, congestion has increased in Kowloon over the years as evidenced by the decrease of average car journey speed. The congestion in Hong Kong Island is slightly worse than the congestion in Kowloon. It can be concluded that cycling is not being promoted by the government in Hong Kong due to the use of other modes of transportation, which are causing congestion problems particularly in Hong Kong Island and Kowloon. If more commuters could be encouraged to cycle, congestion would be reduced. However, cyclists need better infrastructure in order to cycle safely. Lack of biking infrastructure causes people to ride their

bikes on the congested streets, resulting in fear of cyclists to compete with vehicles for road space.

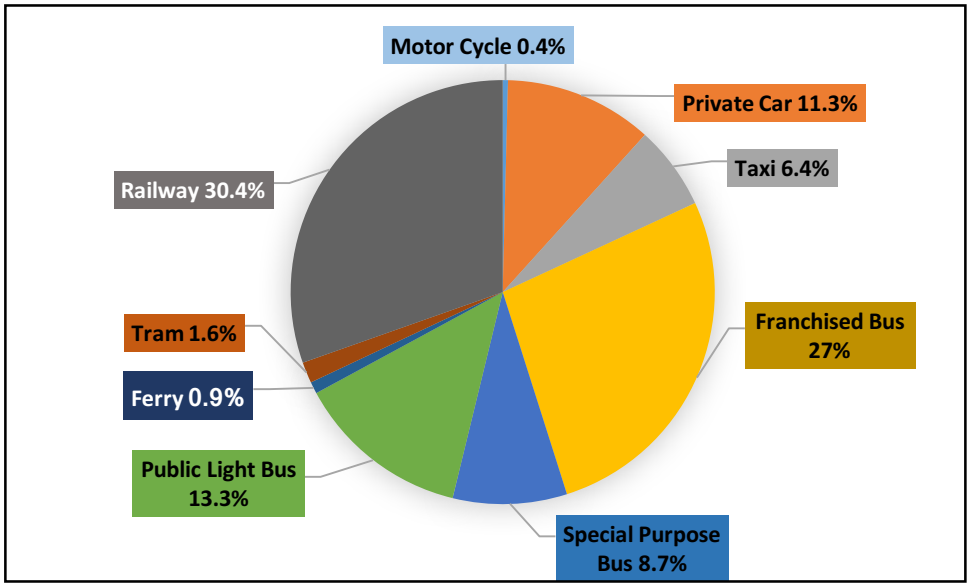

Figure 1: Weekday Daily Passenger Boarding (Modified after Transport Advisory Committee, 2014)

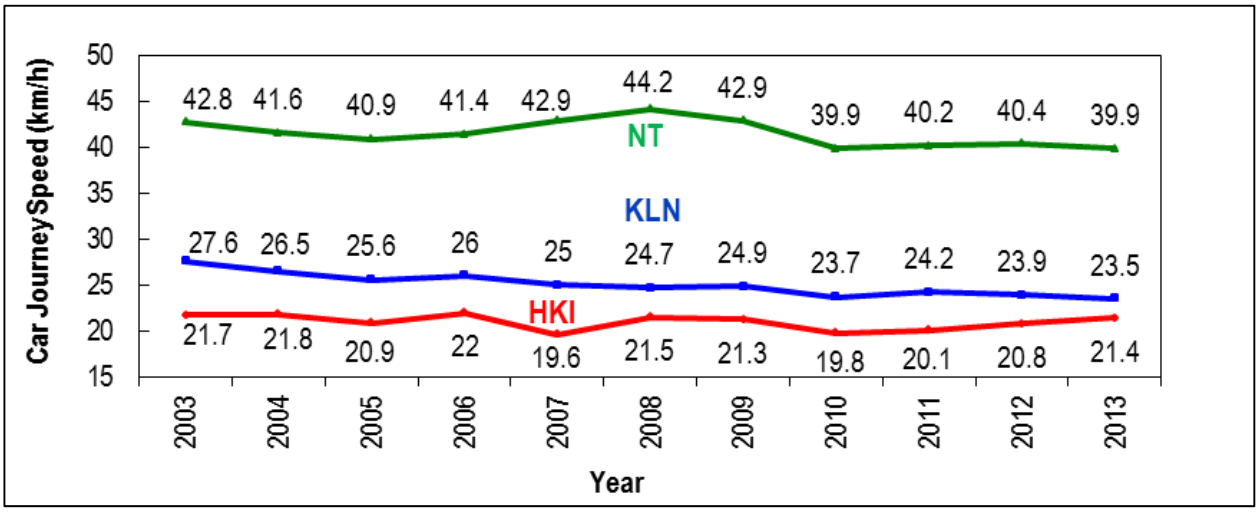

Figure 2: Car Journey Speeds During the Morning Peak Hours on Weekdays (2003-2013) (Transport Advisory Committee, 2014)

According to Figure 2, the New Territories is not as congested as Hong Kong Island and Kowloon, creating less concern for safety. The current cycling policies in Hong Kong mainly focus on improving cycling infrastructure for recreational purposes in the New Territories, where the geographical and road safety conditions allow for it (Lee, 2013). Cycling in the New Territories is "a supplementary transport mode that facilitates short-distance traveling in an

environmentally friendly manner" (Planning Department of Hong Kong, 2009). Cycling is much less popular in Hong Kong Island and Kowloon since there are no cycle tracks and cyclists must compete with motorized traffic on the roads (Transport Department of Hong Kong, 2004). Due to the traffic congestion in Hong Kong Island and Kowloon, cycling accidents occur more frequently than in the New Territories and Outlying Islands (Figure 3).

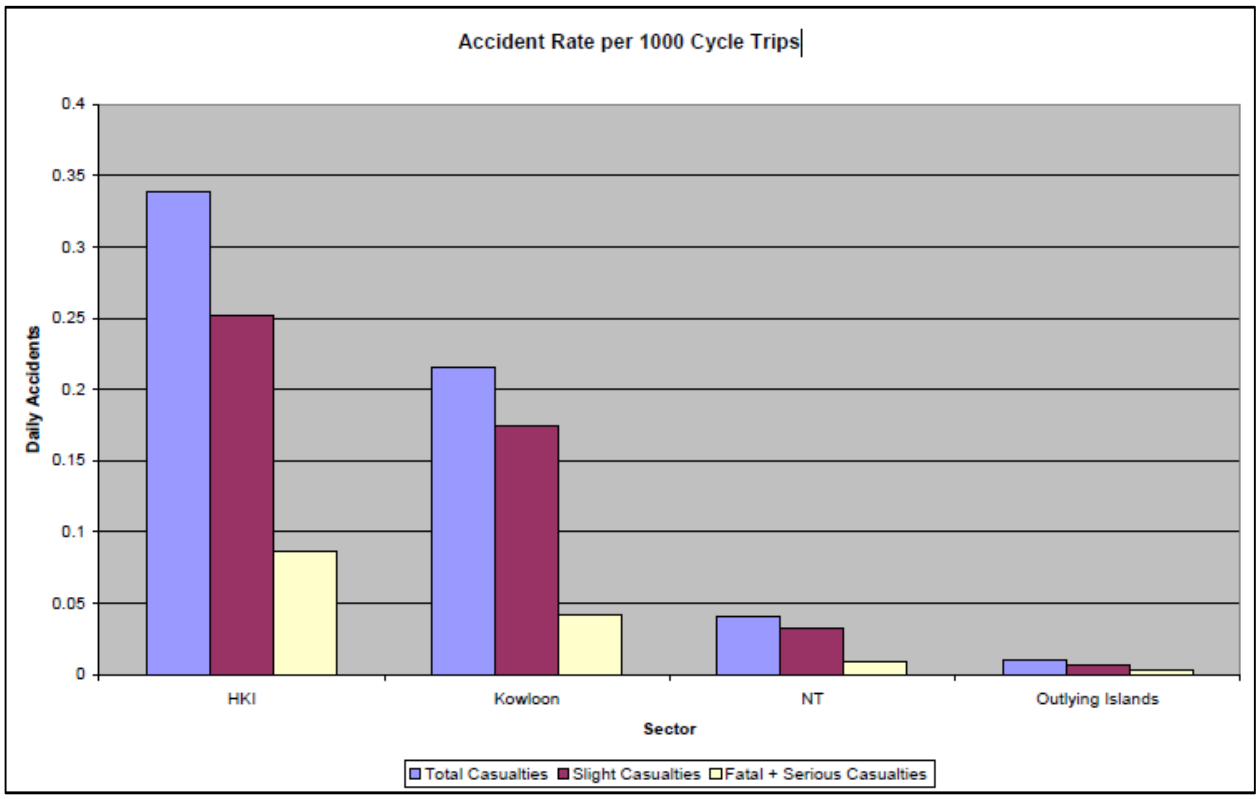

Figure 3: Weekday Accident Rate per 1000 Cycle Trips by Sector (Transport Department of Hong Kong, 2004)

In Hong Kong, cyclists are identified under two categories: Type A and Type B (Transport Department of Hong Kong, 2004). Type A cyclists are experienced and are able to cycle safely in traffic (Transport Department of Hong Kong, 2004). These cyclists prefer to cycle on roads, cycle faster than most cyclists, and can tackle steep slopes due to their high fitness levels (Transport Department of Hong Kong, 2004). Type B cyclists cycle occasionally for recreational purposes on the weekends (Transport Department of Hong Kong, 2004). These cyclists are not comfortable riding on roads and prefer to cycle on existing cycling tracks or sidewalks. The majority of people in Hong Kong are Type B cyclists and cycle for recreational purposes (Transport Department of Hong Kong, 2004). Cycling is not popular in Hong Kong

Island or Kowloon, since Type B cyclists would not feel safe competing with the traffic congestion on roads in these areas.

2.2 Recreational Cycling in the New Territories

Cycling in Hong Kong is used mostly for recreation rather than purposeful transport (Lee, 2013). Among the total 12.3 million mechanized daily trips in Hong Kong, only 62,000 (0.5%) are by bicycle (Transport Department of Hong Kong, 2004). Ninety-seven percent of daily trips by bicycle occur in the New Territories and Outlying Islands (Transport Department of Hong Kong, 2004) where the land is flatter and there are more designated bike lanes (Figure 4). Only 3% of the daily bicycle trips take place on Hong Kong Island and in the urban areas of Kowloon (Transport Department of Hong Kong, 2004), which are hillier and have no designated bicycle routes (Figure 4). For gradients steeper than 4-5%, the average cyclists will get off the cycle and walk (Transport Department of Hong Kong, 2004). Only 30% of the land area of Hong Kong is suitable for cycling if steep slopes and inland bodies of water are omitted (Transport Department of Hong Kong, 2004). While there are some flat areas around the harbor in Hong Kong Island and Kowloon that might be suited for biking, traffic density is a disincentive and there are few bike paths. The low-lying areas of the New Territories, which are less densely settled (Figure 5), are more conducive to recreational cycling, which is why most of the bike paths are located in these areas.

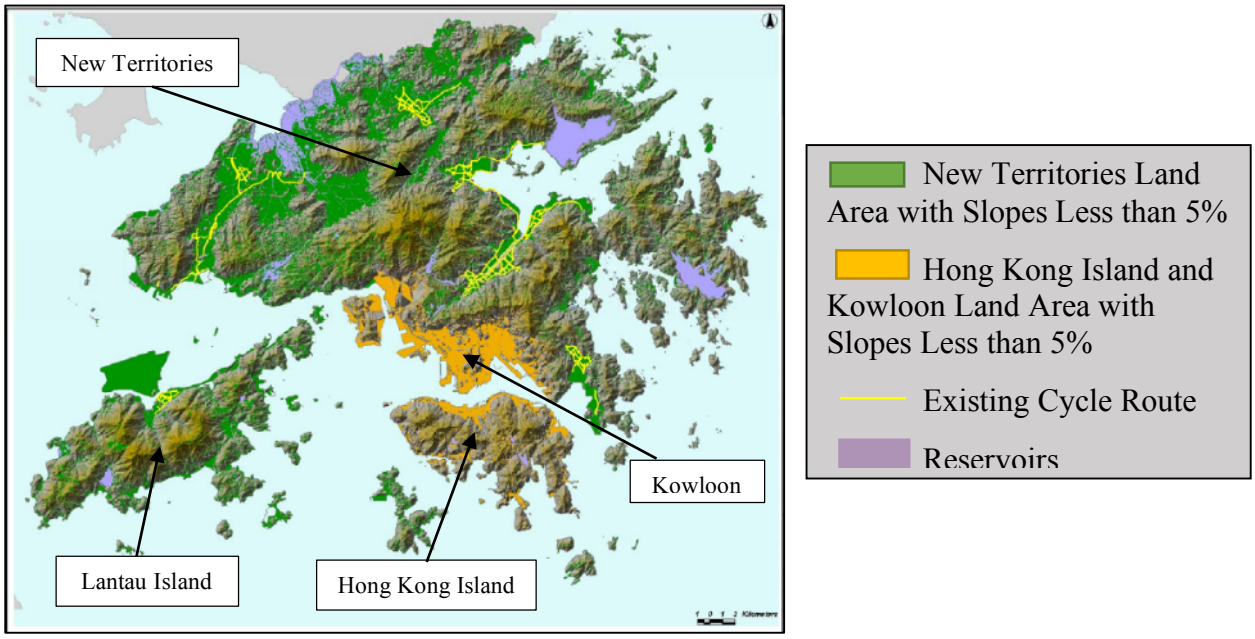

Figure 4: Suitable Land Area for Cycling in Hong Kong (Transport Department of Hong Kong, 2004)

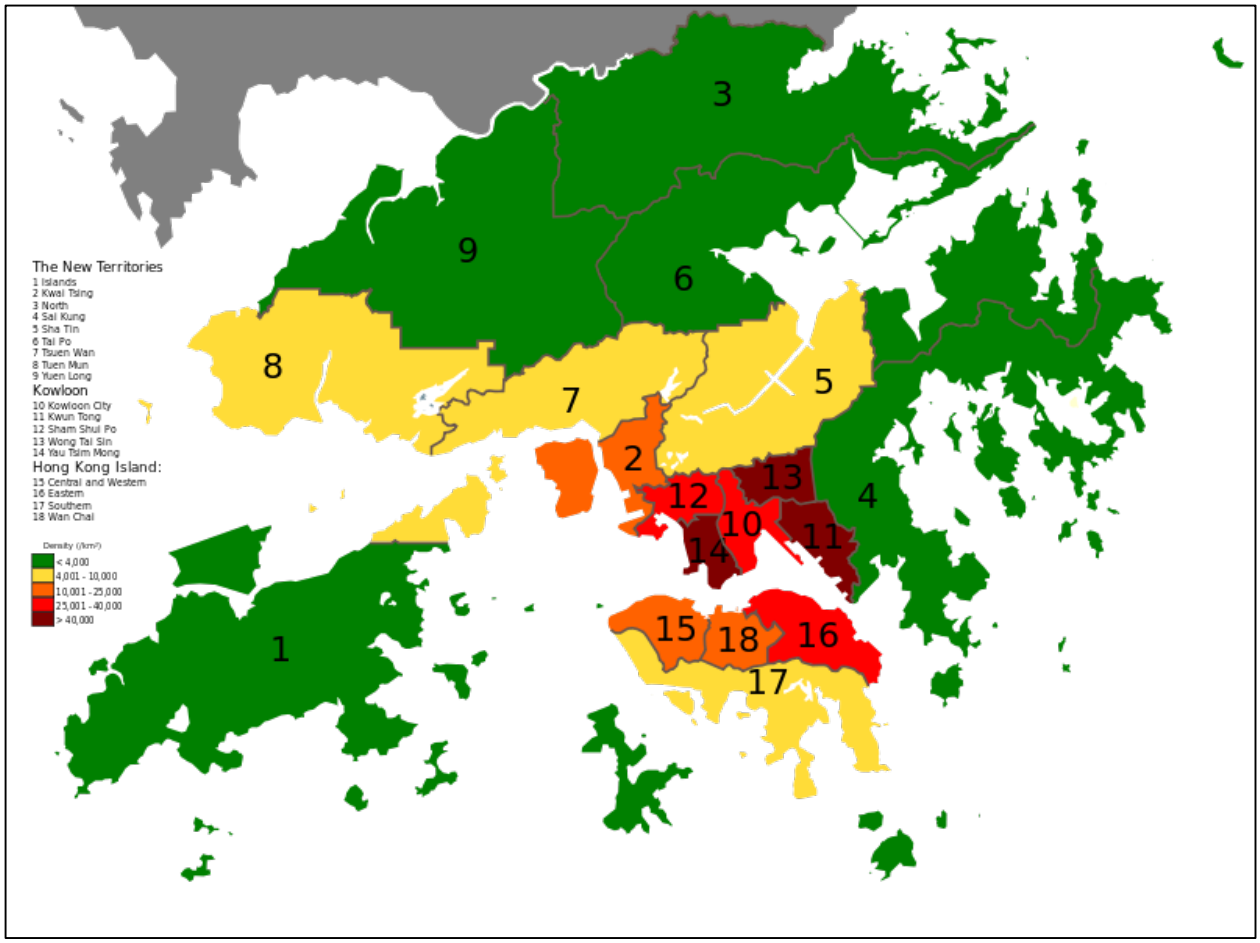

Figure 5: Population Density of Hong Kong by District (Andyso, 2016)

Cycle routes in the form of cycle tracks, or paths, provide a pleasant and safe environment for cycling (Transport Department of Hong Kong, 2004). There is a total length of 206.8 km of cycle tracks in Hong Kong, with 205 km located in the New Territories (Legislative Council of Hong Kong, 2011). In addition, 90% of the 41,400 bicycle parking spaces in Hong Kong are located in the New Territories (Legislative Council of Hong Kong, 2011). As previously stated, the majority of the population/work district lies within Kowloon and Hong Kong Island, where there are hardly any cycle tracks or bicycle parking spaces even though the geography is suitable for cycling. This is an indicator that cycling in Hong Kong is primarily used for recreational purposes, specifically in the New Territories where there is more open space than Kowloon and Hong Kong Island. Several studies were conducted to investigate the possibility of increasing the cycle track network in the New Territories. The "New Territories Cycle Track Network" was a project in 2009 to connect the existing cycling tracks in the West and East New Territories, since most of the cycle tracks in the New Territories were scattered

and disconnected (Legislative Council of Hong Kong, 2009). Additionally, there have been several other cycle track projects to create cycle tracks in tourist areas located throughout Hong Kong (Table 1).

Table 1: Cycling Track Projects (Legislative Council of Hong Kong, 2009)

Infrastructure Project	Length of Cycle Tracks (km)	Location
Waterfront at the new Kai Tak Development Area	6.6	Within the new Kai Tak Development Area
Tsuen Wan Waterfront	2.3	From Tsing Tsuen Bridge to Bayview Garden
Waterfront at Town Centre South, Tseung Kwan O	1.1	Waterfront at Town Centre South, Tseung Kwan O
Northern Waterfront of Mui Wo	0.4	From Mui Wo Pier to Silver River

2.3 Cycling Advocates Encouraging Commuting by Bike

Cities around the world are promoting biking to reduce pollution, relieve congestion, and improve health. “A century of auto-centric urban development has resulted in car-dependent cities that are segregated, gridlocked, dangerous for non-motorists, and polluted” (World Resources Institute, 2015). When proper bike infrastructure and policies exist, urban cycling is a powerful driver of sustainable, healthy, and equitable cities.

2.3.1 The World Bicycle Forum

The World Bicycle Forum is the largest global event focused on promoting cycling usage. At this event, city leaders, businesses, and engaged citizens meet to discuss the challenges cyclists face, solutions for building cycling culture, and how to make local economies more dynamic and cities more livable. At the World Bicycle Forum in late February of 2015 located in Medellin, Colombia, representatives from several cities around the world gathered to take bold steps to improve bike infrastructure: Almaty, Kazakhstan; Buenos Aires, Argentina; Mexico City, Mexico; Santiago, Chile; and Curitiba and Sao Paulo, Brazil. At the Forum, representatives agreed that it can be difficult to improve bike infrastructure since often ‘first generation’ infrastructure in cities previously lacking bike facilities misses key design features that can make cycling safe and attractive. Key design features include cycling networks that are segregated

from cars and pedestrians, which can offer riders a high level of protection (World Resources Institute, 2015).

2.3.2 The London Cycling Campaign

The London Cycling Campaign aims to transform London into a healthier, cleaner, and happier place to live by promoting cycling as a means of transport around the streets of London conveniently and without fear. They achieve this by presenting decision makers within transportation departments throughout London with arguments for encouraging bicycle use before motorized transport. These arguments include improvements to public health, reductions in traffic accidents, less motor traffic congestion, zero CO_2 emissions, and reduced air pollution. In addition, the London Cycling Campaign offers cycling products and services to individuals and organizations, such as cycling promotion events, cycle parking audits, and cycle theft insurance (London Cycling Campaign, 2016).

2.3.3 The Dutch Cycling Embassy

Worldwide, the Netherlands has the highest bicycle use per capita and provides the widest range of cycling products and infrastructure. The Dutch Cycling Embassy works to facilitate cycling worldwide as the most efficient and sustainable method of transport. They believe that cycling contributes to urban mobility, road safety, emission reductions, the economy, social inclusion, and health. The Dutch Cycling Embassy works with foreign parties that want to promote cycling by pairing them up with Dutch experts located within the government or business sector of cycling promotion. The Dutch Cycling Embassy works on projects with cities worldwide such as Melbourne, Australia; Beijing, China; and Cape Town, South Africa to promote cycling. Many of these cities do not have sufficient infrastructure in place to promote cycling as well as the Netherlands. However, the Dutch Cycling Embassy works to provide these cities with resources and representatives that can help propose plans to increase cycling usage at each city (Dayman Media, 2016).

2.3.4 The Hong Kong Cycling Alliance

The Hong Kong Cycling Alliance is an advocacy group that is working to make Hong Kong a more bicycle friendly city. The organization believes that traveling by bicycle is the most energy efficient and sustainable way to travel. This group advocates for programs to encourage

increased levels of cycling in Hong Kong, including more bike lanes, new bike share programs, and education programs. This group references successful solutions in cities around the world, such as London, when promoting these ideas. To create an environment that is truly safe, the Hong Kong Cycling Alliance focuses on nine major points:

- Keep the streets safe.
- Advance stop lines for bikers to move in front of cars.
- Bike lanes.
- Contraflow cycle lanes.
- Bicycle parking.
- Allow bicycles on ferries, trains, and buses.
- Publish literature on bicycle safety.
- Educate people to ride bicycles.
- Educate drivers on road safety with bicycles.

Although the Hong Kong Cycling Alliance has made progress in implementing their ideas, they are still struggling to promote cycling as a means of transport in Hong Kong due to many of the barriers outlined in Section 2.4 (Hong Kong Cycling Alliance, 2016).

2.3.5 Bike The Moment

Bike The Moment is an "urban cycling and lifestyle platform" in Hong Kong (Bike The Moment, 2016). One of the main goals of this organization is to promote cycling as the next trend in transportation. According to their website, they believe that the bicycle "should be a part of… daily city life" (Bike The Moment, 2016). Through a variety of programs and outreach events, Bike The Moment tries to spread a love for cycling around Hong Kong. Projects including a monthly Saturday night bike ride, Lulu Yo's cycling trips, and gathering and spreading testimonials of cyclists in the city have been a major part of the organizations' efforts.

On the first weekend of every month, Bike The Moment organizes a community bike ride. These events serve as promotions for cycling as well as a chance for cyclists to gather and discuss the state of cycling in Hong Kong. The first Saturday night ride was in December of 2013 and the program is still active today. One of the members of Bike The Moment, Lulu Yo, goes on cycling trips around the world in cities with large cycling cultures. She publishes her stories to Bike The Moment's webpage for readers to learn about the cycling culture in other

cities. These trips started in 2013. Bike The Moment also gathers stories and testimonials from local cyclists. The goal of compiling these stories is to encourage cycling by sharing success stories of other people in Hong Kong.

2.4 Barriers and Lessons Learned Around the World

Around the world, cities struggle to overcome the many barriers to getting citizens to bike more. People make choices not to commute via bike for many reasons including personal safety concerns, distance and access concerns, and social and cultural factors. In this section, we discuss these barriers as well as examine different solutions that have been implemented around the world.

2.4.1 Safety

Many people choose not to ride bicycles because of concerns about personal safety related to crime or traffic accidents (Bird, 2010). When the environment is perceived to be unsafe, then physical activity levels will decrease (Wang, Chau, Ng, & Leung, 2016). There are objective and subjective variables involved with the level of safety for cyclists (Bird, 2010). Objective variables include proper travel lanes, traffic volume or speed, and road or path conditions (Bird, 2010). Subjective variables include the riders' skill level, comfort riding alongside traffic, and the community's bicycle awareness and support (Bird, 2010). The absence of cycle lanes that separate motor traffic and cyclists and a lack of bicycle parking facilities make riders feel unsafe and fearful (Lee, 2013). If there is a lack of secure parking facilities at the place of destination, people may choose not to bike due to concerns about bicycle theft (Community Cycling Center, 2012). In addition, some drivers are unfamiliar with the rules of the road and the rights of bicyclists, which many cyclists view as drivers being hostile towards cycling. On the other hand, cyclists are often negligent of traffic laws causing accidents as well (Community Cycling Center, 2012).

An increase in cycling infrastructure will decrease the level of concern for safety in cyclists. One way to increase cycling infrastructure is by creating more bicycle lanes. From 2007 to 2014, the city of Boston increased its total bicycle lane mileage from 0.034 miles to more than 92 miles. A recent study shows that during Boston's bicycle infrastructure expansion, there was a 14% reduction in the odds of being injured in a bicycle accident from 2009 to 2012 (Figure 6),

even as the percentage and number of commuters traveling by bicycle increased. Not only does creating more bicycle lanes reduce the odds of being injured in a bicycle accident, but it also encourages commuters to cycle. The increase of bicycle lane mileage resulted in a 140% increase of bicycle commuters from 2007 to 2014 in Boston (Pedroso, Angriman, Bellows, & Taylor, 2016).

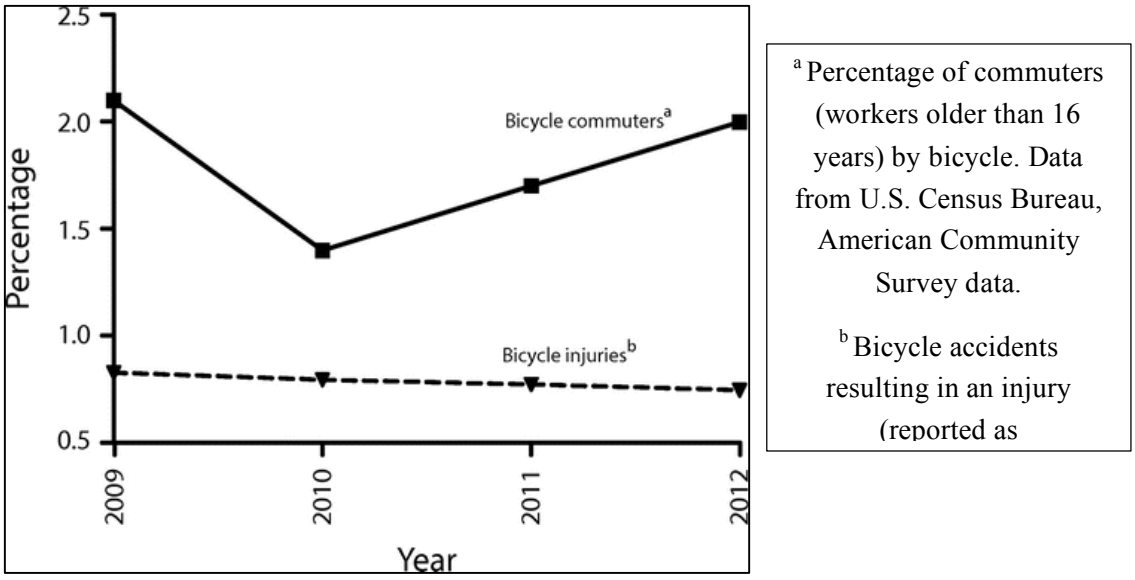

Figure 6: Trends in Bicycle Use and Cyclist Injuries: Boston, MA, 2009-2012

(Pedroso et al., 2016)

In the Netherlands and Germany, most intersections provide separate traffic signals for cyclists (Lee, 2013). Cyclists get advance green lights and are allowed to make right turns at intersections when the traffic signal is red (Pucher & Buehler, 2007). In addition, cyclists have advanced waiting positions in front of motorized vehicles (Lee, 2013). These rights facilitate safer and quicker crossings and turns, allowing cyclists priority in an intersection. In Denmark, cyclists are treated like all other vehicles. For example, if a car is coming from a side street, they must give way to a cyclist traveling on a main street (Krag, 2002). The city of Keil, Germany, has established cycle streets where cyclists have priority over cars, and cyclists are allowed to travel on the whole width of the roadway while cars must reduce their speed to 30 km/h or less (Lee, 2013). By providing cycling infrastructure, such as bike racks and bike lanes, and by giving cyclists priority over cars on streets and at intersections, the level of concern for safety in cyclists will decrease.

2.4.2 Distance of Cycle Route

The distance between the point of origin and destination is another factor that discourages people from cycling as a means of transportation (Wang et al., 2016). People are less likely to cycle and utilize cycling facilities that are located far away from their homes. A majority of people are only willing to spend 20-30 minutes cycling to a destination (Jarvis, 2011). A study showed that the ideal distance for workers to cycle to work is between 2 and 5 km. A distance of less than 2 km is less popular for cycling because it is considered walking distance; and, a distance over 5 km requires too much time and effort to cycle to work (Parkin, Ryley, & Jones, 2007).

2.4.3 Access to Cycle Infrastructure

Low accessibility to cycling facilities is caused by physical and economic limitations (Wang et al., 2016). This includes people not being able to cycle to a destination because the roads do not permit cycling, or people who cannot afford a bicycle. There are many benefits of providing facilities at the destination of cycling trips. The benefits to the employer include a healthier and happier workforce, higher productivity and better attitudes towards work, reduction in absenteeism, reduced car parking demands and associated costs, and an improved environmental and healthy image for the work organization (League Staff, 2016). Work places can include facilities such as bicycle parking spaces, showers, changing rooms, and lockers. Providing changing rooms and showers can encourage people to ride longer distances to work. Work places could also provide financial incentives to promote cycling to work such as discounts for bicycle and equipment purchases, or providing free bike rental, helmets, and locks allowing employees to ride for work purposes (League Staff, 2016). Providing accessibility to cycling facilities can encourage employees to cycle to work.

2.4.4 Social and Cultural Barriers

Studies have concluded that most commuters choose their method of transportation based on rational decisions, but others argue that habit and cultural inertia play a larger role (Anable, 2005). People in the habit of using other modes of transportation are less likely to ride a bicycle because they are less likely to investigate information about different transportation options including cycling (Heinen, Van Wee, & Maat, 2010). People who frequently use non-motorized

and public transportation tend to have more ecological beliefs than those who use motorized vehicles (Heinen et al., 2010). Leisure cycling leads to a higher likelihood of cycling for commuting as well (Stinson & Bhat, 2004).

A National Bicycling and Walking Study Update from the U.S. Department of Transportation found that there is a need for more promotion and public awareness of bicycle issues (U.S. Department of Transportation, 2009). In response, the City of Austin Streets Smarts Task Force recommended a promotional campaign to increase awareness of cycling benefits (Austin City Council, 2014). The city of Portland, Oregon is another example of a city with a successful cycling education campaign (Portland Bureau of Transportation, 2016a). Programs such as these inform the public about the benefits of cycling and help to promote and create a cycling culture throughout cities.

2.4.5 European Cycling Policies

In the 1970s, European cycling policies primarily focused on increasing the total length of bicycle paths (Lee, 2013). Good infrastructure for bicycle traffic does not always lead to an increase in bicycle use. Due to this, bicycle policy began to incorporate more soft measures rather than the construction of infrastructure (Welleman, 2002). In the Netherlands, Denmark, and Germany, bicycle policy used to be associated with transport policy as a whole. Now, all of these countries have national bicycling plans, which focus on improving various aspects of cycling (Lee, 2013). “A national policy plan helps set out the legal and regulatory instruments for safe and efficient bicycle use so that the local areas could implement them” (European Parliament, 2010). In Europe, municipalities have the responsibility to carry out cycling policies and programs. The municipalities in Europe are able to develop local bicycle plans to promote cycling with financial support from federal governments (European Conference of the Ministers of Transport, 2004).

2.4.6 Bike Share Programs

One of the most common methods for increasing bike ridership around the world is a bike share program. At its core, a bike share program is the provision of bikes intended for short-term rental. Bike share programs vary greatly in their implementations and effectiveness. These programs have existed for over fifty years, and have become a lot more popular recently with

bike share programs being built in London, New York, Hangzhou, and Shenzhen (Fishman, Washington, & Haworth, 2013).

In 1965, an organization in Amsterdam released the White Bike Plan as a free system. All of the bikes "were painted white, left permanently unlocked, and placed throughout the inner city for the public to use freely" (Shaheen, Guzman, & Zhang, 2010). While the plan was supposed to help reduce traffic problems in the inner city, the program was ultimately a failure. Shortly after launch, the program was discontinued after many of the bikes were stolen or damaged (Shaheen et al., 2010). Other free bike sharing systems followed this initial attempt but many fell victim to the same problems as the White Bike Plan.

European bike sharing systems have evolved from these initial attempts. In Copenhagen, the city government and the City Bike Foundation of Copenhagen launched Bycyklen in 1995. Bycyklen was much larger and much more sophisticated than the White Bike Plan and other free solutions. The program involved 1,100 bikes that were locked and scattered throughout the downtown area at specified bike racks. After a small coin deposit, a biker could unlock the bike, use it for a period of time, and then return the bike to any Bycyklen bike rack for a refund. The program in Copenhagen has grown and continues to operate today. The success of Bycyklen has led to the development of several more bike sharing programs across Europe.

In Asia, bike sharing systems are much younger, but much faster growing. To combat many of the issues that plagued the early European bike sharing initiatives, the newer Asian programs in South Korea, Taiwan, and China are using technology such as magnetic striped membership cards. The largest bike sharing program in Asia, the Public Bicycle system in Hangzhou, China, operates with over 50,000 bikes. According to Shaheen, "increasing the number of bicycle stations… means that tourists and residents will have access to a bicycle station every 200 meters" (Shaheen et al., 2010). The most remarkable part of Hangzhou's system is that no bicycles were lost in the first year of implementation (Shaheen et al., 2010).

The two main characteristics that differentiate bike share programs are bike access and return procedures and bike rack locations. Some government sponsored programs, like the White Bike Plan, allow people to take and use bikes at will for little or no cost. These programs, while popular, are prone to theft and mistreatment of bikes. To ensure bikes are returned, most bike

share programs require users to pay a deposit or rental fee. Bycyklen requires the rider to pay a cash deposit upfront for the ride, which is returned to them upon bike return. The most common model now uses electronic payment to rent bikes. Payment is taken periodically as the bike is used until the electronic network marks a bike as returned. In these systems, users pay with an account with the company, a credit card, or a public transit card. The chance of bike theft is substantially lowered when electronic records track bike rentals (Shaheen et al., 2010).

The other important detail of bike share programs is where riders pick up and drop off bikes. The systems without restrictions on where people leave bikes have little or no security. Most modern bike sharing efforts use marked bike racks to track the borrowing and returning of bikes. Users return bikes to marked bike racks in order to pay for their rental and to check the bike back in. The Chinese government's implementations have involved mobile bike racks (Shaheen et al., 2010). The government moved the bike racks around and measured bike usage until optimal locations were found, where the racks were then set up as fixed stations.

Finally, the newest innovation in bike sharing uses smart phones and Wi-Fi enabled bikes to allow people to return the bikes anywhere. Ofo and Mobike, both Chinese startups, allow cyclists to determine the location of the nearest bike through a phone app and quickly send a wireless signal to the bike to unlock itself (Bloomberg Technology, 2016). After use, the bikes are locked up anywhere for the next person to discover. These systems do not require large or expensive bike racks; however, they must have sufficient infrastructure for bike parking around the city. All payment and tracking of the bikes is handled using wireless technology.

2.4.7 United States Case Studies

Our sponsor requested that we study cities in the United States with successful cycling promotion programs for comparison to Hong Kong. We selected New York City; Austin, Texas; and Portland, Oregon.

New York City is one of the largest cities in United States, and is on the forefront of promoting cycling for transportation. According to census data, 11% of adults in New York walk or cycle to work compared to just 3% in the rest of the country (New York City Departments of Health and Mental Hygiene, Parks and Recreation, Transportation, & New York City Police Department, 2010). According to the New York City Department of Transportation, "cycling is

booming in New York" (New York City Department of Transportation, 2017). New York City doubled commuting by cycling between 2007 and 2011, and the goal is to triple it in the coming years (New York City Department of Transportation, 2017). Currently, 86% of all auto trips in New York City are less than three miles, a bikeable distance. In just three years, the Department of Transportation built 200 miles of bike lanes, doubling the on-street bike network.

New York City has a bike share program called Citi Bike that was launched in 2013. With safety as a top priority, Citi Bike prints the cardinal rules for cyclists on the handle bars, allowing inexperienced riders to stay safe and informed. Each bike is also equipped with "always-running lights and bells and all-weather drum brakes" (New York City Department of Transportation, 2017). So far, Citi Bike has 10,000 bikes, 600 stations, and is in 55 neighborhoods in New York City and is still growing.

Through the implementation of the "Bicycle Master Plan," the city of Austin has improved cycling infrastructure around the city. Since the beginning of the implementation of the "Bicycle Master Plan," Austin's Department of Transportation has been working to connect bike paths in the city. Austin has many different areas with good cycling infrastructure, but there are also areas of discontinuity in the bike paths. The Department of Transportation is working to improve the connectivity of the bike paths and create a continuous cycling network. Austin has been considered a good city for cycling and was named a "gold-level bicycle friendly community" (The League of American Bicyclists, 2015).

Portland has been a model for cities looking to implement cycling, being named *Bicycling* magazine's number one bike-friendly city year after year. Portland was also designated a "platinum-level" cycling community (The League of American Bicyclists, 2016). A few of the programs implemented by the city of Portland include adding 188 miles of bike lanes, 19 bicycle-specific traffic signals at intersections to improve safety, and 6,500 publicly-installed bike racks (Portland Bureau of Transportation, 2016b). Portland's three separate bicycle plans, implemented in 1973, 1996, and 2010 respectively, have established policies and goals that have made cycling an "integral part of daily life" (Portland Bureau of Transportation, 2016b). In Portland, 7.2% of commuters cycle to work. Not only is this the highest of any large American city, but is 6.7% higher than the national rate (Portland Bureau of Transportation, 2016a). In addition to infrastructure improvements, Portland has implemented traffic engineering plans to

make school zones safer, education programs to teach children about traffic safety, and a bike-sharing program with over 100 stations (Portland Bureau of Transportation, 2016b).

2.4.8 Alternative Solutions

Other communities try to promote cycling in different ways. For example, in Sydney, Australia, the Cycling Connected Communities (CCC) project looked to promote cycling with "a range of community engagement and social marketing activities" (Rissel, New, Wen, Merom, Bauman, & Gerrard, 2010). The goal of the CCC project was to encourage public use of new bike paths in the area. While the motivation may be different, the end goal of this project was very similar to one of our goals of encouraging the use of cycle infrastructure. The CCC provides several different strategies including skills and proficiency training, media awareness, workplace presentations, and community bike rides (Rissel et al., 2010).

Pucher, the author of a study pertaining to cycling, looked into many different types of programs to improve bike ridership. The programs included everything from citywide implemented bike lanes to employers installing showers at workplaces. He noted that the success of any given program is very hard to evaluate due to poor testing settings (Pucher & Buehler, 2007). Pucher also presents several reasons why cycling promotional programs and infrastructure development alone may be insufficient in increasing ridership. He discusses possible factors such as land use patterns and car ownership.

2.4.9 NACTO Guidelines

NACTO, the National Association of City Transportation Officials, is a non-profit organization that represents large cities on transportation issues of local, regional, and national significance. This organization works by promoting transportation standards and allowing the exchange of ideas and insights to solve transportation problems around the world. NACTO is well-known for the guidelines and standards they publish regarding cycling in an urban environment. These standards are called the NACTO Urban Bikeway Design Guide and are a part of NACTO's Cities for Cycling Initiative (National Association of City Transportation Officials, 2016).

The Urban Bikeway Design Guide focuses on five aspects of infrastructure: bike lanes, cycle tracks, intersections, light signals, and signs and markings. The guide suggests three levels

of implementation for each aspect of infrastructure: required, recommended, and optional. This guide states that the best way to implement cycling infrastructure is for engineers to approach each issue on a case-by-case basis. (National Association of City Transportation Officials, 2016).

According to NACTO, bike lanes are essential to a cycling-friendly community. A bike lane is defined as a portion of the roadway that has no physical barrier between the lane and the road and has been designed specifically for bicycles through striping, signage, and pavement markings (Figure 7). Depending on the existing levels and behaviors of traffic on the main roadway, careful consideration should be made when implementing any type of bike lane (National Association of City Transportation Officials, 2016). Bike lanes enable cyclists to ride at their preferred speed without interference of potential road hazards, and they drastically decrease the number of accidents per year involving bicycles (People for Bikes, n.d.).

Figure 7: Markings on a Conventional Bike Lane (National Association of City Transportation Officials, 2016)

Cycle tracks are another form of transportation infrastructure for cycling. They are similar to bike lanes; however, they require a physical barrier that separates them from the roadway and sidewalks (Figure 8). Cycle tracks are most effective where there is a high volume of motor vehicle traffic and also need for biking infrastructure. There are one-way protected

cycle tracks, raised cycle tracks, and two-way cycle tracks. The type of cycle track should vary depending on the severity of the motorized traffic in the area and on the allotted space on the road (National Association of City Transportation Officials, 2016).

Figure 8: Cycle Track (National Association of City Transportation Officials, 2016)

Treatment of intersections is also important under the Urban Bikeway Design Guide. Designs of intersections that include bicycle facilities reduce or remove conflicts between bicycles and motorized vehicles. Intersections should be designed by highlighting the level of visibility, denoting a clear right-of-way, and facilitating eye contact and awareness with competing modes of transportation. Use of signals and markings ties closely into creating safe intersections by raising awareness of competing forms of transportation, denoting safe areas for bicycles, and increasing visibility (National Association of City Transportation Officials, 2016).

Bicycle boulevards are a recommended form of infrastructure used in bicycle-friendly cities. These are streets with low motorized traffic volumes and speeds where bicycles are given travel priority (Figure 9). Like all forms of bicycle infrastructure, signals and markings are key to permitting safe use for all travel mediums. To properly implement a bicycle boulevard, navigation signs must be clearly visible to allow for direction. Bicycle boulevards are not

common or feasible to implement in every city, but can be helpful when creating cycling infrastructure over a wide area. Speed management of motor vehicles is typically the most limiting factor to creating a boulevard or a cycle track (National Association of City Transportation Officials, 2016).

Figure 9: Bike Boulevard (National Association of City Transportation Officials, 2016)

2.5 Summary

In Hong Kong, cycling is used mostly for recreational purposes. The city lacks policies to promote cycling, and the only current infrastructure exists in the New Territories. In urban areas, such as Kowloon and Hong Kong Island, where the population density is the highest in Hong Kong, there is little infrastructure to promote cycling for transport to and from work. Through intensive research, our group further explored the barriers preventing commuting by bike in Hong Kong, and continued to explore innovative ways to overcome them by studying how other cities overcame those barriers.

3. METHODS

The overall goal of this project was to assess the feasibility and limitations of using cycling for the first and the last mile of commuting in Hong Kong. In order to achieve this goal, the team established three project objectives, each with a set of associated tasks described below.

- Objective 1: Assess best practices used in the United States to promote biking at the beginning and end of commuting trips.
- Objective 2: Evaluate the current policies, programs, and practices regarding biking and commuting by bike in Hong Kong.
- Objective 3: Evaluate the feasibility and desirability of promoting biking at two selected locations in Hong Kong.

3.1 Assess Best Practices Used in United States

We continued to build on the assessment of biking programs in the United States presented in the background section by conducting more in-depth analyses of programs in three cities in the United States. Specifically, we looked at Austin, Texas; New York City; and Portland, Oregon. We chose to investigate these cities because they have successfully implemented cycling promotion programs and each relates in different ways to Hong Kong. Austin was chosen for its relatively recent increase in cycling promotion and more specifically their Bicycle Master Plan (Austin City Council, 2014). With programs like Transportation Alternatives and New York Bicycle Coalition, New York City is also a good candidate city for research (New York City Department of Transportation, 2017). Finally, we chose to research Portland because of its impressive cycling infrastructure (Portland Bureau of Transportation, 2016a). Information on the success of programs and cycling infrastructure in these cities is provided in the background section.

We contacted the offices of transportation and biking advocacy groups in these three cities to gather qualitative information about the programs they have implemented. Interviews with representatives from offices of transportation focused on which elements of their programs were most effective, which were hardest to implement, and the specific barriers that had to be overcome. Interviews with representatives from the biking advocacy groups focused on how they

work to implement policies that benefit cycling as a means of transportation, as well as the barriers they have faced. We reached out to these representatives initially via email before leaving for Hong Kong. Because we were not able to meet with any of these individuals in person, we conducted interviews via phone. Questions and topics for these interviews were formulated and revised by our team based on feedback from our sponsors. The information on interviewees from the U.S. cycling organizations and the respective locations of interview questions and interview summaries are displayed in Table 2.

Table 2: United States Contacts

ORGANIZATION	PERSON CONTACTED	AFFILIATION/CREDENTIALS	INTERVIEW QUESTIONS (Appendix A)	INTERVIEW SUMMARY (Appendix B)
New York City:				
NYC Transportation Alternatives	Julia Kite	Policy and Research Manager	A.1	B.1
New York Bicycle Coalition	Kyle Hatch	Project Coordinator	A.2	B.2
Portland:				
Portland Bureau of Transportation	Roger Geller	Bicycle Coordinator	A.3	B.3
The Street Trust	Sheilagh Griffin	Education Director	A.4	B.4
Austin:				
Austin Active Transportation Division	Mike Schofield	Transportation Planner/Designer	A.5	B.5
Bike Austin	Miller Nuttle	Campaign Director	A.6	B.6

All questions for interviews were developed in cooperation with our sponsor and advisors. After each interview, we met as a group to review the questions and responses given, and made improvements to the set of questions for the next interview. As an introduction to each interview, we read a preamble to gain verbal consent from the interviewee. We asked each interviewee if it was okay to take an audio recording of our conversation and adapt select quotations for use in our report. We offered a chance to review all quotations and attributed statements before publication. This preamble is included in Appendix C. With the information collected in our contact with other cities' cycling programs, we made comparisons to Hong Kong and drew conclusions from each cycling program.

3.2 Evaluate the Current Policies, Programs, and Practices in Hong Kong

To evaluate the policies, programs, and practices in Hong Kong, we conducted a series of interviews with key stakeholders within Hong Kong cycling. We identified three groups of people to interview: transportation legislators, spokespersons from cycling advocacy groups, and representatives from organizations within Science Park.

We interviewed Dr. Edward Yiu, a councilman, professor in Geography and Resource Management, and member of the Legislation Council of Hong Kong. The goal of this interview was to gain insight on specific government policies and programs regarding cycling. We also interviewed Martin Turner, chairman of the Hong Kong Cycling Alliance. We wanted to learn what efforts this organization has taken to promote cycling in Hong Kong and the results of their efforts. We also wanted to understand what obstacles they have encountered when trying to encourage cycling and how they have overcome these obstacles. Previous projects that this organization has undertaken have provided a good background for some of our proposed solutions. Specifically, we looked to gain information on the Alliance's opinion on promoting cycling for commuting. A similar interview was conducted with Hughes Lau, the director of Bike The Moment in Hong Kong. This is an organization which organizes community bike rides. These events serve as promotions for cycling as well as a chance for cyclists to gather and discuss the state of cycling in Hong Kong. In Science Park, we conducted an interview with Jessica Lau, the communications director for the bike shop The Contact Design Store. Lastly, we interviewed Jerry Cheung, assistant manager of sustainability within the management office of Science Park. This interview was conducted to understand the opinion of Science Park management with regards to cycling as a means of commute and what facilities are available if an employee were to cycle to work. Table 3 lists our contacts in Hong Kong, their organizations, positions, and respective locations of interview questions and interview summaries. The process of constructing the interview questions and the preamble given for each interview for the Hong Kong contacts were the same as the process of constructing interview questions and the preamble given for U.S. contacts. With the information collected in our contact with Hong Kong organizations, we drew conclusions and made comparisons with the U.S. organizations.

Table 3: Hong Kong Contacts

ORGANIZATION	PERSON CONTACTED	AFFILIATION/CREDENTIALS	INTERVIEW QUESTIONS (Appendix A)	INTERVIEW SUMMARY (Appendix B)
Hong Kong:				
Legislation Council of Hong Kong	Edward Yiu	Professor/Councilman	A.7	B.7
Hong Kong Cycling Alliance	Martin Turner	Chairman	A.8	B.8
Bike The Moment	Hughes Lau	Director	A.9	B.9
The Contact Design Store	Jessica Lau	Communications Manager	A.10	B.10
Science Park Management Office	Jerry Cheung	Assistant Manager of Sustainability	A.11	B.11
Yuen Long District Council	Wong Wai-shun	Vice Chairman	A.12	B.12

3.3 Evaluate the Feasibility and Desirability of Promoting Biking at Two Selected Locations in Hong Kong

This section explains the methods our group used to evaluate the two preselected locations in Hong Kong and conduct surveys at these locations.

3.3.1 Observing Science Park and Tin Shui Wai

Our sponsor identified two sites to analyze and determine ways to promote cycling usage for commuting purposes. The two sites are Science Park and Tin Shui Wai. Science Park is located on the east coast of the New Territories and contains many high-technology enterprises. Promotion of cycling usage at this site involves the morning commute from the MTR station to work, and the afternoon return trip from work to the MTR station. The second site, Tin Shui Wai is located in the northwestern New Territories and contains many residential buildings. Cycling promotion at Tin Shui Wai involves the first-mile commute in the morning, from home to the MTR station, and the last-mile commute in the afternoon, from the MTR station to home. Figure 10 shows the locations of Science Park and Tin Shui Wai within the New Territories.

In order to begin analyzing each site, our group created an observation sheet (Appendix D). Based on discussion with our sponsors and literature review (Moudon & Lee, 2003; Saelens, Sallis, & Frank, 2003; Winters, Brauer, Setton, & Teschke, 2013), the observation sheet was

categorized into the following sections: bike accessibility, intersections, bike path network, and environment. Bike accessibility includes observations and analysis of the biking infrastructure present such as bike paths, bike racks, and bike signage. Intersections contains data on how many intersections are present throughout the bike route with the bike path and road and the quality and safety of each intersection. Bike path network includes observations on continuity of bike paths, the different route options to get from the site to the MTR station, and the total travel distance of the bike route. Environment includes observations on the cleanliness, buildings, and scenery surrounding the bike paths and the site. Finally, the observation sheet provides space for general observations that would impact cycling trips during peak commuting hours. Based on a discussion with our sponsors, peak hours for commuting in the morning are from 07:30-09:00, and peak hours for commuting in the afternoon are from 17:30-20:00. In addition to the observation sheet, we created an assistive guide providing information on what to look for and record for each section (Appendix E). This assistive guide was made to aid each member in making consistent observations across sites.

Figure 10: Location of Science Park and Tin Shui Wai in the New Territories (Modified after Google Maps, 2017)

For each site, our group followed a procedure in order to efficiently analyze each site and fill out the observation sheet. Our first visit was to Science Park (Figure 11). Our sponsors told us to focus on the commuting trip between University station, the nearest MTR station (Figure 12), and Science Park. To begin our visit at Science Park, we rented bikes from The Contact Design Store, which is located right at the site. After renting bikes, each of us used the app CityMapper to identify the bike route to get from Science Park to University station. In addition

to CityMapper, we used the app MapMyRide in order to track our bike route. Once the journey was completed from Science Park to University station, MapMyRide displayed the distance traveled and the elevation change along the route. These data are shown as a graph over the entire route. The observation sheet was filled out for the bike route from Science Park to University station. Some sections of the observation sheet were filled out on site, and other sections were filled out after the visit using the online software Geographic Information System (Greninger, Klemperer, Nokleberg, Aitken, & Diggles, 2016). Geographic Information System was used to measure distances, which was helpful for certain sections of our observation sheet.

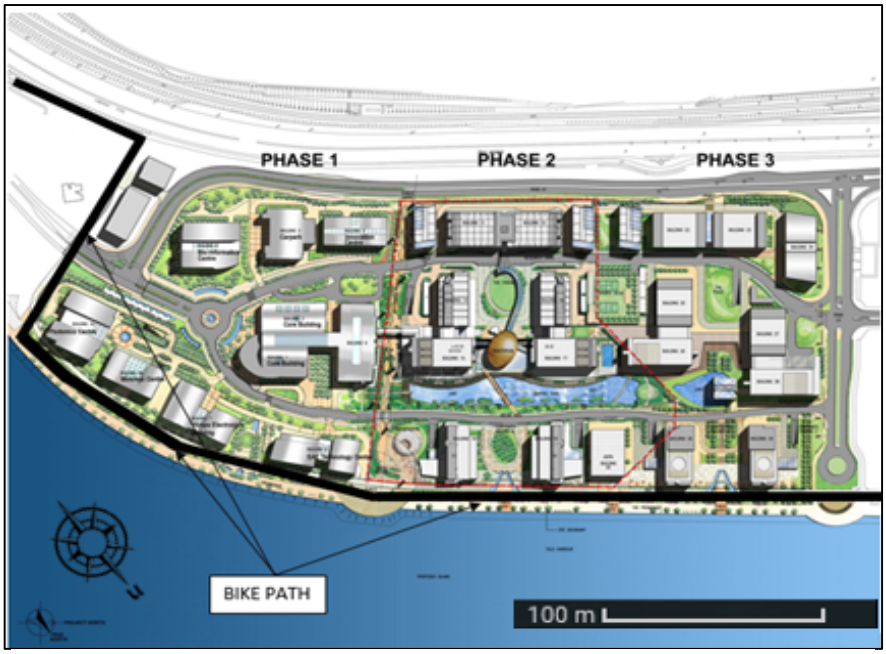

Figure 11: Location of Bike Paths around Science Park

(Modified after Wee, 2007)

Figure 12: Location of University Station and Science Park

(Modified after Mass Transit Railway Corporation, 2014)

Due to the layout of the site, the procedure to analyze Tin Shui Wai was conducted slightly differently than Science Park. Tin Shui Wai is much more spread out than Science Park and has one MTR station, Tin Shui Wai station, located at the southeast border of the district. Since there are no bike rentals at this location, we had to rent our bikes at Tin Fung Bicycle Company located outside of the Long Ping MTR station.

Prior to our visit at Tin Shui Wai, we examined a map, which displayed the locations of all the residential buildings and the MTR station. Using this map, we created two starting points in different locations throughout Tin Shui Wai where clusters of residential buildings are present (Appendix F). During our visit at Tin Shui Wai, the procedure was similar to Science Park. Each of us started at the indicated points and rode our bikes to the MTR station with the assistance of CityMapper and MapMyRide. The observation sheets were filled out the same way as in Science Park, including the use of GIS after the visit to measure distances.

Using the data collected in all of the observation sheets, we were able to summarize the characteristics of the cycling environment at each site. This information helped us to propose a set of recommendations to promote cycling for commuting purposes in both Science Park and Tin Shui Wai.

3.3.2 Surveying Commuters at Selected Sites

We performed a survey to study the public opinion of cycling and commutes of the people in our designated sites. We administered this survey to commuters at key locations in the selected sites during peak hours to gain information on current commuting methods and how cycling could potentially supplement these methods. We also asked questions that gauged how people in the local communities would feel about using cycling as a form of transportation. All of our surveys were done in person with tablets to allow English speaking commuters and non-English speaking commuters to easily fill out a translated version of the survey and to automate tabulating the data. Our sponsors provided three tablets for this survey. Additionally, two translators from The Education University of Hong Kong assisted with the conducting of the survey. We determined that using a short Google Form with between ten and fifteen questions would provide a straightforward survey that would maximize the number of responses that we received.

We found a survey that was used very successfully in the United States for studying commutes and how cycling could be used as part of different commutes and commuting patterns (Carnegie Mellon Tepper: School of Business, 2009). With this survey as our starting point, we consulted with our advisors and sponsors to create a new version of this survey tailored to the citizens in Hong Kong (Appendix G).

We met with our sponsors and received help creating a translation of the survey in traditional Chinese. The survey was displayed with each question and answer written first in English, followed by the Chinese translation. Each answer choice was also translated. To ensure the survey was clear and concise we conducted a pretest of our survey. Initially, we ran the pretest at The Education University of Hong Kong to determine if there were any problems or areas to improve on the survey. The pretest data were discarded when the real survey began as to not affect the total survey results.

To administer our survey in Tin Shui Wai, we stood outside in pairs at the MTR station, the light rail station, and the different shopping malls located throughout this area during peak commuting hours in the morning and afternoon. To survey, we would walk up to people that appeared to not be occupied and performed our survey preamble. In the event that the responder did not speak English, our translator would recite a version of the preamble in Cantonese. We began surveying people in the morning and in the afternoon in order to get the most responses. After initial attempts showed that it was hard to get responders in the morning, we switched to only surveying from 16:00-20:00. Because literacy is very low in Tin Shui Wai, our translator was available to conduct the survey verbally if any person was unable to read.

To administer the survey in Science Park, we asked groups of people in the food court and outside the office buildings if they were available to answer our questions. These surveys were performed during lunch time, between 11:30 and 14:30, to ensure the most responses.

Prior to conducting the surveys, we discussed with our sponsors how to best recite our survey preamble (Appendix H), and how to gather consent. We collected a total of 200 responses from commuters at each site. The estimate of 400 total people is based on a 95% confidence level for 12.6 million daily passenger journeys in Hong Kong (Transport Department of Hong Kong, 2016). We compiled and analyzed our survey results using Google Forms. With these data, we discussed with our sponsors to analyze the feasibility and desirability of promoting cycling for commuters.

4. FINDINGS AND ANALYSIS

Through interviews with cycling experts, as well as on-site observations and background research, we gained an understanding of cycling in both Hong Kong and the United States. We grouped each of these findings into three objectives to complete our comparative study.

- Objective 1: Assess best practices used in the United States to promote biking at the beginning and end of commuting trips.
- Objective 2: Evaluate the current policies, programs, and practices regarding biking and commuting by bike in Hong Kong.
- Objective 3: Evaluate the feasibility and desirability of promoting biking at two selected locations in Hong Kong.

4.1 Best Practices Used in the United States

New York City; Austin, Texas; and Portland, Oregon represent cities in the U.S. that have characteristics such as public transit, cityscape, or weather that are similar to the conditions in Hong Kong and are thus suitable for our comparative study. We conducted this study through online background research and interviews to better understand how cycling is encouraged across the United States. Our research showed that cycling requires specific infrastructure to enable easy access to key areas such as homes, offices, and business.

We also learned how important education programs can be to influence people's desire and ability to cycle. A key distinction we made to understand the first and last mile journey of commuting was distinguishing between cycling in commercial versus residential areas. We learned that the best methods for promoting cycling depend on the area specified. We analyzed the information gathered from the United States to develop strategies, programs, and other ideas to promote cycling at two selected locations in Hong Kong.

4.1.1 Cycling Infrastructure

Infrastructure development has been key to creating the United States' most successful cycling programs. The transportation departments in the cities we researched each have created a safe environment for cycling with new infrastructure implantation. Naturally, the quality of

cycling infrastructure affects how safe people feel while cycling. In Portland, 75% of residents who own a bike and ride infrequently are 'very' or 'extremely' concerned about safety while riding (People for Bikes, 2016). The Street Trust is an organization in Portland, Oregon that promotes safe and healthy communities through cycling, walking, and taking public transportation. Sheilagh Griffin, education director at The Street Trust, explained that "people need to feel safe when they are biking. Providing more infrastructure will greatly increase the number of people who feel comfortable biking, therefore more people will bike." Mike Schofield, of the Austin Active Transportation Division, explained that "as the city of Austin has placed about 20-40 miles of bikes lanes per year, people are more comfortable biking." Statistics show that intersections with protected bike lanes reduce bike-related intersection injuries by about 75% compared to intersections without bike lanes (People for Bikes, 2016). The United States government recognizes the need for cycling infrastructure in certain cities throughout the country and has spent $820 million on cycling-related improvements over the past six years (People for Bikes, 2016). Kyle Hatch, project coordinator for the New York Bicycle Coalition emphasized that safety is one of the most important factors in creating cycling infrastructure. When cyclists are forced to compete with motor vehicles or pedestrians, they feel unsafe and will not utilize the built infrastructure. This is especially important in New York with the implementation of Citi Bike, a popular bike share program. According to Julia Kite of New York City Transportation Alternatives, this bike share program encourages inexperienced riders to use the city's bike lanes. Citi Bike has been successful largely because of the safe cycling infrastructure in New York City.

4.1.2 Cycling Education Programs

Education programs are an important aspect for promoting cycling and increasing safety for cyclists. The Street Trust educates the public with their Safe Routes to School program. According to their website, the Safe Routes to School program "combines educational outreach with targeted street signal safety improvements along the routes Portland's kids use to get to school." They do this by working with partner schools to educate students on safe cycling. Sheilagh Griffin said that "the Safe Routes to School program ensures that both children and adults are familiar with bicycle safety methods." The Safe Routes to School program has resulted in a 35% increase in walking and biking to school (Portland Bureau of Transportation, 2016a).

In Austin, various organizations such as the Department of Transportation and Bike Austin, also run educational programs to teach traffic skills and basic bike riding. For example, The Active Transportation Division runs "Better Street Week." This is a week of free education events around the city for the public, intended to make the streets safer for all cyclists (City of Austin Department of Transportation, 2016).

4.1.3 Cycling in Residential Versus Commercial Areas

Efforts to increase cycling in residential areas focus heavily on education, supportive advocacy groups, and community involvement. These aspects tie together to create a grass-roots effort that supports the building of a cycling community. In neighborhoods and residential areas, when new cycling infrastructure is being constructed, residents often push back because implementing cycling infrastructure generally comes with a tradeoff. For example, in order to put in a bike lane or cycle track, street parking for cars or sidewalk space must be sacrificed. Some residents feel that giving up a portion of their living space for cycling infrastructure, which they may not use, is not worthwhile. Mike Schofield explained that "people tend to take an aggressive stance against new cycling infrastructure because they notice a change in the allocation of road space." In an effort to combat this pushback, the Austin Active Transportation Division has offered free weekend events to encourage residents to ride on the new cycling infrastructure. Additionally, the Austin Active Transportation Division provides a program that gives children free bicycles and teaches proper road etiquette. Mike Schofield noted that once people begin cycling, they are more supportive of the new infrastructure. Miller Nuttle, the Deputy Director of Bike Austin, explained that "going through schools, neighborhood groups, and community leaders allows us to work with the people of the community." This direct community involvement is extremely effective in promoting cycling. Programs like these will reduce the negative stances on changing infrastructure in residential areas and will encourage positive views on cycling.

Promoting cycling in commercial areas is often more difficult than in residential areas. The main problem with cycling in commercial areas is the lack of cycling infrastructure and the resulting concern for safety. Miller Nuttle stated that "although infrastructure must exist to connect commercial and residential areas, commercial areas tend to pose more problems due to larger vehicles that might make cyclists feel unsafe." One way to address these problems is by

building cycle tracks and bike parking. Just as in residential areas, interacting directly with the community can be extremely effective when promoting cycling. Miller Nuttle noted the success of Bike Austin's "Bike to Work Day" where free coffee was offered to people who biked their way to work. This program encouraged people who would otherwise not consider cycling to add it to their daily commute. A key aspect of creating programs like this is to target employers at these commercial locations. Employers providing showers, changing facilities, or other incentives for their employees to cycle will increase the number of people who feel comfortable cycling to work, especially in workplaces with a formal dress code. These types of programs encourage people to begin cycling for their daily commute.

4.2 Current Policies, Programs, and Practices in Hong Kong

There are conflicting views of cycling in Hong Kong coming from the government, the public, and the cycling advocates. Cycling advocates in Hong Kong displayed their enthusiasm when they hosted large promotional events. Interviews with government officials revealed the government's view on biking and how that affects policy.

4.2.1 Biking Advocacy

Even though cycling in Hong Kong is still in its infancy, it is clear that cycling usage is expanding. Most progress at this point is being made through small grassroots efforts rather than government attention and policies. Organizations such as the Hong Kong Cycling Alliance and Bike The Moment are working to make Hong Kong a more bike-friendly city. For example, Bike The Moment organizes Tuesday morning bike rides that have successfully promoted cycling for commuting. Legislative Councilman Edward Yiu participates in these rides and said that since the Tuesday morning bike rides have started, the car drivers have become more respectful and aware of cyclists on the road. According to the councilman, approximately 20-30 people participate in this ride each week. We also had the opportunity to join the Hong Kong Cycling Alliance on one of their promotional bike rides. We joined hundreds of cyclists in a Sunday morning ride from Sai Wan to Quarry Bay. Normally, most of this route would be inaccessible to cyclists; however, the event was escorted by the city police. Even with these precautions, the public still claims that cyclists should not ride on the roads and near the harbor. As evidenced by

these events, while there is a large movement to promote cycling in Hong Kong, there is still a great amount of public opposition.

According to Martin Turner, the chairman of the Hong Kong Cycling Alliance, people in Hong Kong view cycling as unsafe and prefer the luxury of driving to cycling. Jessica Lau, the communications manager for The Contact Design Store in Science Park, had other theories about the public's reluctance to commute by bike. She specifically cited the lack of bike parking facilities, the lack of bike security at public bike racks, the difficulty of bringing a bike onto the MTR, and the lack of showers and changing rooms at the workplace which are all barriers that discourage cycling as a means of commute.

4.2.2 Government Programs and Policies

In an official statement from the Secretary for Transport and Housing in January 2016, Professor Anthony Cheung Bing-leung stated "the Government's current policy is to foster a 'bicycle-friendly' environment where road safety and conditions permit, especially in new towns and new development areas, so as to promote cycling as a green mode for short-distance commuting and to reduce the use of mechanized transport. As such, cycling is no longer regarded as a leisure activity only" (Hong Kong Government, 2016). In the same statement, the Secretary explains the Development Bureau's reasoning for canceling the development of a new cycle track network connecting Ma On Shan and Sai Kung. After examining multiple options for routes of the track, the transportation department decided that too many technical issues, including large-scale ecological impact exists to continue with the development. The Secretary did, however, announce a plan to build a 6.6 km cycling track at the former Kai Tak Airport. Due to public desire for more coverage of cycling track, the Development Bureau has proposed extending the length of the track to 13 km. This track would be used primarily for leisure activities rather than commuting. The Development Bureau is also considering the option of extending the track even further to connect to the MTR station nearby (Hong Kong Government, 2016). Connecting this track to the MTR station would make this area more accessible for cycling commuters.

One of the most interesting findings from the official statement is that the Secretary believes that a self-service bike rental system, or bike share program, is an ill-advised idea. He

claims that there are a sufficient number of bike rental shops in Hong Kong; therefore, there is "no need for a public rental system" (Hong Kong Government, 2016). He also cites high operating costs and other logistical reasons to justify the government's stance against a bike share program.

According to Councilman Yiu, the government continues to reference the 2004 study on cycling in Hong Kong when discussing cycling policies and the creation of cycling infrastructure. The study concluded that cycling infrastructure should be built in the New Territories, but not in Kowloon or Hong Kong Island (Transport Department of Hong Kong, 2004). According to the Councilman, this explains why almost all of the cycling facilities in Hong Kong exist in the New Territories, and there is less than half a kilometer of cycle track on Hong Kong Island.

As an avid cyclist and government official, Mr. Yiu has a unique perspective on cycling in Hong Kong. While the councilman supports promoting cycling for commuting, he said most of his colleagues do not. He claimed they find it hard to justify building the necessary infrastructure when the existing public transit system is already so convenient. In addition, the government only builds cycle tracks and not bike lanes. This extra safety and separation from the roads comes at a huge cost. Table 4 shows the cost for the construction of bike lanes and cycle tracks in Portland, converted to Hong Kong dollars (HKD) for ease of comparison. This cost for construction may not be the same in Hong Kong; however, it shows how constructing cycle tracks is more expensive than constructing a bike lane.

Table 4: Cost Comparison of Bike Lanes and Cycle Tracks in Portland and Hong Kong
(Modified after Weigand, McNeil, & Dill, 2013)

	Bike Lanes	**Cycle Tracks**
Cost in USD per Meter of Construction	$2.72 - $20.83	$81.33
Cost in HKD per Meter of Construction	$21.11 - $161.64	$631.13

Martin Turner is frustrated that the government still views cycling as a dangerous liability rather than a proper form of transportation. Mr. Yiu confirmed this sentiment that as long as the government views cycling in this way, very little progress will be made.

The Yuen Long District Council governs Tin Shui Wai and "plays a linking role between the government and the community through its committees which reflect public concerns to the authorities and advise the government on a wide range of matters related to the district" (Yuen Long District Council, 2017). Mr. Wong Wai-shun, Vice Chairman of the Yuen Long District Council, believes that adding bike lanes on the road would be an effective way to promote cycling. Because the current cycle tracks in Tin Shui Wai are so disconnected, providing a safe space on the road for cyclists would greatly increase safety and ridership.

According to the government, it is illegal to chain or fix a bike to a fence or structure that is not a bike rack. All around Hong Kong, especially near MTR stations, people chain their bikes to handrails and fences. According to Councilman Yiu, people will often leave bikes chained in one place for a long time. The government reserves the right to cut locks and confiscate bikes that are chained illegally; however, Mr. Yiu says this very rarely happens unless an area gets overrun with bikes.

The Hong Kong government provides a Cycling Information Center (CIC), but it primarily focuses on recreational and leisure cycling. The CIC promotes safe cycling and education on relevant cycling legislation and practices. They also provide information on all public cycling tracks and areas in Hong Kong (The Government of the Hong Kong Special Administrative Region, 2015).

4.3 Feasibility of Promoting Biking at Science Park and Tin Shui Wai

The cycling infrastructure in Hong Kong is unique. On Hong Kong Island and in Kowloon there is virtually no cycling infrastructure at all. There is less than ½ km of cycle track in this area, no bike lanes, and very few bike racks. In the New Territories, however, there are many cycle tracks that go unused because they do not connect popular destinations, such as public transit stops. We focused our cycling promotion on two areas in the New Territories: Science Park and Tin Shui Wai. The promotion for cycling in each of these areas is different due to the commercial environment in Science Park, and the residential community in Tin Shui Wai. This section discusses the background, observations, and survey results of these two areas.

4.3.1 Background of Science Park

Science Park is a business park created by the Hong Kong Science and Technology Parks Corporation, HKSTP, with the goal of transforming Hong Kong into "the regional hub for innovation and technology development" (Hong Kong Science & Technology Parks, 2013). HKSTP is a statutory non-profit organization set up by the Hong Kong government in 2001. With 634 companies and 12,204 employees as of December 2016, the businesses in Science Park have an estimated annual turnover of $176 billon HKD ($22.7 billion USD). Science Park has 26 commercial buildings with 330,000 square meters of "R&D office and ancillary space" (Hong Kong Science & Technology Parks, 2013). Of the companies in Science Park, 13.5% work in Green Technology (Hong Kong Science & Technology Parks, 2013). These companies may be more likely to promote cycling with employee incentives because it aligns with their business, and their employees may be more likely to adopt cycling as a preferred mode of transportation. Figure 13 shows the breakdown of partner companies in Science Park by cluster, or area of interest.

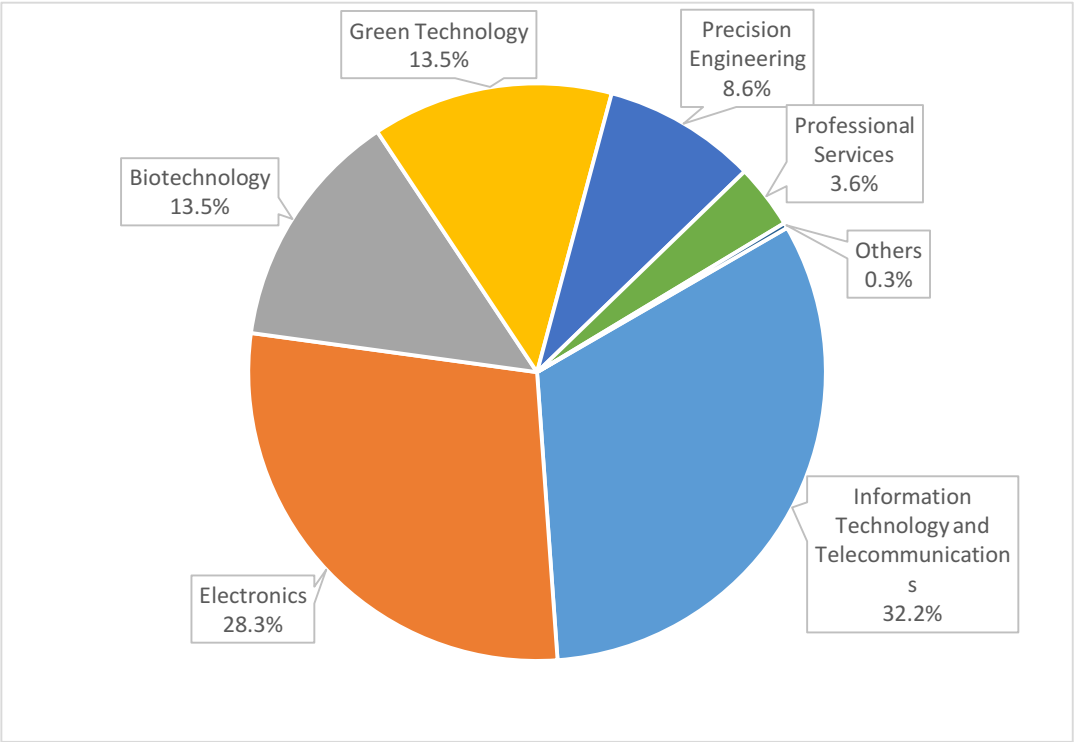

Figure 13: Breakdown of Partner Companies by Cluster in Science Park

(Modified after Hong Kong Science & Technology Parks, 2013)

Science Park has been trying to become more environmentally friendly. Nicholas Brook, Chairman of the Hong Kong Science and Technology Parks Corporation, said that "the sustainability vision is carried out by everyone from the staff recycling paper to the engineers designing more environmentally friendly facilities for [their] tenants" (Hong Kong Science & Technology Parks, 2013). A cycling promotion program would fit well into this "sustainable vision" of HKSTP.

Figure 14 is a site map of Science Park showing the building locations as well as the Tolo Harbour Cycling Track. The map also shows some of the private and public bicycle parking sites within Science Park. The private bike parking facilities, per our observations, were nearly empty. These sites, while more secure than the public bike parking sites, are expensive, costing around $300 HKD ($40 USD) per month. The public bike parking facilities are more easily accessible from the cycle tracks and more widely used than the private parking facilities. The Tolo Harbour Cycling Track that runs along the harbor next to Science Park connects to the nearby MTR stations, including University station, Tai Po Market, and Shek Mun. University station is the closest and easiest station for people at Science Park to reach by bike.

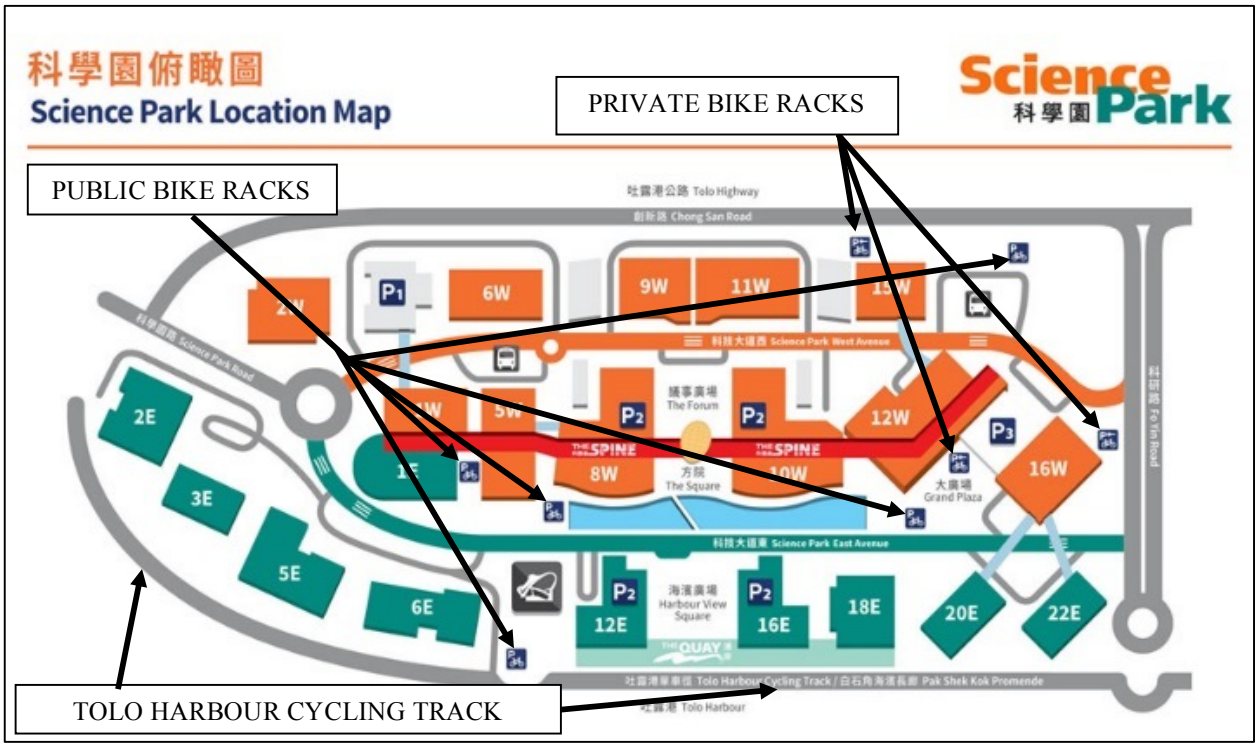

Figure 14: Site Map of Science Park and Tolo Harbour Cycling Track (Modified after Hong Kong Science & Technology Parks, 2013)

One of the reasons few people currently cycle to work in Science Park is because there are many other ways to commute. The most common mode of transportation for employees is to take the MTR, then finish the commute by bus to Science Park. The bus 272K between University Station and the bus terminal at Science Park is most frequently used (Hong Kong Science & Technology Parks, 2013).

4.3.2 Observations in Science Park

The bike route from University station to Science Park covers a total distance of 2.56 km, which is within the bikeable range of 2 km to 5 km (Parkin et al., 2007). A map of the bike route is shown in Appendix I. The continuous bike route has no intersections with the road. The path on the bike route has a smooth surface, measures 6.10 m (20 ft.) wide for two-way cycling, has a safe separation distance of 1 m (3 ft.) from traffic, and has less than a 5% slope along the whole route. The path is very clean, with no litter on or around it. The scenic bike route features water, mountains, and new commercial buildings surrounding the route. Figure 15 displays a picture of a portion of the bike path along the route to Science Park.

Figure 15: Bike Path to Science Park

There are several bike racks inside Science Park and along the bike path from University station to Science Park. One large bike rack (Figure 16) and a bike rental shop are located near University station. All of the bike racks are within walking distance to the buildings in Science Park, the bike path, or University station.

Figure 16: Bike Rack at University Station

There are several signs at both Science Park and University station indicating the presence of a bike path; however, while riding on the path there is limited signage indicating the direction to University station and Science Park. The bike route goes through three subways[1]. These particular cycle tracks are approximately 100 m long. These subways are wide enough for two cyclists to travel side by side in each direction. One location along the bike route has no signage indicating that the rider must go through a certain subway to get to Science Park. Riders unfamiliar with the area would not know to take that subway. Figure 17 displays a picture of the subway entrance with signs in blue pointing towards the entrance of the subway, but not indicating the direction to Science Park.

During peak commuting hours, our group observed that the majority of cyclists on the cycle track appeared to be riding for recreational purposes as they were mostly teenagers with

[1] In Hong Kong, a subway refers to an underground cycle track or pedestrian walkway.

friends or small families. Several cyclists were playing loud music, and there were also several families with young children riding on the path.

Figure 17: Subway Entrance along Bike Route to Science Park

In summary, the bike route from University station to Science Park is very bikeable; however, the path appears to be used primarily for recreational purposes rather than commuting. Appendix J contains the observation sheet for the bike route from University station to Science Park.

4.3.3 Surveys in Science Park

At Science Park, we surveyed 200 people in an effort to understand their commuting habits and their opinions on using bicycles as a means of commuting. These employees were approached during the lunch break at the various restaurants and food courts throughout Science Park.

None of the people we surveyed at Science Park currently bike from the MTR station to Science Park. Over 60% of those surveyed take the MTR to travel to work. Out of the people who use the MTR to commute, 71% of them complete their journey on a bus.

Bike share programs could make a big difference on bicycle ridership. About half of people that are not willing to bike say they do not have space to store a bike. Half of people we surveyed also say that a bike share program would make them more willing to bike. Sixty-four percent of people surveyed view companies more positively if they support cycling. Seventy-two percent of those surveyed under 30 years old view a company better if it is bike friendly. This is particularly applicable to Science Park because it has such a large population of younger people. These data are important in the promotion of a bike share program in Science Park because companies will be more likely to sponsor a bike share program if they know it will improve their public image.

4.3.4 Infrastructure Improvements in Science Park

Based on our observations, two of the three subways on the cycle track between University station and Science Park appear to be accessible for cyclists. The location of the problematic subway in relation to the cycle track from University station to Science Park is shown in Appendix K. This map, provided by the Hong Kong government, indicates that the subway is bike accessible. However, while riding on the cycle track there are no signs at the subway indicating whether or not the subway is bike accessible. Additionally, the third subway is adjacent to the cycle track, but the cycle track does not lead directly into this subway as it does at the other two subways. This creates confusion for the rider on whether or not they are allowed to ride in the subway. One solution to this problem is to clearly indicate that the subway is bike accessible. Furthermore, there should be signage at the subway indicating the directions to Science Park and University station. The layout of this subway is another problem for cyclists. The subway is narrow at certain points, has steep slopes, and makes sharp turns (Figure 18). It is difficult for cyclists to ride in the subway without dismounting from their bikes. Improving the construction of the subway would make it more accessible for cyclists to ride through. Improvements to the signage and minor infrastructure modifications would ease the commute for cyclists, allowing them to get between Science Park and University station.

According to current regulation, the Hong Kong Department of Transportation is responsible for constructing necessary infrastructure to connect the cycle track and University station as well as installing. Bike signs cost about $1,500 HKD per sign to install (Weigand et al., 2013). Construction of a new subway path or construction to widen the current subway are

both feasible options. These projects will need to be recommended by the Tai Po District Council and approved by the Hong Kong Department of Transportation.

(a) Narrow Entryway of Subway Next to Cvcle Track

(b) Sharp and Narrow Turn Inside of Subway

(c) Steep Path Inside of Subway

Figure 18: Problematic Subway on Cycle Track Between University Station and Science Park

4.3.5 Bike Share in Science Park

We have determined that Science Park is well equipped for a bike share program. While some minor infrastructure improvements need to be made as outlined above, we feel that Science Park would benefit greatly from a bike share program. Although Hong Kong does not have a strong cycling culture, 64% of people we surveyed at Science Park said that a bike share program would make them more willing to cycle to work. Some characteristics required to make bike sharing successful include concentrated population and employment centers, an extensive public transit system, a large number of visitors, a culture that supports cycling, and a cycling-supportive environment (Alta Planning + Design, 2012). Science Park has concentrated population and employment centers as demonstrated by the fact that people are generally commuting to and from one particular area. University station and Science Park represent the large population concentrations in this case. There is already a substantial public transit system in place with the MTR to get people to the bike share program. Finally, Science Park provides a cycling-supportive environment by providing the infrastructure such as bike racks and cycle tracks. Their green vision and supportive attitude demonstrated in our conversation with Jerry Cheung provide a positive environment for promoting cycling growth.

Our survey results also show that a bike share program would suit the needs of employees at Science Park. Over 85% of people surveyed do not have access to a bike; yet over 85% feel comfortable riding on cycle tracks. These two factors, along with the fact that 61% of people said they would bike for commuting, demonstrate a great opportunity for a bike share program. We also believe that more people would be willing to cycle for their commute if there were incentives or more opportunity to bike.

One of the major keys to successfully promoting cycling as a form of transport is making it both time and cost competitive with the current mode of transportation. Our survey shows that almost three-quarters of people use the bus to get from their final MTR station to work. When we took the bus 272K from University station to Science Park it took approximately 8 minutes not including waiting for the bus, which arrives every 10 minutes. Cycling to Science Park from University station takes approximately 8-10 minutes. This makes cycling time competitive under most situations. Taking the 272K bus two times a day, for 247 working days per year, would cost almost $1900 HKD.

In one common payment model for bike share programs, users pay for access to the bike share system for a minimum length of time. During that period, they are allowed as many short trips as they would like. After the short trip period ends, the rider is charged for additional time spent riding. This system encourages short trips made mostly for commuting. One possible rate structure is shown in Table 5. These rates are based on prices of similar bike share programs in the United States (Alta Planning + Design, 2012). If this model is applied to the bike share program at Science Park, it would be cost-competitive with the current mode of transportation. Riders could pay for subscriptions for the service online with a credit card or with an Octopus Card. When a rider wants to check out a bike, they simply swipe their Octopus Card or membership card at the bike station, and it would unlock a bike.

Table 5: Cost of Subscription for Bike Share Program

Subscription	Cost (HKD)
Annual	$700
Monthly	$200
24-Hour	$30
30-Minute Period (Short Trip)	$5
Each 30-Minute Period After Short Trip	$5

A bike share program may be funded in a number of ways. The most common sources of funding are user-generated revenue, local company sponsorship, public funding, or other types of private funding. User-generated revenue can be used for upkeep and maintenance of the system and bikes. An outline of different kinds of company sponsorships is shown in Appendix L. Companies in Science Park could be offered the opportunity to sponsor the bike share program in return for advertisement space on the bikes and bike racks. Over two-thirds of people we surveyed would think more positively of a company if they knew that the company supports cycling. Companies will be more likely to provide sponsorship for the bike share program if it promotes their public image.

One of the biggest problems with bike share programs is the uneven distribution of bikes. Because travel demands are not always symmetric, bicycles will inevitably end up poorly distributed. Even if most people use the system to commute between Science Park and

University station, it is likely that bikes may become poorly distributed and concentrate at one site or another. One example of a problematic situation would be a day where it rains in the afternoon. People will be willing to cycle in the morning to work, but will be more likely to take the bus home instead. One way to address this issue is to manually load bikes into a vehicle and drive them between stations. Another possible solution is to offer credits to riders who return their bikes at under-used stations. Based on supply and demand, the system can offer credits to riders and alert them of opportunities to return their bike at a station without many bikes through a smartphone application.

4.3.6 Background of Tin Shui Wai

Tin Shui Wai is a highly populated residential area on the west side of the New Territories. The town began construction in 1991, and by the time it was finished in 2008, 270,000 people lived there. The area has a high population density of 63,000 persons per square kilometer, many of whom live in public housing. Tin Shui Wai has the lowest median age, 34, of any of the new towns built in Hong Kong. There is a lack of familial support due to the very small population of elderly people to aid in child raising. This lack of familial support is one reason 47% of people in Tin Shui Wai have never attended senior secondary school. This educational deficiency means a typical family of three has a household income of $168,000 HKD ($21,500 USD) annually in Tin Shui Wai (Department of Social Work and Social Administration, 2009).

Tin Shui Wai is a mostly residential area with a high population density. A study of Tin Shui Wai conducted by professors at the University of Hong Kong includes a government plan with provisions for cycling as a form of transportation (Department of Social Work and Social Administration, 2009). The plan called for separate cycle ways that minimized conflict between motor vehicles and pedestrians. However, upon implementation of the plan, government officials only viewed cycling as a leisure activity. The cycle routes are not well connected and cannot handle heavy cycling traffic (Department of Social Work and Social Administration, 2009). The discontinuities of the cycle tracks are shown in Figure 19. The study concludes that “due to the differences in planned (as a mode of transportation), developed (for leisure use), and actual (both transport and leisure) usage of the cycle network, accidents and illegal parking of bicycles were

common" (Department of Social Work and Social Administration, 2009). The lack of proper connections between cycle tracks makes the use of these tracks difficult.

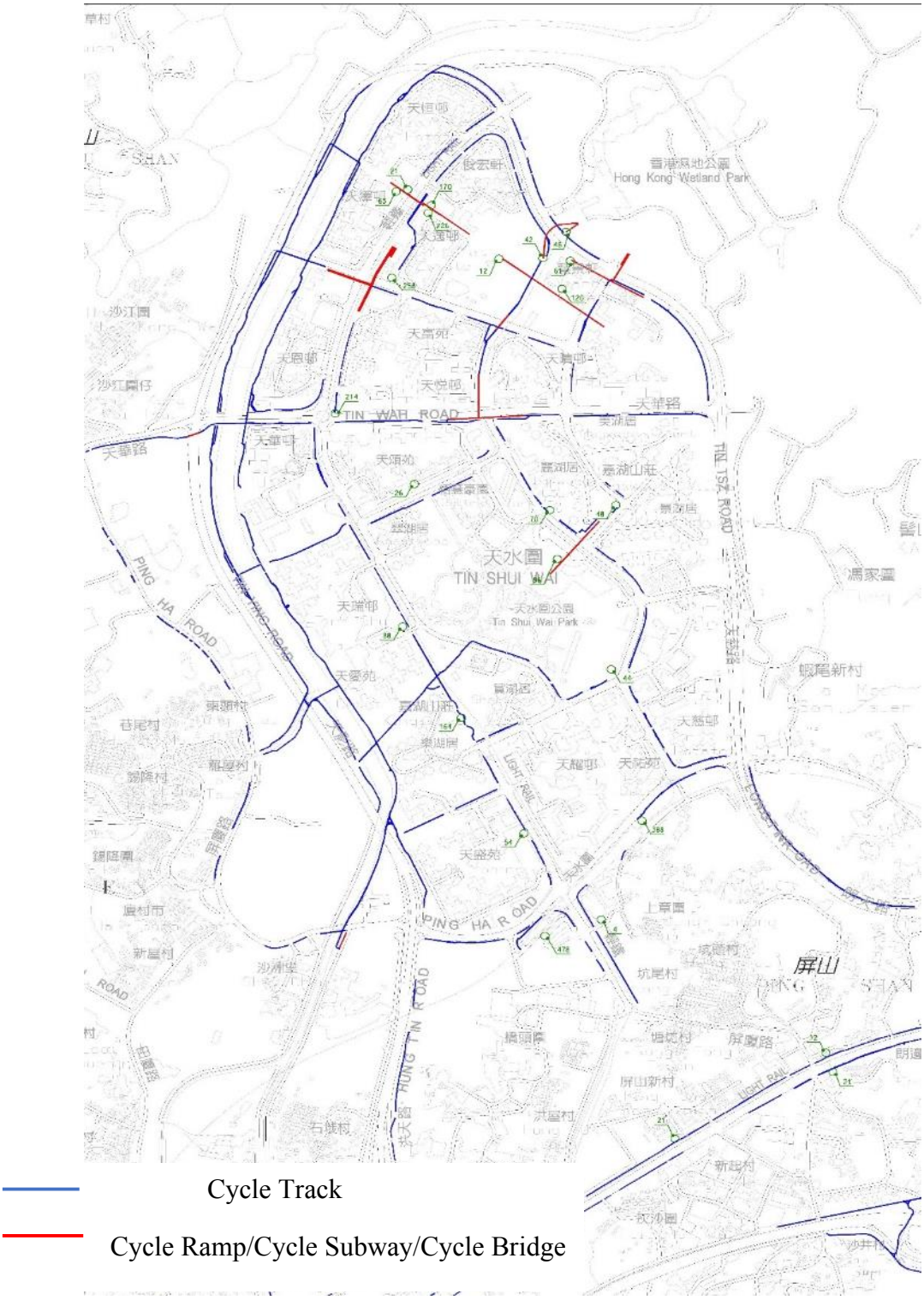

Figure 19: Cycle Tracks in Tin Shui Wai (GovHK: Cycling Information Center, 2011)

4.3.7 Observations in Tin Shui Wai

The cycle tracks in Tin Shui Wai are much less bikeable than in Science Park. There are several cycle tracks within Tin Shui Wai; however, the tracks are disconnected and are located sporadically throughout the town. To get from one cycle track to another, cyclists must ride on the sidewalk and compete with pedestrians. Several of the cycle tracks stop at random locations, with no signage to the next cycle track. It is difficult for a rider to take a direct route to their final destination. The cycle tracks frequently intersect with roads in Tin Shui Wai. The majority of the intersections are safe, with signals and road markings (Figure 20); however, some dangerous intersections have no signals or road markings (Figure 21).

Figure 20: Safe Intersection with Signals and Road Markings in Tin Shui Wai

Figure 21: Dangerous Intersection in Tin Shui Wai

In addition, since not many people bike on the cycle tracks, many pedestrians walk on the cycle tracks to avoid the congestion of the sidewalk. There are more people walking on the cycle tracks than cycling. Riding a bike in Tin Shui Wai requires the rider to constantly warn pedestrians to move out of the way. The riders must also dismount from their bikes and walk in congested areas. Because the cycle tracks are along the sidewalks, cyclists are expected to use the same signals as pedestrians at road intersections. In other countries, intersections often have a separate signal for cyclists since the cycle tracks are separate from the sidewalks. There are no cycle tracks in Tin Shui Wai that intersect directly with the road. Only the sidewalks intersect with the road, and the cycle track ends prior to the intersection. This requires cyclists to dismount from their bikes at all intersections, and follow the pedestrian signals to cross. Based on our observations, the majority of cyclists do not dismount from their bike, and ride across the sidewalk and intersection instead. Another inconvenience of the cycle tracks is that several of the tracks intersect the sidewalk. At each intersection with the sidewalk, yellow posts force the rider to dismount and walk (Figure 22). Figure 23 shows an example of a short, disconnected cycle track in Tin Shui Wai.

Figure 22: Yellow Posts at End of Cycle Track in Tin Shui Wai

Figure 23: Discontinuity and Short Length of Cycle Tracks in Tin Shui Wai

Another problem with cycling in Tin Shui Wai is the congestion on the cycle tracks. While there are not many cyclists on the cycle tracks, pedestrians often use the track to avoid the congested sidewalks. This makes it difficult and dangerous for cyclists to use the cycle tracks. The problem of pedestrians walking on cycle tracks occurs in New York City as well. Kyle Hatch of the New York Bicycle Coalition stated that one of the major problems with cycling in

New York City is the number of people who walk on and "abuse" the cycle tracks. The coalition is currently working to fix this problem by having the New York City Police enforce the policy of cyclists only, and ticket the non-cycling pedestrians on cycle tracks.

In addition to the Tin Shui Wai MTR station, a light railway services the whole district. In fact, many of the bike paths are adjacent to the light railway. During peak commuting hours, our group observed that the majority of people commute using the light railway, the bus, or by walking. There are very few people biking on the bike paths. However, we observed that there are people who park their bikes in various locations surrounding the MTR station. Some people park their bikes at the bike rack (Figure 24), while others chain their bike up against a fence near the station (Figure 25).

Figure 24: Bike Rack at Tin Shui Wai Station

Figure 25: Bikes Chained to Fence Outside of Tin Shui Wai Station

To conclude, biking in Tin Shui Wai is inconvenient, especially in comparison to the convenience of the light railway. In our observations, the bike paths are in good condition. They are smooth and each path is clearly marked and separated from the adjacent sidewalk. However, these positive aspects of the cycling infrastructure are outweighed by the issues. The cycling tracks are too disconnected, narrow, and congested with pedestrians to be used effectively. The observation sheet and map of the Tin Shui Wai east bike route are in Appendix M and Appendix N, respectively. The observation sheet and map of the Tin Shui Wai west bike route are in Appendix O and Appendix P, respectively.

4.3.8 Surveys in Tin Shui Wai

We also surveyed commuters in Tin Shui Wai about cycling and their commuting habits. We surveyed 200 people outside the MTR station as well as throughout Tin Shui Wai.

Currently, cycling is underutilized as a form of commuting in Tin Shui Wai. Only two people we surveyed use cycling for any part of their commute. Over 70% of people surveyed use the MTR as a part of their commute and about half of the MTR riders use a bus or light rail to get to the station. According to our survey, this trip takes less than 15 minutes for 70% of the people surveyed. These short trips could be replaced by cycling.

We believe that the main reason most people do not cycle to the MTR station now is because they do not feel comfortable, and the bus or light rail is more convenient. While most of the people we surveyed were comfortable cycling on cycle tracks, only about 15% were comfortable cycling on roads. This is a major problem in Tin Shui Wai because the cycle tracks are so disconnected and cyclists are required to cross the road or ride on it several times on the way to the MTR station. Additionally, according to our survey, concern for safety was the most common deterrent to cycling. These are most likely major reasons that only 41% of residents surveyed would be willing to bike a portion of their commute. About half of the people who said that it is a good idea for other people to cycle would not bike themselves. This indicates that improving infrastructure and people's attitudes toward cycling could greatly increase cycling as a means of commute.

Age affects willingness to bike according to our study. Those younger than 30 years old were 10% less likely to bike than other age groups. This is most likely because only 21% of people younger than 30 years old had access to a bike compared to about 40% in the other age groups.

4.3.9 Infrastructure Improvements in Tin Shui Wai

A major problem with cycling in Tin Shui Wai involves the lack of infrastructure. Cycle tracks are present; however, they are disconnected and inconvenient to use. Cyclists on the cycle tracks frequently have to dismount due to the many intersections with roads and sidewalks. In addition, there is a lack of bike signage along each cycle track indicating direction to destination

points, or to other cycle tracks. This section describes improvements to the cycling infrastructure that could increase cycling usage throughout Tin Shui Wai.

Constructing more footbridges[2] and subways is a way to decrease the number of intersections between cycle tracks and roads or sidewalks. Figure 19 shows that there are some, but not enough cycle footbridges and subways in Tin Shui Wai. Based on our observations, footbridges can be inconvenient for the average cyclist because the slope to get on them is very steep, requiring most cyclists to dismount and walk their bike up the slope and onto the bridge (Figure 26). There are several subways on the cycle tracks near Science Park, but not on the cycle tracks in Tin Shui Wai. The ramps to access subways are not as steep as the ramps for footbridges, making subways better than footbridges for cyclists. Connecting the existing cycle tracks under the roads and light rail tracks via subways would promote cycle track usage in Tin Shui Wai.

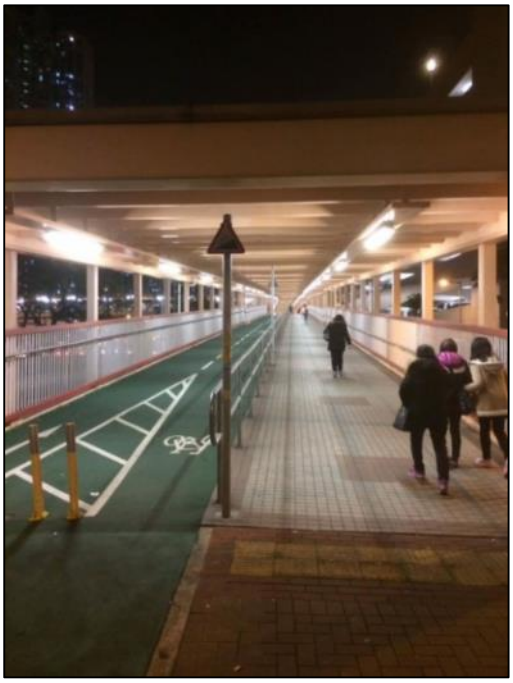

Figure 26: Footbridge Entryway in Tin Shui Wai

[2] Footbridges here refer to structures that allow both pedestrians and cyclists to cross over a street or intersection. Generally, these bridges have adjacent lanes for cyclists and pedestrians. The pedestrian side has stairs for the incline while the cycling side is smooth.

With the construction of subways, cyclists could easily ride along their desired route without the obstruction of dismounting their bike to wait and cross intersections. Mike Schofield of Bike Austin stated “developing a continuous cycling network is the primary factor to increasing the number of cyclists in a region.” Figure 27 displays dots, which represent proposed intersections where the Hong Kong Department of Transportation should consider constructing subways. The 15 dots are placed in areas where cycle tracks are disconnected at major intersections throughout Tin Shui Wai. Construction of subways is time consuming and expensive. Therefore, the district council should conduct further analysis on these intersections to prioritize the need for subways based on volume of motor and pedestrian traffic, and distance of discontinuity between the cycle tracks. To prioritize which intersections need construction for subways, our group has proposed three phases. Phase 1 contains four major intersections with first priority construction. Placing subways at these intersections would improve connectivity between locations of the highest density of public and private housing to the MTR station. Completing this track would provide a continuous and direct route to the MTR station. Phase 2 provides more route choices and access to the connected cycle track for more residents. Phase 3 connects outlying areas, and provides even more route choices for cyclists.

The Yuen Long District Council governs Tin Shui Wai and “plays a linking role between the government and the community through its committees which reflect public concerns to the authorities and advise the government on a wide range of matters related to the district” (Yuen Long District Council, 2017). The Yuen Long District Council is responsible for the creation of plans to extend the length of cycle tracks in Tin Shui Wai.

Designating sections of the sidewalks for cyclists may be a cheaper way to improve the connectivity of cycle tracks than adding new cycle track in Tin Shui Wai. Riding space may be designated on sidewalks by painting white lines or by installing yellow posts to create a bike lane on a portion of the existing sidewalk.

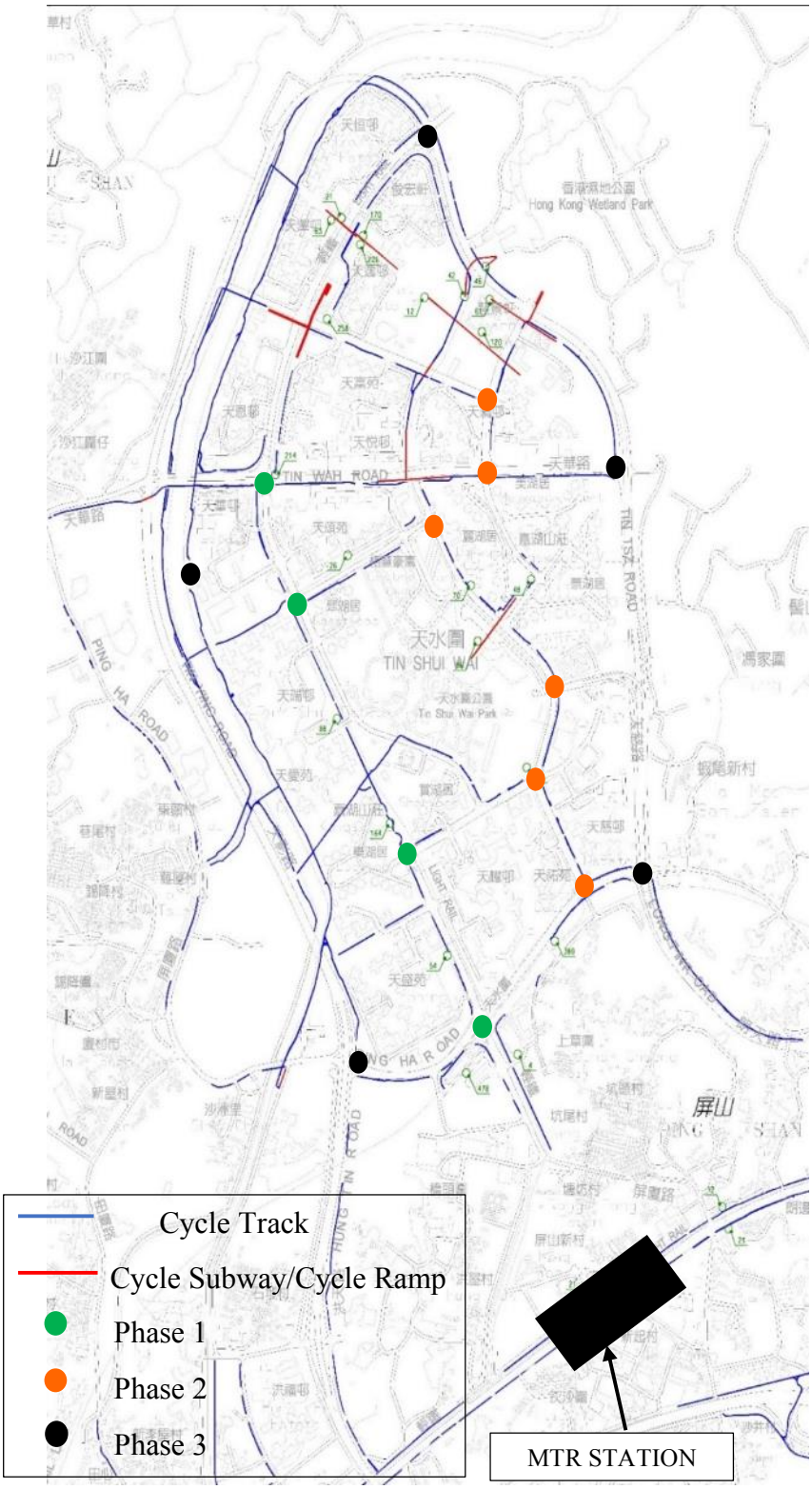

Figure 27: Proposed Intersections for Subway Construction (Modified after GovHK: Cycling Information Center, 2011)

Riding along the cycle tracks in Tin Shui Wai can be very confusing for cyclists. The tracks are disjointed and there is little signage directing cyclists between discontinuous segments of the cycle tracks. Signs should be posted along and at the ends of cycle tracks indicating the current position of the cyclist, and locations of the nearby cycle tracks, direction to the MTR station and other local landmarks. Lastly, to improve the problem of pedestrians walking on the cycle tracks, signs should be placed along the tracks stating "CYCLISTS ONLY: WALKING IS PROHIBITED." Adding signage on and along the cycle tracks would fall under the responsibility of the Hong Kong Department of Transportation.

5. CONCLUSIONS AND RECOMMENDATIONS

Our project goal was to assess the feasibility and limitations of using cycling for the first and the last mile of commuting in Hong Kong. In order to create a set of recommendations to promote cycling, we assembled and analyzed data for two selected study areas - Science Park and Tin Shui Wai. Our findings show that cycling to commute from University station to Science Park is feasible, but many employees do not have access to a bike. Biking from the station to Science Park takes approximately 8 minutes. The bus is the most popular mode of transportation between the Science Park and University station, which takes approximately 8-10 minutes and arrives every 10 minutes during peak commuting hours. Cycling in Tin Shui Wai is much less desirable and requires more infrastructure and policy improvements. The cycle tracks are very disconnected and frequently intersect with roads and sidewalks. For Science Park, we recommend the implementation of a bike share program, as well as improvements to some of the infrastructure along the Tolo Harbour Cycle Track. For Tin Shui Wai, we recommend improvements to the cycle track network, and the implementation of a cycling education program. We made recommendations for The Education University of Hong Kong to continue to assess the feasibility and promotion of cycling in Hong Kong.

Recommendation #1. **We recommend that Hong Kong Science and Technology Parks Corporation and the Hong Kong Department of Transportation implement a bike share program between University Station and Science Park.**

Explanation. Based on our research, we conclude that the best way to promote cycling in Science Park is with a bike share program. The bike share program could be operated by Hong Kong Science & Technology Parks Corporation. We propose that this pilot program features six locking bike racks, at five locations in Science Park (Appendix Q) and one at University station. We further recommend that the program start with approximately 100 total bikes. Estimated cost of subscribing to the bike share program is shown in Table 5. This is one suggestion of a subscription model based on successful programs in the United States such as Citi Bike (Alta Planning + Design, 2012).

From researching existing bike share systems in the United States, we project that the bike share system we propose would require around 6 million HKD in total startup investment.

We propose that the bike share system be funded by a combination of HKSTP funds, user-generated revenue, and private company sponsorships. Companies can sponsor the bike share program at different levels. User fees will be used primarily for operational costs and upkeep and maintenance of the bikes and bike racks. This model has been very successful in China as well as the United States.

We additionally recommend the Hong Kong Science & Technology Parks Corporation submit a proposal to the Tai Po District Council for building a bike share station at University station. The Council must approve a small space for the bike racks at University station. HKSTP can provide space for the bike racks at Science Park according to Science Park's Assistant Manager of Sustainability, Jerry Cheung.

A bike share program will address several problems. According to our survey, few Science Park employees own bikes, nor do they have space to store privately-owned bikes. A bike share program could also be more cost-effective than taking the bus or taxi to work. Additionally, a bike share program removes the worry of bike theft as well as the clusters of broken or worn out bicycles abandoned in racks in the area. When not in use, these bikes will be stored in their locking bike racks overnight.

Limitations. A major limitation of this program is that it would only cover a small area. The program would be used almost exclusively for travel between Science Park and University station. Due to the program's cost, the system would need to start small and grow based on use over a period of years. This program has a significant startup cost which makes it dependent on private sponsorship and HKSTP funding.

Recommendation #2. **We recommend that the Hong Kong Department of Transportation improve the subway under Science Park Road and install additional signage along the Tolo Harbour Cycle Track.**

Explanation. Connectivity of bike paths is key to encouraging people to cycle. The subway under Science Park Road is inadequate for cycling. It is too narrow and steep for cyclists to navigate safely alongside pedestrians. This can disrupt the commute of cyclists because many would have to dismount from their bikes to ride through the subway. We recommend improving the layout of the subway to make it easier for cyclists to ride through. The subway will provide continuity of the commute, which will encourage cycling.

Additional signs on the Tolo Harbour Cycle Track would promote cycling as a form of transportation for commutes as well as provide cyclists with the navigational assistance that they would see on a major roadway.

Limitations. The biggest limitation to this recommendation is cost. Any modifications would have to go through the Hong Kong Department of Transportation, who have been very reluctant to make changes in infrastructure to accommodate cyclists.

Recommendation #3. **We recommend that the Hong Kong Department of Transportation improve the cycling infrastructure in Tin Shui Wai by connecting existing cycle tracks.**

Explanation. The current system comprises a series of tracks that are disconnected and several intersections that are not safe for cyclists. We believe that adding a set of subways that allow cyclists to bike under the current roadways will create a more continuous and safer system. Currently, according to our surveys, most people do not feel that cycling in Tin Shui Wai is a safe transportation method. This is due to heavy traffic as well as the disconnected cycle tracks. These subways would allow cyclists to travel without needing to cross dangerous intersections. Subways would speed up cycle trips and increase safety.

Increasing continuity between the cycle tracks is also key to increasing safety and bike ridership in Tin Shui Wai. Where the width of sidewalks is sufficient, a portion of the existing sidewalks could be designated as a cycle track. Additional markings should be used to denote where the cycle tracks begin and where they end to ensure the safety of pedestrians. We believe that connecting shorter lengths of the cycle tracks will encourage people to ride and shorten commuting time. Designating separate areas for cyclists will protect both cyclists and pedestrians from collisions, since most riders currently ignore cycle laws and ride on the sidewalk. Signs indicating that it is illegal for pedestrians to walk on or obstruct the cycle tracks would improve safety of cyclists and pedestrians.

Limitations. The main limitations to these changes are the cost and construction time. We believe that if these changes are made, ridership will increase significantly. However, the base cost to implementing the changes will be fairly high. Additionally, the residents of Tin Shui Wai might be opposed to the policy change of disallowing pedestrians to walk on the cycle tracks.

Recommendation #4. **We recommend that the Yuen Long District Council create a cycling education program in Tin Shui Wai to promote cycling as a safe mode of transportation.**

Explanation. According to our survey, in Tin Shui Wai many residents are not comfortable biking on roads. This makes commuting by bike in Tin Shui Wai difficult because the cycle track is so disconnected, riders are required to ride on the road for some part of their journey. In the United States, cycling education programs have been very successful to educate and riders improve comfort levels. To educate the residents, we suggest holding safe biking workshops at each of the 11 public housing estates. On different weekends, a safe biking workshop could be hosted at different public housing estates in the area. These events may be sponsored by the Yuen Long District Council, Hong Kong Cycling Alliance, or Bike The Moment to encourage safe cycling in the New Territories. The organizers will need bikes to lend, as our survey shows that 70% of adults in Tin Shui Wai do not have access to a bicycle. We suggest breaking this program into a beginner course and an intermediate course.

The goal of the beginner course is to promote someone with a low-level riding ability to be comfortable riding on cycle tracks. The Yuen Long District Council could ask for volunteers from the Hong Kong Cycling Alliance or Bike The Moment to help teach the course. The intermediate course is primarily for adults and aim towards teaching people how to ride in areas without cycle tracks. Our survey data in Tin Shui Wai shows that 84% of the people are not comfortable biking on roads. The intermediate course will give people experience biking along low volume roads to make them more comfortable riding in areas where cycle tracks are not available. This course will teach residents of Tin Shui Wai how to safely cycle on roads while competing with vehicle traffic. Programs like this one have been implemented successfully in Austin, Portland, and other cities in the United States.

Limitations. This type of program does not educate drivers in the area about cyclists. This program also does not target children in schools. Some of the most successful cycling education programs in the United States are implemented in elementary and middle schools.

Recommendation #5. **We recommend that The Education University of Hong Kong continue our research at Science Park and Tin Shui Wai, as well as other areas in Hong Kong.**

We have provided our observation sheet, assistive guide, and all methods and surveys associated with analyzing a site's bikeability. We believe that Tuen Mun and Tai Po could be good candidates for future research because they both have high residential population densities. Bike share programs and cycling education programs could not only be implemented at our two selected sites, but in other analyzed areas throughout Hong Kong. Wong Wai-shun, Vice Chairman of the Yuen Long District Council believes that bike share programs would work in many areas throughout Hong Kong. Furthermore, he thinks it would alleviate the lack of bike storage and the problem of destroyed bikes piling up at bike racks. The results of this research can be used by the Hong Kong Department of Transportation to assists in planning cycling infrastructure.

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5. Conclusions and Recommendations	Brandon, Garrison	Team

APPENDIX A: INTERVIEW QUESTIONS FOR CYCLING ORGANIZATIONS

Appendix A.1: Interview Questions for NYC Transportation Alternatives

Interviewers: Brandon Coll, Garrison Hefter, Ryan Stokes, Griffin Tabor

Interviewee: Julia Kite - Policy and Research Manager

Date: 2/15/17

Time: 22:30 (HK time)

Q: How long have you been involved with Transportation Alternatives?

Q: Please describe how your organization promotes cycling in NYC.

Q: What are the goals when promoting cycling in NYC?

Q: How would you describe the cycling culture in NYC? How has cycling evolved since when you started working with Transportation Alternatives?

Q: What recommendations would you have to promote cycling in residential vs. commercial areas?

Q: What are some of the challenges for promoting cycling in NYC? What are some of the challenges you feel would be more general/applicable to other cities/communities?

Q: What do you feel has been the largest benefit to come from the efforts of Transportation Alternatives to promote cycling?

Q: Did you look at any other specific programs/cities when developing plans to promote cycling in NYC? What were they?

Q: Are there any specific areas in NYC where cycling promotion has been focused? If so, why? Or why not other areas?

Q: What has NYC done to specifically promote cycling for commuters?

Q: What metrics does your organization use when evaluating cycling?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.2: Interview Questions for New York Bicycle Coalition

Interviewers: Brandon Coll, Garrison Hefter, Ryan Stokes, Griffin Tabor

Interviewee: Kyle Hatch – Project Coordinator

Date: 2/20/17

Time: 23:00 (HK time)

Q: How long have you been involved with New York Bicycle Coalition?

Q: Please describe how your organization promotes cycling in New York.

Q: What are the goals when promoting cycling in New York?

Q: How would you describe the cycling culture in New York? How has cycling evolved since when you started working with New York Bicycle Coalition?

Q: What recommendations would you have to promote cycling in residential vs. commercial areas?

Q: What are some of the challenges for promoting cycling in New York? What are some of the challenges you feel would be more general/applicable to other cities/communities?

Q: What do you feel has been the largest benefit to come from the efforts of New York Bicycle Coalition to promote cycling?

Q: Did you look at any other specific programs/cities when developing plans to promote cycling in New York? What were they?

Q: Are there any specific areas in New York where cycling promotion has been focused? If so, why? Or why not other areas?

Q: What has New York done to specifically promote cycling for commuters?

Q: What metrics does your organization use when evaluating cycling?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.3: Interview Questions for Portland Bureau of Transportation

Interviewers: Brandon Coll, Garrison Hefter, Ryan Stokes, Griffin Tabor

Interviewee: Roger Geller – Bicycle Coordinator

Date: 2/8/17

Time: 07:00 (HK time)

Q: How long have you been involved with the Portland Bureau of Transportation?

Q: Please describe how your organization promotes cycling in Portland.

Q: What are the goals when promoting cycling in Portland?

Q: How would you describe the cycling culture in Portland? How has cycling evolved since when you started working with the Portland Bureau of Transportation?

Q: What recommendations would you have to promote cycling in residential vs. commercial areas?

Q: What are some of the challenges for promoting cycling in Portland? What are some of the challenges you feel would be more general/applicable to other cities/communities?

Q: What do you feel has been the largest benefit to come from the efforts of Portland Bureau of Transportation to promote cycling?

Q: Did you look at any other specific programs/cities when developing plans to promote cycling in Portland? What were they?

Q: Are there any specific areas in Portland where cycling promotion has been focused? If so, why? Or why not other areas?

Q: What has Portland done to specifically promote cycling for commuters?

Q: What metrics does your organization use when evaluating cycling?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.4: Interview Questions for The Street Trust

Interviewers: Brandon Coll, Garrison Hefter, Ryan Stokes, Griffin Tabor

Interviewee: Sheilagh Griffin – Education Director

Date: 1/30/17

Time: 07:00 (HK time)

Q: How long have you been involved with The Street Trust?

Q: Please describe how your organization promotes cycling in Portland.

Q: What are the goals when promoting cycling in Portland?

Q: How would you describe the cycling culture in Portland? How has cycling evolved since when you started working with The Street Trust?

Q: What recommendations would you have to promote cycling in residential vs. commercial areas?

Q: What are some of the challenges for promoting cycling in Portland? What are some of the challenges you feel would be more general/applicable to other cities/communities?

Q: What do you feel has been the largest benefit to come from the efforts of The Street Trust to promote cycling?

Q: Did you look at any other specific programs/cities when developing plans to promote cycling in Portland? What were they?

Q: Are there any specific areas in Portland where cycling promotion has been focused? If so, why? Or why not other areas?

Q: What has Portland done to specifically promote cycling for commuters?

Q: What metrics does your organization use when evaluating cycling?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.5: Interview Questions for Austin Active Transportation Division

Interviewers: Brandon Coll, Garrison Hefter, Ryan Stokes, Griffin Tabor

Interviewee: Mike Schofield

Date: 1/16/17

Time: 23:00 (HK time)

Q: How long have you been involved with the Austin Active Transportation Division?

Q: We have reviewed the Austin Bicycle Master Plan and other information online. Please describe some of the biking promotion programs that your department has implemented in the city of Austin.

Q: Why did the city of Austin decide to implement a cycling promotion program? What were the goals in creating a cycling promotion program?

Q: How would you describe the cycling culture in Austin? How has cycling evolved since when you started working with the Active Transportation Division?

Q: What recommendations would you have to promote cycling in residential vs. commercial areas?

Q: What are some of the challenges for promoting cycling in Austin? What are some of the challenges you feel would be more general/applicable to other cities/communities?

Q: What do you feel has been the largest benefit to come from the efforts of the Active Transportation Division to promote cycling?

Q: Did you look at any other specific programs/cities when developing plans to promote cycling in Austin? What were they?

Q: Are there any specific areas in Austin where cycling promotion has been focused? If so, why? Or why not other areas?

Q: What has Austin done to specifically promote cycling for commuters?

Q: What metrics does your organization use when evaluating cycling?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.6: Interview Questions for Bike Austin

Interviewers: Brandon Coll, Garrison Hefter, Ryan Stokes, Griffin Tabor

Interviewee: Miller Nuttle – Campaign Director

Date: 1/25/17

Time: 23:00 (HK time)

Q: How long have you been involved with Bike Austin?

Q: Please describe how your organization promotes cycling in Austin.

Q: What are the goals when promoting cycling in Austin?

Q: How would you describe the cycling culture in Austin? How has cycling evolved since when you started working with Bike Austin?

Q: What recommendations would you have to promote cycling in residential vs. commercial areas?

Q: What are some of the challenges for promoting cycling in Austin? What are some of the challenges you feel would be more general/applicable to other cities/communities?

Q: What do you feel has been the largest benefit to come from the efforts of Bike Austin to promote cycling?

Q: Did you look at any other specific programs/cities when developing plans to promote cycling in Austin? What were they?

Q: Are there any specific areas in Austin where cycling promotion has been focused? If so, why? Or why not other areas?

Q: What has Austin done to specifically promote cycling for commuters?

Q: What metrics does your organization use when evaluating cycling?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.7: Interview Questions for Legislation Council of Hong Kong

Interviewers: Brandon Coll, Garrison Hefter, Ryan Stokes, Griffin Tabor

Interviewee: Edward Yiu – Councilman

Date: 1/22/17

Time: 11:00 (HK time)

Q: How long have you been biking and how long have you been working with cycling in Hong Kong? In what capacities?

Q: What specific policies has the legislative council had in regards to cycling?

Q: What are the major barriers or obstacles your group faces when promoting cycling in Hong Kong?

Q: How do you believe the public as a whole views biking? Is it perceived as a hobby or more as a mode of transport?

Q: How would you describe the cycling culture in Hong Kong?

Q: What do you feel has been the largest benefit to come from promoting cycling in Hong Kong?

Q: Do you (personally) utilize the biking infrastructure provided by the city? How? Why or why not?

Q: How do you think Hong Kong differs from the other places around the world working to promote biking?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.8: Interview Questions for Hong Kong Cycling Alliance

Interviewers: Brandon Coll, Griffin Tabor

Interviewee: Martin Turner - Chairman

Date: 1/22/17

Time: 15:30 (HK time)

Q: How long have you been biking and how long have you been working with the Hong Kong Cycling Alliance?

Q: What does the Hong Kong Cycling Alliance do to impact cycling in Hong Kong? What were the goals in creating this group?

Q: What are the major barriers or obstacles your group faces when promoting cycling in Hong Kong?

Q: How do you believe the public as a whole views biking, is it perceived as a hobby or more as a mode of transport?

Q: Do you utilize the biking infrastructure provided by Hong Kong? How? Why or why not?

Q: How would you describe the cycling culture in Hong Kong? Now vs. before this group was founded?

Q: Did you look at any other specific programs/cities when developing this group? What were they? How do you think Hong Kong differs from the other cities working on promoting biking?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.9: Interview Questions for Bike The Moment

Interviewers: Brandon Coll, Garrison Hefter, Ryan Stokes, Griffin Tabor

Interviewee: Hughes Lau - Director

Date: 1/24/17

Time: 13:00 (HK time)

Q: How long have you been biking and how long have you been working with Bike The Moment?

Q: What does Bike The Moment do to impact cycling in Hong Kong? What were the goals in creating this group?

Q: What are the major barriers or obstacles your group faces when promoting cycling in Hong Kong?

Q: How do you believe the public as a whole views biking, is it perceived as an activity or more as a mode of transport?

Q: Do you utilize the biking infrastructure provided by Hong Kong? How? Why or why not?

Q: How would you describe the cycling culture in Hong Kong? Now vs. before Bike The Moment was founded?

Q: Did you look at any other specific programs/cities when developing this group? What were they? How do you think Hong Kong differs from the other places working on promoting biking?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.10: Interview Questions for The Contact Design Store

Interviewers: Brandon Coll, Garrison Hefter, Ryan Stokes, Griffin Tabor

Interviewee: Jessica Lau - Communications Director

Date: 1/23/17

Time: 16:00 (HK time)

Q: How long have you been biking and how long have you been working with The Contact Design Store?

Q: Does The Contact Design Store do anything to promote cycling in Science Park or elsewhere?

Q: What do you believe are the major barriers to promoting cycling around Science Park?

Q: How do you believe the public at Science Park views biking? Is it perceived as a hobby or more as a mode of transport?

Q: How would you describe the cycling culture in Hong Kong? In Science Park?

Q: How do most people commute to Science Park now? (i.e. Private car, bus, MTR, taxi, etc.)

Q: Do you think that people in Science Park would cycle to work more if employers/buildings provided more facilities? (i.e. Showers, locker rooms, private bike parking, etc.)

Q: Do you think people in Science Park would cycle more if there was a bike share program?

Q: Do you think it would be feasible to promote cycling as the “first mile and last mile journey” of commuting?

Q: Is bike theft a problem in this area? What about the rest of Hong Kong? Would that deter people from biking?

Q: What types of improvements do you think would need to be made to encourage cycling for the “first mile and last mile journey” of commuting?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.11: Interview Questions for Science Park Management Office

Interviewers: Ryan Stokes, Griffin Tabor

Interviewee: Jerry Cheung - Assistant Manager of Sustainability at Science Park

Date: 2/7/17

Time: 10:00 (HK time)

Q: How long have you worked at Science Park?

Q: Does Science Park do anything to promote cycling?

Q: What do you believe are the major barriers to promoting cycling in Science Park?

Q: How do you believe the public at Science Park views biking? Is it perceived as a hobby or more as a mode of transport?

Q: How would you describe the cycling culture in Hong Kong? In Science Park?

Q: How do most people commute to Science Park now? (i.e. Private car, bus, MTR, taxi etc.)

Q: Do you think it would be feasible to promote cycling as the "first mile and last mile journey" of commuting? (From University Station to Science Park and back)

Q: What types of facilities are provided to encourage cycling in Science Park? Do you think people would cycle more if more facilities are available/what improvements should be made to encourage employees to cycle more?

Q: Do you think people in Science Park would cycle more if there was a bike share program?

Q: If so, what type of bike share program (i.e. Mobike, private/public/business, etc.)? Why?

Q: Do you think an educational program on cycling would be a good promotional idea for cycling in Science Park?

Q: Could employers provide incentives (i.e. discount coupons, cheap or sponsored bike rental, etc.) to their employees for cycling to work?

Q: How would cycling fit into the green/environmentally friendly mission of Science Park?

Q: Is bike theft a problem in this area? What about the rest of Hong Kong? Would that deter people from biking?

Q: Do you have any recommendations for further research? Any other individuals to contact?

Appendix A.12: Interview Questions for Yuen Long District Council

Interviewer: Chan Lai Yee, Ho Hiu Tung, Brandon Coll, Garrison Hefter

Interviewee: Wong Wai-shun – Vice Chairman

Date: 2/21/17

Time: 15:00 (HK time)

Q: How long have you worked within the Yuen Long District?

Q: What type of work have you been involved with in Tin Shui Wai?

Q: Is cycling a popular mode of transport in Tin Shui Wai?

Q: How do you think the average income of Tin Shui Wai affects people's willingness to bike?

Q: How do you believe the public in Tin Shui Wai views cycling?

Q: What are some of the cycling policies in Tin Shui Wai?

Q: What was the purpose of constructing the cycling tracks in Tin Shui Wai?

Q: Is the government in support of promoting cycling as a means of commute in Tin Shui Wai?

Q: What is the governments' view on cycling educational programs at schools within Tin Shui Wai?

Q: Would the government be willing to improve the cycling infrastructure in Tin Shui Wai (ex: construct more cycle tracks/build more subways to connect tracks)?

Q: How does that process work? Who starts this process?

Q: What are some of the barriers the government would face in improving cycling infrastructure/promoting cycling in Tin Shui Wai?

APPENDIX B: INTERVIEW SUMMARIES FROM REPRESENTATIVES OF CYCLING ORGANIZATIONS

Appendix B.1: Interview Summary from NYC Transportation Alternatives

Julia Kite is the policy and research manager at New York City Transportation Alternatives. She has been with this program since June of 2015. Transportation Alternatives focuses on promoting cycling for recreational and commuting purposes. The main way that this organization accomplishes promoting cycling is by pushing for infrastructure changes to benefit cyclists. The core belief of this organization is that if more people cycle, then the streets will be less congested of cars.

The cycling culture in New York City has grown since the establishment of Transportation Alternatives. Transportation Alternatives works closely with the cycling community in New York City by working to implement bike paths and tracks that the community proposes. Julia notes that by "listening to the community and implementing infrastructure in those areas" cycling culture is able to grow.

The greatest accomplishment of Transportation Alternatives was the implementation of Citi Bike. Citi Bike is a very successful bike share program, which has hundreds of stations all throughout New York City. Julia expressed that since the implementation of Citi Bike, more people are commuting to work by bike. Furthermore, Julia believes that the best way to promote cycling in a congested city, such as Hong Kong or New York City, is by implementing and developing a bike path network. The more advanced bike path network, the more likely the success of a bike share program. A bike share program is a great way to encourage people to cycle for commuting purposes.

Appendix B.2: Interview Summary from New York Bicycle Coalition

Mr. Kyle Hatch has been working with the New York Bicycle Coalition for a little over a year, an organization which has been around since 1992. The New York Bicycle Coalition is located in Albany, NY, and works to advocate for educational safety of cyclists all throughout New York. The organization sponsors events like bike tourist week, sets up bike meters for people to bike to work, and works to reduce bike accidents by providing educational safety programs for the public.

Mr. Hatch said that the bike culture in New York City is a lot better than other places throughout New York. Many people in New York City commute by bike, which is not the case in other places throughout New York due to the lack of infrastructure. The residential areas of New York can be dangerous to bike in since cyclists have to compete with vehicles on the road. Commercial areas are less dangerous since there are many bike lanes available. The organization is working to promote biking in residential/rural areas by proposing infrastructure changes to make cycling safe.

The bike lanes in New York City are abused with walking pedestrians. This causes a congestion problem with the cyclists and pedestrians. The Bicycle Coalition is working to enforce the policy of no walking on the bike lanes by having the New York City Police monitor the lanes and ticket pedestrians who abuse them. This is a very similar issue with the cycle tracks in Tin Shui Wai.

Appendix B.3: Interview Summary from Portland Bureau of Transportation

Mr. Roger Geller has been involved with promoting cycling in Portland since 1994. The Portland Bureau of Transportation has built a large scale, interconnected bikeway network over the past 20 years. The bureau believes that cycling is a great mode of transportation for urban areas. The cycling culture in Portland has spawned over time due to the increasing development of cycling infrastructure. Cycling in Portland is promoted for commuting purposes. In 2000, only 1.6% of commuters were cyclists. In the last 15 years, Portland's total commuters has increased by 55,000 commuters, and cycling is now the number one means to transport to work. Portland used to be just like any other city with very little cycling until a cycling network was established and the government began promoting cycling usage. Mr. Geller referred to this as "policy and implementation."

Portland's street pattern has created a comfortable cycling environment. Portland has a tight grid pattern of 200 foot blocks with parallel roadways, which creates good land use to put bicycle ways on the streets for commuting trips. The streets in Portland have reduced speeds to prioritize for bikes. Due to the short blocks and reduced speeds, the average speed of vehicles is between 12 mph – 16 mph. These low speeds create traffic conditions which are not intimidating for cyclists.

Portland has approximately 2,000 annual bicycle events. These events encourage and give people the opportunity to go out and cycle. Ten percent of residents in Portland participate in these events. In addition to the bicycle events, school programs are offered for families to promote safe riding.

Residential areas in Portland have streets which are generally low volume, giving opportunity for shared lanes of the road with bicyclists. There are 80 miles of bicycle boulevards throughout the residential streets of Portland, which run parallel to regular streets. Bicycle boulevards create comfortable conditions for any level of cyclist.

Portland has a "get what we can" mentality, and creates cycling facilities wherever they are able to. As time goes on, they will continue to upgrade and develop better quality infrastructure. Mr. Geller stated that Portland expects more people to migrate into the city over

the next 20 years, and they will not be able to accommodate for these people if they only drive and do not adapt to the cycling culture.

Appendix B.4: Interview Summary from The Street Trust

Ms. Sheilagh Griffin is the Education Director at The Street Trust, a non-profit group that works to promote and improve public transit in Portland. Ms. Griffin has been with this organization since 2010. She enjoys cycling whether it be commuting or riding for recreation. Sheilagh is passionate about developing safer roads through bicycle safety education for all students.

One of the most notable programs that this organization has developed in Portland is the Bike Safety Education Program. This program has reached just under half of all elementary schools in the city. The program encourages bike trips to numerous locations, and ensures that both young people and adults who attend are educated about proper bike safety practices.

Another program that The Street Trust sponsors is the Women Bikes Program. This is both a network and support group that holds bike rides periodically. This is a new program, and its goal is to inspire more women to incorporate a bike in their lives and use biking to meet their goals in both transportation and recreation. In Portland, women account for only 33% of bike riders. This program is meant to increase that percentage.

Ms. Griffin mentioned that the most limiting factor to cycling worldwide is infrastructure. People must feel safe when cycling in their city. Busy roads with large vehicles tend to discourage cyclists. Providing more cycling infrastructure will greatly increase the amount of cyclists on the road. Portland has implemented a cycle track network which denotes a designated space for the rider. Due to this cycle track network, more people in Portland feel comfortable cycling, and are beginning to incorporate cycling as a means of their daily commute.

Appendix B.5: Interview Summary from Austin Active Transportation Division

Mr. Mike Schofield moved to Austin, Texas, 10 years ago, and has been working within the Active Transportation Division for a little over a year now. Prior to working with the Active Transportation Division, Mike has only done "a little bit" of work with cycling.

Smart Trips is a bicycle promotion program that the Active Transportation Division has implemented. This promotional program involves the selection of a neighborhood-sized area within Austin where a dedicated employee goes around and hands out flyers to give information about alternative ways for people to travel besides vehicle. These neighborhoods usually do not have sufficient cycling infrastructure. Mike stated that "many students and kids in these neighborhoods are unaware of alternative transportation methods because they are used to commuting by vehicle." The goal of Smart Trips is to go to areas where there is not a lot of cycling infrastructure present, and inform the neighborhood about cycling as a means of transportation.

Recently, the Active Transportation Department installed cycling tracks in a neighborhood where a lot of the neighbors were not happy about the installation because some road and sidewalk space was taken away for the cycling tracks. To appease the upset neighbors, the Active Transportation Division promoted and offered a free bicycle event at the local elementary school to teach kids how to bike. Mike stated that, "anytime when infrastructure goes in and there is an impact on the neighborhood, like the removal of a lane from a road, neighbors will get upset and it is our responsibility to compromise."

Over the 10 years that Mike has lived in Austin, he has observed that the cycling culture has been expanding and getting better. Each year, Austin puts in 20-40 miles of bike lanes. With an increase in the network of cycling lanes, there is a growing number of cyclists in Austin. The goal of the Division's Bicycle Master Plan is to construct a network of bike lanes around the city of Austin. Many of the bike lanes have gaps within them, which is what the Bicycle Master Plan is trying to improve. Some people are stuck going outside of their comfort level to get off the bike path and ride on the roads.

Promoting cycling is very different in residential areas versus commercial areas. Mike said that there is more resistance to promote cycling in residential areas. "If people do not see

other people biking then why would they start to do it?" In commercial/downtown areas many people bike due to the motorized vehicle density, making biking "a sensible mode of transportation."

Based on bicycle counters and data analysis, the Active Transportation Department has noticed that, surprisingly, more people cycle in the summer, despite the high temperatures. Mike stated "cyclists in Austin are undaunted by 100 plus degree days (~38 degrees Celsius)." In order to determine areas where cycling needs to be promoted, the Active Transportation Division uses an online organization, National Association of Transportation Officials (NACTO), which displays graphics and gives standards/guidelines for areas in need of cycling promotion and infrastructure. Major cycling cities, including Portland and Seattle, also use NACTO.

The Active Transportation Division has the goal of getting people to go from point A to point B on bike (from residential areas to downtown Austin). The division's primary strategy is to create cycle paths where gaps are located. The division would like to implement several continuous bike paths from outlying residential areas to downtown Austin. Once the bike path networks are complete and continuous, the goal is to have the networks to be "time competitive" with getting to work by car. This means people can bike to work almost as quickly as driving to work; since the highways going into downtown can get congested during peak commuting hours.

Appendix B.6: Interview Summary from Bike Austin

Mr. Miller Nuttle is the Deputy Director at Bike Austin, a cycling group that works out of Austin, Texas. Mr. Nuttle has been working for two and a half years for Bike Austin, and originally worked in New York City for the Transportation Department.

Since Bike Austin was founded, the organization has been moving forward based on its master plan. This plan sees cycling as a solution for crowded roads and works to implement bike lanes and cycle tracks around the city of Austin. This master plan focuses on taking into account all street users when designing roadways, not just motorized vehicles. Bike Austin focuses on making cycling easy for people by building infrastructure as quickly as possible. The organization believes that people naturally choose the easiest option for traveling, therefore the organizations' goal is to make cycling the easiest mode of transportation.

Cycling has evolved in Austin specifically because of Bike Austin's actions when working with elected officials. Because of this close relationship, there are less obstacles that the organization faces, and they are able to accomplish their goals with little setbacks. Bike Austin's education program not only allows young people to learn to ride and bike, but it allows adults to learn the proper etiquette of riding as a mode of transportation. These classes also teach skills in defensive driving and how to prevent accidents on the road. This aspect of Bike Austin's collaboration with the cycling community has made biking "part of Austin's DNA."

Miller Nuttle made it clear that it is necessary to distinguish between cycling in residential and commercial areas. Infrastructure must exist to connect both areas to make a city overall more "bikeable." However, commercial areas tend to need more focus when implementing cycling infrastructure due to large trucks and a high volume of motorized vehicles on the roads. To attack some of these problems, Mr. Nuttle notes that going through schools, neighborhood groups, and community leaders allows Bike Austin to work with the people of the community to allow for faster and improved change.

To promote cycling as a mode of commute, Bike Austin has focused on individual communities. This is done through a "Bike to Work Day" where free coffee is given to employees who ride to work via bicycle. This idea has caught on and been largely successful in individual communities.

Appendix B.7: Interview Summary from Legislation Council of Hong Kong

Mr. Edward Yiu is a councilman who is supportive of cycling in Hong Kong. He taught urban studies as an associate professor at the Chinese University of Hong Kong for twelve years before accepting this position. Mr. Yiu focuses on building, housing, and land issues with Hong Kong's government.

Mr. Yiu is very supportive of cycling and has consulted with the legislative council to build a cycle lane along the harbor. He discussed how the Hong Kong government conducted a detailed study in 2009 on cycling in Hong Kong. This study concluded that it is easier to implement cycling in the New Territories, but trying to create cycling infrastructure in dense urban environments, such as Kowloon and Hong Kong Island, is much more expensive.

When considering implementing cycling infrastructure in Hong Kong, the first thing the government looks at is the return on investment. Constructing and repairing cycling infrastructure costs a lot of money and manpower. Additionally, there are regulations in Hong Kong where people are expected to get off their bikes when going through tunnels and when riding on sidewalks between bike paths. This makes cycling an inconvenient mode of transportation due to the slow process of cyclists constantly having to dismount from their bikes. Mr. Yiu suggested that issues with cycling policy may need to be addressed before any infrastructure is implemented.

Mr. Yiu discussed how public perception of cycling is positive, but the reality people cycling is discouraging. Many people would like to live sustainably, however the transportation network in Hong Kong is perceived as more efficient than cycling. People also feel that cycling is not encouraged enough by the government, due to the frequent sight of signs indicating "no cycling," and the lack of infrastructure especially in Kowloon and Hong Kong Island.

Lastly, Mr. Yiu indicated that a large factor that may prevent people from cycling is the weather. Temperatures can reach up to 35 degrees Celsius at times, causing people to utilize a less strenuous form of transportation. To conclude, it is very expensive for the Hong Kong government to construct cycle tracks. Without a connected cycle track network, people will not cycle to commute since Hong Kong already has many well-developed transportation systems.

Appendix B.8: Interview Summary from Hong Kong Cycling Alliance

Mr. Martin Turner is a cycling enthusiast who works for the Hong Kong Cycling Alliance. He has been cycling for well over fifty years and has been working on cycling projects since the organization was founded. Martin Turner runs his very successful promotion program through Facebook by creating events with thousands of participants. He is very well known in Hong Kong's cycling community and knows many advocate leaders throughout the city.

Mr. Turner's advocacy group places emphasis on creating a positive outlook on cycling throughout the community and providing organization to the hundreds of bikers throughout Hong Kong. His main goals are to create positive media attention and organize many "grass roots" efforts within the city. Turner has a vision for Hong Kong where the many problems that the city faces with congestion can be solved by allowing cycling to take roots in the city. He believes in this vision because he travels everywhere by bicycle, noting how easy it is to get around regardless of cars, busses, and busy intersections.

Mr. Turner discussed that the most common barriers to cycling involves the Hong Kong Department of Transportation. He mentioned how the transportation department thinks cycling is more of a dangerous liability than a proper form of transportation. Mr. Turner claimed that cycling is not viewed as a priority by the department, and problems that arise are typically solved by implementing additional non-active transportation methods. There are also problems with the way people in Hong Kong view cycling. People view cycling as unsafe and prefer the luxury of driving. Martin Turner explained that China was once a cycling country, but ever since the rise of the middle class everyone prefers to have a car.

There are problems with cycle tracks in Hong Kong. The cycle tracks that exist in the New Territories do not have signs to direct cyclists on which direction they are travelling in. Additionally, these tracks are typically used for recreation. The people who cycle as a means of transportation have problems finding space to store their bikes. Many people resort to chaining their bikes against the railing of fences along sidewalks.

Martin Turner used his knowledge and experience to give us an insight on why cycling is not "taken seriously" in Hong Kong. He went on to refer us to several individuals to help continue our research.

Appendix B.9: Interview Summary from Bike The Moment

Mr. Hughes Lau has been a cyclist since he was a child. He founded Bike The Moment in 2012. This organization takes on various tasks, such as distributing information about bike tours and locations to cycle, as well as organizing bicycles gatherings. The overarching goal of Bike The Moment is to put a bicycle in more people's lives, for recreational and commuting purposes.

There are several barriers Bike The Moment faces when to trying to promote cycling in Hong Kong. One is the lack of cycling infrastructure in Kowloon and Hong Kong Island. In most of these areas there are no bike lanes and the attitudes of vehicle drivers are very negative towards cyclists. Cycling law in Hong Kong allows cyclists to ride on the road, but due to the negative attitude of vehicle drivers, it is not desirable to cycle with cars and buses on busy roads. The education of drivers is another obstacle Bike The Moment faces when promoting biking. Most drivers think that bicycles are obstacles on the road due to lack of road space. This causes dangerous conditions near cyclists and causes some vehicle drivers to intentionally drive dangerously out of frustration. Lastly, bicycle parking is a barrier to promoting cycling in Hong Kong. Bikes are easily stolen or removed by the government if they are left on the street. Safe parking is key to creating a bike-friendly environment.

"Hong Kong is one of the most congested cities in the world, and the people have a poor perception of how cycling can be used as a mode of transportation to reduce congestion." Mr. Lau stated that Hong Kong should look to promote cycling by comparing the success of cycling in other cities throughout the world.

Appendix B.10: Interview Summary from The Contact Design Store

Jessica Lau has been working as the Communications Director at The Contact Design Store located in Science Park for a year. The Contact Design Store is a consulting firm which designs custom made bikes. The store was chosen to be located in Science Park since the longest bike trail in Hong Kong is located alongside Science Park. The Contact Design Store is working to promote cycling throughout Hong Kong, especially for the people working in Science Park. The store has a bike specialist which brings people to different bike routes in Hong Kong. Jessica believes that a major benefit to cycling is that it is a way to commute places while improving the health of the riders.

Jessica believes that cycling usage is expanding in Hong Kong, especially due to the government planning to develop new cycle tracks. However, Jessica believes that there are many barriers to cycling as a means of commute, since the people who cycle in Hong Kong tend to view it as a recreational activity. Some of these barriers include the lack of bike parking facilities, the lack of security within the bike racks, the law not allowing people to bring bikes onto the MTR without taking the front wheel off, and the lack of shower facilities at the place of work. Fortunately, several of these barriers are not present in Science Park. Jessica informed us that Science Park has shower facilities in most of the buildings, including a clubhouse which has a locker room containing showers. Additionally, there are many bike parking facilities within and surrounding Science Park.

The majority of people who work in Science Park get off the MTR at University Station. In order to commute from University Station to Science Park, most people use a bus. Some people get to Science Park through the use of a private car, since there is a parking lot available. Jessica did state that the cycle track along Science Park can get very congested, especially when there are kids learning how to bike. In order to get rid of this congestion, Jessica suggests implementing places for people to learn how to bike. Jessica believes that a lot of people would not bike to work in Science Park due to the dress attire that they have to wear. Additionally, Jessica expressed that some customers have come into her shop saying that their bike has gotten stolen at the bike racks located around Science Park.

To conclude the interview, Jessica thinks that cycling can be promoted through education programs in residential areas teaching people how to ride bikes. “Only 70-80 percent of people

know how to ride bikes in Hong Kong." Additionally, folding bikes can be helpful for bringing bikes onto the MTR. The biggest takeaway from our interview with Jessica was learning that there are shower facilities located throughout Science Park.

Appendix B.11: Interview Summary from Science Park Management Office

Mr. Jerry Cheung has been working as the Assistant Manager for Sustainability at Science Park for four years. Mr. Cheung lives in Sha Tin and rides his bike to work at Science Park every day. The bike ride from Sha Tin to Science Park is approximately 30 minutes. Due to this commute, Mr. Cheung utilizes the shower facilities provided in his office building. When introducing ourselves and the project, Mr. Cheung said "this is a very hard project because biking is a hard thing to promote in Hong Kong."

Science Park has many facilities which promote the use of cycling. Public and private bike racks were created all throughout the park, and shower/locker room facilities were created to promote exercise for the employees. Mr. Cheung noted that these facilities are underutilized, and hardly anyone bikes to work at Science Park. Employees at Science Park know how to bike, however they view cycling as a leisure activity rather than a way to commute. In general throughout Hong Kong, part of the reason people do not bike for commuting purposes is because bike theft is a problem. Many people do not have room in their living space to store a bike, therefore the bike must be kept outside. A few weeks ago, Mr. Cheung had his bike locked up outside of his living space in Sha Tin when the lock was cut through and his bike was stolen. Now, Mr. Cheung always brings his bike inside whether it is at home, or in his office at work. However, Mr. Cheung does not believe that bike theft is a problem in Science Park; only in certain areas of Hong Kong.

Mr. Cheung was very interested in the idea of a bike share program in Science Park. He believes that this would work very well, especially with the current infrastructure in place. Mr. Cheung said that Science Park would be willing to fund and promote a bike share program. The only obstacle in doing so would be getting the government to fund and allow for a bike share program at University Station. If the government would agree to a bike share program at University Station, then Science Park would proceed with implementing the program. Mr. Cheung also believes that several of the big companies within Science Park would sponsor the bike share program.

To conclude, Mr. Cheung was very interested in our project. He believes that a bike share program would work perfectly with the cycling infrastructure already in place. Science Park

would be willing to support a bike share program, however, Mr. Cheung is unsure if the government would allow for this at University Station.

Appendix B.12: Interview Summary from Yuen Long District Council

Mr. Wong is the Vice Chairman of the Yuen Long District Council. He has worked within the Yuen Long District for over 28 years. As the Vice Chairman, he has worked with every proposal that has come to the council, including all cycling related additions to the district.

Mr. Wong spoke about how cycling has become more important over the past several years. There are many concerns that have been raised by the public regarding cycling in the district. One of these concerns is parking for bicycles in the area. The government has been trying to find a way to provide bicycle parking in the New Territories for a few years. This is due to bike racks becoming crowded and littered with old and broken bikes.

In addition to bike parking, safety has been a major area of concern with cycling in Tin Shui Wai. Many pedestrians have expressed concern that they do not feel safe in areas where cycle tracks exist within sidewalks. The placement of these cycle tracks results in riders breaking the law to ride on the sidewalks, which can result in accidents with pedestrians. All policies and proposals that involve drawing lines on the sidewalk to separate cyclists from pedestrians have been rejected. Cyclists are forced to dismount from their bikes when not in a cycle track. However, this rarely stops riders from cycling on sidewalks.

The solution that Mr. Wong proposes is more designated cycle tracks alongside the road. This solution would result in motorized transportation and cyclists sharing the road and would limit the danger of pedestrian accidents. One barrier that has impacted this solution is that the Hong Kong government does not see cycling as a form of transportation, but only as a leisure activity. Drivers on the roads are not very tolerant of cyclists as well, and lack the education necessary to coexist with them.

Mr. Wong believes that cycling education programs in Hong Kong would not achieve a lot and would cost too much money. He believes that if any cycling or driver education program is implemented, it should be targeted for young people and it would be a long term effort. These programs would create a change in how people perceive cycling, but they may take over ten years before a result is noticed.

Mr. Wong suggested that the best way to attack some of the cycling problems in the New Territories is with a bike share program. He also believes that some areas with historic relics or museums would serve as good locations to create bike share bike racks.

APPENDIX C: INTERVIEW PREAMBLE

Hello, Mr. /Mrs. /Ms. _____, my name is _____ and I am with my fellow students _____, _____, and _____. We are students at Worcester Polytechnic Institute in the U.S., completing a project in conjunction with The Education University of Hong Kong on cycling as a means of transport for the first and last mile journey in Hong Kong. We would like to ask you a few questions about cycling policies and programs in your community. You may choose not to answer any particular questions or end the interview at any time. Would it be okay if we recorded this conversation and use selected quotations in our report? We will offer you the chance to review any quotations or attributed statements before publishing.

APPENDIX D: OBSERVATION SHEET

Categories	Observations
Person(s) Analyzing Location:	
Date:	
Start Time:	
End Time:	
Location:	
Nearest MTR Station:	
BIKE ACCESSIBILITY	
Bike Path	
Quality of Surface	
Ease of Entry onto Bike Path	
Separation Distance from Traffic	
Width of Bike Path	
Slope of Bike Path	
Bike Racks	
Number of Bike Racks	
Distance to Site	
Distance to MTR	
Distance to Bike Path	
Bike Signage	
INTERSECTIONS	
Number of Intersections	
Signaling	
Crosswalks and Markings	
Vehical Speed	
BIKE PATH NETWORK	
Connectivity	
Available Route Choices	
Travel Distance to MTR	
ENVIRONMENT	
Cleanliness	
Types of Buildings	
Scenery and Foliage	
GENERAL OBSERVATIONS DURING PEAK HOURS	
Morning Peak Hours: 07:30-09:00	
Afternoon Peak Hours: 17:30-20:00	

APPENDIX E: GUIDE FOR OBSERVATION SHEET

BIKE ACCESSIBILITY

Bike Path

Quality of Surface: Categorize the surface of the entire length of the bike path as one of the following (Bicycle Network, 2017):

Smooth- Bikeable

Minor bumps or cracks

Major bumps or cracks

Rough- Not bikeable

Ease of Entry onto Bike Path: Identify at the entry ways of the bike path one of the following (Bicycle Network, 2017):

Smooth invert- No curb present

Ledge- Curb present

Separation Distance from Traffic: Identify the distance of the bike path from traffic as one of the following (Bicycle Network, 2017):

Greater than 3 feet (1 meter) - Safe

Less than 3 feet - Unsafe

Width of Bike Path: Identify the width of the bike path including 2-way traffic (Bicycle Network, 2017):

Greater than 11 feet (3.5 meters) - Good width for all times of day

Between 8-11 feet- Adequate width: might get crowded during peak hours

Less than 8 feet (2.5 meters) - Too narrow for 2-way traffic

Slope of Bike Path: Using MapMyRide, calculate the slope along the bike path (Bicycle Network, 2017):

Less than 5% slope- Bikeable

Greater than 5% slope- Only bikeable for short distances

Bike Racks

Number of Bike Racks: Count the number of bike racks around the site, MTR station, and along the bike path.

Distance to Site: Using GIS, determine the distance from the site to the bike racks located nearest to the bike path.

Distance to MTR: Using GIS, determine the distance from the MTR station to the bike racks located nearest to the bike path.

Distance to Bike Path: Using GIS, determine the distance from the bike racks to the bike path at both the site and MTR station.

Bike Signage: Identify if there are signs indicating the presence of a bike path at both the site and MTR station.

INTERSECTIONS

Number of Intersections: Count how many intersections the bike path encounters with the road.

Signaling: Identify if there are signals displayed for bicyclists at each intersection.

Crosswalks and Markings: Identify if there are crosswalks and markings on the road at each intersection.

Vehicle Speed: Identify the speed limit at each intersection.

BIKE PATH NETWORK

Connectivity: Identify if the bike path is continuous from the site to the MTR station.

Available Route Choices: If the bike path is not continuous, identify if there are other route choices, such as biking on the road, to get from the site to the MTR station.

Travel Distance to MTR: Using MapMyRide, identify the overall distance of the bike route from the site to the MTR station (Bicycle Network, 2017):

Between 2-5 km- Bikeable distance

Less than 2 km- People will walk

Greater than 5 km- Too far for people to bike

ENVIRONMENT

Cleanliness: Identify if there is litter present on or around the bike path.

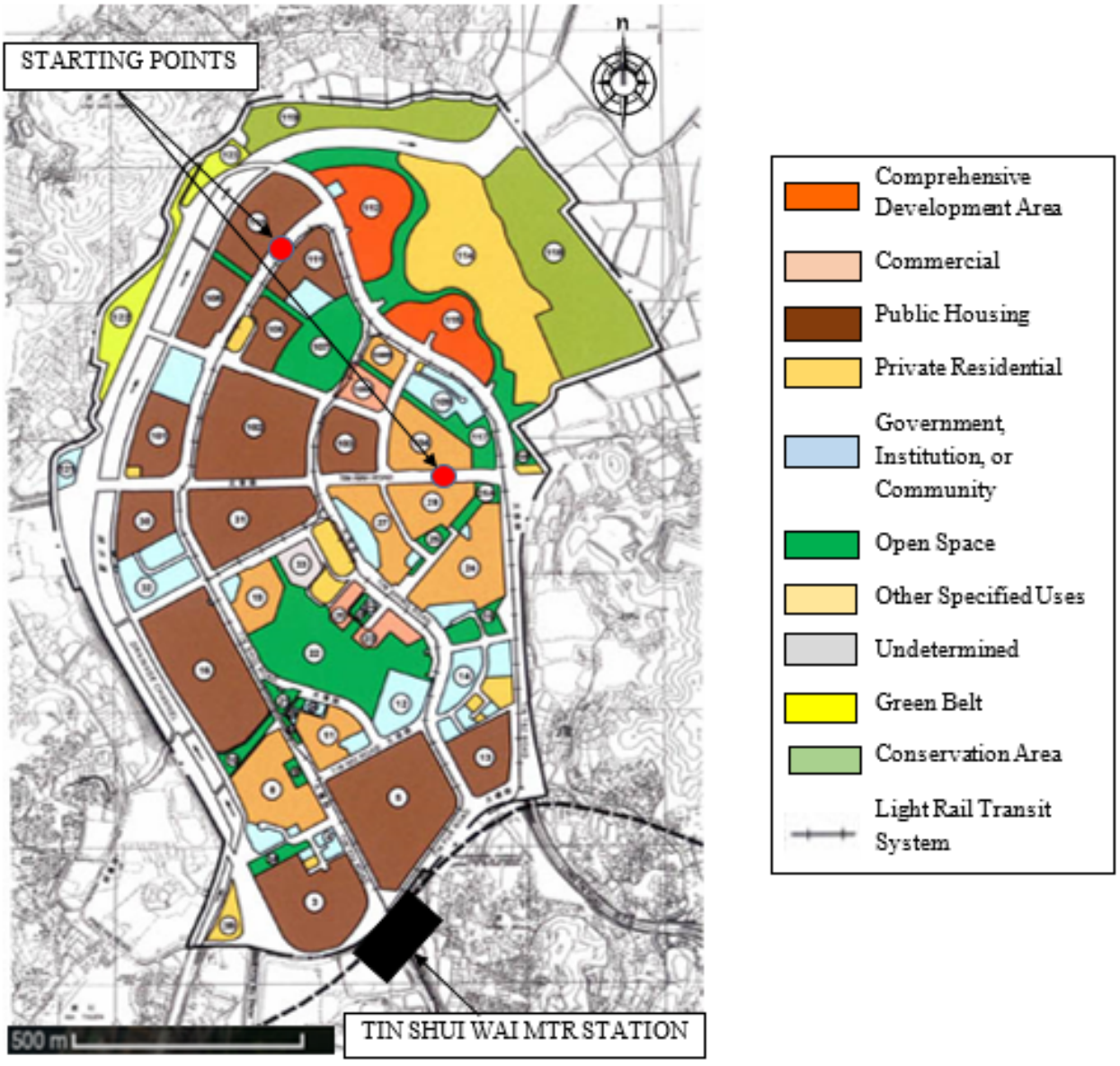
Types of Buildings: Identify the types of buildings surrounding the bike path and at the site. Also identify the overall quality of appearance of the buildings.

Scenery and Foliage: Identify the scenery surrounding the bike path and at the site. Identify the presence of trees, bushes, and/or flowers.

GENERAL OBSERVATIONS DURING PEAK HOURS

Make general observations on how people are commuting to and from work, the number of people commuting by bike, and the congestion of the bike paths and bike racks.

APPENDIX F: LOCATION OF STARTING POINTS IN TIN SHUI WAI (MODIFIED AFTER PLANNING DEPARTMENT, 2005)



APPENDIX G: COMMUTER SURVEY

Commuter Survey

* Required

1. **Do you commute daily? 你每天（或者在工作天）需要進行往返於工作地點與家之間的行程嗎?**
   Mark only one oval.
   - ◯ Yes 是
   - ◯ No 否

2. **Do you have access to a bike? 你是否有可供使用的單車?**
   Mark only one oval.
   - ◯ Yes 是
   - ◯ No 否

3. **How comfortable are you riding a bike? 你如何評價自己騎單車的能力?**
   Mark only one oval per row.

	1. Never riden 從未騎過單車	2.	3. Comfortable on cycle tracks 有能力在單車徑上騎單車	4.	5. Comfortable on roads 有能力在馬路上騎單車
Comfort Level	◯	◯	◯	◯	◯

4. **What is your work dress code on most days? 你的工作是否有特定的衣著要求?**
   Mark only one oval.
   - ◯ Business Professional (suit, dress shirt and tie) 商務正裝 （如西裝，西裙及領帶）
   - ◯ Uniform 制服
   - ◯ Business Casual (dress pants and collared shirt) 商務便裝 （如裙裝，西褲或襯衫）
   - ◯ Casual (no dress requirements) 便裝 （無特別要求）

5. **Do you use the MTR for any portion of your commute? 你的上下班行程（任何一段）是否有搭乘地鐵?**
   Mark only one oval.
   - ◯ Yes 是 *Skip to question 6.*
   - ◯ No 否 *Skip to question 10.*

6. **Which of the following modes of transportation do you generally use to get to your first MTR station during your commute? (Check all that apply) 你會使用下列哪種交通工具到達你行程中的第一個地鐵站? (檢查所有適用)**
Check all that apply.

- [ ] Carpool 汽車共乘 （與別人共同使用私家車）
- [ ] Car - I drive alone 駕駛私家車（獨自駕駛）
- [ ] Bus 巴士
- [ ] Light Rail 輕鐵
- [ ] Motorcycle/Scooter 電單車
- [ ] Bicycle 單車
- [ ] Walk 步行
- [ ] Taxi 的士

7. **How long does that trip take? 你抵達地鐵站的行程需時多久?**
Mark only one oval.

- ◯ Less than 15 minutes 少於15分鐘
- ◯ 15-30 minutes 15-30分鐘
- ◯ 30-60 minutes 30-60 分鐘
- ◯ More than an hour 一小時以上

8. **Which of the following modes of transportation do you generally use to get from your last MTR station to your work? (Check all that apply) 你會使用以下哪種交通工具由地鐵站抵達你的上班地點? (檢查所有適用)**
Check all that apply.

- [ ] Carpool 汽車共乘 （與別人共同使用私家車）
- [ ] Car - I drive alone 駕駛私家車（獨自駕駛）
- [ ] Bus 巴士
- [ ] Light Rail 輕鐵
- [ ] Motorcycle/Scooter 電單車
- [ ] Bicycle 單車
- [ ] Walk 步行
- [ ] Taxi 的士

9. **How long does that trip take? 你從地鐵站抵達上班地點的行程需時多久?**
Mark only one oval.

- ◯ Less than 15 minutes 少於15分鐘
- ◯ 15-30 minutes 15-30分鐘
- ◯ 30-60 minutes 30-60 分鐘
- ◯ More than an hour 一小時以上

10. **Which of the following biking facilities are available at or near your work? (Check all that apply) 你的工作地點附近有否提供以下的單車設施? (檢查所有適用)**
Check all that apply.

- ☐ Changing rooms 更衣室
- ☐ Lockers 儲物櫃
- ☐ Bike racks 單車架
- ☐ Bike paths 單車徑

11. **What is your reaction when you see someone else biking? 你對於其他人使用單車上下班有什麼看法?**
Mark only one oval.

- ◯ Good idea 好主意
- ◯ Does not make sense for Hong Kong 在香港來說不適合
- ◯ Unprofessional 不專業
- ◯ Indifferent 不關心

12. **Would you be willing to bike a portion of your commute? 你會考慮在你上下班的行程中（任何一段）使用單車嗎?** *
Mark only one oval.

- ◯ Yes In some cases 會，視乎情況而定 *Skip to question 13.*
- ◯ No 不會 *Skip to question 14.*

13. **Which of the following conditions might be an exception and would discourage you from biking? (Check all that apply) 在以下哪些情況下你會遲撣不使用單車? (揀選所有適用)**
Check all that apply.

- [ ] Rain 下雨
- [ ] Bright sun 猛烈陽光下
- [ ] Heat 天氣炎熱
- [ ] Wind 強風
- [ ] Cold 天氣寒冷
- [ ] Running behind / in a hurry 遲到或趕時間
- [ ] Other: _____

Skip to question 15.

14. **Which of the following reasons make you not interested in using a bike for commutes? (Check all that apply) 基於下列哪些原因而令你不考慮使用單車上下班? (揀選所有適用)**
Check all that apply.

- [ ] Concern for safety 安全因素
- [ ] Concern for appearance afterwards 騎單車會影響我的服裝儀容
- [ ] Lack of athletic ability 體能不足
- [ ] Too expensive 花費太高
- [ ] No place to store a bike 沒有存放單車的地方
- [ ] Lack of interest 對騎單車沒有興趣

Skip to question 15.

15. **Would knowing that an employer was bike-friendly affect your perception of that organization? 若僱主推行單車友善措施是否會影響你對該公司的觀感?**
Mark only one oval.

- ◯ Yes, it negatively affects my perception 會，我會有負面的觀感
- ◯ Yes, it positively affects my perception 會，我會有正面的觀感
- ◯ No 不會

16. **Which of the following would make you more likely to bike at least one section of your commute? (Check all that apply) 以下哪些措施會令你在行程中考慮使用單車? (檢查所有適用)**
Check all that apply.

- [ ] Bike Share program / Cheap bike rental near MTR station 公共單車租車服務/在地鐵附近便宜的租單車服務
- [ ] Improved cycling infrastructure(dedicated bicycle paths, bike racks) 改善單車設施
- [ ] Employers installing bike friendly facilities (bicycle parking, locker room, changing rooms, etc.) 僱主（或工作地點）提供單車設施 （如單車架，儲物櫃或更衣室）

Please Return 請返回

Demographics
Don't submit without internet connection

17. **Male or Female?**
Mark only one oval.

- ◯ Male
- ◯ Female

18. **Age range**
Mark only one oval.

	1	2	3	
Younger than 30	◯	◯	◯	Older than 45

APPENDIX H: SURVEY PREAMBLE

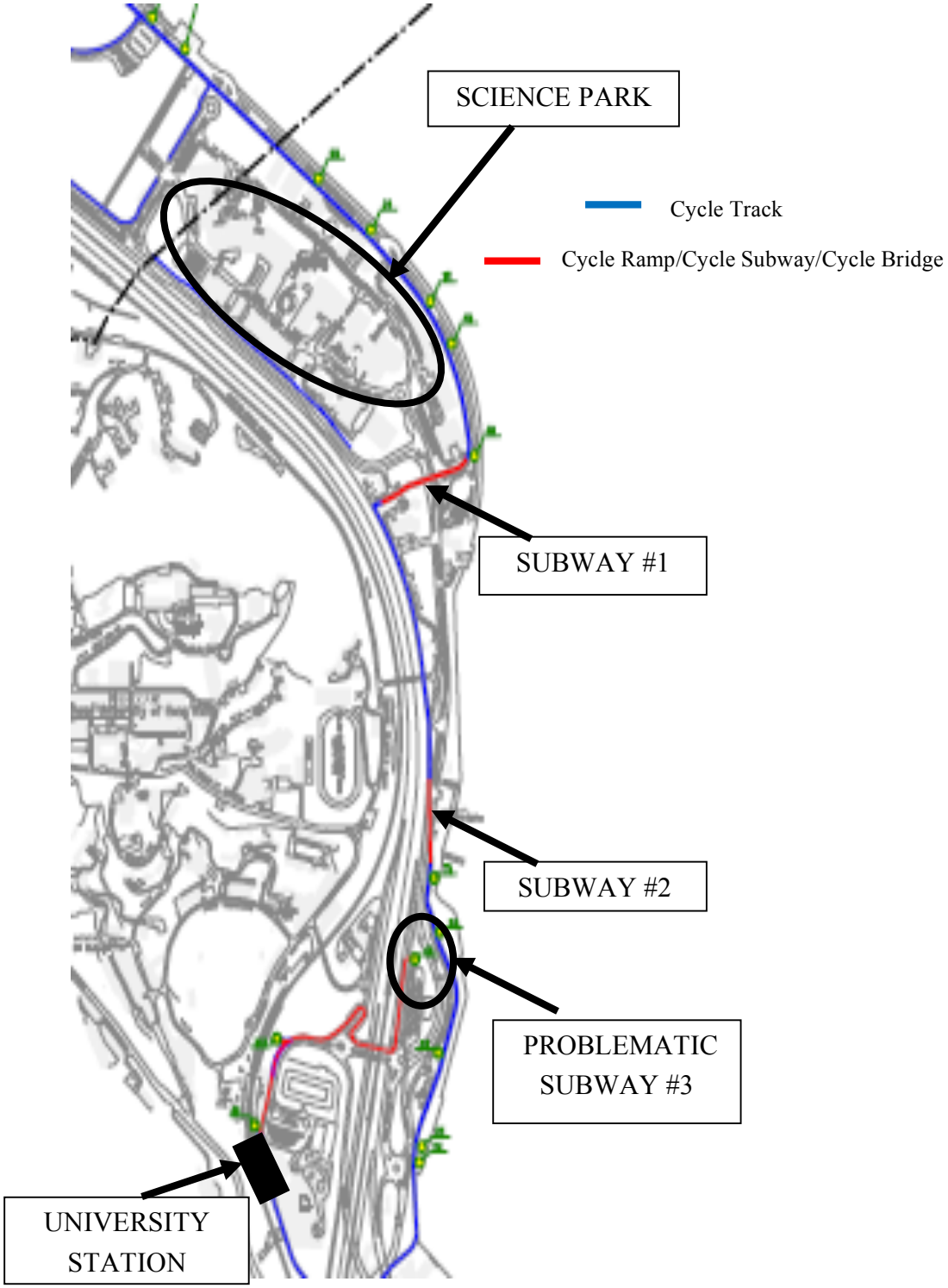
Hello, my name is _____ and I am with my fellow students _____, _____, and _____. We are students at Worcester Polytechnic Institute completing a project on cycling for short legs of commuting journeys. We would like to ask you a few questions about cycling and commuting in your community. Your response will be completely anonymous.

APPENDIX I: BIKE ROUTE FROM UNIVERSITY STATION TO SCIENCE PARK (MAYMYRIDE, 2017)

APPENDIX J: OBSERVATION SHEET FOR SCIENCE PARK

Categories	Observations
Person(s) Analyzing Location:	Brandon Coll, Garrison Hefter, Ryan Stokes, Griffin Tabor
Date:	23-Jan-17
Start Time:	7:30
End Time:	18:30
Location:	Science Park
Nearest MTR Station:	University Station
BIKE ACCESSIBILITY	
Bike Path	
Quality of Surface	Smooth along whole bike path: bikeable
Ease of Entry onto Bike Path	Smooth invert at all entry ways of bike path: no curb present
Separation Distance from Traffic	Greater than 3 ft. (1 m): safe
Width of Bike Path	20 ft. (6.10 m) total/10 ft. (3.05 m) per bike lane: adequate width/might get crowded during peak hours
Slope of Bike Path	Less than 5% slope along whole bike path: bikeable
Bike Racks	Bikes observed in racks were very old, cheap bikes; some bikes may have been rented
Number of Bike Racks	**Within Science Park:** 7; **At Science Park Along Path:** 15; **Along Bike Path:** 3; **At University Station:** 1 (big)
Distance to Site	Bike racks along and within Science Park: less than 100 m from any rack to building
Distance to MTR	Less than 50 m: very walkable
Distance to Bike Path	Less than 50 m: very walkable
Bike Signage	There are several signs at both Science Park and University Station indicating the presence of bike path; however, there is poor signage along path indicating direction of University Station and Science Park
INTERSECTIONS	
Number of Intersections	Zero intersections with the road
Signaling	N/A
Crosswalks and Markings	N/A
Vehical Speed	N/A
BIKE PATH NETWORK	
Connectivity	Very continuous and direct bike path from University Station to Science Park; no riding on road
Available Route Choices	Only one continuous bike route from University Station to Science Park
Travel Distance to MTR	2.56 km: bikeable
ENVIRONMENT	
Cleanliness	Bike path was very clean; no litter on or around path; maintenance people who sweep off bike path
Types of Buildings	Commercial buildings which surround the path; fairly new infrastructure
Scenery and Foliage	Very scenic: portion of route rides along water and mountains; some portion rides adjacent to the highway which is not as scenic (path safe distance/separated by fence from highway)
GENERAL OBSERVATIONS DURING PEAK HOURS	
Morning Peak Hours: 07:30-09:00	Very few people who ride on path for commuting; the majority of people looked to be riding for recreational purposes; not many people utilizing bike path; several elderly people riding on path
Afternoon Peak Hours: 17:30-20:00	Very few people who ride on path for commuting; the majority of people looked to be riding for recreational purposes; several families with young children riding on path; many people playing music out loud when riding

APPENDIX K: LOCATION OF PROBLEMATIC SUBWAY ALONG CYCLE TRACK FROM UNIVERSITY STATION TO SCIENCE PARK (MODIFIED AFTER GOVHK: CYCLING INFORMATION CENTER, 2011)



APPENDIX L: DIFFERENT SPONSORSHIP TYPES FOR BIKE SHARE PROGRAM

Type of Sponsorship	Description of Sponsorship
Title Sponsorship	A sponsor company pays for exclusive rights to advertise and sponsor the system. The sponsor's name would be included in the official name of the bike share system.
Presenting Sponsor	A sponsor company would receive mention in the name of the system. For example, in Denver there is the Denver Bikeshare presented by Kaiser Permanente. The sponsoring company receives branding on some stations and bikes.
Station and Bike Fleet Sponsorship	This is the most common form of sponsorship. The sponsor's logo and/or message would be included on stations, kiosks, and bikes.
Other	Sponsors can receive other returns for their investment such as mention on the webpage, mobile applications, logos on helmets, or others.

APPENDIX M: OBSERVATION SHEET FOR TIN SHUI WAI EAST ROUTE

Categories	Observations
Person(s) Analyzing Location:	Brandon Coll, Ryan Stokes
Date:	25-Jan-17
Start Time:	7:30
End Time:	18:30
Location:	Tin Shui Wai: East Route
Nearest MTR Station:	Tin Shui Wai Station
BIKE ACCESSIBILITY	
Bike Path	
Quality of Surface	**Bike Paths:** smooth and bikeable; **Sidewalks:** minor bumps but still bikeable
Ease of Entry onto Bike Path	All entry ways onto bike path have a smooth invert; there are several intersections with the bike path and sidewalk where yellow posts are aligned forcing cyclists to dismount off of bike (extremely inconvenient and frustrating for rider)
Separation Distance from Traffic	Greater than 3 ft. (1 m): safe
Width of Bike Path	11 ft. (3.35 m) total/5.5 ft. (1.68 m) per bike lane: too narrow for 2-way traffic
Slope of Bike Path	Two locations greater than 5% slope, for short distances, along bike route: bikeable for only some riders
Bike Racks	Bikes observed in racks were very old, cheap bikes
Number of Bike Racks	**Along Bike Path:** 1; **At Tin Shui Wai Station:** 1 (big)
Distance to Site	N/A: only applicable at Science Park
Distance to MTR	Less than 50 m.: very walkable
Distance to Bike Path	Less than 50 m.: very walkable
Bike Signage	There are many signs indicating a bike path, however, there are no signs giving direction along the path; bike paths are disconnected and there are no signs indicating the direction of the next closest bike path
INTERSECTIONS	
Number of Intersections	9 intersections overall
Signaling	4/9 intersections without signals and road markings
Crosswalks and Markings	4/9 intersections without signals and road markings
Vehical Speed	50 km./hr.
BIKE PATH NETWORK	
Connectivity	Bike paths are very disconnected; have to ride on the sidewalk competing with pedestrians; bike paths end at random points, and there is no indication where the next bike path is
Available Route Choices	Due to the disconnectivity of the bike paths, there are several different available routes for bikers to take; depends on familiarity of the rider with the area
Travel Distance to MTR	2.20 km.: bikeable
ENVIRONMENT	
Cleanliness	Litter present on bike path and sidewalk
Types of Buildings	Residential and school buildings
Scenery and Foliage	Scenery includes light railway, roads, park, and identical looking residential buildings; some schools and shopping centers
GENERAL OBSERVATIONS DURING PEAK HOURS	
Morning Peak Hours: 07:30-09:00	Very few people who ride on bike paths for commuting; more people use bike paths to walk rather than ride a bike; there are many bikes chained up against fences surrounding MTR Station
Afternoon Peak Hours: 17:30-20:00	Very few people riding on bike path; majority of people are younger riding for recreational purposes; many people walking on path

APPENDIX N: TIN SHUI WAI EAST BIKE ROUTE

(MAPMYRIDE, 2017)

APPENDIX O: OBSERVATION SHEET FOR TIN SHUI WAI WEST ROUTE

Categories	Observations
Person(s) Analyzing Location:	Brandon Coll, Ryan Stokes
Date:	25-Jan-17
Start Time:	7:30
End Time:	18:30
Location:	Tin Shui Wai: West Route
Nearest MTR Station:	Tin Shui Wai Station
BIKE ACCESSIBILITY	
Bike Path	
Quality of Surface	**Bike Paths:** smooth and bikeable; **Sidewalks:** minor bumps but still bikeable
Ease of Entry onto Bike Path	All entry ways onto bike path have a smooth invert; there are several intersections with the bike path and sidewalk where yellow posts are aligned forcing cyclists to dismount off of bike (extremely inconvenient and frustrating for rider)
Separation Distance from Traffic	Greater than 3 ft. (1 m): safe
Width of Bike Path	11 ft. (3.35 m) total/5.5 ft. (1.68 m) per bike lane: too narrow for 2-way traffic
Slope of Bike Path	Along bike path there are two overpasses which go over the road for cyclists; in order to get onto overpass, rider must ride up and down slopes greater than 5%; everywhere else on bike route has a slope less than 5% (bikeable)
Bike Racks	Bikes observed in racks were very old, cheap bikes
Number of Bike Racks	**Along Bike Path:** 9; **At Tin Shui Wai Station:** 1 (big)
Distance to Site	N/A: only applicable at Science Park
Distance to MTR	Less than 50 m: very walkable
Distance to Bike Path	Less than 50 m: very walkable
Bike Signage	There are many signs indicating a bike path, however, there are no signs giving direction along the bike path; bike paths are disconnected and there are no signs indicating the direction of the next closest bike path
INTERSECTIONS	
Number of Intersections	10 intersections overall: 9 with roads, 1 with light railway
Signaling	3/10 intersections without signals and road markings
Crosswalks and Markings	3/10 intersections without signals and road markings
Vehical Speed	50 km./hr.
BIKE PATH NETWORK	
Connectivity	Bike paths are extremely disconnected; have to ride on the sidewalk competing with pedestrians; bike paths end at random points, and there is no indication where the next bike path is; bike paths would stop on one side of the street, and continue on the other side of the street without indication
Available Route Choices	Due to the disconnectivity of the bike paths, there are several different available routes for bikers to take; depends on familiarity of the rider with the area
Travel Distance to MTR	4.10 km.: bikeable
ENVIRONMENT	
Cleanliness	Litter present on bike path and sidewalk
Types of Buildings	Residential and school buildings
Scenery and Foliage	Scenery includes light railway, roads, and identical looking residential buildings; some schools and shopping centers
GENERAL OBSERVATIONS DURING PEAK HOURS	
Morning Peak Hours: 07:30-09:00	Very few people who ride on bike paths for commuting; more people use bike paths to walk rather than ride a bike; there are many bikes chained up against fences surrounding MTR Station
Afternoon Peak Hours: 17:30-20:00	Very few people riding on bike path; majority of people are younger riding for recreational purposes; many people walking on path

APPENDIX P: TIN SHUI WAI WEST BIKE ROUTE

(MAPMYRIDE, 2017)

APPENDIX Q: LOCATIONS OF BIKE STATIONS IN SCIENCE PARK (MODIFIED AFTER HONG KONG SCIENCE & TECHNOLOGY PARKS, 2013)