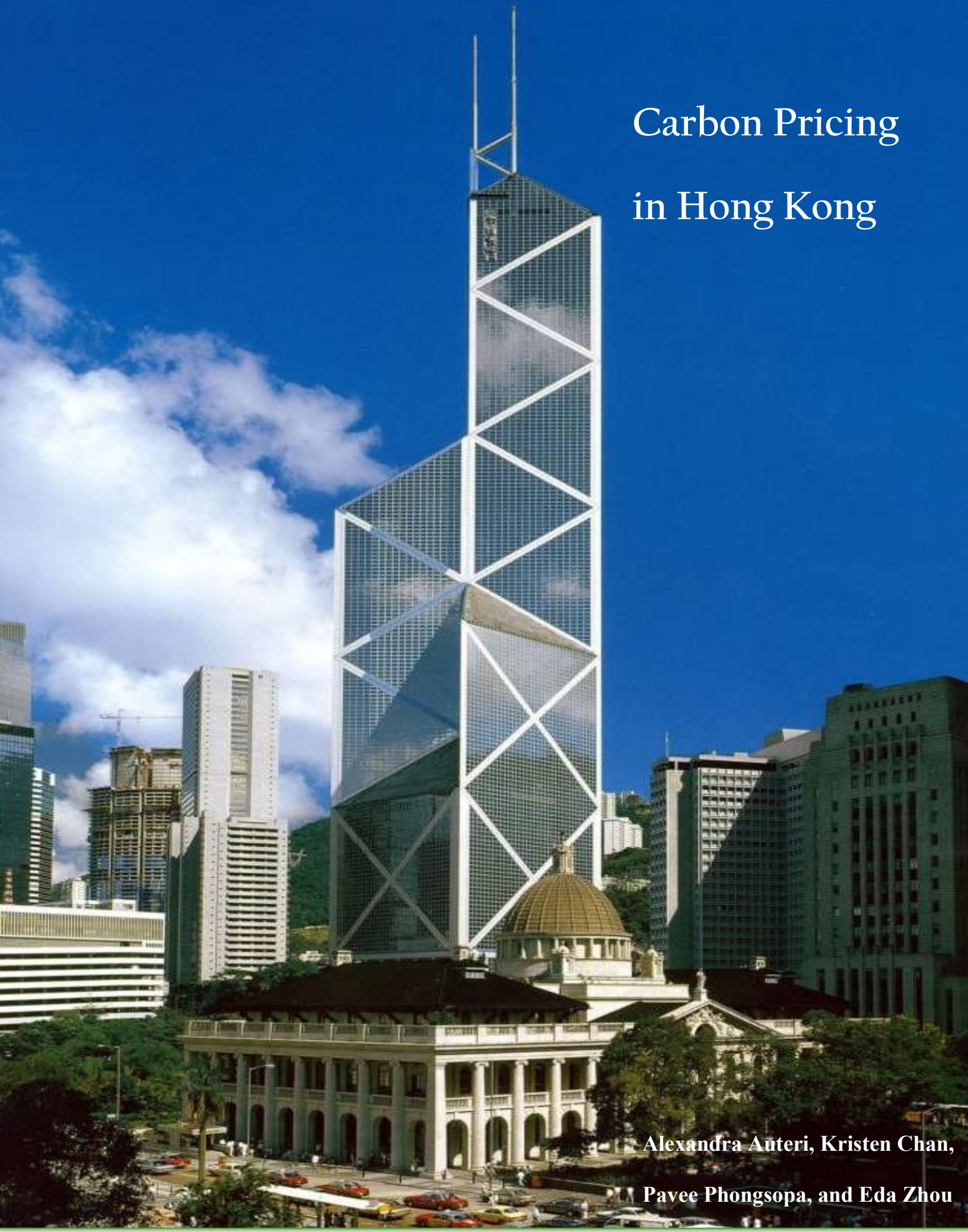
Carbon Pricing in Hong Kong



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Carbon Pricing in Hong Kong

An Interactive Qualifying Project

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Report Submitted to:

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Abstract

Hong Kong falls short in its efforts to transition to a low carbon economy. Our goal is determining if carbon pricing could be successful in reducing carbon emissions in Hong Kong. After organising workshops and focus groups with sectors and attending a public seminar, we proposed a position to the Business Environment Council (BEC) on carbon pricing. We determined that carbon pricing would be effective in some sectors in Hong Kong, but alternative policies would be better for others.

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Executive Summary

Climate change has been a major concern across the globe for decades. Due to the increased amount of human activity since the Industrial Revolution, the Earth is warming up at a dangerous rate. There have been global health risks, economic challenges, and environmental threats as a result of our changing climate. The rising temperatures are due to excessive amounts of greenhouse gases (GHGs), mostly carbon dioxide (CO_2), being trapped in the atmosphere. Urban areas are significant contributors of CO_2 emissions.

Climate change is a global issue, and Hong Kong, as a dense urban area, both contributes to and suffers from the problem. The city has been experiencing severe storms and rising sea levels in recent years. This calls for a practical solution to reduce local carbon emissions—specifically in the energy, buildings, and transport sectors of Hong Kong, as they account for roughly 90% of Hong Kong's carbon emissions. The Business Environment Council (BEC) (see Figure 1) has considered carbon pricing as potentially effective means to lower GHG emissions by putting a price on carbon. When implemented successfully, carbon pricing holds GHG emitters financially responsible for their emissions, giving them a strong incentive to decarbonise.

Figure 1: Business Environment Council Office

Our goal is determining the feasibility of carbon pricing in Hong Kong and proposing a position to BEC regarding its implementation in Hong Kong. To create a policy plan that would be the most appropriate for Hong Kong, we identified the attitudes that Hong Kong businesses have on decarbonisation policies and carbon pricing with an emphasis on the high emitting sectors: energy, buildings, and transport.

To accomplish our goal, we had four distinct objectives during our time in Hong Kong:

(1) Exploring what carbon pricing is, the rationale behind it, and why Hong Kong and businesses should understand the concept of carbon pricing;

(2) Understanding the existing policy framework related to greenhouse gas (GHG) reduction in the energy, buildings, transport and other sectors in Hong Kong by identifying policies that may in effect already serve as a price on carbon;

(3) Exploring rationale and options for carbon policies by referring to overseas experience;

(4) Analysing different approaches and recommending the best one for Hong Kong, with a focus on the three sectors above.

We made use of several methods—preparing pre-workshop material, leading focus groups, and attending a public event—to complete our objectives and overall goal. A locally held environmental discussion provided us with a good look at Hong Kong's overall attitude towards the environment. We developed pre-workshop materials for workshop participants to raise their level of understanding of carbon pricing. This led us to have more insightful discussions. Through BEC's workshops (see Figure 2), we further engaged and educated businesses with

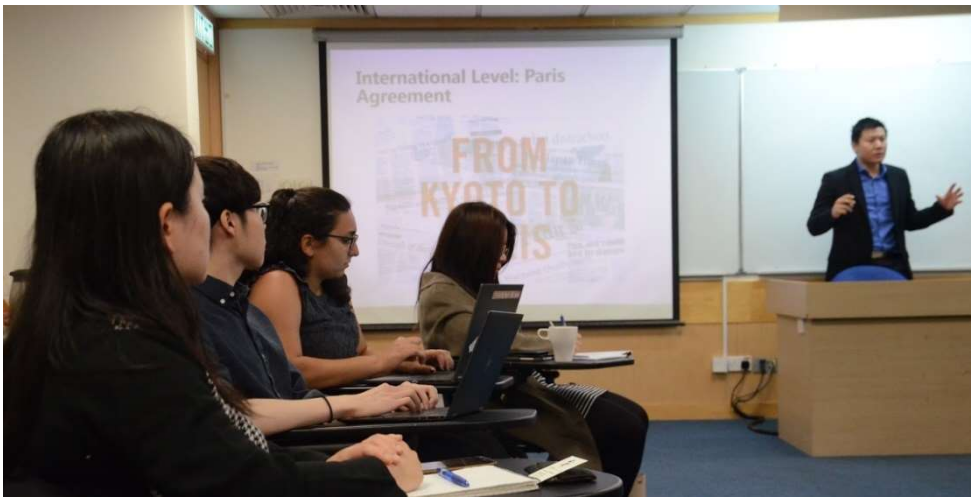

Figure 2: WPI students participating in a workshop

various speakers and presentations. We used focus groups to determine what businesses are willing to do to reduce CO_2 emissions.

We gained insightful information about Hong Kong's decarbonisation efforts. From attending the Investing in Building Energy Efficiency: Enhancing Hong Kong's Policy Framework seminar and hearing from the speakers at the workshops, we learned about the obstacles to decarbonisation in different sectors, their efforts to achieve a low-carbon environment, and possible solutions to carbon emissions.

In our focus group discussions, we found differing opinions between the sectors, but a general consensus typically emerged within each sector. The stakeholders in the energy sector agreed that the current environmental policies are not effective in lowering emissions, but they had negative attitudes towards carbon pricing as a solution. They believed that Hong Kong would not widely support a carbon pricing policy strict enough to encourage decarbonisation. While joining China's carbon pricing system would simplify logistics, participants did not want to rely on Mainland China for their energy needs. Another concern about pricing carbon was Hong Kong's limited renewable energy (RE) potential, which restricts the energy sector's ability to decarbonise.

The building sector was more receptive to carbon pricing, but still not completely confident in carbon pricing as an effective carbon reducing solution. Participants expressed negative feelings towards a carbon tax, due to the negative connotations of the word "tax". People in Hong Kong are especially dismissive of the word "tax" because the city prides itself on its free market economy. Therefore, the building sector finds an emissions trading system (ETS) more appealing. An ETS is usually established as a cap-and-trade system that sets the total amount of carbon emissions that can be emitted, and allowance credits are sold. Participants preferred an ETS because it offers opportunities for financial benefits. Participants discussed the valid concern that current policies hold landlords responsible for energy usage and do not penalise tenants who use the energy. They believe that it would be better for the Hong Kong government to adjust policies and tighten building codes rather than regulate energy usage.

The transport sector was similar to the energy sector in that they agreed that the sector must decrease CO_2 emissions, but their view was that an ETS would not be a suitable method.

Participants believed that carbon pricing would be too confusing for Hong Kong and a better solution would be straightforward policies or regulations that require decarbonisation. Another issue with carbon pricing is the effect that it would have on public transportation companies. If the government continues to encourage commuters to use public transport, then the carbon emissions from trains and buses would increase. Direct carbon pricing, such as an ETS or carbon tax that prices carbon emissions, would unfairly punish public transport companies for emitting more carbon, even though they are contributing to a low-carbon economy. The transport sector was more in favour of a simpler solution like a fuel tax, which is a form of indirect carbon pricing. Establishing a harsher tax on fuel and substantial subsidies for electric vehicles (EVs) could make a full transition to EVs possible. Another issue that the government should examine is how to discourage private car usage, as car ownership growth is ten times greater than Hong Kong's population growth.

The information that we gathered helped our team determine the position on carbon pricing to propose to BEC. We recommend that BEC should be in favour of implementing carbon pricing schemes in Hong Kong. Carbon pricing is an aggressive enough policy that can help Hong Kong meet the reduction targets set in their climate action plan. However, we concluded that carbon pricing would not work throughout all of the business sectors of Hong Kong because of the differences in their decarbonisation options. Our team made recommendations for each of the three main sectors of Hong Kong because they will be able to create the most change in their operations.

In the building sector, we recommend that Hong Kong implements an ETS. We found several studies in which a city effectively implemented an ETS in the building sector only. This sector was the only one that showed support of an ETS, which would make it more likely to work. In the transport sector, we recommend not implementing any form of carbon pricing. We found that encouraging the switch to electric vehicles by strengthening EV incentive programs for current car owners and discouraging the use of private cars would be more successful in reducing carbon emissions. Our final recommendation is increasing the accessibility and knowledge of carbon offsets among Hong Kong businesses, especially the energy sector. This sector was the most opposed to an ETS and carbon pricing as a whole. Due to Hong Kong's lack of natural resources, it is difficult for energy companies to produce energy from greener sources.

Encouraging companies to invest in offset projects can help them make some form of emission reduction without changing their own operations.

Our final recommendation for Hong Kong is raising environmental awareness and promoting environmental education in schools. From our focus groups, we learned that one reason why Hong Kong has not been successful in their transition to a low carbon economy is because the public is uneducated about the environment. One's knowledge of the implications their actions have on the environment can influence their decisions about transportation and appliance use. If Hong Kong begins to incorporate environmental awareness into school curriculums starting at lower grade levels, it will help change the behavior of the public and their attitudes towards helping the environment.

Our hope is for BEC to take our recommendations under consideration and develop their own position on carbon pricing that is in favour of it for Hong Kong. If the government implements a carbon pricing policy, we believe Hong Kong can begin to make significant reductions to their carbon output.

Authorship

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Background: All team members wrote and edited this section

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Results: Alexandra and Pavee; Editor: Alexandra and Kristen

Conclusions and Recommendations: Alexandra and Kristen; Editor: Alexandra and Kristen

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1 Introduction

Climate change has been at the forefront of politics recently due to the wide-ranging impact it is having on the planet (World Bank Group, 2018). Changing temperatures have contributed to global health risks, economic challenges, and environmental threats. Natural causes alone cannot explain recent changes in the climate. The largest contributor to global warming is increased greenhouse gas (GHG) emissions caused by human activities (EPA, 2018). Notably, atmospheric carbon dioxide (CO_2) levels have risen from 280 parts per million (ppm) to 400 ppm in the last 150 years due to industrial activities (NASA, 2018). Because of increasing awareness of the severe effects of climate change, countries, companies, and individuals feel pressured to reduce their CO_2 emissions.

Hong Kong is following the global trend of supporting a greener economy (United Nations Framework Convention on Climate Change, 2018). In 2010, the Environment Bureau announced a goal of reducing GHG emissions by 20% over the next decade, but the results have been inconsistent (Mayer, 2017). In 2014, emissions in Hong Kong increased by 9% over 2013. In 2016, the city's GHG emissions decreased, but not by as much as they aimed to (Research Office Legislative Council Secretariat, 2017). The Hong Kong government wants to reduce its carbon footprint, but current policies have not been enough. A possible solution is a carbon pricing policy. Implemented in 46 national and 25 subnational jurisdictions, carbon pricing creates economic incentives for companies to reduce their CO_2 emissions (The World Bank, 2018; Carbon Pricing Leadership Coalition, 2018). Figure 4 displays all of the jurisdictions that have implemented or scheduled a carbon pricing policy. The European Union implemented their carbon pricing policy in 2005 and have been able to reduce their emissions by 19% based on 1990 levels. (Hong Kong Productivity Council, 2017). However, policy is not always successful. In Australia, a carbon tax reduced CO_2 emissions, but placed the financial burden on consumers because the government used it to increase total tax revenue. The tax was not revenue neutral, which led to public dissatisfaction and resulted in its repeal (Centre for Public Impact, 2017). Although Hong Kong does not have a carbon pricing policy in place, the city's Environment Bureau has recently published many plans on increasing sustainability and lowering CO_2 emissions. Detailed proposals for reducing energy use and CO_2 can be seen in Hong Kong's

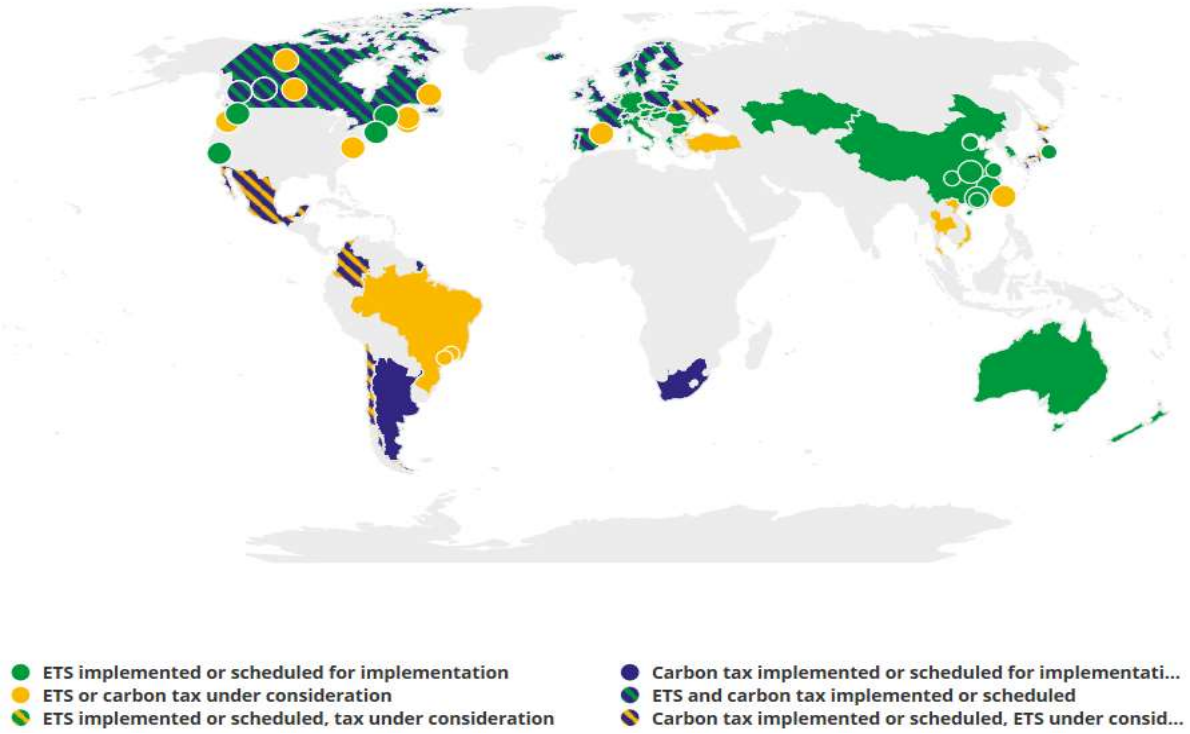

Figure 4: Summary map of regional, national and subnational carbon pricing initiatives (The World Bank, 2019)

Climate Action Plan 2030+ and Energy Saving Plan for Hong Kong's Built Environment 2015~2025+ (Hong Kong Environment Bureau, 2015; Hong Kong Environment Bureau, 2017b). But even with these comprehensive plans, Hong Kong has not seen the CO_2 emission reductions that they have been aiming for (see Figure 5).

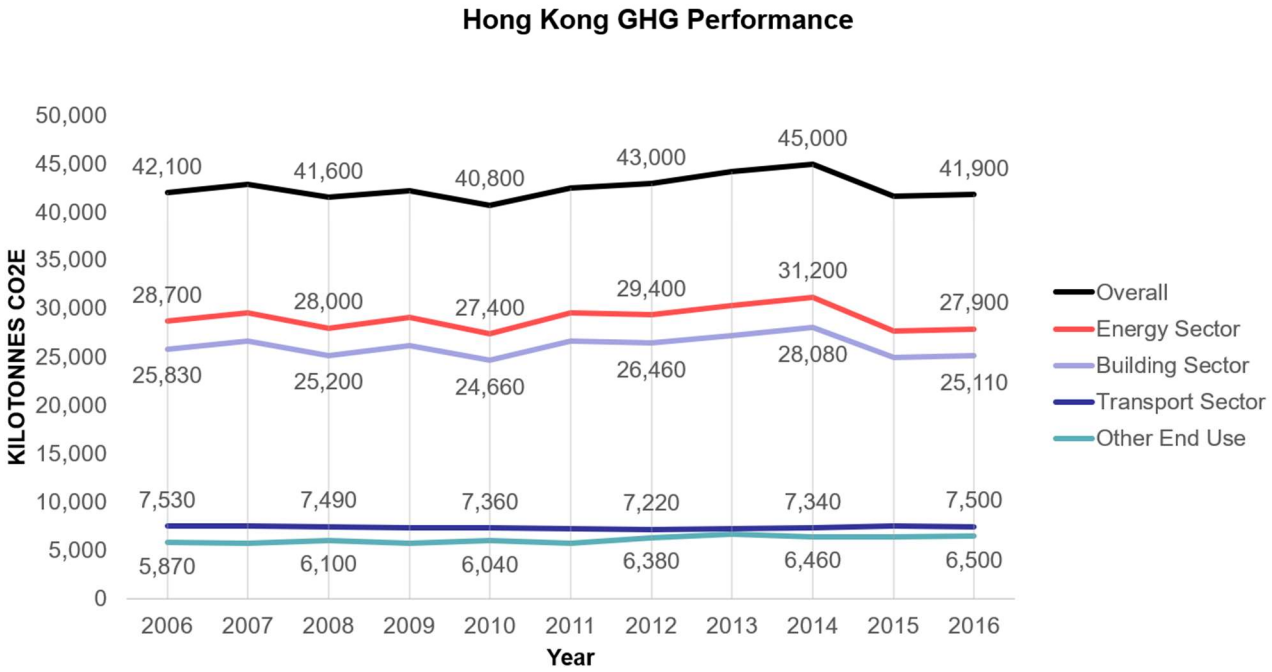

Figure 5: Hong Kong Overall Greenhouse Gas Emissions (Environment Bureau, 2018)

The Hong Kong government can set examples for reducing CO_2 emissions in the public sector, but private companies must also lower their emissions. The Business Environment Council (BEC) would like to know if a carbon pricing policy could be used to drive businesses to reduce their CO_2 emissions, but they want their position to be reflective of the views of its membership. BEC did not know how much businesses know about carbon pricing or what their opinions are on it. BEC wanted to educate their members and use their viewpoints to determine what kind of carbon policy would be best for Hong Kong and learn their preferences over different policy options.

Our goal was proposing a position on carbon pricing for BEC. To accomplish our goal, we established four main objectives:

(1) Exploring what carbon pricing is, the rationale behind it, and why Hong Kong and businesses should understand the concept of carbon pricing,

(2) Understanding the existing policy framework related to greenhouse gas (GHG) reduction in the energy, buildings, transport and other sectors in Hong Kong by identifying policies that may in effect already serve as a price on carbon,

(3) Exploring rationale and options for carbon policies by referring to overseas experience,

(4) Analysing different approaches and recommending the best one for Hong Kong, with a focus on the three sectors above. For the research on carbon pricing and environmental awareness, we will attend public events and conferences.

With assistance from BEC, we developed pre-workshop materials and coordinated workshops about carbon pricing to engage business representatives on the subject. During the workshops, we conducted focus groups with the participants to determine their opinions on carbon pricing to reduce GHG emissions. By following this methodology, we provided BEC with an appropriate proposal to aid them in their pursuit towards a low-carbon economy and environmental sustainability.

2 Background

In this chapter, we examine how carbon emissions affect global warming and how carbon pricing can be a possible solution. We discuss how countries have implemented carbon pricing policies to transition towards a low-carbon economy and their outcomes. Finally, we describe how Hong Kong's current initiatives have contributed to their carbon emission reductions.

2.1 Climate Change

Climate change is commonly known as global warming due to consistently rising temperatures (NASA, 2018). Greenhouse gases (GHGs), such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), trap heat in the atmosphere, creating a warmer atmosphere. This is referred to as the greenhouse effect, which changes the balance and characteristics of the Earth's ecosystems. Since 1880, the average global temperature has increased by 1.8º Fahrenheit. Although rising surface temperatures are a big part of climate change, they are not the only symptom. Over the past hundred years alone, the global average sea level has risen nearly seven inches. Climate change also contributes to the increasing number of extreme rainfall events, melting of glaciers (see Figure 6) and the acidity of the ocean's waters, which has increased by 30% since the beginning of the Industrial Revolution. Although it is natural for our planet to warm, evidence shows that the current warming is occurring ten times faster than the average rate of "ice-age-recovery" warming. The increasing amount of human activities over the past century is the only explanation for this accelerated rate of warming.

Figure 6: Polar bear among melting glaciers (NASA, 2017)

2.1.1 Greenhouse Gas Emissions

The main source of GHG emissions is burning fossil fuels (EPA, 2018). The transportation sector is the largest culprit of global emissions, as cars, trains, planes, and most

forms of transportation burn fossil fuels. When fossil fuels are burned, they release GHGs into the air (Global Emissions, 2018). These include water vapor, CO_2, CH_4, N_2O, and chlorofluorocarbons (CFCs) (Ritchie & Roser, 2018). CO_2 is the most commonly known GHG, and it is also the most significant contributor to climate change. It is released through human activities and other natural processes, such as respiration. CO_2 levels have increased from 280 to 400 ppm in the last 150 years. Excess CO_2 in the air changes the natural compositions of the atmospheric greenhouse. Some regions are experiencing more precipitation, while others are turning into deserts.

2.1.2 Carbon Emissions

The amount of carbon that people emit into the atmosphere has been exponentially increasing since 1850 (EPA, 2017) and global carbon emissions are currently 32 billion metric tons per year. Most of these emissions come from a few regions: China, the United States, and the European Union. As we show in Figure 7, China (including Hong Kong) contributed 30.0% of global CO_2 emissions in 2014, the largest of any single country.

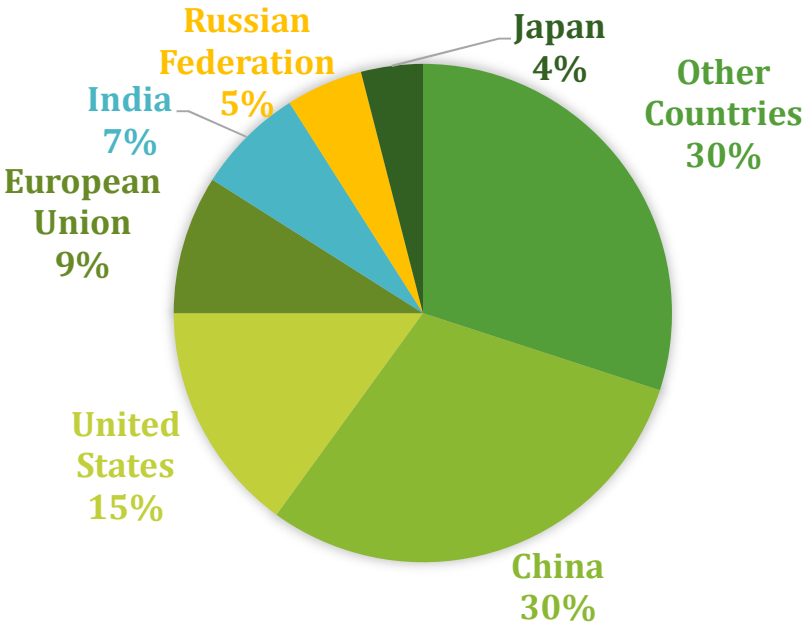

Figure 7: 2014 Global Carbon Dioxide Emissions from Fossil Fuels Combustion and Some Industrial Processes (EPA, 2017)

2.1.3 Possible Solutions to Reduce Carbon Emissions

National governments around the world have proposed and implemented several solutions to reduce carbon emissions. One approach is increasing use of renewable energy (RE) to decrease fossil fuel dependence (Union of Concerned Scientists, 2018). Creating new sources of RE or improving current sources can make such sources more accessible for everyone. Another possible solution is increasing the fuel efficiency of gas-dependent vehicles so consumers can use less gas overall. Recently, the idea of regulating the amount of carbon that polluters emit by setting a price on the emission, referred to as carbon pricing has become more widely seen as a viable way to mitigate CO_2 emissions.

2.2 Carbon Pricing

Carbon pricing gives polluters the option to continue their current practices and pay for their emissions, or to decarbonise (Carbon Pricing Leadership Coalition, 2018). Carbon pricing takes two main forms. One is an emissions trading system (ETS) that limits the total emissions by giving each company an allowance (The World Bank, 2018b). An ETS can be broken down into cap-and-trade and baseline-and-credit systems (The World Bank, 2018a). For cap-and-trade, the total amount of emissions is capped, and extra allowances can be sold from companies that emit below the cap, creating a market with supply and demand (The World Bank, 2018b). For baseline-and-credit systems, baseline emission amounts are set based on previous emission measurements and credits are awarded to those who reduce their emissions below this level (The World Bank, 2018a). The credits can then be sold to entities who are exceeding their baseline limit. Both systems restrict the amount of carbon emitted. If companies do not choose to trade, then the carbon policy is simply a regulation and not a carbon price.

The other popular type of carbon pricing is carbon tax (The World Bank, 2018b). A carbon tax sets a direct price on carbon by implementing a tax rate on emissions or on the carbon content of fossil fuels. It is relatively simple to implement as the tax can be built into existing taxes and does not require establishing a trade-market (Carbon Pricing Leadership Coalition, 2017). In this case, the price of carbon is predetermined, but there is no cap on the amount of emissions.

Some other types of carbon pricing that are often used in conjunction with the two main methods are offset mechanisms, results-based climate finance (RBCF), and internal carbon prices (The World Bank, 2018b). The offset mechanism lets businesses earn carbon credits by investing in certified green projects (Kelly, 2012). This helps companies that cannot sufficiently reduce their own carbon output still earn carbon credits. RBCF is a system where payments are awarded to companies who meet predetermined goals related to climate change (The World Bank, 2018a). Lastly, several governments and corporations use internal carbon prices to guide their decision-making. It incentivises organisations to follow a lower CO_2 emission model when creating new projects or investments. There is no one carbon policy that is applicable for all situations. The best choice depends on the specific circumstances of the nation.

2.2.1 Carbon Pricing Case Studies

According to Dinakaran (2018) with the Carbon Pricing Leadership Coalition, the number of carbon pricing initiatives has tripled in the last decade. As of 2018, fifty-three carbon pricing initiatives have been implemented or are scheduled for implementation. At the international level, the signing of the Paris Agreement in 2015 marked a critical point in the battle against climate change (United Nations Framework Convention on Climate Change, 2018b). All participating parties are required to "to put forward their best efforts through 'nationally determined contributions' (NDCs) and to…report regularly on their emissions and on their implementation efforts" (para. 3). Unlike its predecessor—the Kyoto Protocol—, the Paris Agreement does not require emission reduction targets or commitment (United Nations Framework Convention on Climate Change, 2018a). Since participation is voluntary, signing parties are expected to be more committed to fighting climate change than those who were bound to the Kyoto Protocol (Wong, 2018). To fulfill these agreements, many nations are using carbon pricing policies.

To meet their Paris accord targets, Canada created a pan-Canadian approach in 2016 that requires all provinces and territories to meet a federal benchmark (Associated Press in Toronto, 2016; Government of Canada, 2017). This benchmark outlines the criteria a province or territory's carbon pricing system must meet by the end of 2018. If a province or territory fails to meet the federal benchmark, the government will enforce the federal carbon pricing backstop system. It offers flexibility for each province and territory to implement their own systems, while

ensuring that they all meet baseline regulations. The backstop has two elements: a carbon tax applied to fossil fuels, and an ETS applied to the larger emitters in place of the tax.

A carbon policy may not always be successful. The Australian federal government introduced a carbon tax in 2011 in order to meet their Kyoto Protocol targets (Centre for Public Impact, 2017). One year after the government implemented the plan, the country's GHG emissions had decreased by 1.4%. However, the cost of electricity for households and industry rose—the average family saw a 10% increase in electricity costs and small businesses saw a 30% increase in electricity costs due to the carbon price. The Government's carbon tax was not revenue neutral because the government did not properly reimburse consumers, and the public's dissatisfaction led to the Act's repeal in 2014.

In other cases, countries can learn from their policy miscalculations and successfully adjust them. The European Union established the largest ETS in the world in 2005 to fulfill their commitment to the Kyoto Protocol (Hong Kong Productivity Council, 2017). However, the ETS allowances were set too high in the year following its implementation and caused a lack of demand. The carbon allowance trading market crashed, but in the following years, the EU readjusted their allowance limits and staggered their release. By 2016, the EU had reached a 23% GHG reduction below 1990 levels (European Commission, n.d.).

Finally, Mainland China has a national ETS planned for implementation in 2020 that will cover more than all existing carbon markets combined (Hong Kong Productivity Council, 2017; The World Bank, 2018a). In preparation, China has been running pilots since 2011 in seven locations to reflect the economic, social, and geographic diversity of China. The National Development and Reform Commission of China will determine the national ETS regulations from the data of these pilots. While China has not yet fully implemented its ETS, it is important to keep it in mind when considering carbon pricing policies for Hong Kong.

2.3 CO_2 Emissions in Hong Kong

Hong Kong, like many other large urban areas around the world, also struggles to regulate its GHG emissions (Mayer, 2017). Of all the GHGs emitted in Hong Kong, CO_2 emissions are responsible for over 85% of the total emissions (Climate Change Business Forum, 2014). After a short decline in the 1990s, CO_2 emissions have reverted to an upward trend (see

Figure 8). In 2010, Hong Kong emitted 40.8 kilotons of CO_2 (Hong Kong Environment Bureau, 2018). Aware of the adverse effects of high CO_2 emissions, the Hong Kong government held a

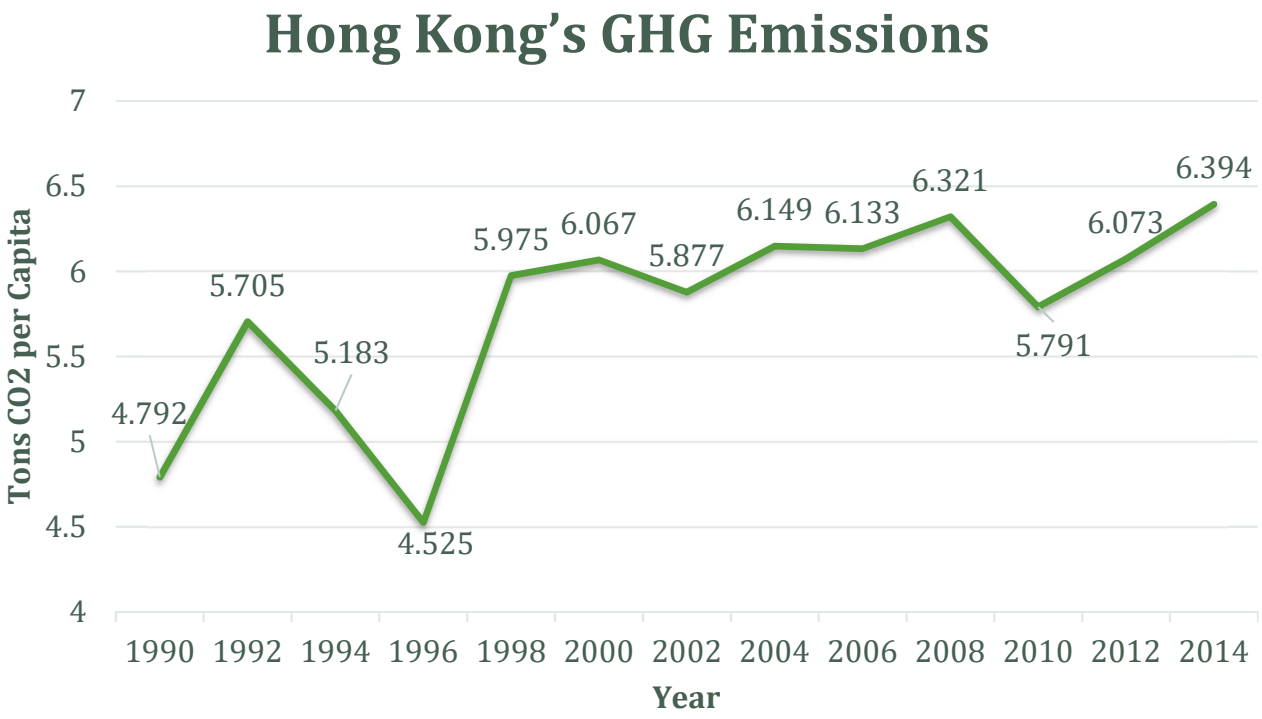

Figure 8: Hong Kong CO2 Emissions (metric tons per capita) (The World Bank, 2018c)

public consultation in September of that year, announcing their goal of reducing CO_2 emissions by 20% in the next decade. However, emission reduction efforts have not been successful in the years that followed. In 2014, Hong Kong's CO_2 emissions increased by 9% to 45 kilotons or 6.4 tons per capita (The World Bank, 2018c). In 2016, CO_2 emissions declined to 41 kilotons, which is an improvement, but the city is still far from its goal (Hong Kong Environment Bureau, 2018). Research released in Norway ranked Hong Kong as the city with the second highest CO_2 emissions in the world at 29 tons per capita, which is much higher than the 6.4 tons per capita stated by Hong Kong (Independent UK, 2009). The Norway study includes all the emissions produced by Hong Kong's imported goods, which explains the discrepancy in CO_2 emissions since the city imports many necessities. Both studies, however, confirm that power generation, buildings, and transport are the three major contributors of Hong Kong's CO_2 emissions and are responsible for up to 90% of the overall CO_2 emissions (see Figure 9).

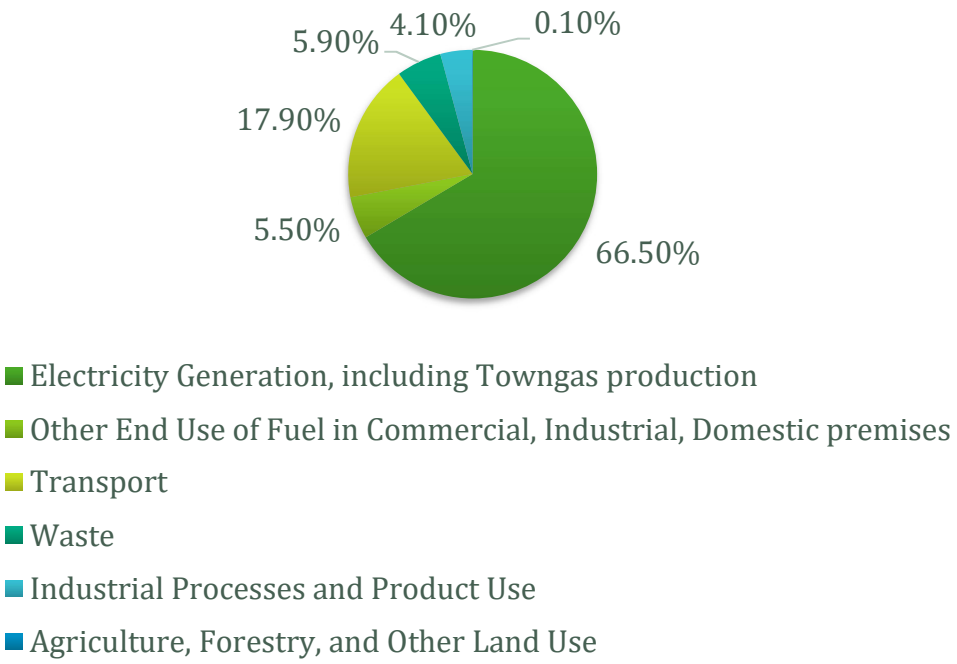

Figure 9: Breakdown of Hong Kong's Emissions (EMSD, 2018)

2.3.1 CO_2 Emissions from the Energy Sector

The biggest contributor to CO_2 emissions in Hong Kong is the energy sector, which consists of any activities involving power generation, transmission, and distribution. It is responsible for over 60% to 70% of the total CO_2 emissions throughout the past 25 years (Research Office Legislative Council Secretariat, 2017). In 2016, electricity generation alone released 27.9 kilotons of CO_2 (Hong Kong Environment Bureau, 2018). Most CO_2 emissions from the energy sector can be attributed to Hong Kong's sources of power generation and its growing power consumption (Research Office Legislative Council Secretariat, 2017). Between 1990 and 2014, locally generated power increased by 37% and power consumption grew over 84%. Despite Hong Kong's effort to cut its usage, coal remained the main source of power generation to produce enough energy to meet the increased demand due to its cost effectiveness. As shown in Figure 10, coal generated almost half of Hong Kong's electricity in 2017.

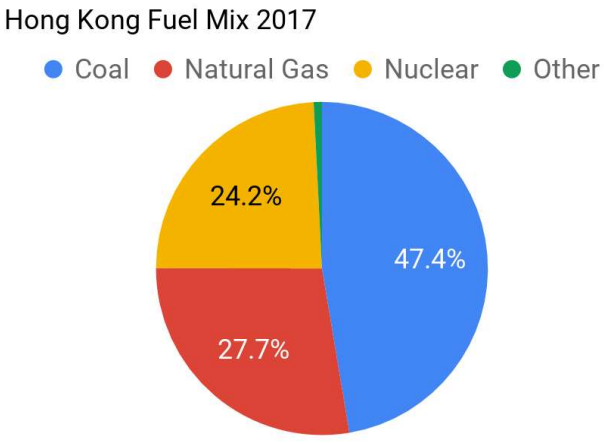

Figure 10: Hong Kong Fuel Mix 2017 (CLP, 2018; HEC, 2018)

While natural gas is more environmentally-friendly and produces half as much CO_2 as coal, coal power is 74% cheaper (CLP, 2018; HEC, 2018).

2.3.2 CO_2 Emissions from the Building Sector

Hong Kong's building sector is responsible for over 90% of electricity consumption, making it accountable for a large amount of CO_2 emissions, as seen in Figure 11 (Hong Kong Environment Bureau, 2017b). Emissions from the building sector can be split into energy usage during construction and energy use operating buildings after construction. During construction, the main sources of emissions are from the manufacturing of building materials, construction equipment, energy for processing resources, and waste disposal. The majority of building operation energy is used for air-conditioning, lifts and escalators, and lighting, largely due to energy inefficient appliances (Hui, 2010).

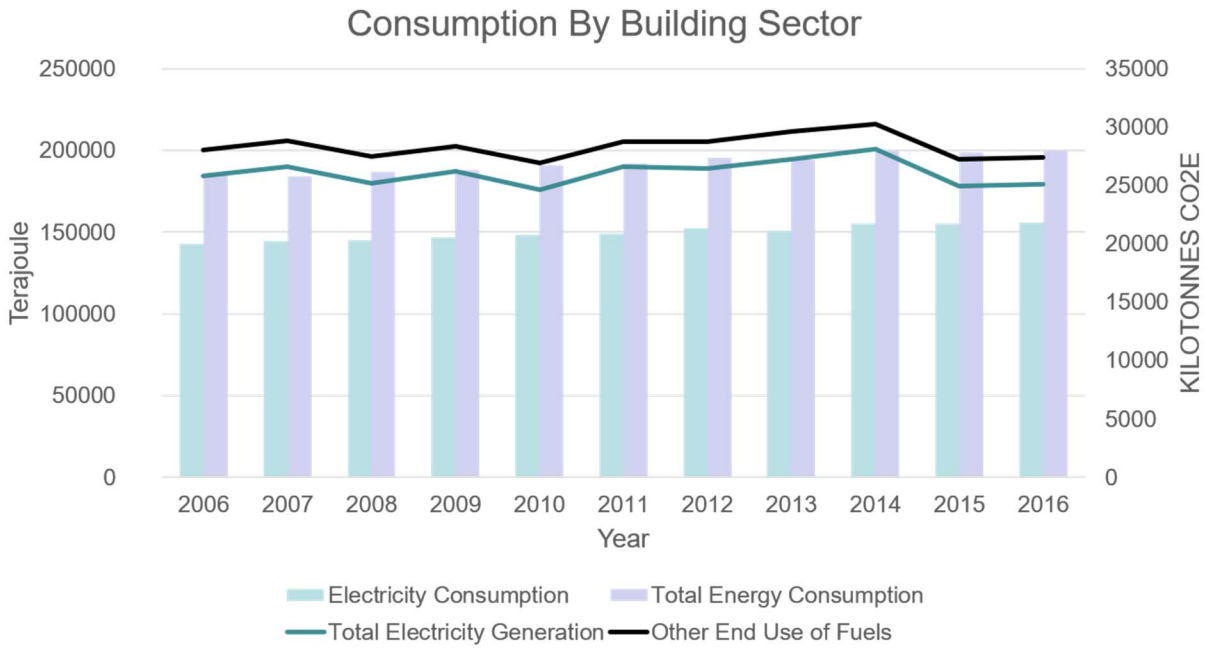

Figure 11: Hong Kong Building Sector Consumption (EMSD, 2018) (Environmental Bureau, 2018)

2.3.3 CO_2 Emissions from the Transport Sector

The transport sector has been responsible for around 13% to 18% of CO_2 emissions in recent years, making it the second highest contributor of this in Hong Kong (Hong Kong Environmental Bureau, 2017). In 2016, 7.5 kilotons of CO_2 were attributable to energy used for transportation (Hong Kong Environment Bureau, 2018). Within the transport sector, 28% of CO_2

emissions come from commercial vehicles, 24% from private transport, 21% from buses, 16% from taxis, 3% from the railway, and 8% from other sources. Thus, despite having a well-developed public transportation system, a lot of Hong Kong emissions still come from vehicular traffic.

2.4 Hong Kong's Efforts to Reduce Carbon Emissions

In recent years, Hong Kong's Environment Bureau (2015; 2017a; 2017b) has published many environmental plans that detail the city's CO_2 emissions and its strategies for reduction. The reports range from a broad plan that covers all of Hong Kong to plans that focus on just one aspect of reducing emissions. The most recent plan was published in January 2017: Hong Kong's Climate Action Plan 2030+ describes Hong Kong's plans for reaching an updated CO_2 emissions reduction target for 2030 (Hong Kong Environment Bureau, 2017b). The city's goal for 2030 is to reduce overall CO_2 emissions by 26% to 36% compared to its 2005 levels (see Figure 12).

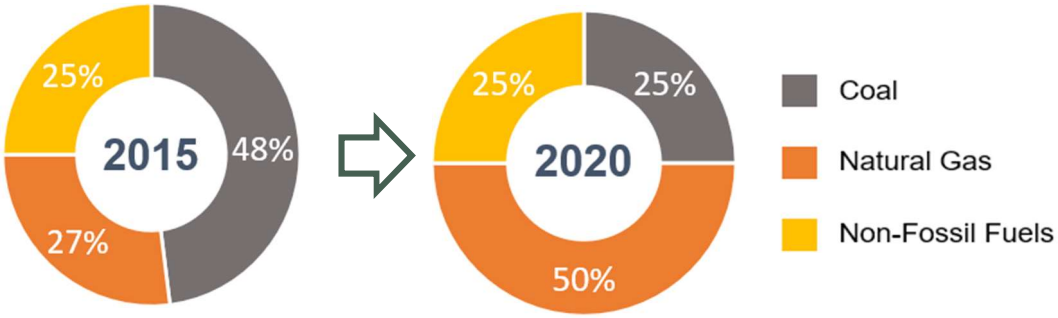

Figure 12: Reduction of Coal in Fuel Mix For Electricity Generation (Hong Kong's Climate Action Plan 2030+, 2017)

2.4.1 Reducing Carbon Emitted through Electricity Generation

Coal-generated power releases a large amount of CO_2. Because of this, Hong Kong decided to stop building new coal-fired electricity plants in 1997 (Hong Kong Environment Bureau, 2017b). As coal-fired plants reach their normal retirement life, they will be phased out and replaced with natural gas-powered electricity plants and RE sources. As of 2015, natural gas generated 27% of the city's electricity and will produce about 50% of the electricity by 2020.

Hong Kong has limited RE potential due to its small land area, which consists of a lot of hilly terrain, that would be expensive to develop (Hong Kong Environment Bureau, 2017). However, the government is trying to encourage the private sector to invest in RE by establishing a feed-in tariff. A feed-in tariff allows the private sector to sell the power they generate from

renewable sources at a higher rate than that of the usual electricity generated from fossil fuels, which assists them in covering their electricity generation costs.

2.4.2 Energy Efficiency in the Building Sector

Because over 60% of Hong Kong's CO_2 emissions come from electricity used by buildings, the *Energy Saving Plan for Hong Kong's Built Environment 2015~2025+* focuses on this issue (Hong Kong Environment Bureau, 2015). Hong Kong implemented the Building Energy Efficiency Funding Scheme (BEEFS) from 2009 to 2012 to help offset the costs of energy efficient projects (Hong Kong Environment Bureau, 2015). With this scheme, Hong Kong's Environment and Conservation Fund allocated HK$450 million toward subsidies for building owners to conduct energy audits and implement energy efficiency projects. Over 6,400 buildings participated in the program, with 1,115 energy efficiency projects approved by the Hong Kong government and an estimated total energy saving of 180 million kWh annually. BEEFS helped make building owners more aware of the benefits for energy saving and pushed them to take actions.

In 2009, the Hong Kong government passed the Mandatory Energy Efficiency Labelling Scheme (MEELS), requiring certain products to be labelled with their energy efficiency. With the product labels, building owners and individuals can purchase appliances, such as air conditioners and refrigerators, that use less energy to lower building energy usage. By 2025, it is estimated that MEELS will save 800 million kWh of electricity annually.

In 2012, Hong Kong's Electrical and Mechanical Services Department enacted the Buildings Energy Efficiency Ordinance (BEEO) with a Building Energy Code that all newly constructed buildings must follow. The Building Energy Code focuses on minimum energy efficiency requirements for infrastructure, saving an estimated 1,000 million kWh of energy annually by 2025 (Hong Kong Environment Bureau, 2017a). The BEEO also has an Energy Audit Code that requires buildings to conduct an energy audit every 10 years. To further increase building energy efficiency, both codes will be reviewed regularly by the government and further restricted.

The government created a dialogue platform in 2016 to develop trust and transparency. Using the Dialogue Platform, the Hong Kong government can communicate with building

owners and learn about their opinions regarding energy efficiency. Conversations like these are extremely important to determine which energy saving policies will be successful by promoting understanding between the public and private sectors.

The Hong Kong government has also expanded the Overall Thermal Transfer Value (OTTV) standard and the Residential Thermal Transfer Value (RTTV) standard. Both standards reduce energy demand by minimising heat transfer through buildings, lowering air-conditioning use. The OTTV applies to commercial buildings and the RTTV was developed for residential buildings. The Hong Kong government will review and adjust both standards twice by 2030.

2.4.3 Energy Efficiency in the Transport Sector

Hong Kong already has a highly effective public transport system with a reliable railway system as its foundation: about 90% of Hong Kong's daily passenger trips are made using public transport (Hong Kong Environment Bureau, 2017b). To ensure that public transport remains the preferred transportation choice for commuters, Hong Kong will continue to fund its railway network. HK$9.3 billion is being used to upgrade infrastructure, which will make it more energy efficient and reduce CO_2 emissions. Hong Kong is also considering using electronic road pricing (ERP) to reduce traffic congestion. ERP manages local road traffic by charging vehicles different rates, depending on the congestion of the roads (Menon & Guttikunda, 2010). The highest charges are during peak hours to encourage commuters to use other forms of transport.

2.5 Summary

Hong Kong's many publications with detailed CO2 emission reduction plans demonstrate their desire to reduce emissions. But when looking at the city's actual emission levels, not much progress has been made. Our goal is proposing to the Business Environment Council (BEC) a position on carbon pricing as a possible option for Hong Kong to decarbonise. We will achieve this goal using the methods that we discuss in the following chapter.

3 Methodology

Our goal is proposing a position on carbon pricing in Hong Kong to the Business Environment Council (BEC). To accomplish this goal, our specific objectives are: (1) Exploring what carbon pricing is, the rationale behind it, and why Hong Kong and businesses should understand the concept of carbon pricing; (2) Understanding the existing policy framework related to greenhouse gas (GHG) reduction in the energy, buildings, transport and other sectors in Hong Kong by identifying policies that may in effect already serve as a price on carbon; (3) Exploring the rationale and options for carbon policies by referring to overseas experience; (4) Analysing different approaches and recommending the best one for Hong Kong, with a focus on the three sectors. In the following chapter, we discuss in detail our methods for achieving each objective and the reasons behind them.

3.1 Public Events and Conferences

In Hong Kong, our team attended local events and conferences on environmental issues and CO_2 emissions with our sponsors. While attending these events, we interacted with other attendees and presenters to determine their level of understanding of environmental issues and assess their viewpoints on reducing carbon. We used the calendar on the climateready.gov.hk website to look for public events that we could attend. For conferences, we used BEC's connections to attend any events to which we were invited. This includes the Investing in Building Energy Efficiency: Enhancing Hong Kong's Policy Framework Seminar, which took place on January 28 from 4:15 pm to 6pm at City Gallery, 3 Edinburgh Place, Central, Hong Kong. At the seminar, green building professionals discussed their experiences with increasing building energy efficiency and how collaboration between landlords and tenants can be most successful. With this knowledge, we were able to understand the rationale behind carbon pricing from different perspectives, determine what is currently being done, and what experts feel should be done to make significant improvements in reducing Hong Kong's emissions, achieving objectives 1, 2, and 3.

3.2 Pre-Workshop Materials

For businesses to have opinions on carbon pricing, they must understand what it is. To use time efficiently at the workshops, we prepared pre-workshop materials for the workshop participants. We prepared workshop materials that briefly describe all the main types of carbon pricing, including direct, indirect, and internal methods, and explain what each method entails. We then describe case studies of carbon pricing from around the world, providing information about the type of carbon pricing policy that was used, how it was implemented, and if emissions were reduced. We also included a graph of Hong Kong's overall carbon emissions in the pre-workshop materials. Up until this point, we kept this part of the materials the same for all sectors. Our pre-workshop materials are in Appendix C.

We conducted online research and used a variety of sources, including the Carbon Pricing Leadership Coalition and the Hong Kong Climate Ready website, to create the materials. By providing workshop attendees with this information, they were able to familiarise themselves with carbon pricing and Hong Kong's current carbon policies, without using our time with them.

3.3 Workshops

We helped BEC organise a series of workshops at BEC's office at 77 Tat Chee Ave, Kowloon Tong, Hong Kong. There were four workshops: one for each major CO_2 emitting sector (energy, building, and transport), and one for the remaining sectors. The dates and times for the workshops were January 16, January 30, February 15, and February 25 from 4:00pm to 5:30pm for the energy, building, transport, and other sectors. BEC invited all member representatives to their respective workshops and had 72 participants. During the workshops, we engaged businesses about what carbon pricing is, how it works, and why it may be important for combating climate change. Several experts on carbon emissions also attended the workshops, informing participants about carbon pricing and helping us achieve objectives 1, 2, and 3. Workshop agendas are in Appendix D.

3.4 Focus Groups

To determine whether carbon pricing could be accepted in Hong Kong, we need to determine the different business sectors' viewpoints on the matter. We need to understand how businesses feel about a carbon pricing policy compared to other initiatives that are already

established in Hong Kong and what factors will make a policy more preferable over different policy options. We are targeting the energy, building and transport sectors because together they contribute close to 90% of Hong Kong's GHG emissions, hence can make the most significant reductions.

During the workshops, we set aside a certain amount of time to conduct focus groups. We separated our workshop attendees into four groups of around 5-6 participants. We facilitated the discussion to keep participants on task but took care to not voice our own opinions. We did not want to lead the focus group members towards a certain opinion, so we mostly focused on taking notes on the discussion and helped the conversations move along if needed. The purpose of breaking up the focus groups by sector is determining if there is a difference in opinions between them regarding carbon policies. This method helped us complete objectives 2 and 4, as we needed to understand how businesses feel about current carbon policies, why they may or may not favor a carbon pricing policy, and what factors will make a policy more acceptable to them. A detailed focus group protocol can be found in Appendix E. We will use these notes to help us determine the willingness of businesses to adapt their operations to align with more environmentally friendly policies and determine if carbon pricing is a potential solution for businesses to contribute in the reduction of Hong Kong's emissions. Our notes from the focus groups are in Appendix F.

3.4.1 Feedback and Adjustments

After each event, we met with our sponsors and reviewed the outcomes, including successes and failures. We shared our notes from the discussions and talked about our limitations. As a team, we discussed what we could do to make the next workshop more successful. One idea that we suggested was to assign attendees to sit in pre-organised group when they first walk in. Using guidance from our sponsor, we separated the participants into groups to make sure that each focus group had a balanced variety of participants. We separated more talkative members and representatives from the same company into different groups to make sure that dominant participants did not get the conversation off track and more groups could hear about one company. This ensured that the focus groups had a balanced variety of participants, allowing each group to have a more efficient discussion. Another topic that we discussed was how to better facilitate discussions within our focus groups. Our sponsors

suggested that we should focus more on encouraging conversation and only record key points, rather than trying to write down everything said during the discussions as shown in Figure 13. Our sponsor proposed that we take notes on whiteboards to help assert our authority as moderators. Standing in front of the whiteboards would make it clearer to the participants that we are facilitating the conversation and we can make sure that we correctly understand the participants' thoughts.

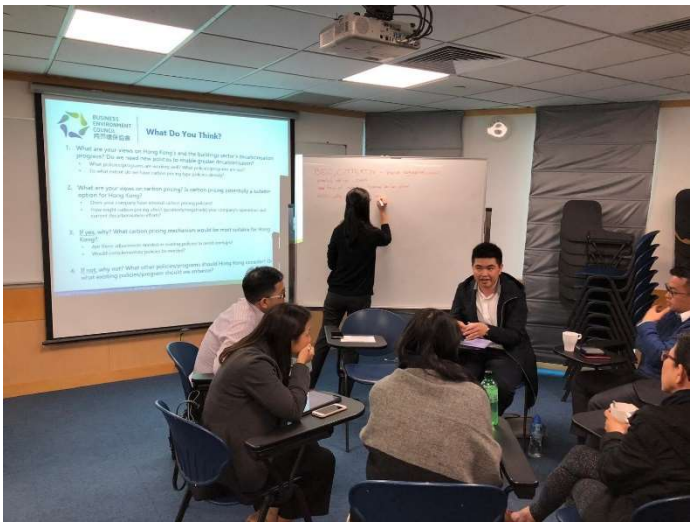

Figure 13: Kristen Chan takes notes during discussion

Our advisors also gave us recommendations on how to conduct our focus groups more successfully. As facilitators, a common problem that we all faced was overcoming dull moments in conversation. When no participants have any comments to add to the discussion, we can put forth an opinion, whether it be our own or one that we came across in our research and ask how they feel about it. For example, we could say "Some people feel this way about a carbon tax. What are your thoughts about that? Do you agree or disagree with this idea?"

3.5 Summary

Our methods helped us understand the problem of CO_2 emissions from the perspective of stakeholders in Hong Kong and were important steps towards developing an effective position on carbon pricing that aligns with the objectives of businesses. We hope our recommendation assists BEC in formulating a position that will eventually encourage the Hong Kong government to pass a carbon pricing policy. If such legislation occurs, our aim is that it results in the

reduction of CO_2 emissions, helping Hong Kong reach their goal of reducing the carbon intensity by 65-75% from 2005 to 2030 as stated in the *Hong Kong Climate Action Plan 2030+*.

4 Results

In this chapter, we discuss our findings from the public events and conferences that we attended, and the workshops that we conducted. We obtained different types of information to meet our objectives and accomplish our goal of helping the Business Environment Council (BEC) develop a position on carbon pricing. Here, we describe our data and findings on carbon pricing. We also explain the limitations that we encountered during our workshops and focus groups.

4.1 Public Events and Conferences

On January 28, 2019, we attended the Investing in Building Energy Efficiency: Enhancing Hong Kong's Policy Framework seminar and research report launch event presented by BEC. The seminar had around 100 attendees and featured three main speakers: Ir. C.F. Leung, (Director of Operations, BEC), Mr. Simon Ng (shown in Figure 14) (Director of Policy & Research, BEC), and Dr. Raymond Yau, (BEC Board Director and General Manager, Technical Services and Sustainable Development, Swire Properties Limited).

Figure 14: Mr. Simon Ng facilities the seminar panel. Dr. Raymond Yau pictured on right

Ir. Leung discussed the hurdles and opportunities for existing buildings in Hong Kong to reduce emissions with an emphasis on retro-commissioning. We learned that there are already policies that regulate new buildings in Hong Kong, but there is not much done for existing buildings. In order to reduce energy use from existing buildings, they must be more data on building performance and incorporate tenant performance into energy audits. Mr. Ng summarised BEC's research report which highlighted the need for enablers, data transparency and benchmarking, and landlord-tenant collaboration. The report describes international case studies from Singapore, Tokyo, New York City, Sydney, Essen, Beijing, and Shenzhen to compare existing green policies and create suggestions for Hong Kong. Shenzhen's ETS includes commercial buildings that emit more than 10,000 tonnes of CO_2

and allocates allowances based on historical emissions. Hong Kong may be able to implement an ETS similar to Shenzhen's to decrease carbon emissions. Finally, Dr. Yau spoke about the importance of accurate data and gave examples of landlord-tenant improvement projects Swire Properties has completed in Mainland China. We learned that engaging with tenants about energy saving can be effective in reducing energy usage. After the presentations, there was a panel discussion where the three speakers went in depth on software and stakeholder involvement in data monitoring. It is very difficult to lower energy usage from buildings if landlords do not know how much energy their buildings use. Decabonisation policies need data on historical energy usage in order to set accurate benchmarks for energy reduction The conference exposed us to alternative methods of carbon emission reduction and what is essential to a policy foundation.

4.2 Pre-Workshop Materials

Before we conducted the workshops, we assumed that the participants had no prior knowledge of carbon pricing. We prepared materials that briefly described key points we felt were important for participants to know in order to have fruitful discussions later.

As our project progressed, we found some limitations with using this method that are important to consider. Throughout the workshops, we observed that participants did not read the material or was as familiar with the content as they could have been. Participants assumed that BEC would cover the material in a more in-depth manner during the workshop. Unfortunately, we could not control how the participants prepared for the workshop. With limited time for the workshop, we wanted to prioritise more time for a discussion that could help us with our research.

4.3 Workshops

Seventy two BEC members attended at least one of the four workshops. The interest of members in participating demonstrates that companies and businesses want to learn more about carbon pricing and express their thoughts on the possible implementation of a carbon pricing policy in Hong Kong. To ensure that group discussion could occur after the presentations, we arranged the chairs in the room into four semi-circles before the workshop began. For the first workshop, the participants divided themselves into groups as they arrived. However, because of

conflicts and inconsistencies that we discuss later in this chapter, we pre-assigned participants into groups for the other three workshops.

4.3.1 Energy Workshop

Figure 15: Professor Anatole Boute presents his research

The energy sector workshop took place on January 16, 2019 and had 23 attendees. The participants represented a variety of companies involved in the energy sector. The workshop presenters were Professor Anatole Boute (shown in Figure 15) from the Chinese University of Hong Kong, Faculty of Law, and Mr. Raymond Fong from the Hong Kong Productivity Council.

Professor Boute specialises in energy and environmental law, and his presentation was about the relationship between an emissions trading system (ETS) and the regulations of the electricity market. He also spoke about the differences between an ETS in a fully regulated market versus a deregulated market. Professor Boute then discussed how the energy industry needs stability and high prices to make investments, but there is not a lot of stability with the ETS. One solution to alleviate this issue is to enforce stability with a market reserve, which the European Union has successfully done.

Mr. Fong is the General Manager of the Environmental Management Division at the Hong Kong Productivity Council; he spoke about a study his company conducted about emissions trading in China. His presentation included how it is important to put a price on carbon to help reduce emissions. He mentioned an important point about how a blockchain system could be extremely effective in an ETS because it is a decentralised system, is transparent between all the sectors, and has a low cost. From this workshop, we learned that there are multiple ways to implement an ETS in an economy and that it has shown to be effective in other different types of governments.

4.3.2 Building Workshop

The building sector workshop (shown in Figure 16) took place on January 30, 2019 and had 26 attendees. The participants represented a variety of companies involved in the building sector, including construction companies and real estate developers. The workshop presenters were Mr. Wayne Wong from BEC, and Dr. Jimmy Tong from Arup, an engineering consultancy firm. Mr. Wong is a part of the Policy and Research team at BEC and recently took part in the publication

Figure 16: Jonathan Ho gives a presentation on carbon pricing

of a BEC paper titled *Investing in Energy Efficient Buildings*. He emphasised that the building sector contributes to most carbon emissions and expressed that it is extremely important to improve current policies that reduce carbon within the building sector. A final recommendation of the paper was to explore carbon policy options for Hong Kong; Mr. Wong also discussed important ETS case studies, notably Shenzhen. This city allocated carbon credits by benchmarking and the government developed an energy quota for different types of buildings (malls, hotels, etc.). Taking part in the ETS is optional for the building sector, so most buildings stopped participating because owners do not have control over the tenants and their energy output.

Dr. Tong is a Mechanical Engineer and East Asia Energy Skill Leader under Arup. He presented his research on carbon pricing and the building sector nexus. After analysing many case studies and visiting carbon pricing centers, including one located in Shenzhen, Dr. Tong concluded that one important factor to consider is that the amount of carbon saving is subject to

the price: if the price is too low, then there is no incentive to do anything. However, if the price is too high, the market could crash. A case study from Sweden demonstrates how businesses wanted to sell their carbon credits when the price of carbon was extremely high but found it difficult to find buyers due to the high cost. From Dr. Tong's presentation, we learned that a very important part of a successful carbon pricing policy is the price of carbon. In order to prevent a market crash, it would be better to start out with a low price and then slowly increase it over time to reach the right price.

4.3.3 Transport Workshop

The transport sector workshop took place on February 15, 2019 and had 12 attendees. The participants represented a variety of companies involved in the transport sector, including representatives from the Mass Transit Railway (MTR) and Cathay Pacific. The workshop presenters were Professor Sylvia He from the Chinese University of Hong Kong (CUHK), and Mr. Yee Chow from Cathay Pacific, an international airline. Professor He spoke about her recent publication titled *Best Practices and Strategies For Low-Carbon Urban Transport System* and discussed several recommendations her team concluded in order to achieve a low carbon transport system in Hong Kong. We learned that one of her key recommendations was to extend the MTR network. Many people do not live near an MTR Station; increasing the accessibility of the MTR could encourage consumers to not use private transportation or resort to take taxis or Ubers. Another method of lowering emissions from the transport sector is the implementation of electronic road pricing (ERP). With ERP, motorists must pay tolls that vary in price, depending on how congested roads are. Charges are highest during rush hour to encourage people to use alternative methods for their commute. We already knew that Hong Kong is considering implementing ERP, and Professor He confirmed the large potential ERP has in reducing congestion and carbon emissions. Professor He also recommended deploying more electric vehicle (EV) charging stations in locations with high demand and making them more easily accessible. Her team concluded this in hope that people would be more likely to purchase an EV if the charging stations were as accessible and frequent as gas stations.

Mr. Yee Chow is the Lead Manager-Procurement of the Biofuel and Carbon Strategy team at Cathay Pacific (as shown in Figure 17). He studies carbon offsetting and reduction

schemes for international aviation and spoke about the work that is currently being done within the aviation sector. An important take away that we learned from his presentation is how the replacement of biofuels with regular fuels is the best method of decarbonisation for this sector because there are little alternatives for aviation. However, the current obstacle is the high cost of biofuels, resulting in low demand.

Figure 17: Mr. Yee Chow talks about the importance of biofuels for decarbonising the aviation sector

With low demand, there is little supply, driving up costs and creating a continuous cycle. To move forward, Mr. Chow stated that incentives are vital for the early stages in development of implementing biofuels to break the cycle and lower fuel costs. In conclusion from this workshop, we learned that there are many options to promote a low carbon transportation system and it's possibly that major carbon pricing schemes within this sector may not be necessary.

4.3.4 Other Sector Workshop

Figure 18: Dr. Ivan Li giving his presentation

The other sectors workshop took place on January 25, 2019 and had 11 attendees. The companies involved represented all sectors; participants included representatives from Fuji Xerox, HK Disney, Hong Kong Jockey Club, and Swire Pacific. The workshop presenter was Dr. Ivan Li (as shown in Figure 18) from Hong Kong Emissions Exchange Limited. We learned about

major carbon pricing pilots and successful policies implemented around the world with an emphasis on market stability. Dr. Li used graphs to compare the European market and Chinese pilots, showing how an ETS under a single jurisdiction can be much easier to regulate. He explained that the reason behind European carbon market's multiple crashes was the result of political uncertainties from different countries under the EU ETS. On the other hand, China was able to freely manipulate the market and compel compliance from the businesses under its jurisdiction due to its unique governance. Through his presentation, we learned that the key to a successful ETS is to not necessarily have total control over the scheme, but to start small to have enough power to influence it. To implement a successful ETS, a jurisdiction could start with a single sector, and then slowly expand to other sectors within the country or even on the international level once it becomes stable enough.

4.4 Focus Groups

During each workshop, we conducted small focus group discussions with the attendees. We were able to hear different views and opinions directly from different businesses within the same sector. We scheduled the discussions to be 40 minutes long and facilitated the focus groups ourselves.

4.4.1 Energy Sector

Through our discussion (as shown in Figure 19), we learned that the Hong Kong government has already implemented multiple policies aimed at reducing carbon emissions. But the consensus of the energy sector is that the current environmental policies in Hong Kong are not effective in lowering emissions. However, they are unsure of what can be done to reduce emissions and are even more doubtful of carbon pricing as a solution. Businesses believe that Hong Kong would not widely support a carbon pricing policy strict enough to encourage decarbonisation. An alternative to Hong Kong making their

Figure 19: Eda Zhou engages focus group participants

own ETS was to join China's to reduce the amount of planning and funding Hong Kong would have to do to establish a carbon pricing policy. Participants expressed how Hong Kong would reject this idea because they do not want to rely on Mainland China for their energy needs.

Aside from the issue of implementing a carbon policy, many representatives were concerned with the additional costs associated with a policy that would be imposed on their companies or the consumers. Many were indifferent about different types of carbon pricing policies, if their profits stayed the same to avoid conflict with their investors. Some suggested that if Hong Kong implemented carbon pricing, it would be easy to develop the infrastructure needed for an ETS due to the small number of Hong Kong electricity generators. Another viable solution could be carbon offsets since emissions from the energy sector are sometimes not within their control and largely depend on the amount of electricity used by consumers. Thus, it is easier to invest in other places rather than trying to lower carbon intensity from energy production.

A common concern that arose during discussion was Hong Kong's limited potential. Hong Kong natural hilly terrain does not create favourable conditions for RE development to revert away from fossil fuels. To make an ETS policy more favourable to the energy sector compared to other policies, the government could implement a carbon offset program. This would allow companies that cannot reduce emissions from their operations, such as those in the energy sector, to still contribute to worldwide carbon reduction.

4.4.2 Building Sector

In the building sector, companies are more receptive of carbon pricing than in the energy sector but are still not completely confident in carbon pricing as an effective carbon reducing solution. We learned from this workshop that "tax" is a very sensitive term in Hong Kong (as pictured in Figure 20). Therefore, the representatives from the building sector believe that the public would not be very receptive of a carbon tax. An ETS was more appealing to the building sector because it offers opportunities for companies to generate financial benefits.

Figure 20: Pavee Phongsopa listens to the participants opinions

However, they also had concerns about how the government would develop the ETS and how they would implement it: Participants wanted to know which sectors would be included in the ETS, what the emissions cap would be, and how allowances would be allocated.

During the focus group, participants raised concerns about how current policies hold landlords responsible for emissions and penalise only them. Many believe that current policies are not fair towards landlords because they cannot control their tenants' energy usage. Energy efficiency should be the landlords' responsibility, while energy usage reduction should be the tenants'. Sometimes tenants are financially responsible for their electricity usage, but in other cases, landlords pay for their tenants' electricity. The participants believed that energy efficiency should be the landlords' responsibility, while energy usage reduction should be the tenants'. This served as another argument against carbon pricing being the best solution for Hong Kong; a simpler and potentially more effective solution would be to adjust other policies. Some felt that rather than regulating energy usage, the Hong Kong government could tighten building energy efficiency codes and hold the buildings accountable to a strict goal. This would make construction companies responsible for ensuring that new buildings are energy efficiency. Others felt that allocating more money towards green funding could encourage more voluntary green initiatives from businesses.

The discussions we had with the building sector led us to a similar conclusion to that of the energy sector. Many agreed that regardless of the method in which the government would promote decarbonisation, their priority should be increasing public awareness and environmental education. Businesses, and the public in general, need to understand how high carbon emissions affect themselves and their operations. We also found that businesses favour policies with larger financial incentives, given that monetary costs are a major obstacle of decarbonisation.

4.4.3 Transport Sector

We learned during our conversations with the transport sector that the representatives believe that there is not enough decarbonisation progress for themselves when compared to another major emitters, like the energy sector. Many mentioned the lack of regulations within the transport sector, especially for roadside emissions that mostly come from commercial vehicles. However, they share the same opinion as the energy sector that carbon pricing might

not be the right solution for Hong Kong. Many approaches of carbon pricing were deemed to be overly complicated, which would mainly confuse the public and companies. Participants (shown in Figure 21) also brought up the issue of government indecisiveness that does not provide clear logistics for businesses to move forward with carbon pricing. A better solution would be straightforward

Figure 21: Prof. Sylvia He and Mr. Simon Ng chat and share their opinions after the completion of the workshop

regulations that require decarbonisation. For example, Hong Kong implemented an ex-gratia payment scheme to phase out pre-Euro IV diesel commercial vehicles in March 2014. By the end of the year, franchised buses complied with Euro emission standards and all recently registered franchised buses met Euro V standards.

A large part of discussions focused on the fairness of carbon pricing and who should bear responsibility for increased costs. One participant from a public transportation company brought up an example of how carbon pricing could affect public transportation companies. He was concerned that if commuters rely even more on public transportation, overall emissions in Hong Kong will be reduced, but the emissions from public transportation will increase. With increased emissions from public transportation, a carbon pricing system would unfairly punish those companies, even though they are promoting a low carbon economy.

Instead, the participants heavily favoured an indirect carbon pricing solution like a fuel tax, especially one that targets diesel. Currently, fuel taxes are either non-existent or too low to discourage fuel usage and provide incentives for innovations. With a harsher tax on fuel and substantial subsidies for EVs, a full transition to EVs is very possible. One participant also brought up that better driving practices can reduce individual fuel consumption by 10%, which

he learned through his own work and research. Additionally, the Hong Kong government may need to investigate discouraging private car usage, given that car ownership growth is ten times greater than the city's population growth. With a large increase in the number of cars on the road, there will inevitably be more traffic and less fuel efficiency, resulting in more emissions per capita.

4.4.4 Other Sectors

Participants from other sectors (as pictured in Figure 22) also agreed that Hong Kong could be stricter with its current policies. Many did not have strong opinions on carbon pricing because they wanted to learn more about it at the workshop, but they all agreed that the government needs to act fast to combat rising emissions. They were also optimistic about people's behavior and Hong Kong's likely success in implementing additional policies. It is simpler when many internal carbon pricing schemes already exist in some companies and Hong Kong people are general willing to comply with the rules. Any potentially implemented policies would be most effective if they are mandatory and transparent. Many participants said that the government should make the policies mandatory because people would not decarbonise if given a choice. Transparency and information about the policy is also very important. For example, renewable energy (RE) certificates are available for people to purchase to support clean energy. But several business representatives had little knowledge on the certificates—some did not know that they were available for purchase.

Figure 22: Participants discussing decarbonisation options

They also confirmed our speculation from the energy sector about the inevitable implication of social cost. The participants believe they will pass on most of the financial responsibility onto the consumers. This brought back the concern about people's reactions to the added cost of their actions and how supportive they will be of new policies. In the end, our discussions reached the same conclusion that any new policy would be more successful if there was a large amount of strong awareness of environmental issues. People are more willing to pay extra costs if they know and believe in what they are paying for. Whether it is carbon pricing or a different environmental policy, many believed either to be a practical solution and beneficial to the emission reduction effort. It is, however, largely dependent on how the government will advertise those policies to the public.

4.4.5 Limitations

While conducting our focus groups, we became aware of some limitations in our methodology. One stems from our inexperience in facilitating discussion. None of our team members had any prior practice with facilitation, so it was difficult for us to conduct the focus groups and take notes simultaneously. We also had some issues keeping the participants engaged and the discussion on track, especially for the first focus group discussion. Some groups were more reluctant to share their thoughts, while others would have conversations that went off topic. We adjusted our methodology for conducting the focus groups, which helped resolve most of these issues.

5 Conclusions and Recommendations

We investigated the viewpoints and understanding of carbon pricing of business leaders in Hong Kong. By doing so, we learned about the ideas of representatives of all of the sectors—energy, building, transport, and other. We were then able to develop recommendations for the Business Environment Council (BEC) to formulate a position on carbon pricing.

5.1 Summary of Focus Group Discussions

Different business sectors in Hong Kong have varying opinions on carbon pricing. While the energy sector and transport sector are reserved about carbon pricing, the building sector is more open to it. We expected varying opinions because a carbon pricing policy would have different effects on the different sectors. As the upstream production source, the energy sector cannot be as flexible as the building sector; the utility companies must meet Hong Kong's energy demands. Utility companies have less control in where they can source their natural gas and coal, and Hong Kong's terrain limits renewable energy (RE) production. The difficulties the energy sector faces in decarbonisation explain the sector's objections towards a carbon pricing policy.

The discussions with the building sector revealed that they are more supportive of a carbon pricing policy. Specifically, participants were more active in engaging in conversations about which type of policy they preferred. We learned that the building sector favours an emissions trading system (ETS) over a carbon tax, due to the negative connotations of the word "tax". With an ETS, businesses who decarbonise their operations enough to meet their allotted carbon credits do not need to pay for their emissions, while a carbon tax penalises everyone for their CO_2 emissions. Another reason the building sector is more accepting of a carbon pricing policy is because a few companies already have internal carbon pricing policies: different kinds of carbon offsets or green bonds. Already faced with restrictions on energy use, the building sector is accustomed to complying with decarbonisation efforts, making the proposition of an additional policy not unfamiliar.

The transport sector was not that open to a carbon pricing policy, particularly an ETS system. Many participants believed that an ETS would be too complicated for businesses to understand and would mostly confuse a lot of people. A better solution would be a mandatory policy that is more straightforward. Participants also discussed the issue of fairness of carbon

pricing. If more people take public transportation, then overall emissions will decrease but the public transport companies will have increased carbon emissions. A carbon pricing system would unfairly punish those companies, even though they are promoting a low carbon economy. The transport sector heavily favoured a solution like a fuel tax because current fuel taxes are too low to discourage fuel usage. Many participants believed that transitioning to EVs would be effective in reducing emissions and very possible with increased EVs subsidies.

In our last workshop with the other sectors, we learned that participants from various sectors did not have strong opinions on carbon pricing. They believed that if the energy sectors incurred increased costs from generating cleaner energy, then they would pass most of the extra expenditures onto consumers. Then, the issue would be if people are willing to pay the extra cost for cleaner energy. The participants agreed that the public would be more inclined to pay higher electricity bills if they knew about the effects that cleaner energy generation can have on the environment. Both carbon pricing and other decarbonisation solutions require a solid foundation of environmental education and awareness to work. In the end, it is up to the consumers to either change their behaviors or pay for their emissions.

Even though all of the workshop participants had different views and ideas, there were some points of agreement. All of the focus groups said that they believed that everyone needs more education. Some participants discussed the lack of information about government initiatives; not everyone was aware that RE certificates were available or how to purchase them. Other participants wanted more detailed information on carbon pricing and how it works. Some focus groups discussed the lack of environmental education and awareness of the Hong Kong public in general.

We must acknowledge some limitations to our project. First, we limited our focus group discussions to 40 minutes. Second, the environment, with other companies and BEC, could have influenced the participants' responses. Finally, participants had different levels of understanding about carbon pricing. While we prepared and distributed pre-workshop materials with this information, it was the participants' choice of how extensively they wished to prepare.

5.2 Recommendations to BEC

We believe that BEC should be in support of carbon pricing. Hong Kong has made many strides to combat climate change, but still falls behind in decarbonisation. If they are going to reduce their carbon emissions, they need to make stronger efforts to do so. Carbon pricing can be an effective tool for decarbonising if implemented aggressively enough with a smooth transition. However, every sector is different and decarbonises differently, which means that carbon pricing is not suitable for all of Hong Kong. We have made several recommendations for whether Hong Kong should implement carbon pricing within each of the sectors and how we believe the main three sectors can most effectively decarbonise.

Recommendation 1: We recommend implementing an ETS within the building sector.

There have been several case studies where an ETS was implemented within the building sector and was effective in reducing carbon emissions. It would also be easier to implement an ETS in the building sector because this sector demonstrated the most support for this policy compared to the other sectors. Figure 23 displays an assessment of an ETS for the building section. The government can allocate carbon credits to buildings based on their past emissions and their building type—residential, industrial, or commercial. For example, an apartment building would have a different carbon credit allocation compared to a school building due to the

Figure 23: ETS Assessment for Hong Kong

difference in energy usage and in building type standards.

For Hong Kong to implement an effective ETS policy, the government must establish transparency, a fundamental part of any policy. Inadequate disclosure between the government and the public is a consistent reason why carbon pricing policies in other areas of the world have failed. All the sectors agree that if Hong Kong were to implement a carbon pricing policy, the government would need to be clear about where the revenue would go and to what extent the public would be reimbursed.

Recommendation 2: We recommend encouraging motorists to switch to electric vehicles (EVs) and promoting alternative modes of transportation to private cars.

Fuels in Hong Kong are fairly cheap, so there is little incentive to reduce fuel consumption. The citizens of Hong Kong would likely not support adding taxes to fuels, so another method must be used to lower fuel consumption. Increasing the usage of EVs would aid in the transition away from conventional fuels. However, it is inconvenient to find EV charging stations around Hong Kong. We recommend increasing the frequency and accessibility of EV charging stations to make the purchase of an electric vehicle more reasonable. In addition, we recommend that Hong Kong enhance incentives specifically for people who purchase EVs and previously owned a regular vehicle. This is to ensure that the number of conventional cars in Hong Kong decreases which will lower emissions, rather than just adding EVs and not changing the number of regular vehicles on the road.

We also recommend that the city of Hong Kong discourage the use of private vehicles by extending the MTR lines. Many commuters use the MTR; however, it is not accessible in all areas of Hong Kong. Many people do not live near an MTR station, which pushes them to purchase their own cars for convenience. Extending the lines would encourage the public to use the MTR more because it would be more convenient compared to driving their own cars.

Our final recommendation for the transport sector is to encourage walking and cycling as modes of transportation to use in Hong Kong. Currently, cycling is mostly promoted in the New Territories and it can be unsafe to bike in areas on Hong Kong Island and in Kowloon. The city

should work towards increasing the safety of biking in the rest of Hong Kong to make the public more willing to use bikes as a mode of transportation.

Recommendation 3: We recommend increasing the accessibility and knowledge of carbon offsets for all Hong Kong businesses, especially the energy sector.

We determined that making carbon offsets more well-known and widely available could help all types of companies, especially those in the energy sector, contribute to decarbonisation efforts. If companies in Hong Kong can invest in carbon offsets, they can offset their carbon output without making changes to their operation methods. This would be very effective for businesses that cannot afford to change their operations and for companies in the energy sector. Hong Kong struggles to develop green sources of energy because of its limited RE potential, making it difficult to decarbonise the energy sector. It is also difficult to control emissions from the energy sector because the utility companies must meet the electricity demands of consumers and cannot control the energy usage of them. We did an assessment of carbon offsets which can be seen in Figure 24.

Figure 24: Carbon Offset Assessment for Hong Kong

Recommendation 4: We recommend that the Hong Kong government promote environmental awareness and education for the public and in schools.

A theme that was discussed in all the workshops was the lack of environmental awareness in Hong Kong. Many people are uneducated about environmental issues and do not care about the environment, which is one of the reasons why the city has been unsuccessful in lowering carbon emissions. Increasing public knowledge of environmental issues can encourage people to change their behavior to reduce energy consumption and make them more accepting of policies that may increase financial costs for the benefit of the environment. If Hong Kong begins to include environmental awareness in school curriculums, the younger generation of people in Hong Kong will make environmentalism a higher priority and make environmentally conscious decisions.

5.3 Summary

In conclusion, carbon pricing can be an effective tool for reducing carbon emissions, but there are other valid methods of decarbonisation that can be more successful in certain sectors. We hope that BEC takes our recommendations into consideration as they determine their organisation's position on carbon pricing. BEC can use the influence they have to push the Hong Kong government towards carbon policies and initiatives that we believe will be successful for the city. We hope that Hong Kong seriously considers adopting these options and that carbon reductions will be achieved, helping Hong Kong reach its goals stated in the *Climate Action Plan 2030+* to reduce their carbon intensity by sixty five to seventy percent.

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Appendix A: Sponsor Description

The Business Environment Council (BEC) 商界環保協會有限公司 (2018) was established by the business sector of Hong Kong in 1992. It is an independent, charitable membership organisation that advocates for the protection of the environment. Their membership is a compilation of various organisations from many of the business sectors in Hong Kong. However, BEC mostly works with government, business, academic and community organisations. The organisation's mission is to address the environmental concerns in the area and strive to assist Hong Kong in becoming a more sustainable place to live.

BEC (2018) is run by a Board of Directors, composed of eighteen chairmen from several successful multinational and local corporations. Below their division are the two standing committees of BEC, the Executive Committee and the Communications and Membership Committee (see Figure 25). The Executive Committee is responsible for providing a strategic direction for the organisation and is made up of two chairmen and five general body members, who are hand-picked and voted on by the Board. The Communications and Membership Committee has a total of fifteen members, including one chairperson. The role of this committee is to advise management on how to attract new members, communicate BEC core values and initiatives to current and potential members, maintain a solid membership base and revenue stream and other objectives that fall under BEC's public communications. The rest of the organisation is broken down into five advisory groups, made up of 20-30 committee members each, which have members who focus on more specific environmental issues in Hong Kong. The Climate Change Business Forum Advisory Group's goal is to promote the awareness of climate change throughout the business community of Hong Kong. The Energy Advisory Group has the objectives to promote the best practices for energy management, which includes fostering and building capacity for a low carbon energy management culture. The Environmental, Social and Governance (ESG) Advisory Group aims to foster an ESG management culture and forge collaborative links between local and global expertise related to ESG performance. The Transport and Logistics Advisory Group aims to foster clean, low carbon transport practices. They attempt to achieve this by building a capacity for a clean, low carbon and sustainable transport and logistics sector and by forging collaborative links between local and global sources

of expertise. The sixth Advisory Group is the Waste Management Advisory Group, which advocates for better waste management strategies and policies from a business perspective. The committees are made up of representatives from their respective organisations, and BEC is a middleman that encourages collaboration among members to come up with better ways to make their businesses use more green practices. Our team will be working with the Climate Change Business Forum Advisory group; however, we will ultimately be reaching out to all the advisory groups to gain a large variety of perspectives and opinions.

Since this organisation is composed of many different organisations, such as Diversey Hong Kong Limited, Veolia Environmental Services China Limited and Allied Sustainability and Environmental Consultants Group Limited, BEC (2018) has access to a lot of resources and information from all the organisations that are members. BEC receives their funding through multiple different revenues. Most of their funds come from compensation given through the projects and consultations the company completes. Another source is through membership fees that they charge other companies in order to be affiliated with BEC.

BEC (2018) partners with Hong Kong Green Building Council, Building Environmental Assessment Method (BEAM) Society Limited, and the World Business Council for Sustainable Development, who all work on similar issues and have common passions like BEC. One project BEC has previously worked on looked to find energy-efficient technologies. Their goal was to analyse the current technologies that businesses use and analyse the benefits and costs of changing the existing equipment to more environmentally friendly technologies.

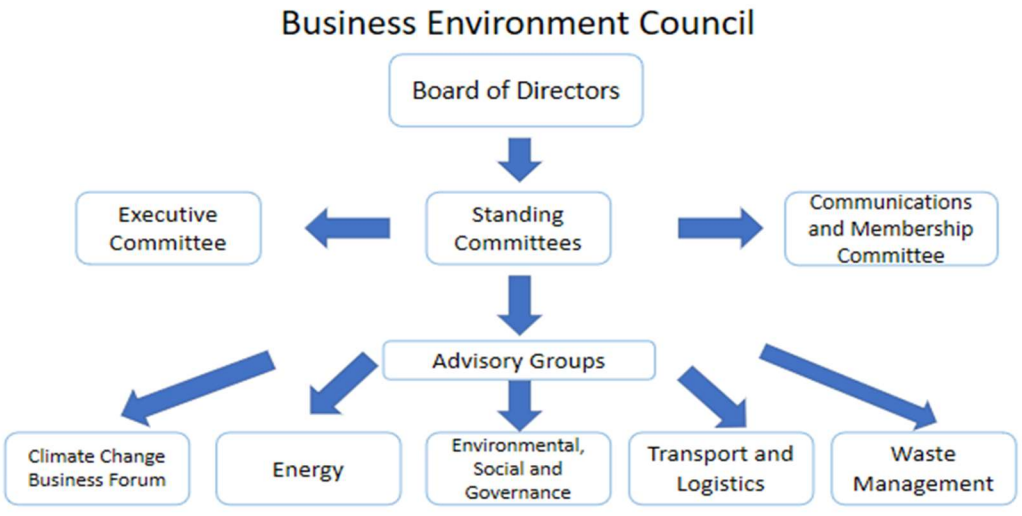


Figure 25: The BEC organisation and its different committees

Appendix B: What Is an IQP?

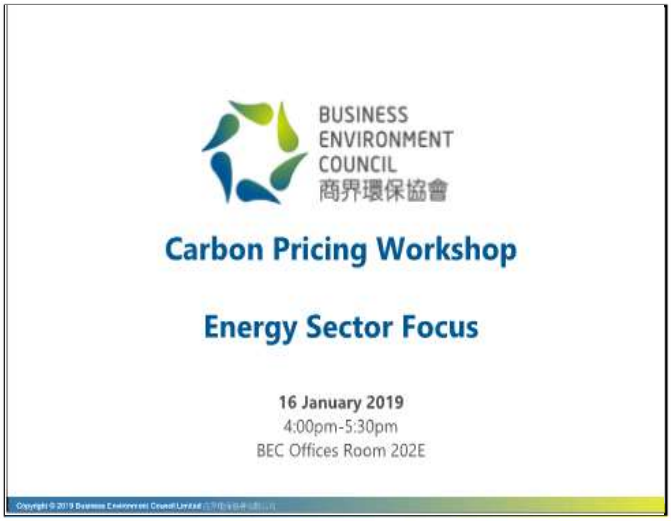
Worcester Polytechnic Institute's (WPI) (2018) unique project-based learning curriculum requires all students to complete an Interactive Qualifying Project (IQP). The IQP involves tackling a problem that combines science or technology with society. Students work in interdisciplinary teams to develop solutions to real world issues. By completing the IQP, students learn about the impact that science and technology has on the globe and society's endeavors to manage and promote evolving technologies. Students can use the IQP as an opportunity to learn about topics outside of their major and work with others to solve complex problems.

The IQP is typically completed in a student's junior year and is equal to 3 courses (WPI, 2018). It can be completed in 1 term as a full course load or over 3 terms as 1 course per term. Students can also complete the IQP at one of WPI's residential project centers around the globe or on-campus. Projects completed at a project center are sponsored by external organisations, and students must complete project preparation equivalent to one course before travel. WPI faculty can also advise projects for IQPs completed on campus.

Our project qualifies as an IQP because we are focusing on the issue of climate change and if carbon pricing can be a possible solution. Humans have greatly increased GHG emissions due to technological developments, and possible solutions can include both technical and societal factors. The issue that we are looking at is interdisciplinary in nature; we must review the problem and potential solution through an economic, environmental, and social perspectives. Our project will culminate in the development of a carbon pricing policy recommendation for Hong Kong. If carried out, our proposal can potentially have long lasting impacts, affecting the energy, building, and transport sectors in Hong Kong and the city's environment.

Appendix C: Pre-Workshop Materials

Appendix C1: Energy Sector Materials



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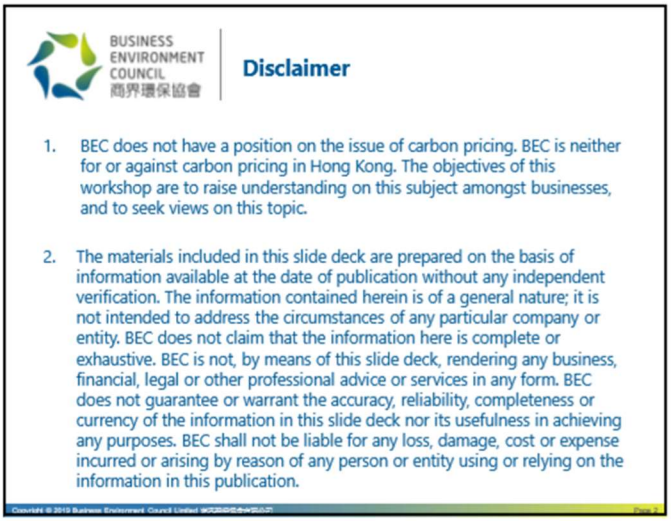

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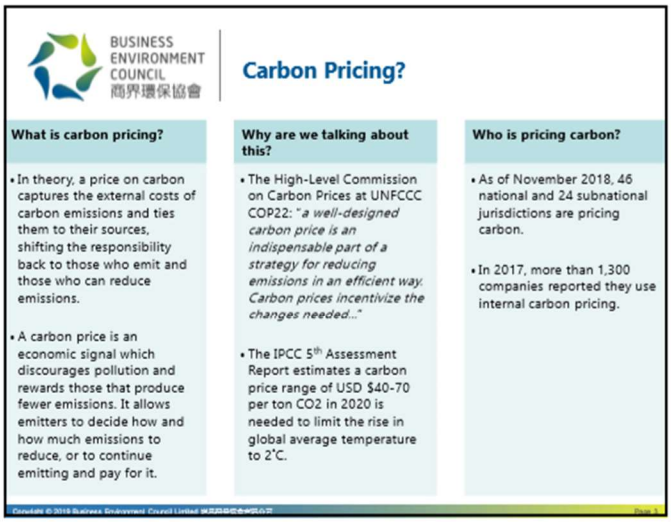

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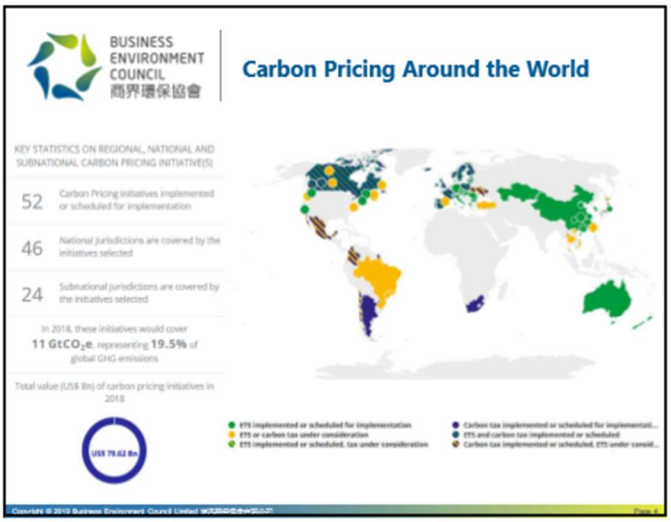


4

Examples of Carbon Pricing Methods

External

Direct

Emissions Trading System (ETS)
- Emitters can trade emission units to meet emission targets. To comply with their emission targets at the least cost, regulated entities can implement abatement measures or acquire emission units in the carbon market, depending on the costs of these options.

Carbon Tax
- A levy that requires companies and consumers to pay for each ton of carbon pollution they emit.

Indirect

Tax on Fuels
- An excise tax imposed on the sale of fuel.

Results-Based Climate Finance (RBCF)
- Funds are disbursed by the provider of climate finance to the recipient upon achievement of a pre-agreed set of emissions reduction goals.

Offset Mechanisms
- Entities can acquire carbon credits by investing in external emissions reduction projects, indirectly reducing emissions.

Renewable Energy Certificates (RECs)
- Similar to offset mechanisms, entities acquiring RECs indicate their energy is provided from low/zero emission renewable sources.

Internal

Internal Tax/Fee
- A charge on different business units for emissions resultant of their activities. A revenue/fund is generated in this approach.

Shadow Pricing
- A theoretical, hypothetical price on carbon that assists businesses in making and planning investment decisions.

Implicit Price
- A simple accounting of how much a company needs to spend to reduce emissions to become compliant with regulations.

5

Examples of Existing Schemes

Jurisdiction	Approach	Notes	Looking Ahead
European Union	EU ETS (cap-and-trade)	• Established in 2005 • Allowances set too high, insufficient demand of credits, market "crashed" • To date, emission reduced by 19% compared to 1990 levels	• Will lower allowances to create more demand. • Expected to reach 21% emission reduction by 2020
British Columbia, Canada	Carbon Tax, Federal Benchmark	• Introduced carbon tax in 2008 • GDP increased 17%, emissions decreased 4.7% • Revenue-neutral: all revenue returned to the people through tax cuts	• Price will be raised to CAD$50 per tonne of CO_2 by 2021 (from CAD$35) in accordance with federal benchmark
China	Nationwide ETS (cap-and-trade)	• To unfold in 3 phases: 1) development of market infrastructure, 2) simulation trading, 3) operation and expansion • Established ETS framework using pilots	• Prepare for a complete ETS system by 2020
Singapore	Carbon Tax beginning in 2019	• Will begin at $5 per tonne of CO_2 Note: Global average is $21.50 per tonne	• Rate review in 2023, anticipate raise to $10-$15 per tonne by 2030
United Kingdom	Climate Tax and Reward System	• 2% decrease in total emissions after the first year	• Policy will be reviewed, possible extension

6

Energy Sector: Carbon-related Policies

Hong Kong's Overall Target
- Carbon intensity reduction by 65-70% by 2030 compared to 2005 base year. (26-36% absolute reductions)

Fuel Mix

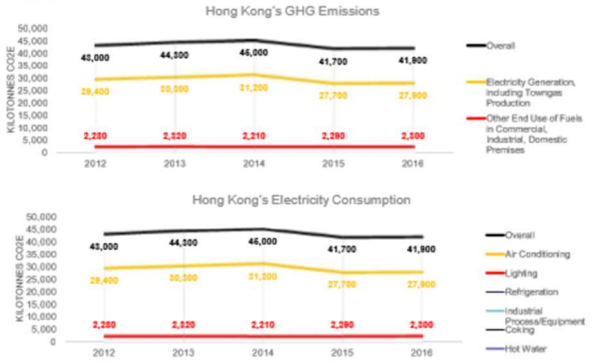
MEELS
- Effective until 2033. Contains incentives for CLP & HEC to increase RE in fuel mix, and to reduce energy demand.

BEEO (BEC & EAC)
- Administered via CLP & HEC, to encourage local RE generation. Primarily for solar PV.

SCA Funds?
- Government RE and waste-to-energy projects.
- Indirect: Power plants fuel mix must meet Air Quality Objectives (currently under review). Could reduce carbon.

7

Hong Kong GHG Performance



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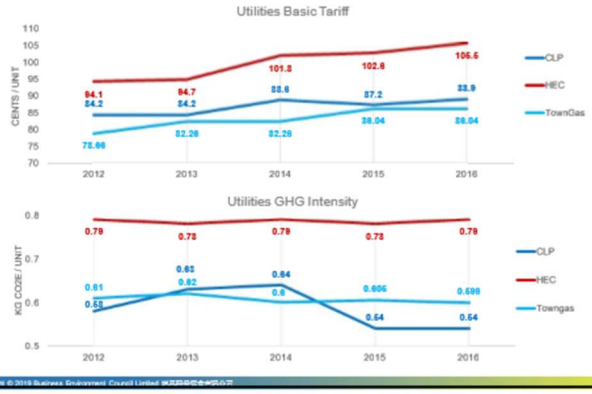
Energy Sector GHG Performance



9

Fuel Mix

10

Appendix C2: Building Sector Materials

BUSINESS ENVIRONMENT COUNCIL 商界環保協會

Carbon Pricing Workshop

Buildings Sector Focus

30 January 2019
4:00pm-5:30pm
BEC Offices Room 202E

1

BUSINESS ENVIRONMENT COUNCIL 商界環保協會

Disclaimer

1. BEC currently does not have a position on the issue of carbon pricing; BEC is neither for nor against carbon pricing in Hong Kong. The objectives of this workshop are to raise understanding on this subject amongst businesses, and to seek views on this topic.
2. The materials included in this slide deck are prepared on the basis of information available at the date of publication without any independent verification. The information contained herein is of a general nature; it is not intended to address the circumstances of any particular company or entity. BEC does not claim that the information here is complete or exhaustive. BEC is not, by means of this slide deck, rendering any business, financial, legal or other professional advice or services in any form. BEC does not guarantee or warrant the accuracy, reliability, completeness or currency of the information in this slide deck nor its usefulness in achieving any purposes. BEC shall not be liable for any loss, damage, cost or expense incurred or arising by reason of any person or entity using or relying on the information in this publication.
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Carbon Pricing?

What is carbon pricing?

- In theory, a price on carbon captures the external costs of carbon emissions and ties them to their sources, shifting the responsibility back to those who emit and those who can reduce emissions.
- A carbon price is an economic signal which discourages pollution and rewards those that decarbonise. It allows emitters to decide how and how much emissions to reduce, or to continue emitting and pay for it.

Why are we talking about this?

- The High-Level Commission on Carbon Prices at UNFCCC COP22: "*a well-designed carbon price is an indispensable part of a strategy for reducing emissions in an efficient way. Carbon prices incentivize the changes needed..*"
- The IPCC 5th Assessment Report estimates a carbon price range of USD $40-70 per ton CO2 in 2020 is needed to limit the rise in global average temperature to 2°C.

Who is pricing carbon?

- As of November 2018, 46 national and 24 subnational jurisdictions are pricing carbon.
- In 2017, more than 1,300 companies reported they use internal carbon pricing.

3

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Carbon Pricing Around the World

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4

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Examples of Carbon Pricing Methods

External		Internal
Direct	**Indirect**	
Emissions Trading System (ETS) • Emitters can trade emission units to meet emission targets. To comply with their emission targets at the least cost, regulated entities can implement abatement measures or acquire emission units in the carbon market, depending on the costs of these options. **Carbon Tax** • A levy that requires companies and consumers to pay for each unit of carbon pollution they emit.	**Tax on Fuels** • An excise tax imposed on the sale of fuel. **Results-Based Climate Finance (RBCF)** • Funds are disbursed by the provider of climate finance to the recipient upon achievement of a pre-agreed set of emissions reduction. **Offset Mechanisms** • Entities can acquire carbon credits by investing in external emissions reduction projects; indirectly reducing emissions. **Renewable Energy Certificates (RECs)** • Similar to offset mechanisms, entities acquiring RECs indicate their energy is provided from low/zero emission renewable sources.	**Internal Tax/Fee** • A charge on different business units for emissions resultant of their activities. A revenue/fund is generated in this approach. **Shadow Pricing** • A theoretical, hypothetical price on carbon that assists businesses in making investment and planning decisions. **Implicit Price** • A simple accounting of how much a company needs to spend to reduce emissions to become compliant with regulations.

5

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Examples of Existing Carbon Pricing Schemes

Location	Approach	Description	Looking Ahead
European Union	EU ETS (cap-and-trade)	• Established in 2005 • Allowances set too high, insufficient demand for credits, market "crashed" in 2006 & 2014 • EU reduced 23% GHG between 1990 and 2016, economy grew 53%	• Will reduce allowances to create more demand • Target is to reach 21% emission reduction by 2020 from 2005 levels
British Columbia, Canada	Carbon Tax, Federal Benchmark	• Introduced carbon tax in 2008 • To date, GDP increased 17%, emissions decreased 4.7% • Revenue-neutral: all revenue returned to the people through tax cuts	• Price will be raised to CAD$50 per tonne of CO_2e by 2021 (from CAD$35) in accordance with federal benchmark
China	Nationwide ETS (cap-and-trade)	• Established ETS framework using pilots • To unfold through 3 phases: 1) development of market infrastructure; 2) simulation trading; 3) operation and expansion	• The 3rd phase, deepening and expanding phase, will commence around 2020
Singapore	Carbon Tax	• Beginning in 2019 at S$5 per tonne of GHG Note: Global average is USD$21.50 (S$29.50) per tonne	• Rate review in 2023, anticipate raise to S$10-15 per tonne by 2030
United Kingdom	Climate Tax and Reward System	• 2% decrease in total emissions after the first year	• Policy pending review • Currently part of EU ETS: Brexit?

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Examples of Existing Buildings-Related Carbon Pricing Schemes

Location	Approach	Description	Looking Ahead
Republic of Korea	Downstream ETS	• Established in 2015 • Covers ~600 of the country's largest emitters (includes building sub-sectors), responsible for 68% of national GHG emissions • 87% of Residential & Commercial emissions and 91% of Industry emissions covered	• Target of 32.7% GHG emission reduction in buildings sector by 2030 compared to BAU
Shanghai, China	Pilot ETS	• Commenced in 2013 • Includes shopping malls, hotels, and other commercial buildings • Free allocation, based on historic emissions • 100% compliance in both 2014 and 2015	• Target of 20.5% reduction in carbon intensity by 2020, compared to 2015 levels
Tokyo, Japan	ETS	• Established since 2010 • Covers ~1,300 large buildings, responsible for 20% of Tokyo's total carbon emissions • Engaged and consulted industry groups before implementation of cap and trade • Total GHG emissions from buildings reduced by 26% from 2010 to 2016	• Target to reduce GHG emissions by 30% by 2030, compared to 2000 levels

7

Buildings Sector: Existing Carbon-Related Policies in Hong Kong

Policies	Description	Results
Building Energy Efficiency Ordinance (Since 2012)	• BEEO contains a Building Energy Code (BEC) and Energy Audit Code (EAC) • New building major infrastructure must meet minimum energy efficiency standards specified in the BEC • "Major retrofitting works" must comply with BEC • Commercial building must have energy audit every 10 years according to EAC	• Currently ~850 buildings have been issued certificates • ~1700 buildings in declaration stage • Reviewed every 3 years • Standards were tightened by 10-15% in 2014
Building (Energy Efficiency) Regulations (Since 1995)	• First code on energy standards: Overall Thermal Transfer Value (OTTV) and Residential Thermal Transfer Value (RTTV) • OTTV requires commercial buildings to meet thermal performance minimums to reduce heat loss • RTTV is an optional standard for residential buildings	• OTTV & RTTV standards were revised in 2005 and 2011 • OTTV was tightened by 20% in 2011 • Pre-requisite for GFA concessions • Review currently underway
Mandatory Energy Efficiency Labelling Scheme (Since 2009)	• Certain electrical appliances must have energy efficiency labels with a Grade from 1 to 5 • Manufacturers send products to accredited test laboratories to be assigned an efficiency grade before distribution in Hong Kong	• Grading standards most recently reviewed and adjusted in 2015 • Phase 3 commenced in 2018, expanding appliances coverage

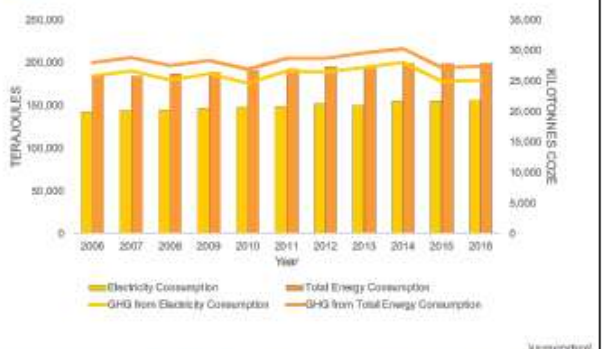
8

Buildings Sector: Existing Carbon-Related Policies in Hong Kong

Policies	Description	Results
Energy Efficiency Funds under SCA from HEC & CLP	• CLP Eco-Building Fund & HEC Smart Power Fund provide funds for energy efficiency retrofitting projects (since 2014) • Energy Saving Loan Fund provide loans for energy saving initiatives (since 2018/19) • Community Energy Saving Fund for upgrading energy efficiency of appliances (since 2018/19)	• As of March 2018, CLP EBF approved 145 applications, covering over 400 residential buildings
Accelerated Tax Deduction for Energy Efficiency Installations (Since 2008)	• 2 categories: Environmental Protection Machinery and Environmental Protection Installations • 100% deduction provided under profit tax in the year of eligible machinery purchase • 20% deduction provided under profit tax in 5 consecutive years for construction of eligible installations	
BEAM (Since 2010)	• Voluntary green building rating tool designed for buildings in Hong Kong	• 1,061 registered BEAM Plus projects • Of 566 assessed projects, 237 are rated Gold or higher

9

Hong Kong Buildings Energy & GHG Performance



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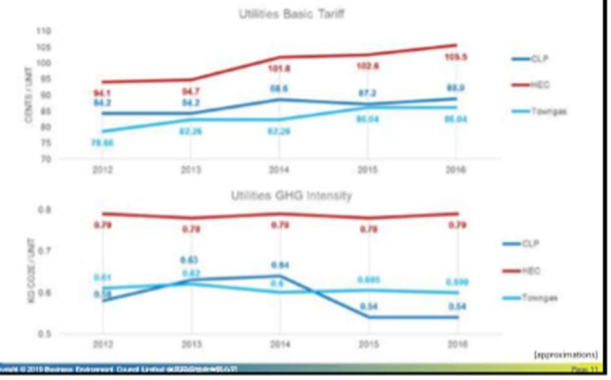
Hong Kong Energy Sector Trends



11

RECs, Carbon Offsets & Credits

Renewable Energy Certificates

- Offered by HEC & CLP
- REC purchaser has the right to claim the environmental benefits associated with the amount of electricity carried in REC
- RECs purchased in blocks of 100 units of electricity
- Currently priced at HK$0.5/unit of electricity

Sources of RE:

- Solar PV
- Wind
- Landfill Gas (CLP only)

How large is the supply of RECs?

Carbon Offsets & Credits

Many carbon credits verification and supply bodies, for example:

- Clean Development Mechanism Certified Emission Reductions
- Gold Standard
- Conservation International
- Carbon Care Asia

And more...

- JI (Joint Implementation)
- VCS (Verified Carbon Standard)
- VER+ (TÜV SÜD standard)
- CAR (The Climate Action Reserve)
- CCBS (developed by the Climate, Community and Biodiversity Alliance, CCBA)
- Plan Vivo

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Appendix C3: Transport Sector Materials

BUSINESS ENVIRONMENT COUNCIL 商界環保協會

Carbon Pricing Workshop

Transport Sector Focus

15 February 2019
4:00pm-5:30pm
BEC Offices Room 202E

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Disclaimer

1. BEC currently does not have a position on the issue of carbon pricing; BEC is neither for nor against carbon pricing in Hong Kong. The objectives of this workshop are to raise understanding on this subject amongst businesses, and to seek views on this topic.
2. The materials included in this slide deck are prepared on the basis of information available at the date of publication without any independent verification. The information contained herein is of a general nature; it is not intended to address the circumstances of any particular company or entity. BEC does not claim that the information here is complete or exhaustive. BEC is not, by means of this slide deck, rendering any business, financial, legal or other professional advice or services in any form. BEC does not guarantee or warrant the accuracy, reliability, completeness or currency of the information in this slide deck nor its usefulness in achieving any purposes. BEC shall not be liable for any loss, damage, cost or expense incurred or arising by reason of any person or entity using or relying on the information in this publication.
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Carbon Pricing Around the World

4

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BUSINESS ENVIRONMENT COUNCIL 商界環保協會

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United Kingdom	Climate Change Levy (RBCF)	• Established in 2001 • 2% decrease in total emissions in 2002 compared to business-as-usual	• Currently part of EU ETS. Brexit?

6

Examples of Existing Transport-Related Carbon Pricing Schemes

Location	Approach	Description	Looking Ahead
Shenzhen	ETS (cap-and-trade)	• ETS expanded to include public transport in 2016 • Allowances for transport sector are distributed based on grandfathering and the entity's historical carbon intensity	• Goal: 45% reduction in carbon intensity by 2020 compared to 2005 and peak its GHG emissions by 2022
Sweden	Carbon Tax	• Implemented in 1991 • Targets fossil fuels, including those used as motor fuels • Transport emission levels decreased, 2018 levels are 15% lower than 1990	• Goal: 70% reduction in GHG emissions from 2010 levels from domestic transports (excluding aviation) by 2030
Singapore	Tax Structure for Cars	• Vehicles with larger engines pay a higher road tax, diesel vehicles must pay additional special tax • Carbon Emissions-Based Vehicle Scheme (CEVS): Cars with low CO2 emissions qualify for rebates, while high emissions incur registration surcharges, replaced by Vehicular Emissions Scheme (VES) in 2018 to cover 4 more pollutants in addition to CO2	• Goal: 36% reduction in emissions intensity from 2005 levels by 2030 and peak its GHG emissions by 2030

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Examples of Existing Transport-Related Carbon Pricing Schemes

Initiatives	Description	Looking Ahead
Carbon Offsetting and Reduction Scheme for International Aviations (CORSIA)	• An emission mitigation approach for the global airline industry, developed by the UN's International Civil Aviation Organisation (ICAO) • Aiming for carbon neutral growth from 2020 onwards • Each year starting from 2021, the sector must offset covered CO2 emissions that exceed the average baseline emissions of 2019 and 2020; aeroplane operator offsets take into account sectoral and individual operator's emissions growth • As of 15 January 2019, 78 States, representing 76.63% of international aviation activity, intend to voluntarily participate in CORSIA	• 2021-2023: pilot phase, voluntary • 2024-2026: 1st phase, voluntary • 2027-2035: 2nd phase, mandatory for all States that meet share criteria except those that are exempt
International Maritime Organisation (IMO)	• Set out future vision for international shipping and GHG emission reductions, adopted by IMO's Marine Environment Protection Committee (MEPC) • Includes short, mid and long-term measures with possible timelines and their impacts on Member States • Short-term measures to be finalized between 2018-2023; mid-term measures between 2023-2030; and long-term measures beyond 2030 • Plans include strengthening energy efficiency	• Goal: reduce carbon emissions by 40%, compared to 2008 levels by 2030 • Goal: reduce carbon emissions by 70% and reduce GHG emissions by 50%, compared to 2008 levels by 2050

8

Transport Sector: Existing Carbon-Related Policies in Hong Kong

Initiative	Description	Results
Liquefied Petroleum Gas Vehicle Scheme (Since 1999)	• Incentivised replacement of diesel taxis and light buses with LPG ones • Continued development of hard and soft infrastructure: LPG filling stations, training mechanics for LPG fuel systems maintenance	• At end of 2003, ~99.9% of taxis switched to LPG • Currently, >70% of PLBs are LPG • 12 dedicated LPG filling stations
Energy Efficiency Labelling Scheme for Petrol Passenger Cars (Since 2002)	• Voluntary 'Comparison Type' labelling system by the Electrical and Mechanical Services Department • Provides information on urban and highway fuel consumption, and estimated annual fuel consumption, based on standardised tests	
Pilot Electronic Road Pricing in Central and Adjacent Areas	• 2015: Three-month public consultation/engagement exercise • 2017+: Government commenced an in-depth feasibility study; includes analysing the collected views and formulating specific proposals	
Pilot Green Transport Fund (Since 2011)	• Subsidises the testing of innovative green technologies in the public transport sector and goods vehicles • $300 million allocated	• Currently, 140 trials approved & covered under the Fund, receiving a total of ~$139 million
Tax on Fuels	• Tax is $6.06 per litre for unleaded petrol (~38% of retail price) and no tax for diesel	

9

Transport Sector: Existing Carbon-Related Policies in Hong Kong

Initiative	Description	Results
First Registration Tax (FRT) Concessions for Electric Vehicles	• FRT for electric private cars will be waived up to $97,500 (previously full exemption until 1 April 2017); electric commercial vehicles fully waived until 31 March 2021 • "One-for-One Replacement" Scheme: scrap and de-register eligible old private car and register a new electric private car for up to $250,000 FRT concession	• At the end of 2018, there were 11,496 EVs for road use, up from less than 100 at the end of 2010 • Only 99 electric private cars were sold from April to December in 2017, compared to 2,078 in the same period the year before
Vehicle License Fee	• Private cars annual license fee amount determined by engine capacity Note: • Fee independent of CC for buses, light buses, taxis, and goods vehicles	Engine CC: <1,500 / 1,500 - <2,500 / 2,500 - <3,500 / 3,500 - <4,500 / >4,500 Private Petrol Car: $3,929 / $5,794 (147%) / $7,664 (195%) / $9,534 (243%) / $11,329 (288%) Private Diesel Car: $5,389 / $7,254 (135%) / $9,124 (169%) / $10,994 (204%) / $12,789 (237%)
Ex-gratia Payment Scheme (Since 2014)	• Incentive-cum-regulatory approach by EPD • Aiming to phase out some 82,000 pre-Euro IV diesel commercial vehicles by end of 2019 involving ex-gratia payment of about $11.4 billion	• At the end of 2014, all franchised buses were in compliance with Euro emission standards and all recently registered franchised buses meet the Euro V standards

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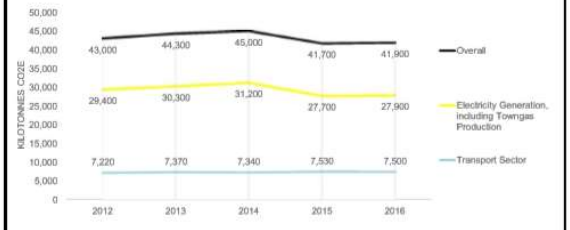
Hong Kong GHG Performance



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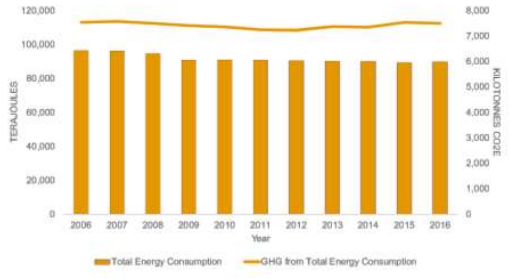
Hong Kong's Transport Sector Energy & GHG Trends



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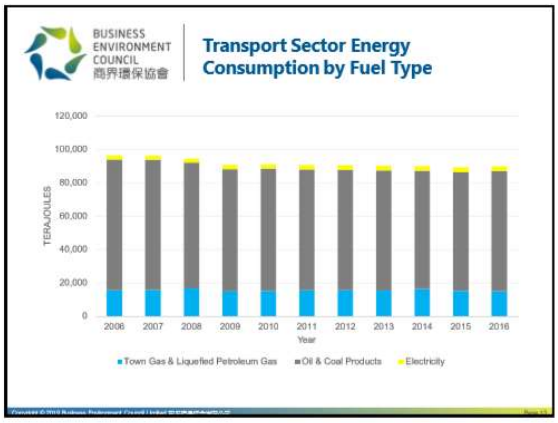
BUSINESS ENVIRONMENT COUNCIL 商界環保協會
Transport Sector Energy Consumption by Fuel Type
120,000
100,000
80,000
60,000
40,000
20,000
0
TERAJOULES
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year
Town Gas & Liquefied Petroleum Gas
Oil & Coal Products
Electricity

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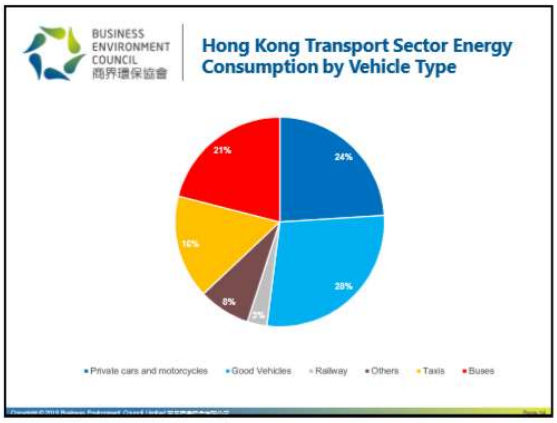
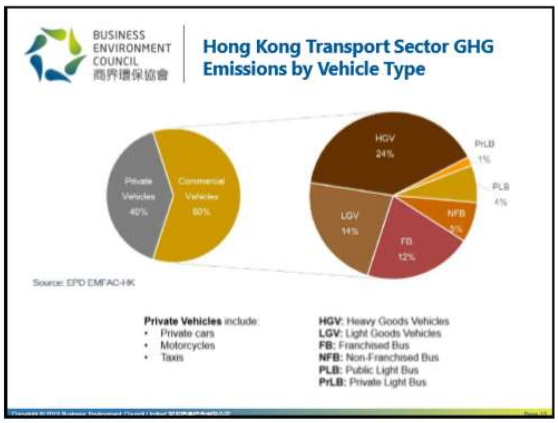

BUSINESS ENVIRONMENT COUNCIL 商界環保協會
Hong Kong Transport Sector Energy Consumption by Vehicle Type
24%
28%
2%
8%
16%
21%
Private cars and motorcycles
Good Vehicles
Railway
Others
Taxis
Buses

14


BUSINESS ENVIRONMENT COUNCIL 商界環保協會
Hong Kong Transport Sector GHG Emissions by Vehicle Type
Private Vehicles 40%
Commercial Vehicles 60%
HGV 24%
PrLB 1%
PLB 4%
NFB 2%
FB 12%
LGV 14%
Source: EPD EMFAC-HK
Private Vehicles include:
• Private cars
• Motorcycles
• Taxis
HGV: Heavy Goods Vehicles
LGV: Light Goods Vehicles
FB: Franchised Bus
NFB: Non-Franchised Bus
PLB: Public Light Bus
PrLB: Private Light Bus

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Appendix C4: Other Sector Materials

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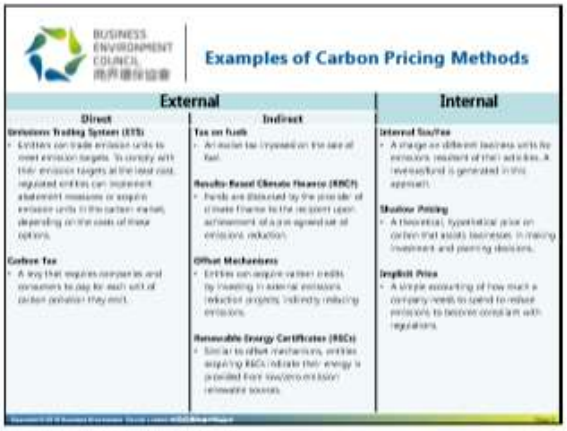

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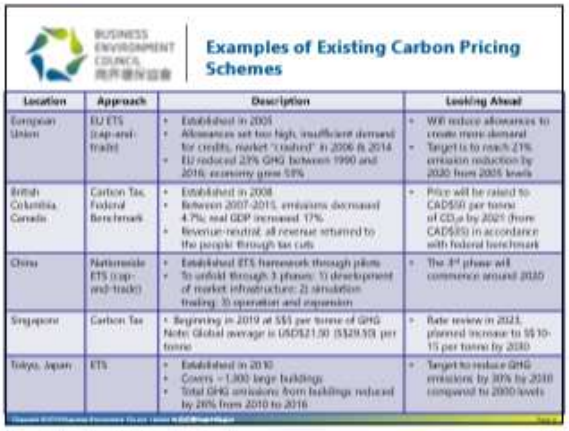

6

Hong Kong Existing Carbon-Related Policies: Energy

Hong Kong's Overall Target:
Carbon intensity reduction by 65-70% by 2030 from 2005 base year; ~26-36% absolute reductions

Initiative	Description	Results
Fuel Mix for Electricity Generation		• Coal in Hong Kong's overall fuel mix decreased from 53% to 48% from 2012 to 2015
Scheme of Control Agreements	• Current agreements effective until 2033 • Contains incentives for CLP & HEC to increase RE in fuel mix and reduce demand-side energy consumption • Establishes funds to support community and private sector to improve energy efficiency	
Feed-in Tariff & RE Certificates	• Effective since October 2018 for CLP & January 2019 for HEC • Administered via CLP & HEC to encourage local RE generation • Primarily designed for solar PV	• By December 2018, CLP received 1,100+ applications, 85% applications approved, accounting for ~25,000kWh of RE

7

Hong Kong Existing Carbon-Related Policies: Buildings

Initiative	Description	Results
Buildings Energy Efficiency Ordinance	• New building major infrastructure and major retrofit works must meet minimum energy efficiency standards • Commercial buildings must have energy audit every 10 years	• ~850 buildings have been issued certificates • Review every 3 years, tightened by 10-15% in 2014
Building (Energy Efficiency) Regulations	• Overall Thermal Transfer Value: requirement for commercial buildings • Residential Thermal Transfer Value: optional standards for residential buildings	• Revised in 2005 and 2011; OTTV was tightened by 20% in 2011
Scheme of Control Agreements Energy Efficiency Funds	• CLP Eco-Building Fund & HEC Smart Power Fund: funds for energy efficiency retrofitting • Energy Saving Loan Fund • Community Energy Saving Fund	• As of March 2018, CLP EBF approved 145 applications, covering over 400 residential buildings
Accelerated Tax Deduction for Energy Efficiency Installations	• 100% deduction in the first year for machine purchase • 20% deduction over 5 years for construction of eligible installations	
GFA Concession & BEAM Plus	• GFA concessions for new buildings if register for BEAM Plus certification	• 1,061 registered BEAM Plus projects • 237/966 rated Gold or higher • GFA concession under review

8

Hong Kong Existing Carbon-Related Policies: Transport

Initiative	Description	Results
LPG Vehicle Scheme	• Incentivized replacement of diesel taxis and light buses with LPG	• ~70% of PLBs use LPG • All taxis use LPG
Pilot Green Transport Fund	• Subsidises testing of innovative green technologies in the public transport sector and goods vehicles • $300 million allocated	• Currently, 140 trials approved, equivalent to $139 million in funding
Ex-gratia Payment Scheme	• Aim to phase out 82,000 pre-Euro IV DCVs by end of 2019 involving ex-gratia payment of $11.4 billion • Will phase out Euro IV DCVs by 2023	• By 2014, all franchised buses met Euro-emission standards
Tax on Fuels	• Tax of $6.06 per litre for unleaded petrol (~38% of retail price); no tax for Euro V diesel	
First Registration Tax Concessions for Electric Vehicles	• Waived up to $97,500 for private EV (was fully waived until April 2017); fully waived for commercial EV until April 2021 • Replacement Scheme: scrap old car and register new private EV for up to $250,000 concession	• 11,496 EVs in 2018 vs. <100 in 2010 • 99 private EVs sold in 2017 vs. 2,078 in 2018 (April to December)
Vehicle License Fee	• Private car annual license fee dependent on engine capacity • Fee independent of engine capacity for bus, PLB, taxi, goods vehicle	Engine CC / Private Petrol Car / Private Diesel Car <1,500 / $3,028 / $1,389 1,501 - <2,500 / $5,794 / 147% / $2,264 / 139% 2,501 - <3,500 / $7,664 / 195% / $3,124 / 169% 2,501 - <4,500 / $9,534 / 243% / $10,994 / 284% >4,500 / $11,329 / 289% / $12,789 / 229%

9

Hong Kong Existing Carbon-Related Policies: Resource & Waste

Initiative	Description	Results
Charging for Municipal Solid Waste	• Implementation delayed to late 2020 • 80% of waste charged through using predetermined bags priced at ~HK $0.11/litre; 20% of waste charged by weight	
Waste-to-Energy	• Landfill gas usage from existing and retired landfills • T-PARK: sludge treatment facility, reduces sludge volume by 80% • Organic Resources Recovery Centres planned as two phases and facilities. Phase 1 is under construction • Integrated Waste Management Facility capable of producing 480 GWh gross electricity/year, to be completed by 2024	
Producer Responsibility Schemes	• Producers pay levy to cover cost of recovering and recycling regulated items • Plastic bags, WEEE covered; expanding to glass beverage and plastic product containers	
Carbon Labelling Scheme for Construction Products	• Voluntary initiative by the Construction Industry Council • Provides carbon footprint information on covered construction products	

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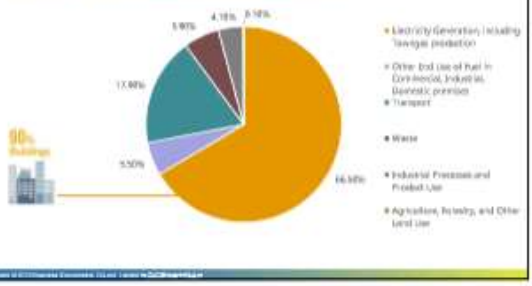
Hong Kong GHG Emissions Trends

11

Hong Kong GHG Emissions by Sector

In 2016, Hong Kong emitted 41,900 kilotonnes of CO_2e.



12


BUSINESS ENVIRONMENT COUNCIL
Hong Kong Energy Use by Fuel Type & Sector
In 2016, Hong Kong consumed 289,219 TJ of energy.
Electricity:
• 98% used in residential, commercial, industrial sectors.
• 2% used in transport sector.
Oil & Coal Products:
• 11% used in residential, commercial, industrial sectors.
• 89% used in transport sector.
Towngas & LPG:
• 70% used in residential, commercial, industrial sectors.
• 30% used in transport sector.

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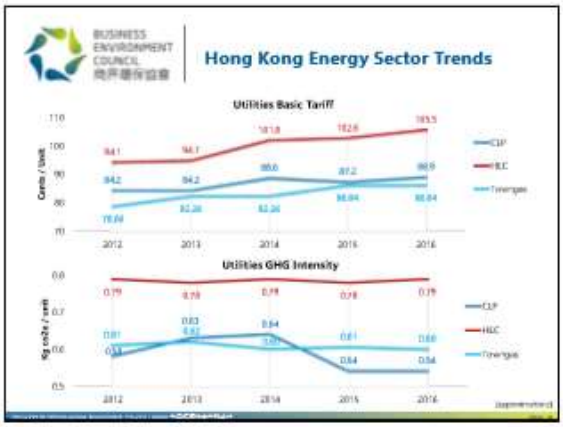
BUSINESS ENVIRONMENT COUNCIL
Hong Kong Energy Sector Trends
Utilities Basic Tariff
Cents / Unit
2012
2013
2014
2015
2016
CLP
HEC
Towngas
Utilities GHG Intensity
kg co2e / unit
0.79
0.78
0.78
0.78
0.78
0.81
0.83
0.84
0.81
0.80
0.64
0.64

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BUSINESS ENVIRONMENT COUNCIL
RECs, Carbon Offsets & Credits
Renewable Energy Certificates
• Offered by HEC & CLP
• REC purchaser has the right to claim the environmental benefits associated with the amount of electricity carried in REC
• RECs purchased in blocks of 100 units of electricity
• Currently priced at HK$0.5/unit of electricity
Sources of RE:
• Solar PV
• Wind
• Landfill Gas (CLP only)
How large is the supply of RECs?
Carbon Offsets & Credits
Many carbon credits verification and supply bodies, for example:
• Clean Development Mechanism Certified Emission Reductions
• Gold Standard
• Conservation International
• Carbon Care Asia
And more..
• JI (Joint Implementation)
• VCS (Verified Carbon Standard)
• VER+ (TÜV SÜD standard)
• CAR (The Climate Action Reserve)
• CCBS (developed by the Climate, Community and Biodiversity Alliance, CCBA)
• Plan Vivo

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Appendix D: Workshop Agendas

Appendix D1: Energy Workshop Agenda

Energy Workshop, 16 January Program

Time	Activity	Notes
4:00-4:05pm (5 minutes)	Welcome & Introduction	Simon Ng, BEC
4:05-4:15pm (10 minutes)	Presentation • What is carbon pricing? • Snapshot: carbon pricing around the world	Jonathan Ho, BEC
4:15-4:30pm (15 minutes)	Presentation • Carbon pricing & the energy sector nexus: global trends and lessons learned	Prof Anatole Boute, CUHK
4:30-4:45pm (15 minutes)	Presentation • Recap of CPU Study • Recent Developments in Hong Kong	Raymond Fong, HKPC
4:45-5:20pm (35 minutes)	Facilitated Group Discussion 25 minutes group discussion 10 minutes to report back to main group	Split into groups. WPI student each sit in one group to take notes and report back.
5:20-5:30pm (10 minutes)	Closing & Next Steps	Simon Ng, BEC

Appendix D2: Building Workshop Agenda

Building Workshop, 30 January Program

Time	Activity	Notes
4:00-4:05pm (5 minutes)	Settle down & chit chat	Everyone
4:05-4:20pm (15 minutes)	Welcome & Introduction Presentation • What is carbon pricing? • Snapshot: carbon pricing around the world	Jonathan Ho, BEC
4:20-4:35pm (15 minutes)	Presentation • Investing in Energy Efficiency Report: Carbon Pricing & Buildings	Wayne Wong, BEC
4:35-4:45pm (10 minutes)	Presentation • Transitioning to low carbon buildings: conclusions of the 3030 report • Recent developments in Hong Kong	Jimmy Tong, Arup
4:45-5:25pm (40 minutes)	Facilitated Group Discussion 30 minutes group discussion 10 minutes to report back to main group	Split into 4 groups. Will assign groups beforehand based on registration list. WPI student each sit in one group to facilitate, take notes, and report back.
5:25-5:30pm (5 minutes)	Closing & Next Steps	Simon Ng, BEC

Appendix D3: Transport Workshop Agenda

Transport Workshop, 15 February Program

Time	Activity	Notes
4:00-4:05pm (5 minutes)	Settle down & chit chat	Everyone
4:05-4:20pm (15 minutes)	Welcome & Introduction Presentation • What is carbon pricing? • Snapshot: carbon pricing around the world	Jonathan Ho, BEC
4:20-4:35pm (15 minutes)	Presentation • Low Carbon Transport & Policies	Professor Sylvia He, CUHK
4:35-4:45pm (10 minutes)	Presentation • CORSIA and Biofuels • Aviation	Yee Chow, Cathay Pacific
4:45-5:25pm (40 minutes)	Facilitated Group Discussion 30 minutes group discussion 10 minutes to report back to main group	Split into 2 groups. Will assign groups beforehand based on registration list. WPI student each sit in one group to facilitate, take notes, and report back.
5:25-5:30pm (5 minutes)	Closing & Next Steps	Simon Ng, BEC

Appendix D4: Other Sectors Workshop Agenda

Other Sectors Workshop, 25 February Program

Time	Activity	Notes
4:00-4:05pm (5 minutes)	Settle down & chit chat	Everyone
4:05-4:20pm (15 minutes)	Welcome & Introduction Presentation • What is carbon pricing? • Snapshot: carbon pricing around the world	Jonathan Ho, BEC
4:20-4:45pm (15 minutes)	Presentation • China's carbon pricing market • Carbon accounting/offset projects	Dr. Ivan Li, Hong Kong Exchange Limited
4:45-5:25pm (40 minutes)	Facilitated Group Discussion 30 minutes group discussion 10 minutes to report back to main group	Split into 2 groups. Will assign groups beforehand based on registration list. WPI student each sit in one group to facilitate, take notes, and report back.
5:25-5:30pm (5 minutes)	Closing & Next Steps	Simon Ng, BEC

Appendix E. Focus Group Protocol

1. What are your views on Hong Kong's energy/building/transport sector* decarbonisation progress? Do we need new policies to further enable greater decarbonisation?
    - What policies/programs are working well? What policies/programs are not?
    - To what extent do we have carbon pricing type policies already?

2. What are your views on carbon pricing? Is carbon pricing potentially a suitable option for Hong Kong?
    - Does your company have internal carbon pricing policies?
    - How might carbon pricing affect (positively/negatively) your company's operations and current decarbonisation efforts?

3. <u>If yes</u>, why? What carbon pricing mechanism would be most suitable for Hong Kong?
    - Are there adjustments needed in existing policies to avoid overlaps?
    - Would complementary policies be needed?

4. <u>If no</u>, why not? What other policies/programs should Hong Kong consider? Or what existing policies/programs should we enhance?

*specify the sector to correspond with the workshop

Appendix F. Focus Group Notes

Appendix F1. Energy Sector Notes

Participants:

CLP Power Hong Kong Limited

Chinese University of Hong Kong

DSG Energy Limited

Gammon Construction Limited

Green Mobility Innovations Limited

Hong Kong EV Power Limited

Hong Kong Productivity Council

MTR Corporation Limited

Schneider Electric (Hong Kong) Limited

Shell Hong Kong Limited

Siemens Limited

The Hong Kong & China Gas Company Limited

The Hongkong & Shanghai Banking Corporation Limited

The Hongkong Electric Company Limited

VPower Group International Holdings Limited

Consensus:

1. What are your views on Hong Kong's and the energy sector's decarbonisation progress? Do we need new policies to enable greater decarbonisation?

- There are policies starting to focus on decarbonisation, but not enough.
- The government keeps saying they want to reduce carbon emissions, but nothing happens. They need to provide more incentive.
    - What policies/programs are working well? What policies/programs are not?

- The Feed-in Tariff is creating an incentive to use renewable energy only when it is more economically appealing.
- The Scheme of Control Agreement (SCA) may be enough to regulate power companies. More terms could be added to it to regulate carbon emissions.
- The current policies aren't offering worthy enough incentives to encourage the decarbonisation of the sector.

2. What are your views on carbon pricing? Is carbon pricing potentially a suitable option for Hong Kong?

- Some representatives believed it would be suitable and some did not.
    - Does your company have internal carbon pricing policies?
- No one has carbon pricing, but there are decarbonisation initiatives.
    - How might carbon pricing affect (positively/negatively) your company's operations and current decarbonisation efforts?
- If the costs are comparable, then using greener alternatives is preferred.
- Public transportation could be negatively affected by decarbonisation efforts. If more people switch to public transport, emissions from public transport will increase, while overall emissions decrease.

3. <u>If yes</u>, why? What carbon pricing mechanism would be most suitable for Hong Kong?

- A carbon price should be easy to implement because the market is small in Hong Kong.
- Many believed an emissions trading system (ETS) would be more suitable than a carbon tax.
    - Hong Kong can simply join China's ETS.
    - Some thought it would be good if Hong Kong companies could reduce carbon emissions to earn carbon credits and then sell them to China.
- For some, if profit is the same, companies do not mind what kind of carbon price. Higher costs could be good for getting consumers to reduce energy usage.

- Each sector should develop the most suitable policy for them.
- Would complementary policies be needed?
- The government would need to provide more financial assistance in order to keep companies motivated.
- A carbon offset can be more efficient if we find a way to group several offset projects into one transaction (block chain).

4. If no, why not? What other policies/programs should Hong Kong consider? Or what existing policies/program should we enhance?

- There needs to be more education about clean energy and decarbonisation.
- The government is too slow to implement an effective policy and would never implement a carbon tax.
- More terms could be added to the SCA to regulate carbon emissions from energy companies.
- Issues of fairness/consequences of carbon price.
- Carbon pricing would force companies to find other sources of energy (i.e. renewable energy), but Hong Kong doesn't have the resources/infrastructure necessary for that.
    - Would increase the price of electricity from offshore projects or they would have to rely on China for energy and that is not desirable.

Individual Notes:

Group 1:

- 2050 target, if we invest in renewable energy, 70% of the land is untouchable, limited options to renewable energy
- Do we need new policies to enable greater decarbonisation?
- Should invest in renewable energy
- Rely on surrounded lands who have the sources, ex: land, wind, etc.
- HK doesn't have these resources

- What policies/programs are working well? What policies/programs are not?
- Currently helping consumers reduce carbon footprint
- Help reduce usage with high efficiency
- Customer would try to save energy to reduce burden on electricity prices
- Government could import electricity from mainland, otherwise hard to decarbonise
- Macau does this; however, HK doesn't want to rely on the mainland like Macau does
- Using more nuclear power and importing electricity from mainland, doesn't seem like an option
- The current incentives are not efficient to decarbonise the sector
- Govt currently set target for carbon intensity reduction: want GDP to grow ,which will cause energy level to rise
- Target different to decarbonisation, reduce in intensity could result in an increase emission
    - What would be most suitable for Hong Kong?
        - Carbon offset program: more resources and more people will be willing to improve efficiency and generate carbon credits
        - Collect credits to sell and buy
        - Need to figure out a way to group a bunch of projects into one transaction
- Companies need a Financial incentive, get 50% of funding
- To rely on mainland, there will be no energy security energy efficiency : improvements sell carbon credits to make
- The government will never want carbon tax, didn't want to carbon trading , never liked the carbon tax
- They don't want to induce new tax
- Singapore doesn't want trading, might not be a good way to price the carbon, everyone pays the same, its fair
- What needs to be done?
    - Need to focus on energy efficiency
    - The financial burden on the power companies will be higher

- Government would need to increase financial support to companies to feel more motivated

Group 2:

- Discussion about fuel mix:
  - Natural gas is better than coal, but it's more expensive and still a fossil fuel that emits carbon
  - Some concern over nuclear power
  - Japan used to have a lot of nuclear power, but stopped after Fukushima
    - Now using a lot of biomass, but biomass prices are getting more expensive
  - Higher prices are an unavoidable outcome
- Education is very important, talking to power companies isn't enough
  - People don't have as much awareness about the importance of clean energy
  - People are willing to pay more for organic food because they know it's healthier
  - People need to learn that if they want to be sustainable, they will have to pay more for clean energy
- Higher prices could be a good driver for people to use less energy
  - HK government always talks about reducing energy use, but nothing happens
  - HK's electricity tariffs aren't that high anyway, compared to southern China (Shenzhen, Guangdong)
- SCA could be enough to regulate power companies - new SCA just went into effect, can't do anything for the next 15 years/lots of time to think
  - Could add more terms to SCA to regulate carbon emissions
- Carbon pricing could be a good option for HK
  - ETS is more favorable than carbon tax
  - Companies could just pass the cost of the tax onto consumers and make them pay
    - Companies don't care, if the profits stay the same
    - But higher prices could also encourage consumers to use less energy
- A company supports carbon pricing

- A few companies are trying to change their fuel mix

Group 3:

- Blue sky campaign from few decades ago shows that it is not effective to specifically target power production
- A company is currently attempting to switch to nuclear power by retiring old coal plants and replacing them with nuclear plants
    - Earthquake in Japan in 2011 did delay and give them a little scare
- Given the current trend in Hong Kong carbon emissions obviously there's a lot to be accomplished but what to do?
- Overtaxing on certain product such as fuel might become a problem if we keep adding more policies
- A lot of companies are being proactive about environmental issues such as converting their buses
- Energy sector has been increasing its production but the emissions within the sector is going down by 8%
- Renewable energy might be an option
    - Government is reluctance
    - Price of electricity going up
- Concern about social cost
    - Where then should the carbon pricing be put within the economy chain
- Inequality of payment and responsibility within different jurisdictions since this is a global issue
- Carbon emissions measured, is it produce locally or from imports
    - How do we split or tax this if we were to tax goods accordingly?
    - Food is a major part of imports so will this implicate the general population?
- Initial investment of implementation of different system
    - Training cost
    - Infrastructure cost

    - Blockchain cost
- Environmental education might be what we can spend the revenue from carbon pricing on or it can be another place to spend money rather than carbon pricing policy or ETS system

Group 4:

- Current decarbonisation is "getting there" because **control schemes** (SCA) that promote decarbonisation have started.
- Hong Kong is at the beginning.
- We need to know how to encourage helping small businesses because they will need to follow stakeholders' decisions.
- Power company getting there but partially controlled by government and company policy.
- The oil industry has hardly and policies that incentivise decarbonisation.
- Synthesis: Decarbonisation efforts are starting, but there needs to be incentives and engagement. The Feed-in Tariff is creating monetary incentive to use renewable energy.
- Carbon pricing should be easy to implement because the markets are small, but if it must go through the government then it will take a long time and be a long process.
- There may not be enough projects to support offsets in Hong Kong.
- A company installed solar panels at a site because of the **Feed-in Tariff**. They calculated the costs, which is important because it is about the money, and there is a 5-year payback period while the panels will be there temporarily for 8 years. This is a relatively short payback time and they can **claim decarbonisation** from the panels.
- A company negotiated with an oil company several years ago to ask for biodiesel instead of diesel. They were able to because they had the **buying power**. They did not do it because there was a carbon price, but because they were of **comparable prices** and they could claim carbon reduction. There was no obligation or financial gain, just wanted to be greener.

- Small businesses have no way of verifying carbon emissions because it is tedious and expensive, the blockchain sounds like a good idea.
    - A SME (small and medium enterprise) in the transport sector makes hybrid buses that run on diesel and battery for an up to 70% emission reduction. Would be good if they could verify, but they receive **no government funding**. No government plan to change to electric vehicles unlike in China and the EU.
- You can see the benefits in the sectors, and it's all related to cost and the scale of the cost.
- Synthesis: Carbon pricing would be implementable in Hong Kong, but it would be about the cost. If the costs are comparable, then using greener alternatives helps a company claim carbon reduction, but they would not spend more for alternatives. The government has nearly no involvement in funding green initiatives.
- Must achieve **green funding** and it is something that can be done.
    - Sometimes you cannot receive funding from multiple sources even if they are unrelated funds.
- A company is **passive**, it depends on the government initiative because a carbon price is more cost to them.
    - Currently they have some internal policy, but it will probably not drive significant reduction in Hong Kong.
- Carbon price is good and should have no problem getting started but the small market means little impact.
- Each sector may have different policies that are suitable (ex: tax on the oil sector).
- Synthesis: A carbon price is good and should have no problem getting started since the market is small. However, some companies are dependent on government initiatives and small marked means little impact. Each sector should develop the most suitable policy for them
- There is not enough perception on the topic and there is not enough **infrastructure** either (for electric vehicles), there needs to be a technology breakthrough.
- Teach people to reduce carbon **internally** before trading (ETS).
- The cost of **verification** is expensive and needs government support.

- Synthesis: The Government currently provides no funding for electric vehicles or carbon verification and are slow to develop policy. The people need to learn to reduce carbon internally before establishing a nationwide trade.

Appendix F2. Building Sector Notes

Participants:

Allied Environmental Consultants Limited

Chinachem Agencies Ltd

Cundall Hong Kong Limited

Dunwell Enviro-Tech (Holdings) Limited

Gammon Construction Limited

Great Eagle Holdings Limited

HM Environmental Technologies Limited

Hong Kong Emission Exchange Limited

Hong Kong Productivity Council

Johnson Controls Hong Kong Limited

MTR Corporation Limited

New World China Land Limited

New World Development Company Limited

Ove Arup & Partners Hong Kong Limited

Ronald Lu and Partners (Hong Kong) Limited

Schneider Electric (Hong Kong) Limited

Siemens Limited

Swire Properties Limited

The Hong Kong Jockey Club

The Hongkong Electric Company Limited

Consensus:

1. What are your views on Hong Kong's and the building sector decarbonisation progress? Do we need new policies to enable greater decarbonisation?

- There is a lack of awareness and incentive on the tenant side for using more energy efficient alternatives.
- The landlords cannot control tenants who are responsible for usage.
- What policies/programs are working well? What policies/programs are not?
- The current policies are doing a good job, but can be improved (i.e. tighter benchmarks, more funding).
- Current policies focus on landlords, however, reducing energy usage is also the tenant's responsibility.

2. What are your views on carbon pricing? Is carbon pricing potentially a suitable option for Hong Kong?

- Most participants were open to the idea of carbon pricing.
    - Does your company have internal carbon pricing policies?
- A few companies stated that they do not have an internal carbon pricing policy, there is no motivation for one.
    - How might carbon pricing affect (positively/negatively) your company's operations and current decarbonisation efforts?
- Some mentioned that it will probably increase the cost of their operation which will eventually fall upon consumers.

3. <u>If yes</u>, why? What carbon pricing mechanism would be most suitable for Hong Kong?

- An ETS would be more appealing to the public because "tax" is a sensitive word.
- It may be easier for the government to encourage internal carbon pricing policies because they are also voluntary actions but may need to provide an incentive.
    - Would complementary policies be needed?
- There needs to be more environmental awareness and education before a carbon price can be implemented.
- Some initial government funding will be needed.

4. If no, why not? What other policies/programs should Hong Kong consider? Or what existing policies/program should we enhance?

- A carbon tax wouldn't work in Hong Kong because tax has bad connotations and would be difficult to justify.
- An ETS is too complicated to implement.
- Current policies can work, they just need to be stricter and/or mandatory.
    - There needs to be better and more thorough data reporting.
    - Hong Kong should focus on public awareness as the first step.

Individual Notes:

Group 1:

- Views on Hong Kong's current decarbonisation policies
        - Need to take multiple markets into consideration: carbon, electricity
        - Current policies don't focus enough on old building and tenants: need a policy to encourage a change in behavior of the users
        - The regulations or benchmarks need to stricter in order to make a change
        - Hong Kong hasn't made much of a difference, so 30% reduction is an unrealistic goal
        - Current policies can help, but if everyone is going to use it, we need a hard number for people to achieve
        - Behavioral changing
        - Need more data
        - More holistic and radical
    - Policies that are working well/ not working well
        - BEAM is a good option, however, it doesn't look at tenant side of the operation
    - Where do we already have carbon pricing policies

        - Hong Kong does not
- Views on carbon pricing
        - Carbon pricing needs to have more desirable incentives
    - Does your company have carbon pricing?
        - No one has any internal policies; however, it has been suggested for companies to do so
        - Chinese companies have internal carbon pricing policies: they are incentivised to do this because they need to prepare for the ETS that will soon be implemented all over the country
    - How would carbon pricing affect your company's operations?
        - They don't know
- Why would carbon pricing work and what carbon pricing be most suitable?
        - Target the building and transport sectors because they can make the most reductions
        - Target buildings who have the most awareness for environmental issues
        - Hong Kong is money driving
        - Nothing will work unless companies are required to do something
        - We can try to use a competitive angle approach because Hong Kong considers themselves at the top
        - No fuel on tax
        - Government needs to provide funding
        - Need to develop a baseline, to get carbon credit

- Why would carbon pricing not work and what could we do better?
        - Bottom -up approach could show some results: Give incentives to those who do reduce more and are doing better that other companies
        - Environment awareness isn't high or strong
            - Need to educate more people on these issues
            - This is not public enough

        - Nothing will be done without education because the average person doesn't think beyond their personal responsibilities
    - Doing more for the environment is viewed as an additional burden: helping the environment needs to be integrated into what they already do
    - Need to educate companies so they could have their own initiatives

Group 2:

- The current policies do a pretty good job of regulating specific aspects of the building sector. BEC, OTTV, and RTTV all target just one part of building energy efficiency.
- It could be beneficial to have something broader like a carbon pricing policy that just sets a general cap for overall emissions.
- Carbon pricing could be suitable for Hong Kong.
- Companies need a form of incentive if the government wants to see decarbonisation.
- The financial incentive in carbon pricing can be a good driver for low carbon initiatives
- HKPC is developing a blockchain carbon trading platform for Hong Kong.
- Other companies don't exactly have internal carbon pricing policies but have other environmental efforts.
- One company has stopped using timber to prevent deforestation and has switched to metal.
- One company has stopped using plastic cups and utensils.
- An ETS could be suitable for Hong Kong, gives companies a choice.
- They can continue to pollute and pay for it or decarbonise.
- There were some questions about logistics and the specifics about how the policy would be implemented: which sectors should be included? How do you determine what the emissions cap is?
- A carbon tax probably wouldn't work in Hong Kong.
- It wouldn't get passed due to the negative connotations of the word "tax".

Group 3:

- Current policies work, as seen from air pollution and statistic.
- Need more aggressive policy which can be done by lowering the cap on energy usage or adjustment in different building code of practice.
- Current green fund policy such as EAC or from other energy production companies are beneficial but there is not enough capital for every applicant.
- New buildings are covered within the Building Energy Efficiency Code but what about the older buildings? They are responsible for much of the carbon emissions of the building sector but there are no regulation forcing them to change.
- Many were concerned with the lack of economic incentives that carbon pricing has to offer.
- May need to implement different type of carbon pricing policies due to the diversity of businesses in Hong Kong.
- Many questioned the specifics of the implementation such as how high the fee should be for a policy to effectively reduce carbon emissions.
- Everything ultimately comes down to the cost of operation and how much government are willing to lend its resources to private sectors.
- If we were to assume that carbon pricing will be implemented, carbon offset and different types of internal carbon pricing might be more viable to Hong Kong's building owners.
- Since there are many companies that are already engage in some form of carbon reduction effort, it will be easier for government to encourage internal carbon pricing policies because they are also voluntary actions.
- Carbon tax or ETS is just another one of financial instruments which is unnecessarily complicated.
- Requires too much financial resources and manpower.
- More direct method such as higher "tax" would be better since government need to make it clear that this is a "punishment."
- Need to address the root of the problem which is a behavioral problem stemming from the lack environmental awareness and education.

Group 4:

- Hong Kong can create better long-term targets
- Building Energy Codes (BEC) needs to be tightened
- There needs to be tenant-landlord collaboration
    - Data alignment
- Data privacy between buildings and government
- Tenants are more concerned with the price, not energy efficiency (it is largely their responsibility to reduce, but landlord being green can lead to higher prices then tenant will just move out)
    - Need incentive to motivate change
    - OR is it a lack of awareness?
    - If short-term lease, then not worth investing in greener appliances (vs. LED where payback is almost immediate)
    - Landlords can't control tenant usage
- Landlords can invest in creating smart buildings so there is less responsibility on the tenants
- Synthesis: BEC needs to continue to be tightened to stay effective. There is a lack of awareness and incentive on the tenant side for using more energy efficient alternatives. The landlords lack incentive.
- Must consider **embedded carbon** costs (can be positive if a gap is created)
- Need more public awareness because tenants care about price, not energy efficiency
- Johnsons Control does not have any internal carbon price
- Synthesis: There needs to be better data reporting and embedded carbon costs also need to be considered. A few companies stated that they do not have an internal carbon pricing policy.
- Tax is lower cost to implement and requires less people to be involved → higher efficiency
- Emissions trading system (ETS) would be more appealing because it isn't a "tax"
- Need to be clear about revenue return to make a policy more appealing

- Synthesis: A tax would be cheaper and more effective than an ETS due to implementation costs and the amount of people who would need to be involved. However, an ETS would be more appealing to the public because “tax” is a sensitive word. Either way, there will need to be transparency about where the revenue goes/if it is returned. There needs to be a step to increase public awareness as well.
- Easy to implement if you need to hold a single entity accountable, however tenant-landlord. Hong Kong is not used to it (multiple entities working together)
- Tax is a sensitive word in Hong Kong and would be difficult to justify
- ETS is complicated
- **Public awareness** is the first step
- Synthesis: A policy would be easy to implement if a single entity is held accountable. However, with carbon pricing on the building sector, the tenants and landlords will need to work together and that is something Hong Kong is not used to. A “tax” would also be difficult to justify to the public and an ETS is too complicated. Hong Kong should focus on public awareness as the first step.

Appendix F3. Transport Sector Notes

Participants:

Agile Group Holdings Limited

Cathay Pacific Airways Limited

CLP Power Hong Kong Limited

Gammon Construction Limited

Green Mobility Innovations Limited

MTR Corporation Limited

Scania (Hong Kong) Limited

The Chinese University of Hong Kong

The Hongkong Electric Company Limited

The Kowloon Motor Bus Company (1933) Limited

Consensus:

1. What are your views on Hong Kong's and the energy sector's decarbonisation progress? Do we need new policies to enable greater decarbonisation?

- Not enough regulation within the transport sector especially for commercial vehicles that are responsible for a vast majority of roadside emissions
- There's been a lot of focus on decarbonisation in the energy sector, but the transport sector must also be looked at

What policies/programs are working well? What policies/programs are not?

- There's no diesel tax which is needed to either discourage the usage or provide motives for innovation
- Hybrid cars are not economical, and we should just push for full EVs

2. What are your views on carbon pricing? Is carbon pricing potentially a suitable option for Hong Kong?

- One participant was strongly against carbon trading because of the market crash of the EU's ETS

Does your company have internal carbon pricing policies?

- No one has carbon pricing, but there are decarbonisation initiatives.

How might carbon pricing affect (positively/negatively) your company's operations and current decarbonisation efforts?

- One construction company has switched to biodiesel, need large amount of buying power to negotiate contracts

3. If yes, why? What carbon pricing mechanism would be most suitable for Hong Kong?

Would complementary policies be needed?

- Restricted car ownership (Car growth is 10 times higher than the population growth)

4. If no, why not? What other policies/programs should Hong Kong consider? Or what existing policies/program should we enhance?

- Government has no long-term vision, so we have nothing to adapt to and have no clear logistic on how to proceed forward
- Carbon pricing would be too confusing and just confuse people
- Because of the complexity of carbon pricing, Hong Kong should look at other solutions: ERP, encourage public transport, encourage EV

Individual Notes:

Group 1:

- There are no current decarbonisation policies
- There is no diesel tax; it's so cheap to buy diesel that there's no point to be fuel efficient
- Diesel is "Fantastically cheap"
- Commercial vehicles are the largest part of roadside emissions, need to target them now with short term solutions first
- Need to target certain groups and change their behaviors
- Tax structure doesn't make sense
- Every driver can improve their fuel consumption, drivers need to change behavior
- Need to make more efficiency improvements at minimal cost
- There is no reason for companies to change
- Trying to promote EV cars, however the obstacle is that there is no incentive for people to buy EV (The EV chargers are not very accessible)
- The government needs to support the infrastructure
- Need to target the people who can make the most change
- Participants felt that hybrid isn't a good solution
- The current tax on fuels polices are not effective
- The government should implement policies on parking
- Government has no long-term vision; hence companies stay the same
- Promote less carbon intensity transportation options
- Higher costs of fuels could drive the carbon reduction
- The diesel tax is unpopular but maybe introduce it progressively overtime.
- There is no diesel tax
    - No push for better tech etc.
    - Pay only 15% of that flow
- Commercial vehicles are vast majority of roadside emissions

- Changing people's behavior might be the only effective solution
- In recent years some politicians are supporting higher car consumption
- Fuel can be at least 10% more expensive
    - Push electric substitute
    - Hybrid is not economical
- Cost of cars in Hong Kong is not the fuel, so tax on fuel might not be as effective
- In Hong Kong, we achieve a much slower transition from diesel bus to electric busses when compared to Shenzhen
- Need to figure out how to make people give up their private cars?
- Every driver can improve consumption reduction by 10%
    - Better driving behavior
    - Better time management
- Main problem with EV's infrastructure specifically the charging station
- Concern: Car growth is 10x of the pop growth
- More car = more traffic = more fuel used for the same distance = more emissions/capita
- Government has no long-term vision, so we have nothing to adapt to and have no clear logistic on how to proceed forward

<u>Group 2</u>

- The transport sector needs to be looked at; there's been a lot of focus on the energy sector
    - In the UK, there was a large focus on decreasing emissions from the energy company; emissions decreased a lot, now the transport sector is the highest emitter
    - HK is very price sensitive on certain things (raising the Cross-Harbor Tunnel toll), but there has still been double digit car growth over the years, even though HK has one of the highest first registration taxes in the world

- Transport sector needs to decarbonise and the government keeps saying they will further develop the railway system, but there's been no progress, no projects have gone forward
- Transport sector needs to decarbonise, but the HK government isn't as firm as Mainland and European government, not strong enough to move forward, the government tries to balance a lot of the views of industry and is holding back innovation
    - Government tried to increase the Cross-Harbor Tunnel toll, but met a lot of opposition from industry and public, ended up not doing it
- One participant doesn't like carbon trading - EU ETS crashed, left bad opinion
    - Undecided about both carbon tax and ETS
    - Need to focus on commercial vehicles rather than private cars, ~90% of air pollutants are emitted from commercial vehicles
        - But it's tricky to electrify commercial vehicles due to power requirements
        - Not sure how much carbon pricing would incentivise commercial vehicles to switch to EV
        - Because of performance issues, it would just be a tax
- What would further decarbonisation mean for railway?
    - Government wants people to increase public transportation use, but then subway emissions will increase
    - Need to look at power companies too, since power companies supply energy for subway
    - Should not look at just absolute carbon emissions; need to use better terms of efficiency, see what the passenger load per km is
- Maybe HK should do carbon pricing, but doesn't see the government pushing for it in a prioritised discussion soon

- One participant thought that an ETS would just be complicated, would confuse people, would be better to set clear target and clear requirements
    - Tax would be easier but not that supportive of it
- Not enough info on what carbon pricing would mean for transport since aviation and maritime industry would be very different with different fuels
    - Don't think carbon pricing would be most suitable because of other options
        - ERP
        - Encourage public transport instead of private
        - Encourage bus companies to have more EV
    - Carbon pricing would get a lot of people confused
- Not issue of adding more electric vehicles (EV), need to replace existing cars with EV, how do you do that?
    - For aviation, is it cheaper to buy biofuel or offsets? If it's cheaper to buy offsets, then no one will bother with biofuel
    - Diesel is highly taxed for the public, but not for commercial, should we look at that? How do we tax fuels? Why is petrol much more expensive than diesel for commercial? Need for info
        - Should petrol be priced differently to incentivise industry to convert to different operated vehicles? Should the government have better subsidies to upgrade to different vehicles?
- Needs to be more accurate measurements of carbon emissions; you always need to measure performance; if you don't measure carbon, how can you price it?
    - Switched fuel to biodiesel, prices were comparable, not much of a change
    - Government doesn't have any subsidies on biodiesel, but they try to mandate it through contracts

    - Large companies have more buying power and can negotiate for better offers with no additional costs, need to work with fuel supplier to promote biodiesel so they're willing to invest
    - Construction equipment uses biodiesel but not vehicles; Euro IV-VI are compatible, but you need to do more maintenance
- The focus of the last decade has been power, it is time to give attention transport because there are a lot of emissions
- Transport emissions is related to power emissions because of electric vehicles (EV)
    - Fuel mix is improving so not a big issue anymore, power generation will be greener
- Hong Kong has not done much to decarbonise
- Initiatives to phase out older Euro vehicles is good
- The government is not firm enough to say what is right → holding back innovation
- Decarbonisation should target commercial vehicles since they contribute most of the emissions, would not be good to target private vehicles since mostly is not them
- CO_2 may grow because GDP is also growing → there is a need for more performance information to get a better idea of emissions
    - For example, how efficient public transport is more people take the train → more trains need to run → more emission; what is the carbon hit
- All about the price, company with buying power has more opportunity to use greener alternatives because they can get a similar price
- The people in Hong Kong are price sensitive, e.g. the Cross-Harbor Tunnel, public outrage when the government tried to raise prices
    - However, Hong Kong has one of the highest first registration taxes on vehicles and there has been double digit car growth

- Measurements are needed to price carbon
- The policy needs to report figures
- Easier to start with internal pricing and offsets
- There are alternatives to carbon pricing because for carbon pricing, the government is needed and would need to explain it clearly
- Should try to replace/phase out conventional cars for EV instead of trying to switch people to buying EV since that is still increasing the number of cars
- There is not enough direct/indirect price evaluation so not sure what a carbon price would mean
    - Like for diesel emissions
- Needs to be a clear pathway and political will for a policy which will be difficult for carbon pricing → there are more effective and clearer alternatives to reduce emissions than carbon pricing
- Not sure about carbon pricing, against an ETS
    - Because of EU ETS allowance crash

Appendix F4. Other Sectors Notes

Participants:

Agile Group Holding Limited

Alaya Consulting Limited

BASF East Asia Regional Headquarters Limited

Crown Gas Stoves (Holdings) Company Limited

Fuji Xerox (Hong Kong) Limited

Fuji Xerox (Hong Kong) Limited

Hong Kong Disney

Hong Kong Emissions Exchange Limited

Intertek Testing Services Hong Kong Limited

Intertek Testing Services Hong Kong Limited

Sino Land Company Limited

Swire Pacific Limited

The Hong Kong Jockey Club

Consensus:

1. What are your views on Hong Kong's and the building sector decarbonisation progress? Do we need new policies to enable greater decarbonisation?

- Hong Kong isn't on the right path and they need to be stricter with their current policies.
    - What policies/programs are working well? What policies/programs are not?
        - The feed-in tariffs (FIT) have a lot of potential and could make some companies a lot of money. There just needs to be more information and transparency on how to use them.

        - The RE certificates aren't working that well: participants didn't know a lot about them or that they were even available for purchase.

2. What are your views on carbon pricing? Is carbon pricing potentially a suitable option for Hong Kong?

- The participants of this focus group didn't have strong views about carbon pricing because they wanted to come to the event to get more educated. Participants were curious about how Tokyo implemented their ETS. They felt it could potentially work in Hong Kong because Tokyo and Hong Kong share similar business practices.
    - Does your company have internal carbon pricing policies?
        - Some companies are trying to incorporate internal carbon pricing schemes, however they want to learn more about it, determine how to implement this and determine the operation costs of having the internal price.
        - One company invest in carbon offsets, preferably local projects.
    - How might carbon pricing affect (positively/negatively) your company's operations and current decarbonisation efforts?
        - One company's Hong Kong office was carbon neutral, so carbon pricing wouldn't affect them that much.
        - It would not affect the large companies much since they have the capital

3. <u>If yes</u>, why? What carbon pricing mechanism would be most suitable for Hong Kong?

- The people in Hong Kong follow the rules so it is possible to implement
- Carbon tax would be easy enough to implement. There would be some questions at first (how would the tax be calculated), but once established, people would pay it.

4. <u>If no</u>, why not? What other policies/programs should Hong Kong consider? Or what existing policies/program should we enhance?

- There is too much politics to join China's ETS and an ETS in the building sector of Hong Kong will be too small and uncompetitive → Greater Bay Area is a possibility or if a Pan-Asia carbon price was created/linked (e.g. with Japan, Singapore, or China)
- The full first registration tax concession for EVs was really good; sad to see the government take it away, people won't switch to EV, wrong move to try to get people to buy less cars
- The government could and should just make a mandatory policy and make everyone follow it
    - Hong Kong should focus on public awareness as the first step.

Individual Notes:

Group 1:

- Hong Kong is not on the right path
- There's only a focus on Electricity, which means there's only a focus on the power companies
- Hong Kong should focus more on older buildings and try to upgrade them to be more energy efficient
- A company is looking for renewable energy sources and wants to invest in carbon offsets. Company believes that setting this up will probably take about a dozen of years. They are also beginning to figure how to implement an internal carbon price.
- Another company has their targets set to reduce 30% of their emissions. They haven't spoken out the potential to incorporate a carbon price because they don't know how to achieve this and wanted to learn more through this workshop
- A participant asked about the operation costs required to set up an internal carbon price. Another participant answered that there might be some costs for additional software programs
- Internal Carbon pricing was compared to training for a race, the race being a mandatory carbon price.

- Another company sets to reduce their emissions started from reduce energy usage, water consumption and waste
    - During the winter: they shut down some air conditioners because it's not necessary to have all of them running
- This company wants to set up an internal carbon price to calculate how much they are saving
- Operation costs depends on the type internal price: can be cheap, depends on which one you decide to use
- Participant is curious how Tokyo implemented their ETS because Tokyo and Hong Kong are very similar and feels if it works in Japan, it could work here in Hong Kong
- Another participant is curious if the ETS was effective in changing the behavioral habits of the consumer
- Participant believes slowly putting the carbon price on consumers is the only way to enforce good environmental awareness behavior
- Hong Kong should be more strict about their policy, Japan has more voluntarily actions
- Does Hong Kong have time of day electricity prices? Residents in Belgium do laundry in the middle of the night because it is cheaper
- High electricity prices drives the right behavior; it gives you the excuse to do the right thing
- Companies are trying to be creative in figuring out how to reduce their emissions, we should find a way to give them the option to do what they want
- Participants believe the carbon cost will always be passed down to the consumer and the consumers will get angry and one company admits that's what they currently do

Group 2:

- With the electricity tariff, big companies use the most energy, but they get the biggest discount; is this the right way to go? It might encourage people to use more energy, it doesn't incentivise energy reduction
- Many sectors are reliant on energy, which industry to control?

- Hong Kong's feed-in-tariff is one of the highest around the world, it's really attractive, but people aren't taking part as much as one would think
    - Large property company could make a lot of money out of it, but they don't know how to manage it, need more understanding so that they can participate
    - They don't understand it → they don't see the business potential → they don't do it
- The government needs to support biodiesel more; there's already BEAM for buildings
- Sad to see the government move away from the tax subsidy for electric vehicles (EV)
- Don't think Hong Kong would join China's emissions trading system (ETS); the politics wouldn't allow it
- A domestic ETS would be similar to Singapore's: too small and conservative, pointless, just be good public relations (PR)
    - The market is too small in Hong Kong, for buildings they all have similar emissions so there would be no competition
- Need more information and transparency on renewable energy (RE) certificates: how they work, how they're priced
    - There's a lack of information and transparency, companies didn't even know they were available
    - Need to be commercialised
- Corporate social responsibility (CSR) wouldn't really work in Hong Kong; it would need to be mandatory for it to work
- Maybe increase the electricity tariff to get people to use less energy, but would need more transparency on how and why the tariff would increase
- One company's Hong Kong office is carbon neutral: invest in carbon offsets, various water, solar, and wind energy projects in China and Asia; preference for investing in local projects
- A carbon tax would be easy enough to administer, there would be initial questions about it, but once it was explained people would follow it
    - Backlash wouldn't come from large companies because they can afford to pay it
    - It would have more of an affect on small and medium enterprises (SMEs)

- It would be better for the government to just make a mandatory policy; for example, just say after a certain date, there will be no more fossil fuel vehicles and just do it