Guidelines to Account for and Report on Greenhouse Gas Emissions and Removals for Buildings (Commercial, Residential or Institutional Purposes) in Hong Kong

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I Introduction

Climate change has become a challenge to the international community. The Government of the Hong Kong Special Administrative Region is committed to working closely with the international community in formulating measures to reduce greenhouse gas (GHG) emissions.

As a member economy of the Asia-Pacific Economic Co-operation (APEC), Hong Kong is working towards achieving a reduction in energy intensity of at least 25% by 2030 (with 2005 as the base year) as set out in the APEC Leaders' Declaration on Climate Change, Energy Security and Clean Development issued in September 2007. Delivery of this goal can only be achieved through co-operation among the Government, the business sector and the public in general.

Being a service economy without any major energy-intensive industries, electricity generation is the major source of GHG emissions in Hong Kong, accounting for over 60% of the total local emissions. The transport sector is the second largest GHG emission source (16%), followed by waste (12%). Among various end uses of electricity, buildings account for some 89% in Hong Kong. Therefore, reducing electricity consumption for building operations is instrumental in bringing down our GHG emissions. It will also have the co-benefits of reducing operational costs and improving the local and regional air quality.

In order to assist the users and managers of buildings to improve their awareness of GHG emissions, measure their GHG emission performance and actively participate in actions to combat climate change; the Government has prepared this set of guidelines (the Guidelines) to provide a systematic and scientific approach to account for and report on the GHG emissions and removals from buildings in Hong Kong. The Guidelines are applicable to buildings which are entirely used for commercial or residential purposes. They are also applicable to most of the buildings used for institutional purposes, which include schools, universities, community centres, sports complexes, etc. They may, however, not be applicable to buildings for industrial or other special purposes because of the complexities of GHG emitting processes in these buildings.

With the help of the Guidelines, the users and managers of buildings can measure their GHG performance, identify areas of improvement and conduct voluntary programmes to reduce

and / or offset emissions arising from buildings according to the organizational or business goals.

II Principles and Applicability

Accounting for and reporting on GHG emissions and removals from activities are similar to the financial accounting and reporting exercises that many business entities are familiar with. The users and / or managers of buildings (the reporting entity) should apply the Guidelines based on the following principles to ensure the GHG emissions and removals reported are true and fair representation of the GHG performance of the concerned buildings.

Relevance

The reporting entity should ensure that the boundaries, information, data, assumptions and methodologies selected for compiling the GHG inventory can appropriately reflect the GHG emission status of the buildings concerned and serve the needs of the internal and external users.

Completeness

The reporting entity should account for and report all GHG emissions and removals within the chosen physical and operational boundaries. Specific exclusions should be disclosed and justified.

Consistency

The reporting entity should use consistent methodologies to allow meaningful comparisons in the GHG-related information including the trends of emissions over time. Any changes to the boundaries, information, data, assumptions and methodologies over time should be clearly reported.

Accuracy

The reporting entity should ensure that any bias and uncertainties in quantifying GHG emissions and removals are minimized as far as practicable.

Transparency

The reporting entity should disclose sufficient and appropriate information, including assumptions and references, to allow the users of the report to arrive at conclusions / decisions with reasonable confidence.

The Guidelines are intended primarily to be applied to buildings in Hong Kong which are

entirely used for commercial (including offices, retails, restaurants, hostels and hotels) and / or residential purposes. The Guidelines can also be applied to buildings used for institutional purposes such as schools / universities, community centres, sports complexes, etc. However, care should be taken when the Guidelines are applied to buildings which have GHG emitting activities not commonly found in normal office or residential environment. The simplified quantification methodologies and conversion factors in the Guidelines are not intended to be used for activities associated with industrial buildings and / or buildings for special purposes because of the complexities of GHG emitting processes in these buildings.

While there are a certain number of gases found to have effects on our climate systems, the Guidelines only cover the six types of GHG, viz carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6), included in the Kyoto Protocol to the United Nations Framework Convention on Climate Change. Since SF_6 is not commonly found in normal operations of building types covered by the Guidelines, no quantification methodology related to SF6 is provided in the Guidelines.

While the Guidelines are designed for self-assessment and self-reporting, the reporting entity may employ third party to conduct the accounting process and to report on the GHG performance for its buildings. The reporting entity (and its agent) may apply the Guidelines to prepare a report on the GHG performance of its buildings by taking the following steps-

1. to determine the physical boundaries of the report (see part III for details);
2. to determine the operational boundaries of the report (see part IV for details);
3. to determine the reporting period (usually the reporting period will be one year in length to match other accounting cycle);
4. to collect necessary data and information and to quantify the GHG performance (see part V for details); and
5. to prepare the report (see part VI for details).

III Physical Boundaries

The physical boundaries of the accounting and reporting process usually match the site boundaries of the building concerned.

However, the reporting entity may choose to report GHG emissions and removals for a group of buildings collectively if these buildings are adjoining one another and / or sharing some centrally provided services.

The reporting entity is encouraged to report on the whole building concerned in totality as far as practicable. However, the reporting entity may elect to exclude specific parts of the building in the accounting and reporting process because there are real difficulties in collecting necessary information with respect to these parts. In such cases, the reporting entity should separately cover GHG emissions and removals of the communal areas of the building (including centrally provided services and facilities such as central air conditioning, car parks, etc.) as well as other parts of the building which it has access to reliable data and information.

The reporting entity is required to give details in the report on the areas, services, facilities covered and excluded in the accounting process as well as the basis of allocating emissions / removals.

IV Operational Boundaries

The reporting entity shall determine the operational boundaries of its accounting and reporting process. This comprises identification of those operational activities which will result in GHG emissions or removals, classification of these activities into direct and indirect emissions, and determining the scopes of accounting and reporting for indirect emissions. The reporting entity shall document the operational boundaries and shall explain any change or deviation from those adopted in the past.

Emissions (direct and indirect) and removals in relation to the buildings can be broadly classified into three separate scopes as below-

- Scope 1 – direct emissions and removals;
- Scope 2 – energy indirect emissions; and
- Scope 3 – other indirect emissions.

Scope 1 – Direct emissions from sources and removals by sinks

The reporting entity shall quantify and report GHG emissions from sources and removals by sinks it controls within the physical boundary of the building concerned. Scope 1 emissions and removals are principally resulted from the following activities-

- Combustion of fuels in stationary sources (excluding electrical equipment) to generate electricity, heat, or steam. For example: electricity generators, boilers, gas cooking stoves, etc.

- Combustion of fuels in mobile sources (e.g. motor vehicles and ships) controlled by the reporting entity and dedicated to the building concerned to transport materials, products, waste and employees to and / or from the building concerned or used within the physical boundary of the building.[1] For example, the commuter shuttle bus services operated for the building.

- Intentional or unintentional GHG releases from equipment and systems. For example: HFCs and PFCs emissions during the use of refrigeration and air conditioning equipment and other fugitive emissions.

- Assimilation of CO_2 into biomass through e.g. planting of trees in addition to those already in existence before the operation of the concerned building.

- Any other physical and chemical processing in the physical boundary which will emit or remove GHG. For example, on-site waste or sewage processing facilities in the building.

Scope 2 – Energy indirect emissions

The reporting entity shall quantify and report GHG emissions from the generation of purchased electricity and / or Towngas that is consumed by its controlled equipment or its operations within the physical building boundary. Scope 2 emissions include-

- Electricity purchased from power companies.

- Towngas purchased from The Hong Kong and China Gas Company (Towngas).

Scope 3 – Other indirect emissions (Optional for reporting purposes)

The reporting entity may choose, with quantification methodologies and necessary input information used being well-defined and easily available to the reporting entity, to quantify and report other indirect GHG emissions that are relevant to their activities and goals. While reporting on such indirect emissions is optional on the part of the reporting entity, the latter is encouraged to collect information relevant to the following areas where simple quantification methodologies have been developed for Hong Kong situation, and to quantify and report under Scope 3 GHG emissions-

- Methane gas generation at landfill in Hong Kong due to disposal of paper waste.

[1] Mobile sources controlled by users of the concerned building dedicated for particular employees/groups of employees working in the buildings are not included under Scope 1. However, the reporting entity may choose to report these under Scope 3 as transport for employees.

- GHG emissions due to electricity used for fresh water processing by Water Services Department.

- GHG emissions due to electricity used for sewage processing by Drainage Services Department (if the sewage collected within physical boundary is treated by the Drainage Services Department).

Other examples of GHG emissions that the reporting entity may consider to quantify and to report on include, but not limited to, emissions arising from the following activities-

- Extraction and production of purchased materials and fuels for sources covered in Scope 1 or for generation of electricity / Towngas gas covered in Scope 2.

- Transportation of purchased materials or goods, fuels, products, waste, employees, occupants and guests, to and from the concerned buildings (other than those covered under Scope 1).

- Business travel by employees.

- Emissions from outsourced activities or other contractual arrangements.

- Use of sold products and services.

- Waste disposal other than those covered in the above list.

Links with International Emissions Reporting Framework

Scopes of emissions (direct and indirect) and removals mentioned in the Guidelines are defined in accordance with the international reporting framework published by the World Resources Institute (WRI) / World Business Council for Sustainable Development (WBCSD), as reported in *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard* and International Organization for Standardization (ISO), as reported in ISO14064-1.

V Quantification Methodologies

The reporting entity shall select and use quantification methodologies to separately quantify the GHG emissions and removals on a gas-by-gas basis for each activity covered in Scope 1 and 2, and as an option, for each activity covered in Scope 3 it chooses to report on.

Simplified quantification approaches together with the corresponding conversion factors, working procedures and worksheets for activities commonly found in buildings are provided in **Annex A** to assist the reporting entity to quantify the emissions and removals. The reporting entity, however, may employ quantification methodologies other than those provided in the Annex if such methodologies are well-documented and will reasonably minimize uncertainty and yield accurate, consistent and reproducible results.

The reporting entity shall explain any change of quantification methodologies as appropriate.

VI Reporting Emissions and Removals

The reporting entity shall prepare a report on its GHG emissions and removals to inform internal or external users. The reporting entity shall determine whether to disseminate the report for public consumption.

Required Information

The reporting entity should ensure that the following information is included in the report-

Description of the Reporting Entity and Operations of the Building(s)

- description of the reporting entity (e.g. the property management company of the reporting building) and the chosen physical boundary;
- an outline of the physical boundary chosen;
- description of the types of areas within the reported building;
- reporting period with its start date and end date;
- an outline of the operational boundaries. When Scope 3 emissions are included, a list of activities that are covered should be given;
- any specific exclusion of sources and / or operations under Scopes 1 and 2;
- contact person of the reporting entity; and
- sources of data collected (e.g. electricity, gas and water bills).

Information on GHG Emissions and Removals

- total emissions for Scope 1 and Scope 2 operations (in tonnes of CO_2 equivalent);
- emissions data for each separate scope and for each type of GHGs (in tonnes of CO_2 equivalent);
- total GHG removals from Scope 1 operations, in tonnes of CO_2 equivalent;
- methodologies used to quantify emissions and removals of GHG, including any methodologies changes since the last report of emissions and removals; and

- changes in GHG emissions and removals since the last report over time, including any recalculations to previously reported emissions and removals.

Information on GHG Offsets / Programmes

- description of performance measured against internal and external benchmark, if any;
- scopes and areas that have been identified to improve GHG performance;
- description of on-site GHG offsets to compensate GHG emissions by the provisions of renewable energy sources within the physical boundary; and
- description of on-site GHG programme(s) to reduce GHG emissions and / or to increase GHG removals within the physical boundary.

Optional information

The reporting entity is encouraged to provide the following information in the report-

- emissions data from Scope 3 operations;
- emissions data further divided by sources types (stationary, mobile, purchased electricity, purchased gases), activity types (office, community / institutional uses, retails, restaurants, other special purposes), etc. in order to improve the transparency of the reported information;
- off-site offsetting activities (e.g. the use of renewable energy sources) to compensate the emissions within the physical boundary with the information further subdivided by location (within and outside Hong Kong);
- goals and / or timeframe of the GHG emission reduction programme;
- programmes to collect necessary, reliable information to expand reporting of emissions from Scope 3 operations;
- programmes to improve GHG performance of service providers and / or clients of the reporting entity (see **Annex C** for some carbon reduction tips);
- any verification activities carried out by the reporting entity and / or an independent verifier to review the information contained in the report; and
- discussion in relation to the uncertainty analysis on the reported GHG data.

Use of Ratio Indicators

If the reporting entity uses ratio indicators, i.e. quantified GHG emissions and removals normalized by certain operational measuring units such as GHG emissions per floor area or GHG emissions per employee, to organize its activities to reduce emissions, these indicators should also be reported with clear description of the normalization process used. If “floor area” is chosen to be the basis for such indicators, construction floor area (CFA) is recommended to provide consistency among different reports.

A sample for reporting the accounting exercise is attached at Annex B for reference.

VII Contact for Enquiry

For further enquiry on the Guidelines, please feel free to contact

Cross-boundary & International Group Environmental Protection Department, Hong Kong	or	Energy Efficiency Office Electrical and Mechanical Services Department
Tel: (852) 2594 6134 Fax: (852) 2838 2155 Address: Environmental Protection Department 33/F, Revenue Tower, 5 Gloucester Road, Wanchai, Hong Kong Website: www.epd.gov.hk		Tel: (852) 2808 3465 Fax: (852) 2890 6081 Address: Electrical and Mechanical Services Department, 3 Kai Shing Street, Kowloon, Hong Kong Website www.emsd.gov.hk

VIII Information Sources and References

The principal sources of information used in developing the Guidelines are-

(a) World Resources Institute and World Business Council for Sustainable Development (WRI / WBCSD). (2004), *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (revised edition)*, WRI / WBCSD. Copyright remains with WRI / WBCSD. More information is available at website: http://www.ghgprotocol.org

(b) ISO (2006), *International Standard on Greenhouse Gases- Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*, (ISO 14064-1), International Standard Organization. Copyright remains with ISO.

Annex A

Simplified Quantification Approaches and Working Procedures

Scope 1 Direct Emissions and Removals

(i) GHG Emissions from Stationary Combustion Sources

Introduction

The combustion process is defined by the rapid oxidation of substances (i.e. fuels) with the release of thermal energy (i.e. heat). Stationary combustion activities emit direct greenhouse gases (GHG) such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) as well as ambient air pollutions. Emission of these gases from stationary combustion sources depend upon fuel characteristics, size along with combustion technology. Emissions also vary with operation and maintenance practices. This guidance only addresses direct emissions of the following types of GHG, i.e., CO_2, CH_4 and N_2O.

Definitions

Most stationary combustion devices can be classified into one of the following categories-

- Boilers
- Burners
- Turbines
- Heaters
- Furnaces
- Ovens
- Dryers
- Internal Combustion Engines (e.g. Emergency Electricity Generator)
- Any other equipment or machinery that combusts carbon bearing fuels or waste streams.

It should be noted that non-combustion type electrical equivalent should not be counted for calculation.

Within the physical boundary, multiple combustion units may be operated. Emissions from all combustion units located within the physical boundary which are managed or controlled by the reporting entity should be included in the GHG inventory.

Description of Approach and Procedure

A fuel-based approach will be applied to calculate GHG emissions. The approach typically

requires the collection of activity data, in the form of the type and quantity of fuel consumed for combustion purposes.

In order to calculate CO_2 emissions using fuel type, fuel consumption and emission factor data, the following equations can be applied:

Emission (CO_2) = ∑ Amount of Fuel Consumed x Emission Factor of CO_2
where
Emission, in terms of tonnes of CO_2 -equivalent, is summed over all types of fuel used;
Amount of fuel consumed is in terms of volume (e.g. litre) or mass (e.g. kg) for particular fuel; and
Emission Factor of CO_2 = Net Calorific Value of the Fuel x Carbon Factor of Fuel x Fraction of Carbon Oxidised x (44 / 12)

To calculate CH_4 and N_2O emissions, the equation below can be applied:

Emission (CH_4 / N_2O) = ∑ Amount of Fuel Consumed x Emission Factor of (CH_4 / N_2O) x Relative GWP
where
Emission, in terms of tonnes of CO_2-equivalent, is summed over all types of fuel used;
Amount of fuel consumed is in terms of volume (e.g. litre) or mass (e.g. kg) for particular fuel;
Emission Factor of (CH_4 / N_2O) = Net Calorific Value of the Fuel x Specific (CH_4 / N_2O) Conversion Factor; and
Relative GWP = Relative Global Warming Potential (GWP) of CH_4 / N_2O

To apply the equation, the following steps should be taken
Step 1
Collect data on the quantity of fuel consumed on volume / weight basis. These data can be based on fuel receipts, purchase records or metering of the amount of fuel entering the combustion device of the reporting period.

Step 2
Check to ensure that all units are consistent.

Step 3
Estimate GHG emissions by multiplying the amount of fuel use by the relative emission factor and the corresponding relative GWP.

Activity data, in the form of the type and quantity of fuel consumed, is the key input parameter to calculation-based methods. It is the one data variable that is completely dependent on the reporting entity to collect because no default values are possible. All activity data are therefore required to be in good record keeping by the reporting entity.

A sample reporting format and tables on emission factors are in Tables 1, 1-1, 1-2, 1-3 for reference.

Documentation and archiving

In order to ensure that the quantification process is transparent and verifiable, information and data should be documented. All raw data used to estimate emissions should also be archived for a reasonable period of time. The following information is recommended to be documented for stationary combustion emission estimates-

- Description of the physical boundary
- Description of the type of stationary sources carried out that result in GHG emissions
- Description of fuel consumed by each activity related to GHG emissions
- Description and list of metering or monitoring devices for each source
- Description of any cases of missing data for fuel based methods and the steps taken to approximate and / or replace missing data
- Description of management procedures implemented to ensure quality of the quantification process
- Discussion of the likely causes of uncertainty (statistical and systematic bias) and available data on the precision of measurement instrumentation or calibration errors.
- Description of steps taken to deal with confidential business information

Special Note: Direct Emissions from Stationary Combustion Sources Using Towngas

GHG emissions due to combustion of Towngas at stationary sources are required to be quantified and reported separately under Scope 1 (as direct emissions within the physical boundary) and Scope 2 (as indirect emissions outside the physical boundary due to generation and transportation of Towngas from the production plant to the building of concern).

Reference

Michael Gillenwater, Environmental Resources Trust (2005), *Calculation Tool for Direct Emissions from Stationary Combustion*, World Resources and World Business Council for Sustainable Development (WRI / WBCSD). Copyright remains with WRI / WBCSD. More information is available at website: http://www.ghgprotocol.org

(ii) GHG Emissions from Mobile Combustion Sources

Introduction

The following categories of mobile sources are covered:

- Road transport
- Air transport
- Water transport

Emissions from all mobile sources which serve within the physical building boundary, and mobile sources dedicated to provide transportation services for the concerned building (e.g. shuttle bus services provided by the building) should be included in the GHG inventory. The electricity purchased to operate the concerned mobile sources should be reported as energy indirect emissions under Scope 2 in the Guidelines.

Description of Approach and Procedure

As fuel consumption data will usually be available from fuel receipts or other purchase records, a fuel-based method is applied to calculate GHG emissions. The following equation outlines the recommended approach to calculating GHG emissions based on fuel use.

Emission (CO_2) = $\sum$ Amount of Fuel Consumed x Emission Factor of CO_2

where

Emission, in terms of tonnes of CO_2-equivalent, is summed over all types of fuel used, all transport modes and vehicle categories;

Amount of fuel consumed is in terms of volume (e.g. litre) for particular fuel, transport mode and vehicle category; and

Emission Factor of CO_2 = Net Calorific Value of the Fuel x Carbon Emission Factor of Fuel x Fraction of Carbon Oxidised x (44 / 12)

To calculate CH_4 and N_2O emissions, the equation below can be applied-

Emission (CH_4 / N_2O) = $\sum$ Amount of Fuel Consumed x Emission Factor of (CH_4 / N_2O) x Relative GWP

where

Emission, in terms of tonnes of CO_2-equivalent, is summed over all types of fuel used, all transport modes and vehicle categories;

Amount of fuel consumed is in terms of volume (e.g. litre) for particular fuel, transport mode and vehicle category;

Emission Factor of (CH_4 / N_2O) = Net Calorific Value of the Fuel x Specific (CH_4 / N_2O)

Conversion Factor; and
Relative GWP = Relative Global Warming Potential (GWP) of CH_4 / N_2O

The calculation requires essentially two main steps-

Step 1: Gather fuel consumption data by fuel type, by vehicle category and by transport mode. Fuel use data can be obtained from several different sources including fuel receipts, financial records on fuel expenditures, or direct measurements of fuel use.

Step 2: Convert fuel estimate to GHG emissions by multiplying results from Step 1 by relative emission factor and corresponding relative GWP.

A sample reporting format and tables on emission factors are in Tables 2, 2-1, 2-2, 2-3 for reference.

Reference

World Resources Institute and World Business Council for Sustainable Development (WRI / WBCSD). (2005), *Calculating CO2 Emissions from Mobile Sources- Guidance to calculation worksheets*, WRI / WBCSD. Copyright remains with WRI / WBCSD. More information is available at website: http://www.ghgprotocol.org

(iii) HFC and PFC Emissions for Refrigeration / Air-conditioning

Introduction

Hydrofluorocarbons (HFC) and perfluorocarbons (PFC), which are commonly used in refrigeration and air conditioning sectors, are GHGs with global warming potentials (GWP) much higher than that of carbon dioxide. Therefore, uncontrolled release of these gases into atmosphere may have significant potential impact on climate change.

Description of Approach and Procedure

The approach below covers only emissions from operating phase of refrigeration / air conditioning system. If reliable data are collected, the reporting entity is encouraged to consider accounting for emissions of HFC / PFC during the assembly / installation as well as the disposal processes which are regarded as Scope 3 emissions in the Guidelines.

This methodology requires data including the type of refrigerant used, the inventory of refrigerant and the amount of refrigerant purchased for each type of equipment. The equation for calculating emissions for operating stage of refrigeration / air-conditioning systems can be summarized as follows-

$$OE = \sum (C_s + C_i - C_d - C_e)_j \times GWP_j$$

where:

OE = Emissions from operation of equipment due to release of refrigerant *j* (in CO_2-equivalent)

C_s = Refrigerant inventory at beginning of the reporting period (in storage, not equipment) (kg)

C_i = Refrigerant added to the inventory during the reporting period (kg)

C_d = Refrigerant disposed of through environmentally responsible means (e.g. collected by contractor for recycling) during the reporting period (kg)

C_e = Refrigerant inventory at end of the reporting period (in storage, not equipment) (kg)

GWP=100-year global warming potential of the refrigerant *j*. Global Warming Potential (GWP) of the corresponding refrigerant can be obtained using Table 3-1.

The calculation requires five main steps-

Step 1: Gather information on the type of refrigerants used and the GHG composition for each refrigerant.

Step 2: Gather data by amount of each refrigerant which is in stock at beginning and end of the reporting period.

Step 3: Gather data by amount of each refrigerant added to the stock during the reporting period.

Step 4: Gather data by amount of each refrigerant disposed of through environmentally responsible means during the reporting period.

Step 5: Convert into GHG emissions by multiplying the amount of each refrigerant escaped / leaked by relevant GWP of its constituent GHGs.

A sample reporting format and tables on GWP of common refrigerants are in Tables 3, 3-1 for reference.

Documentation and archiving

To ensure that quantification process is transparent and verifiable, information and data should be documented by equipment users who maintain their own equipment. For equipment users who have contractors that provide maintenance service on their equipment, reporting entity is recommended to obtain a record from the corresponding contractors.

Special Note: Climate change impact due to the use of hydrochlorofluorocarbons (HCFCs) in refrigeration and air conditioning systems

HCFCs are still commonly found in some refrigeration and air conditioning systems. Although these chemicals have high GWP, they are not listed in Kyoto Protocol to the United Nations Framework Convention on Climate Change as they are in the process of being phased out under Montreal Protocol on Substances that Deplete the Ozone Layer. To make the accounting and reporting system consistent with the Kyoto Protocol, the reporting entity is not required to report the release of HCFCs but is encouraged to report the efforts to reduce the production and consumption as well as to phase out these chemicals in the report.

Reference

World Resources Institute and World Business Council for Sustainable Development (WRI / WBCSD) (2005), *Calculating HFC and PFC Emissions from the Manufacturing, Installation, Operation and Disposal of Refrigeration & Air-conditioning Equipment (Version 1.0) - Guide to calculation worksheets*, WRI / WBCSD. Copyright remains with WRI / WBCSD. More information is available at website: http://www.ghgprotocol.org

(iv) GHG Removals from Newly Planted Trees

Introduction

Planting of trees can help reduce GHG from the atmosphere by assimilating CO_2 in the plant tissues when the trees grow with time. A default figure for the removal potential of each unit of tree is suggested based on Hong Kong's location, woodland types, and estimated density of trees. The figure is applicable to all trees commonly found in Hong Kong which are able to reach at least 5 metres in height. Since this figure is derived as annual average based on an extended period of time corresponding to the life cycle of the trees, the figure is suggested to be applicable to trees at all age unless the concerned trees are intended to be planted for a period significantly shorter than their natural life cycles.

However, the removal potentials of trees varied according to tree species, climate zones, management approach, etc. The reporting entity is encouraged to estimate the removal potentials based on recognized approach such as those provided by Intergovernmental Panel on Climate Change and reliable information.

Description of Approach and Procedure

The basic equation is as follows-

CO_2 removed by trees in one year = net number of additional trees planted since the concerned building is constructed x Removal Factor (estimated at 23kg / tree).

The calculation of GHG removals requires two main steps-

Step 1:
Gather data of the net number of plants **newly planted** within the physical boundary after the beginning stage of construction, or in cases when no reliable record is available for the pre-construction status, the net number of newly planted trees recorded since the operation of the building of concern.

Step 2: Convert CO_2 removals by multiplying the data at Step 1 by the removal factor.

Note: Reporting entity should make reference to internationally recognized methodology for specific calculation of removal factors for different tree species if reporting entity can gather sufficient reliable information.

A sample reporting format is in Table 4 for reference.

Reference

Intergovernmental Panel on Climate Change (IPCC) National Greenhouse Gas Inventories Programme (1996), *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 5: Land Use and Forestry,* IPCC.

Scope 2 Energy Indirect Emissions

(v) Energy Indirect GHG Emissions due to Electricity and Towngas Purchased

Introduction

Electricity is produced when fossil fuels are burned in stationary combustion units or when other fuel sources (e.g. natural gas, nuclear, wind, etc.) are consumed to produce energy. Towngas is produced from naphtha, landfill gases and natural gas.

While GHG emissions that result from the purchased electricity and Towngas are physically emitted at off-site facilities where the electricity and Towngas are converted from their fuels and raw materials, the emissions are still a consequence of the activities of the consumer that purchases the energy. Therefore, GHG emissions from the consumption of purchased energy are considered to be "indirect" emissions as they are the indirect consequence of purchase and consumption of electricity and Towngas.

Description of Approach and Procedure

Indirect GHG emissions from the consumption of purchased electricity / Towngas can be estimated by the equation-

GHG Emission = Quantity of purchased electricity / Towngas x Emission Factor

where

purchased electricity is measured in kilowatt-hours (kWh) and Towngas is charged in unit (i.e. 1 unit registered by the gas meter = 48 megajoules (MJ) consumed).

The calculation requires 3 main steps-

Step 1: Determine the facility (e.g. area that the meter covers) involved in the report.

Step 2: Collect the amount of electricity / Towngas consumed for the facility mentioned.

Step 3: Calculate the emissions by filling in Tables 5 and 6.

Emission Factors[Note]

The reporting entity is required to account for GHG emissions associated with the electricity purchased in Hong Kong based on two emission factors. First, the reporting entity will quantify the emissions based on a territory-wide default value of **0.7kg / kWh**. Second, the

reporting entity will quantify the emissions based on specific emission factors provided by its respective provider of electricity. In case that the specific emission factor for the reporting period is not available at the time of accounting, the latest specific emission factor from the power company may be used as an approximation. These specific emission factors are available from the power companies' websites.

For purchased Towngas, the emission factor may be obtained from the public information provided by the Towngas company. In case that the emission factor for the reporting period is not available at the time of accounting, the latest emission factor from the Towngas company may be used as an approximation.

Sample reporting formats are in Tables 5 and 6 for reference.

Note:
For the emission factors of the power companies, more information is available at websites:
China Light & Power Company Limited (CLP group): https://www.clpgroup.com
Hong kong Electric Holdings Limited (HEC): http://www.hec.com.hk
The emission factor of The Hong Kong and China Gas Company (Towngas) is available in the Annual report issued by the company. More information is available at website: http://www.hkcg.com/

Reference

References to power companies' and gas company's websites/ reports
World Resources Institute and World Business Council for Sustainable Development (WRI / WBCSD). (2007), *Indirect CO_2 Emissions from the Consumption of Purchased Electricity, Heat, and / or Steam- Guide to calculation worksheets v1.2*, WRI / WBCSD. Copyright remains with WRI / WBCSD. More information is available at website: http://www.ghgprotocol.org

Scope 3 Other Indirect Emissions

Introduction

Apart from Scope 1 and Scope 2 emissions, reporting entity may choose to quantify and report other kinds of indirect GHG emissions that are applicable in Hong Kong. Simplified approaches for the following areas are developed for the reporting entity to consider-

- Methane gas generation at landfill in Hong Kong due to disposal of paper waste.

- GHG emissions due to electricity used for fresh water processing by Water Supplies Department.

- GHG emissions due to electricity used for sewage processing by Drainage Services Department (if the sewage collected within physical boundary is treated by Government department).

(vi) GHG Emissions from Paper Waste Disposed at Landfills

Description of Approach and Procedure

GHG, mainly methane (CH_4), are generated from decomposition of organic carbon content of paper waste at landfills. While such emissions from landfills will usually continue over a long period of time, most of them are generated in the first few years after disposal. For simplifying the accounting process, the suggested calculation method assumes that the **total raw amount** of CH_4 emitted (i.e. the amount generated without taking into consideration of collection, recovery and utilization of landfill gas due to the management practices at landfills) throughout the whole decomposition process of the paper waste disposed at landfills will be emitted into the atmosphere within the same reporting period as paper waste collected.

The methodology requires data including the inventory of paper (kg), the amount of paper purchased (kg) and the amount of paper recycled (kg). It is assumed in the Guidelines that all paper (i.e. paper which is stored or purchased within the organization boundary) will eventually be disposed at landfills unless collected and recycled. The equation for calculating emissions for operating process can be summarized as follows-

$E = (P_s + P_i - P_r - P_e)$ x Emission Factor (estimated at 4.8 kg CO_2-e / kg)

where

E = Emissions from paper waste disposed at landfills

P_s = Paper inventory at the beginning of the reporting period (in storage) (kg)

P_i = Paper added to the inventory during the reporting period (kg)
P_r = Paper collected for recycling purpose (kg)
P_e = Paper inventory at the end of the reporting period (in storage) (kg)

The suggested calculation method of GHG emissions result from paper waste disposed at landfills in Hong Kong requires four main steps-

Step 1: Gather data by amount of paper which is in stock at beginning and end of the reporting period.

Step 2: Gather data by amount of paper purchased during the reporting period.

Step 3: Gather data by amount of paper disposed of through environmentally responsible ways (e.g. through collection of recycler) during the reporting period.

Step 4: Convert into GHG emissions by multiplying the net amount of paper consumed (i.e. the sum of amount collected in Steps 1 and 2 minus that in Step 3) by the emission factor which takes into account the carbon content of the paper waste and the GWP of CH_4.

A sample reporting format is in Table 7 for reference.

Reporting entity is encouraged to use more elaborated accounting method based on established internationally recognized approaches if the reporting entity maintains a good database on the necessary raw information.

Special Note: Reporting the GHG avoided by recycling waste paper
In case that the reporting entity can only collect information on the amount of waste paper recycled, he is encouraged to quantify the amount of GHG avoided by multiplying the amount of waste paper recycled with the emission factor above and to report the amount as part of the off-site GHG emission reduction efforts.

Reference
Intergovernmental Panel on Climate Change (IPCC) National Greenhouse Gas Inventories Programme (1996), *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter6: Waste,* IPCC.

(vii) GHG Emissions due to Electricity Used for Processing Fresh Water and Sewage by Government Departments

Description of Approach and Procedure

The calculation takes into account the indirect GHG emissions due to electricity used for processing fresh water by Water Supplies Department and sewage by Drainage Services Department in departments' fresh water / sewage treatment plants. The calculation requires two main steps-

Step 1: Gather water consumption data from water supply bill.

Step 2: Convert to GHG emissions by multiplying the amount of water consumed by relevant emission factor.

Sample reporting formats are in Tables 8 and 9 for reference.

Reference:

Drainage Services Department (DSD) (2007), *DSD Environmental Performance Report 2006*, DSD. More information is available at website: http://www.dsd.gov.hk

Water Services Department (WSD) (2007), *Annual Report – Water Supplies Department 2006-2007, WSD.* More information is available at website: http://www.wsd.gov.hk

(viii) Emissions / Removals not Covered in Previous Parts

If the reporting entity possesses necessary information to quantify GHG emissions / removals which are not covered in the Guidelines, it is encouraged to quantify and report them by making use of internationally recognized quantification approaches.

Table 1: GHG Emissions from Stationary Sources

Step 1	Step 2			Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
A	B	C	D	E	F	G	H	I	J
Source description with location (e.g. boilers, furnaces, ovens, and emergency electricity generator etc.)	Fuel Information			CO_2 emission factor [Note 2]	CO_2 emissions in tonnes of CO_2 equivalent ((BxE) / 1000)	CH_4 emission factor [Note 3]	CH_4 emissions in tonnes of CO_2 equivalent ((BxG) / (1000x1000) x GWP [Note 4])	N_2O emission factor [Note 3]	N_2O emissions in tonnes of CO_2 equivalent (BxI) / (1000x1000) x GWP [Note 4])
	Fuel used		Fuel type [Note 2]						
	Amount	Unit [Note 1]							
Total									

Please insert more rows as necessary

IMPORTANT: Combustion of Towngas from stationary sources should also be reported in Table 1 (refer to Tables 1-1 to 1-3 for the emission factors) as it falls into the category of direct emissions. Indirect emission of purchased Towngas should be calculated in Table 5.

Note 1: Select the appropriate fuel unit

Note 2: Select the appropriate fuel type and the corresponding emission factor (from Table 1-1) for calculation

Note 3: Refer to Table 1-2 for calculating CH_4 emissions and Table 1-3 for N_2O emissions.

Note 4: Global Warming Potential (GWP) of CH_4 is 21 while it is 310 for N_2O

Emission Factors for Stationary Combustion Sources

Table 1-1 CO_2 Emission factor by fuel type (for stationary combustion sources)

Fuel Type	Emission Factor	Unit
Diesel Oil	2.614	kg/litre
LPG	3.017	kg/kg
Kerosene	2.429	kg/litre
Charcoal	2.970	kg/kg
Towngas	2.549	kg/Unit

Table 1-2 CH_4 Emission factor by fuel type (for stationary combustion sources)

Fuel Type	Emission Factor	Unit
Diesel Oil	0.0239	g/litre
LPG	0.0020	g/kg
Kerosene	0.0241	g/litre
Charcoal	5.5290	g/kg
Towngas	0.0446	g/Unit

Table 1-3 N_2O Emission factor by fuel type (for stationary combustion sources)

Fuel Type	Emission Factor	Unit
Diesel Oil	0.0074	g/litre
LPG	0.0000	g/kg
Kerosene	0.0076	g/litre
Charcoal	0.0276	g/kg
Towngas	0.0099	g/unit

Table 2: GHG Emissions from the Mobile Sources

Step 1	Step 2		Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
A	B	C	D	E	F	G	H	I
Source description *(by different vehicle and fuel types)*	Fuel Information		CO_2 emission factor **Note 1**	CO_2 emissions in tonnes of CO_2 equivalent ((BxD) / 1000)	CH_4 emission factor **Note 2**	CH_4 emissions in tonnes of CO_2 equivalent ((BxF) / (1000x1000) x GWP[Note 4])	N_2O emission factor **Note 3**	N_2O emissions in tonnes of CO_2 equivalent ((BxH) / (1000x1000) x GWP **Note 4**)
	Amount of fuel used (in litres)	Fuel type						
Road Transport								
Navigation								
Aviation								
Total								

Please insert more rows as necessary

Notes for GHG Emissions from Mobile Source

Note 1: Refer to Table 2-1 for CO_2 emission factors for different vehicle and fuel type.

Note 2: Refer to Table 2-2 for CH_4 emission factors for different vehicle and fuel type.

Note 3: Refer to Table 2-3 for N_2O emission factors for different vehicle and fuel type.

Note 4: Global Warming Potential (GWP) of CH_4 is 21 while it is 310 for N_2O.

Emission Factors for Mobile Combustion Sources

Table 2-1 CO_2 Emission factor (For mobile combustion sources)

Fuel Type	Emission Factor	Unit
Diesel Oil (DO)	2.614	kg/litre
Unleaded Petrol (ULP)	2.360	kg/litre
Liquefied Petroleum Gas (LPG)	1.679	kg/litre
	3.017	kg/kg
Gas Oil (For Ships only)	2.645	kg/litre
Kerosene (Including Jet Kerosene)	2.429	kg/litre

Table 2-2 CH_4 Emission factor (For mobile combustion sources)

Vehicle Type	Fuel Type	Emission Factor	Unit
Motorcycle	ULP	1.422	g/litre
Passenger Car	ULP	0.253	g/litre
	DO	0.072	g/litre
Private Van	ULP	0.203	g/litre
	DO	0.072	g/litre
	LPG	0.248	g/litre
Public Light Bus	DO	0.072	g/litre
	LPG	0.248	g/litre
Light Goods Vehicle	ULP	0.203	g/litre
	DO	0.072	g/litre
Heavy Goods Vehicle	DO	0.145	g/litre
Medium Goods Vehicle	DO	0.145	g/litre
Ships	Gas Oil	0.146	g/litre
Aviation	Jet Kerosene	0.069	g/litre
Other Mobile Machinery	DO	0.0239	g/litre
	LPG	0.0036	g/litre
		0.006	g/kg
	Kerosene	0.0241	g/litre

Table 2-3 N_2O Emission factor (For mobile combustion sources)

Vehicle Type	Fuel Type	Emission Factor	Unit
Motorcycle	ULP	0.046	g/litre
Passenger Car	ULP	1.105	g/litre
	DO	0.110	g/litre
Private Van	ULP	1.140	g/litre

Vehicle Type	Fuel Type	Emission Factor	Unit
	DO	0.506	g/litre
	LPG	0.000	g/litre
Public Light Bus	DO	0.506	g/litre
	LPG	0.000	g/litre
Light Goods Vehicle	ULP	1.105	g/litre
	DO	0.506	g/litre
Heavy Goods Vehicle	DO	0.072	g/litre
Medium Goods Vehicle	DO	0.072	g/litre
Ships	Gas Oil	1.095	g/litre
Aviation	Jet Kerosene	0.000	g/litre
Other Mobile Machinery	DO	0.007	g/litre
	LPG	0.000	g/litre or g/kg
	Kerosene	0.0076	g/litre

Table 3: HFC and PFC Emissions from Refrigeration / Air-conditioning Equipment (Operation Process)

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
A	B	C	D	E	F	G
Type of refrigerant **Note 1**	Amount of HFC / PFC at the beginning of the reporting period (kg)	Amount of HFC / PFC purchased during the reporting period (kg)	Amount of HFC / PFC disposed (through environmentally responsible means) during the reporting period (kg)	Amount of HFC / PFC at the end of the reporting period (kg)	GWP of refrigerant **Note 2**	HFC / PFC emissions in tonnes of CO_2 equivalent ((B + C - D - E) x F / 1000)
Total						

Please insert more rows as necessary.

Note 1: Enter the type of refrigerant of the equipment

Note 2: Refer to Table 3-1 for the Global Warming Potential (GWP) of the corresponding refrigerant

Table 3-1 Global Warming Potentials (GWP) of Common Refrigeration / Air-Conditioning Refrigerants [Note 1]

Gas or Blend	GWP	Information Source [Note 2]
HFC-23	11,700	A
HFC-32	650	A
HFC-125	2,800	A
HFC-134a	1,300	A
HFC-143a	3,800	A
HFC-152a	140	A
HFC-236fa	6,300	A
R-401A	18	B
R-401B	15	B
R-401C	21	B
R-402A	1,680	B
R-402B	1,064	B
R-403A	1,400	B
R-403B	2,730	B
R-404A	3,260	B
R-406A	0	B
R-407A	1,770	B
R-407B	2,285	B
R-407C	1,526	B
R-407D	1,428	B
R-407E	1,363	B
R-408A	1,944	B
R-409A	0	B
R-409B	0	B
R-410A	1,725	B
R-410B	1,833	B
R-411A	15	B
R-411B	4	B
R-412A	350	B
R-413A	1,774	B
R-414A	0	B
R-414B	0	B
R-415A	25	B
R-415B	105	B

Gas or Blend	GWP	Information Source [Note 2]
R-416A	767	B
R-417A	1,955	B
R-418A	4	B
R-419A	2,403	B
R-420A	1,144	B
R-500	37	B
R-501	0	B
R-502	0	B
R-503	4,692	B
R-504	313	B
R-505	0	B
R-506	0	B
R-507 or R-507A	3,300	B
R-508A	10,175	B
R-508B	10,350	B
R-509 or R-509A	3,920	B
PFC-116 (C_2F_6)	9,200	A
PFC-14 (CF_4)	6,500	A

Note 1: Refrigerants, with components other than HFCs and PFCs, have been well-recognized to have effects on our climate systems. Nevertheless, the Guidelines only cover those which are in the group of Kyoto protocol recognized gases (CO_2, CH_4, HFC, PFC, SF_6 and N_2O). Hence, in the Guidelines, GWPs of all refrigerants other than HFCs and PFCs are considered to be zero.

Note 2: Information sources:

A: IPCC Second Assessment Report (1995)

B: "World Resources Institute (2005), *Calculating HFC and PFC Emissions from the Manufacturing, Installation, Operation and Disposal of Refrigeration & Air-conditioning Equipment (Version 1.0) - Guide to calculation worksheets*, World Business Council for Sustainable Development", in which the latter states that the source of reference is from ASHRAE Standard 34.

Table 4: Direct GHG Removals from Newly Planted Trees

Step 1	Step 2	Step 3	Step 4	Step 5
A	B	C	D	E
Source description (Location of the trees planted)	No. of trees planted (unit)	No. of trees removed (unit)	CO_2 removal factor [Note] (kg / unit / year)	CO_2 removals in tonnes of CO_2 equivalent ((B-C) x D / 1000 x length of reporting period (in years))
			23	
Total				

Please insert more rows as necessary

Note: The default figure for the removal potential of each unit of tree is suggested based on Hong Kong's location, woodland types, and estimated density of trees. The figure is applicable to all trees commonly found in Hong Kong which are able to reach at least 5 metres in height.

Table 5: GHG Emissions from Electricity Purchased from Power Companies

Step 1	Step 2	Step 3		Step 4	
A	B	C [Note]		D	
Facility / source description (i.e. Area / facilities the electricity bill is reporting)	Amount of electricity purchased (in kWh)	Emission factor (kg / kWh)		Indirect GHG emissions in tonnes of CO_2 equivalent (B x C / 1000)	
		Power company - specific	Territory-wide default value	Power company - specific	Territory-wide default value
Total					

Please insert more rows as necessary

Note : The reporting entity is required to account for GHG emissions associated with the electricity purchased in Hong Kong based on two emission factors. First, the reporting entity will quantify the emissions based on a territory-wide default value of **0.7kg / kWh**. Second, the reporting entity will quantify the emissions based on specific emission factors provided by its respective provider of electricity. In case that the specific emission factor for the reporting period is not available at the time of accounting, the latest specific emission factor from the power company may be used as an approximation. These specific emission factors are available from the power companies' websites. For reference, the table below indicates the emission factors of the two power companies in Hong Kong for the past 6 years.

GHG Emission Factor for Different Power Companies in Hong Kong (in kg CO_2-e / kWh)

Power company	2002	2003	2004	2005	2006	2007	2008
CLP[#]	0.48	0.56	0.53	0.52	0.53	0.57	0.54
HEC[*]	0.96	0.98	0.98	0.92	0.91	0.83	0.84

Emission factors for CLP were derived from information in *CLP Holdings Annual Report* and *CLP's Key Performance Statistics.*

* Emission factors for HEC were derived from information in *HEC's Environment, Quality, Health and Safety Report* and HEC's website.

Table 6: GHG Emissions from Towngas Purchased from the Hong Kong and China Gas Company (Towngas)

Step 1	Step 2	Step 3	Step 4
A	B	C	D
Facility / source description(i.e. Area / facilities the Towngas bill is reporting)	Amount of Towngas purchased (Unit [Note])	Emission factor (kg / Unit)	Indirect GHG emissions in tonnes of CO_2 equivalent (B x C / 1,000)
Total			

Please insert more rows as necessary

Note : Each unit registered by gas meter represents that the town gas with a heat value of 48 MJ. Based on the information from the Hong Kong and China Gas Company, the emission factors for the past three years were derived as below. This factor only accounts for the emissions during the production of Towngas within the company. Reporting entity should report in Table 1 as well the GHG emissions associated with combustion of Towngas within the physical boundary under Scope 1

In case that the emission factor for the reporting period is not available at the time of accounting, the latest emission factor from the Towngas company may be used as an approximation.

GHG Emission Factor (in kg CO_2-e / Unit of Towngas purchased)

Year	2005	2006	2007	2008
Emission Factor	0.735	0.693	0.592	0.593

Table 7: Methane Generation at Landfill in Hong Kong due to Disposal of Paper Waste

Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
A	B	C	D	E	F	G
Source description (i.e. Area / floor)	Amount of paper in storage at the beginning of the reporting period (kg)	Amount of paper purchased during the reporting period (kg)	Amount of paper collected for recycling during the reporting period (kg)	Amount of paper in storage at the end of the reporting period (kg)	Emission factor (kg CO_2-e / kg of waste) **Note**	Indirect emissions in tonnes of CO_2 equivalent ((B + C - D - E) x F / 1000)
					4.8	
Total						

Please insert more rows as necessary

Note: For simplifying the accounting process, the default emission factor assumes that the **total raw amount** of CH_4 emitted throughout the whole decomposition process of the paper waste disposed at landfills will be emitted into the atmosphere within the same reporting period as paper waste collected. In addition, the default value does not take into account the reduction in emission due to collection, recovery and utilization of landfill gas due to the management practices at landfills.

Table 8: GHG Emissions due to Electricity Used for Fresh Water Processing by Water Supplies Department

Step 1	Step 2	Step 3	Step 4
A	B	C	D
Source description (i.e. Area / facilities the water service bill is reporting)	Amount of water consumed as listed on the water service bill (m^3)	Emission factor (kg / m^3)**Note**	Emissions in tonnes of CO_2 equivalent (B x C / 1000)
Total			

Please insert more rows as necessary

Note: Emission factor of GHG emissions due to electricity used for processing fresh water = Unit electricity consumption of fresh water (from WSD) x Territory-wide default value (i.e. 0.7kg / kWh) of purchased electricity provided in Table 5.

In case that the unit electricity consumption for processing fresh water for the reporting period is not available at the time of accounting, the latest emission factor from table below may be used as an approximation.

GHG Emission Factor (in kg CO_2-e / m^3)

Year	2003	2004	2005	2006	2007	2008
Emission Factor	0.440	0.463	0.476	0.438	0.414	0.424

Table 9: GHG Emissions due to Electricity Used for Sewage Processing by Drainage Services Department

Step 1	Step 2	Step 3	Step 4
A	B	C	D
Source description (i.e. Area / facilities the water service bill is reporting)	Fresh water consumption (m^3)	Default Emission Factor (kg / m^3)[Note]	Emissions in tonnes CO_2 equivalent (B x C /1000)
Total			

Please insert more rows as necessary

Note: The default emission factor is determined according to the purpose of water used as follows:

Source description	**Default Emission Factor (kg / m^3)**
Restaurants and catering services	(0.7 x Emission Factor) assuming 70% of the fresh water consumed will enter the sewage system.
Other commercial, residential and institutional purposes	(1.0 x Emission Factor) assuming 100% of the fresh water consumed will enter the sewage system.

In which emission factor is the emission factor of GHG emissions due to electricity used for processing fresh water derived from the following equation

Emission Factor = Unit electricity consumption of processing sewage (from DSD) x Territory-wide default value (i.e. 0.7kg / kWh) of purchased electricity provided in Table 5

In case that the unit electricity consumption for processing sewage for the reporting period is not available at the time of accounting, the latest emission factor from table below may be used as an approximation.

GHG Emission Factor (in kg CO_2-e / m^3)

Year	2003	2004	2005	2006	2007	2008
Emission Factor	0.172	0.155	0.160	0.171	0.174	0.172

Annex B

Sample Reporting Format

1. Name of the reporting entity:

2. Description of the reporting entity

Some possible descriptions are:

(a) Building management with a single responsible occupier;

(b) Building management with all end-users;

(c) Building management with some of the end-users (with details of the end-users participated);

(d) Building management only of a building of multiple responsible occupiers; and

(e) Others (with full details).

3. Reporting period (with start and end dates)

4. Scope of physical boundary chosen

(a) Location of the building(s)

(b) Description of the purpose of the building(s) or physical boundary chosen

Some possible descriptions are:

(i) Offices;

(ii) Retails;

(iii) Restaurants;

(iv) Hotel / hostel;

(v) Residential;

(vi) School;

(vii) University;

(viii) Sports complex; and

(ix) Community centre

(c) Description of physical boundary with detailed information (including the respective construction floor areas) on the areas covered in the exercise by

(i) Communal areas (including common facilities); and

(ii) Tenant areas.

(d) Description of areas excluded in the exercise

5. Scope of operational boundary chosen

(a) Description of Scope 1 activities included and excluded

(b) Description of Scope 2 activities included and excluded

(c) Description of Scope 3 activities included

6. Methodologies for quantifying emissions and removals

(a) List of activities for which simplified methodologies and conversion factors in the Guidelines are used for quantification

(b) Details (including necessary reference) of other methodologies and conversion factors used for quantification

(c) Details of any changes in methodologies and conversion factors since the last report

(d) Details on any re-calculation of previously reported emissions and removals because of changes in methodologies and conversion factors

7. Information on GHG emissions and removals (see sample reporting table below)

8. Information on GHG emissions and removals over time

(a) Summary of the quantities and changes of GHG emissions and removals since the first report

(b) Details of any changes to previously reported emissions and removals

9. Information on GHG offsets and programmes

(a) Description of GHG performance against internal and / or external benchmark (if any) including any ratio indicators used

(b) Scopes and areas identified to improve GHG performance

(c) Description of activities / programmes to improve GHG performance including provision of on-site renewable energy sources and on-site offsetting activities. For example, if the reporting entity can only quantify the amount of paper waste recycled, the amount of GHG avoided due to recycling of paper waste can be reported here.

10. Other optional information

11. Contact person of the reporting entity

12. List of data sources, references, etc.

Sample Reporting Table

Information on GHG emissions and removals for XXX

Reporting Period: (XX/XX/XXXX – XX/XX/XXXX)

Description (by sources, areas, etc.)	Emissions by gas type (in tonnes of CO_2-equivalent)					
	Carbon dioxide (CO_2)	Methane (CH_4)	Nitrous oxide (N_2O)	Hydrofluoro-carbons (HFCs)	Perfluoro-Carbons (PFCs)	Total
Scope 1 Direct Emissions						
Stationary Combustion Sources						
				N/A	N/A	
				N/A	N/A	
Mobile Combustion Sources						
				N/A	N/A	
				N/A	N/A	
Fugitive Emissions						
	N/A	N/A	N/A			
	N/A	N/A	N/A			
Other Direct Emissions						
Scope 1 Emissions Total						
Scope 1 Direct Removals						
Planting of additional trees						
		N/A	N/A	N/A	N/A	
		N/A	N/A	N/A	N/A	
Other Direct Removals						
Scope 1 Removals Total						
Scope 2 Energy Indirect Emissions (To be reported in general without being classified into specific gas type)						
Electricity Purchased						
Towngas Purchased						

Description (by sources, areas, etc.)	Emissions by gas type (in tonnes of CO_2-equivalent)					
	Carbon dioxide (CO_2)	**Methane (CH_4)**	**Nitrous oxide (N_2O)**	**Hydrofluoro-carbons (HFCs)**	**Perfluoro-Carbons (PFCs)**	**Total**
Scope 2 Emissions Total						
Scope 3 Other Indirect Emissions						
Methane Generation at Landfill due to Disposal of Paper Waste						
	N/A		**N/A**	**N/A**	**N/A**	
	N/A		**N/A**	**N/A**	**N/A**	
Electricity for Processing Fresh Water (To be reported in general without being classified into specific gas type)						
Electricity for Processing Sewage (To be reported in general without being classified into specific gas type)						
Others						
Scope 3 Emissions Total						
Other GHG Offsets / Removals						
On-site Renewable Energy Sources for Off-site Uses						
Off-site GHG Reduction Projects in Hong Kong						
Off-site GHG Reduction Projects outside Hong Kong						

Summary of Results

Total Scope 1 Emissions: _____ Tonnes of CO_2 Equivalent

Total Scope 1 Removals: _____ Tonnes of CO_2 Equivalent

Total Scope 2 Emissions: _____ Tonnes of CO_2 Equivalent

Total Scope 3 Emissions: _____ Tonnes of CO_2 Equivalent

Total other GHG Offsets / Removals: _____ Tonnes of CO_2 Equivalent

GHG Performance in Ratio Indicator:

Annex C

Carbon Reduction Tips

Vehicle Maintenance

- Keep your car properly tuned: an inefficient car will use more fuel and emit more pollutant, which will harm the environment and cost you more money.
- Maintain correct tyre pressure by inspecting your tyres regularly and inflating them to the pressure recommended by the manufacturer.
- Avoid sudden acceleration, because it increases fuel consumption.
- Switch off when idling.

Air Conditioning

- Avoid installing air-conditioners where they will be exposed to direct sunlight.
- Close off areas that do not require air-conditioning, and turn air-conditioners off in unoccupied rooms.
- Place weather strips on doors and windows to prevent the leakage of cool air.
- Clean or replace the filters in all air-conditioners at the beginning of summer, and clean them every two weeks from then on.
- Set the office temperature at 25.5°C in summer and fix thermometers at various office locations to regularly cross check the temperature setting.
- Carry out regular leakage check on the air-conditioning system to check for possible leakage of refrigerants.

Saving Energy

- Use energy-saving light bulbs.
- Use daylight whenever possible.
- Place your lighting carefully where you need it.
- Use dimmers where possible (except for fluorescent lamps and compact fluorescent bulbs).
- Use non-opaque, light-coloured lamp shades.
- Keep light fixtures and lamps clean to maximise their efficiency.
- When buying new lighting, consider choosing compact fluorescent lamps, which use 75% less energy than standard bulbs for the same amount of illumination.
- Switch off the lights and air-conditioning when not in use.
- Ensure that computers are switched off before the end of a working day.
- Make good use of the energy-saving features and options which come with the Operating System of the computers.
- Switch off all electrical appliances or, where appropriate, switch them to the

energy-saving mode when not in use.

- Encourage the use of staircase instead of taking the lift for inter-floor traffic.
- Use energy efficient electronic equipment as far as possible.
- Keep track of the power consumption records and take measures to reduce the increase in power consumption.

Paper Saving

- Disseminate information by electronic means (i.e. via email or e-bulletin boards) as far as possible.
- Set duplex printing as the default mode for most network printers.
- Order recycled paper for office photocopying.
- Think carefully how many copies you need and do not copy too many.
- Use e-fax to screen junk fax.
- Place boxes and trays beside photocopiers as containers to collect single-sided paper for reuse and used paper for recycling.
- Encourage the staff to use paper on both sides, reuse envelopes and loose minute jackets, and use the backside of letter pads with outdated letterhead for drafting or printing.
- For easier recycling, separate waste before disposal.

Water Saving

- Carry out regular leakage tests on concealed piping and check for overflowing tanks, waste, worn tap washers and other defects in the water supply system.
- Fix dripping taps immediately.
- Reduce water pressure to the lowest practical level.
- Collect used water if possible for cooling purposes, floor cleaning and yard washing.
- Turn off the water supply system at night and on holidays.
- Ensure that hot water pipe runs are as short as possible and that cold water pipes are laid away from heated areas.
- Place posters and other publicity materials in prominent places to encourage water conservation.
- Determine water requirements for each facility and check usage frequently.
- Use reclaimed water for non-drinking use.