



# Applicability of clean development mechanism to the Hong Kong building sector



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## ABSTRACT

Under the Kyoto Protocol's Clean Development Mechanism (CDM), countries worldwide co-operate on encountering climate change by emissions trading, which enables a win–win situation by effectively “regenerating” a cleaner environment in developing countries, whilst efforts in developed countries may still not meet their committed targets of carbon reduction. According to the CDM rules, energy efficiency improvement projects in the building sector are valid for emissions trading. Although the potential saving of energy is significant, there is only a limited number of building projects being registered as CDM projects. This paper explores the applicability of CDM in the building sector by reviewing the implementation of CDM and its advantages and disadvantages. Hong Kong was selected for an in-depth study due to its eligibility for CDM and yet non-starter status. According to a questionnaire survey supplemented by interviews with the stakeholders in this study, major hindrances such as the lack of financial incentive, inadequate knowledge about emissions trading and insufficient governmental support were found in potential CDM projects in the building sector. It is recommended that an inter-city emissions trading market covering mainland China and Hong Kong, and suitable emission reduction targets should be established and led by the government at the initial stage. By setting up an emission exchange centre, local emissions trading activities could be facilitated and job opportunities could be created. In addition to conducting emissions trading, Hong Kong may also contribute to emissions trading in the region by making use of its highly skilled professional services and efficient business environment. This study paves the way for a densely built city such as Hong Kong to benefit environmentally and economically from a cleaner region in its vicinity.

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## 1. Introduction

Climate change is a serious threat to the world, and Hong Kong, a Special Administrative Region of China (i.e. the HKSAR) playing the role of an economic hub, is no exception to the adverse impacts. According to Tracy et al. (2006), climate change causes long-term impacts on ecology, human health and economy, and also hampers the competitiveness of businesses. As a contributory cause of climate change, greenhouse gas (GHG) emissions in Hong Kong kept rising to 42,000 ktCO<sub>2</sub>-e in 2008 with energy use in the building sector being a major source of emissions (Environment Bureau, 2010). Despite some attempts, the Audit Commission reported that Hong Kong has not fully achieved the air quality objectives adopted in 1987, which targeted at reducing the

concentration levels of seven major air pollutants (Audit Commission, 2012). In its efforts to tackle climate change, Hong Kong should aim at improving energy efficiency in the building sector due to its densely built up environment and aging building stock, as an important means to reduce GHG emission.

Clean Development Mechanism (CDM) is a cross-border emissions trading scheme (ETS) under the auspices of the United Nations. It provides an opportunity for developed countries (Annex I countries) to partially meet their carbon emissions reduction obligation under the Kyoto Protocol and a financial incentive for developing countries (i.e., non-Annex I party) to implement clean projects. China has been one of the largest carbon credit suppliers in the world under the CDM scheme and has contributed more than 40% of the global registered CDM projects by 2010 (Linacre et al., 2011), including projects related to the use of energy efficient equipment in buildings, as well as improvement in the fabrics of buildings for energy saving. Globally, successful building-related

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projects funded under CDM include (i) energy retrofitting of food retail chain stores in Brazil; (ii) distribution of compact fluorescent lamps to 700,000 households in India; and (iii) replacement of existing luminaries with LED luminaries in public housing managed by 6 town councils in Singapore (UNFCCC, 2014).

Hong Kong, being part of China, is considered as a non-Annex I party to the United Nations Framework Convention on Climate Change (UNFCCC), and thus is eligible for implementing CDM projects. Since 2008, the HKSAR government has tried to promote CDM projects in Hong Kong by announcing clarifications from the National Development and Reform Commission (NDRC) of China that carbon credits generated in Hong Kong would be included in China's national account. The Environmental Protection Department will liaise with the NDRC in channelling applications for the latter's approval. CDM revenues would also be exempted from the mainland's levy (Malleons Stephen Jaques, 2008). Some capacity building seminars were organised with full house attendance. The Hong Kong Quality Assurance Agency (HKQAA) was also officially accredited as a Designated Operational Entity. Although a number of scholars suggest that Hong Kong could contribute to mitigating climate change by participating in emissions trading activities (Choy et al., 2013; Leung et al., 2009; Lunsford and Loh, 2012), there has yet been any CDM project registered in Hong Kong. In contrast, Singapore, a compact city state with an even lower emission factor than Hong Kong in their electricity generation, has embarked on a series of CDM applications in their building sector.

In tandem with global efforts to combat the adverse effects of climate change, this research study aims to investigate the applicability of CDM to the building sector in Hong Kong, by exploring the potential opportunities and barriers of implementing building-related CDM projects in Hong Kong. Towards the end, a discussion is made on possible solutions to overcome the barriers, based on a questionnaire survey and interviews with experts from the related fields. Furthermore, the potential roles of Hong Kong in emissions trading (besides CDM) in the region are examined. The reason for looking at emission trading (ET) is that at the regional level, ET is introduced for reducing GHG emissions at both national and cross-border level. In particular, the building sector is covered in the domestic ETs implemented in Australia, Japan and the United Kingdom (Lam et al., 2014). It is imperative that Hong Kong, as one of the metropolitan cities in the world, can catch up with the encouraging trend as a result of this reflective study, which is also relevant to the neighbouring countries.

## 2. Contextual background

### 2.1. Current energy consumption and GHG emission in Hong Kong

Since the implementation of the China's economic reform and open-door policy in 1979, most of the labour-intensive industries of Hong Kong were moved to the Mainland because of the relatively low labour costs (Lee, 2005). The Hong Kong economy then transformed from manufacturing to the services sector. In 2012, the GDP at current prices of Hong Kong was HK\$2037 billion, to which the services sector contributed 92%, while the manufacturing sector only accounted for 1.5% (Census and Statistics Department, 2014).

The restructuring of the Hong Kong economy also altered the energy consumption pattern. Between 1979 and 2012, the electricity consumption share of the commercial sector increased from 39% to 66%, while that of the industrial sector decreased from 40% to 7% (Census and Statistics Department, 1990, 2014) due to the industrial activities moving across Hong Kong's border to mainland China. In the same period, the population of Hong Kong increased from 4.5 million to 7 million. As a result, the residential and commercial sectors have dominated electricity consumption in Hong Kong.

Likewise, with the flourishing commercial activities and the growth of population, Table 1 shows that the electricity consumption of the residential sector increased by 23%, and that of the commercial sector increased by 22% in the recent decade (EMSD, 2014). According to the Electrical & Mechanical Services Department (EMSD) (2014), the residential and commercial sectors consumed about 41,189 TJ and 101,813 TJ of electricity respectively in 2012, amongst which building services systems, such as air-conditioning and lighting, were the major electricity users (see Figs. 1 and 2).

In Hong Kong, electricity is mainly generated by combusting fossil fuel, thus power generation produces a considerable amount of GHG emissions. From 2000 to 2008, the total GHG emissions in Hong Kong increased from 7400 ktCO<sub>2</sub>-e to 42,000 ktCO<sub>2</sub>-e, in which 67% of the GHG was emitted by electricity generation in 2008 and about 90% of electricity was consumed by the building sector (Environment Bureau, 2010). These figures indicate that there is great potential for Hong Kong to reduce GHG emissions by improving building energy efficiency. However, apart from a series of Technical Memoranda limiting the air pollutant emissions locally from power plants, there has been no binding GHG emission reduction target in Hong Kong itself.

### 2.2. Existing green schemes in Hong Kong's building sector

In order to promote a sustainable built environment in Hong Kong, the Hong Kong SAR (HKSAR) Government and the industry have initiated some efforts. In 1998, the EMSD launched a green certificate scheme, entitled the "Voluntary Energy Efficiency Registration Scheme for Buildings", to promote the application of the Building Energy Code (BEC), which stipulates the minimum energy performance standards of the installations of lighting, air conditioning, electrical supply and lifts & escalators. In 2012, the Government enacted the Buildings Energy Efficiency Ordinance, under which developers or building owners must comply with the requirements stated in the BEC. Apart from establishing guidelines of building energy performance, the Government provided matching funds for existing building owners to conduct energy-carbon audits and energy efficient projects. In addition to the regulatory measures, the Hong Kong Green Building Council (HKGBC) introduces the Building Environmental Assessment Method (BEAM Plus), a voluntary building assessment scheme, to the industry. To encourage property developers participate in the BEAM Plus scheme, the HKSAR Government stipulates that certification of BEAM Plus for new buildings is one of the prerequisites for granting Gross Floor Area (GFA) concessions (Development Bureau, 2011). The resulting additional GFA is, in fact, a form of financial incentive to developers for implementing environmentally friendly measures in new buildings, thanks to the land-scarce and densely built-up cityscape of Hong Kong. Although stakeholders of the building sector can benefit from the use of energy efficient equipment, e.g. lower energy bills, they require financing means to support their energy retrofitting projects. The higher initial cost of green buildings compared with conventional buildings is one of the barriers inhibiting the promotion of the former (Tam et al., 2011). As a cross-border emissions trading scheme, CDM functions as a promising financing tool providing additional funding for energy efficient projects to be implemented in non-Annex I countries, including Hong Kong under China.

## 3. Introduction of CDM

Emissions trading (ET) was first proposed in 1968 by John Dales, who suggests that pollution can be controlled by instigating transferable property rights for waste disposal, i.e. putting a price

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