

Mandatory Reporting of Greenhouse Gas Emissions from Buildings: A Survey of the Stakeholders in Hong Kong

Joseph H.K. Lai¹

Abstract

Recognising the need of mitigating global warming, mandatory reporting of greenhouse gas (GHG) emissions from buildings has been increasingly implemented across the globe. For buildings in Hong Kong, however, GHG reporting remains as entirely voluntary although the government has issued in recent years a guidance document to facilitate building owners and managers to quantify GHG emissions from commercial, residential and institutional buildings. Aimed at investigating the views of the building stakeholders on whether, and to what extent, the GHG reporting should be made mandatory, a self-administered survey was carried out. Analysis of the response given by 200 stakeholders revealed that the majority supported making the reporting mandatory, mainly for office, industrial, and hotel/hostel buildings. Their agreement on requiring mandatory reporting for activities in scopes 1 and 2 of the GHG Protocol was stronger than that on the scope 3 activities. The common reasons for those who did not support the mandatory reporting policy were also identified. While these findings are useful information to policy makers, further work is needed to investigate whether the vested interests of the stakeholders are influential in determining their support to the policy; what kinds of building areas should be covered by the mandatory reporting; and what factors would affect the views of the stakeholders on the extent to which the mandatory reporting should cover.

Keywords: building, greenhouse gas, mandatory reporting, public policy, stakeholder survey.

¹ Associate Professor; Department of Building Services Engineering; Hong Kong Polytechnic University; Hung Hom, Kowloon, Hong Kong; joseph.lai@polyu.edu.hk.

1. Introduction

Climate change is a growing problem that stems from the increasing greenhouse gas (GHG) emissions across the globe. Man-made activities that give rise to such emissions include combustion of fossil fuel for energy generation, release of refrigerants from mechanical equipment, and so on. While most of the emissions are inevitable by-products of economic activities nowadays, more and more stakeholders have started to find ways to reduce their generation. This is not only a social responsibility but also a critical element in achieving sustainable development.

Quantification of the GHG emissions associated with business activities, operations in buildings, etc. is essential to understanding the impacts they impose on the environment. Proper documentation of the quantified amounts of GHG emissions, also known as GHG reporting, has been increasingly implemented by local governments as well as large organisations since the late 1990s (Kauffmann et al., 2012). For instance, over 80 company GHG reporting methods and initiatives were identified as being in use around the world, among them some are prescribed by the law and the others are taken on a voluntary basis (EC, 2010).

In Hong Kong, the public have become aware of the need of mitigating GHG emissions. A few years ago, the government issued a set of guidelines to facilitate building owners and managers to quantify and report the GHGs emitted/removed from their buildings. So far, the guidelines remain as a voluntary initiative and it is entirely up to the individuals to decide whether to adopt the guidelines. Whereas official statistics on such adoption rate are not available, the nascent implementation of GHG reporting was revealed by an earlier empirical audit (Lai et al., 2012) where the necessary record data of the audited building were found incomplete. With an aim to understanding whether the building stakeholders agree making the initiative mandatory and, if so, the extent to which it should cover, a survey was carried out.

The ensuing section shows an abridged review of the major overseas GHG reporting schemes and the current reporting guidelines in Hong Kong. Then the design of the questionnaire used in the stakeholder survey and the demographic information of the respondents are reported. The collected responses, including the support of various stakeholder groups to making GHG reporting mandatory for buildings and the extents they considered the reporting should cover, are analysed and discussed. Based on the analysed findings, the conclusions drawn as well as the further works needed are given at the end.

2. GHG reporting schemes

2.1 Overseas schemes

According to the 2009 RICS Global Zero Carbon Capacity Index (RICS, 2010), Australia and the UK were the top two performing countries in terms of developing policy frameworks for making progress towards the goal of a zero-carbon built environment. Earlier Lai et al.

(2012) conducted a review, which included making comparisons between the key features of the GHG reporting schemes of the two countries. The major findings are shown in [Table 1](#).

Table 1: GHG reporting schemes in Australia and the UK (Lai et al., 2012)

Feature	Australia	UK
Reporting of carbon emissions	Mandatory (governed by National Greenhouse and Energy Reporting Act)	Will become mandatory (governed by Climate Change Act; Companies Act)
Standards that the guidelines are based on	AS ISO 14064, ISO 14040, GHG Protocol, NGER Act 2007	GHG Protocol (also aligns with ISO 14064-1 and Carbon Trust Standard; complements PAS 2050 and ISO 14040)
GHGs quantified	All six Kyoto Protocol recognized gases	All six Kyoto Protocol recognized gases
Emissions classified into scopes 1, 2 and 3 of the GHG Protocol	Yes	Yes
Optional reporting for scope 3	No	Yes
Separate guidelines for emission factors	National Greenhouse Account Factors	Guidelines to DEFRA/DECC's GHG Conversion Factors for Company Reporting

Meanwhile, a stocktaking of government schemes on corporate GHG reporting was prepared ([Kauffmann et al., 2012](#)), which showed that a number of governments had established voluntary or mandatory GHG measurement and reporting schemes in the past decade. Such mandatory schemes include those listed in [Table 2](#).

Table 2: Examples of mandatory GHG reporting schemes

Country	Reporting schemes	Year
Canada	GHG Emission Reporting Scheme (mandatory)	2004
Japan	Mandatory GHG Accounting and Reporting System	2006
Australia	NGER Mandatory Reporting	2009
US	Mandatory Reporting GHG Rule	2010
France	<i>Bilan des Emissions de gaz à effet de serre (BEGES)</i> (mandatory reporting)	2012

Lately, the UK government announced on 20 June 2012 the introduction of a statute requiring reporting of GHG emissions by the quoted companies, which follows a public consultation in 2011 where the majority supported making the reporting mandatory. At the time of this writing, a consultation (set to end on 17 October 2012) was launched to seek views on the regulations drafted ([DEFRA, 2012](#)).

2.2 The Hong Kong situation

The total volume of GHG emissions in Hong Kong, according to the latest available statistics of the Environmental Protection Department ([EPD, 2012](#)), was 42,900 kilotonnes of CO₂-e in 2009, representing a 28.8% increase from the total emissions in 1999. As shown in [Figure 1](#),

the majority of GHG emissions were due to electricity generation, followed by transport, other end use of fuel, waste, and others.

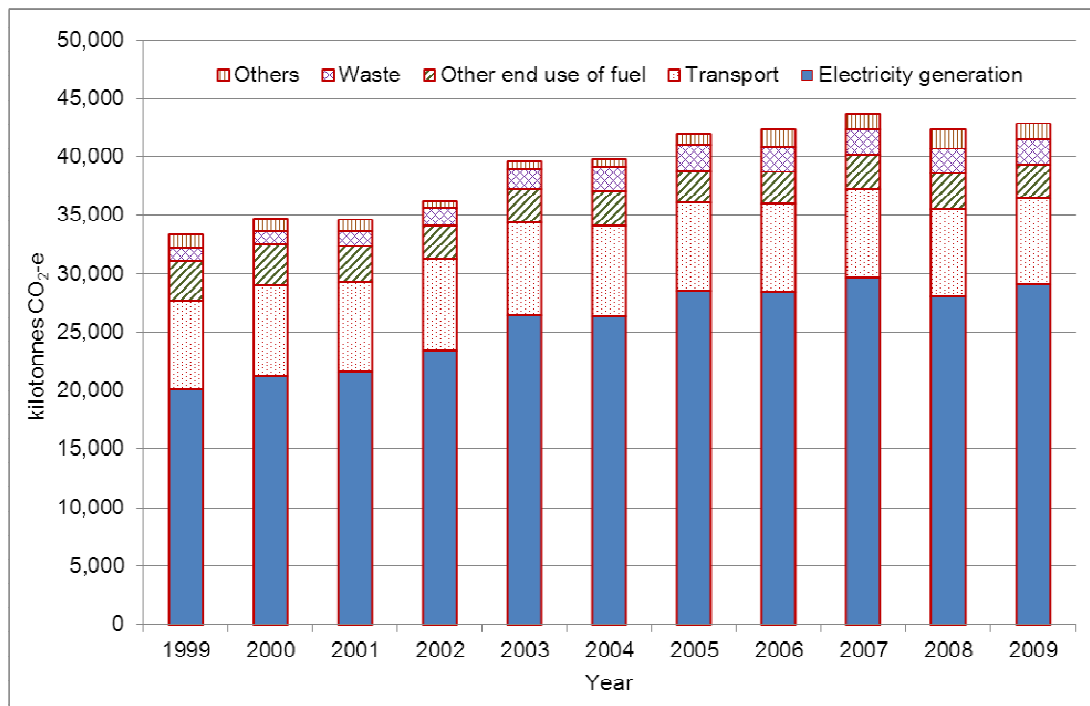


Figure 1: Greenhouse gas emissions in Hong Kong

Being a member economy of the Asia-Pacific Economic Co-operation (APEC), Hong Kong has committed to 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 (APEC, 2007). Without energy-intensive industries, Hong Kong is a service economy where electricity generation is the major source of GHG emissions. Since buildings account for 89% of the end uses of electricity, reducing electricity consumption for building operations is crucial to mitigating GHG emissions.

To raise the awareness of building owners and managers about GHG emissions and assisting them to measure the emissions from buildings, the Environmental Protection Department and the Electrical and Mechanical Services Department jointly issued in 2008 the "Guidelines to Account for and Report on Greenhouse Gas Emissions and Removals for Buildings (Commercial, Residential or Institutional Purposes)". This guidance document was revised in 2010 to become the current guidelines (EPD-EMSD, 2010). Defined in accordance with the reporting framework of the Greenhouse Gas Protocol (WRI-WBCSD, 2004) and the International Standard on Greenhouse Gases (ISO, 2006), the scopes of emissions and removals covered by the guidelines are summarized in Table 3.

Intended primarily for use on buildings which are used for commercial (including offices, retails, restaurants, hostels and hotels) and/or residential purposes, the guidelines can also be applied to institutional buildings such as schools, universities, community centres, sports complexes, etc. Basically the guidelines are designed for self-assessment and self-reporting

by the buildings' reporting entities, but third parties may also be employed to assess the GHG emissions/removals from the buildings. While Hong Kong is a community governed by the rule of law and thus a variety of statutory controls on buildings have been in place (Lai et al., 2011), adoption of the above guidelines for GHG reporting remains as entirely voluntary.

Table 3: Scopes of GHG emissions

Scope 1	Scope 2	Scope 3
<ul style="list-style-type: none"> • Combustion of fuels in stationary sources excluding electrical equipment to generate electricity, heat or steam • Combustion of fuels in mobile sources • Intentional or unintentional GHGs release from equipment and systems • Assimilation of CO₂ into biomass • Any other physical and chemical processing 	<ul style="list-style-type: none"> • Consumption of purchased electricity • Consumption of purchased town gas 	<ul style="list-style-type: none"> • Methane gas generation at landfill in Hong Kong due to disposal of paper waste • Electricity used for fresh water processing • Electricity used for sewage processing • Others

3. Stakeholders survey

3.1 Questionnaire design and data collection

In order to solicit the opinions of building stakeholders on whether, and to what extent, the GHG reporting for buildings in Hong Kong should be made mandatory, a survey was conducted. For this purpose, a questionnaire comprising four sections was designed. Under section 1, the respondents were asked to provide their personal particulars, including years of work, company types, work natures, building/premises types they worked on, and professional and academic qualifications. Section 2 asked for their opinions on the scope of physical boundary of buildings to be included for mandatory GHG reporting. Opinions of the respondents on the extent of mandatory reporting of GHG emissions/removals (under scopes 1, 2 and 3 of the GHG Protocol) were collected by the questions in Section 3. An open-end question was included in Section 4 to allow the respondents to express any additional views or opinions not covered by the preceding sections of the questionnaire.

The survey was conducted in a self-administered manner on two occasions - a seminar and a forum. The participants of the two events were requested to take part in the survey voluntarily, and totally 200 questionnaires completed with useful data were collected.

3.2 Demography of the respondents

The majority (42.5%) of the respondents were highly experienced, having worked for 15 years or more. Respondents with the least work experience (five years or less) amounted to one-fourth of the sample. When classified by company types, the vast majority (78.5%) of the respondents were employed by the private sector. 14.5% worked for non-government public organizations and the rest were government employees.

The respondents were asked to indicate the main nature of their work and the latest types of building/premises they worked on at the time of the survey. The proportion distributions of such responses are shown in Table 4. The proportions of those working in the building/facility management, construction/contracting and design/consulting fields were comparable and they collectively represented the majority (67.5%) of the respondents. The proportion of those working for property developers or project management companies was smaller, and even fewer respondents were from the academic/research sector.

Table 4: Work natures and building/premises types

Main work nature		Building/premises type*	
Property development / project management	12.5%	Office	67.5%
Design / consulting	21.5%	Retail	24.5%
Construction / contracting	22.5%	Residential	31.5%
Building / facility management	23.5%	Industrial	18.0%
Academic / research	3.0%	Hotel / hostel	22.5%
Others	8.5%	Restaurant	9.0%
More than one of the above natures	8.5%	School / university	15.0%
		Leisure / cultural	11.0%
		Others	12.5%

*Note: The aggregate proportions exceeded 100% because some respondents worked on multiple types of buildings/premises.

Office was the dominant type of building/premises the respondents worked on. The proportions of the remaining building/premises, in descending order, were: residential, retail, hotel/hostel, industrial, school/university, leisure/cultural, and restaurant. Additionally, 12.5% of the respondents indicated that they worked on other types of building/premises which are beyond those listed in the answer options.

Generally the respondents belonged to those who were well educated. 96.0% possessed a bachelor degree; 30.0% had their highest qualification up to the master degree level. As regards their professional qualifications, 23.5% were professional engineers registered under the Engineers Registration Ordinance (Cap. 409), 6.0% were energy assessors registered under the Buildings Energy Efficiency Ordinance (Cap. 610), and 5.5% were carbon auditors meeting the requirements for registration as a qualified service provider to certify energy-cum-carbon audit projects under the Environment and Conservation Fund of Hong Kong.

4. Analysis and discussions

4.1 Overall agreement

Of all the respondents, 72.0% agreed imposing mandatory GHG reporting on buildings. Those with a neutral stance and those who did not indicate their views amounted to 22.5%. Only a small proportion (5.5%) expressed their disagreement. Projecting on the basis of

these findings, it is likely to obtain strong support from the stakeholders in Hong Kong if a consultation for making the reporting mandatory is launched.

This part of the responses was further scrutinized to reveal the proportions of agreements and disagreements given by different subgroups of the respondents. As [Table 5](#) shows, the majority across the subgroups were generally supportive of regulating GHG reporting for buildings. In particular, the supports among those working for non-government public organisations were much common than the counterpart among the government subgroup.

Table 5: Subdivided groups of response

Group	Subgroup	n	Disagree	Neutral/Nil	Agree
Work experience	≤ 5	50	8.0%	22.0%	70.0%
	>5 , ≤ 15	58	5.2%	24.1%	70.7%
	>15	85	4.7%	21.2%	74.1%
Company	Government	13	7.7%	23.1%	69.2%
	Non-government public	29	10.3%	6.9%	82.8%
	Private	157	3.8%	25.5%	70.7%
Main work nature	Property development / project management	25	12.0%	40.0%	48.0%
	Design / consulting	43	4.7%	20.9%	74.4%
	Construction / contracting	45	4.4%	22.2%	73.3%
	Building / facility management	47	6.4%	19.1%	74.5%
	Academic / research	6	0.0%	0.0%	100.0%
Professional qualification	Carbon auditor	11	9.1%	18.2%	72.7%
	Registered energy assessor	12	0.0%	16.7%	83.3%
	Registered professional engineer	47	4.3%	31.9%	63.8%
Academic qualification	Sub-degree	6	16.7%	33.3%	50.0%
	Bachelor degree	60	8.3%	20.0%	71.7%
	Master degree	126	3.2%	21.4%	75.4%
	Doctorate degree	6	0.0%	50.0%	50.0%

When grouped by the respondents' work natures, less than half of those in the property development/project management sector supported requiring buildings to have mandatory reporting of their GHG emissions/removals. In fact, this subgroup of respondents mainly worked on new building projects but the framework of GHG reporting under the current guidelines ([EPD-EMSD, 2010](#)) targets on the operation of existing buildings. This may be a reason for the relatively low support rate among them. On the other hand, all those in the academic/research field considered that GHG reporting for buildings should be made mandatory. Note, however, should be taken that the number of samples of this subgroup

was small. A larger sample of this subgroup is needed before their views can be generalized.

The professional qualifications that the respondents were allowed to select were not mutually exclusive to each other. In general, carbon auditors include registered professional engineers (RPEs) having attended relevant training for carrying out carbon audits, and registered energy assessors include RPEs possessing the required experience and qualifications as defined under the Buildings Energy Efficiency Ordinance (Cap. 610). Those who were carbon auditors commonly agreed requiring mandatory GHG reporting for buildings. This kind of agreement was even more commonly found among the registered energy assessor subgroup.

Most of the respondents with their highest academic qualifications up to the bachelor or master degree level agreed to making the reporting mandatory. But only half of those with a lower academic qualification (sub-degree) indicated their support to this arrangement, and an identical proportion of response was found with the doctorate degree subgroup. Common to both of these subgroups, the small sample size limits the representativeness of the respective observations.

4.2 Types of building/premises

As shown in [Table 6](#), six in every 10 respondents agreed imposing mandatory GHG reporting on office building/premises but obviously less (42.5%) of the respondents indicated their agreement on requiring retail building/premises to be bound by the same mandatory reporting. Whereas both types of these building/premises are occupied by commercial users whose energy consumption significantly outweighs other groups of energy end use, the reasons for the significant difference between the agreements are yet to be identified.

Table 6: Responses on building/premises types to be covered

Building type	No.	Proportion
Office	120	60.0%
Retail	85	42.5%
Residential	51	25.5%
Industrial	106	53.0%
Hotel / hostel	109	54.5%
Restaurant	63	31.5%
School / university	62	31.0%
Leisure / cultural	47	23.5%

Unlike commercial buildings which are mainly used by business organizations and customers, residential building/premises are occupied by all people in society and their operation period extends to cover the night time during which most commercial premises are left idle. However, only about one-fourth of the respondents indicated their agreement on implementing mandatory GHG reporting for the residential building/premises. Possible

reasons for this level of response may include the following perceptions of the respondents: i) residential activities are basic necessities for daily life and so reporting of the GHG emissions associated with such activities should not be regulated; and ii) residential activities are much less GHG-intensive and so the mitigation effect that can be achieved through regulating the reporting of their emissions is minimal.

Hotels and hostels are similar to residential buildings in that they have round-the-clock operations. Over half of the respondents expressed their agreement on including these two types of accommodations in the list of buildings for which GHG reporting should be made mandatory. A comparable proportion of the respondents supported that mandatory GHG reporting should also be imposed on industrial buildings. Even though the volume of this kind of buildings in Hong Kong has substantially gone down as a result of the progressive move of industrial organizations to the mainland China over the past few decades, the high intensity of GHG emissions generated from industrial activities is probably a key consideration for those who supported the mandatory policy.

Commercial premises used for operating restaurants, as compared with those used for office and retail purposes, are even more energy-intensive and the intensity of their GHG is thus even higher. But only a weak support (31.5%) was given to having mandatory GHG reporting for this type of premises. While the reasons for this finding are not known from the analysis so far, an almost equal proportion of response was found with the same question on school/university buildings, whose nature and hence operations are distinct from those of restaurants.

The group of buildings recording the lowest rate of support for having mandatory GHG reporting was leisure/cultural. In fact, most of such buildings in Hong Kong are managed by the Leisure and Cultural Services Department (LCSD) of the government. It is likely that LCSD has already practiced regular GHG reporting for the buildings they managed. Yet, whether this is the reason for those who considered it not necessary to regulate GHG reporting for leisure/cultural buildings is worth-investigating.

4.3 Extent of GHG emissions/removals

Scope 1 emissions cover those due to stationary combustion sources, mobile combustion sources and fugitive GHGs release from equipment and systems. Within this group, emissions due to mobile combustion sources received the lowest level of support for inclusion in the list of GHG emissions that should be reported mandatorily ([Table 7](#)). Among those who opposed to this arrangement, 14 considered it hard to gather the required data for reporting, echoing with the difficulty encountered in an earlier carbon audit study ([Lai et al., 2012](#)). An equal proportion of the respondents indicated that they agreed requiring mandatory reporting of CO₂ removals. The reason given by 13 respondents who were against this arrangement was it is time-consuming to do so.

Emissions due to consumptions of electricity and town gas, which were both under scope 2, were supported by most of the respondents to be included in the mandatory GHG reporting coverage. Essentially quantification of these emissions, in annual term, entails identification

of the corresponding monthly electricity and town gas consumptions, as well as the emission factors pertaining to productions of electricity and town gas. The fact that such emission factors for a particular year are given in the annual reports of the respective electricity and gas supply companies in the subsequent year typically leads to delay in the quantification. This concern may be a consideration for those who expressed their disagreement to the mandatory reporting policy.

Table 7: Opinions on extent of emissions/removals

Emission/removal	Disagree	Neutral/Nil	Agree
Stationary combustion sources	5.5%	20.5%	74.0%
Mobile combustion sources	12.5%	26.0%	61.5%
Fugitive emissions	11.5%	23.5%	65.0%
CO ₂ removals	13.5%	25.0%	61.5%
Consumption of electricity	9.0%	16.0%	75.0%
Consumption of town gas	13.0%	16.0%	71.0%
Disposal of paper waste	17.5%	23.5%	59.0%
Consumption of fresh water	12.5%	17.5%	70.0%
Treatment of waste water discharged	12.5%	17.0%	70.5%
Transportation of purchased materials or goods	12.0%	18.5%	69.5%
Business travel by employees	12.0%	17.5%	70.5%
Outsourced activities	13.0%	17.5%	69.5%

The remaining items in [Table 7](#) belong to scope 3 GHG emissions, among them disposal of paper waste attracted the largest proportion of respondents who disagreed to making the GHG reporting for such activity mandatory. 18 respondents of this group considered that gathering the required data for reporting GHG emissions due to disposal of paper waste is difficult. In fact, the same difficulty was experienced in a hotel's carbon audit where the record on the amounts of paper consumed and paper collected for recycling was incomplete ([Lai et al., 2012](#)).

5. Conclusions

The global trend of enforcing mandatory requirement on GHG reporting is on the rise. The guidelines on GHG reporting for buildings in Hong Kong, first issued by the government in 2008 and subsequently revised in 2010, remain as a voluntary initiative. A questionnaire, which was designed with consideration of the coverage of the guidelines, was distributed to collect the views of 200 building stakeholders on imposing mandatory GHG reporting on buildings. Overall, the majority were supportive of this policy but the rate of agreement among those in the property development/project management fields was below half. Only office, industrial, and hotel/hostel buildings were considered by over half of the respondents to be the types of buildings on which the mandatory policy should be imposed. Among the

activities to be covered by the mandatory reporting, disposal of paper waste received the least proportion of support among the respondents.

In order to obtain a more comprehensive and detailed understanding of the views of the building stakeholders, the collected response needs to be analyzed further to reveal whether the backgrounds and hence the vested interests of the stakeholders affect their views on the building types to be covered by mandatory GHG reporting; and what areas (e.g. communal area, tenant area) of different types of buildings should be covered. Future work is also needed to identify the factors that influence the views of the stakeholders on the extent to which the GHG emissions from buildings should be reported on a mandatory basis.

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