

CENTRAL POLICY UNIT
THE GOVERNMENT OF THE HONG KONG
SPECIAL ADMINISTRATIVE REGION

A STUDY ON EMISSIONS TRADING IN THE MAINLAND:
OPTIONS FOR HONG KONG

HONG KONG PRODUCTIVITY COUNCIL

MAY 2017

**CENTRAL POLICY UNIT
THE GOVERNMENT OF THE HONG KONG SPECIAL
ADMINISTRATIVE REGION**

**A STUDY ON EMISSIONS TRADING IN THE MAINLAND: OPTIONS
FOR HONG KONG**

FINAL REPORT

[HKPC Project No. 10003604]



Environmental Management Division
Hong Kong Productivity Council

31 May 2017

Quality Index

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EXECUTIVE SUMMARY

- Emissions trading (or cap-and-trade) is a policy tool that utilises the market mechanism to price emissions. It works by setting an emissions cap and then allowing a market to trade defined quantities of emissions allowances to meet this cap. Globally, actions on carbon emissions trading (carbon trading) are growing; suggesting that it is no longer just a theoretical concept but a practical policy tool. In view of this, this Study explores what options exist for Hong Kong in carbon trading.
- A total of 18 carbon Emissions Trading Systems (ETS) are in force globally and their experiences are important to enriching our understanding of Hong Kong’s options. The Study focuses on the European Union (EU) due to its significance as the first ETS, and Tokyo due to it being the first large city-level ETS focussed on buildings. The Study also looks at the developments of the Mainland based on which Hong Kong should consider how it can play a part.
- The Study summarizes the views of major stakeholders solicited on four key issues for Hong Kong to consider, as follows:

1. Whether there is a case for Hong Kong to develop its own ETS and if so what activities should be included	Key reasons to support include: <ul style="list-style-type: none"> - Internalizing carbon emission costs through a pricing signal. - Promoting behavioural change and calling for individual action. - Opportunity to set a stricter carbon reduction goal. - Maintaining Hong Kong’s competitive edge as a service provider and upholding its reputation as a “world city”.
	Key obstacles include: <ul style="list-style-type: none"> - Relatively small local market size for a liquid market. - Danger of overlooking reduction but emphasizing speculation. - Huge setup cost and long lead time required for building such system procedure, as well as the inclusion of exemptions may trigger controversy. - A lack of general awareness and expertise in carbon trading.
2. Whether there is a case for Hong Kong to become a part of the national ETS in due course	Key reasons to support include: <ul style="list-style-type: none"> - Enhances local market liquidity and stabilises price. - Reduces overall reduction costs and provides flexibility to local businesses. - Administratively beneficial. - Provides potential business opportunities. - Signals strong international collaboration and commitment to long-term climate policy.
	Key obstacles include: <ul style="list-style-type: none"> - Uncertainty with the design of the national ETS. - Net wealth outflow to places with lower abatement cost. - Linkage dependent on government-to-government negotiation and decision.

3. Whether there are certain market skills that Hong Kong has that could be useful to the Mainland as it designs and establishes the national ETS	Potential skills: - Finance services- and infrastructure-provider. - Other professional services (e.g. carbon auditing and verification).
4. Whether there may be any policy or commercial risks for Hong Kong if no action is taken	Key potential risks if no action taken include: - Losing a strategic policy tool to combat climate change. - Being marginalized in the global carbon market. - Losing business competitiveness and opportunities. - Losing an effective educational tool.
	Low/No risks if no action taken include: - Other more effective alternative policies exist. - No indication that carbon trading is beneficial to Hong Kong.

- Looking at other countries, carbon trading is part of a bigger action to price carbon, where tax can also be an option. Nearby in other Asian jurisdictions, carbon trading is being used in Mainland China, Japan and South Korea, and will soon be used in Taiwan; while carbon tax is planned in Singapore. The Study considers there will be a case for the HKSAR Government to take the issue of carbon pricing on board in its policy thinking in the near future.
- Considering Hong Kong’s unique emissions characteristics, the power, buildings and aviation sectors are highly relevant. Power generation to produce electricity is the largest source of carbon emissions today in Hong Kong, accounting for 70% of Hong Kong’s total carbon emissions, while 90% of the electricity produced is consumed by buildings. On the other hand, the aviation sector will participate in the International Civil Aviation Organisation’s (ICAO) carbon offsetting scheme for international flights starting from 2021 but flights between Hong Kong and the Mainland are not covered in the scheme nor the Mainland’s national ETS as currently designed; thus, presenting potential opportunities for market based carbon reduction measures here.
- With the Mainland’s clear commitment and fast development in carbon trading, Hong Kong may discover financial opportunities from the national ETS (such as from derivative trading) by leveraging its mature financial market and infrastructure, as well as its advantageous position and well-established networks to overseas markets. It is opportune for Hong Kong to establish itself as the derivatives and carbon finance centre of the national ETS.
- On the other hand, this Study finds diverse views on whether or not there is immediate need for developing a local ETS in Hong Kong. However, there is real interest in the matter and urgency in view of the Mainland’s development. In view of this, the Study recommends the following:
 - a) To raise the issue of carbon pricing at a meeting of the Steering Committee for Climate Change of the HKSAR Government (SCCC) so that the Government can recognise the subject and decide how it may wish to consider the subject.

- b) To consider what kind of financial and professional services that Hong Kong could provide for the Mainland's carbon market, irrespective of whether and when Hong Kong may establish its own carbon market.
- c) To organise cross-sectoral engagement activities between the Government and stakeholders for co-learning and action.

行政摘要

1. 排放權交易（或總量管制和交易Cap-and-Trade）是一種利用市場機制為排放定價的政策工具，主要通過設定排放上限並允許市場交易限量的排放配額以控制整體排放量。全球碳排放權交易（簡稱碳交易）規模日漸增長，特別是中國內地將會推出全國性碳排放權交易體系。這些都反映出碳交易已經不再只是停留在理論概念層面，而是切實可行的政策工具。有鑒於此，本研究探討碳交易和香港可以採取的行動選項。
2. 全球現時共有十八個碳交易體系，為本研究提供寶貴的經驗。本研究重點研究歐盟碳排放權交易體系（作為首個多國參與的碳排放權交易體系）及東京碳排放權交易系統（作為首個以建築物為主要目標的大型城市碳交易系統），以及探討中國內地碳排放權交易體系的發展和香港在其中的角色和機遇。
3. 本研究圍繞四個關鍵問題，徵集了主要持份者的意見。所採集的意見摘要如下：

a) 香港應否發展碳交易機制？若是，應採取甚麼行動？	支持，主要原因包括： <ul style="list-style-type: none">- 通過碳價格信號內化碳排放成本- 促進行為改變和鼓勵個人減碳行動- 提供設定更嚴格碳減排目標的機會- 保持香港作為「世界城市」的美譽及維持香港的服務競爭優勢
	持保留態度，提出的主要障礙包括： <ul style="list-style-type: none">- 市場規模相對細，影響市場流動性- 市場參與者只關注投機性活動而忽略減排- 建立交易系統昂貴和所需時間冗長，而設定豁免範圍等容易引起爭議- 缺乏碳交易的普遍認知和專業知識

b) 香港是否應適時參與中國內地全國性碳排放權交易系統？	<p>支持，主要原因包括：</p> <ul style="list-style-type: none"> - 加強本地市場流動性和穩定價格 - 降低整體減排成本及提供靈活性，以減少對業界的影響 - 具行政效益 - 帶來潛在商機 - 展示強烈的國際合作信號和對長期氣候政策的承諾
	<p>持保留態度，提出的主要障礙包括：</p> <ul style="list-style-type: none"> - 全國碳交易機制設計的不確定性 - 資金從香港流出到低減排成本的地區 - 系統連結取決於政府間的談判和決策
c) 香港是否具備市場技能，以協助中國內地設計及設立其全國性碳交易市場？	<p>具備的市場技能：</p> <ul style="list-style-type: none"> - 金融服務和基礎設施供應商 - 其他專業服務 (如碳審計及核證)
d) 若不採取任何行動，會否為香港帶來政策或商業風險？	<p>不採取任何行動所帶來的主要風險包括：</p> <ul style="list-style-type: none"> - 失去應對氣候變化的戰略政策工具 - 於全球碳市場被邊緣化 - 失去商業競爭力和機遇 - 失去有效的公眾教育手段
	<p>認為不存在或只存在低風險的原因：</p> <ul style="list-style-type: none"> - 存在其他更有效的替代政策 - 缺乏數據支持碳交易對香港有利

4. 參考其它地區，碳交易及碳稅是碳定價政策的其中一個重要手段。鄰近亞洲國家/地區如中國內地、日本、韓國和台灣已經或有計劃推行碳交易機制，而新加坡則在計劃徵收碳稅。香港應適時審視是否把碳交易作為其中一個減排政策工具。

5. 香港獨特的碳排放特點反映出電力、建築物和航空業為最具潛力進行碳交易的部門。香港最大的碳排放源是發電部門，約佔香港七成碳排放量，而九成的電力為建築物所耗用。此外，雖然航空業將會參與國際民航組織（ICAO）的國際飛航減碳協定，但香港往來中國內地的航班均未被該協定或中國內地碳排放權交易體系所涵蓋，這也為在香港進行碳交易帶來機遇。
6. 隨著中國內地對碳交易的明確承諾和快速發展，香港可利用其成熟的金融市場和基建，以及對海外市場的有利地位及成熟網絡，發掘各種商業機遇，例如碳衍生產品交易，亦可爭取發展成為中國碳市場的碳衍生產品及碳金融服務中心。
7. 另一方面，本研究發現主要持份者對應否成立本地碳排放交易系統持不同意見，但中國內地碳市場的急速發展的確引起他們的關注。有鑒於此，本研究建議：
 - a) 在香港特區政府內設的氣候變化督導委員會提出碳定價議題，並關注及考慮制定應對行動；
 - b) 不論會否或在何時成立其碳交易市場，香港應進一步探討可為中國內地碳交易市場提供金融和專業服務；
 - c) 舉辦政府與持份者的跨行業公眾參與活動，以共同學習及帶動不同界別的參與。

1 Introduction

The adoption of the Paris Agreement on 12 December 2015 at the 21st Conference of the Parties (COP 21) of the United Nations Framework Convention on Climate Change (UNFCCC) signalled a new chapter in global commitment to dealing with greenhouse gas (GHG) emissions. One of the key aims of the agreement is to hold the increase in global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, which is recognized as significant towards reducing the risks and impacts of climate change. The agreement also acknowledges that markets are required to lead countries to a low emissions development pathway and enhance ambitions to achieve the aim. On September 2016, China and the United States of America (US), the two of the world’s biggest emitters of GHG, officially ratified the Paris Agreement.

The appeal for the use of “market mechanism”¹, as a cost-effective means to GHG emissions (hereinafter referred to as carbon emissions) reduction, has solicited international support. The World Bank, for example, launched the Partnership for Market Readiness (PMR) in 2010 and sponsored the Carbon Pricing Leadership initiative, launched on 30 November 2015 by several heads of state, supporting nations to put up a price on carbon. Amongst the options of market mechanism is emissions trading, which requires the development of an emissions trading system (ETS). ETS is also referred to as “cap-and trade”.

Carbon ETS is defined by setting a definitive carbon emissions cap on capped entities and the use of emissions allowance credits and other permitted tools to meet their compliance obligations. Allowance credits may be obtained through trade. As a result of the supply and demand of allowance credits, an ETS establishes a market price for carbon emissions, which in principle will help capped entities discover the least-cost option to carbon emissions reductions.

To date, a total of 18 carbon ETSs are in force globally, out of which eight are pilot systems in Mainland China, and the rest are in the European Union (EU), Switzerland, Tokyo, Saitama, South Korea, New Zealand, California, Regional Greenhouse Gas Initiative (RGGI), Ontario and Québec. This covers a total of approximately 4,755 Mt of carbon dioxide equivalent (CO₂e) in 2017². The total monetary value of global carbon trading transactions reached USD34 billion in 2015, representing a growth rate of 6% compared with 2014³. Looking ahead, more than half of the submitted Intended National Determined Contributions (INDC) include international carbon markets⁴. With the introduction of

¹ Market mechanism is defined as the forces of demand and supply that influences resources allocation. Government fiscal policy and monetary policy are also a type of market mechanism, as these policies influence demand by price adjustment through, e.g., taxes.

² ICAP, 2017.

³ *Environmentalist et al.*, 2016.

⁴ ICAP, 2016.

national ETS in Mainland China expected in late 2017, the total carbon emissions covered are expected to reach approximately 7,425 Mt CO₂e⁵.

China's pledge to reduce carbon intensity and to peak emissions by 2030 highlights the Central People's Government's (CPG) commitment to combating climate change. Part of its commitment is to establish the national ETS within the 13th Five-Year Plan period (2016-2020), as clearly articulated by President Xi Jinping on 25 September 2015. The 12th Five-Year Plan period witnessed Mainland China launching seven pilot ETSs in Beijing, Chongqing, Shanghai, Shenzhen, Tianjin, Guangdong Province and Hubei Province, which provided practical experiences for the setting up of the national ETS. In December 2016, the eighth pilot ETS was established in Fujian. Once the planned national ETS is established in 2017, the new market is expected to surpass the EU ETS and is likely to become the world's largest carbon trading market in terms of emissions coverage⁶.

Hong Kong has yet to take actions in response to the growth and development of ETS in the Mainland China and around the world. The HKSAR Government has announced that it will meet its carbon intensity reduction target of 50-60% by 2020 using 2005 as the base. The Government also published *Hong Kong's Climate Action Plan 2030+* in January 2017 highlighting the current study of looking at "...what role Hong Kong might play in emissions trading in light of the launch of the national [ETS] scheme."

As ETS is no longer just a theoretical concept but a practical policy tool, this Study attempts to explore what options are open for Hong Kong and the possible way forward in terms of carbon emissions trading (carbon trading).

1.1 Scope of the Study

There are four key issues to consider in the Study:

- a) whether there is a case for Hong Kong to develop its own ETS and if so what activities should be included;
- b) whether there is a case for Hong Kong to become part of the national ETS in due course;
- c) whether there are certain market skills that Hong Kong has that could be useful to the Mainland as it designs and establishes the national ETS; and
- d) whether there may be any policy or commercial risks for Hong Kong if no action is taken.

Ultimately, the objectives of the Study are to:

- a) define the role of Hong Kong as the Mainland designs and establishes its national ETS; and
- b) formulate the responding policy recommendations on how Hong Kong may participate in the national ETS directly or indirectly.

⁵ ICAP, 2017.

⁶ ICAP, 2016.

2 Study Approach

2.1 ETS Experiences from Established Systems

Many jurisdictions have adopted or are considering adopting ETS. The Study reviewed relevant experiences from these established systems. Throughout the discussion of the four key issues of the Study, relevant experiences from selected case studies have been examined.

Literatures relating to studying different systems offered fresh insights into the Study. The Mainland Partner of the Study, the Shanghai Environment and Energy Exchange (SEEE), provided first-hand accounts of the Mainland's ETS development, including the pilot ETSs and the national ETS.

2.2 Solicitation of Views of Major Stakeholders

A critical component of the Study is to give an account of the views of major stakeholders when discussing the four key issues of the Study as solicited through a series of focus group discussions and interviews.

In order to ensure relevance, the selected interviewees and focus groups were based on their significance (i.e. larger carbon emitters), experience in carbon trading and interest in the subject. Six sectors were broadly identified for the focus group discussions, as follows:

- Property development / management;
- Transportation operation;
- Financial services;
- Commerce, industry, and trade;
- Professionals; and
- Non-government organization (NGO) and academia.

As for the individual interviews, the following sectors were identified:

- Energy sector (electricity and gas utilities);
- Green building representative;
- Companies and organizations experienced in carbon trading, CDM / CCER, and carbon finance;
- International NGO;
- Policy think tank;
- HKSAR Governmental Bureau;
- The Singapore Government; and
- Other major stakeholders that were not covered in the focus group discussions.

The individual interviews and focus group discussions followed a succession of topics as described below for a comparison and integration of various views:

- a) *Awareness and experience in carbon emissions trading* – As the levels of awareness and experience of carbon trading among individual groups were so different, interviews began with this topic.
- b) *Thoughts on carbon trading & established systems elsewhere* – Interviews sought opinions on the concept of carbon trading⁷ and how ETSs elsewhere were viewed. Questions were asked on what other climate policy mechanisms were preferred to reduce carbon emissions in order to understand interviewees' stance policy beyond ETS.
- c) *Whether an ETS is needed in Hong Kong's climate policy mix* – Questions sought to explore the reasons and obstacles for Hong Kong to establish its own ETS. Considerations within the local context included Hong Kong being a service-based economy in pursuance of higher level of environmental effectiveness, economical efficiency, and administrative feasibility, etc.
- d) *Scenario: Local ETS considerations* – Although it was premature to ask about design of a local ETS, questions were asked about implementation⁸, scope⁹, and linkage with the national ETS to explore how interviewees looked at the key considerations. Additional questions included: possible impact of a local ETS on their organization / company; readiness to join; and what other climate policy mechanisms were preferred.
- e) *Whether Hong Kong should become part of the national ETS in due course* – In view of the establishment of national ETS, this topic explored whether Hong Kong should become part of the national ETS.
- f) *Opportunities created for Hong Kong from Carbon Trading* – Environmental, economic, and social opportunities arising from the carbon trading market, especially the national ETS in the Mainland, were explored. Discussions also included when these opportunities would be realized and what preparations were required to realize them, etc.
- g) *Scenario: The potential risks if no action taken* – considerations were also given to the potential risks for Hong Kong, if any, and the situation in which no action being taken or pursued against carbon trading from environmental, social, and economical aspects.

Overall, a total of 18 individual interviews and 6 focus group discussions were conducted between August 2016 and January 2017 from which the views of 67 companies and organizations were gathered.

⁷ e.g. whether they agreed with it being a cost-effective method for reducing carbon emissions.

⁸ i.e. mandatory or voluntary or semi-mandatory

⁹ i.e. covered sectors

3 Basics of the Emissions Trading System

3.1 Market Mechanism & Carbon Pricing

Financing mitigation is one of the major hurdles to achieving carbon reductions. The UNFCCC recognizes the difficulties that some may face and suggests the use of market mechanism to enhance the cost-effectiveness of these actions¹⁰.

Market mechanism is the use of the forces of demand and supply to influence resource allocation. Driving this requires a price. Therefore, combating climate change requires pricing carbon emissions, which gives a monetary value to carbon emissions. By doing so, prices that are usually absorbed by society¹¹ are given back to those responsible for emissions; thus realizing the “polluter pays” principle according to which the polluter should bear the cost of measures to reduce pollution. Usually, this price is set on equivalent carbon dioxide emissions (CO₂e); hence, generally referred to as carbon pricing. With a carbon price in place, it can then be used in different ways to charge emitters and incentivize those producing less emissions. One of the ways is through carbon trading.

3.2 Origin and Development of ETS

The prototype of carbon trading can be traced back to 1970s when the US deployed it as a tool to curb air pollution problems by setting an absolute emission limit on air pollutants from power plants while featuring a market mechanism. The first regulated trading scheme was embodied in the U.S. Clean Air Act Amendments of 1990. This was then applied to carbon emissions in the 1997 Kyoto Protocol, stipulating in Article 17 that Annex B Parties were allowed to fulfil the assigned target of carbon emissions by trading for surplus emissions reduction from countries that surpassed their targets. Since then, a market has emerged where carbon emissions reductions or removals have been traded to help meet caps, and some countries and multi-national companies proceeded to set internal carbon trading schemes.

3.3 Key Principles and Elements of ETS

ETS, or cap-and-trade, is based on the use of emissions cap and market mechanism to theoretically realize emissions reduction at the least cost. ETS works on the principle that there is discrepancy between the emissions abatement costs of different entities. Driven by the demand force created by the cap, the entity with higher abatement cost would buy cheaper surplus credits from the entity with a lower abatement cost, resulting in resource flow to cost-effective solutions. One of the benefits, in theory, is that it provides autonomy for emitters to decide the best method according to their situation, such that it facilitates the decoupling of economic development and carbon emissions.

¹⁰ Refer to: <http://bigpicture.unfccc.int/content/mitigation/what-are-the-market-mechanisms.html>

¹¹ e.g. impacts on health and property, from environmental degradation, extreme weathers, etc.

Under an ETS, an emissions cap is set on a scope of emitters (covered entities). The scope of covered entities is allocated with allowance credits based on the cap. At the end of each compliance period, covered entities are required to surrender allowance credits equivalent to their emissions level. The purchase of offsets from emissions reduction projects or other sources would allow greater flexibility to meet compliance requirements. Non-compliance leads to penalties. Some systems are linked to enhance market liquidity.

4 ETSs in Overseas and the Mainland

4.1 Introduction

This chapter focuses on the experience of overseas ETSs and the Mainland's pilot ETSs.

4.2 Overseas Development

Currently, 18 ETSs are in force globally. Each system is designed to fit the local context. This section introduces two ETSs – firstly the EU ETS, which is the first of its kind ETS established in developed countries by governments and being the world's largest system at present in terms of total emissions covered; and secondly the Tokyo ETS, which is the first large-scale city-level ETS with focus primarily on emission from buildings.

a) European Union (EU) ETS

The EU ETS was established in 2005m covering 28 EU Member States and three European Economic Area-European Free Trade Association (EEA-EFTA) states, namely Iceland, Liechtenstein and Norway. Its total emissions coverage was approximately 2,007.8 MtCO₂e in 2015, the largest so far. The following table presents some of its key design features:

Key Design Features	Description ^(ICAP, 2017)
Sectors covered	Industry, Power, Aviation
Liable entities	11,000+
Cap	Absolute
Emissions coverage	45%
GHG covered	CO ₂ , N ₂ O, PFCs
Offsets	CDM, JI

It was established by the *Directive of the European Parliament and of the Council* to allow carbon emissions allowance trading within the EU. The *Green Paper on GHG emissions trading within the EU* (Green Paper) noted that an ETS was seen as a cost-effective way to fulfil the EU's commitments target to the Kyoto Protocol. It was also chosen in view of the commencement of international emissions trading under the Kyoto Protocol in 2008, so a "learning-by-doing" approach was taken to ensure the EU would be better prepared for it or even take a leading role.

Currently, the EU ETS is in its third phase (2013-2020). The first two phases (2005-2012) presented a reduction of 19% below 1990 levels, which is very close to its target to reduce 21% below 1990 by 2020. Between 2005 and 2011, it observed 1.2 billion tonnes of CO₂ being avoided comparing to a business-as-usual scenario¹².

¹² EDF, 2015.

A unique aspect of the EU ETS is that it is the first multi-national installation-level system that covers carbon dioxide and two other GHGs. As mentioned above, it caps 28 EU Member States plus three other countries in one market. The Green Paper estimated that, by including the energy producers and energy intensive industry of the EU in one trading system, it could help reduce the costs of implementing the EU’s Kyoto commitments by nearly a fifth in comparison to a scenario where separate Member State schemes did not allow for cross-border trading. It estimated that the potential cost saving was approximately at EUR1.7 billion a year. Furthermore, by providing only one single price for all, it could ensure a level playing field for its Member States participants.

The carbon price crash in 2006 marked one of its greatest challenges, as caused by an over-issuance of the allowances. It was revealed that actual emissions from a number of EU Members (the Netherlands, the Czech Republic, Belgium, France, and Spain) were lower than the initial allowances given. Subsequently, the European Commission confirmed that verified emissions were about 80 million tonnes or 4% lower than the number of allowances distributed. This sudden drop in demand and increase in supply of allowances sent prices crashing to almost zero in 2007. It should be noted that while the price crashed, a good level of emissions reduction was achieved.

b) Tokyo ETS

The Tokyo ETS commenced in 2010 under the Tokyo Metropolitan Environmental Security Ordinance. It is a city-level system but permits the use of carbon offsets from outside the Tokyo area and Saitama Prefecture. Tokyo is the first mega-city to implement an ETS and also a pioneer to focus on carbon emissions generated from large-scale office buildings and facilities. In 2013, the city’s total carbon emissions was 70.1 MtCO₂e, with its commercial sector accounting for 37.4%, followed by residential (29.7%), transport (16.7%) and industry (7.3%). Over 50% of the Tokyo Stock Exchange listed companies are located in Tokyo. Its emissions coverage is approximately 10.8 MtCO₂e in 2015. The following table presents some of its key design features:

Key Design Feature	Description ^(ICAP, 2017)
Sectors covered	Industry, Buildings
Liable entities	1,300
Cap	Absolute
Emissions coverage	20%
GHG covered	CO ₂ only
Offsets	Various domestic offsets

Following the adoption of the Kyoto Protocol in 1998, the national government of Japan enacted the *Law Concerning the Promotion of the Measures to Cope with Global Warming*, which stipulates that local governments are responsible for formulating and implementing programs for the control of GHGs. In 2000, the Tokyo Metropolitan Government (TMG) included “global warming” for the first time in its *Environment Ordinance to Ensure Tokyo*

Citizens' Health and Safety (Tokyo Metropolitan Environmental Security Ordinance). Within the same year, it also implemented a mandatory emissions reporting and reduction scheme (the *Tokyo CO₂ Emissions Reduction Programme / CERP*), and in 2002, its green building programme that evaluates environmental-friendly approaches to buildings. In 2007, it introduced the cap-and-trade system through the *Tokyo Climate Change Strategy*, as well as set out reduction targets and measures for Tokyo and individual sectors in its *Tokyo Metropolitan Environmental Master Plan*. In 2008, the amendment of the *Tokyo Metropolitan Environmental Security Ordinance* officially established the cap-and-trade system. Following the national government's trial at a voluntary scheme in 2008, the TMG introduced a mandatory cap-and-trade scheme in 2010.

Currently, it is in the second compliance period (FY2015-FY2019). Within its first compliance period (FY2010-FY2014), it has achieved 23% in reduction compared to the base year (an average from any three consecutive years between 2002 and 2007 as selected by the covered entities). In 2013, the accumulated emissions reductions were 880,000 tCO₂, which is just below the planned accumulated emissions reduction of 1.08 million tCO₂¹³. By February 2015, over 90% of covered facilities had already surpassed their reduction targets for the first compliance period and 69% of the facilities had exceeded their second compliance period, resulting in more than 100 facilities going under the threshold and leaving the programme¹⁴.

The Tokyo ETS is uniquely a cap-and-trade system only for large buildings and facilities on the account of its high level of commercial activities and low level of industrial activities. It covers commercial and industrial buildings and facilities that consume more than 1,500kL of crude-oil-equivalent (COE) per year. Facilities with annual energy consumption of 1,500kL of COE per year would equate to over 2,000-3,000 tCO₂ and electricity consumption of over 6 million kWh. For office buildings, this consumption would be adequate to cover a total floor area of approximately 20,000-30,000m²; approximately 300-400 rooms for hotels; or approximately 500-600 beds for hospitals.

A challenge of the system is that reductions through trading constituted a small percentage. Considering 3.36 million tonnes of reduction achieved to date, 570,000 tonnes of credit supply translates to only 17% of the reduction. This indicates that regulated facilities primarily chose self-reduction to meet reduction goals¹⁵. A reason for this is due to the preparedness of the city to reduce emissions by way of its reporting and green building programmes, as well as their trial ETS, which paved the way in building up the city's capacity and pro-active approach to emissions reduction. Trading is therefore an alternative to meeting the cap. Another reason is its relatively long five-year compliance period, which

¹³ EDF, 2015.

¹⁴ EDF, 2015.

¹⁵ Zhu, 2016.

provides sufficient time to continually deploy reduction actions that require longer installation time¹⁶.

4.3 The Mainland's Carbon Trading Experience & National ETS

This section will discuss the measures set by the CPG of Mainland China over the past seven years related to emissions trading and its national ETS.

a) The Need for Carbon Reduction

China is the world's largest carbon emitter, accounting for approximately 28% of global emissions in 2013, and also the largest emitter amongst UNFCCC non-Annex I countries. This growth in emission has largely been attributed to the Mainland's accelerated economic growth, with heavy reliance on fossil fuel consumption and the dominance of energy supply from coal-fired power plants in the Mainland. Another contributing factor to high carbon emission in the Mainland is due to its lower energy efficiency in different sectors, e.g. the average efficiency of thermal power generation in the Mainland was just 35% in 2011, which is 5% points lower than that of the Organization for Economic Cooperation and Development (OECD). In this regard, there is a continuing and pressing need to reduce carbon emissions more aggressively in the Mainland.

In the last decade, the Mainland has relied heavily on administrative means to achieve its energy-intensity reduction goal. From this lesson learnt in the 11th Five-Year Plan (2006-2010) and the increasing difficulty faced in further reducing energy and carbon intensities in the future, administrative measures are only considered effective but not efficient. It is becoming increasingly crucial for the Mainland to harness market forces to reduce energy consumption and carbon emissions for transitioning to a low-carbon, green economy. The CPG is well aware of this necessity and the 12th Five-Year Plan (2011-15) called for increasing use of market-based instruments to complement administrative measures to control carbon emissions.

Since then, the Mainland has been actively engaged in climate change mitigation in the last decade, which has given it good experience with climate change-related market mechanisms – from CDM and the establishment of voluntary emissions trading, to the implementation of ETS pilots and its preparation for a national ETS. A brief history of the Mainland's emissions trading policies is listed below:

Timeline	Key milestones
2002	The Mainland ratified the UNFCCC.
2007-09	The Mainland began to progressively strengthen its commitment to climate change mitigation with the issuance of the country's first global warming policy initiative - the <i>National Climate Change Program</i> (2007) and two 2020 targets (2009): reduce CO ₂ per

¹⁶ Nishida *et al.*, 2016.

Timeline	Key milestones
	unit of GDP by 40-45% relative to 2005; and increase the ratio of non-fossil energy to 15% of primary energy consumption.
2010	12 th Five-year plan (FYP12 – from 2011 to 2015) was announced, calling for market-based mechanisms such as ETS as a tool to achieve its energy/carbon intensity goals.
2011	The NDRC published a Notice that assigned the task of establishing ETS pilots to five cities and two provinces. In November 2011, the State Council also released a white paper on <i>China's Policies and Actions for Addressing Climate Change</i> , which outlined their intention to gradually implement a <i>carbon emissions trading market</i> by taking into account international experience in order to “realize the objective of controlling greenhouse gas emissions at minimum cost”.
2013-14	The seven pilots each started their operations between June 2013 and June 2014 provided valuable experimental learning opportunities which would help facilitate the development of a national-scale system to be commenced under the 13 th Five-year Plan (FYP13).
November 2014	USA and China released a joint-statement on climate change, which outlined their respective action plans to combat climate change beyond 2020. China's statement outlined its plans to peak its CO ₂ emissions by 2030, and its attempt to reach this peak as early as possible.
December 2014	The NDRC released the first legal document on <i>Provisional measures for the administration of carbon emission rights trading</i> , as a framework to regulate the national ETS that will be implemented in 2017. The document was supplemented with a Notice covering the national market plan framework and its timeline in February 2015.

b) The First Seven Pilot ETSS

In October 2011, the NDRC published a Notice that assigned the task of establishing ETS pilots to five cities (Beijing, Chongqing, Shanghai, Shenzhen and Tianjin) and two provinces (Guangdong and Hubei). The seven pilots each started their operations between June 2013 and June 2014. Cumulatively, the seven ETSSs covered 1,159 GtCO₂e, together placing them as the world's second-largest ETS. In December 2016, the eighth pilot ETS was launched in Fujian Province. In late 2017, the national ETS is expected to commence and the design of this system will be largely based on the experimentation of the first seven pilots. This section will discuss the observations of the first seven pilots, while data collected from the last pilot in Fujian is considered inadequate for meaningful interpretation. Therefore the Fujian's pilot is not covered in this report.

The provinces and municipalities of these pilot programs were carefully selected. The selection of the seven pilots was based on two main criteria: one was the willingness of provincial leaders to have an ETS pilot within their territory; the second was the need to represent a variety of the Mainland's economic, social, and geographic criteria. Indeed, the seven pilots cover a wide range of different economic, industrial and geographic circumstances. Together, they comprise about 25% of the country's annual GDP, and represent the spectrum of economic development and wealth within the country. Running pilots in diverse regions, and thereby educating policymakers about what types of programs best suit specific types of regions, is intended to support the national ETS development process.

The NDRC guidelines help structure the overall design of the pilots by requiring them to set (a) an emissions cap; (b) an allowance allocation methodology; (c) an emissions registry, covering allowances and Chinese Certified Emission Reductions (CCERs) trades; (d) a monitoring, reporting and verification (MRV) system; and (e) an emissions trading platform (for allowances and CCERs). Each pilot has been designed locally by integrating the joint capabilities of the relevant provincial and municipal Development and Reform Commissions (DRCs), local emissions trading exchanges, academia and think tanks.

Whilst each of the provincial and municipal governments has the flexibility to design features according to local circumstances, there are some common features among them: (a) common sectoral coverage, (b) use of free allowances, (c) CCERs, (d) flexible provisions, such as banking of allowances, and (e) covering both direct emissions from fossil fuel use and emissions attributable to electricity use, including those from electricity generated outside their boundaries. **Appendix A** tabulates the key design features of each ETS.

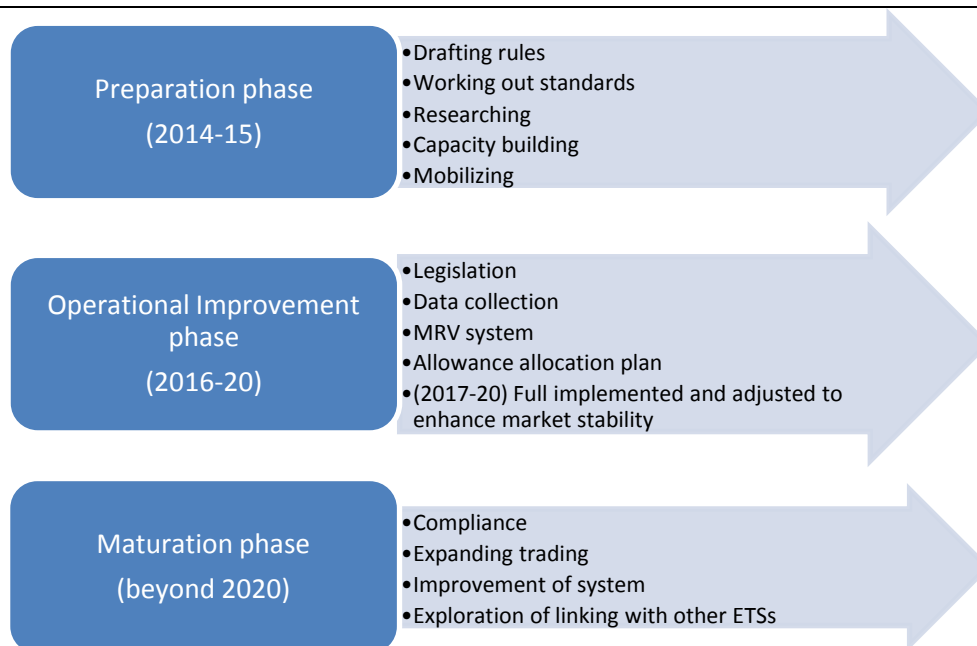
Since trading began in June 2013, 94 million tonnes of emissions allowances have been traded in the secondary market across the seven pilot carbon markets as of 30 June 2016¹⁷. This accounts for a total value of US\$349 million, with an average price of US\$3.72/tonne.

The Mainland's national ETS is expected to come into operation in late 2017. The pilot markets are preparing themselves for the transition. Most have issued notices about compliance for 2017 and beyond, eliminating concerns about their roles to play in the future when the national ETS is in place. Without much official information on the operation at this point of time, it is considered possible that both regional and national schemes could run concurrently. With the concurrent running of ETS schemes, the higher threshold of the national scheme (say, 10,000 tonnes of coal equivalent or roughly >20,000tCO₂e) will cover large emitters (or energy consumers), while regional schemes would then be in a position to cover medium to large emitters (say 3,000 - 20,000 tCO₂e).

c) Development of the Mainland's National ETS

The NDRC has been given oversight of the national scheme. The *Provisional Measures for the Administration of Carbon Emission Rights Trading (Provisional Measures)* was issued by NDRC in December 2014 to outline the design, roadmap, and requirements for a national ETS, and was supplemented with a notice in February 2015 to cover a national market plan framework and its implementation timeline as below:

¹⁷ PMR, 2016.



The *Provisional Measures* covers (a) the cap, allowance allocation and management; (b) regulatory mechanisms of emissions trading; (c) a monitoring, reporting and verification (MRV) system; (d) supervision and administration; and (e) non-compliance and legal liability. These measures are a kind of “ministry-level rule” that requires strong support from and enforcement by provincial government agencies. The agencies shall also report to and get resources from minister-level provincial governors. However, apparently no consequences will be resulted if these measures are not followed. On 27 March 2017, it was announced that the total number of allowances and its allocation methods had been approved by CPG, while the registry system and trading infrastructure remained under progress¹⁸.

To prepare for legislation, the NDRC held a public hearing in July 2015 on the draft *National Carbon Emissions Trading Management Regulations* to discuss the proposed administration of the ETS Allowance Management Regulation and the qualification of verification bodies. The regulations were eventually submitted to the State Council by NDRC for consideration in 2016. After review and approval by the State Council, the *National Carbon Emissions Trading Management Regulations* will provide legally-binding regulation needed to underpin the national ETS, as well as the third-party verification and allowance allocation systems. Such regulations will help to ensure openness, fairness, and compliance in the operation of the ETS. At the recent National People’s Congress held on 5 March 2017, the NDRC stated that “a national market for carbon emissions rights will be put into operation” (in its report *Requirements, Objectives, and Policies for Economic and Social Development in 2017*). A teleconference was further held with the DRCs in Beijing propelling carbon market construction in the same month. It is expected that the relevant ETS legislative framework will be passed soon.

¹⁸ Source: <http://finance.sina.com.cn/stock/t/2017-03-27/doc-ifycsukm3750655.shtml>

Preliminary Design of the National ETS

While full details of the national scheme have not yet been released, a notice circulated by NDRC to all provincial DRCs, government administrations, the civil aviation administration, state-owned enterprises (SOEs), and major industry associations in the Mainland on 19 January 2016 revealed preliminary design of the Mainland's national ETS: firms from eight sectors and 18 sub-sectors, which consume over 10,000 tonnes of coal equivalent per year, would be included in the national ETS. Those sectors and subsectors include:

1. Power (generation, heat-power cogeneration, and grid operators);
2. Petrochemicals (crude oil refining and processing and ethylene);
3. Chemicals (ethane, methanol, acetylene and ammonia);
4. Iron and Steel;
5. Non-ferrous metals (copper smelting and electrolytic aluminium);
6. Building production and materials (cement and glasses);
7. Pulp and Paper; and
8. Aviation (civil commercial, cargo, and airports)

The notice specifies that companies in each of these sectors should establish an internal "compliance plan" this year to prepare for the national ETS.

The NDRC will determine the total quantity of allowances available to operators. The Mainland will use a mix of historical emission data and industrial benchmarks to decide how many carbon allowances emitters will receive. In some sectors, allowances will be grandfathered; while in some others, they will be benchmarked (such as power, petrochemicals, chemical manufacturers, and aviation). According to the *PMR Project Implementation Status Report* submitted by NDRC on March 2016, the estimated scale of national ETS would involve some 7,000 companies, with emission level accounting for about 40-45% in total carbon emissions. Some allowances will be set aside for market stabilization and a new entrants' reserve/innovation fund. A hybrid free allocation/auctioning system will be implemented, and it is expected that the ETS will be moving towards auctioning over time after 2020. The total amount of allowances will be set by the NDRC only, and all allowances that are issued by the NDRC to emitters for free will have to be surrendered for compliance in the first phase.

The NDRC is also looking at a pilot phase where operators can perform a non-compliance trial of allowance allocation and surrender to familiarize with the process. Under the national ETS, allowances that are not used for compliance can be traded in the open market through the exchange platforms authorized by the government.

The national ETS will include most, if not all, of the Mainland's SOEs where leakage is not expected to be an issue considering their ownership structure. Manufacturing costs in some sectors are still relatively low in the Mainland. Hence, leakage might not be a large concern,

but caution is still warranted amongst the Mainland's ETS policymakers. There is a possibility that trade-exposed industries, such as aluminium or steel, will be put on a "carbon leakage list" like industries in the EU, but this information still rests on a final rule from the government.

Free allocation will be determined by the NDRC, but each of the provinces is required to send a list of companies to be included in the national ETS. The NDRC will operate a national registry. Revenues from allowance auctions will be channelled for an innovation fund (both at the national and regional level) which is still being designed by policymakers.

The NDRC will soon designate exchange(s) for trading, and trading information will be made publicly available. The NDRC will also nominate verifiers to perform MRV services, and announce covered entities which will have to submit annual emissions reports to their provincial DRCs. Covered entities will be able to offset part of their compliance obligations with CCERs. There will be penalties for non-compliance.

Significance of the National ETS

With an expected cap size of at least four billion tonnes, the Mainland's ETS would be twice the size of the EU ETS and greater than all existing carbon markets combined. The carbon market of such magnitude at the national level in the Mainland shall promote climate action through carbon markets (e.g. incentivising other countries to implement carbon pricing policies and carbon market cooperation) and present business opportunities to Hong Kong (e.g. financial services and professional services) which will be further discussed in Section 6.4 and 7.4.

5 Hong Kong's Carbon Emissions Inventory & Characteristic

5.1 Introduction

This chapter gives an account of the carbon emissions inventory and relevant characteristics in the local Hong Kong context.

5.2 Emissions Inventory & Characteristics

From the latest carbon emission inventory of Hong Kong by the Environmental Protection Department (EPD), the carbon emission was around 44.9 million tonnes in 2014, accounting for about 0.1% of the global carbon emissions. The emissions per capita in Hong Kong were around 6.2 tonnes and the carbon intensity (as measured in terms of carbon emissions per unit of Gross Domestic Product, GDP) was 20 kilograms per HK\$1,000 of GDP in 2014.

Hong Kong's position can be benchmarked against international emission levels on a per capita basis as well as on a carbon intensity basis. *Hong Kong Climate Change Report 2015* reported that the world averages on a per capita basis and on a carbon intensity basis were about 6.1 tonnes and 0.45 kgCO₂/US\$, respectively in 2011. Figure 3.1 compares emissions level of selected countries. The emission per capita and carbon intensity for Hong Kong were 6.0 tonnes and 0.16 kgCO₂/US\$ in 2011, which were lower than that of other selected countries.

The CO₂ emission level in Hong Kong, both on per GDP and per capita basis, is quite low compared with many developed economies. It could be partially attributable to Hong Kong's inherent factors: dense population (i.e. city's population is located in less than 25% of the land area with small per capita domestic and working space and smaller electricity consumption per capita), short distance for commuting, low percentage of car ownership, well-developed mass transport system, small-scale agriculture and industries, limited heavy manufacturing activities, etc.

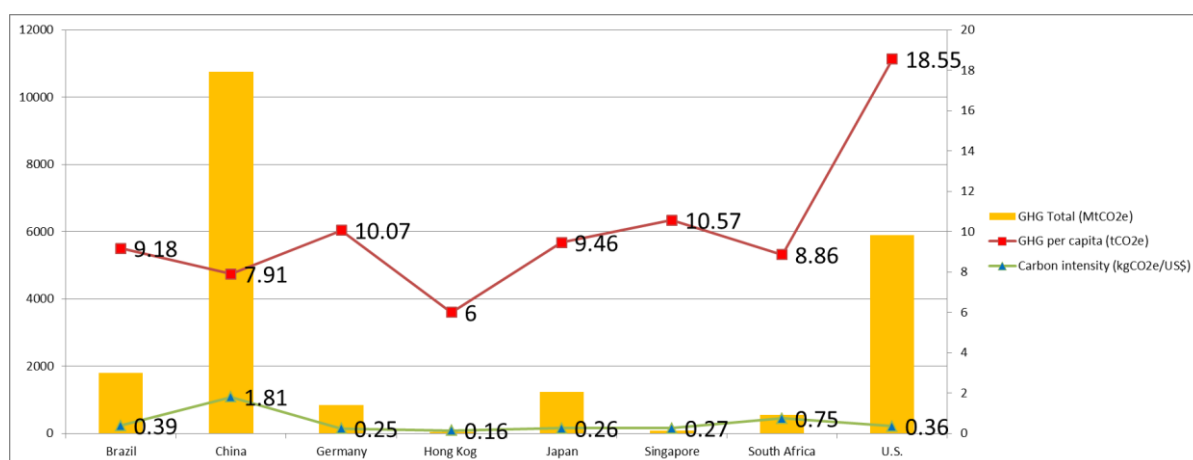
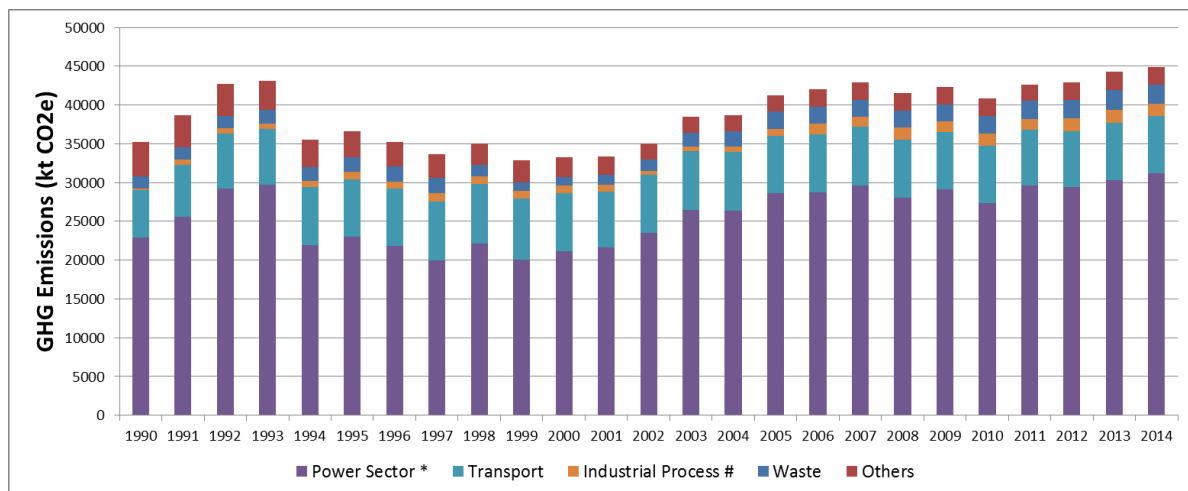


Figure 3.1 Comparison of emissions level with selected countries (2011)

a) Trends

The general trend of carbon emissions in Hong Kong is shown in Figure 3.2. The amount of carbon emissions may change over time as a result of changes in our activities, for example, Hong Kong’s carbon emissions dropped substantially in 1994 as we started to import nuclear power from the Mainland. Generally, from a peak in the early 1990s, carbon emission declined throughout the mid- and late-1990s, largely as a result of the migration of manufacturing facilities to the Mainland and the displacement of a significant proportion of coal for electricity generation by both imported nuclear power and natural gas-fired combined-cycle plant. However, annual carbon emissions generally started to increase again from 1999 onward as a result of the expanding population and growing economy. Under business-as-usual situation, it can be anticipated that emission will still rise moderately in the near future due to population and economic growth.



* Including carbon emissions arising from Towngas production

Only accounts for direct carbon emissions from industrial processes and end use of fuel

Figure 3.2 Trends of Carbon Emissions in Hong Kong (1990-2014)

b) Breakdowns

Hong Kong is primarily a service-based economy without energy-intensive industries. A breakdown of the carbon emissions by sector revealed that electricity consumption, transport and waste are the main sources of carbon emissions in Hong Kong (Figure 3.3). According to the Environment Bureau (ENB), HKSAR Government, in 2014, 69.6% of Hong Kong's total carbon emissions were from electricity generation, of which about 90% of the electricity consumption was by buildings, which means the electricity used in buildings contributed to about 62% of the total carbon emissions. Transportation is the second largest source of emissions with about 16.4% of the total carbon emissions, mainly arising from fuel usage for vehicles. Other emissions sources were waste (5.4%), industrial processes (3.7%) and agriculture, forestry and other land use (0.1%).

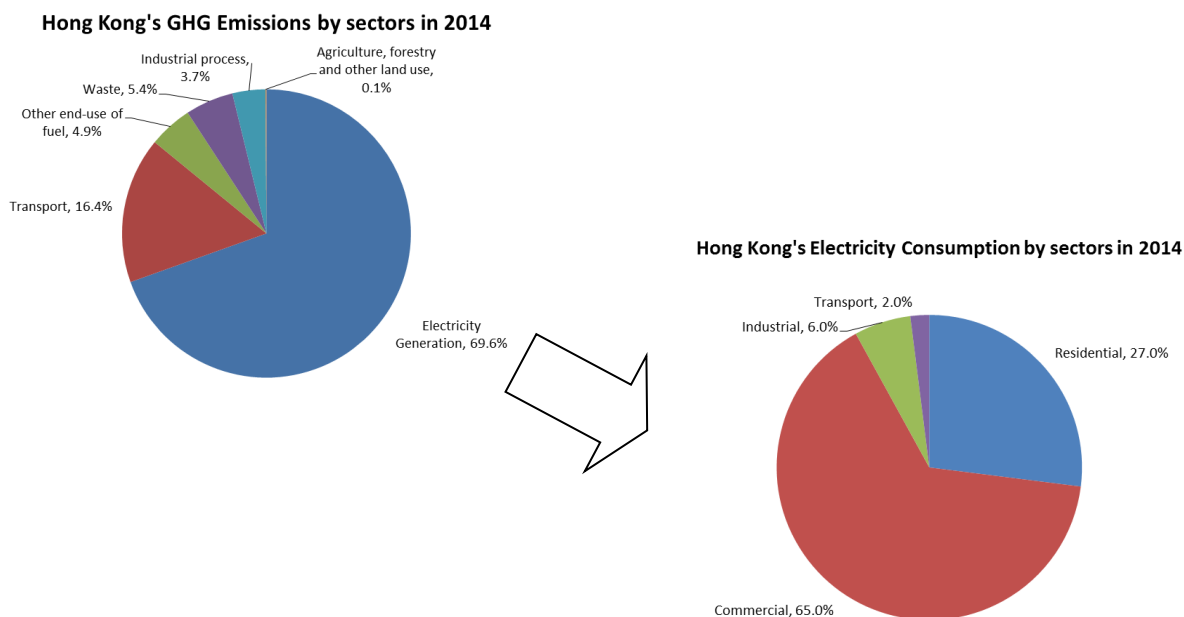


Figure 3.3 Breakdown of Greenhouse Gas Emissions in Hong Kong (2014)

5.3 Current Carbon Emissions Reduction Policies in Hong Kong

a) Targets

Although the carbon emissions of Hong Kong only accounts for a small portion of the global total emissions, the HKSAR Government has made continuous efforts to implement various measures to minimize local emissions.

Hong Kong's current targets are to reduce carbon intensity from the 2005 level by 50-60% by 2020 (*2010 Hong Kong's Climate Change Strategy and Action Agenda: Consultation document*); to reduce by 65-70% by 2030 (*Hong Kong's Climate Action Plan 2030+*); and to reduce the city's energy intensity from the 2005 level by 40% by 2025 (*Energy Saving Plan for Hong Kong's Built Environment 2015-2025+*). Since 2010, Hong Kong has developed a range of measures to meet this target. As of 2013, Hong Kong's carbon intensity had dropped 19% using 2005 as the base, and a reduction of about 50% by 2020 was expected (*Hong Kong Climate Change Report 2015*).

b) Carbon Reduction Measures

The greatest potentials to reduce sizable quantities of carbon emissions in Hong Kong are through reducing coal usage for local electricity generation and maximizing energy efficiency, especially in buildings. Related proposals and plans are articulated in the *Public Consultation on the Future Development of the Electricity Market* (March 2015), *Energy Saving Plan for Hong Kong's Built Environment 2015-2025+* (May 2015) and *Hong Kong Climate Change Report 2015* (Nov 2015), which will also bring various societal benefits too, including better air quality, cost savings from reducing energy consumption, better health

and many new job opportunities create in the environmental field in the economy. In January 2017, the HKSAR Government put forth the *Hong Kong's Climate Action Plan 2030+* outlining the longer-term action in combating climate change and meeting the targets. Action plan would be reviewed and updated every five years from 2019 onwards, in line with the submission timelines under the Paris Agreement.

6 Views of Major Stakeholders

6.1 Introduction

This chapter presents the viewpoints from major stakeholders solicited from focus group discussions and individual interviews (collectively referred to as “interviewees” hereinafter) on the four key issues of the Study:

- a) whether there is a case for Hong Kong to develop its own ETS and if so what activities should be included;
- b) whether there is a case for Hong Kong to become part of the national ETS in due course;
- c) whether there are certain market skills that Hong Kong has that could be useful to the Mainland as it designs and establishes the national ETS; and
- d) whether there may be any policy or commercial risks for Hong Kong if no action is taken.

6.2 Whether there is a case for Hong Kong to develop its own ETS and if so which activities should be included

a) Key Reasons for Local ETS

(i) Internalizes carbon emissions and the market system provides the pricing signal

As currently no monetary value is attached to the level of carbon emission from the daily operations of Hong Kong’s carbon emitters, some concerns are raised about the ever-growing level of emissions in future if there is no system in place to manage or regulate it. As the ETS enables the attachment of a price to a tonne of carbon emitted, it internalizes the costs of carbon emissions. Relative to an arbitrary cost¹⁹, the market system is considered by some to be the “best, easiest and quickest” way of sending a price signal to emitters.

(ii) Promotes behavioural change and individual action

Most of the interviewees agreed that by putting a market price on carbon, it provides clarity of the monetary benefits of carbon reduction behaviour and incentivizes emission cutting measures, as each tonne of carbon cut may bring saving in carbon fee or even generate extra returns²⁰.

¹⁹ For example, tax.

²⁰ Hence, there is not only incentive to proactively do so but also find that investments in low-carbon measures yield returns and be paid back eventually. Additionally, this could foster greater investments into carbon reduction potential measures and projects in order to yield higher returns.

(iii) Provides opportunity to set a stricter carbon reduction goal

Most of the interviewees believed that a local cap-and-trade system requires an absolute cap to be set and that the cap would represent the ultimate target that needs to be achieved. Hong Kong's target today is expressed in intensity terms²¹. An absolute cap not only represents a clearly defined target for the ETS to achieve, some expressed that it could also provide long-term clarity and certainty for emitters when making decisions. Additionally, some considered that a stricter carbon reduction target through corresponding adjustment to the cap over time may position Hong Kong better when the time comes to mainstream with international climate regime, if not be one of the leaders in this agenda.

(iv) Maintains its edge as service provider and reputation as a "World City"

Most of the interviewees considered that Hong Kong has its unique positioning and competitive edge as a well-established service-provider and an international city. The establishment of a local ETS could facilitate Hong Kong to maintain its edge by providing relevant services to the Mainland that are well-established and trusted²². Other business opportunities could arise along the value chain of carbon trading. On the other hand, some considered a local ETS necessary to maintain Hong Kong as a global citizen and a green / smart city.

Other views cited by some interviewees include:

- to improve the energy efficiency of existing building stocks.
- to engage the private sector, especially the financial sector, to initiate action.
- to increase local readiness to participate, e.g. from Environmental, Social and Governance (ESG) reporting for listed companies; and to capitalize on personnel supply; and mature market skills and infrastructure.
- to indirectly improve air quality and public well-being.
- to promote low-carbon innovation and facilitate development of regional carbon reduction projects from revenue generated from carbon trading.

b) Key Obstacles against Local ETS

(i) Inadequate local market size resulting in an illiquid market

The ETS is a market-driven tool and, as with any market, its market players determine its liquidity²³. Majority of the interviewees consider that Hong Kong does not have enough

²¹ We note that a calculated absolute reduction target is derived from the intensity target as reported in the *Hong Kong's Climate Action Plan 2030+* (ENB, 2017).

²² An example given was corporate governance service.

²³ We note that for the market to be efficient, a number of factors would need to be further considered in the future. E.g. initial allocation of allowance, capability of the market participants to minimize costs, the degree of

market players and diversity to generate sufficient liquidity. Some considered the difference in marginal carbon abatement costs between different controlled parties too small for any price discovery and trading activity. Also, even if there are surplus allowance credits, the amount that could be sold does not pay back reduction actions. Furthermore, majority find that Hong Kong's small power market and very little to no renewable energy choices available in the power utilities market would limit the market's liquidity.

(ii) Overlooking local carbon reduction but emphasizing speculation

As trading is a part of a cap-and-trade system, its over-emphasis is a cause of concern for most interviewees. The first concern is speculation as opposed to a tool for emissions reduction. The second concern is the abuse of allowance credits and offsets, and that emitters comply purely by purchasing credits and offsets instead of conducting any reduction actions, as this is "easier" to do. In this case, some raised concern that Hong Kong might become a net importer of offsets, resulting in spending money elsewhere rather than on local reduction actions.

(iii) Costly, lengthy, and concern over fairness of administrative procedure

Some thought that huge setup cost and long lead time required for building such system is likely to attract controversy, while some other thought that it would be very costly for the HKSAR Government to start from scratch especially for building up peripheral support, such as MRV. For emitters, it is an additional cost to bear and will not be highly welcomed, especially for Small and Medium Enterprises (SME). A common view shared by most of the interviewees was that absence of clear public policy would take it even longer to establish a local system, so that legislation would be needed. Lastly, some expressed that it would be difficult to balance the system if exemptions be included, and such system might also attract controversy.

(iv) Lack of general awareness and expertise in carbon emissions trading

Since carbon trading is a relatively new topic, awareness and expertise in this area would take time to build. There are some concerns that individual corporates would struggle to understand and perform in commodity trading.

Other obstacles for consideration include:

- Uncertainty over the feasibility of cross-sector trading in attempt to improve the market liquidity.
- Concern with impact on carbon-intensive yet important projects / utilities.
- Concern over redundancy / conflict with current policies / schemes.

competition in the market, the design of the trading rules, the ability of the agency to monitor and enforce compliance etc.

c) Features / Activities in a local ETS

(i) Type of Implementation

Should an ETS be implemented in Hong Kong, it was generally agreed that such a scheme on voluntary basis is rather ineffective without any legally-binding obligation imposed on its players²⁴. Hence, it is considered that there is a need to adopt a mandatory approach to the implementation of the cap-and-trade system having regard to its effectiveness and the need to assess and manage its impact on Hong Kong's industries, especially SMEs.

Taking a phased approach to implementing a mandatory system was supported by most of the interviewees. The scheme should be launched on a voluntary basis first to engage market players who are keen to participate in an attempt to predict market response, refine the implementation approach and improve upon such design as appropriate in preparation for the introduction of the mandatory one²⁵. Another suggestion is to implement a semi-mandatory / hybrid system that sets a voluntary scheme within a mandatory one²⁶.

Some suggested that Hong Kong should adopt the designs implemented in the Mainland to save time and money to build its own one.

(ii) Scope

Property and Power Sectors

Both the property and power sectors are regarded as highly relevant to the local ETS as they are the top big emitters in terms of the total carbon emissions in Hong Kong.

Most of the interviewees considered that the property sector should reap the benefits of this development as a tool to reduce carbon emissions. The tool would be highly relevant for existing buildings as reductions are difficult once low-hanging fruits are exhausted. However, they are concerned with setting the point of regulation as a result of complicated ownership and tenant relationships²⁷; insufficient financial and personnel resources; and double-charging of electricity consumption and carbon emissions.

Most of the interviewees see the power sector as highly relevant, having regard to power generation as one of the major sources of Hong Kong's total carbon emissions. However, some argue against the inclusion of the power sector. A main reason is the sufficiency of the

²⁴ Players may come and go at their own discretion and inability to meet the cap would not be penalized. In a voluntary system, setting the cap would be difficult. Trading would also likely be uncertain with fluctuating demand and price.

²⁵ Some suggested that the voluntary scheme may include existing buildings and the aviation sector for flights going to the Mainland.

²⁶ For example, smaller emitters are involved voluntarily while larger emitters are mandatory. This option caters to the capability of emitters with less financial and operational flexibility, and could provide benefits of improved market liquidity and a stricter cap through widespread involvement.

²⁷ I.e. whether the owner or the tenant should be responsible for compliance.

current arrangement whereby power companies' carbon emissions are limited through requirements on fuel mix and from the control of other air pollutants under the Technical Memorandum set on the emission limits of power generating units, albeit indirectly as it currently does not explicitly control carbon emissions in the Technical Memorandum. Another reason mentioned is that there are only two players in the power sector which operate in a non-competitive power market, thus resulting in an ineffective ETS per se.

Regarding double-counting of direct and indirect emissions from electricity sold and consumed, some did not consider it as a big concern, as overall emissions could be reduced in one way or another. Adjustments in the system could address this issue to prevent excessive allowances from being allocated.

Other Sectors

Other possibilities considered are the transport and waste sectors. Under the transport sector, the aviation sector is considered most intriguing when taking into account the new international carbon offsetting initiatives (e.g. from the International Civil Aviation Organization) and from pilot ETSs in the Mainland (e.g. Shanghai and Guangdong). As for road and sea vehicles, uncertainties are expressed.

Other views also suggested that general public should be included in the voluntary scheme at citizen-level. Examples of such can be found in Shenzhen, where individual citizens may earn coupons through the accumulation of carbon credits from daily activities. It is generally agreed that there are concerns with the administration of such a scheme, such as the verification of individual activities, however in terms of public education and awareness-building, it can be an effective approach.

SMEs should be considered under a voluntary scheme, whereby emissions reduced can be sold as carbon offsets in the market. This not only reduces the burden on SMEs, but also incentivizes them to adopt carbon emission reduction measures. The same approach is being adopted in Tokyo as well.

Other features / activities for consideration include:

- Curbing compliance from 100% use of allowances and offsets by requiring a percentage of reductions from the emitter's reduction, in order to achieve actual local reductions and being trade-dependent.

(iii) Interim regulations and policies

From the experience of Tokyo and the EU for building their own ETSs, the establishment of such mandatory scheme took a long time. For Hong Kong, there will be no exception if a local ETS is to be introduced. In this connection, many suggested that considerations should be given to interim regulations and policies, which would be important and necessary in the transitional period. Examples include command-and-control regulations; carbon tax; green

finance and derivatives development; energy efficiency and renewable energy incubation; shadow pricing for infrastructure (to help ‘future-proof’ decisions); and revenue neutral switch from property tax to tax on energy use for commercial buildings.

6.3 Whether there is a case for Hong Kong to become a part of the national ETS in due course

a) Key Reasons for Joining National ETS

(i) Enhance market liquidity and price stabilization

As mentioned previously, interviewees raised the concern of Hong Kong having limited number and diversity of market players. In principle, by increasing and diversifying the number of buyers and sellers in a carbon market, market liquidity is improved. As a result, most of the interviewees consider linkage between Hong Kong and the Mainland as necessary to improve market liquidity and reduce price volatility²⁸.

(ii) Reduce overall reduction costs and enhanced flexibility to reduce impact on local business

The impact of a local ETS on business, especially SME’s, due to the additional compliance cost is a particular concern. By linking systems, some thought that it could provide additional flexibility (in terms of compliance and financial) for players by providing them with the option to take advantage of other credits such as offsets generated outside Hong Kong^{29 30}.

(iii) Administrative benefits and potential business opportunities

Some consider that linkage would enable Hong Kong to start from somewhere if Hong Kong follows the footpath of the Mainland by adopting similar system design and implementation

²⁸ This property of linkage is particularly important for small cap-and-trade systems with relatively few participants. Consistent with this hypothesis, almost all of the smallest independent cap-and-trade systems have taken steps to link with other systems. For example, Norway created a one-way linkage with the EU ETS in 2005, and then joined multi-lateral linkage with the EU ETS in 2008; and Switzerland is in the process of negotiating a two-way link with the EU ETS.

²⁹ Some consider that the location and sector where GHGs are offset are irrelevant for climate change on the global level. The costs of mitigation actions, however, may be lower in certain regions or sectors due to less stringent environmental regulations or lower marginal abatement cost. Therefore, offering covered entities the opportunity to contribute to emission reduction projects outside the sectoral or geographic scope of an ETS may reduce compliance costs without compromising environmental integrity, and may also help minimize the overall total emissions reduction costs by shifting high-cost reductions from local ETS to lower-cost reductions in national ETS. Nevertheless, proper design of offsets with consideration of their additionality (i.e. demonstrate actual emission reductions compared to what would have otherwise happened), permanence (i.e. ensure emissions are not simply released at a later date), and leakage (i.e. ensure emissions not displaced elsewhere) is crucial.

³⁰ We note that the carbon price in the national ETS, which may be conducive to attaining emission target for the nation or certain region as a whole, may not be conducive to reducing Hong Kong’s local emission. Further study on this is required.

approach as the Mainland does³¹. This also leverages on the extensive experiences that the Mainland has accumulated in operating an ETS. Besides, some consider linkage to be a business opportunity for Hong Kong (this is further discussed in the next sub-section).

(iv) Foster international collaboration and reinforce commitment to long-term climate policy

Some thought that linkage with the national ETS fosters international collaboration for carbon reduction and reinforce commitment to pursue long-term climate policy action and multilateralism, thereby helping reinforce the UNFCCC process. The presence will strengthen the positioning in global carbon reduction, coordinate policies and abatement effort and develop mutual trust.

Other reasons for consideration include:

- Geographic proximity for linkage with Shenzhen or Shanghai Exchange.
- Help enhance the credibility and transparency of national ETS system.
- Expand the knowledge base and capability of HKSAR Government and professionals to keep up with new development.
- Facilitate exchange of information and low-carbon technology for the development of regional carbon reduction projects.

b) Key Obstacles for Joining National ETS

(i) Uncertainty about design of national ETS

At the end of 2014, the overall rules for the national ETS were released by NDRC. However, the national ETS is still in the preparation stage and many design aspects of the ETS remain unknown. As such, with limited information and access, many participants opined that it would be too early at this stage to determine whether joining national ETS would be beneficial. Difference between Hong Kong and the Mainland in various aspects, such as level of transparency, completely regulated energy market in the Mainland, and different emission-reduction ambitions, may pose difficulties to negotiate a link.

(ii) Net wealth outflow from high local abatement cost

Many believed that Hong Kong possesses a greater marginal abatement cost than the Mainland. Hence, if Hong Kong links with the Mainland's ETS, it would be cheaper for local entities to purchase emission reductions from firms in the Mainland than to invest in efficiency measures for their own facilities. In this regard, concerns over uncontrolled use of allowance credits and offsets in Hong Kong are raised, resulting in a net transfer of wealth from Hong

³¹ E.g. MRV works. Building up a framework for MRV, including methodology development and capacity building of verification personnel, is typically a lengthy process and the cost of establishing such system from scratch is high.

Kong to the Mainland which could be politically and economically problematic. Although allowing such offsets without limit may help minimize the cost of the region's reduction actions, criticism is received for not reducing actual local emissions by this way³².

(iii) Linkage dependent on government-to-government negotiation and decision

Most of the interviewees opined that linkage is a government-to-government decision³³. Hence, the final decision hinges on the political hurdle of whether the policies of the Mainland and Hong Kong could be integrated under the "one country two systems" principle. The HKSAR Government is encouraged to begin a dialogue with the Mainland counterpart regarding this issue.

Other obstacles for consideration include:

- Cross-boundary emissions across the power sector's asset portfolio in the Mainland may result in double-counting.
- The currency exchange of Chinese Yuan Renminbi (CNY) is still controlled and is not internationalized, thus CNY and HKD currently are not fully fungible.
- Reduced local control over the design and impact of local ETS.
- Exposure to the Mainland's market shocks.

6.4 Whether there are certain market skills that Hong Kong has that could be useful to the Mainland as it designs and establishes the national ETS

a) Potential Skills

(i) Carbon Finance Service- and Infrastructure-provider

Hong Kong is relatively well-established as a financial hub in China. Leveraging on this advantage, many think that Hong Kong has vast potential to offer its finance and trading expertise to the Mainland as it builds its national ETS.

The upcoming national ETS would include thousands of eligible players, some of whom may require assistance, as they are unfamiliar with carbon trading and lack the personnel and knowledge to participate effectively³⁴. Most agreed that service-providers specialized in

³² Therefore, it is common for ETSs to set quantitative (i.e. maximum amount of offset to the compliance obligation) and/or qualitative (i.e. requirement on type and regions of carbon offset projects) limits on offsets, as in all of the Mainland's pilot ETSs, to ensure local reductions.

³³ Under the latest plan of national ETS, Hong Kong is not covered in the scheme. The Mainland would have the sole decision-making power to accept any proposal to develop a link between local ETS and the national ETS with consideration of variety of economic, political and strategic factors. Nevertheless, Mr. Xie Zhenhua, China's special representative for climate change, expressed in 2016 at a conference in Hong Kong that Hong Kong would be welcomed to participate in the national ETS when it launches in late 2017.

³⁴ Zhang (2015) and Shen W (2015) found that many players have had to pay higher prices on allowances at the end of the trading period to meet their obligations due to unfamiliarity with the procedures and rules of trading.

trading from Hong Kong have the opportunity to fill this gap, such as by consultancy, training or infrastructural development (e.g. IT equipment), so that these players are properly equipped with the necessary knowledge to participate effectively (i.e. to achieve compliance at the least cost / at a price that they consider reasonable). However, there are also other service providers capable of providing such services. If Hong Kong does not grasp this opportunity to align its services quickly with the market demand, other experienced traders (e.g. players or service-providers from the Mainland's pilot ETS or overseas ETS) could also fill the gap.

As with any commodity trading, derivatives are useful in hedging risks for traders. So far, futures have yet to be permitted for trading in the national ETS. However, derivatives and other financial tools have emerged in some of the pilot ETSs, e.g. Shanghai, in preparation for the inauguration of this huge market. Hong Kong is generally considered to be financially more mature as compared with the Mainland. Hence, it might be advisable for Hong Kong to leverage on its financial expertise to enter the carbon derivatives market and create new financial products, such as the use of carbon as collateral for loans.

On the other hand, some considered that Hong Kong might take a more active role in the development of Chinese Certified Emissions Reduction (CCER) projects. For example, this may involve sourcing / identification of potential projects and setting up CCER funds to finance such projects. However, some factors also affect the decision making of investors, as a result deterring their investments. The main concern is the over-supply of CCERs in the market. The designs of the pilot ETSs permit only a certain percentage of compliance be obtained through CCERs to limit its impact on allowance prices³⁵. Hence, there is limited demand for CCERs within the system itself. Another concern is the lengthy approval time of CCER projects, which means that investment returns are delayed in an ever-changing market.

(ii) Carbon Professional Services

Some interviewees expressed that some local and foreign entities lack confidence in the Mainland's data reliability and counterparty corporate governance, holding them back from participating in the Mainland's market. Hence, with the well-established reputation for its credibility and service quality of Hong Kong, it is generally agreed that Hong Kong has a better positioning to provide its verification and auditing services for the entities to improve the Mainland's data transparency and credibility. Similarly, Hong Kong's edge in corporate governance is mentioned as a potential service area. Currently, the Closer Economic Partnership Arrangement (CEPA) provides the channel for professional services to enter the Mainland market, and this could be built upon to benefit services entering the carbon market in the Mainland. Lastly, Hong Kong could provide advanced low-carbon emissions technologies and devices to the Mainland as demand for reduction opportunities is expected to rise with the exhaustion of low-hanging fruits.

³⁵ On 23 March 2017, a news report indicated the possibility of the national ETS starting without any access to offsets to bolster the demand for allowances. Source: <http://carbon-pulse.com/32292/>

6.5 Whether there may be any policy or commercial risks for Hong Kong if no action is taken

a) Key Potential Risks if No Action Taken

(i) Losing a strategic policy tool to combat climate change

ETS is able to regulate the emissions generated from multiple sectors. Rather than setting different policies for each sector, it is a strategic policy to adopt the ETS as a tool to reduce emissions over a variety of sectors. Amongst the climate actions being planned or implemented³⁶, some of the interviewees considered that carbon trading would be one of the effective measures to form part of the strategic policy to combat climate change. More specifically, the introduction of ETS could reduce the need for setting specific policies, which could be administratively demanding in the long run, to control each emission source. Hence, not considering ETS might mean losing an opportunity to optimize the use of resource and manpower to achieve the same results.

(ii) Being marginalized in the global carbon market

Since the launching of the first ETS in EU in 2005, the number of ETSs has increased steadily and there are a total of 18 ETSs globally in 2017. Most expressed concerns that Hong Kong would inevitably be marginalized in the global carbon market if it does not take any action in carbon trading despite its prominent positioning as a global financial centre. For example, Hong Kong may be caught unprepared to pay for higher carbon prices and face greater marginal abatement costs in the future. Some opined that Hong Kong would miss the opportunity to take a leading role amongst C40 cities if no robust strategies are set out related to carbon trading nor sound justification be given for not taking action to respond to carbon trading³⁷. There is also concern over the preparedness of Hong Kong if it has to be included in the national ETS in the future.

(iii) Losing business competitiveness and opportunities

Given carbon market is a growing new market around the world, the market potential and demand for related professional service industry is expected to grow substantially³⁸. If no action is taken, some opined that Hong Kong would miss business opportunities, deter foreign investment and even weaken its longstanding competitive advantage.

³⁶ Detailed in the *Hong Kong's Climate Action Plan 2030+* and *Hong Kong's Energy Saving Plan* etc.

³⁷ Especially when amongst the member cities, there are those that have taken action in carbon trading or other carbon pricing policies. E.g. Singapore has taken action to implement a carbon tax in 2019 and Taiwan has passed a climate law that is paving the way to a national cap-and-trade system in the future.

³⁸ For example, services to assess one's carbon risk exposure.

(iv) Losing an effective educational tool

Carbon trading is a new concept for the general public of Hong Kong. In this regard, public awareness and the understanding of this concept and the impact of climate change could be further enhanced. Some commented that the general public of Hong Kong are generally not too concerned about climate change since it apparently does not significantly affect their livelihoods. A carbon pricing tool in carbon trading is considered as a good method to educate the general public about the impacts of carbon emissions. Disregarding any action in carbon trading could be disregarding an effective educational tool in climate change.

b) Low/No Risks if No Action Taken

Contrarily, some considered the risk of no action to be insignificant on the basis that carbon trading is not the only tool to tackle climate change and argued that there are more effective alternatives³⁹. This is especially the case when there is no study to indicate that carbon trading is beneficial to Hong Kong, especially when weighed against the “foreseeable” costliness of setting one. Some cited the ineffectiveness of overseas ETSs, such as the EU that saw its carbon price crash, as prime reason for the low risk of no action taken⁴⁰.

³⁹ E.g. the SCA in the power sector.

⁴⁰ Although some admitted that this depends on one’s definition of what makes ETS successful – some focus on meeting the cap and some focus on the trade.

7 Discussion of Observations

7.1 Introduction

This chapter discusses the Study's observations. It begins with a reflection of Hong Kong's situation and then identifies areas for further consideration and perhaps where opportunities may lie when discussing carbon pricing and the role of trading in Hong Kong.

7.2 Carbon Pricing

7.2.1 How Hong Kong May View Carbon Pricing

It is generally accepted by economists and even many governments that setting a carbon price will encourage emitters to reduce the amount of carbon they emit. The two ways to set such a price is either by way of a carbon tax or to develop a cap-and-trade system. Either way, it has not been easy for governments to take action because the politics involved are far from easy. We recognize that discussion is at a very early stage in Hong Kong and this is not the time to be prescriptive. However, carbon trading has been evolving around the world and it is time for Hong Kong to pay attention.

Carbon trading is included in Article 17 of the Kyoto Protocol, which allows the trading of allowance units for Annex B Parties (i.e. Parties that have accepted emissions targets) and the purchase of carbon offsets from other countries. Emissions trading systems have been growing since the first one was established in the EU in 2005. There are a total of 18 systems now in force and the total carbon emissions covered have more than doubled since 2005⁴¹. Amongst the Intended Nationally Determined Contributions (INDC) submitted by the UNFCCC Parties, more than half have either plans to use markets or are considering the use of markets to reduce emissions⁴². Global carbon emissions covered by the ETS are expected to grow to 16% in 2017 from 4% in 2010⁴³.

More carbon trading systems can be expected in Asia in the foreseeable future. The Mainland has been piloting in 8 areas in the country over the past few years and carbon trading is part of the Mainland's overall climate policy. The upcoming national ETS is expected to become the largest system in the world. Tokyo, Saitama and South Korea all have developed their systems. Taiwan approved a climate law in 2015 and a set of climate change action guidelines in 2017 which are meant to pave the way for building a cap-and-trade system.

⁴¹ From 2,150 MtCO₂e covered in 2005 to 4,590 MtCO₂e covered in 2015. (ICAP, 2016)

⁴² Out of a total of 160 INDCs, 64 are planning to use markets and 25 are considering the use of markets. (ICAP, 2016)

⁴³ ICAP, 2016.

Singapore has established the National Climate Change Secretariat under the Prime Minister's Office to oversee climate actions. The Government announced in its 2017 Budget that a carbon tax would be introduced in Singapore in 2019.

Hong Kong too will have to consider how it may price carbon in order to meet the demands set out in the Paris Agreement that requires continuous efforts to reduce carbon emissions to keep global average temperature increase well below 2°C of pre-industrial levels and to pursue efforts to limit it to 1.5°C by 2050. The mayors of C40 Cities are considering how cities can be more aggressive in pursuing emissions reduction. It is no doubt a complex issue for all jurisdictions to consider how each of them should internalize carbon emissions into its economy but there will be no escape from this challenge over the coming decade.

While Hong Kong may consider when and how it wishes to explore the use of trading or tax for its own jurisdiction, there is also the dimension of the Mainland's expanding and continuously evolving ETS. There is a case for the HKSAR Government to take the issue of carbon pricing on board in its own policy thinking in the near future; and also to consider what role Hong Kong can play to assist the Mainland in its ETS from the perspective of what services Hong Kong may provide.

7.2.2 In Considering Carbon Trading

Hong Kong may wish to consider whether and how an ETS may complement each other in its carbon policy framework and contribute to Hong Kong's overall efforts in carbon emissions reduction. Experience from elsewhere may provide useful perspectives when Hong Kong explores how it wishes to price carbon. Obviously, not all the examples are directly relevant but at this early stage, some observations may be helpful. For example:-

(a) An effective carbon policy instrument?

When considering carbon trading, it must be evaluated in light of whether it would be an effective policy instrument to Hong Kong in emissions reduction. The merits of developing an ETS must be evaluated relative to those of enhancing existing policies⁴⁴ and/or introducing other new policy instruments⁴⁵.

A study found that the EU ETS contributed to biggest savings in emission when compared with other individual energy-environmental policy measures⁴⁶. This was found based on a variety of evaluations that the attributable emissions saving during pre-financial crisis was in the range of 40-80 MtCO₂/year, which is about 2-4% of the total capped emissions, which is bigger than the impact of most other individual energy-environmental policy instruments.

⁴⁴ E.g. setting emission/technology standards through various ordinances/schemes.

⁴⁵ E.g. carbon tax.

⁴⁶ Laing *et al.*, 2013; Tvinnereim, 2014.

(b) An effective way to foster cooperation with the private sector?

In light of the complexity involved in carbon emissions reduction throughout the economy, governments around the world will have to work closely with the affected stakeholders to understand their carbon emissions so as to design ways that are workable and acceptable to reduce emissions over time. Tokyo's cap-and-trade system for buildings offers some useful reference for those highly urbanized cities with many large buildings:

- Government-private sector interactions paved the way to an ETS that was designed to meet emissions reduction targets and at the same time to provide appropriate incentives (i.e. the targets and reduction measures were considered achievable by the private sector)⁴⁷.
- Building owners are mandated to cooperate with tenants to achieve its target, which is crucial in pursuing comprehensive energy-efficiency improvements⁴⁸.
- Over 90% of the covered facilities had surpassed their reduction targets at the end of the first compliance period with 69% of the facilities having already surpassed their second compliance period target.

(c) An effective way to drive innovation and research and development?

One of the beneficial opportunities of carbon trading is that it incentivizes innovation and research and development in carbon reduction actions and technologies. For example, in adopting ETS in the EU, it was found that the ETS has had a mild influence on R&D and investment in low-carbon technologies; and the potential to sell offsets into the scheme had driven innovation⁴⁹.

In Tokyo, a general increase in energy saving investment was recorded after the establishment of the ETS; e.g. the installation rate of high-efficiency turbo chillers had increased from 53% to 70% amongst top-level facilities, and from 31% to 48% amongst other facilities under the ETS⁵⁰.

(d) What are the pre-requisite for developing ETS?

Data is the pre-requisite for developing an ETS. Data collection takes time and its associated MRV works would also need to be done. This not only provides transparency, but it also allows the government to gather empirical data for decision-making.

⁴⁷ Adisorn *et al.*, 2014.

⁴⁸ Nishida *et al.*, 2016.

⁴⁹ Laing *et al.*, 2013

⁵⁰ Nishida *et al.*, 2016

7.2.3 Relevant Hong Kong Experience

Government, industry stakeholders and public understanding and preparedness is important in establishing any kind of market mechanism, including a new tax. Small steps had been taken in the past in Hong Kong but they had turned out to be too early to attract industry and public attention.

In 2008, the HKSAR Government introduced arrangements to enable companies incorporated in Hong Kong to collaborate with foreign institutions on carbon offsetting projects under the UN's CDM in Hong Kong (for which projects must be located in Hong Kong), as Hong Kong being part of China is a Party to Kyoto Protocol. Currently, there are around a dozen projects registered through EPD.

In 2009, after conducting a study, the Hong Kong Exchange (HKEx) carried out a stakeholders' consultation exercise, seeking views on the feasibility of offering CER futures in Hong Kong. However, no positive feedback was received at that time. It was cited that there was a lack of knowledge and experience in emissions trading in Hong Kong among the investors, practitioners and the general public at large.

After almost a decade to 2017, the question is whether now is the right time to look at carbon trading again.

7.3 Unique Hong Kong Characteristics

7.3.1 General Conditions

Hong Kong is a city with a relatively small land area but with a large and vibrant service economy. The largest fossil fuel consuming sector and largest carbon emitters by far are the two power companies that generate electricity catering for about 75% of the city's total needs. The rest is imported from the Mainland in the form of nuclear energy. The fuel mix for local electricity generation has been shifting from coal to natural gas, and there will be increasing use of renewable energy in the future. Over 90% of the electricity in Hong Kong is used in buildings, most of which are high-rises. Indeed, Hong Kong ranks as one of the world's most extreme cities in terms of its high density (of both population and buildings). Other large fuel consumers in the transportation sector include road, aviation and marine transport, which take up about 45% of all the fuels imported to Hong Kong. Figure 7.1 illustrates the sources of carbon emissions in Hong Kong. The city's population currently stands at 7.3 million and Hong Kong's capita carbon emissions stand at 6.2 tonnes⁵¹.

⁵¹ *Hong Kong's Climate Action Plan 2030+* (ENB, 2017).

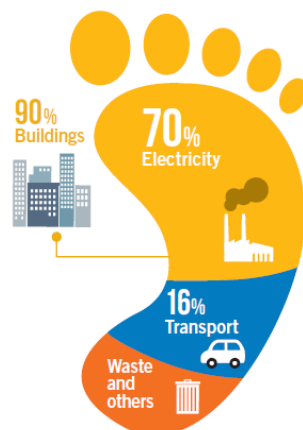


Figure 7.1 – Sources of carbon emissions in Hong Kong. (ENB, 2017)

The HKSAR Government has announced its roadmap to reduce carbon intensity in 2020 and progressing to 2030 that will significantly reduce carbon in absolute and per capita terms. The question is what role carbon pricing can play within the stated plans and where might opportunities lie.

7.3.2 Power Generation

Hong Kong's two power companies have contracts in the form of the SCA with the Government, and they are also bound by the Technical Memorandum for Allocation of Emission Allowances in respect of Specified Licences (TM) under the Air Pollution Control Ordinance (APCO). Together, the SCA and TM provide emissions allowances / permissible requirements for three specified air pollutants (sulphur dioxide, nitrogen oxides, and respirable suspended particulates); incentives and penalties for outperformance and underperformance; renewable energy incentives; etc. Plans have also been released for the replacement of coal-fired plants with natural gas plants that will reduce air pollutants and carbon emissions significantly by 2020 and 2030. Moreover, negotiations are on-going for the next period of the SCA (likely for 10 to 15 years from 2018 when the current contracts expire), where the Government has proposed the inclusion of feed-in tariff and green certificate provisions. With such provisions in place, electricity customers would have the choice of purchasing renewable energy / non-fossil fuel sources, and there would be feed-in distributed renewable energy. The former allows customers to purchase zero carbon energy (e.g. nuclear or wind) from the power companies at a higher tariff rate, which could in turn stimulate the renewable energy market. In addition, smart metering is also being considered⁵².

Government information shows the increase in natural gas generation reduces the difference in the two power companies' abatement cost and, thus, minimizing the effectiveness of a market (provided that the two power companies have similar efficiency). Over the years, there have also been discussions in Hong Kong about allowing the two companies, which have territorial

⁵² *Public Consultation on the Future Development of the Electricity Market* (ENB, 2015); and *Hong Kong's Climate Action Plan 2030+* (ENB, 2017).

monopolies, to compete. There are also studies that will be done to consider connecting Hong Kong to the Mainland grid so that Hong Kong has the option to import more power in the future⁵³. In light of the many complexities and evolving discussions in respect of the power sector in the foreseeable future, it is understandable that the power companies believe measures are already in place to reduce carbon emissions that would exceed what may be achieved through designing a trading mechanism.

On the other hand, throughout the Study's discussions, some others hold the opinion that the power sector has a role to play in an ETS.

7.3.3 Property Sector

The property sector being the largest electricity consumer has the largest carbon footprint in Hong Kong and has the greatest potential to save energy and thereby reduce carbon emissions. The Building Energy Efficiency Ordinance (BEEO) requires compliance of prescribed buildings with the codes of practice concerning the energy efficiency of air-conditioning installations, electrical installations, lift and escalator installations, and lighting installations and energy audits. The Code of Practice for Energy Efficiency of Building Services Installation (or Building Energy Code / BEC) and the Code of Practice for Building Energy Audit (or Energy Audit Code / EAC) are the technical guidelines for the minimum energy efficiency requirements for the four main installation types and energy audit, respectively. The BEC is applicable to buildings prescribed in Schedule 1 of the BEEO and EAC is applicable to buildings prescribed in Schedule 4 of the BEEO.

For new buildings, these regulations ensure that they must meet the minimum energy efficiency requirements at the design stage. For existing buildings, constraints from older designs and installations may hinder their energy efficiency performance. Improvements in existing buildings are also important, as they make up the majority of buildings in Hong Kong. Since 2015, we note the HKSAR Government's effort to work with building owners and managers in both the public and private sectors to improve energy saving. These efforts are extensively articulated in its *Energy Saving Plan for Hong Kong's Built Environment 2015-2025*⁵⁴ and *Climate Action Plan 2030+*⁵⁵ and will not be repeated here. Further, some works are being done to improve building energy data transparency and benchmarking. While there would still be a long way to go in the Government's effort to build this partnership to save energy in buildings, many see this effort as a possible prelude to development of its own cap-and-trade scheme for buildings in Hong Kong in the future.

⁵³ Legislative Council Paper No. CB(4)217/15-16(04), and Paper No. CB(4)217/15-16(03).

⁵⁴ *Hong Kong's Energy Saving Plan* articulated the creation of a "dialogue platform" between the HKSAR Government and the building sector. Refer to:

<http://www.enb.gov.hk/sites/default/files/pdf/EnergySavingPlanEn.pdf%20>

⁵⁵ *Hong Kong's Climate Action Plan 2030+* reported on the dialogue platform between the HKSAR Government and the building sector using the voluntary 4T (Target, Timeline, Transparency, and Together) framework to reduce electricity consumption on an on-going basis.

Refer to: https://www.climateready.gov.hk/files/report/en/HK_Climate_Action_Plan_2030+_booklet_En.pdf

The Japanese ETS systems for Tokyo and Saitama account for electricity from the demand-side only⁵⁶. Taking Tokyo as an example, large-scale office buildings and facilities are capped for carbon emissions from electricity consumption only. Its first phase proved successful in terms of achieving its cap, despite the criticism against its little trading activity and function being more like a regulation than a market. Therefore, this achievement could be largely accredited to their prior programmes in reporting (the CERP) and green building in 2000 and 2002, respectively, focusing extensively on demand-side management.

7.3.4 Aviation Sector

The aviation sector's involvement in carbon trading consists of two different parts: international and domestic aviation.

Accounting for carbon emissions from international aviation activity is a complicated issue as it covers cross-jurisdictional emissions – i.e. how to account for emissions from an aircraft that departs from one country and arrive at another. Most noticeably, the International Civil Aviation Organisation (ICAO) and its member states are attempting to achieve carbon neutral growth for international aviation from 2020 onwards. In 2016, ICAO committed to the “Carbon Offsetting and Reduction Scheme for International Aviation” (CORSIA) to address any annual increase in total carbon emissions from international civil aviation above 2020 levels. Its pilot phase is expected to commence in 2021 for member states that have volunteered to participate. Eventually, all member states are expected to participate from 2027 to 2035. The scheme would only cover routes with both states participating in the scheme, otherwise where either one of the states is not participating then the route would not be covered. China is part of its member states and intends to participate voluntarily.

Accounting for emissions from domestic aviation activity is relatively less contentious. Amongst the ETSs currently in force, the EU⁵⁷, Korean, Shanghai and recently Guangdong have included domestic aviation into their scope. Taking the Guangdong ETS as an example, carbon emissions from domestic aviation are accounted based on an activity unit (e.g. revenue tonne-kilometre⁵⁸) and based on the emission factor specific to an airplane type. Allowances are either freely given or are auctioned. So far, based on this method, individual airline companies are responsible for meeting the requirements for compliance. In terms of the national ETS, it has been announced that the civil aviation sector, with sub-sectors of air passenger transport, air cargo transport and airport, would be included. Individual airline companies are likely to take responsibility for meeting compliance requirements.

⁵⁶ The remaining ETS without inclusion of the power sector is the Swiss ETS, which covers fuel combustion from its industry's installations only.

⁵⁷ Accounted as intra-EU aviation.

⁵⁸ RTK is defined as one tonne of load (passengers and/or cargo) carried for one kilometer.

Hong Kong's circumstances are unique because of its special political status as a special administrative region. Hong Kong's emissions arising from international aviation (i.e. those not related to the Mainland) will come under CORSIA. However, the Mainland puts aviation carbon emissions from Hong Kong to the Mainland cities under a special category and is not considered as domestic. This means there is a gap, albeit small, for this category of emissions. Some air services companies have voluntary off-set schemes and they will be bound by CORSIA. The question is whether there could be a better method to narrow or close this gap.

7.4 The Mainland Perspective

Assisting the Mainland and Capturing Opportunities

As of 30 June 2016, the secondary carbon market for the first seven pilot ETSs in the Mainland recorded a total trading volume of 94 million tonnes, representing a value of US\$349 million. A total of 725 CCER projects have been registered by the NDRC with a cumulative total of 62.1 million tonnes of CCER being traded on the trading platform⁵⁹. However, the estimated value of the national ETS by 2020 is CNY 50-100 billion⁶⁰.

The current value has come from spot trading only, as no derivatives are permitted due to market rules. However, this may change as NDRC is expected to push for derivatives trading in the future. Currently, at least three pilots (Shanghai, Hubei and Guangdong) have been launched or planned for forward trading. Hong Kong may find the greatest financial opportunity in this area by leveraging its strong, credible and mature financial market and infrastructure, as well as its advantageous position of being the gateway to overseas markets. Other financial opportunities include carbon finance and carbon asset management.

Leveraging the Mainland's clear commitment to and experience in carbon trading, Hong Kong may offer its experience and ability in derivative trading to assist the Mainland in its development of the national ETS, thereby also enabling Hong Kong to capture new business opportunities.

Hong Kong as the Derivatives and Carbon Finance Centre of National ETS

The Mainland's massive plans to develop a low-carbon economy requires capital investment (e.g. capital for developing non-fossil fuel energy generation, cleaner manufacturing industries, and data management and infrastructure), and the private sector plays a big role in mobilizing a large portion of this capital. Hong Kong's financial sector should look further into the future to maximize these opportunities by leveraging its strong financial background and connection with the Mainland. Otherwise, this narrow window of opportunity would be taken by Mainland and foreign companies. Regardless whether Hong Kong has a local ETS or not, it

⁵⁹ PMR, 2016.

⁶⁰ Xinhua Finance Agency.

is considered that Hong Kong's private sector, especially the finance sector, should be urged to place greater focus on strategies to tap this market.

Currently, Hong Kong can still boast that it has an edge in its professionalism as a financial centre and from its connection with the Mainland. There is a general sentiment from experienced carbon trading practitioners in the Mainland, considering that Hong Kong may become the off-shore centre of the national ETS, such as by setting up U.S. dollar-denominated carbon funds or bonds to leverage the lower cost of capital financing in Hong Kong. Also, building on the connections between Hong Kong, Shenzhen and Shanghai's exchanges, there may be opportunities from the trading of carbon credits, derivatives and other carbon-related finance tools. A potential package of CCERs and derivatives could be created in the short term to cultivate the secondary CCER market in Hong Kong. There are also sentiments that Hong Kong could bridge the national ETS with overseas markets, no matter this is by linkage with other ETSs or by providing carbon asset management and trading services to countries under the "Belt-and-Road" initiative. On the other hand, given Hong Kong's connection with the Mainland, foreign companies that are looking to enter the Mainland market are likely attracted by the relatively friendlier rules in Hong Kong on establishing local offices, as well as benefiting from Hong Kong's better CNY exchange rates.

Currently, action from Hong Kong's financial sector is alarmingly low, as many consider this market as lacking short-term financial gains. Granted that there are still uncertainties in the national ETS and its derivatives market, the HKSAR Government should nonetheless raise the sector's awareness of the market's potential opportunities and push for their early involvement. Initial actions could include organizing large-scale international conferences on carbon trading in Hong Kong to attract big overseas banks and investment companies. In conjunction, the HKSAR Government could explore the potentials of encouraging the participation of local large emitters in the national ETS, e.g. the aviation sector, as a means to stimulate the finance sector.

8 Way Forward

8.1 Introduction

This Study identified that key stakeholders have diverse views on whether there is the immediate need to create a local carbon trading system in Hong Kong. This is not a surprise because carbon pricing using cap-and-trade as the means is considered a complex issue that requires more time for co-learning and discussion. However, there is a real interest among the interviewees that Hong Kong should take the matter up in light of the pressure to meet the 2°C-1.5°C target in the Paris Agreement. Moreover, there is the Mainland perspective and interviewees strongly urged Hong Kong to look into it urgently. This chapter suggests the way forward for policy makers to consider.

8.2 Proposal for the Way Forward

There is an urgency for concerted effort from the Government and industry stakeholders to discuss openly the issue and arrive at a consensus on the possible way forward and appropriate actions to be taken. Three recommendations are put forth for consideration as follows:

(a) *Carbon pricing could be raised at the Steering Committee for Climate Change*

From the Study's findings, there is the general sentiment that the issue of carbon pricing/trading should be raised at a high policy level so that the HKSAR Government may note its relevance in combating climate change and coordinate among relevant Bureaux and Departments. As this is a new and cross-disciplinary subject⁶¹, it is fitting that the Steering Committee for Climate Change (SCCC) should be briefed so that it may consider the way forward (see below).

The Policy Address 2016 announced the establishment of an inter-departmental committee, led by the Chief Secretary, to steer and co-ordinate work relating to climate change. The SCCC had reviewed previous efforts relevant to climate change and set a new carbon intensity reduction target for 2030 in *Hong Kong's Climate Action Plan 2030+*, which was launched in January 2017. The SCCC is the body that will continue to coordinate the HKSAR Government's climate change work going forward.

(b) *Hong Kong to serve the Mainland's Carbon Market*

The Study's findings clearly show that there is the strong general sentiment for Hong Kong to provide its financial and professional services to the Mainland's carbon market

⁶¹ Carbon trading involves many complex parts, e.g. environmental, financial, economics, carbon emitters (e.g. whether including power, buildings, transport, waste etc.), accounting, auditing, research and development, and infrastructural support, etc.

irrespective of whether and when Hong Kong may establish its own carbon market⁶². Perhaps one of the greatest opportunities that awaits Hong Kong is the carbon futures market. Similar actions could already be seen developing in the Mainland, where carbon forward contracts are being explored in Shanghai, Hubei and Guangdong. With Hong Kong's sophisticated financial market and well-established legal system, as well as the wealth of financial professionals in futures trading, Hong Kong is well positioned to assist the Mainland in the evolution of the national ETS in this respect. Discussions with prominent financial bodies in Hong Kong on this issue should be considered.

(c) *Cross-sector Engagement and Capacity Building*

In general, carbon pricing/trading is a new subject in Hong Kong, and local knowledge is relatively modest. Nevertheless, there are those who are paying attention to the subject. These include those companies in Hong Kong that have engaged in purchasing credits, those who have financial market expertise in derivatives, as well as those who will come under the Mainland's national ETS because of their investments there. In light of the Mainland's imminent rolling out of the national ETS, the interest in Hong Kong will grow.

The FSDC report on green finance, the interviews and events related to this Study, as well as the many financial sector events that are now happening in Hong Kong, show there is growing interest to go more deeply into the subject. As carbon pricing/trading is a complex issue, cross-sector engagement is needed and the HKSAR Government should consider how it wishes to stimulate and participate in such engagement as the Government has a good reason to play a convening role so that there could be cross-sector discussions.

We note the dialogue platform for the building sector led by the Secretary for the Environment and that cross-sector engagement is an effective and meaningful way for the Government and stakeholders to co-learn and consider action together. This kind of dialogue platform is a good example of how the Government and private sector can exchange views on new issues. The Government's experience with respect to the building sector dialogue platform may be a useful guide when considering how to stimulate and set-up a cross-sector platform for carbon pricing/trading.

⁶² Dr. Richard Sandor, considered as the father of carbon trading, noted that "Hong Kong has a huge amount of human capital and enormous expertise in the financial system and a market which the world's future depends on...If you marry environmental objectives with its well-developed financial system, I am very optimistic that it will, can and should be a laboratory for all of China", Hong Kong can take the lead in carbon trading, US economist argues". SCMP, 28 February 2017

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APPENDIX

Appendix A - Design features of China's Pilot programs

	Beijing	Chongqing	Guangdong	Hubei	Shanghai	Shenzhen	Tianjin	Fujian
Overall Carbon emissions	188.1 MtCO ₂ e (2012)	243.1 MtCO ₂ e (2012)	610.5 MtCO ₂ e (2012)	463.1 MtCO ₂ e (2012)	297.7 MtCO ₂ e (2012)	153 MtCO ₂ e (2012)	215 MtCO ₂ e (2012)	200 MtCO ₂ e (2016)
Overall Carbon emissions by sector	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Overall Carbon reduction target	20.5% reduction in carbon intensity compared to 2015 by 2020	19.5% reduction in carbon intensity compared to 2015 by 2020	20.5% reduction in carbon intensity compared to 2015 by 2020	19.5% reduction in carbon intensity compared to 2015 by 2020	20.5% reduction in carbon intensity compared to 2015 by 2020	45% reduction in carbon intensity compared to 2005, to reach 0.81 tCO ₂ /CNY10,000. Shenzhen has also pledged to peak its carbon emissions by 2022, as one of the first group of cities in China to endorse such peak year target.	20.5% reduction in carbon intensity compared to 2015 by 2020	19.5 % reduction in carbon intensity compared to 2015 by 2020
Cap	Absolute	Absolute	Absolute	Absolute	Absolute	Absolute	Absolute	N/A
Emissions covered by the ETS	40%	40%	60%	35%	57%	40%	55%	>60%
GHG covered	CO ₂ (both direct and indirect emissions)	CO ₂ (both direct and indirect), CH ₄ , N ₂ O, HFCs, PFCs, SF ₆	CO ₂ (both direct and indirect emissions)	CO ₂ (both direct and indirect emissions)	CO ₂ (both direct and indirect emissions)	CO ₂ (both direct and indirect emissions)	CO ₂ (both direct and indirect emissions)	CO ₂ (both direct and indirect emissions)
Sectors covered and thresholds	Industrial and non-industrial companies and entities, including electricity providers, heating sector, cement, petrochemicals, other industrial enterprises, manufacturers, service sector and public transport. Inclusion threshold: 5,000t CO ₂ /year. Mandatory reporting: 2,000 tce/year	Power, electrolytic aluminium, ferroalloys, calcium carbide, cement, caustic soda, and iron and steel. Inclusion threshold: 20,000t CO ₂ e/year.	Power, iron and steel, cement, petrochemicals, aviation, paper and white cement. Reporting sectors: ceramics, textiles, non-ferrous metals, and chemicals. Inclusion threshold: 20,000t CO ₂ /year or energy consumption of 10,000 tce/year.	Power and heat supply, iron and steel, non-ferrous metals, chemicals, petrochemicals, chemical fibre, cement, automobile and general equipment manufacturing, glass, pulp and paper, food and beverage, and medicine producers. Inclusion threshold: energy consumption more than 10,000 tce/year in any year between 2013 and 2015 for the power, steel, non-ferrous, chemicals, petrochemicals, building materials and pulp and paper sectors and 60,000 tce/year for the rest of the sectors.	Airports, aviation, chemical fibre, chemicals, commercial, power and heat, water suppliers, commercial, hotels, financial, iron and steel, petrochemicals, ports, shipping, non-ferrous metals, building materials, paper, railways, rubber, and textiles. Inclusion threshold: Power and industry - 20,000 t CO ₂ /year or 10,000 tce/year; and those that have participated in 2013-2015 phase with 10,000 CO ₂ /year or 5,000 tce/year; For transport: 10,000 CO ₂ /year or 5,000 tce/year (aviation and ports), 100,000t CO ₂ /year or 50,000 tce/year (shipping). For buildings: 10,000 CO ₂ /year or 5,000 tce/year.	Power, water, gas, manufacturing sectors, buildings, port and subway sectors, public buses and other non-transport sectors. Inclusion thresholds: 3,000t CO ₂ e/year for enterprises; 20,000m ² for public buildings and 10,000m ² for government buildings.	Heat and electricity production, iron and steel, petrochemicals, chemicals, exploration of oil and gas. Inclusion threshold: 20,000 t CO ₂ /year.	Electricity, petrochemical, chemical, building materials, iron and steel, nonferrous metals, paper, aviation, and ceramics. Inclusion threshold: 10,000 tce/year for any year between 2013 and 2015.

	Beijing	Chongqing	Guangdong	Hubei	Shanghai	Shenzhen	Tianjin	Fujian
Number of liable entities Accounting boundary	415 (2013) 543 (2014) 947 (2016) Company-level (legal person)	242 (2013-2015) 230 (2016) Company-level (legal person)	184 (2013) 193 existing enterprises and 18 new entrants (2014) 280 (2016) Company-level (organizational and operational boundary)	138 (2013-2014) 236 (2016) Company-level (legal person)	191 (2013) 368 (2016) Company-level (legal person)	635 enterprises 197 public buildings 824 (2016) Company level (organizational and operational boundary)	114 (2013-2015) 109 (2016) Company-level (legal person)	277
Point of regulation	Covers emissions from power sector upstream and other sectors downstream.	Covers emissions from power sector upstream and other sectors downstream.	Covers emissions from power sector upstream and other sectors downstream.	Covers emissions from power sector upstream and other sectors downstream.	Covers emissions from power sector upstream and other sectors downstream.	Covers emissions from power sector upstream and other sectors downstream.	Covers emissions from power sector upstream and other sectors downstream.	Covers emissions from power sector upstream and other sectors downstream.
Compliance period	One year (June 15)	One year (June 20)	One year (June 20)	One year (May 30)	One year (June 30)	One year (June 30)	One year (May 31)	One year (June 30)
Trading period	Four years (2013-2016)	Four years (2013-2016)	Four years (2013-2016)	Four years (2013-2016)	Three years (2013-2015)	Four years (2013-2016)	Four years (2013-2016)	One year
Allocation	Free allocation via grandfathering based on 2009-2012 emissions or emissions intensity. Benchmarking for new entrants and entities with expanded capacity.	Free allocation via grandfathering based on highest historic emission in period 2008-2012. If the sum of allocation for all enterprises exceeds the cap, a reduction factor is applied. Ex-post adjustments based on production data are also possible.	Free allocation via grandfathering based on 2013-2015 emissions for 2016 vintage allocation. Benchmarking for coal or gas fired electricity generators (including heating, combined heat and power), aviation, certain cement, white cement, paper and iron and steel industrial processes and relevant new entrants. For those using benchmarking, pre-issuance of allowance is based on 2015 production and final number will be updated based on 2016 production. During pilot phase 3% (2013) to 10% (2015) of allowances are auctioned. During first compliance year participation in auctions was mandatory to receive free allocation.	Free allocation of 2016 vintage allowances through benchmarks for power, heat, co-generation and cement (except the entities using outsourced clinker); historical carbon intensity method for glass and other building material, and ceramics sectors; grandfathering based on 2013-2015 historic emissions for all other sectors.	Free allocation based on sector-specific benchmarks (power, heat, car glass manufacturers), historic emissions intensity (industry, aviation, ports, shipping and water suppliers, generally based on 2013-2015 data) or historic emissions (buildings and commercial sector, generally based on 2013-2015 data).	Free allocation based on sector-specific benchmarks. Benchmarking is applied to the water, power and gas sectors based on sectoral historical carbon intensity; while grandfathering based on the entity's historical carbon intensity is applied to port and subway sectors, public buses and other non-transport sectors. For those using benchmarking and historical carbon intensity, the final number of allowances will be updated based on 2016 output. At least 3% are ought to be auctioned.	Free allocation via grandfathering based on 2009-2012 emissions or emissions intensity. Benchmarking of new entrants and expanded capacity.	Free allocation
Banking and borrowing	Banking allowed. No borrowing.	Banking allowed. No borrowing.	Banking allowed. No borrowing.	Banking allowed during pilot phase, but only for allowances that were traded at least once. No borrowing.	Banking is allowed. No borrowing.	Banking is allowed. No borrowing.	Banking allowed. No borrowing.	Banking allowed. No borrowing.
Offsets and credits	CCER allowed, limit to 5% of annual allocation, of which at least 50% have to be from projects from within the jurisdiction of the city of Beijing.	CCER allowed, limit to 8% of the compliance obligation.	CCER allowed, limit to 10% of annual compliance obligation of which at least 70% have to be from projects from within the jurisdiction of the province.	CCER allowed, limit to 10% of annual allocation. CCER must come from rural biogas or forestry projects in the province of Hubei or from provinces and regions	CCER allowed, limit to 1% of annual allocation.	CCER allowed, limit to 10% of annual compliance obligation.	CCER allowed, limit to 10% of the annual compliance obligation.	CCER and Fujian Forestry Certified Emission Reduction (FFCER) allowed, limit to 5% of the annual compliance obligation and to

	Beijing	Chongqing	Guangdong	Hubei	Shanghai	Shenzhen	Tianjin	Fujian
				that have signed agreements with Hubei and that were generated after 1 January 2015.				increase to 10% for companies that use FFCER credits.
Provisions for price management	In case of market fluctuations, Beijing DRC can buy back or auction allowances in order to stabilize the market.	In case of market fluctuations, the exchange can take price stabilization measures. Compliance entities must not sell more than 50% of free allocation.	Floor price for auctions - policy reserve price served as a price floor.	In case of market fluctuations, the Hubei DRC can buy or sell allowances to stabilize the market.	If prices vary more than 10% in 1 day, the exchange can take price stabilization measures, temporarily suspend trading or impose holding limits.	The SZ DRC can either sell extra allowances from a reserve at a fixed price that can only be used for compliance and cannot be traded, or buy back up to 10% of total allocation.	In case of market fluctuations, the Tianjin DRC can buy or sell allowances in order to stabilize the market.	In case of market fluctuations, severe imbalances between supply and demand, or liquidity issues, Fujian DRC can buy or sell allowances in order to stabilize the market.
MRV	Annual reporting of emissions. 3rd party verification required.	Annual reporting of emissions. 3rd party verification required.	Annual reporting of emissions. 3rd party verification is required.	Annual reporting of emissions. 3rd party verification is required.	Annual reporting of emissions, 3rd party verification is required.	Annual reporting of emissions with a tier approach by company size. 3rd party verification is required.	Annual reporting of emissions. 3rd party verification is required.	Annual reporting of emissions. 3rd party verification is required.
Enforcement	Penalties for non-compliance range from CNY30,000 to CNY50,000. Companies failing to surrender enough allowances are fined 3-5 times the average market price for each missing allowance.	No financial penalties for non-compliance. The punishments may include media reporting and public exposure of the non-compliance; disqualification from the energy saving and climate subsidies and associated awards for 3 years; and a record entered on the State Owned Enterprise performance assessment system.	Penalties of non-compliance range from CNY10,000 to CNY50,000. Companies failing to surrender enough allowances is deducted twice the amount of allowances from next year's allocation and are fined CNY50,000.	Penalties for failing to submit an emissions or verification report on time range from CNY10,000 to CNY30,000. Trade participants that manipulate the market face up to CNY150,000 in fines. Further, companies that fail to surrender enough allowances to match their emissions will be deducted twice the amount of allowance from next year's allocation and are fined 1-3 times the average market price for every allowance.	Penalties for failing to submit emission report or verification report on time or providing fraudulent information range from CNY10,000 to CNY50,000. Between CNY50,000 and CNY100,000 can be imposed for non-compliance, besides surrendering the adequate amount of allowances. On top of financial sanctions, further sanctions may be imposed.	Institutes providing fake information can be fined for the difference between reported and actual emissions at the price 3 times of the average of the past 6 months. Penalties for disturbing the market order can cost up to CNY100,000. Companies failing to surrender enough allowances to match their emissions are fined 3 times the average market price of the past 6 months. The missing allowances can be withdrawn from the account of the company or deducted from next year's allocation.	In case of non-compliance, companies are disqualified for preferential financial support and policies for three years.	Penalties for failing to submit an emissions or verification report on time, providing fake information, or disturbing the verification process range from CNY10,000 to CNY30,000. Companies failing to surrender enough allowances are fined 1-3 times the average market price of the past 12 months with maximum limit of CNY30,000. Twice the amount of the missing allowances can be withdrawn from the account of the company or deducted from next year's allocation.
Institutions involved	Beijing DRC (Competent authority) China Beijing Environment Exchange (Trading platform)	Chongqing DRC (Competent authority) Chongqing Carbon Emissions Exchange (Trading platform)	Guangdong DRC (Competent authority) China Emissions Exchange Guangzhou (Trading platform)	Hubei DRC (Competent authority) China Hubei Emission Exchange (Trading Platform)	Shanghai DRC (Competent authority) Shanghai Environment and Energy Exchange (Trading platform)	Shenzhen DRC (Competent authority) China Emissions Exchange Shenzhen (Trading platform)	Tianjin Development and Reform Commission (Competent authority) Tianjin Climate Exchange (Trading platform)	Fujian DRC (Competent authority); Fujian Provincial Forestry Department (FFCER projects management); Fujian Haixia Equity Exchange (Trading platform); Fujian Economic and

	Beijing	Chongqing	Guangdong	Hubei	Shanghai	Shenzhen	Tianjin	Fujian
								Information Centre (Registry, market management, MRV administration)
Linkage with other schemes	In 2014, launched an inter-regional cooperation for carbon emission trading pilot with Changde City, Hebei Province. Plan to link with Tianjin.	N/A	Intra-provincial linkage was planned for 2014. Possibly with Hubei Province. Preparatory studies conducted during the second half of 2013.	There were discussions in 2011 on Hubei linking with Guangdong, but this has not been officially confirmed since then.	Shown willingness to develop a regional carbon ETS with the surrounding cities in the Yangtze River Delta.	Shown willingness to build regional ETS, signed MoU with Huain in 2014 and Baotou in 2014.	Plan to link with Beijing and Hebei.	N/A

Source: IETA et al., 2015; ICAP, 2016; ICAP, 2017.