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Panel on Environmental Affairs

Subcommittee on Improving Air Quality

Meeting on 13 January 2009

**Updated background brief on
greenhouse gas emissions and their effects on global warming
(Position as at 7 January 2009)**

Introduction

Greenhouse gases (GHG) are components of the atmosphere, including water vapour, carbon dioxide (CO₂), methane, nitrous oxide and ozone. Some GHG occur naturally in the atmosphere while others result from human activities. GHG act like a blanket around the earth or the glass roof of a greenhouse, trapping heat and keeping the planet warm. If the concentration of GHG in the atmosphere increases, the average surface temperature of the earth will increase. With more GHG released to the atmosphere due to human activities, such as burning of fossil fuels, deforestation and agriculture, more heat is being trapped near the earth's surface, giving rise to global warming. Associated with global warming are other changes in the climate system, including changes in the frequency and intensity of extreme weather and climate events such as heat wave, cold spells, heavy rain, droughts and tropical cyclone as well as a rise in the sea level. These changes have profound impacts on natural and human systems and are often adverse in nature.

2. There are two major pieces of international agreements related to global warming, namely the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. UNFCCC is an international treaty signed among member countries of the United Nations (UN) in 1992. Its objective is to stabilize GHG concentrations "at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system". As of May 2007, 191 countries have ratified the treaty, including China. The Kyoto Protocol is an agreement made under UNFCCC. Countries ratifying this protocol commit themselves to reducing emissions of carbon dioxide and five other GHG or engaging in emissions trading if they maintain or increase emissions of such gases. As of December 2006, 169 countries and other government entities have ratified the agreement.

GHG emissions in Hong Kong

3. The volume of GHG emissions in Hong Kong was about 44.8 million tonnes CO₂-equivalent (CO₂-e)¹ in 2005, accounting for about 0.2% of the global GHG emissions. Approximately, 85% of the total global warming potential (GWP)-weighted GHG emissions in Hong Kong are CO₂. The emissions per capita in Hong Kong were around 6.4 to 6.5 tonnes in recent years which were lower than that of United States of America (about 24 tonnes), Canada (about 24 tonnes), Australia (about 27 tonnes), United Kingdom (about 11 tonnes), Japan (about 11 tonnes), European Union (about 9 tonnes) and Singapore (about 9 tonnes). Hong Kong's carbon intensity, as measured in terms of GHG emissions per unit of Gross Domestic Product (GDP), was 27.6 kilograms per HK\$1,000 of GDP in 2005.

4. The energy sector, mainly electricity generation, is the major source of GHG emissions, accounting for over 60% of the total local GHG emissions. The transport sector, contributing to about 16% of the total emissions, is the second largest emission source.

GHG emission reduction targets

5. The UNFCCC and Kyoto Protocol were extended by the Central Peoples' Government (CPG) to Hong Kong with effect on 5 May 2003. As with other developing countries which have ratified the Kyoto Protocol, China (including the Hong Kong Special Administrative Region (HKSAR)) is not required to achieve any GHG emission limits. Instead, it is required to submit national communications in accordance with the specific requirements of the Protocol by around 2010. In order to assist CPG in fulfilling the obligations under the Protocol, the Administration is required to prepare a HKSAR submission to CPG covering the following -

- (a) Emission inventories of GHG;
- (b) Appropriate measures for Hong Kong to facilitate adequate adaptation to and mitigate climate change;
- (c) Cooperation activities in promotion of development and application of environmentally sound technologies pertinent to climate change;
- (d) Cooperation activities in scientific research related to climate change; and
- (e) Activities in promoting public awareness and disseminating the relevant messages.

¹ CO₂-equivalent is a metric measure used to compare the emissions from various GHG based upon their global warming potential (GWP). The CO₂-equivalent for a gas is derived by multiplying the tonnes of the gas by the associated GWP.

6. In addition, alongside some other 20 member economies of the Asia-Pacific Economic Co-operation (APEC), Hong Kong has adopted the APEC Leaders' Declaration on Climate Change, Energy Security and Clean Development announced at the APEC Leaders' Meeting held in Sydney in September 2007. The Declaration calls upon APEC economies to achieve a reduction in energy intensity of at least 25% by 2030 (with 2005 as the base year). In this connection, the Chief Executive has reaffirmed in the 2007 Policy Address that Hong Kong will endeavour to meet this required reduction in energy intensity. Achieving this goal will avoid emission of approximately 20 million tonnes of GHG every year in 2030.

GHG reduction measures

7. Hong Kong is a relatively small emitter of GHG due to the fact that it is a service economy without any energy intensive industries. The principal source of GHG emissions is power generation, and 50% of the electricity is generated from coal burning. Given that there is at present no mature and commercially viable technology in the world that could reduce, capture and store the GHG discharged from the burning of fossil fuels, GHG emissions from power generation can only be substantially reduced by changing the fuel mix, such as substantial reduction in coal burning, increase in the use of natural gas or switching to nuclear energy. However, changing fuel mix for power generation requires careful consideration of a number of important and complicated issues, such as stability in power supply and electricity tariff.

8. In support of the international efforts in reducing GHG, the Administration has been pursuing a string of measures since the 1990s. A summary of these measures is in **Appendix I**. Following the announcement of the 2007 Policy Address, further measures have been introduced to combat climate change. These include mandatory implementation of the Building Energy Codes and Energy Efficiency Labelling Scheme, promotion of the use of biodiesel, incorporation of provisions in the new Scheme of Control of Agreements signed between the Administration and each of the two power companies to encourage the use of renewable energy (RE) and promote energy efficiency, the Administration to lead by example, implementation of greening in Government projects as well as continued cooperation with the international community to cope with the impact of climate change and mitigate GHG emissions.

9. To strengthen co-ordination of efforts in tackling climate change among the relevant bureaux and departments, the Administration has established an Inter-departmental Working Group on Climate Change (IWGCC) under the lead of the Environmental Protection Department. The terms of reference and membership of the Working Group are in **Appendix II**. The Working Group is tasked to co-ordinate and promote actions to address climate change and reduce GHG emissions. It is also responsible for steering a consultancy study on climate change. With the recent release of the findings of major international studies on climate change, particularly those published by the Intergovernmental Panel on Climate Change, there is a need to conduct a comprehensive study to assess the likely impacts of climate change in Hong

Kong. The study will, inter alia, -

- (a) review and update the inventories of GHG emissions;
- (b) project the future trends in GHG emissions under different scenarios;
- (c) characterize the impacts of climate change on Hong Kong; and
- (d) recommend additional policies and measures to reduce GHG emissions and facilitate adaptation to climate change and assess their cost-effectiveness.

This will provide a solid scientific basis for further development of adaptation and mitigation measures as well as for the preparation of the HKSAR submission to CPG for meeting the national communication obligations under the Kyoto Protocol.

Deliberations by the Panel

10. The subject of GHG emissions and their effects on global warming was discussed by the Panel at its meetings on 28 May 2007 and 28 January 2008. Deputations were invited to attend the former meeting while the Advisory Council on the Environment (ACE) at the latter. A summary of deputations' views and the Administration's response was circulated vide LC Paper No. CB(1) 2202/06-07 on 26 July 2007. In gist, deputations generally agreed that being a developed city, Hong Kong should make efforts to reduce its GHG emissions through the use of liquefied natural gas to replace coal in electricity generation, development of RE, control of idling vehicles, introduction of energy tax, development of energy conservation measures and provision of green rooftops etc. Consideration should also be given to setting emission targets for GHG and a timetable for achieving the targets. ACE held the view that there might be a need for a timetable to work out the emission reduction targets for GHG, including CO₂, but more studies would be required as there was no effective means to reduce CO₂ emission from power generation using fossil fuels. It would pose immense difficulties to the power companies if an emission cap on CO₂ was imposed at this stage. Meanwhile, more efforts should be made by the general public to tackle global warming through energy conservation, reduction in vehicular emissions and proper waste management.

11. Some members were disappointed at the conservativeness of ACE on the imposition of an emission cap on CO₂ while others accepted that power companies would have difficulties in complying with the CO₂ emission cap if there were no effective means to reduce such emission during power generation. To this end, more incentives should be provided to encourage the development of RE for application on a larger scale. Consideration should also be given to introducing bus route rationalization schemes to reduce the number of franchised buses running on the roads during non-peak hours with few passengers on board. The Administration was

further requested to re-consider the bus-bus interchange schemes to relieve traffic congestion at the Central Business District on the one hand while improving air quality on the other.

12. On IWGCC, members held the view that an official at a much higher rank should be appointed to steer IWGCC. They also emphasized the need to for IWGCC to ensure transparency in the appointment of consultants for the study on climate change. Consideration should be given to including in the terms of reference of IWGCC the timetable for setting the emission reduction targets for GHG such that this could be considered in the context of the consultancy study.

Relevant papers

Information paper provided by the Administration for the Environmental Affairs Panel meetings on 28 May 2007

<http://www.legco.gov.hk/yr06-07/english/panels/ea/papers/ea0528cb1-1666-15-e.pdf>

Information note entitled "Policies and measures for mitigation of climate change" prepared by the Research and Library Services Division

<http://www.legco.gov.hk/yr06-07/english/sec/library/0607in14-e.pdf>

Minutes of the Environmental Affairs Panel meeting on 28 May 2007

<http://www.legco.gov.hk/yr06-07/english/panels/ea/minutes/ea070528.pdf>

Administration's response to deputations' views

<http://www.legco.gov.hk/yr06-07/english/panels/ea/papers/ea0528cb1-2202-1-e.pdf>

Information paper provided by the Administration for the Environmental Affairs Panel meetings on 28 January 2008

<http://www.legco.gov.hk/yr07-08/english/panels/ea/papers/ea0128cb1-647-18-e.pdf>

Minutes of the Environmental Affairs Panel meeting on 28 January 2008

<http://www.legco.gov.hk/yr07-08/english/panels/ea/minutes/ea080128.pdf>

Council Business Division 1
Legislative Council Secretariat
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Summary of existing GHG reduction measures in Hong Kong

Categories	Control Measures
Electricity Generation	To allow only the construction of gas-fired power generating units since 1997.
	To encourage power companies to maximize the use of natural gas for power generation.
	To utilize landfill gas as fuel, including its use in production of town gas.
Demand Side Management	To encourage power companies to implement demand side management to promote energy efficiency and conservation.
Energy Efficiency and Conservation	To implement the voluntary Energy Efficiency Labelling Scheme for household and office appliances and equipment, as well as for vehicles since 1995.
	To actively promote the use of water-cooled air-conditioning systems. A Code of Practice for Water-cooled Air Conditioning System was published in July 2006, covering guidelines for cooling tower design, installation, testing, commissioning, operation and maintenance.
	To implement energy saving programmes in Government. The Government has pledged and achieved the target to reduce its energy consumption by 6% between FY 2003-04 to FY2006-07. Energy audits and re-audits are carried out at Government venues.
	To maintain air-conditioned room temperature of government offices at 25.5°C in summer months.
	To encourage the public and business sector to save energy, through, for example, minimise the use of air-conditioners, set air-conditioned room temperature at 25.5°C and maintain air-conditioners in good working condition to reduce power consumption.
	To support the Clean Air Charter initiative led by the business sector.
Building Energy Efficiency	To implement the voluntary Energy Efficiency Registration Scheme for Buildings introduced since 1998 to promote the application of the Building Energy Codes covering lighting, air conditioning, electrical and lift & escalator installations.
	To require all new Government buildings and retrofit projects to fully comply with the Building Energy Codes.

Categories	Control Measures
	To require all works departments to apply energy efficient features (including green roofing) in new Government buildings and retrofit projects where feasible. Guidelines are provided to bureaux and departments in adopting energy efficient measures in their operations.
Renewable Energy	To have 1-2% of the local power needs to be met by renewable energies by 2012.
	To actively promote wider application of renewable energy by collaborating with the two power companies and providing necessary incentives.
	To continue the on-going efforts to promote the use of renewable energy in public works projects. A number of pilot projects have been implemented.
Land Transport	To continue to extend the coverage of the public transport system, in particular the railway network.
	To promote use of cleaner vehicles under the “Tax Incentives Scheme for Environment-friendly Petrol Private Cars”, i.e. reducing the First Registration Tax by 30%, subject to a cap of HK\$50,000 per car.
	To encourage early replacement of diesel taxis and light buses with liquefied petroleum gas (LPG) ones by providing financial incentives.
Landfill Gas Utilization	To maximise utilisation of landfill gas from all 3 operating and 13 closed restored landfills as fuel substitutes.
Tree Plantation	To carry out tree plantation programmes.
Research and Studies	To continue and support scientific research related to climate change.
Public Awareness and Education	To raise public awareness and enhance the community’s understanding of climate change and the important role that individuals could play in tackling the problem through lifestyle and behavioural changes, notably in respect of energy conservation. e.g. through organizing “I love Hong Kong I love Green” campaign, “Hong Kong Energy Efficiency Award”, production and distribution of an educational package on climate change to schools; and organizing thematic talks and seminars, etc.

Inter-departmental Working Group on Climate Change

Terms of Reference

Having regard to the obligations of the Hong Kong Special Administrative Region (HKSAR) under the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, the Terms of Reference of the Inter-departmental Working Group on Climate Change are –

- (i) to co-ordinate, in close consultation with Government bureaux and departments and other bodies concerned, existing and planned activities to fulfill the HKSAR's obligations under UNFCCC;
- (ii) to monitor and co-ordinate efforts of relevant Government bureaux and departments in formulating and carrying out measures to control greenhouse gas emissions and facilitate adequate adaptation to climate change;
- (iii) to monitor closely the latest international developments on climate change and make recommendations for appropriate action taking account of these developments; and
- (iv) to formulate and co-ordinate action to promote public awareness and understanding of climate change and its likely effects.

Chairman

Deputy Director (Environment)3, EPD

Membership

Representatives at directorate level from:

Environment Bureau (Energy Division)

Development Bureau (Works Branch)

Transport and Housing Bureau (Transport Branch)

Food and Health Bureau

Education Bureau

Economic Analysis and Business Facilitation Unit, Financial Secretary's Office

Environmental Protection Department

Hong Kong Observatory

Electrical and Mechanical Services Department

Housing Department

Planning Department

Agriculture, Fisheries and Conservation Department

Architectural Services Department

Buildings Department

Civil Engineering and Development Department

Drainage Services Department

Food and Environmental Hygiene Department

Health Department

Home Affairs Department

Leisure and Cultural Services Department

Transport Department

Water Supplies Department