3. Policy maps and global trends

3.1 Overview

This chapter documents the significant city efforts made to date and illustrates global trends regarding city-led policies or programmes for building energy efficiency. These programmes are classified into separate policy maps for new buildings and existing buildings. The policy maps cover the cities of Chicago, Hong Kong¹, Houston, Johannesburg, London, Melbourne, New York City, Philadelphia, Portland, San Francisco, Seattle, Singapore², Stockholm, Sydney, Tokyo, and Toronto.

The focus of the mapping exercise is primarily on programmes run by city governments. In those cases where no specific city government level programmes were identified, national or state government programmes, or collaborations with industry associations, private coalitions and utilities are featured instead.

The major areas covered by policy maps include:

- New buildings and existing buildings (measures concerning major renovations are categorised under 'new buildings');
- Energy efficiency (excluding renewables/energy supply); and
- All building sectors (commercial, industrial, multi-family residential and government etc.) except single-family residential dwellings.

The various policies and programmes are classified into 12 categories of policy elements as outlined in **Table 3.1**.

 ¹ Under the Basic Law, building energy efficiency policies of the People's Republic of China are not applicable to the Hong Kong Special Administrative Region. Therefore, Chinese policies are not cited in the policy maps.
² Singapore is a city-state and as such the programmes featured in the policy maps are from the national government.

	· · ·	
1.	Building energy codes	Any building codes containing energy efficiency requirements for a
		whole building, part of a building, or equipment embedded in a
		building, or other regulations, laws and ordinances based on such
		codes.
2.	Reporting and benchmarking of	Any policy or programme requiring reporting (to the government),
	energy performance data	benchmarking or disclosing data for building energy consumption and
		GHG emissions, etc.
3.	Mandatory auditing and	Any policy or programme mandating auditing and/or
	retro-commissioning	retro-commissioning of buildings.
4.	Emissions trading schemes	Emissions trading schemes that covers emissions from the building
	Ŭ	sector.
5.	Green building rating and energy	Any scheme run by a government to rate or certify levels of building
•	nerformance labelling	environmental performance or energy performance. Alternatively, any
	periorinariae labelling	regulatory policy or programme based on existing green building
		contification /rating schemes or operative performance
		certification/rating schemes of energy performance
6.	Financial incentives	Any financial incentive (e.g. tax incentives, rebates, etc.) offered to
		offset costs associated with the implementation of one or more
		specific energy efficiency measures for building envelopes or
		equipment.
7.	Non-financial incentives	Any non-financial incentive (e.g. accelerated permitting, floor area
		bonus) to encourage implementation of one or more specific energy
		efficiency measures for building envelopes or equipment.
8.	Awareness raising programmes	Awareness raising programmes for building owners, tenants or the
		wider public, such as free or subsidised energy efficiency advice,
		weatherization programmes, open online sources for energy efficiency
		tips, educational programmes and public campaigns, etc.
9.	Promoting green leases	Programmes to promote green lease contracts between building
		owners and tenants.
10.	Voluntary leadership	Voluntary leadership programmes such as voluntary private sector
	programmes	programmes, friendly competitions, flagship projects and voluntary
		design guidelines.
11.	Government leadership	Any initiative to demonstrate governmental leadership in building
		energy efficiency and sustainability through implementation measures
		in government owned or occupied buildings or government
		operations.
12.	Other	Any other initiatives that contribute to building energy efficiency.

Table 3.1 Definition of policy elements

s ³

Country China Japan				Australia		Canada	United States							United	Sweden	South
			-pore		1								Kingdom		Africa	
Cities	Hong	Tokyo	Singa	Melbo	Sydney	Toronto	Chicago	Houston	Philadel	Portland	New York	San	Seattle	London	Stock	Johanne
Policy elements ⁴	Kong		-pore	-urne					-phia			Francisco			-holm	-sburg
1. Building Energy Codes*																
2. Reporting and Benchmarking																
3. Mandatory Auditing and Retro-commissioning																
4. Emissions Trading Schemes																
5. Green Building and Energy Ratings*																
6. Financial Incentives*																
7. Non-financial Incentives																
8. Awareness Raising Programmes																
9. Promoting Green Leases																
10. Voluntary Leadership Programmes																
11. Government Leadership*																
12. Other																

City-led programmes⁵

Regional, national or state government-led programmes⁶

Partner-led programmes⁷

³ It should be noted that this information was collected through an initial desk research. Data for Hong Kong, Sydney, Chicago, San Francisco, Stockholm has subsequently been revised according to new information from city officials. Policy maps are accurate as of March 2015.

⁴ See definitions in **Table 3.1**. Policy elements 2. and 5. are named in short form. Originally they are '2. Reporting and Benchmarking of Energy Performance Data', and '5. Green Building Rating and Energy Performance Labelling'. Stars(*) indicate 'Regional, national or state government-led programmes' are considered (also see footnote below).

⁵ See *Appendix 2* for the list of city-led programmes in each cell.

⁶ Regional, national or state government programmes are highlighted only when no city-led programmes were identified in that category, and also they are complementary to city efforts.

⁷ Partner-led programmes are coloured only when no city-led or higher-tier government-led programmes were found in that category, and also they are identified during the online research.

Country	China Japan Singa Australia Canada United States								United	Sweden	South					
			-pore										Kingdom		Africa	
Cities	Hong	Tokyo	Singa	Melbo	Sydney	Toronto	Chicago	Houston	Philadel	Portland	New York	San	Seattle	London	Stock	Johanne
Policy elements ^{9, 10}	Kong		-pore	-urne					-phia			Francisco			-holm	-sburg
1. Building Energy Codes*																
2. Reporting and Benchmarking*																
3. Mandatory Auditing and Retro-commissioning*																
4. Emissions Trading Schemes*																
5. Green Building and Energy Ratings*																
6. Financial Incentives*																
7. Non-financial Incentives																
8. Awareness Raising Programmes																
9. Promoting Green Leases*																
10. Voluntary Leadership Programmes																
11. Government Leadership*																
12. Other																

City-led programmes¹¹

Regional, national or state government-led programmes¹²

Partner-led programmes¹³

⁸ It should be noted that this information was collected through an initial desk research. Data for Hong Kong, Sydney, Chicago, San Francisco, Stockholm has subsequently been revised according to new information from city officials. Policy maps are accurate as of March 2015.

⁹ See definitions in **Table 3.1**. Policy elements 2. and 5. are named in short form. Originally they are '2. Reporting and Benchmarking of Energy Performance Data', and '5. Green Building Rating and Energy Performance Labelling'. Stars(*) indicate 'Regional, national or state government-led programmes' are considered (also see footnote 12).

¹⁰ Major renovation or alterations are classified in 'New buildings' in this research, as they are most likely to legislate together.

¹¹ See *Appendix 2* for the list of city-led programmes in each cell.

¹² Regional, national or state government programmes are highlighted only when no city-led programmes were identified in that category, and also they are complementary to city efforts.

¹³ Partner-led programmes are coloured only when no city-led or higher-tier government-led programmes were found in that category, and also they are identified during the online research.

3.2 Global trends illustrated by policy maps

3.2.1 Building energy codes

(1) Programmes for new buildings

Many cities around the world develop their own codes for new buildings and major renovations that are broader or more stringent than national or state codes. It should be noted that major renovations and new construction are covered under 'new buildings,' as they are most likely to be regulated together.

In the US, most state governments have adopted a certain level of national model codes¹⁴. However, some cities are operating codes that are stricter or wider in scope, as indicated above. For example, the City of Houston set the residential energy conservation standard 15% higher than the Texas state code requires. Also, San Francisco Building Code 13C under the Green Building Ordinance, which is another mandatory code for both new residential and non-residential sectors buildings, requires a level 15% stricter than the state code. With the Californian code being one of the strictest in the US, this additional city modification could be seen as one of the most advanced codes in the country. Local Law 85 of New York City is a mandatory energy conservation code covering both new residential and non-residential buildings. The scope of this code has been widened to encompass any renovation or alteration project, in addition to new development.

In European countries, cities tend not to have their own building energy codes. This is probably because of the existence of stringent national codes required by European Union (EU) directives. The Energy Performance of Buildings Directive (EPBD) has required each national government to facilitate minimum performance requirements since 2002 and in 2009 tightened the obligation to a building energy code targeting nearly Zero Energy Buildings. An exception worth noting is the City of Stockholm, who has stricter energy codes for buildings that are built on city-owned land, which makes up 60% of all land in the city. A new building in Stockholm built on city-owned land must not use more than 55 kWh/m² per year, while national building codes allow 90 kWh/m² per year.

¹⁴ The International Energy Conservation Code (IECC) and American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1 act as US national model codes, with the IECC covering both the residential and commercial sectors and the ASHRAE Standard 90.1 being referred in IECC for the commercial sector. Both codes are updated once in every three years, and US Department of Energy (DOE) issues a 'determination' for the latest code (as to whether it achieves greater energy efficiency in buildings) within one year of its publication to recommend State governments to adopt them. States have two years to revise their codes or decide not to meet the new code (and submit an explanation to the Secretary of Energy in this case).

In Japan, where the national building energy code is still not strictly enforced¹⁵, the Tokyo Metropolitan Government mandates compliance with the Green Building Program for large residential and non-residential buildings (and allows voluntary submissions from smaller buildings). This requires the submission of a Building Environment Plan in the event of new construction or major renovations, with these plans disclosed online. Although this programme originally intended to foster the voluntary introduction of greener measures into new buildings, since 2010, adherence to minimum energy efficiency performance specifications has been required for certain non-residential buildings larger than 10,000 m².

Apart from directly setting the building energy codes, some cities incorporate energy performance criteria into their building permission processes. For instance, Toronto mandates all new planning applications to be met with Tier 1 of Toronto Green Standard. The Standard requires energy performance that is 15% higher than the Ontario Building Code, and not only targets energy efficiency but also covers comprehensive environmental criteria such as air quality, water and waste. The City of Melbourne also endeavours to set energy performance requirements, as well as water and waste efficiency, in its Planning Scheme by citing external standards such as NABERS, Green Star and the Building Code of Australia (BCA). This may be partly because codes are implemented by the state government in accordance with the BCA and therefore cities usually do not have the authority to impose their own energy codes.

Another strategy is to set codes focused on specific parts of buildings. For example, Toronto developed the Green Roof Bylaw in 2009 for new commercial, industrial, institutional and residential buildings larger than 2,000 m² and Philadelphia adopted the Cool Roof Law in 2010 to mandate reflective roofing for all new commercial and residential buildings with no or low roof angles.

(2) Programmes for existing buildings

City-level building energy codes focused on existing buildings are rare given that major renovations are categorised into new buildings in this analysis. The building codes of cities like Houston tend to apply only to new buildings. Even at the national or state level, where it is more common to set building energy codes, the main target tends to be new buildings and

¹⁵ Due to the general attitude of Japanese laws towards private assets, compliance to codes set by the Energy Conservation Law, i.e. Building Energy Standard, is still voluntary; however, they have started the process of making it mandatory for all buildings and housing over 300m² by 2020. Currently, building owners are required to make efforts to meet the codes, and are additionally mandated to submit energy efficiency plans for new buildings and major renovation of residential and non-residential buildings larger than 300 m². In cases where energy efficiency levels in a submitted plan are significantly sub-standard, the government can issue recommendations, publicise the offense, or give them an order to amend their plan (if not followed, a fine is imposed).

major renovations. One exception, however, is the New York City Energy Conservation Code (NYCECC) scheme. As described above, compliance with the NYCECC is required even for renovations or alterations affecting less than half of the building and/or its systems.

Alternatively, as another form of regulating energy efficiency in existing buildings, some cities have set minimum performance standards for equipment embedded in a building. Again in New York City, Local Law 88 mandates that by 2025 covered buildings must replace or install all lighting to meet the NYCECC standard, and introduce sub-meters and provide a monthly statement based on sub-metered electricity consumption to tenants. In Singapore, building owners are required to meet a standard equivalent to the Green Mark Certified level when replacing or installing new cooling systems.

3.2.2 Reporting and benchmarking of energy performance data

(1) Programmes for new buildings

No examples of reporting and benchmarking schemes for new buildings were identified for city government programmes, mainly because the reporting of energy performance requires actual energy use data. In Sweden and the UK, the national governments mandate benchmarking by requiring Energy Performance Certificates (EPCs) when a building is built.

(2) Programmes for existing buildings

Requiring energy performance data reporting appears to be a major trend by which surveyed cities are seeking to spur action on building energy efficiency. The majority of reporting and benchmarking programmes target large buildings and mandate annual reporting of energy performance and GHG emissions data, with differing policies regarding disclosure of the data. Some policies simply require disclosure between building owners and potential buyers or tenants, whilst others require public disclosure of the data online via city websites.

The US in particular is home to an array of benchmarking schemes. As many as five¹⁶ out of seven US cities surveyed (and 16 cities nationwide) have enacted their own building energy reporting and benchmarking policies (see four case studies for Seattle, Philadelphia, New York City and San Francisco in *Chapter 4*, the fifth being Chicago). Such measures sometimes exist on top of statewide benchmarking programmes, the scope of which may be modified at the city level. There are even cases where a city government took the lead in introducing a benchmarking scheme, which was then followed by the state government. Programmes mainly

¹⁶ Portland became the sixth in the cities surveyed in this report, and launched its Energy Performance Reporting Policy in April 2015. It targets commercial buildings larger than 20,000 sq ft.

target large buildings, however, in their ten-year plan, New York City recently announced their intention to widen the target to mid-sized buildings by lowering the limit of eligible floor area from 50,000 sq ft to 25,000 sq ft.

In addition to energy benchmarking, Chicago has started requiring homeowners to issue a Home Energy Performance Report when listing their home for sale. The report includes monthly gas and electricity use and cost for a one-year period and is disclosed via the online Multiple Listing Service. This is the first attempt in the US to disclose residential energy cost and is expected to allow for more informed decision-making by home buyers.

In Europe, neither London nor Stockholm operates reporting or benchmarking schemes as noted below. This seems to be due to the stricter requirement for EPCs under EU EPBD. Both in the UK and Sweden, an EPC based on the projected performance is needed when a building is sold or rented (as well as built), and obliges the building owner to obtain a certificate from an accredited assessor and to disclose it to potential buyers and tenants. Additionally, a Display Energy Certificate (DEC), based on the actual energy performance, is required for public buildings in the UK.

Cities may also provide simple tools to facilitate benchmarking without any mandates. Hong Kong has a programme called the Energy Consumption Indicators and Benchmarks for Residential, Commercial and Transport Sectors. This programme offers online benchmarking tools for residential and commercial buildings without requiring reporting or disclosure of the energy performance data. Additionally, the Tokyo Metropolitan Government operates the Carbon Reduction Reporting Program for Small and Medium Facilities. Based on data submitted under this scheme¹⁷, benchmarks are provided for small to medium facilities in accord with building usage. In June 2014, the city used this benchmark to launch a new scheme, Carbon Report, a self-rated energy performance labelling for small to medium sized buildings.

Tokyo has also taken a slightly different approach to the reporting of energy performance data for larger non-residential buildings. Under the emissions trading scheme, large facilities are subject to reporting obligations (also see **3.2.4**). The report is used to set the amount of emissions, as owners must procure emission credits in the event that an establishment exceeds its emissions cap. For this reason, building owners are required to assess data through a government registered verification agency before submission.

¹⁷ Reporting is mandated for facilities above a certain level of annual energy consumption. For facilities with lower consumption levels, the reporting is encouraged on a voluntary basis.

3.2.3 Mandatory auditing and retro-commissioning

(1) Programmes for new buildings

As auditing and retro-commissioning apply to existing buildings, no programme was identified under new buildings.

(2) Programmes for existing buildings

Energy auditing and retro-commissioning have emerged as a key policy trend around the world to promote greater energy efficiency in buildings. For example, under the EU Energy Efficiency Directive (EED) of 2012, all organisations except small and medium-sized enterprises (SMEs) are obliged to carry out energy audits once every four years¹⁸.

In some cities such as Hong Kong, Singapore, New York City and San Francisco, either or both auditing and retro-commissioning¹⁹ are mandated. They are required periodically (every three years in the case of Singapore, five in San Francisco, and ten in Hong Kong and New York City), while also being conducted by registered or qualified professionals such as assessors or auditors. The targeted buildings are mainly large buildings (Hong Kong covering almost all buildings except small buildings) in the non-residential sector (except New York City which targets all sectors). While Singapore, Hong Kong and New York City are focusing on basic building components (building cooling systems in Singapore; four key building service installations, i.e. air-conditioning, electrical, lifts and escalators and lighting in Hong Kong, and base buildings in the case of New York City), San Francisco targets the entire building including both tenants and common areas. It is noteworthy that these are often implemented along with reporting and benchmarking schemes (this is the case for Singapore, New York City and San Francisco with the exception of Hong Kong). This is because it can be highly effective to identify energy efficiency improvement opportunities (i.e. via audits and retro-commissioning) together with reporting of current energy performance. Also, free or subsidised audits are provided by several cities to building owners, which will be explored in 3.2.8 Awareness Raising Programme section.

3.2.4 Emissions trading schemes

(1) Programmes for new buildings

Emission trading schemes are based on emissions from building operations and therefore do

¹⁸ In Sweden, energy use in new buildings must be reported to the national database together with audits from existing buildings.

¹⁹ Retro-commissioning refers to the act of testing and adjusting building systems and equipment to ensure their functioning in an energy efficient manner. Auditing, on the other hand, refers to the inspection and measuring of overall energy performance in a building and the identification of opportunities to increase energy efficiency.

not apply to new buildings.

(2) Programmes for existing buildings

The mandatory emissions trading scheme in Tokyo is highly unique in that it was developed by a city, being managed by a city and focused on buildings (see also **3.2.2** and a case study in **4.2**). The emissions trading scheme was developed based on the then Carbon Reduction Reporting Program introduced in 2000 and has been in implementation since 2010. Although some Chinese cities that were not surveyed for this report (namely Beijing, Shanghai and Shenzhen) have been targeting building sectors through pilot emissions trading schemes since 2013, it can be said that Tokyo has pioneered this approach.

3.2.5 Green building rating and energy performance labelling

(1) Programmes for new buildings

Results suggest that it is uncommon for a green building certification or rating scheme to be run by a city government²⁰. This is partly because in most cases, including those from the US, Australia, UK and Japan, comprehensive building certification systems are developed and managed by a national non-governmental organisation.

As an exception however, Tokyo Metropolitan Government has developed its own scheme, the Green Labelling Program for Condominiums, which started in 2005. The scheme consists of a simple star rating that covers areas such as thermal performance and use of renewables, and is based on information submitted under the Green Building Program. It is mandated that this rating is displayed on any advertisement upon sale or lease of the building. Some US cities, e.g. Portland, have developed their own green building ratings that were based on LEED (Leadership in Energy & Environmental Design) but adapted to local circumstances.

A popular way to promote the uptake of green building certifications and rating schemes is to utilise them as standards that must be met to qualify for financial or non-financial incentives. For example, to encourage the adoption of green building technologies and practices, Singapore provided cash incentives through its Green Mark Incentive Scheme for New Buildings (GMIS-NB) for projects that made efforts to achieve a Green Mark Gold rating or higher. To encourage higher standards such as Green Mark Gold^{Plus} and Platinum, additional gross floor area can be granted to developments that achieve these ratings as a bonus under the Green Mark Gross Floor Area Incentive Scheme (GM-GFA). BEAM Plus in Hong Kong also

²⁰ The **Appendix 2** (Policy map – City-led programmes) includes Green Mark in Singapore and BEAM Plus in Hong Kong. Although BEAM Plus is developed and operated by Hong Kong Green Building Council (HKGBC), the programme is significantly supported by the government through some policy schemes.

acts as a criteria for the city's Gross Floor Area Concessions. In Chicago, under the Green Permit Program, the City allows an expedited permit process and a reduction of permit fees for green buildings. In terms of criteria, commercial buildings require LEED certification, and for smaller residential buildings, either LEED for Homes or another certification developed by the city is needed.

Many city governments also use existing certifications as a requirement for municipal buildings or city-funded projects. Philadelphia has mandated LEED Silver or above for all new construction or major renovations of governmental buildings since 2009. Similar requirements are found in quite a few cities including Houston, New York City, Philadelphia, Portland and San Francisco. Many, like Portland, have even gradually strengthened the standards. Whilst Portland's first Green Building Resolution of 2001 required the 'Certified' level of the local Portland LEED Green Building Rating System for new construction and major retrofit projects by the city, in 2005 it was updated to mandate USGBC LEED Gold certification with specific additional requirements, and again in 2009 to require even stricter performance (also see examples of other requirements under Portland Green Building Resolution in existing buildings section below and **3.2.11 Government Leadership**).

Similar to green building rating and certifications, it is unusual for a city to develop its own energy performance labelling scheme. The reason appears to be that existing major labelling schemes, such as ENERGY STAR in the US, NABERS in Australia and Energy Performance Certificate (EPC) in the EU, operate nationally or regionally.

Tokyo appears to be unique in implementing its own labelling scheme, called the Energy Performance Certificate Program, aimed at new and large commercial buildings. The programme requires owners to issue an Energy Performance Certificate to potential buyers and tenants during the mandated period (from 21 days before commencement of construction to 180 days after completion). Although this programme relies on self-reporting, data is based on documentation submitted to the Tokyo Metropolitan Government under the Green Building Program. In addition, the Energy Performance Certificate itself must also be reported to the city government after the mandated period.

Another type of programme in this category is one that utilises existing labelling schemes as a tool or standard. For example, the Melbourne Planning Scheme cites the NABERS rating as the standard for energy efficiency requirements. For new construction, alterations and additions, an office building larger than 2,000 m² must provide a statement from a qualified professional

assuring that it has the preliminary design potential to achieve NABERS Energy 5 Stars or equivalent.

(2) Programmes for existing buildings

There were fewer cases where green building rating or certifications systems were applied to existing buildings. In Singapore, in addition to the Green Mark Scheme (which applies to existing buildings, existing office interior or existing data centres), the Existing Buildings Legislation requires compliance with the minimum Green Mark standard at the time of replacement or installation of a new cooling system. Under the Portland Green Building Resolution of 2009, all interior upgrade projects for city-owned or leased buildings must either obtain LEED Silver or higher certification from LEED for Commercial Interiors (CI), or follow the local Green Tenant Improvement Guide, and all city-owned existing buildings are required to be certified as LEED Silver or higher with LEED for Existing Buildings Operation and Maintenance (EBOM). It should be noted that while many cities use green building certification as a requirement for the major renovation of governmental buildings, such measures are discussed under the 'new buildings' section in this analysis.

Cities have not typically developed energy performance labelling schemes for existing buildings, potentially because these labelling systems are often run by national level organisations. Tokyo Metropolitan Government, however, is an exception. As noted in **3.2.2**, the Carbon Report programme (for existing and small to medium sized commercial buildings) was introduced in June 2014 to label the actual energy performance using benchmarks created under the Carbon Reduction Reporting Program for Small and Medium Facilities. This unusual case of a city implementing its own labelling scheme can be explained by the fact that prior to the launch of the national 'Building Energy-efficiency Labeling System (BELS)' in April 2014, there were no such schemes on the Japanese market.

A few cases of using existing energy ratings as a standard for other programmes were documented in US cities. For example, the Green Building Resolution of Portland requires an ENERGY STAR-rated roof or material for replacement works in city-owned existing buildings.

3.2.6 Financial incentives

(1) Programmes for new buildings

It is currently uncommon for the surveyed cities to use financial incentives to drive energy efficiency improvements in new buildings. At a national level, however, governments often offer financial incentives for new residential or non-residential buildings and innovative building technologies (see **3.2.4** regarding the Singaporean Green Mark Incentive Scheme for New Buildings as an example). One exception is in Toronto, where a refund of the 20% Development Charge is provided to new buildings that meet the comprehensive Tier 2 of the Toronto Green Standard. The standard covers not only energy efficiency but also other aspects such as site and water, requiring alignment with LEED for New Construction (NC) and supporting the city's argument that meeting the Toronto standard facilitates achievement of LEED Gold certification. The energy efficiency standard of Tier 2 is 25% higher than that required in the Ontario Building Code. Another example in this category is the Portland Energy Efficient Home Pilot (PEEHP). This grant was awarded to builders to cover the cost of two housing projects which substantially exceeded the state code. This pilot programme was started in order to identify the cost and feasibility of such housing projects, as well as providing builders with technical assistance to achieve the high performance standard.

(2) Programmes for existing buildings

In the case of existing buildings, many cities offer one or more financial incentives. For example, Retrofit Chicago²¹ Residential Partnership provides free energy efficient fixtures, such as programmable thermostats and showerheads, as well as rebates on larger appliances, like qualifying air conditioners, to homeowners while helping them identify trusted energy efficiency assessment contractors. The Singapore government offers financing for the purchase of energy efficiency equipment and renewable energy systems through its pilot Building Retrofit Energy Efficiency Financing Scheme. In Tokyo, tax incentives have been made available through the Energy Saving Promotion scheme targeting small to medium enterprises. These incentives exempt individuals and corporations from the enterprise tax when they introduce energy efficient equipment and renewable energy facilities. In some cases, cities focus on financial incentives for a certain type of building or certain parts of a building, as in the High-Rise Retrofit Improvement Support Program and Eco-Roof Incentive Program, for example, in Toronto. Innovative financial schemes are also being trialled in leading cities. These initiatives include the Energy Service Agreement in NYC, the PACE (Property Assessed Clean Energy) programme in San Francisco (i.e. GreenFinance SF) and Environmental Upgrade Finance in Melbourne and Sydney.

Additionally, national or state governments offer a wide variety of financial incentives, including tax incentives, grants and rebates. In many cases they ask local authorities to manage

²¹ Retrofit Chicago is the City of Chicago's voluntary energy efficiency programme with three sector-based components: municipal, commercial, and residential. Each of these three programme efforts draws on sector-specific approaches and partnerships to deliver tangible energy savings. See **3.2.10** for their commercial initiative and **3.2.11** for the municipal effort,

the schemes and distribute incentives to households and businesses.

Finally, partners such as utilities offer financial assistance to building owners. These incentives are sometimes offered in the form of mandated grants or rebates, as in the case of London (by Energy Company Obligation) and other US cities. For instance, Philadelphia Gas Works (PGW) and Philadelphia Electric Company (PECO) offer a wide variety of incentives to homeowners and businesses throughout the city for energy efficiency improvements.

Many city governments provide a list of the financial incentives available in their jurisdiction, including ones offered by partners or national or state governments, via their websites. In some cases, the city provides further assistance by advising the building owner on the relevant incentives, as part of major regulatory or voluntary programmes run by the city.

3.2.7 Non-financial incentives

(1) Programmes for new buildings

Expedited building permits are a common type of non-financial incentive offered by cities. Seattle delivers programmes such as Priority Green Expedited and Priority Green Facilitated, whereas San Francisco allows Priority Permitting to new developments with a formal commitment to achieve an advanced green building certification such as LEED Platinum. As mentioned earlier, the Green Permit Program in Chicago thoroughly incorporates green building practices into the permitting process. By applying for this programme at the beginning of the permitting process, developers are able to qualify for expedited processing and a reduction of permit fees.

Another form of non-financial incentive is an allowance for extra height or floor area for new buildings that meet a certain green building or energy efficiency standard. For example, in the case of Singapore, the Green Mark Gross Floor Area Incentive Scheme permits extra floor area for new buildings committed to achieving Gold^{Plus} or Platinum ratings for Green Mark. In the case of a Platinum rating, gross floor area allowances can be twice as high as in Gold^{Plus}. In Tokyo, an energy efficiency performance requirement was introduced as a prerequisite for four urban planning criteria, which include existing floor area ratio bonus schemes. Many large buildings in the city are eager to meet the standard and earn the valuable floor area bonus. Hong Kong employs BEAM Plus certifications as a criteria for granting a maximum of 10% Gross Floor Area Concessions (see also **3.2.5**).

(2) Programmes for existing buildings

Non-financial incentives, which, as discussed, tend to offer expedited permitting or additional

floor area bonuses, are less common for existing buildings. Nonetheless, the Green Mark Gross Floor Area Incentive Scheme in Singapore grants owners of existing buildings extra floor area in the event that "substantial energy efficiency (EE) enhancements" have been made to achieve a Gold^{Plus} or Platinum rating for Green Mark.

3.2.8 Awareness raising programmes

(1) Programmes for new buildings

Apart from making information on green buildings and energy efficiency available online, few cases of city-led public awareness raising programmes to support energy efficiency in new buildings were encountered. This may reflect the greater focus on operation and retrofit of existing buildings among the surveyed cities.

(2) Programmes for existing buildings

The most basic example in this category is the provision of web-based resources detailing ways to save energy in the course of building operation. For instance, New York City operates a well-known public education programme, 'GreeNYC', featuring a popular mascot, recognised by 40% of New Yorkers. They run a dedicated website to offer tips at home, at work and for different occasions. Another example is Stockholm. The City has an organisation that provides energy saving advice to tenants, private property owners and SMEs. This includes online fact sheets for energy saving, telephone support and advisory visits to property owners.

US cities often provide a 'weatherization' programme²² mainly targeting low-income households. In Chicago, the Low-Cost Education and Weatherization Program offer residents training opportunities for low-cost weatherproofing techniques and a tool kit including weatherstripping (double edge seals for door and window openings), a caulk gun to seal smalls gaps, and Compact Fluorescent Light bulbs (CFLs).

Another way cities deliver advice and raise public awareness is via free or subsidised energy audits. For example, the Tokyo Metropolitan Government has been offering free audits for small and medium businesses since 2009. The Greenovate Challenge Programme in Singapore, a friendly competition amongst secondary schools, provides a free audit by ESCOs. Students are requested to work together with ESCOs to create action plans based on their audit result.

The Tokyo Metropolitan Government has also been offering energy efficiency textbooks for

²² This refers to the implementation of low-cost improvements like adding weather stripping to doors and windows to eliminate air leaks and save energy.

various sectors with small to medium sized businesses and free seminars based on the textbook. Since 2006, 28 textbooks for more than 20 business sectors, including hotels, cleaning businesses, public bathhouses and confectionary factories, have been made available online through the Tokyo Metropolitan Center for Climate Change Actions (known as Cool Net Tokyo). Industry associations can apply for the scheme so that Cool Net Tokyo analyses typical facilities and develops a comprehensive textbook focusing on energy saving measures for that sector.

3.2.9 Promoting green leases

(1) Programmes for new buildings

As a green lease contract is between owners and tenants for buildings in operation, no green leasing programmes were identified for new buildings.

(2) Programmes for existing buildings

Some cities endeavour to promote green leases to tackle the split incentive problems between building owners and tenants. In New York City, the Energy Aligned Clause was enacted in 2011 to initiate and disseminate model lease language for Green Leases between commercial owners and tenants. Most recently, the Building Construction Authority of Singapore published a Green Lease Toolkit for office and retail buildings, containing specific provisions for improving environmental performance. Other cities such as Sydney, Melbourne, San Francisco and London have released Green Lease Guides or Toolkits in cooperation with industry partners such as the Better Buildings Partnership as early as 2007.

3.2.10 Voluntary leadership programmes

(1) Programmes for new buildings

This category includes guidelines and flagship development projects from city governments. Guidelines in this sense are different from building energy codes in that they are promulgated on a voluntary basis, with the goal of showcasing exemplary ideas. For example, Johannesburg demonstrates leadership to its residents and the building industry with Design Guidelines for Energy Efficient Buildings, which were created to guide energy efficient building practices in new government developments. Flagship development projects, such as the Stockholm Royal Seaport and the Melbourne Docklands, may also be observed in several cities. Such zones provide excellent opportunities for the City to try innovative policy measures such as stricter or more comprehensive codes, the implementation of new technologies, financial initiatives and knowledge sharing programmes.

(2) Programmes for existing buildings

Some cities endeavour to implement voluntary leadership programmes for energy efficiency efforts and/or retrofits in the commercial sector. For instance, the 1200 Buildings programme in Melbourne helps commercial building owners to understand the current performance of their buildings and to make improvements by offering advice and financial solutions (see a case study in 4.2). Retrofit Chicago's Commercial Buildings Initiative asks for participating buildings to commit to start energy efficiency improvements within six months and to reduce energy consumption by at least 20% in five years. Houston launched the Green Office Challenge (also see a case study in 4.2) to encourage owners, managers and tenants alike to better manage their energy and water use alongside other key topics such as waste and transport. The City holds an annual competition and provides training and resources to tenants and building owners. The Seattle 2030 District²³ focuses on a downtown area to create "a groundbreaking high-performance building district" by engaging owners, managers and tenants of the medium to large existing buildings in the area. The City also supports this challenge by developing district energy, such as district heat recovery and distributed generation, to serve the buildings. Often these programmes are coupled with energy assessments or recommendations and advice on available financial incentives. Participants in these programmes are also expected to serve as leaders and share their experience with the wider public.

Other voluntary programmes target a range of sectors. For instance, New York City's Carbon Challenge, which started in 2007, includes 17 of the City's leading universities, 11 hospital organisations, 12 global companies, and 17 residential management firms. They have all committed to reducing their building-based GHG emissions by 30% or more in ten years. The City supports the Challenge by convening quarterly partner meetings for participants to exchange information and ideas, and also by providing simple tools to track and report progress, including a standard annual carbon emissions inventory and Climate Action Plan template. In the recent ten-year plan, 'One City: Built to Last', the City announced its ambition to expand its targeted sectors to, for example, hotels, restaurants and/or retail. Through its Energy Saving Charter on Indoor Temperature, Hong Kong has been targeting air-conditioning in commercial and residential buildings. Participants sign a pledge to maintain an average indoor temperature between 24 and 26 degree Celsius. The programme started in 2012 by targeting developers and property management companies of shopping malls, and expanded in 2013 to include common areas in shopping malls, shops, office buildings and offices, and again in 2014 to include common areas in residential buildings and housing estates. It has successfully won pledges from a significant number of participants including more than 220

²³ San Francisco and Toronto also operate 2030 District programmes.

shopping malls, 190 office buildings, 630 shops and 600 offices, as well as more than 200 residential buildings.

3.2.11 Government leadership

(1) Programmes for new buildings

Almost all cities have shown a willingness to lead by example. In London, all new buildings for the Greater London Authority are required to meet the London Development Agency's Sustainable Design and Construction Standards or to exceed targets in the London Plan. Also, as described in **3.2.5**, some cities aim to achieve green building certification when developing new governmental buildings. For example, the Singapore government has committed to obtaining Green Mark Platinum for new and existing public sector buildings that have undergone major retrofitting and with more than 5,000m² of air-conditioned floor area. In the same way, all new government buildings larger than 10,000 m² of gross floor area in Hong Kong²⁴ are requested to pursue the second highest grade or above of locally or internationally recognised certifications such as BEAM Plus or LEED. Many US cities, including Houston, Philadelphia, Portland, New York City and San Francisco, require a certain level of LEED certification for all new municipal or government-funded development.

(2) Programmes for existing buildings

The most common government-leading-by-example programme for existing buildings involves the retrofitting of city-owned buildings. For example, the City of Johannesburg has identified opportunities for energy efficiency upgrades in 104 municipal buildings, with five of these already having undergone lighting upgrades and achieved significant reductions in GHG emissions. New York City has been promoting municipal GHG emissions reduction through its 30x17 programme (meaning 30% reduction by 2017). Although the focus of this programme is comprehensive and addresses other operations such as street lighting and waste management, it aims to foster retrofitting as a way of reducing a major portion of GHG emissions from municipal operations. To this end, the City utilises benchmarking results to identify target buildings and subsequently carry out audits to detect opportunities for reducing energy consumption at low or no cost. Some cities facilitate funding schemes for municipal buildings retrofit. Within Retrofit Chicago's municipal effort, the 'Retrofit One' project identified and implemented energy savings opportunities across 60 municipal facilities, supported by funding through the Chicago Infrastructure Trust. Also as described in **3.2.5**, Portland requires LEED CI certification (Silver or above) for tenant improvements in city-owned or leased buildings, in

²⁴ In Hong Kong, new government buildings with floor area of more than 10,000 m² are also required to surpass the Building Energy Codes by, for instance, 10% for office buildings and 5% for schools and hospitals.

addition to pursuing LEED EBOM certification for city-owned existing buildings.

Other measures include policies mandating the disclosure of energy performance for government buildings and setting up institutions to advise municipal bodies on how they can achieve their energy consumption reduction targets. The Tokyo Metropolitan Government publicly discloses GHG emissions from as many as several thousand municipal facilities online, with New York City, Philadelphia, Seattle and San Francisco also disclosing the energy performance of municipal buildings via its benchmarking scheme. The Stockholm Energy Centre, which today consists of five energy specialists and an advisor, was set up by the City of Stockholm in 2005 as a support function for saving energy and tracking energy consumption in the city organisation. The Energy Centre is an important function to reach the city's target of reducing energy consumption in the municipal building stock by 10% between 2012 and 2015 and by a further 10% between 2016 and 2019.

Additionally, governments are endeavouring to showcase innovative measures in sustainable building practices. For instance, the City of Chicago is leading the way by building a rooftop garden in City Hall. Another interesting example is the Municipal Entrepreneurial Testing Systems of New York City. This initiative provides opportunities for entrepreneurs to test new green building technologies in municipal buildings before they are released to the market. In this manner, New York is also hoping to attract new businesses and green jobs to the city.

3.2.12 Others

This category covers a wide variety of schemes that have grouped together in their own category because they were only recently developed, are rare, have a scope broader than the building scale, and/or represent more of a coordination role rather than an active implementation role for cities. Examples of these initiatives include RE:CONNECT in London with the goal of setting 10 low carbon zones, EcoDistricts in Portland and San Francisco, and energy management schemes like those seen in Seattle and Tokyo. Promotion or utilisation of ESCOs is another type of programme, for example, by the 'Zero Initial Investment Cost Business Model for Energy Saving' in Tokyo. Other efforts include launching Better Buildings Partnerships in the city (in the case of Sydney, Toronto and London) and participating actively in national programmes, such as the City Energy Project in the US.

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