

Investing in Buildings Energy Efficiency

How to Enhance Hong Kong's Policy Framework



BUSINESS
ENVIRONMENT
COUNCIL
商界環保協會

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About BEC

Business Environment Council Limited (“BEC”) is an independent, charitable membership organisation, established by the business sector in Hong Kong. Since its establishment in 1992, BEC has been at the forefront of promoting environmental excellence by advocating the uptake of clean technologies and practices which reduce waste, conserve resources, prevent pollution and improve corporate environmental and social responsibility. BEC offers sustainable solutions and professional services covering advisory, research, assessment, training and award programs for government, business and the community, thus enabling environmental protection and contributing to the transition to a low carbon economy.

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This project is funded by:



Foreword

For 26 years, Business Environment Council (BEC) has been at the forefront of improving Hong Kong's environmental performance and transition into a sustainable and low carbon society.

BEC works not only with the business sector to promote environmental excellence, but also with public bodies through our policy research and engagement work. This research project, "Investing in Buildings Energy Efficiency", was generously supported by Konrad-Adenauer-Stiftung. It puts emphasis on improving the public policy framework that supports and encourages investment in buildings energy efficiency and performance. The topic is especially relevant in the Hong Kong context considering residential and commercial buildings are responsible for more than 60% of the city's total greenhouse gas emissions; therefore improving the overall level of energy efficiency in buildings – both new and existing ones – will be instrumental to reducing demand-side carbon emissions.

The research report is structured in a way that explains Hong Kong's existing policy framework relating to buildings energy efficiency along with seven other cities, explores the areas of improvement for Hong Kong under each of the seven policy categories, identifies factors that drives and enables good energy efficiency governance, and outlines how other key players in the private sector can contribute to our policy recommendations moving forward.

The publication of this report is also highly timely considering the Government will launch a public consultation exercise on long-term decarbonisation strategies for Hong Kong in the first quarter of 2019. BEC hopes that our recommendations will be carefully examined by relevant government departments, supported by the key players in the private sector and progressively implemented in buildings and premises, contributing to a low carbon, energy-efficient Hong Kong.



Mr Adam Koo

Chief Executive Officer

Business Environment Council Limited

Konrad-Adenauer-Stiftung (KAS) and our Regional Project Energy Security and Climate Change Asia-Pacific (RECAP) is glad to have worked with BEC over the past two years. In December 2017, the Energy Efficient Retrofits Guide and Calculator was launched to provide a tool for property owners and managers to estimate the cost and energy savings of various retrofit options, and to build a business case for carrying out energy efficiency upgrades.

This subsequent research project acts as a continuation on the topic of buildings energy efficiency, but shifting the focus from energy efficiency technologies and the buildings sector to a broader view of government policies in Hong Kong and seven selected cities across the world, with the German city of Essen being one of the cities studied in the project. This echoes one of KAS's approaches to support knowledge transfer with German and European examples.

KAS RECAP also places strong emphasis on the regional approach to facilitate mutual understanding and learning between cities and regions, and we are also interested in identifying the socio-political actors behind energy efficiency, which is a key element in driving energy security and climate change mitigation.

In this sense, we are pleased that BEC's research not only studied and highlighted policy instruments used across cities and regions, but also delved into the drivers and enablers of energy efficiency policies, which can be especially useful to governments in their planning and implementation phases. We believe the experiences and lessons learnt from Hong Kong and overseas cities featured in this report can provide valuable insights to other metropolitan cities in their journey to a sustainable and energy-efficient built environment.



Dr Peter Hefe

Director

Regional Project Energy Security and Climate Change
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Executive Summary

The Paris Agreement, which became effective in 2016, and the Intergovernmental Panel on Climate Change 1.5°C Special Report published in October 2018, both emphasised the need and urgency for climate actions. In the case of Hong Kong, around 92% of electricity¹ and 95% of gas² were consumed by commercial and residential buildings in 2016, translating to over 60% of the city's total greenhouse gas emissions. As enhancing energy efficiency in buildings is critical to Hong Kong's long-term decarbonisation, this report aims to:

1.

Map the existing policy framework in Hong Kong relating to buildings energy efficiency

2.

Compare the policy frameworks between Hong Kong and the 7 selected cities – Singapore, Tokyo, New York City, Sydney, Essen, Beijing and Shenzhen – to draw out gaps and suggest possible enhancements for Hong Kong

3.

Identify the key drivers behind energy efficiency policies, and enablers that allow impactful implementation of such policies, which are relevant to Hong Kong

4.

Summarise policy recommendations for the government, and explain their relevance to stakeholders and other interest groups

The policy frameworks are mapped according to seven categories:



1.

Information
& Education



2.

Government
Leadership



3.

Non-
financial
Incentives



4.

Financial
Incentives



5.

Green
Finance



6.

Buildings &
Appliances
Standards



7.

Green
Leases

¹ https://www.emsd.gov.hk/filemanager/en/content_762/HKKEUD2018.pdf

² <https://www.statistics.gov.hk/pub/B11000022017AN17B0100.pdf>

Focusing on commercial and residential buildings, this report draws insights from overseas cities as well as from our discussions with the business sector, NGOs and academics; and develops policy recommendations for the Government that will encourage investment on improving energy efficiency of Hong Kong's built environment.

Buildings Energy Efficiency Policies at a Glance

We identified and analysed energy efficiency policies and measures across seven selected cities, and summarised those measures in the table below for comparison.

(L – local/city-level; S – state-level; N – national-level; U – EU-level)

	Singapore	Tokyo	New York City	Sydney	Essen	Beijing	Shenzhen	Hong Kong
1. Information/Education								
Centralised official information website/repository	L	L	L	N	L S	L N	L N	L
Professional training/education	L	L	L	S	L	L N	L	L
Energy efficiency benchmarks	L	L	N	N		L	L	L
Electrical appliance labels	L	N	N	N	U	N	N	L
Free/subsidised energy auditing/advisory services	L	L N	L	S	L			L
Subsidised R&D and demonstration buildings/areas	L		L			N	L N	L
2. Government Leadership								
Green buildings targets	L	N	S	S	U	L N	L N	
Emission reduction targets (e.g. on GHG emissions, energy consumption and energy efficiency)	L	L N	L S	L S N	L S N U	L N	L N	L
Mandatory green public procurement plans	L	N	L		U			
3. Non-financial Incentives								
Voluntary partnership/agreements with regular reporting		L	L	S	N	L		L
Competition/award schemes	L		L N	N	S	L		L
Mandatory reporting/disclosure of buildings energy usage	L	L	L	N	N	N	N	L
Green building certification schemes	L	L N	N	N	N	L N	L N	L

	Singapore	Tokyo	New York City	Sydney	Essen	Beijing	Shenzhen	Hong Kong
4. Financial Incentives								
Direct subsidies/tax benefits	L	L	L S	L S	S N	L	L	L
Carbon pricing, e.g. ETS, Cap and Trade, Carbon Tax	L	L	S		U	N	N	
5. Green Finance								
Government support for green bond issuance	L	N		N	N U	L N	L N	L
Low-interest loans/financing schemes	L	N	L S	L	S N	L		L
6. Building and Appliance Standards								
Minimum Energy Performance Standards for electrical appliances	L	N	N	N				
Statutory buildings energy efficiency standards	L	N	L	N	N U	N	N	L
7. Green Leases								
Green lease guidelines	L	N	L N	N				L

Policy Recommendations for Hong Kong

Category	Policy Recommendations
1. Information/Education Provision	<p>1. <u>Strengthen energy labelling for electrical appliances</u></p> <p>Expand the types of electrical appliances covered in the mandatory labelling scheme with regular reviews and update of labelling standards to reflect improvements in product design.</p>
	<p>2. <u>One-stop shop website for energy efficiency information</u></p> <p>Revamp existing websites or develop a user-friendly website that consolidates up-to-date cross-departmental information on energy efficiency-related policies, incentive schemes, guidelines and case studies.</p>
2. Government Leadership	<p>1. <u>Set a long-term vision and specific supplementary targets</u></p> <p>Formulate long-term, evidence-based decarbonisation targets beyond 2030 that are aligned with ambition of the Paris Agreement. Specific targets, for example an Energy Utilisation Index (EUI) reduction target, can also be set to provide greater clarity and a clearer direction.</p>
	<p>2. <u>Enhance and leverage leadership from government buildings</u></p> <p>Require government owned or leased buildings to attain a minimum level of energy performance, in both the design/construction and operational phases. Public buildings can also serve as pilot sites for innovative approaches.</p>

Category	Policy Recommendations
	<p>3. <u>Enhance public procurement requirements</u></p> <p>Expand the green public procurement scheme to cover not only the energy performance in building and construction supplies, and electrical appliance, but also to contracts – such as requiring public premises to make use of green leases and taking on board energy efficiency considerations.</p>
<p>3. Non-financial Incentives</p>	<p>1. <u>Improve transparency of building level data and buildings energy efficiency benchmarks</u></p> <p>Implement a mandatory reporting system for energy intensity data for all existing buildings (in both shared and tenanted spaces). The collected data, anonymised or otherwise, should be utilised to develop a set of comprehensive and robust benchmarks published in the right format to maximise their usage.</p> <p>2. <u>Develop a performance-based green building rating system</u></p> <p>Improve and incentivise existing green building rating systems to cover operational efficiency and encourage proper maintenance of buildings of both newly-built and older buildings. This also ensures buildings are performing on par with their design specifications, and incentivises existing buildings to further enhance their energy efficiency.</p>
<p>4. Financial Incentives</p>	<p>1. <u>Link incentive schemes with actual building energy performance</u></p> <p>Recognise buildings with incentives based on their ongoing energy performances and efficiency improvements. For example, linking gross floor area (GFA) concessions proportionately to achievements under the BEAM Plus scheme, and develop a mechanism where property developers submit a deposit to the Government upon being granted additional GFA, to be returned to the developer upon receiving evidence that the building is built and operated to the proposed energy efficiency level.</p> <p>2. <u>Increase diversity and coverage of financial support</u></p> <p>If necessary, support and supplement the financial incentives offered by power companies under the Scheme of Control Agreements. Also consider providing support for ongoing energy efficiency management and continuous improvement in buildings.</p> <p>3. <u>Explore different carbon pricing options</u></p> <p>Study the feasibility of different carbon pricing mechanisms such as carbon tax and emission trading schemes to provide insights on how to meet global trends, as well as local and national emission targets. Pricing carbon will be a potential solution to drive behavioural changes in the Government, businesses and the community.</p>
<p>5. Green Finance</p>	<p>1. <u>Raise standards for green bonds and green loans</u></p> <p>Develop and/or encourage the use of standards that assess the “greenness”, or the extent of the positive environmental effects, of bonds and loan schemes. This will distinguish and recognise efforts for financial products that bring significant energy efficiency improvements, particularly to those that align with or exceed ambitions of the Paris Agreement.</p>

Category	Policy Recommendations
	<p><u>2. Develop a green investment bank</u></p> <p>Establish a green investment bank, or a similar entity with a focused mandate to provide easy access of finance for energy efficiency and environmental projects. The entity can also support energy service companies (ESCOs) to perform energy efficiency improvement works.</p> <p><u>3. Provide loans/mortgage discounts</u></p> <p>Encourage the use of low interest or interest free loans for energy efficiency improvement projects. Another possibility is to provide mortgage interest discounts for purchasing energy efficient homes.</p>
<p>6. Building/ Appliance Standards</p>	<p><u>1. Expand coverage and strength of building standards</u></p> <p>Extend the scope of the Building Energy Code to cover building envelope components, or enhance existing Overall/Residential Thermal Transfer Value (OTTV/RTTV) standards to prescribe the thermal performances of façade and fenestration. Alternatively, tighten the current values of OTTV/RTTV.</p> <p><u>2. Remove thresholds for existing buildings' retrofits</u></p> <p>Require improvement in the energy efficiency of existing buildings. For example, remove the threshold for "major retrofitting works" to mandate all renovation works to comply with the building energy code, or require actions in relation to the energy management opportunities identified from mandatory energy audits.</p> <p><u>3. Review and amend building regulations continuously</u></p> <p>Extend the Building Energy Code reviews to look beyond the code itself and cover the wider set of building regulations and standards, for instance, revising outdated regulations that may obstruct energy efficiency improvements.</p> <p><u>4. Include minimum appliance standards</u></p> <p>Set minimum energy performance standards for electrical appliances to remove relatively inefficient models from the market. The coverage could be expanded in phases, starting with energy intensive appliances like air conditioners and refrigerators.</p>
<p>7. Green Leases</p>	<p><u>1. Simplify guidance and provide training</u></p> <p>Review and identify relevant green lease clauses overseas which are applicable to local leasing agreements. This may also involve capacity building and discussion sessions involving key stakeholders like landlords, tenants, lawyers, sustainability managers and ESCOs to address specific issues.</p> <p><u>2. Roll out trial and exemption to merit innovations</u></p> <p>Perform green leases trials in government owned and rented premises to provide case studies for further analysis and impact assessment.</p>

Category

Policy Recommendations

3. Incentivise landlord-tenant collaboration

This could include the provision of incentives for longer tenancy terms without reinstatement clauses, or require performance-related reporting of energy usage in tenanted parts of buildings. The installation of smart meters and sub-meters may be needed to enable real time collection of granular data for reporting and analytics.

Identified Drivers and Enablers

Based on our city analyses, a number of drivers were identified to be crucial in sustaining energy efficiency improvements and the development of related policy initiatives:

Drivers



A.

International &
National Policy
Influences



B.

Demonstrating
Climate Change
Leadership



C.

Enhancing Energy
Security



D.

Maintaining
Public Health &
Social Wellbeing



E.

Long-term Economic
Development &
Competitiveness

Whereas drivers facilitate the development of public policies, we have also identified several enablers, or factors that enable effective implementation and improvement of energy efficiency policies:

Enablers

i. Institutional Capacity for Long-Term Planning

Taking responsibility for long term climate change policy making, supplemented by the capacity of using evidence-based analysis, and corresponding policy evaluations after the implementation of such policies. This will allow governments to align with long term goals, such as the Paris Agreement.

ii. Inter-departmental Coordination

Coordination and alignment of goals across government departments, with clear responsibilities identified and allocated. This allows a holistic view of the policy-making process so that the effort by individual departments will not be offset by one another unintendedly.

iii. Systems of Engagement

This includes proper channels to involve and develop policies with the relevant stakeholders in the early stages of policy making to address concerns, explain misconceptions, and increase acceptability. The discussions should also be directed to focus on building consensus to avoid stagnation.

1. Introduction

1.1 Background

The Paris Agreement was adopted at the 21st Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC) in December 2015 and became effective on 4 November 2016. As of November 2018, 195 UNFCCC members have signed the Agreement³. It aimed at limiting the global average temperature rise to below 2°C, while ideally maintaining it within 1.5°C. In the Special Report⁴ from the Intergovernmental Panel on Climate Change (IPCC) published in October 2018, policymakers were informed that keeping global warming to 1.5°C, rather than 2°C, could significantly reduce the severity of climate impacts, implying that rapid and far-reaching transitions and transformations, rather than piecemeal actions on a best-effort basis, are required.

China formally signed and ratified the Paris Agreement in 2016. The Paris Agreement also applies to Hong Kong, as a Special Administrative Region (SAR) of China. In 2017, Hong Kong's Climate Action Plan 2030+⁵ was published by the Hong Kong SAR Government (the Government), which set a target to reduce 65 – 70% of Hong Kong's carbon intensity per GDP, roughly equivalent to cutting 26 – 36% of absolute carbon emissions by 2030 relative to 2005 levels.

In 2016, 66.5% of Hong Kong's total greenhouse gas (GHG) emissions came from electricity generation⁶, of which 93% of the electricity produced was consumed by existing commercial and residential buildings⁷. However, recent performance shows limited progress in the reduction of energy intensity in buildings. Though the energy intensity of office buildings fell by almost 25% between 2002 and 2008, further reduction has been negligible since then (see Fig. 1), while the energy intensity of private residential buildings remained at similar levels over the years.

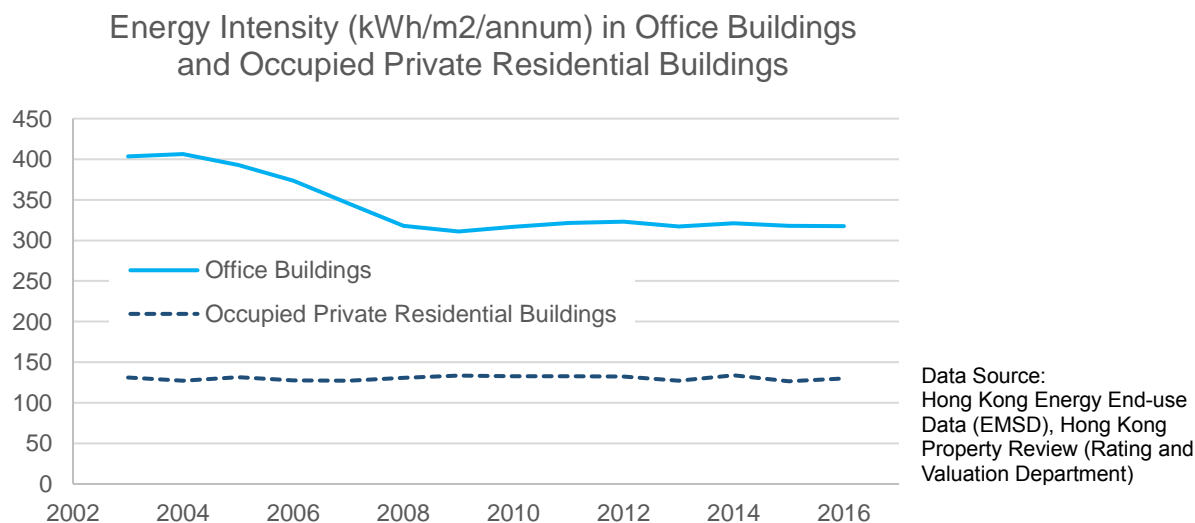


Fig. 1. Energy Intensity of Office Buildings and Occupied Private Residential Buildings

³ https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=en

⁴ <http://www.ipcc.ch/report/sr15/>

⁵ <https://www.enb.gov.hk/sites/default/files/pdf/ClimateActionPlanEng.pdf>

⁶ Including Towngas generation which contributed to around 0.73% of the total GHG emissions of Hong Kong in 2016.

⁷ From: https://www.climate.gov.hk/files/pdf/HKGHG_Sectors_2016.pdf

⁷ https://www.emsd.gov.hk/filemanager/en/content_762/HKEEUD2017.pdf

The room for improvement in buildings energy efficiency is significant. Hong Kong Green Building Council (HKGBC)'s "HK3030 Market Drivers for Transformation of Green Buildings in Hong Kong"⁸ showed that, with current technologies, buildings can reduce their energy use by up to 55% by 2030 (baseline 2005). BEC's "Energy Efficient Retrofits Guide and Calculator"⁹ also showed similar levels of energy saving projections, and demonstrated that numerous energy efficiency retrofits will also bring net monetary savings.

However, in BEC's discussions with the property sector through its Low Carbon Hong Kong¹⁰ project, it was apparent that actual reductions will be closer to 10-15%¹¹ if only business-as-usual improvements, such as retro-commissioning and replacement of end-of-life equipment, are in place. This suggests that without other scaled-up measures and actions, which would in turn require significant policy support in terms of incentives and regulations, greater savings would be difficult to deliver.

Apart from contributing to emission reduction targets, co-benefits from energy savings include air quality improvement and cost savings from reduced energy use. In 2016, public electricity generation was the second largest source of SO₂ and NO_x in Hong Kong after marine transportation¹², therefore reducing electricity consumption in buildings will also contribute to lowering health risks from air pollution.

1.2 Study Aims and Methodology

In this respect, this BEC study, funded by Konrad-Adenauer-Stiftung and supported by BEC's Energy Advisory Group¹³, aims to identify opportunities where the current policy framework related to the promotion of energy efficiency in Hong Kong could be enhanced, so as to expedite Hong Kong towards an energy-efficient built environment.

To approach the topic, BEC researched and analysed the policy framework in selected cities via a holistic systems approach and examined policies that support energy efficiency investment choices, and/or foster the establishment of pragmatic options for policy enhancement.

Exemplar cities were identified and selected through preliminary research and screening, as well as consulting experts within BEC's membership and the Energy Advisory Group. Seven cities – Singapore, Tokyo, New York City, Sydney, Essen, Beijing and Shenzhen – were chosen after this process.

Specifically, Singapore was chosen based on its green building masterplans and its success with the Green Mark certification scheme; Tokyo was selected based on its unique Cap and Trade Programme targeting large buildings; New York City was similar to Hong Kong with its large number of skyscrapers; Sydney was selected following discussions with the Australian Sustainable Built Environment Council, due to its Better Buildings Partnership and the use of performance-based rating schemes; Essen was selected being the 2017 European Green Capital; Shenzhen and Beijing were chosen as China's central government uses the latter to pilot change while the former is a well-

⁸ https://www.hkgbc.org.hk/ebook/HKGBC_Roadmap/files/assets/basic-html/page-1.html#

⁹ <https://bec.org.hk/resource-centre/eerguide>

¹⁰ Low Carbon Hong Kong, Property and Construction Working Group Workshop 2, 12 April 2018.

¹¹ Low Carbon Hong Kong, Property and Construction Working Group Workshop 3, 6 June 2018. This was attended by 16 people from property sector, energy management consultants, NGO and academia. The 2 groups in our discussion separately concluded that 10-15% was the expected level of reduction in energy utilisation.

¹² https://www.epd.gov.hk/epd/english/environmentinhk/air/data/emission_inve.html

¹³ <https://bec.org.hk/about-us/bec-energy-advisory-group>

known modern high-technology city, and both cities are part of China's Alliance of Peaking Pioneer Cities¹⁴. Each of the cities are then analysed according to the 7 policy categories listed below. Besides, BEC also commissioned ICF International Consulting (Beijing) Company Limited to carry out an additional study for the city analysis of Beijing and Shenzhen.

The policy framework of the cities were studied based on the following categories:

1. Information and education
2. Government leadership
3. Non-financial incentives
4. Financial incentives
5. Green finance
6. Buildings and appliance standards
7. Green leases

The categorisation was adapted from C40 Cities' Urban Efficiency report¹⁵ with modifications such as merging and re-arranging categories to energy utility obligations (e.g. Hong Kong's Scheme of Control Agreements for the electricity companies) within the category of financial incentives. The detailed categorisation criteria can be found in the "City Studies Template" in Annex A.

Desk studies contributed the most significant part of our research and were supplemented by workshops organised by BEC which engaged Hong Kong's business community, NGOs, academics and other experts.

	Content	Attendance
Workshop 1 (23 April 2018)	To seek views on our initial city analyses of Tokyo, Singapore, Sydney, New York City and Hong Kong, and to begin to understand the policy gaps in Hong Kong.	Around 30 attendees from the utility, property and construction sectors, as well as solution providers and NGOs
Workshop 2 (11 June 2018)	To present our city analyses of Beijing, Shenzhen, and Essen, and to explore our "horizontal analysis" of policy categories across cities. This also contributed to developing our understanding of gaps in Hong Kong.	More than 15 experts, consultants and researchers from universities, NGOs and the property sector.
Workshop 3 (16 July 2018)	To present our findings and enabled us to refine our conclusions as well as develop an understanding of the enablers and drivers of impactful policies. Participants commented on the policies identified by BEC as most relevant to Hong Kong.	Around 20 attendees from the property development and management sector, as well as solution providers.

¹⁴ https://rmi.org/wp-content/uploads/2017/12/RMI_City_Peaking_Decarbonization_Handbook.pdf

¹⁵ <https://www.c40.org/researches/urbanefficiency> | p.19

1.3 Scope of the Study

This report focuses on reducing the energy consumption in Hong Kong's commercial and residential buildings, which consumed 65% and 27% of all electricity generated¹⁶, as well as 41% and 54% of towngas¹⁷ in Hong Kong in 2016. Commercial buildings generally refer to commercial premises, including hotel and serviced apartments, offices, retail (such as shops and shopping malls), and catering premises such as restaurants and commercial kitchens. Residential buildings, on the other hand, refers to public housing, private housing, subsidised housing and others. This study does not cover industrial buildings, construction methods, construction materials, nor embodied carbon.

The largest portion of electricity consumed in both types of building was for space cooling, especially during summer months. For commercial buildings with centralised air conditioning systems, tenants are typically billed a fixed fee for air-conditioning. On the contrary, for buildings with decentralised air conditioning systems (e.g. split-type units), tenants are billed with actual electricity consumed for air conditioning. Gas is primarily used for cooking and hot water heating.

The study relates only to buildings energy efficiency and is confined to policies that impact on energy savings in the operational phase of commercial and residential buildings, as well as policies that ensure and encourage energy efficient designs of new buildings – which HKGBC estimates¹⁸ 20% of buildings in place in 2030 would have been built between 2015 and 2030. It examines policy measures related to building envelopes and technology¹⁹, and behavioural change of those responsible for investment, management, and usage.

1.4 Structure of the report

In chapters 2 and 3, we explain the current policy framework of Hong Kong, and a brief account of relevant policies implemented in the 7 selected cities, with reference to the 7 policy categories mentioned in Section 1.2.

Chapter 4 analyses the commonalities and highlights specific successful policies across other cities relevant to Hong Kong's case, and identifies policy gaps in Hong Kong. In response of the gaps identified, we then develop recommendations for improving Hong Kong's policy framework.

Chapter 5 discusses drivers and enablers identified from our cities research, and Chapter 6 concludes the report and lists out the relevance of our policy recommendations to the key players in relation to buildings energy efficiency.

¹⁶ https://www.emsd.gov.hk/filemanager/en/content_762/HKEEUD2018.pdf

¹⁷ <https://www.statistics.gov.hk/pub/B11000022017AN17B0100.pdf>

¹⁸ https://www.hkgbc.org.hk/ebook/HKGBC_Roadmap/files/assets/basic-html/page-1.html#

¹⁹ <https://webstore.iea.org/market-report-series-energy-efficiency-2017-pdf>

2. Hong Kong's Policy Framework on Buildings Energy Efficiency – An Overview

A summary of the policies used in Hong Kong, categorised following our methodology specified in Section 1.2, is shown below.



2.1 Information and Education Provision

The main information/education policy measures identified are:

Information on HKSAR Government Policies and Action

This is provided through a number of Government publications and websites. The key publication, the Energy Saving Plan for Hong Kong's Built Environment 2015~2025+²⁰, summarises Hong Kong's energy efficiency policies to date, and lays down a roadmap to 2025. The Energy Saving for All website²¹ has been set up by the Environment Bureau (ENB) to provide educational information on energy saving measures, including events, competitions, awards, tips, and guidelines. The website also provides links to work done by other organisations such as the Electrical and Mechanical Services Department (EMSD) and the Hong Kong Green Building Council (HKGBC).

Published by EMSD, the Energy End-use Data²² is an annual publication showing the demand-side energy consumption of Hong Kong, broken down by sector and by end-use. This dataset is collated annually using surveys, but the detailed methodology is not disclosed.

Technical Guidelines and Advice

The Technical Guidelines on Retro-commissioning²³ (RCx) was published by EMSD in 2017 on how to retro-commission existing buildings. The guidance includes 17 detailed RCx examples and supplementary information forms to aid facilities managers to carry out RCx.

EPD's recent Guide to Low Carbon Offices – Practical Guide on Carbon Audit and Management²⁴ also provides a set of guidelines on evaluating emissions of commercial buildings with suggested ways for further reduction.

Energy Efficiency Labelling of Products

Under the Energy Efficiency (Labelling of Products) Ordinance Cap. 598, certain appliances are required to be labelled. The Mandatory Energy Efficiency Labelling Scheme (MEELS) was introduced as 60% of electricity is consumed on space conditioning, refrigeration and lighting in the residential sector²⁵. MEELS mandates energy labels indicating energy efficiency performance to be shown on 8 types of electrical appliances (room air conditioners, refrigerators, compact fluorescent lamps, washing machines, dehumidifiers, televisions, induction cookers, and storage type water heaters). The covered product types had expanded through different phases, with the first phase started in November 2009, second phase in September 2011, and third phase in June 2018²⁶. The labels are divided into 5 grades with Grade 1 being the most energy efficient. For example, Grade 1 Refrigerating Appliances consume 41% and 97% less

²⁰ <http://www.enb.gov.hk/sites/default/files/pdf/EnergySavingPlanEn.pdf>

²¹ <http://www.energysaving.gov.hk/en/home/index.html>

²² https://www.emsd.gov.hk/en/energy_efficiency/energy_end_use_data_and_consumption_indicators/hong_kong_energy_end_use_data/data/index.html

²³ <http://www.energysaving.gov.hk/filemanager/template/common/pdf/rcx/2017%20TG-RCx.pdf>

²⁴ https://www.carbon-footprint.hk/PDF/EPD_CA_Guidebook_Office_English.pdf

²⁵ https://www.emsd.gov.hk/filemanager/en/content_762/HKEEUD2017.pdf

²⁶ <https://www.emsd.gov.hk/energylabel/en/development.html>

electricity than their Grade 3 and Grade 5 counterparts respectively; and Grade 1 split-type room air conditioners consume 36% and 61% less electricity than their Grade 3 and Grade 5 counterparts²⁷.

The EMSD estimated that 25 GWh of energy can be saved with the implementation of the second phase of MEELS²⁸.

There is also a Voluntary Energy Efficiency Labelling Scheme (VEELS) that covers 22 types of household appliances and office equipment²⁹.

Free Energy Audits

A free energy audit serves as a regular check-up on energy-saving performance. Under the Scheme of Control Agreements (SCA), the two power companies in Hong Kong, CLP Power Hong Kong Limited (CLP) and The Hongkong Electric Company (HEC), provide free energy audits to all their commercial and industrial customers³⁰. HEC also provides the Energy Survey Programme to encourage on-line energy auditing carried out by end-users of commercial and residential buildings on a continuous basis³¹.

Smart Metering

The Government has recently approved the new Development Plans for the two power companies which include the progressive roll-out of smart meters to all residential and small business customers³². This is expected to facilitate the provision of much more granular and timely electricity consumption information to customers and help drive both understanding of energy efficiency and behavioural change.

2.2 Government Leadership: Targets and Own Operations

Government-set Target

The Government has set a carbon emissions reduction target for the whole of Hong Kong that reflects China's Nationally Determined Contribution (NDC). Using a 2005 baseline, the Government aimed to reduce carbon intensity (per unit of GDP) by 50 – 60% by 2020 and 65 – 70% by 2030, or in terms of absolute carbon emission reduction, 20% by 2020 and 26 – 36% by 2030³³.

Government Buildings and Procurement

The Government has set three commitments regarding new government buildings, existing government buildings and procurement of appliances:

1. By 2025, the Government aims to have new government buildings with construction floor area larger than 5,000 m² with central air-conditioning, or larger than 10,000 m² to achieve at least BEAM Plus Gold rating (see Section

²⁷ <https://www.emsd.gov.hk/energylabel/en/faq/faqs.html>

²⁸ https://www.emsd.gov.hk/filemanager/conferencepaper/en/upload/42/4th_Greater_Pearl_River_Delta.pdf

²⁹ https://www.emsd.gov.hk/en/energy_efficiency/voluntary_energy_efficiency_labelling_scheme/index.html

³⁰ <https://www.clp.com.hk/en/my-business/energy-saving-service/energy-audit-service-and-loan-scheme>

³¹ <https://www.hkelectric.com/en/corporate-social-responsibility/caring-for-our-environment/energy-efficiency-and-conservation>

³² <https://www.clp.com.hk/en/my-home/energy-saving-service/smartmeter>

³³ <http://www.enb.gov.hk/sites/default/files/pdf/ClimateActionPlanEng.pdf>

- 2.3 below). New public housing will need to be at least BEAM Plus Gold ready³⁴.
2. Existing public buildings have already achieved a 7% energy consumption reduction from 2003 to 2007, a 9% reduction from 2009 to 2014. Under the Energy Saving Plan 2015, the Government committed to further reduce energy usage by 5% from 2015 to 2020³⁵.
 3. Voluntary systems for green public procurement³⁶ supported by green procurement product specifications. This is a list of 150 items under 23 different categories, including electrical appliances and guidelines on their energy performance. The Government encourages bureaux and departments to adopt green specifications in their purchases as far as practicable.

New Initiatives in Kowloon East

The Government implemented the Kai Tak District Cooling System (DCS)³⁷ in East Kowloon, which provides energy-efficient air conditioning system for the new developments in the area. The DCS is expected to consume 20 to 35% less electricity than traditional air- or water-cooled air conditioning systems, and is estimated to save 85 million kWh of electricity per year³⁸.

The Government has also set lease conditions in relation to new land sales site in Kowloon East³⁹, which include conditions that require developers to achieve BEAM Plus Gold or above ratings, higher greening ratio, provide smart water metering systems and electric vehicle charging facilities. New public buildings in the area are also required to comply with the same requirements.

2.3 Non-financial Incentives

Green Building Certification and Rating Tools

The Building Environmental Assessment Method (BEAM) Plus is Hong Kong's own voluntary green building rating tool for new buildings, existing buildings, interiors, and neighbourhoods. There are various incentive schemes to encourage the uptake of BEAM Plus assessment, notably GFA concession conditional on a BEAM Plus assessment and meeting some prerequisites (see Section 2.4 below). All BEAM Plus certifications (except provisional assessment for new/existing buildings) are valid for 5 years⁴⁰.

As of February 2018, there were 1,061 registered BEAM Plus projects. Among the 566 assessed projects (both provisional and final), 192 (34%) were unclassified (fulfilled

³⁴ <http://www.enb.gov.hk/sites/default/files/pdf/EnergySavingPlanEn.pdf>

³⁵ https://www.enb.gov.hk/sites/default/files/pdf/EnergySaving_EB_EN.pdf p.14

³⁶ https://www.epd.gov.hk/epd/english/how_help/green_procure/green_procure.html#a2

³⁷

https://www.emsd.gov.hk/en/energy_efficiency/district_cooling_system_at_kai_tak_development/introduction/index.html

³⁸ https://www.emsd.gov.hk/filemanager/conferencepaper/en/upload/42/4th_Greater_Pearl_River_Delta.pdf

³⁹ https://www.ekeo.gov.hk/en/smart_city/index.html

⁴⁰ <https://www.beamsociety.org.hk/files/ND/BEAMPlusProceduresManual.pdf> p.37

prerequisites but did not obtain enough credits for Bronze), 66 (12%) were rated Bronze, 71 (13%) were rated Silver, 156 (28%) were rated Gold, and 81 (14%) were rated Platinum⁴¹. HKGBC shows all BEAM Plus certified buildings online⁴².

EMSD also runs the Hong Kong Energy Efficiency Registration Scheme for Buildings (HKEERSB)⁴³. This is a registration scheme launched in 1998 to encourage building owners to outperform the statutory requirements set out in the Building Energy Code (see Section 2.6 below) for both new and existing buildings. Buildings that attain a minimum award grading or above in BEAM Plus or other internationally recognised building environmental assessment systems (e.g. LEED) are eligible to apply for the scheme. The HKEERSB certificate is only valid for 5 years from the date of issue. As of March 2017, there were 3,974 building venues successfully registered under HKEERSB⁴⁴.

Indices and Benchmarking

Hong Kong has a set of energy utilisation indices (EUIs) for residential, commercial and transport sectors issued by EMSD in 2011. Its Online Benchmarking Tool⁴⁵ was also published together with the set of EUIs, for users to input their energy consumption data and calculate their relative energy performance in percentiles. HKGBC also developed a set of benchmarks for commercial buildings and office occupants⁴⁶.

Energy Saving Charter and 4Ts Charter⁴⁷

These voluntary charters are set up by the Government to encourage stakeholders in the built environment to adopt energy saving measures (Energy Saving Charter) and to set transparent targets within a timeline (4Ts Charter). The Government may carry out sample checking of indoor temperatures for Energy Saving Charter participants, and may request energy saving results and records from 4Ts Charter participants.

At present, over 3,300 premises have signed up to the Energy Saving Charter in 2017. As for the 4Ts Charter, transparency on on-going performance is ensured, which requires regular information disclosure on the participating companies' website, annual report or newsletter⁴⁸.

Hong Kong Awards for Environmental Excellence (HKAEE)⁴⁹ and Hong Kong Green Organisation Certification (HKGOC)⁵⁰

A couple of award schemes are also put in place: the Hong Kong Awards for Environmental Excellence (HKAEE) and the Hong Kong Green Organisation Certification (HKGOC). Both the HKAEE and HKGOC are funded by the Environment and Conservation Fund. Run by the Environmental Campaign Committee (ECC), which

⁴¹ <https://www.hkgbc.org.hk/eng/BEAMPlusStatistics.aspx>

⁴² <http://greenbuilding.hkgbc.org.hk/projects/map>

⁴³ https://www.emsd.gov.hk/filemanager/en/content_723/hkeersb2018_en.pdf

⁴⁴

https://www.emsd.gov.hk/en/energy_efficiency/energy_efficiency_registration_scheme_for_building/EERSB/register/index.html

⁴⁵ <http://ecib.emsd.gov.hk/en/index.htm>

⁴⁶ <http://hkbest.hkgbc.org.hk/index.html>

⁴⁷ <http://www.energysaving.gov.hk/esc2018/en/charter/index.html>

⁴⁸ https://www.enb.gov.hk/sites/default/files/pdf/EnergySaving_EB_EN.pdf

⁴⁹ <http://www.hkaee.gov.hk/eindex.html>

⁵⁰ http://www.hkaee.gov.hk/english/hkgoc/green_org_labels/green_organization.html

was set up by the Government, in conjunction with 9 public and private organisations, HKAEE is an annual award that covers 11 sectors for large organisations and 4 sectors for small and medium-sized enterprises (SMEs). It aims to encourage and recognise organisations that have adopted green management practices.

HKGOC consists of 5 certificates, Wastewi\$e, Energywi\$e, IAQwi\$e, Productwi\$e, and the Carbon Reduction Certificate. These certificates recognise organisations for attaining a prescribed level and number of environmental initiatives in the respective aspects (waste, energy use, indoor air quality and product lifecycle), and the Carbon Reduction Certificate to recognise organisations for having verified carbon emission reductions.

As at October 2018, there were 1,412 Energywi\$e Certificate awardees, resulting in a total energy saving of 119 million kWh⁵¹, which roughly translates to 0.35% of the total energy consumption by the commercial sector in 2016.

2.4 Financial Incentives

The most significant financial incentive in place in Hong Kong is the gross floor area (GFA) concession for new buildings, but Hong Kong also has a profits tax deduction to support investment in energy efficient technologies, as well as a number of grant schemes.

New Buildings

The GFA concession for new buildings which relate to Hong Kong's planning regulations (Cap.123 section 38) states that buildings that meet certain prerequisites are eligible to enjoy GFA concession of up to 10% of the total GFA of the development. In terms of energy efficiency, the key prerequisite for the concession is to carry out a BEAM Plus provisional assessment but without a requirement to attain a particular standard. The additional plot ratio allowed can be utilised by property owners to add green or amenity features, as well as non-mandatory or non-essential plant rooms and services⁵². This extra space is conditional on undergoing a BEAM Plus assessment and submitting final assessment results.

Existing Buildings

There are essentially three types of incentives for retrofitting existing buildings. Firstly, tax deductions for energy efficiency installations: the Accelerated Tax Deduction for Energy Efficiency Installations under HKEERSB⁵³. For buildings registered under HKEERSB, the capital cost incurred in the construction of energy efficient equipment and installations (including lighting, air conditioning, electrical and lift and escalator installations) can be offset against profits tax. Starting from 1 April 2018, tax deduction can be claimed in full in one year⁵⁴, instead of 20% each year for five consecutive years as in the previous scheme⁵⁵, hence reducing upfront investment cost significantly.

⁵¹ http://www.hkaee.gov.hk/english/hkgoc/energywise_certificate/list/list.html

⁵² <https://www.bd.gov.hk/english/documents/pnap/APP/APP151.pdf>

⁵³ https://www.emsd.gov.hk/en/energy_efficiency/energy_efficiency_registration_scheme_for_building/index.html

⁵⁴ <http://www.info.gov.hk/gia/general/201803/01/P2018030100661.htm?fontSize=1>

⁵⁵ <https://www.ird.gov.hk/eng/ppr/archives/08042601.htm>

Secondly, there are schemes provided by the Government or by the power companies under the SCA, to subsidise owners of residential, industrial and commercial buildings to carry out energy audits and retrofit projects.

Under the new SCA effective from October 2018 for CLP and January 2019 for HEC⁵⁶, both power companies in Hong Kong provide funds to improve buildings energy efficiency in commercial and residential buildings. CLP's Eco-building Fund⁵⁷ (EBF) and HEC's Smart Power Fund (SPF)⁵⁸ match funds that will subsidise up to 50% of the expenditure of energy efficiency improvement works for communal areas, such as retrofitting, RCx, and smart/IT technologies. Private⁵⁹ residential, commercial, and industrial buildings will be eligible to apply. EBF will have HK\$100 million and SPF will have HK\$25 million to award per year, plus any roll-over from previous years.

The EBF was initially launched back in 2014 for residential buildings and approved 145 applications with a total of HK\$64 million in subsidies, covering more than 400 residential buildings as of March 2018. Targets set by the Government for CLP expect the new EBF, with the expanded scope and budget, to subsidise 400 buildings a year and save 48 GWh annually⁶⁰.

In addition, Community Energy Saving Funds are being set up under the new SCAs by the power companies aimed at supporting customers to upgrade and use more energy efficient appliances that consume less energy, primarily targeting residential premises and also the disadvantaged groups. The funds will be allocated from 65% of the incentives earned from achieving energy saving targets that CLP entitles to. The CLP Community Energy Saving Fund will be launched in Jan 2019⁶¹.

The Buildings Energy Efficiency Funding Schemes (BEEFS), funded by the Government, was a 3-year programme launched in April 2009 with HK\$450 million to subsidise owners of residential, industrial and commercial buildings to carry out energy-cum-carbon audits and energy efficiency projects. Subsidies awarded ranged from HK\$3,000 to HK\$500,000. More than 1,700 energy efficiency projects and 233 energy-cum-carbon audit applications were received, and of those, 1,115 (56%) were approved. Over 6,400 buildings received subsidies from BEEFS, and EMSD estimated the annual energy savings resulted from the scheme was around 180 million kWh⁶², or around 0.6% of the commercial sector's total electricity consumption in 2014.

The third scheme is the provision of Energy Saving Loan Funds to provide interest-free loans for the implementation of energy efficiency initiatives, which can be used to supplement projects under EBF and SPF. Under the new SCA (2018) the fund size from CLP is HK\$25 million per year and HK\$12.5 million per year from HEC.

⁵⁶ <https://www.legco.gov.hk/yr17-18/english/panels/ea/papers/ea20180423cb1-809-4-e.pdf>

⁵⁷ <https://www.clp.com.hk/en/community-and-environment/community-funds/eco-building-fund>

⁵⁸ <https://www.hkelectric.com/en/corporate-social-responsibility/caring-for-our-environment/energy-efficiency-and-conservation/hk-electric-smart-power-fund>

⁵⁹ All government buildings and housing estates that are more than 50% owned by the Hong Kong Housing Authority and Hong Kong Housing Society will not be eligible for the funds.

⁶⁰ <https://www.legco.gov.hk/yr17-18/english/panels/ea/papers/ea20180423cb1-840-1-e.pdf>

⁶¹ https://www.clpgroup.com/en/Media-Resources-site/Current%20Releases%20Documents/20180423_Factsheet_CES%20Fund_en.pdf

⁶² https://www.emsd.gov.hk/filemanager/conferencepaper/en/upload/42/4th_Greater_Pearl_River_Delta.pdf

Additional funding provided by the power companies to note is for free energy audits. Under the new SCA, both power companies will quadruple the number of free energy audits under their existing schemes – for commercial and industrial customers – from 150 to 600 per year for CLP, and from 50 to 200 per year from HEC. CLP stated that their existing scheme had helped business customers to achieve 140 million kWh of electricity between 2009 and 2017 and had conducted a total of over 2,300 energy audits as of April 2018. Moreover, both CLP and HEC will plough back 65% of the incentives earned from energy saving from energy audits and energy efficiency funds to set up a new Community Energy Saving Fund to further support energy efficiency enhancement and conservation.

There are also education funds managed by the power companies to promote energy efficiency in the community through educational programmes. The fund size from CLP is HK\$10 million per year and HK\$5 million per year from HEC.

Innovation and Technology Fund (ITF)⁶³

This is a funding source set up by the Government to support applied R&D projects conducted by universities, industry support organisations, industry and trade associations, or private sectors that contribute to innovation in technology. As at November 2018, more than 9,000 projects were approved, involving over HK\$15 billion⁶⁴ of funding commitment.

2.5 Green Finance

There are four main initiatives in place in Hong Kong, all introduced in 2018:

Pilot Bond Grant Scheme⁶⁵

This is a three-year scheme to cover enterprises issuing bonds in Hong Kong for the first time. This scheme subsidises half of the issue expenses, capped at HK\$2.5 million, and each enterprise can also apply for a grant for at most two issuances. The scheme aims to attract local, mainland and overseas enterprises to issue bonds in Hong Kong but is not limited to green bonds.

Government Green Bond

Through the Hong Kong Monetary Authority (HKMA), the Government will issue up to HK\$100 billion green bonds for green public works project credited to the Capital Works Reserve Fund. No commitments have been made as to how these funds will be used and whether they will be used for new projects or refinancing existing green projects.

Green Bond Grant Scheme⁶⁶

A grant scheme to cover the costs of external review that applies to green bonds of a minimum size of HK\$500 million. Under this scheme, the Financial Services and the Treasury Bureau (FSTB) will meet 100% of the cost of obtaining an external review

⁶³ <https://www.itf.gov.hk/l-eng/about.asp>

⁶⁴ <https://www.itf.gov.hk/l-eng/StatView107.asp>

⁶⁵ <https://www.budget.gov.hk/2018/eng/budget14.html>

⁶⁶ <https://www.legco.gov.hk/yr17-18/english/panels/fa/papers/fa20180403cb1-724-5-e.pdf>

under the Green Finance Certification Scheme (GFCS)⁶⁷, up to HK\$800,000 per issuance. The GFCS was established by the Hong Kong Quality Assurance Agency (HKQAA) to provide third party certification for pre- and post-issuance of green finance products. The first certification was issued in December 2017⁶⁸.

HSBC Sustainable Financing Programme⁶⁹

Co-organised with Business Environment Council, this programme aims at supporting businesses to invest in reducing carbon emissions across different scale of enterprises and across different industries, by providing flexible financing options for instalment loans, hire purchases, or leases. At a minimum amount of HK\$1,000,000, the programme can finance up to 100% of the purchase price with a repayment period up to five years.

2.6 Building/Appliance Standards

Hong Kong has a statutory code for energy efficiency technologies and services as well as statutory requirements for the building envelope of commercial and industrial buildings. It does not have a statutory code for the building envelope of residential buildings, but this is a prerequisite for the GFA concession for those buildings.

Technology and Services Requirements

Under the Buildings Energy Efficiency Ordinance (BEEO) Cap. 610⁷⁰ that has been in force since September 2012, newly constructed buildings and major retrofitting works in existing buildings must comply with minimum requirements set out in the Building Energy Code⁷¹. The Code specifies the energy performance of building services installations (lighting, electrical installation, air conditioning systems, lifts and escalators), and will be reviewed every 3 years. The latest review was completed in 2015, and further improved the energy efficiency by 10% compared to the 2012 version⁷². EMSD estimates BEEO will save 2.8 billion kWh of energy for new buildings in the first 10 years of implementation⁷³, and the 2015 version of the Building Energy Code is expected to have a total savings of 5 billion kWh for newly constructed buildings up to 2025⁷⁴.

Mandatory Audits

The BEEO also mandates existing building owners to carry out an energy audit every 10 years with guidelines provided in the energy audit code⁷⁵. The EUI of central building services installations from the mandatory energy audit reports is publicly disclosed at BEEO's website⁷⁶. As at October 2018, there were 2,556 building EUI records.

⁶⁷ http://www.hkqaa.org/en_certservice.php?catid=26

⁶⁸ http://www.hkqaa.org/cmsimg/Green%20Finance/20180326_HKQAA_Green_Finance_Cer.pdf

⁶⁹ <https://www.business.hsbc.com.hk/en-gb/hk/campaign/sustainable-financing>

⁷⁰ http://www.beeo.emsd.gov.hk/en/mibec_beeo_WhatsNews.html

⁷¹ http://www.beeo.emsd.gov.hk/en/pee/BEC_2015.pdf

⁷² http://www.beeo.emsd.gov.hk/en/pee/BEC2015_EAC2015_In-house_Briefing.pdf

⁷³ https://www.emsd.gov.hk/filemanager/conferencepaper/en/upload/42/4th_Greater_Pearl_River_Delta.pdf

⁷⁴ http://www.beeo.emsd.gov.hk/en/pee/BEC2015_EAC2015_In-house_Briefing.pdf

⁷⁵ http://www.beeo.emsd.gov.hk/en/pee/EAC_2015.pdf

⁷⁶ https://www.emsd.gov.hk/beeo/en/register/search_eaf.php

Thermal Transfer Value Requirements

The Building (Energy Efficiency) Regulations set the Overall Thermal Transfer Value (OTTV) requirements for commercial building. These values are based on energy modelling results, as opposed to the prescriptive approach by components (e.g. façade and fenestration) undertaken in some countries. They were first set in 1995 and further revised in 2005 and 2011. The latest⁷⁷ set of standards require the OTTVs of a building tower and a podium to not exceed 24 W/m² and 56 W/m² respectively. As at October 2018, the OTTV requirements were under review.

Residential Thermal Transfer Value (RTTV) requirements are not mandatory, but it is one of the prerequisites of granting GFA concessions in a residential building, which sets out the maximum RTTV for external walls to be 14 W/m² and 4 W/m² for the roof⁷⁸.

2.7 Green Leases

In Hong Kong, there is currently no public policy support for green leases.

HKGBC issued its Green Tenancy Driver for Office Buildings⁷⁹ in 2014 as a set of voluntary guidelines to encourage collaborative action between landlords and tenants. It also provides a “green lease toolbox” with sample green leases clauses and a green tenancy checklist.

2.8 Key Drivers and Enablers of Energy Efficiency Policies in Hong Kong

The key drivers identified from our research and study are as follows:

Paris Agreement – National Level Policies

Hong Kong’s Climate Action Plan 2030+ states at the outset that the Chinese Government has declared that Hong Kong is formally covered by the Paris Agreement. Accordingly, Hong Kong-specific targets were set and a plan was put in place focusing on the energy intensity of the grid, as well as energy efficiency – setting out a voluntary means to achieve change in the form of the 4Ts Charter. Under the Paris Agreement, Hong Kong must review its progress and update its plan in 2020, committing to further actions.

Climate Change Leadership: Corporate Social Responsibility

Listed companies in Hong Kong are required by the Stock Exchange of Hong Kong to disclose their environmental, social and governance (ESG) performance. Major companies also view sustainability, including green buildings and energy efficiency, as a way to showcase their contribution to society, and some have reported on their performance for many years.

Strong Finance Sector

Though not a major driver to date, it appears that the interest on the part of the finance sector to make Hong Kong a “green finance hub” may drive green bond issuances and

⁷⁷ 2011 standards <https://www.bd.gov.hk/english/documents/pnap/APP/APP067.pdf>

⁷⁸ <https://www.bd.gov.hk/english/documents/pnap/APP/APP156.pdf>

⁷⁹ <https://www.hkgbc.org.hk/eng/got.aspx>

a green investment bank/corporation. This may lead to potential issuers deciding to issue green bonds and seeking projects for the use of bond proceeds.

Enablers

Basing on overseas experience (see Chapter 5 for more), we posit that key enablers of action are:

1. Institutional capacity for long-term policy development
2. Inter-departmental co-ordination
3. Stakeholder engagement: networks and partnerships

Hong Kong has in recent years witnessed developments in relation to all the above. A Steering Committee on Climate Change was set up in 2016 and formally chaired by the Chief Secretary. Responsibility has been allocated across bureaux: the Environment Bureau is responsible for mitigation, Development Bureau is responsible for adaptation, and Security Bureau is responsible for resilience. However, the outcomes of these new institutional arrangement are not made public, and bureaux/departments do not have key performance indicators (KPIs) or plans for public scrutiny.

2.9 Limitations and Barriers in the Hong Kong Context

To develop recommendations for Hong Kong's policy framework, it is important to understand the underlying barriers⁸⁰ that disable stakeholders to perform substantive actions on buildings energy efficiency. Some of the limitations and barriers encountered in Hong Kong are listed below:

a) Split incentives or principal – agent problems⁸¹

- For existing buildings, property owners/developers have little incentive to ensure high levels of energy efficiency in the design and construction of new buildings as are not the ones paying for operating costs;
- For existing buildings, property owners/developers do not benefit from investment in energy efficiency in tenanted areas (depending on how energy savings are shared); and,
- Tenants may not have the incentive to reduce energy usage if they are paying a fixed fee for cooling, lighting and/or others. Short tenancies combined with reinstatement clauses also contributes to the problem.

The nature of the property landscape in Hong Kong with large numbers of high rise buildings, and with commercial buildings occupied by multiple tenants means that the impact of split incentives is pronounced. The high property price in Hong Kong means that energy efficiency plays only a small part to businesses in terms of financial decisions regarding properties.

b) Capital costs and budgetary control

⁸⁰ https://www.iea.org/publications/freepublications/publication/25recom_2011.pdf

⁸¹ This analysis of the split incentive situation in Hong Kong is derived from a series of interviews undertaken by BEC in July/August 2017 for a preliminary study on Green Leases. This study was based on interviews with 5 companies: 2 large property owner/developers, 2 large property management companies and a tenant of substantial office premises within a modern commercial building.

- Some energy efficiency measures require additional capital costs, though for new buildings, studies worldwide show that these additional costs are low⁸².
- Separate management on capital and operational budgets. Those managing operational budgets may have little call on capital budgets and may not be able to leverage additional upfront capital for retrofits.
- Those managing capital budgets may not have a strong interest in saving operational costs and may be resistant even to energy saving measures with relatively short payback periods.
- Finance directors may put little pressure on those managing operational costs to save money, as these costs may seem small in comparison with other costs like staff costs and rental costs.

c) Information and uncertainty

- Lack of information for landlords and tenants to decide on energy saving measures.
- Uncertainty of the results (actual energy and cost savings) of investments in energy efficiency which may detract from the finance sector investing in such projects.
- This may in some cases be a perception of uncertainty, high capital costs, or limited capacity to analyse impacts⁸³.

With the complexity of high rise buildings it may not always be immediately obvious as to how to reduce energy usage. Moreover, a landlord will not generally have sight of the energy consumption of their tenants.

In this respect, efforts on public-private partnerships on information disclosure, policy-making and governance, as well as on-going financial support remain crucial for long-term sustainable development in the built environment. This will be further discussed in the later parts of the report, especially in Section 4.7.

⁸² <https://www.usgbc.org/articles/green-building-costs-and-savings>

⁸³

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/392908/Barriers_to_Energy_Efficiency_FINAL_2014-12-10.pdf p.2 For operational savings, this UK study shows that capital costs are often not necessary.

Glossary

BEAM	Building Environmental Assessment Method
BEEFS	Buildings Energy Efficiency Funding Schemes
BEEO	Buildings Energy Efficiency Ordinance
CIC	Construction Industry Council
CLP	CLP Power Hong Kong Limited
DCS	District Cooling System
EBF	Eco-Building Fund
ECC	Environmental Campaign Committee
EMSD	Electrical and Mechanical Services Department
ENB	Environment Bureau
EPD	Environmental Protection Department
ESCOs	Energy Service Companies
ESG	Environmental, Social and Governance
EUIs	Energy Utilisation Indices
FSTB	Financial Services and Treasury Bureau
GFA	Gross Floor Area
GFCS	Green Finance Certification Scheme
HEC	The Hongkong Electric Company Limited
HKAEE	Hong Kong Awards for Environmental Excellence
HKEERSB	Hong Kong Energy Efficiency Registration Scheme for Buildings
HKGBC	Hong Kong Green Building Council
HKGOC	Hong Kong Green Organisation Certification
HKMA	Hong Kong Monetary Authority
HKQAA	Hong Kong Quality Assurance Agency
HKSAR	Hong Kong Special Administrative Region
HSBC	The Hongkong and Shanghai Banking Corporation Limited
ITF	Innovation and Technology Fund
KPIs	Key Performance Indicators
LEED	Leadership in Energy and Environmental Design

MEELS	Mandatory Energy Efficiency Labelling Scheme
OTTV	Overall Thermal Transfer Value
RCx	Retro-commissioning
RTTV	Residential Thermal Transfer Value
SCA	Scheme of Control Agreement
SMEs	Small and Medium-sized Enterprises
SPF	Smart Power Fund
VEELS	Voluntary Energy Efficiency Labelling Scheme

3. Summary of Policies – City Studies

In this chapter, we provide a snapshot of each exemplar city and how they support improvement in buildings energy efficiency through different policy means, as well as what Hong Kong can learn from them.

3.1 Singapore



3.1.1 Overview

Singapore's total greenhouse gas emissions in 2012 were 47.1 million tonnes (MT) of CO₂-e⁸⁴, or 8.61 metric tonnes CO₂ per capita in 2016⁸⁵. Electricity consumption by the commerce & service-related and household sectors combined accounted for more than 20%⁸⁶. Projecting from 2005, the government expect their business-as-usual (BAU) emissions to reach 77.2 MT CO₂-e by 2020, with 60% of the emissions from the industrial sector and around 14% from buildings⁸⁷.

3.1.2 Progress

Singapore has had some successes in terms of buildings energy efficiency. As of 2016, the energy use intensity (EUI) of buildings had fallen by 9% to 290 kWh/m², from 2008 EUI levels⁸⁸. The government's commitment and leadership in green building development has been recognised internationally, and won awards from World Green Building Council⁸⁹, Aspen Institute⁹⁰, and Alliance to Save Energy⁹¹.

3.1.3 Impactful Policies

The policies we have identified through our analysis as being most impactful are explained below.

Information and Education Provision

Singapore has an easy to access one-stop-shop information website, Energy Efficient Singapore⁹², with comprehensive and well-structured information regarding energy efficiency legislation, best practices and incentive schemes.

It also has a good system of benchmarking compiled using robust data. Existing buildings are legally required to private disclose their energy consumption data to BCA annually when requested, for the purpose of developing the Building Energy Benchmarking Report (BEBR)⁹³. This is an annual report that provides energy performance trends and benchmarks for different building types. Voluntary public disclosure of building energy performance data is also encouraged.

Public Sector Leadership: Government Targets

The Singapore government itself also took a leadership role through Public Sector Taking the Lead in Environmental Sustainability⁹⁴, by requiring large new and existing public buildings and office premises to acquire Green Mark certifications. It also required ensuring public agencies to only lease from buildings with at least a Green Mark Gold^{Plus} rating, and encouraging public agencies to adopt contracting models with accredited

⁸⁴ http://www.e2singapore.gov.sg/DATA/0/docs/Resources/bur_2_singapore_2016.pdf

⁸⁵ <https://knoema.com/atlas/Singapore/CO2-emissions-per-capita>

⁸⁶ https://www.ema.gov.sg/cmsmedia/Publications_and_Statistics/Publications/SES%202016/Publication_Singapore_Energy_Statistics_2016.pdf

⁸⁷ <https://www.nccs.gov.sg/climate-change-and-singapore/national-circumstances/singapore's-emissions-profile>

⁸⁸ https://www.bca.gov.sg/GreenMark/others/BCA_BEER_Abridged_FA_2017.pdf

⁸⁹ https://www.bca.gov.sg/Newsroom/pr06122011_WGBC.html

⁹⁰ https://www.bca.gov.sg/green_mark/pdf/news_august05.pdf

⁹¹ <https://www.ase.org/events/2013-evening-stars-energy-efficiency-awards-dinner>

⁹² <http://www.e2singapore.gov.sg/>

⁹³ <https://www.bca.gov.sg/BESS/BenchmarkingReport/BenchmarkingReport.aspx>

⁹⁴ <https://www.e2singapore.gov.sg/programmes/public-sector-taking-the-lead-in-environmental-sustainability>

Energy Services Companies (ESCOs) while undertaking retrofit projects.

Green Finance

Singapore's green finance ecosystem supports the ESCO market, making it easier for expert energy saving companies to raise finance. This in effect is a highly targeted finance scheme, addressing a sector that has difficulty in raising finance but potentially has an important role to play. The BCA launched this Building Retrofit Energy Efficiency Financing (BREEF) Scheme⁹⁵ in 2011 to provide loans that cover up to 90% of the total retrofit costs through energy performance contracts to boost retrofits in existing buildings. This is backed up by a dedicated accreditation scheme to regulate and give official recognition to ESCO and Qualified Energy Services Specialist (QuESS)⁹⁶.

Singapore also encourages green bond issuance through the Monetary Authority of Singapore's Green Bond Grant scheme⁹⁷ that offsets 100% of expenses attributable to obtaining an external review for green bonds with more than SGD \$200 million (HK \$1.2 billion) in size.

Buildings Standards and the "Green Mark" Certification Scheme

Singapore's buildings standards – the statutory standards combined with the Green Mark Scheme – appear to have been successful in driving the market. The Green Mark scheme has a broad set of building-type specific certifications for new and existing offices and residential buildings, as well as occupant-centric certifications for premises like restaurants and data centres. In September 2018, BCA launched a new Green Mark scheme for Super Low Energy Buildings⁹⁸, aiming to provide recognition for best-in-class buildings that could bridge the gap between "green buildings" and "net zero carbon buildings".

Under the Building Control Act, large newly constructed buildings and large existing commercial buildings undergoing cooling system replacements must comply with the minimum environmental sustainability standards⁹⁹, including achieving a minimum Green Mark score. Existing buildings are also legally required to submit periodic energy audit reports and disclose their energy consumption data to BCA when requested, for the purpose of developing annual energy performance benchmarks for various building types¹⁰⁰.

In terms of certifying green buildings, it is important to support the market, and Singapore has been fairly successful. With Government targets, statutory requirements and numerous incentive schemes¹⁰¹ to encourage Green Mark certification in the private sector, the number of Green Mark certified buildings in Singapore surged from 17 in 2005 to more than 2,300 in 2016¹⁰². By the end of 2016, it accounted for over 25% of

⁹⁵ <https://www.bca.gov.sg/GreenMark/brief.html>

⁹⁶ http://www.e2singapore.gov.sg/Programmes/ESCO_Accreditation_Scheme.aspx

⁹⁷ http://www.mas.gov.sg/annual_reports/annual20162017/MAS_AR_201617_Editorial.pdf

⁹⁸ https://www.bca.gov.sg/GreenMark/others/GM_SLE.pdf

⁹⁹ https://www.bca.gov.sg/EnvSusLegislation/others/Env_Sus_Code2013.pdf

¹⁰⁰ https://www.bca.gov.sg/EnvSusLegislation/Existing_Building_Legislation.html

¹⁰¹ https://www.bca.gov.sg/GreenMark/green_mark_buildings.html

¹⁰² <https://solidiance.com/insights/white-papers/the-top-10-global-cities-for-green-buildings/download?token=rGyZ0GMXav>

the total built-up areas in Singapore¹⁰³.

To encourage building owners in engaging tenants to be energy-efficient, BCA has set up the Green Mark Pearl Award¹⁰⁴ to recognise buildings with a certain percentage of tenanted floor space certified under Green Mark Occupant-Centric schemes.

Green Leases

The BCA introduced a toolkit for offices and retail premises on green leases in 2014. It sought to encourage the establishment of environmental standards between landlords and tenants, covering aspects like energy consumption, electricity use, water and waste management, as well as office management. Standard clauses, reporting guidelines, certification and suggestions on setting targets and ways to retrofit internal infrastructure were also included to help tenants and landlords to formulate green leasing agreements¹⁰⁵. The BCA also encourages the use of energy performance contracting (EPC) and ESCOs through its BREEF scheme.

Drivers and Enablers

Singapore has a well-coordinated and ambitious approach to buildings energy efficiency, with a roadmap to achieve a sustainable built environment. This roadmap has been set out in its Green Building Masterplans (GBMs), the first of which was in 2006. The 3rd Green Building Masterplan¹⁰⁶ published in 2014 set out a vision for Singapore as a global leader in green buildings with special expertise in tropics, sub-tropic buildings, enabling sustainable developments and quality living. Its buildings energy efficiency policies are mainly formulated by the National Environment Agency (NEA) and the BCA. In September 2018, BCA introduced the Super Low Energy Building Technology Roadmap¹⁰⁷, which aimed to foster research and development on energy efficiency enhancements and alternative energy uses. With the collaboration between government, academia and the public sectors, green building development is secured financially with sufficient technical support.

3.1.4 Key Lessons Learnt

Overall, a large portion of Singapore's energy efficiency policies revolve around its Green Mark Scheme, with green building certification driven by building environmental sustainability standards, numerous government-backed incentive schemes as well as public sector taking the lead through raising energy efficiency standards in public buildings. The city provides strong benchmarks and has various award schemes, driving good energy management and retrofitting on buildings as a whole. Lastly, it has developed visionary roadmaps for a sustainable built environment and excellent easy-to-navigation websites.

¹⁰³ https://www.bca.gov.sg/GreenMark/others/3rd_Green_Building_Masterplan.pdf

¹⁰⁴ https://www.bca.gov.sg/GreenMark/others/GM_Pearl_Award_2018.pdf

¹⁰⁵ <https://www.bca.gov.sg/Sustain/sustain.html>

¹⁰⁶ https://www.bca.gov.sg/GreenMark/others/3rd_Green_Building_Masterplan.pdf

¹⁰⁷ https://www.bca.gov.sg/GreenMark/others/SLE_Tech_Roadmap.pdf

Glossary

BAU	Business-As-Usual
BCA	Building and Construction Authority
BEBR	Building Energy Benchmarking Report
BREEF	Building Retrofit Energy Efficiency Financing
CO ₂ -e	Carbon Dioxide equivalent
CSB	Centre for Sustainable Buildings
EENP	Energy Efficiency National Partnership
EPC	Energy Performance Contracting
EUI	Energy Use Intensity
GBM	Green Building Masterplan
GMIS	Green Mark Incentive Scheme
MELS	Mandatory Energy Labelling Standards
MEPS	Minimum Energy Performance Standards
MT	Million Tonnes
NEA	National Environment Agency
QuESS	Qualified Energy Services Specialist
SCEM	Singapore Certified Energy Manager
SGBP	Singapore Green Building Product
SGBS	Singapore Green Building Services

3.2 Tokyo



3.2.1 Overview

Buildings alone accounted for more than 70% (28.8% from residential and 44% from commercial) of Tokyo's total carbon emissions in 2016, which was 58.3 million tonnes (MT) of CO₂-e, or 4.22 metric tonnes of CO₂-e per capita¹⁰⁸.

3.2.2 Progress

The city's final energy consumption has dropped 21% from 801 petajoules (PJ) in 2001 to 635 PJ in 2015, while carbon emission levels stayed roughly the same, due to the increase in carbon intensity of the grid after the shutdown of nuclear power plants. Tokyo appears to have been one of the most successful cities we have studied in terms of reducing its energy emissions in the recent decade.

3.2.3 Impactful Policies

Energy efficiency policies in Tokyo come from two levels: country and city. Country-level policies formulated by the Government of Japan (GoJ) under 3 main ministries: Ministry of Economy, Trade and Industry (METI), Ministry of Environment (MoE), and Ministry of Land, Infrastructure, Transport and Tourism (MLIT). City level policies are formulated by the Tokyo Metropolitan Government (TMG), mainly by the Bureau of Environment.

Information and Education Provision

To lay the groundwork for possibilities to control peak electricity demand, GoJ plans to introduce smart meters into all households and businesses by the early 2020s¹⁰⁹.

At the city level, TMG provides free energy audits, information on seminars, events and list of funding schemes related to energy saving measures for households and businesses through the website "Cool Net Tokyo"¹¹⁰. Notably, GoJ also provides free energy audit services targeting SMEs through the website "Diagnosis Net"¹¹¹ on a nation-wide scale.

Government Leadership and Own Operation

GoJ has set ambitious timelines for net zero carbon buildings: all newly constructed public buildings and houses to be net zero carbon by 2020; and all newly constructed buildings and houses to be net zero carbon by 2030.

Within government departments, green procurement¹¹² is required (the green procurement list includes items like air conditioners, lighting, and office and household electrical appliances), while green contracts and bidding requirements with an emphasis on reducing greenhouse gas emissions¹¹³ are encouraged.

The city of Tokyo itself has also set a target to reduce greenhouse gas emissions by 30% by 2030 (2000 baseline) as well as to reduce city-wide energy consumption by 38% by 2030 (2000 baseline), and TMG's own facilities to reduce energy consumption by 25% by 2019 (baseline 2000, already achieved 20% reduction in 2014). The city is on

¹⁰⁸ http://www.metro.tokyo.jp/english/about/environmental_policy/documents/01_full_text_in_english_1.pdf

¹⁰⁹ http://www.enecho.meti.go.jp/en/category/others/basic_plan/pdf/4th_strategic_energy_plan.pdf

¹¹⁰ <https://www.tokyo-co2down.jp/>

¹¹¹ <https://www.shindan-net.jp/>

¹¹² https://www.env.go.jp/policy/hozen/green/kokusai_platform/2015report/handbook_eng.pdf

¹¹³ http://www.env.go.jp/policy/ga/bp_mat/01whole-02/en_full.pdf

track to achieving targets by promoting energy conservation measures & operations, energy efficiency equipment and installation of renewable energy, for example, it has set a very specific target to have 100% LED lighting penetration rate in TMG facilities by 2020¹¹⁴.

Non-financial Incentives: transparency

At the city level, TMG implemented various policies covering a wide spectrum of buildings. Large new buildings are required to submit a green building plan with environmentally related ratings under the Green Building Programme, while large existing buildings are covered by the Cap and Trade Programme.

Large residential buildings and non-residential buildings are required to display their energy performance certificates during transactions and leasing, under the Green Labelling Programme for Condominiums and Energy Performance Certificate Programme. The energy consumption and energy saving plans of large buildings (covered by the Cap and Trade Programme), as well as small and medium buildings (covered by the Carbon Reduction Reporting Programme), are all publicly disclosed on TMG's website. TMG reported an 11% GHG emissions reduction in 2014 (baseline 2010) from the 25,579 small and medium facilities that submitted the report in four consecutive years¹¹⁵.

From the data collected from its various programmes, TMG developed carbon intensity benchmarks for 30 categories of buildings in Tokyo that will enable building owners to understand their comparative performances in terms of buildings energy efficiency.

Financial Incentives

The Cap and Trade Programme is the first-ever urban emission trading scheme that limits the amount of greenhouse gases each building can emit. Around 1,300 large buildings, responsible for 20% of Tokyo's total carbon emissions, are covered by the programme and are obligated to reduce their average carbon emissions by 6 – 8% from 2010 to 2014 and 15 – 17% from 2015 to 2019. As of 2016, total GHG emissions from buildings under the Cap and Trade Programme have already reduced by 26% compared to 2010 levels¹¹⁶.

To encourage owners of small and medium buildings covered in the Carbon Reduction Reporting Programme to increase their energy efficiency, TMG also provides financial subsidies and tax credits for energy-efficient building equipment¹¹⁷.

On the supply side, Japan has a nationwide carbon tax on top of the oil, gas, and coal tax.

Green Finance

The Japan Housing Finance Agency offers a mortgage scheme with reduced interest levels linked to houses achieving overall safety and environmental standards¹¹⁸.

¹¹⁴ http://www.metro.tokyo.jp/english/about/environmental_policy/documents/01_full_text_in_english.pdf

¹¹⁵ http://www.kankyo.metro.tokyo.jp/en/climate/index.files/Tokyo_GB_eng.pdf

¹¹⁶ Ibid.

¹¹⁷ https://issuu.com/c40cities/docs/urbanefficiencyii_final_hi_res_1

¹¹⁸ <http://www.housingfinance.org/uploads/Publicationsmanager/HFI%20Winter%202011.pdf>

There are also low interest loans to support energy efficiency improvements in both existing and new commercial buildings provided by the Japan Finance Corporation, with financial support up to ¥720 million (HKD\$51.7 million)¹¹⁹. This loan schemes targets on small and medium-sized enterprises since 2008.

Buildings and Appliance Standards

The Energy Conservation Law¹²⁰ published in 1979 after the oil crisis is the cornerstone of Japan's energy efficiency policies. The law requires the effective utilisation of fuel resources, which includes energy efficiency, to enhance Japan's energy security.

It is the basis of policies such as the widely-studied Top Runner Programme¹²¹ that sets out mandatory energy efficiency improvement targets and target years for a selection of electrical appliances. The law also prescribed a set of voluntary building energy performance standards which was replaced in 2016 by a newer set of mandatory standards under the Building Energy Efficiency Act¹²².

Green Leases

A Green Lease Guide was published by MLIT in cooperation with MoE and METI in 2016. It provided comparative studies on green leasing policies between different cities in the world and case studies of how Japan's property sector apply green leases. It introduces the concept of "Operational Improvement" and "Energy Efficient Retrofit" to foster a win-win relationship between landlords and tenants by setting up voluntary agreements on energy saving and improvement on the indoor environment. The ultimate goal is to provide a pleasant working environment for workers and reduce utility costs simultaneously¹²³.

Drivers and Enablers

The key legislation driving energy efficiency in the national level is the Energy Conservation Law, which was developed after the 1973 oil crisis to improve Japan's energy security. This was also reflected after the 2011 Fukushima incident followed by the Tohoku earthquake and tsunami, when the government decided to shut down all nuclear reactors, and requested the industry and households to drastically reduce energy consumption to prevent blackouts. Another rationale behind the Energy Conservation Law was to improve the competitiveness of Japan's industry by becoming more efficient, and by developing and producing energy efficient products.

At the city level, using the Cap and Trade Programme as an example, TMG first reviewed the effectiveness of their mandatory reporting scheme, then actively engaged and negotiated with the focused industry groups to address their concerns¹²⁴ before implementing the Cap and Trade Programme which required large buildings to reduce their emissions. The active engagement with stakeholders in the policy-making process addressed the concerns brought up by different parties, and facilitated public policy implementation.

¹¹⁹ <https://www.apec.org/-/media/APEC/Publications/2013/3/Regulatory-Reform-Case-Studies-on-Green-Investments/TOC/Buildings-in-Japan-and-Thailand.pdf>

¹²⁰ <https://www.eccj.or.jp/law/e-law.html>

¹²¹ http://www.enecho.meti.go.jp/category/saving_and_new/saving/data/toprunner2015e.pdf

¹²² <http://www.mlit.go.jp/common/001134876.pdf>

¹²³ <http://www.mlit.go.jp/common/001206912.pdf>

¹²⁴ <https://www.tandfonline.com/doi/abs/10.1080/09613218.2011.596419>

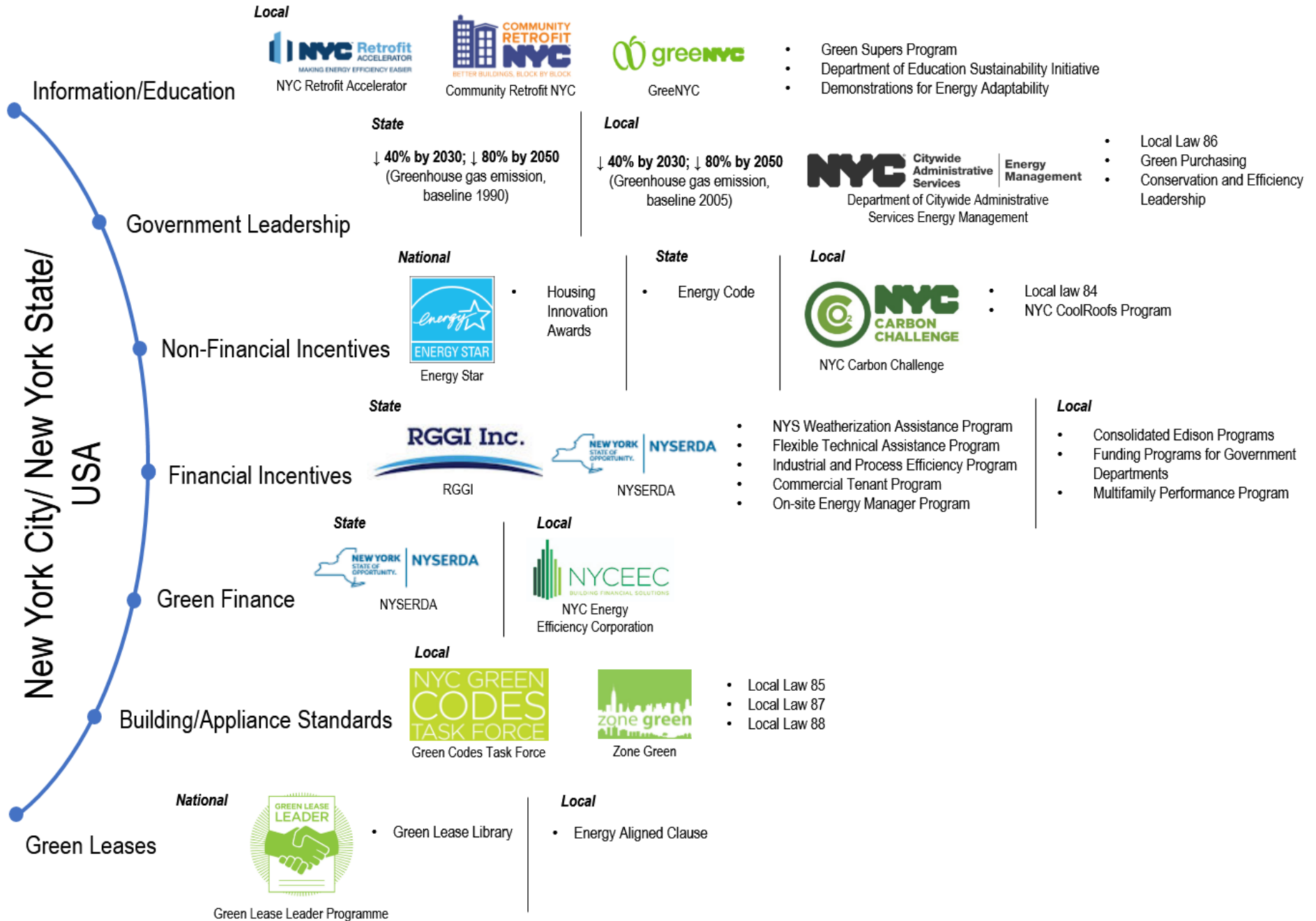
3.2.4 Key Lessons Learnt

Overall, Tokyo and Japan have a comprehensive policy framework that covers the major aspects of buildings energy efficiency, from new to existing buildings, building equipment to household appliances, and building owners to large tenants. To aid building owners and users, incentive schemes are also put in place together with case-studies and energy saving best practices displayed on government websites. Tokyo stands out in terms of transparency of building energy performance data and benchmarking – even down to the tenant level – as well as for its cap & trade programme.

Glossary

CASBEE	Comprehensive Assessment System for Built Environment Efficiency
GHG	Greenhouse Gas
GoJ	Government of Japan
LED	Light-Emitting Diode
METI	Ministry of Economy, Trade and Industry
MoE	Ministry of Environment
MLIT	Ministry of Land, Infrastructure, Transport and Tourism
TMG	Tokyo Metropolitan Government

3.3 New York City



3.3.1 Overview

The City of New York emits 52 million tonnes of CO₂-e annually, translating to 6 tonnes of CO₂-e per capita per year, around the same for Hong Kong. Buildings are responsible for 66% of greenhouse gas emissions – 32% from residential buildings, 26% from commercial and institutional buildings, and 8% from industrial buildings and construction¹²⁵.

3.3.2 Progress

Since 2005, NYC's building floor area increased by 3% while greenhouse gas emissions from buildings decreased by 16%^{126, 127}. Although NYC's overall greenhouse gas emissions from buildings decreased substantially¹²⁸, the electricity emissions factor which fell by 39% since 2005 was largely responsible for this reduction. As to buildings energy consumption, partly gas usage for heating, the per area energy intensity of buildings has remained relatively stable, with only modest reductions¹²⁹. Nevertheless, some beneficial policies have been developed of relevance to other cities.

3.3.3 Impactful Policies

Based on our review of the policies in NYC, we highlight its strengths and impactful policies here. Our conclusion is that these strengths fall under the Information & Education Provision, Non-Financial Incentives, Financial Incentives, Buildings & Appliance Standards, and Green Lease categories. The identification of these policies are based on our research, analysis, and taking on board the research done for the HK3030 Market Drivers for Transformation of Green Buildings in Hong Kong report.

Information and Education Provision

The NYC Retrofit Accelerator stands out amongst the studied cities in terms of tailored information and advice focused on building retrofits. It is an outreach and assistance programme which provides free, customised advisory services to expedite energy efficiency improvements in buildings. Services include working one-on-one to identify needs, connecting with qualified contractors, explaining required permits, navigating existing financing and incentive programmes, and providing training to building staff¹³⁰.

While the Retrofit Accelerator primarily serves large buildings, Community Retrofit NYC, a complementary program, assists small and mid-sized residential buildings in neighbourhoods with overlapping issues of housing affordability and grid reliability. The nature of the programme is similar to the Retrofit Accelerator¹³¹.

These programmes provide easy access to free tailored information and expert advice. They help building owners navigate through and take advantage of existing incentive programmes for energy efficiency upgrades.

Since their establishment in 2015, these programmes had supported more than 4,000

¹²⁵ https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/1point5-AligningNYCwithParisAgrmt-02282018_web.pdf

¹²⁶ http://www.dec.ny.gov/docs/administration_pdf/nycghg.pdf

¹²⁷ <http://www1.nyc.gov/assets/builttolast/downloads/OneCity.pdf>

¹²⁸ https://www.dec.ny.gov/docs/administration_pdf/nycghg.pdf

¹²⁹ <http://www.nyc.gov/html/gbee/downloads/pdf/UGC-Benchmarking-Report-101617-FINAL.pdf>

¹³⁰ <https://retrofitaccelerator.cityofnewyork.us/>

¹³¹ <http://www1.nyc.gov/site/communityretrofitnyc/index.page>

buildings by 2017.¹³² They are expected to assist more than 20,000 buildings out of NYC's 1 million buildings, or 15% of NYC's floor area, by 2025¹³³.

Government Leadership: Targets and Own Operations

The NYC government is targeted to reduction greenhouse gas emissions by 40% and 80% by the end of 2030 and 2050, respectively, according to the baseline year 2005. Meanwhile, there is also an interim goal of 35% overall reduction by the year 2025.

In order to support this, the Department of Citywide Administrative Services Energy Management (DEM) was launched to support related activities within NYC government operations, including project support to reduce GHG emissions to align with the emission targets. Up to 2015, DEM had committed USD\$2.7 billion (HK\$ 21 billion) to retrofit city-owned buildings¹³⁴.

Non-financial Incentives

The ENERGY STAR is a voluntary national scheme launched by the US Environmental Protection Agency which rates the energy performance of appliances, equipment, homes and buildings. It has become the most well-recognised and authoritative energy label scheme in US. More than 90% of American households recognise the ENERGY STAR, and 75% of household reported the product labels to be influential in their purchasing decisions¹³⁵.

New homes can earn the ENERGY STAR. Homes with the certification mean they are 15 – 30% more energy efficient than those built to buildings code. In 2017, one out of every ten homes built earned the Energy Star certification¹³⁶.

The ENERGY STAR Portfolio Manager measures and tracks the energy performance of commercial buildings across the nation. On average, buildings that earn the ENERGY STAR use 35% less energy than their peers. Studies find that ENERGY STAR certified buildings command a premium of up to 16% for sales prices and rental rates. As of the end of 2017, 26 local governments and two states, including NYC, rely on the Portfolio Manager tool as the foundation for building energy benchmarking requirements, creating uniformity for businesses and reducing transaction and implementation costs¹³⁷.

NYC's voluntary leadership program, the NYC Carbon Challenge, initiated by the Mayor's Office also appears to have been a success. It has involved many of the city's colleges, universities, hospitals, commercial owners and tenants committing to reduce building-based greenhouse gas emissions by 30% or more over the course of ten years¹³⁸. Since its launch, over 100 participants have accepted the challenge, representing 9% of NYC's building floor area. A number of participants have achieved the 30% reduction ahead of schedule, and have expanded their commitment to a 50%

¹³² https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/1point5-AligningNYCwithParisAgmt-02282018_web.pdf

¹³³ <http://www1.nyc.gov/assets/builttolast/downloads/OneCity.pdf>

¹³⁴ https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/1point5-AligningNYCwithParisAgmt-02282018_web.pdf

¹³⁵ https://www.energystar.gov/about/origins_mission/energy_star_numbers

¹³⁶ https://www.energystar.gov/about/origins_mission/energy_star_overview/about_energy_star_residential_sector

¹³⁷ https://www.energystar.gov/about/origins_mission/energy_star_overview/about_energy_star_commercial_buildings

¹³⁸ http://www.nyc.gov/html/gbee/downloads/pdf/NYC%20Carbon%20Challenge_2018_Progress%20Report.pdf

reduction by 2025¹³⁹.

Its success can be attributed to a number of factors: regular annual reporting of progress to the City, the City providing pragmatic resources and tools to support participants, those that don't meet pledges are not penalised, participants are promoted and celebrated for their progress, and the government has partnered with trade associations to promote this challenge.

Another policy which has stimulated action is Local Law (LL) 84 – the benchmarking law. Large buildings are required to audit, benchmark and publicly disclose energy data annually¹⁴⁰. The information is submitted to the city authorities, which analyse and release them through reports and in spreadsheets. The benchmarking and disclosure is intended to generate demand for energy efficiency in buildings. Using this data, maps have been developed to enable those seeking to rent or purchase premises and others to see the individual performance of buildings across the city. LL84 requires buildings to undertake benchmarking using the ENERGY STAR Portfolio Manager.

Financial Incentives

A wide range of buildings energy efficiency financial incentives are available. The coverage is broad and goes beyond capital expense of hard infrastructure and technology. Financial incentives range from discounts for efficient appliances, cost-sharing for equipment installation, rebates for energy savings achieved, to funding for technical studies and for employing a full-time energy manager.

On top of subsidies, NYC is also part of the Regional Greenhouse Gas Initiative (RGGI)¹⁴¹, a joint cap and trade programme between the New England and Mid-Atlantic States of the US, including New York State, that seeks to reduce carbon emissions from the power sector. Each state is given allowances for trading via auctioning or other strategies such as buildings energy efficiency enhancements, renewable energies, and R&D.

Buildings and Appliance Standards

NYC's buildings standards are unique in that they cover building alteration/renovation projects of any scale, for the work undertaken at that time, and mandate retro-commissioning for large buildings. NYC also stands out in that it has made a concerted effort to collaboratively and comprehensively review its building standards and relevant laws to enable buildings to be more sustainable.

Local Law 85 establishes the NYC Energy Conservation Code, which all buildings must comply with at the time of construction and renovation. Renovation or alteration projects of any size must meet code requirements¹⁴². The code is reviewed every three years. In 2019 and 2022, NYC will adopt ambitious revisions of the code which could realise a 20% and 40% energy intensity reduction respectively over current construction standards¹⁴³.

¹³⁹ http://www.nyc.gov/html/gbee/downloads/pdf/NYC%20Carbon%20Challenge_2018_Progress%20Report.pdf

¹⁴⁰ <http://www.nyc.gov/html/gbee/html/plan/l184.shtml>

¹⁴¹ <https://www.rggi.org/>

¹⁴² http://www.nyc.gov/html/planyc2030/downloads/pdf/energy_code_summary_for_website.pdf

¹⁴³ <https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/1point5-AligningNYCwithParisAgmt->

Local Law 87 requires large buildings to conduct detailed energy audits and retro-commissioning once every 10 years¹⁴⁴.

Local Law 88 requires lighting to be compliant with current energy codes and requires electrical sub-meters for large non-residential tenant space. The compliance deadline is 2025.¹⁴⁵

In 2008, the City convened a Green Codes Task Force consisting of 200+ industry experts and conducted a comprehensive review of all the laws that regulate NYC's buildings, with the aim to enable buildings to be more sustainable¹⁴⁶. More than a hundred recommendations were proposed to the various codes which buildings are subject to. As of 2015, 53 of 111 recommendations had been enacted or partially enacted¹⁴⁷. Recommendations include removing penalties for buildings insulation, permitting shading devices, and more.

Green Leases

The NYC Mayor's Office developed an "Energy Aligned Clause", a gross commercial lease to tackle the split incentive problem, and addressed the concerns from both landlords and tenants. A pass-through structure is established so that both parties share the costs and benefits of energy retrofit¹⁴⁸.

The Green Lease Leaders Program¹⁴⁹ developed by the Institute of Market Transformation recognises efforts of landlords and tenants on the execution of green leases with language and policies formulated based on the Green Lease Leaders Reference Guides for Landlords and Tenants¹⁵⁰.

Drivers and Enablers

New York City strives to be a national and international leader in climate action. It was the first major US city to commit to divest pension funds from fossil fuels, and to file suit against 5 large fossil fuel companies. On 1 June 2017, President Trump announced his intention to withdraw the US from the Paris Agreement. The next day, Mayor de Blasio signed Executive Order 26 committing the City to the goals of the Paris Agreement¹⁵¹. In September 2017, NYC released a roadmap on aligning NYC with the Paris Agreement¹⁵². In the roadmap, Mayor de Blasio directed all agencies of City government to develop their own plans to accelerate decarbonisation efforts and bring NYC in line with the Paris Agreement¹⁵³.

The Mayor's Office serves as a key central coordinating authority for energy efficiency policies and action. The Mayor convened a Green Codes Task Force to comprehensively review buildings codes to promote investing in energy efficiency. The Mayor's Office also

[02282018_web.pdf](#)

¹⁴⁴ <http://www.nyc.gov/html/gbee/html/plan/l187.shtml>

¹⁴⁵ <http://www.nyc.gov/html/gbee/html/plan/l188.shtml>

¹⁴⁶ http://www.nyc.gov/html/gbee/downloads/pdf/gctf_executive_summary.pdf

¹⁴⁷ <http://www.nyc.gov/html/gbee/html/codes/enacted.shtml>

¹⁴⁸ <http://www.nyc.gov/html/gbee/html/initiatives/clause.shtml>

¹⁴⁹ <https://www.greenleaseleaders.com/>

¹⁵⁰ <https://www.greenleaseleaders.com/green-leasing-resources/>

¹⁵¹ <https://www1.nyc.gov/site/sustainability/codes/1.5-climate-action-plan.page>

¹⁵² https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/1point5-AligningNYCwithParisAgrmt-02282018_web.pdf

¹⁵³ https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/1point5-AligningNYCwithParisAgrmt-02282018_web.pdf

introduced the Greener, Greater Buildings Plan and the One City: Built to Last blueprint, which set out comprehensive policies and programmes to improve buildings energy efficiency. The Mayor’s Office also published the aforementioned roadmap to align NYC with the Paris Agreement.

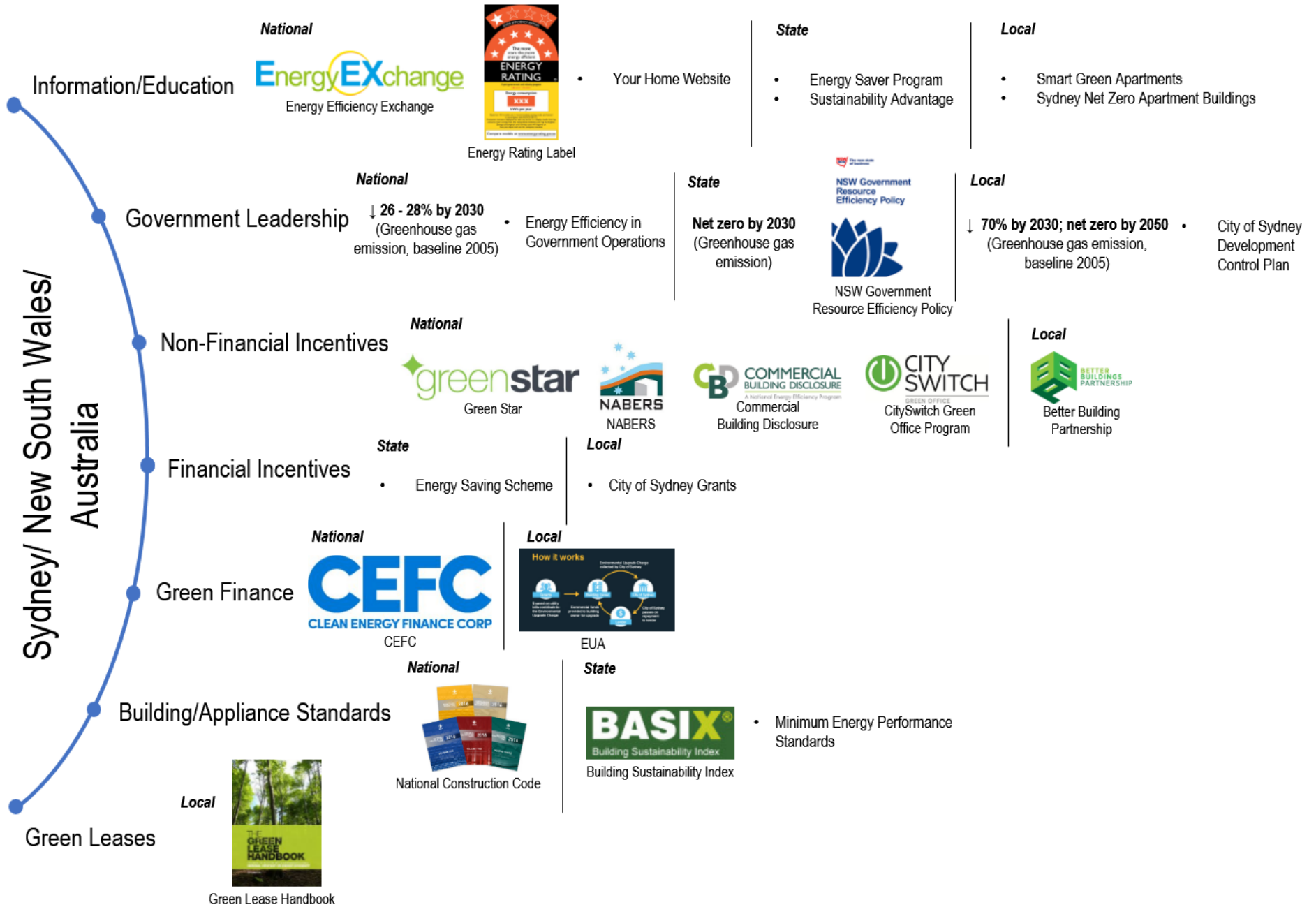
3.3.4 Key Lessons Learnt

While NYC’s actual energy efficiency gains have been modest, there still are policies that stand out as impactful and innovative. The Mayor’s Office has been instrumental to making ground in buildings energy efficiency and engaging the private sector and civil society in the process. It has put forward comprehensive efforts and action plans such as the Greener, Greater Buildings Plan and the One City: Built to Last plan, which introduced a wide range of policies and initiatives. The NYC Carbon Challenge and the Green Codes Task Force are testaments of successful public-private partnerships and collaboration. Local Laws mandating disclosure of data, retro-commissioning, sub-metering, and retrofitting to higher standards also stand out.

Glossary

DEM	Department of Citywide Administrative Service Energy Management
LL	Local Law
NYC	New York City
NYS	New York State
RGGI	Regional Greenhouse Gas Initiative
US	United States

3.4 Sydney



3.4.1 Overview

The City of Sydney emitted 4.8 million tonnes of CO₂-e in 2014, equating to 21 tonnes CO₂-e per capita per annum¹⁵⁴, more than three times of Hong Kong's level. Buildings are responsible for 80% of Sydney's greenhouse gas emissions, while 44% are from commercial office buildings alone^{155, 156}.

3.4.2 Progress

Between 2006 and 2013, Sydney's building floor area increased by 4% while total energy consumption decreased by 8%. To date, its building energy use intensity is estimated to have decreased by close to 10% from 2006 levels¹⁵⁷. Sydney's overall greenhouse gas emissions have reduced by 17% since 2006¹⁵⁸.

3.4.3 Impactful Policies

Based on our review of the policies in Sydney, we highlight its strengths and impactful policies here which fall under the Information & Education Provision, Government Leadership, Non-Financial Incentives, Financial Incentives, Buildings & Appliance Standards, and Green Lease categories. The identification of these policies are based on our research, analysis, and crosschecking with a City of Sydney report and a consultancy study^{159, 160}.

Information and Education Provision

An important scheme for information provision is the Energy Rating Labelling (ERL) scheme. ERLs is a comparative label that provides consumers with energy performance of appliances. Eight categories of appliances are labelled at point of sale and the information is also accessible on an online database¹⁶¹.

As appliance efficiency improves, the star ratings and rating formulae are reviewed "from time to time"¹⁶². The label design initially had a maximum of six stars, but to take on board continuous improvement, the rating system is now out of a maximum of ten stars with the extra four stars to recognise "super efficiency"¹⁶³. The impacts of ERL will be further elaborated on along with the Minimum Energy Performance Standards below.

Government Leadership

Sydney has an ambitious greenhouse gas reduction target – to reduce GHG emissions by 70% by 2030 from 2006 levels and to reach net zero emissions by 2050¹⁶⁴. This sets a clear direction for the city and has served as an anchor and stimulus for other actions, such as improvements in the city government's own operations – a 25% energy saving was achieved since 2006 compared to the citywide 17% over the same period, and continued funding and partnerships for initiatives to improve buildings energy

¹⁵⁴ http://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0007/284749/Environmental-Action-strategy-and-action-plan.pdf

¹⁵⁵ Ibid.

¹⁵⁶ http://cdn.sydneybetterbuildings.com.au/assets/2018/03/BBP_FY17_AnnualReport_FA_Online.pdf

¹⁵⁷ http://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0020/241436/Energy-Efficiency-Master-Plan-low-res.pdf

¹⁵⁸ http://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0007/284749/Environmental-Action-strategy-and-action-plan.pdf

¹⁵⁹ http://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0020/241436/Energy-Efficiency-Master-Plan-low-res.pdf

¹⁶⁰ http://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0003/241437/Energy-Efficiency-Master-Plan-Foundation-Report.pdf

¹⁶¹ <http://www.energyrating.gov.au/about/what-we-do/labelling>

¹⁶² Ibid.

¹⁶³ http://www.energyrating.gov.au/sites/new.energyrating/files/documents/ERL_Review_Final_Report.pdf

¹⁶⁴ http://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0007/284749/Environmental-Action-strategy-and-action-plan.pdf

efficiency¹⁶⁵.

Non-Financial Incentives

Three non-financial incentives programmes stand out to be effective in stimulating action for buildings energy efficiency.

The National Australian Built Environment Rating System (NABERS) is a rating tool and scheme established by the Federal government to measure environmental performance of buildings¹⁶⁶. It is the authoritative energy rating system utilised and referenced by many programmes and policies – from the mandatory requirements of the National Construction Code to financial incentive programmes such as the Energy Saving Scheme. A NABERS rating is valid for twelve months¹⁶⁷. Given this, many buildings are incentivised if not mandated, to perform energy assessments at a frequency of at least once a year.

The Commercial Building Disclosure (CBD) programme requires large commercial office space to disclose energy efficiency information at time of sale, lease or sub-lease. Sellers or lessors are required to obtain a Building Energy Efficiency Certificate (BEEC), which is valid for one year. To avoid potential delays in transactions, many owners routinely conduct assessments to ensure certificates remain current. CBD also requires a building's NABERS energy rating to be displayed in all forms of advertising for the office space¹⁶⁸. Not only does CBD incentivise frequent energy assessments, it increases public awareness and the visibility of buildings energy efficiency performance. Since 2010, more than 1,500 buildings in Australia have been covered by programme, with more than 5,000 BEECs issued. The nation-wide average NABERS rating on BEECs is 3 stars¹⁶⁹. Currently, buildings in Sydney with valid BEECs average a NABERS rating of more than 4 stars¹⁷⁰.

Sydney's Better Buildings Partnerships (BBP) is a collaboration of property owners and industry influencers providing green leadership and sustainable innovation for Sydney's commercial and public buildings. It is a key initiative to operationalise Sydney's carbon reduction target. Under the banner "moving industry forward together", the partnership produces resources and tools, builds capacity, and embeds and creates sustainability best practice standards in the sector. Members of the BBP represent 54% of office space in Sydney¹⁷¹. The partnership supports and encourages its members to benchmark building energy performance, and achievements are showcased in annual reports based on data reported by members.

Since 2006, members of the partnership have reduced energy consumption by 46% and GHG emissions by 52%, making considerable progress towards Sydney's 2030 target of 70% GHG emissions reduction¹⁷².

Financial Incentives

The Energy Saving Scheme (ESS) is an effective mechanism to mobilise investments

¹⁶⁵ http://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0007/284749/Environmental-Action-strategy-and-action-plan.pdf

¹⁶⁶ <https://nabers.gov.au/public/webpages/ContentStandard.aspx?module=0&template=3&include=homeIntro.htm>

¹⁶⁷ <https://nabers.gov.au/public/webpages/ContentStandard.aspx?module=10&template=3&id=5&include=HowNabersWorks.htm&side=factsheets.htm>

¹⁶⁸ http://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0020/241436/Energy-Efficiency-Master-Plan-low-res.pdf

¹⁶⁹ <http://cbd.gov.au/>

¹⁷⁰ <http://www.cbd.gov.au/registers/cbd-downloadable-data-set>

¹⁷¹ http://cdn.sydneybetterbuildings.com.au/assets/2018/03/BBP_FY17_AnnualReport_FA_Online.pdf

¹⁷² Ibid.

into energy efficiency. Through the ESS, households and businesses can generate Energy Saving Certificates (ESCs) for each unit of energy saved through buildings energy efficiency projects¹⁷³. Electricity retailers are then required to purchase ESCs to meet an ESS target with the costs passed on to electricity consumers. In 2018, ESCs are required to match the target of 8% of electricity supplied to end users¹⁷⁴. The ESS creates a market demand for energy efficiency improvements to be undertaken, and helps cover the costs of performing the upgrades projects by placing a monetary value on the ESCs. The ESS is expected to be key for New South Wales to achieve its energy saving target¹⁷⁵. Electricity customers are therefore funding property improvements by building owners and occupiers.

Australia implemented its carbon pricing scheme under the Clean Energy Act 2011 targeting large emitters that covered around 60% of Australia's carbon emissions; however, the scheme was revoked on 1 July 2014¹⁷⁶.

Buildings & Appliance Standards

The Minimum Energy Performance Standards (MEPS) also appear to be an effective mechanism. MEPS specifies the minimum energy performance that electrical products must meet or exceed before they can be offered for sale or used in commercial purposes. It prevents inefficient products from entering the market, and helps to ensure better quality products are not undermined by competition from low-efficiency alternatives^{177, 178}.

The MEPS establishes a minimum standard for appliances, the ERL further assist consumers to distinguish products by their efficiency performance. It is estimated that for every AUD\$1 (HK\$5.6) of costs to the MEPS and ERL programme, there is AUD\$4.60 (HK\$25.8) worth of savings, in effect a negative cost of carbon abatement¹⁷⁹.

Green Leases

The implementation of the National Green Leasing Policy¹⁸⁰ is the first step for Australia in promoting green leases. A series of guidance documents including the Tenant's Guide to Green Leases¹⁸¹, Green Lease Handbook¹⁸² and Negotiating Green Leases Case Studies¹⁸³ were released by the Department of Climate Change and Energy Efficiency in 2012.

Sydney has been particularly successful in implementing green leases through the BBP, with over 60% of all leases in its central business district containing green principles¹⁸⁴.

Drivers and Enablers

Sydney is one of the only two Australian cities in the C40 Cities network, which serves as a motivation to play a leadership role in decarbonisation and energy efficiency. This is reflected in Sydney's ambitious 2050 target. Increasing energy costs is another driver

¹⁷³ https://www.ess.nsw.gov.au/How_the_scheme_works/Overview_of_the_scheme

¹⁷⁴ https://www.ess.nsw.gov.au/Scheme_Participants/Targets_and_penalties

¹⁷⁵ <https://www.resourcesandenergy.nsw.gov.au/energy-consumers/sustainable-energy/efficiency/scheme>

¹⁷⁶ <http://www.cleanenergyregulator.gov.au/Infohub/CPM/About-the-mechanism>

¹⁷⁷ <http://www.energyrating.gov.au/suppliers/legislation>

¹⁷⁸ http://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0020/241436/Energy-Efficiency-Master-Plan-low-res.pdf

¹⁷⁹ Ibid.

¹⁸⁰ <http://www.apcc.gov.au/ALLAPCC/GPG%20-%20National%20Green%20Leasing%20Policy.pdf>

¹⁸¹ <https://www.energy.gov.au/sites/g/files/net3411f/tenants-guide-to-green-leases-2012.pdf>

¹⁸² <https://www.energy.gov.au/sites/g/files/net3411f/green-lease-handbook-2012.pdf>

¹⁸³ <https://www.energy.gov.au/sites/g/files/net3411f/negotiating-green-leases-case-studies-2012.pdf>

¹⁸⁴ <http://cdn.sydneybetterbuildings.com.au/assets/2018/09/BBP-Leasing-Factsheet-v08.pdf>

to improve buildings energy efficiency. New South Wales is one of the states that does not have electricity price regulations, and the price of electricity has increased significantly in the past decade¹⁸⁵. By encouraging energy efficiency, the government wants to empower citizens and companies to have control over their energy consumption and cost. The government has made coordinated efforts to specifically tackle the energy efficiency issue through the NSW Energy Efficiency Action Plan and Sydney Energy Efficiency Master Plan.

Furthermore, given the robust framework for energy performance and transparency, property companies are driven by friendly competition to perform well in ratings and benchmarks.

3.4.4 Key Lessons Learnt

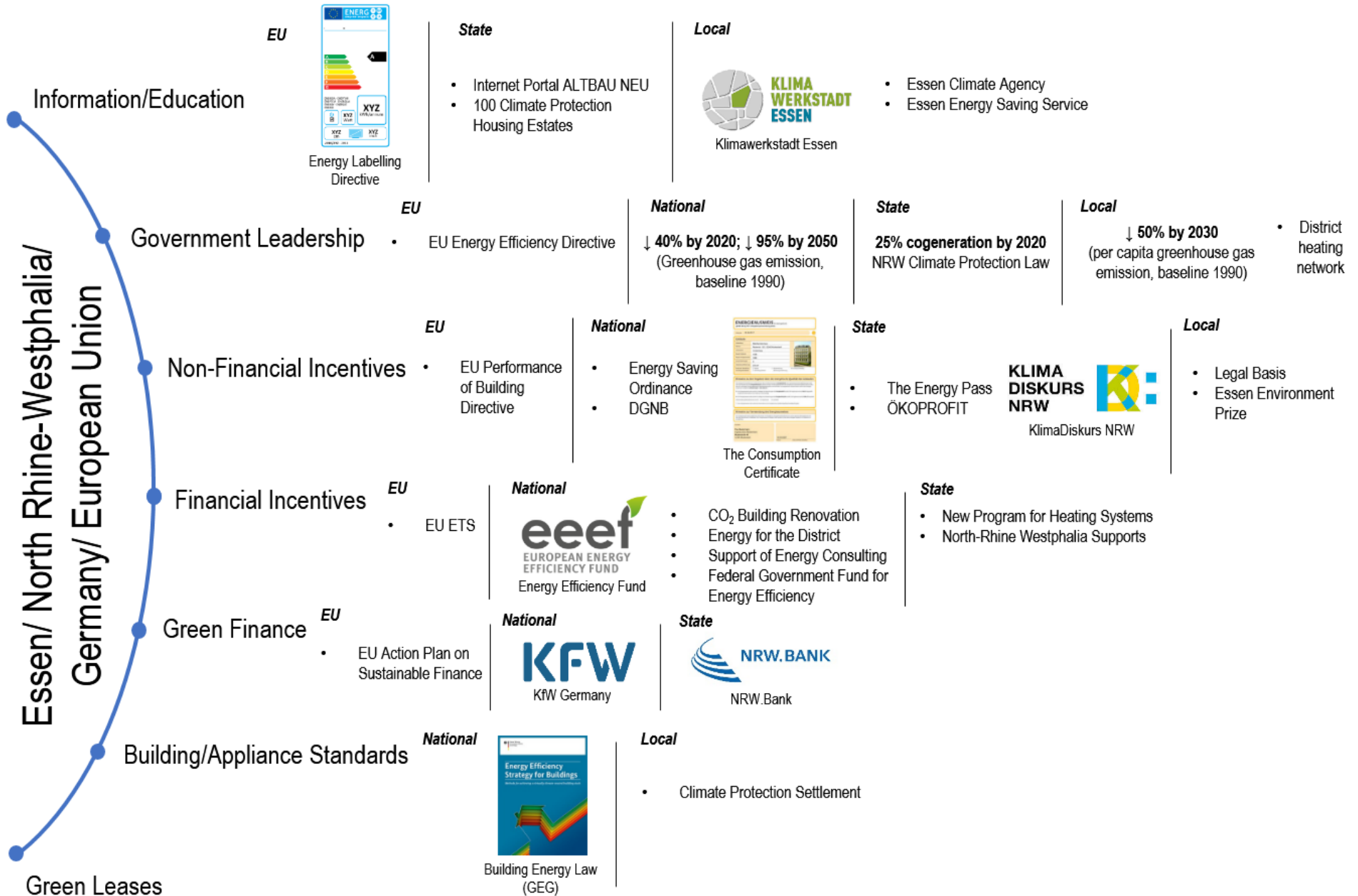
With the combination of national, state, and local laws, Sydney has a comprehensive set of policies for buildings energy efficiency which has reduced buildings energy use intensity by close to 10% since 2006. Sydney's strengths include a clear and ambitious 2050 carbon neutrality target, a robust system for frequent energy assessments and disclosure, and minimum energy efficiency standards for appliances coupled with labelling. The upcoming 2019 review of the National Construction Code could also potentially make a big difference to drive buildings energy efficiency.

Glossary

BBP	Better Buildings Partnership
BEEC	Building Energy Efficiency Certificate
CBD	Commercial Building Disclosure
ERL	Energy Rating Labelling
ESCs	Energy Saving Certificates
ESS	Energy Saving Scheme
MEPS	Minimum Energy Performance Standards
NABERS	National Australian Built Environment Rating System
NSW	New South Wales

¹⁸⁵ <https://www.energy.gov.au/sites/g/files/net3411/f/energy-update-report-2017.pdf>

3.5 Essen



3.5.1 Overview

Essen's total GHG emissions in 2013 was 4.42 million tonnes (MT) of CO₂-e¹⁸⁶, which is equivalent to 7.80 tonnes CO₂-e per capita. In 2011, businesses and households were responsible for 65% of Essen's total energy consumption, and the majority of that (42% of Essen's total energy consumption) was for space heating of residential and non-residential buildings.

3.5.2 Progress

In 2013, the amount of GHG emissions was reduced by 21% compared to 1990. From 2003 to 2013, the weather-adjusted energy consumption had reduced by 18%, and the heating energy consumption intensity had reduced by 22%¹⁸⁷ to 110 kWh/m². Almost 20% of all heating requirements in Essen are supplied by the district heating network, which is mainly fuelled by the waste incineration plant at Essen-Karnap.

Essen also won the European Green Capital Award in 2017¹⁸⁸ for its success in transitioning from a heavily polluting mining centre to a clean and green economy.

3.5.3 Impactful Policies

Energy efficiency policies in Essen are formulated at the city level, at the state level, North-Rhine Westphalia (NRW), at the national (Germany) level, and at the European Union (EU) level with the key Energy Efficiency Directive¹⁸⁹.

Information and Education Provision

The city of Essen takes a coordinated approach on climate change actions under the government agency Klimawerkstadt Essen¹⁹⁰. It organises and implements climate protection strategies, as well as provides a platform for all stakeholders to share knowledge and learn from each other. Some of its work include replacing off-peak storage heaters in buildings, and expanding the coverage of cogeneration plants. There are also free energy advisory services for residents provided by the EnergieSparService (Energy Saving Service) Essen¹⁹¹, where specialists will visit houses and create tailored energy savings reports for individual households.

The city, as part of the European Union also takes part in the EU Energy Labelling Directive which provides households with the information they need to make informed choices regarding the purchase of electric appliances.

City Targets and Leadership

Essen has signed up to many global commitments affirming its CO₂ emission reduction agenda. The city has committed to reduce carbon emissions by 5% every ten years and halve its per capita emissions by 2030, with a 1990 baseline. Emissions dropped by 29.5% in 2011 in relation to 1990, which exceeded the German national average

¹⁸⁶ https://media.essen.de/media/wwwessende/aemter/59/klima/bilanzbericht_2016_riss.pdf

¹⁸⁷ http://ec.europa.eu/environment/europeangreencapital/wp-content/uploads/2015/06/01_Application-EGC-2017_Climate-Change_ESSEN.pdf

¹⁸⁸ <http://ec.europa.eu/environment/europeangreencapital/winning-cities/2017-essen/essen-2017-application/>

¹⁸⁹ <https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive>

¹⁹⁰ http://www.klimawerkstadtessen.de/klimawerkstadtessen_startseite_1/startseite.de.jsp

¹⁹¹ http://www.neue-arbeit-essen.de/fileadmin/user_upload/DownloadsAlteWebseite/Flyerport/flyer_Energiesparservice_Engl_web.pdf

reduction¹⁹².

Essen is also focused on achieving the German climate target which aims at reducing CO₂ emissions by 40% by 2020; 70% by 2040; and 95% by 2050 with base year 1990.

As part of the Covenant of Mayors and its EU commitments, the city has two main goals. First, Essen has undertaken to exceed the 20/20/20 by 2020 goals set by EU to reduce 20% or more CO₂ emissions compared to 1990 levels; for 20% of its energy consumption to come from renewable energy, and to increase energy-efficiency by 20%. Essen is also committed to build all new public buildings in the passive house standard¹⁹³.

Secondly, pursuant to the EU Energy Efficiency Directive (EED), the city has decided to achieve a 2.5 to 3% renovation quota for public buildings, meaning that each year the administration will renovate 2.5 to 3% of its public buildings to higher energy standards.

Essen also made use of Federal Government funding, for example the Economic Stimulus Package II, to support energy efficiency renovations of more than 100 public building¹⁹⁴.

At the state level, 100 Climate Protection Housing Estates in NRW¹⁹⁵ is a set of planning guidelines to apply innovative technologies to reduce carbon emissions in residential estates. The carbon emissions of new estates built under this project are 50% to 60% less than the reference buildings set out in the Energy Saving Ordinance (EnEV 2009).

EU Energy Efficiency Directive (EED)¹⁹⁶

Under the EED, EU member states have to implement public procurement plans¹⁹⁷ with respect to energy efficiency. For instance, central governments have to choose buildings which comply with the national minimum energy efficiency requirements set under the Energy Performance of Buildings Directive (EPBD). Large enterprises are required to carry out mandatory and regular energy audits¹⁹⁸.

Member states also have to ensure that meters are installed for all energy end-users when a new connection is made in a new building, or when a building undergoes major renovations. This ensures payment for energy relates to usage¹⁹⁹.

Non-financial Incentives

The Energy Saving Ordinance (EnEV)²⁰⁰ (2002) stipulates buildings in Germany must provide certificates, otherwise known as the Energy Pass, as evidence of their energy consumption and overall efficiency. It provides information about the building energy consumption, energy efficiency level and the expected costs of heating and hot water. It also contains recommendations for energy performance improvement options.

¹⁹² <https://unfccc.int/news/essen-a-beacon-of-city-climate-action>

¹⁹³ http://ec.europa.eu/environment/europeangreencapital/wp-content/uploads/2015/06/01_Application-EGC-2017_Climate-Change_ESSEN.pdf

¹⁹⁴ http://ec.europa.eu/environment/europeangreencapital/wp-content/uploads/2015/06/11_Application-EGC-2017_Energy-Efficiency_ESSEN.pdf

¹⁹⁵ <https://www.energieagentur.nrw/klimaschutz/klimaschutzsiedlungen/100-climate-protection-housing-estates-in-north-rhine-westphalia>

¹⁹⁶ <https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive>

¹⁹⁷ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013SC0446&from=EN>

¹⁹⁸ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013SC0447&from=EN>

¹⁹⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013SC0448&from=EN>

²⁰⁰ <https://www.dena.de/en/topics-projects/energy-efficiency/buildings/consulting-and-planning/german-energy-saving-ordinance-enev-standards-and-laws/>

The state NRW developed the KlimaDiskurs.NRW²⁰¹ (Climate Discourse NRW), an independent association that gathers over 80 stakeholders from the general public, private sector and the civil society. This serves as a platform to discuss issues related to energy transition and developing decarbonisation strategies.

Financial incentives

As a member of the EU, Germany is covered by the emissions trading system (ETS) since 2005²⁰². It is a Cap and Trade system dedicated to specific types of GHG including carbon dioxide, nitrous oxide and perfluorocarbons; and is applied only to power generation, manufacturing industries and commercial aviation.

The federal government, along with state owned banks, provides funds for investments in the energy refurbishment of buildings. The federal government also finances on-site energy consulting sessions, with funding up to €1,000 (HK \$9,000). The state of NRW subsidises investigation into the feasibility of energy efficiency renovations of private buildings. Other financial incentives take the form of a project competition for social innovators specialising in the field of energy transition.

As to energy efficiency retrofits, the municipal housing association Allbau AG has been performing 3% of energy renovations in the residential area every year since 2003, and the average heating energy demand has dropped 20% over that period²⁰³.

Green Finance

At the national level, Kreditanstalt für Wiederaufbau (KfW)²⁰⁴, a state-owned development bank, provides low interest loans and grants for energy efficiency projects, including the construction of new green buildings and retrofits of existing buildings²⁰⁵. In 2017, KfW's loans for SMEs reached €21.9 billion (HK \$197 billion), of which €5.7 billion (HK \$51.3 billion) went to energy efficiency improvement projects²⁰⁶.

At the state level, NRW.BANK²⁰⁷ supports the energy transition through green bond issuance. The majority of climate mitigation proceeds are used for renewable energy, and the rest for refurbishing public and private buildings²⁰⁸.

EU also takes the role of promoting sustainable finance via a number of initiatives, such as proposing a framework for the classification of environmentally sustainable economic activities, and proposing a new category of benchmarks that will allow a better understanding the carbon performance of investments for investors²⁰⁹.

Drivers and Enablers

The 2017 European Green Capital Award recognised Essen's successful transition from a heavy mining state to a clean and green economy. Its buildings energy efficiency

²⁰¹ <https://www.klimadiskurs-nrw.de/index.php?id=1>

²⁰² https://ec.europa.eu/clima/policies/ets_en

²⁰³ http://ec.europa.eu/environment/europeangreencapital/wp-content/uploads/2015/06/01_Application-EGC-2017_Climate-Change_ESSEN.pdf

²⁰⁴ <https://www.kfw.de/kfw.de-2.html>

²⁰⁵ <https://www.kfw.de/inlandsfoerderung/Unternehmen/Energie-Umwelt/index-2.html>

²⁰⁶ <https://www.kfw.de/PDF/Download-Center/Konzernthemen/Nachhaltigkeit/englisch/GRI-Report-2017-engl.pdf>

²⁰⁷ <https://www.nrwbank.com/en/index.html>

²⁰⁸ https://www.nrwbank.com/en/downloads/Investor_Relations/INVESTOR_RELATIONS_-_Issuances/INVESTOR_RELATIONS_-_ISSUANCE_NRW.BANK.Green_Bond/WI-Impact_Report_NRW.BANK.Green_Bond_2017.pdf

²⁰⁹ https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en

initiatives are influenced by a multi-scale policy framework, locally, regionally, nationally, and across the European Union. The introduction of the overarching Integriertes Energie- und Klimakonzept (IEKK)²¹⁰, or Integrated Energy and Climate Concept, in 2007 set a clear direction of achieving continuous carbon emissions reductions.

Public-private partnership and engagement platforms, locally through the Klimawerkstadt Essen and regionally through KlimaDiskurs.NRW appeared to be a main enabler for building efficiency enhancement as well as wider climate change actions.

3.5.4 Key Lessons Learnt

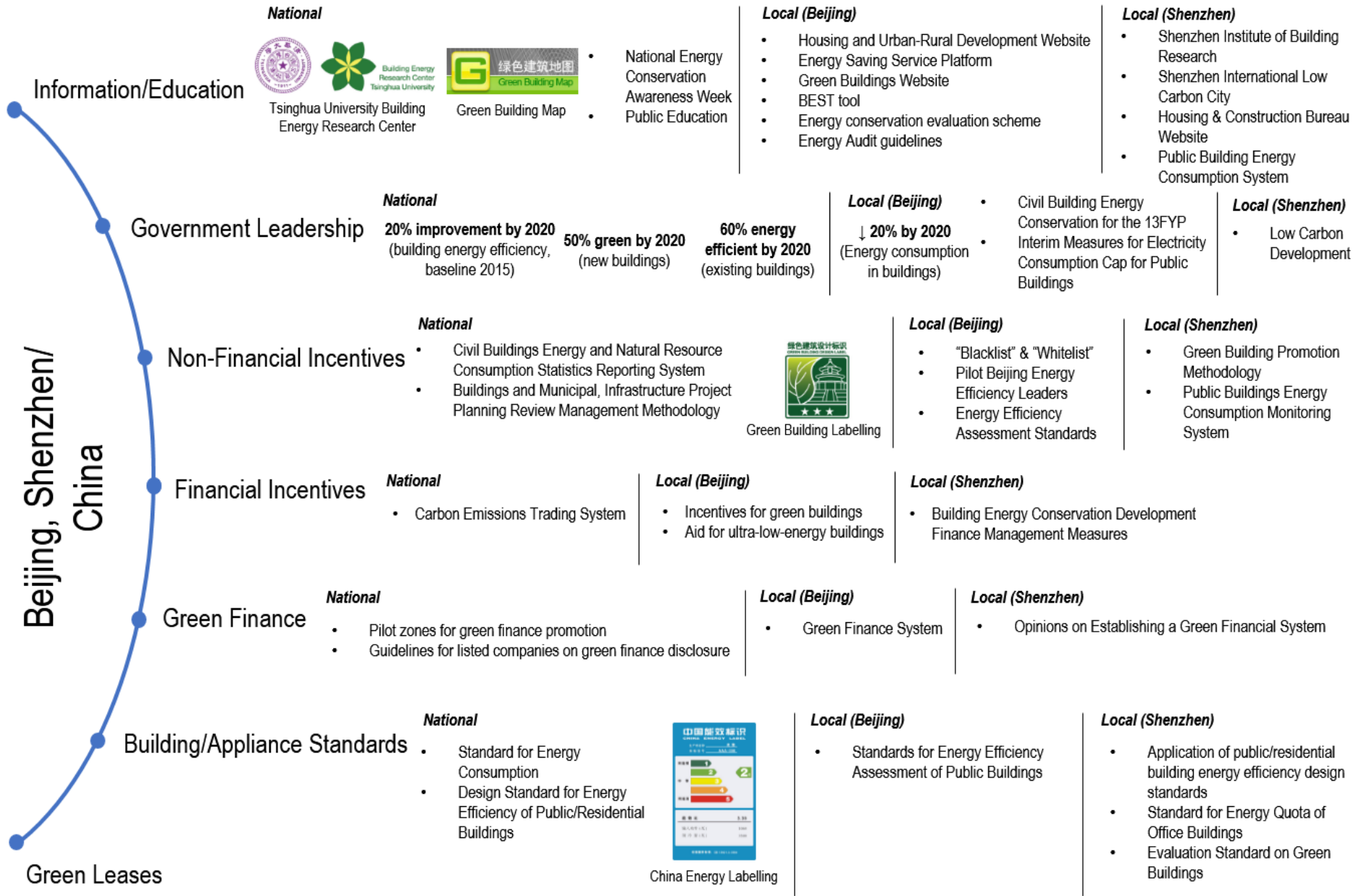
Overall, what appeared to be helping drive Essen's energy policies is a clear direction set by the IEKK, as well as the city government's ambition to overachieve national and EU level targets. This is enhanced by well-connected stakeholder engagement platforms that form a coordinated approach for climate protection actions, which include energy efficiency improvements.

Glossary

EED	Energy Efficiency Directive
EnEV	Energieeinsparverordnung (Energy Saving Ordinance)
EPBD	Energy Performance of Buildings Directive
ETS	Emission Trading Scheme
EU	European Union
IEKK	Integriertes Energie- und Klimakonzept (Integrated Energy and Climate Concept)
KfW	Kreditanstalt für Wiederaufbau
NRW	North Rhine-Westphalia

²¹⁰ [https://www.essen.de/leben/umwelt/klima/Integriertes Energie und Klimakonzept.de.html](https://www.essen.de/leben/umwelt/klima/Integriertes_Energie_und_Klimakonzept.de.html)

3.6 Beijing and Shenzhen



3.6.1 Overview

Both Beijing and Shenzhen have committed to reducing their energy consumption as participants in China's Alliance of Pioneer Peaking cities. We explain the policy provisions of both cities below because of the significance of country-wide policies relevant to both cities.

The CO₂ emissions of Beijing and Shenzhen in 2017 were 102.6 million tonnes (MT) and 38.6 MT respectively^{211, 212}. In 2016, Beijing's total energy consumption was 69.9 million tons of coal equivalent (TCE) and buildings alone account for 47% of the total energy use²¹³. Shenzhen's public and commercial building energy use in 2016 was 8.5 million TCE²¹⁴, accounting for almost 40% of the city's total energy end-use.

3.6.2 Progress

According to Tsinghua University's Building Energy Research Centre report in 2018²¹⁵, the average heating intensity for the northern urban heating (NUH) buildings dropped by 39% from 186 kWh/m² in 2001 to 114 kWh/m² in 2016, owing to the improvement in insulation and heating systems. However, for public and commercial buildings (excluding NUH), the energy consumption intensity grew by 40%, from 137 kWh/m² in 2001 to 191 kWh/m² in 2016 due the increasing share of large scale buildings.

According to the Shenzhen Large-scale Public Buildings Energy Consumption Monitoring Report 2016²¹⁶ published by the Housing and Construction Bureau of Shenzhen Municipality (SZJS), the electricity consumption intensity of 563 public and commercial buildings included in the city's energy monitoring platform was 99.6 kWh/m² in 2016.

3.6.3 Impactful Policies

Based on our review of the policies in Beijing and Shenzhen, we highlight its strengths and impactful policies here at both national and city levels.

Information and Education Provision

Our research suggested that China lags behind in public education on green buildings. However in some aspects of information and education it has good examples of impactful policy measures.

A notable aspect of Shenzhen's actions on this front is the development of a centre for buildings research. It appears that the Shenzhen Institute of Building Research (IBR)²¹⁷, a centre for technological support, research and education on green buildings has had a significant impact. It has helped develop expertise on green buildings as well as

²¹¹ <http://www.ceads.net/city-level-emission-inventory-by-sectoral-approach/>, emission inventories for 182 Chinese cities in 2017

²¹² <http://www.ceads.net/?ddownload=1617>

²¹³ <http://news.dichan.sina.com.cn/2017/11/09/1251650.html>

²¹⁴ While the Shenzhen government publishes data for residential energy consumption, it does not provide explicit data for public and commercial buildings. Instead, we use here the data for 'Wholesale and Retail Trade and Catering' as a proxy for commercial buildings and 'Services – Other' for public buildings.

²¹⁵ <https://berc.bestchina.org/?ky/Article250/>

²¹⁶ http://www.szjs.gov.cn/csml/bgs/xxgk/tzqg_1/bgsjzjn/201712/P020171204597579939679.pdf

²¹⁷ <http://www.szibr.com/index.aspx>

inspire and engage local architects and engineers.

The IBR building itself is also an exemplary energy efficient building incorporated with passive building designs, which consumes around 40 – 60% less energy than comparable buildings in Shenzhen. In addition, the Shenzhen International Low Carbon City, a demonstration area to promote low climate friendly construction and energy efficient buildings, has capitalised on the presence of the IBR.

In addition, Shenzhen has 563 metered buildings (for large-scale public buildings including office buildings, shopping malls, and government buildings) included in the city's energy consumption monitoring platform²¹⁸.

Beijing also offers a good example in terms of the collection and provision of building energy data. This includes the Beijing Energy Saving Monitoring and Service Platform²¹⁹, which collects energy consumption from 130 key energy-using companies, accounting for more than 30% of the total energy consumption in Beijing. The platform provides energy consumption data and policy updates for the public (latest update was 2017). The platform is run by the Beijing Energy Saving and Environmental Protection Centre (BEEC).

This is supplemented by the Green Building Map for China²²⁰ which shows individual green building information. While the website is a useful resource, it is not clear how regularly it is maintained, and some information may be outdated. According to the platform, as of 1 August 2018, Beijing has 277 green buildings (37 one-star, 147 two-star, 93 three-star), and Shenzhen has 143 (94 one-star, 30 two-star, 19 three-star).

The China Academy of Building Research also launched the China Building Energy Saving Tool (BEST)²²¹, a free online tool that enables benchmarking of energy performance against buildings of the same category, as well as energy conservation suggestions and other relevant information. This is due to be enhanced to include retrofit analytical features. Beijing has been prioritised for the application of this tool.

Government Leadership and Own Operation

The Chinese government has set targets for green buildings under the 13th Five Year Plan (13FYP), for example:

- By 2020, 20% improvement in the energy efficiency level of newly constructed buildings in urban areas compared to the 2015 level;
- 50% of those to be “green buildings” (at least one-star certified under the China Three Star green building rating system); and
- By 2020, at least 60% of existing residential buildings in urban areas to be “energy efficient buildings”²²².

The city of Beijing has set demanding additional targets under various government plans, for example:

²¹⁸ http://www.sz.gov.cn/zj/csm1/bgs/xxqk/tzqg_1/bgsjzjn/201712/P020171204597579939679.pdf

²¹⁹ <http://www.bjnjc.com/seeyon/>

²²⁰ <http://www.gbmap.org/>

²²¹ <http://www.chinabestbuilding.com/global/intro/index.html>

²²² The term “energy efficient buildings” was not defined in the plan.

- By 2020, reduce energy intensity of new urban residential buildings by 25% compared with 2015 (Beijing Municipal Civil Building Energy-saving Development Plan during the 13 FYP Period²²³)
- From 2016 to 2018, complete retrofitting works for public building areas of not less than 6 million m² (Beijing Public Buildings Energy Efficiency Improvement Plan²²⁴)

Shenzhen has also set specific targets relating to green buildings, for example:

- During the 13 FYP period, all publically funded large scale buildings to be at least two-star certified
- 100% of new buildings to be compliant with green building standards by 2020
- Energy efficiency retrofits and greening of existing buildings to reach an area of 8 million m² by 2020 (Shenzhen Municipal Energy Saving and Green Building Plan during the 13 FYP Period²²⁵)
- By 2020, 80% of new buildings to be at least one-star certified (Shenzhen Medium and Long-term Plan for Low Carbon Development²²⁶)

Beijing regards public sector buildings as having an important demonstration role with a stated ambition for government office buildings to take the lead in creating a near-zero carbon emission demonstration area, accelerating the implementation of the green smart energy system project, and achieving a renewable energy utilisation rate of more than 30%.

It also has a unique system of auditing and reporting the energy consumption of all large public buildings. Well-performing buildings in terms of actual energy reduction will be whitelisted²²⁷, while underperforming buildings that exceed more than 20% of the energy consumption cap will be blacklisted and subject to fines. A voluntary standard for energy efficiency assessments of public buildings has also been formulated²²⁸.

In Shenzhen, the Shenzhen Green Building Promotion Methodology²²⁹ requires large public buildings to install energy consumption metering devices and real-time monitoring equipment, and transmit the monitoring data in real time to the Shenzhen Building Energy Consumption Data Centre, run by the Shenzhen Institute of Building Research. Buildings whose level of energy consumption exceeds the limit should conduct energy-saving retrofit measures.

Non-financial Incentives

The Chinese government has been pushing the uptake rate of the “Three Star” rating system for green buildings (analogous to the LEED programme in the US)²³⁰. The

²²³ <http://www.bjjs.gov.cn/bjjs/gcjs/jzinyicjg/jzinyicqcx/zcfqjxqwi/407109/index.shtml>

²²⁴ <http://www.bjjs.gov.cn/bjjs/gcjs/jzinyicjg/tzgg/396929/index.shtml>

²²⁵ http://www.szjs.gov.cn/csml/bgs/xxqk/tzgg_1/bqsjzn/201512/P020151214382243996951.doc

²²⁶ http://www.szpb.gov.cn/wx/wx_dtxx/fgzl_wx/zxqh/201310/P020131016528315499518.doc

²²⁷ <http://www.bjjs.gov.cn/bjjs/gcjs/jzinyicjg/tzgg/396927/index.shtml>

²²⁸ <http://www.bjjs.gov.cn/bjjs/xxqk/qtwj/gcislz/353422/index.shtml>

²²⁹ http://www.fzb.sz.gov.cn/fgqzsjk/201505/t20150512_2874205.htm

²³⁰ <http://neec.no/uploads/Article.%20China%20green%20building%20standard.pdf>

evaluation methods are further subdivided to “design” and “operation” ratings. This rating system evaluates buildings’ performance in utilisation and conservation of land, energy, water, and materials, indoor environment, as well as other environmental considerations such as use of renewable power.

This standard began as a voluntary scheme, but has been promoted through incentives and subsidies at both the national and local levels, with some local governments tying the system to mandatory requirements for new buildings.

As of March 2018, the total number of buildings certified under the Three Star rating system in Beijing was 277, including 34 one-star, 134 two-star, and 109 three-star projects²³¹.

Apart from the national Three Star rating scheme, there are also multiple sets of voluntary building energy performance assessment guidelines for public and civil buildings in Beijing and Shenzhen.

In February 2018, a Civil Buildings Energy and Natural Resource Consumption Statistics Reporting System²³² was set up to require government office buildings, large public buildings and central heating information of civil buildings in the northern heating regions to report their building energy consumption data to the Ministry of Housing and Urban-Rural Development (MOHURD) annually. The data collected is solely for internal use and will not be disclosed publicly²³³.

Financial Incentives

Beijing has established a fund to provide incentives for new buildings, retrofitting, or extended construction project that qualifies for green building rating labels. Public and residential buildings with two or three-star certified under the Three Star rating scheme are qualified to apply for financial aid. The amount of aid is dependent on the rating of the building – for example in 2017-18, financial aid²³⁴ for a two-star project was 11.25 CNY/m² and for three-star project 20 CNY/m².

In addition to green building label certified buildings, ultra-low energy buildings are also subsidised on a per square metre basis to meet the target set under the Action Plan for Promoting the Development of Ultra Low Energy Buildings in Beijing (2016-2018)²³⁵. Passive ultra-low energy buildings²³⁶ are defined as those with better thermal insulation and airtightness features, using high-efficiency heat recovery technology to minimise heating of buildings, and fully utilising renewable energy. The ultra-low-energy buildings are described to achieve over 90% energy saving rate in severe cold and cold zones due to significantly reduced demand for heating and cooling of buildings, and energy consumption of heating reduced by 85% compared with existing national energy-saving design standards.

Under the Shenzhen Building Energy Conservation Development Finance Management Measures²³⁷, Shenzhen provides grants, discount loans, and rewards for the

²³¹ <http://www.jungreen.com/news/detail/f2d677bd-638c-4c25-a81a-a8ea0120b271%20.html>

²³² <http://www.mohurd.gov.cn/wjfb/201803/W020180314052735.doc>

²³³ Ibid.

²³⁴ <http://www.bjjs.gov.cn/bjjs/xxgk/kjzc/tztq/511523/index.shtml>

²³⁵ <http://www.bjjs.gov.cn/bjjs/xxgk/qtwj/gcsltz/396931/index.shtml>

²³⁶ <http://www.mohurd.gov.cn/wjfb/201511/W020151113040354.pdf>

²³⁷ http://www.szjs.gov.cn/csml/bgs/xxgk/tzgg_1/bgszjzn/201703/P020170320416728525432.pdf

development of various aspects of energy efficient buildings. This includes technical standards for energy efficient buildings, development and application of new processes, equipment and materials, construction of pilot/demonstration projects, as well as energy-saving projects approved by the national Ministry of Finance.

Both Beijing and Shenzhen are covered by China's pilot carbon emissions trading scheme (ETS) – Beijing's emissions cap was a 20.5% reduction in carbon intensity (per GDP) by 2020 compared to 2015 levels, while Shenzhen's emissions cap is a 45% reduction in carbon intensity by 2020 compared to 2005. These city schemes are expected to become part of a national scheme in around 2019/20. In addition, Shenzhen piloted inclusion of buildings within the sectors covered by the ETS, which involved demand-side carbon trading similar to the Tokyo model. The inclusion threshold is 20,000m² for public buildings and 10,000m² for government buildings. Reports suggest that this has not been entirely successful with a key reason being the owner obtaining the commitment of tenants to energy savings.

Green Finance

China's green bond market has been developing rapidly, with the total green bond issuance reaching CNY \$248.6 billion in 2017²³⁸.

The State Council of the Chinese National Government selected pilot zones in 5 provinces to promote and trial various green finance development strategies. Guangdong, for instance, was chosen to strengthen collaboration with financial agencies in Hong Kong and Macau to develop green financing channels, and to encourage foreign companies to issue CNY green bonds in China²³⁹.

In 2015, the National Development and Reform Commission (NDRC) published a set of green bond issuance guidelines²⁴⁰, while the People's Bank of China and China Securities Regulatory Commission jointly released the green bond assessment and verification guidelines²⁴¹ for listed companies in 2017.

In 2017, Beijing issued the Implementation Measure on Building the Green Finance System in Beijing, in which green building was listed as one of the green products supported by the government²⁴². Shenzhen also issued a similar document²⁴³.

Buildings Standards

In China, the Design Standard for Energy Efficiency of Residential Buildings mandates the energy efficiency of residential buildings²⁴⁴. The standard varies across buildings in the three climate zones – Severe Cold and Cold Zone²⁴⁵, Hot Summer and Cold Winter Zone²⁴⁶, and Hot Summer and Warm Winter Zone²⁴⁷.

²³⁸ <https://www.climatebonds.net/resources/reports/china-green-bond-market-2017>

²³⁹ http://www.xinhuanet.com/fortune/2017-06/27/c_1121216191.htm

²⁴⁰ http://www.ndrc.gov.cn/zcfb/zcfbtz/201601/t20160108_770871.html

²⁴¹ http://www.gov.cn/qongbao/content/2018/content_5271800.htm

²⁴² <http://zhengce.beijing.gov.cn/library/192/33/50/438650/1290620/index.html>

²⁴³ http://jr.sz.gov.cn/sjrb/xxgk/tzgg/201805/t20180529_12006215.htm

²⁴⁴ http://www.paulsoninstitute.org/wp-content/uploads/2017/06/2017_Green-Finance-for-Low-Carbon-Cities_R2_EN.pdf, p.9

²⁴⁵ <http://11416.aly18.demo3w.com/upload/P290796d9afdc4f62b64c606652ff68d2.pdf>

²⁴⁶ http://www.jianzhuxh.com/download/40065.5224768519_x_%EF%BC%89.pdf

²⁴⁷ <http://www.jungreen.com/news/detail/2d6d7029-37c4-4add-9e34-a7d800b94d8b%20.html>

All newly constructed public buildings, or extension/modification to public buildings need to meet the Design Standards for Energy Efficiency of Public Buildings²⁴⁸ issued by MOHURD. It is a set of prescriptive standards that specifies energy performance requirements for building façade design, HVAC, water use, electrical systems, and renewable energy.

In late 2016, MOHURD issued the Standard for Energy Consumption of Building²⁴⁹, a set of performance-based regulations governing the actual energy consumption intensity of both new and existing buildings. The standards provided “recommended” and “required” energy intensity indices: the “recommended” values are to be used as the upper limit when designing new buildings, and the “required” values are to be used as the minimum energy performance baseline for existing buildings. Retrofits should be done for existing buildings that performs worse than the “required” values.

Notably, Shenzhen trialled the Standard for Energy Consumption Quota for Public Buildings in Shenzhen²⁵⁰ for a period of 6 months in 2013. This standard sets an annual energy intensity (per capita or per floor area) limit for hotels, office buildings and shopping malls.

China also has two main energy efficiency labelling programmes for electrical appliances: the mandatory energy efficiency labelling system, China Energy Label (CEL), and the voluntary energy conservation certification system, China Energy Conservation Certification Label²⁵¹.

Drivers and Enablers

Both Beijing and Shenzhen represent the more developed and wealthier parts of China, which serve as the focal points for pilot-testing and implementation of new policies and initiatives. Whereas the Chinese government stresses target setting with aggressive development and ambitious environmental goals, Shenzhen and Beijing often play the role as demonstration cities to meet national and international standards, such as their involvement in the national ETS pilots.

3.6.4 Key Lessons Learnt

Central and local governments together have implemented a wide set of policy measures to support energy efficient green buildings in Beijing and Shenzhen.

This framework covers the usual set of measures including information, target-setting, building and appliance standards as well as financial and other incentives.

The set of ambitious and specific targets (relating not just to carbon emissions but also to energy consumption), statutory building standards, emissions trading, and innovative approaches to information and benchmarking stand out as likely to be the most impactful.

A weakness may be in relation to their current focus on incentivising actions only from landlords but not from tenants.

²⁴⁸ <http://www.waizi.org.cn/law/10436.html>

²⁴⁹ http://www.shaoyang.gov.cn/UploadFiles/file/20180212/20180212084829_2322.pdf

²⁵⁰ http://www.szjs.gov.cn/csml/bgs/xxgk/tzqg_1/201301/t20130122_2102964.htm

²⁵¹ https://www.energy.gov/sites/prod/files/2013/11/f4/session_1_buildings_track_cheng_jianhong_en.pdf

Glossary

BEEC	Beijing Energy Saving and Environmental Protection Centre
BEST	Building Energy Saving Tool
CEL	China Energy Label
ETS	Emissions Trading Scheme
FYP	Five Year Plan
HVAC	Heating, Ventilation and Air-Conditioning
IBR	Institute of Building Research
MOHURD	Ministry of Housing and Urban-Rural Development
NUH	Northern Urban Heating
SZJS	Housing and Construction Bureau of Shenzhen Municipality

4. Gaps/differences between HK policy framework and others

In this chapter we explore gaps in the Hong Kong framework having regard to an analysis of the commonalities across the cities we have studied, the exemplary policies identified, as well as with regard to the barriers to progress in Hong Kong. We do so having regard to our city studies.

4.1 Information and Education Provision



4.1.1 Importance of Information and Education Provision

The underlying aims of information and education provision are:

- Providing information for experts: high quality, technical, up to date information that supports continuing development of skills and knowledge. Information relating to new technologies through exemplar buildings can be particularly helpful especially where payback periods are shown.
- Providing the consumer or procurer with information to support market functioning. This information ranges from energy labels of appliances and buildings to smart metering showing actual energy usage at a granular level. Accurate and up-to-date information as to energy usage and providing sufficient discrimination between electrical appliances appear to be of significance.
- Raising public awareness which will have a positive impact in the longer term. Also, putting information of various energy efficiency policies together can enhance their publicity (e.g. informing the public of existing subsidy schemes) and possibly, through public scrutiny, enhance their effectiveness.

Information and education can be potentially useful in addressing the following barriers identified for Hong Kong:

- Information asymmetry especially on the part of the non-professional or non-technical personnel.
- Limited incentives on the part of tenants to save energy and landlords to invest in energy efficiency, by educating and making it simple for them to make choices.

4.1.2 Common Policy Approaches and Other Significant City-specific Policies

The following are the policies we have identified as being significant to a system taking on board not only what is common across the cities studied but also other exemplary policies drawn from specific cities.

One-stop Shop Government Website

The simplest element of this part of the system is an easy to use and navigate website. This is generally a government maintained or sponsored website which includes information on the following:

- Rationale for policies on energy efficiency
- Explanation of the policy framework, targets, and subsidy schemes
- Trends and progress in terms of building
- Best practices and case studies
- Technical information for experts

A good example of this approach is the Energy Efficiency Singapore website (<http://www.e2singapore.gov.sg/>), a comprehensive one-stop-shop website that

provides energy efficiency policies, supporting incentive schemes, and information to household, buildings, industry and transport sectors.

In Hong Kong, the Government has issued various reports and plans related to energy efficiency, for example the Energy Saving Plan 2015, and the Climate Action Plan 2030+, which bring together information otherwise held on different websites. ENB and EMSD also co-manage the Energy Saving For All website²⁵² that aims at the promotion and education of energy saving. BEC has also developed a tool and calculator²⁵³ which assists with return on investment calculations, and which could be regularly updated with good information to support “proof of performance”. This is critical for sustainability managers to build a business case for action.

Energy Labels for Electrical Appliances

The second common aspect of information/education provision relates to standards for appliances. All cities have mandatory energy labels for electrical appliances. In New York City and the US, apart from the mandatory EnergyGuide label, the voluntary ENERGY STAR label managed by the US Environmental Protection Agency (EPA) is also widely used and recognised and covers the certification of buildings.

Though all the cities we examined have some form of labelling, the best have a dynamic system that is routinely updated to ensure that the higher labels are awarded for electrical appliances at the top range.

In Hong Kong, 8 types of electrical appliances including room air conditioners, refrigerators, compact fluorescent lamps, washing machines, dehumidifiers, televisions, induction cookers and storage type water heaters are required to display their energy labels under the Mandatory Energy Efficiency Labelling Scheme (MEELS).

Free Energy Audits and/or Bespoke Advice Services

There are schemes across cities to provide free energy audits or bespoke advisory services to households and SMEs, for example in Tokyo through “Cool Net Tokyo”, as well as for large buildings, such as the NYC Retrofit Accelerator. In Hong Kong, power companies provide free energy audits for their commercial and industrial customers, which represents around 75% of total electricity consumption.

Smart Metering

Japan aims to provide smart meters for all households and businesses by the early 2020s. In Hong Kong, the power companies will be installing smart meters for all their customers. This will enable a better understanding of energy consumption patterns and may have an impact on behaviour. Systematic collection of building energy consumption data for further analysis and energy management can also be highly beneficial if the data is used well.

Demonstration Projects, Research and Development

Demonstration projects relating to an energy-efficient built environment bring awareness to, and provide insights as to what is possible for various stakeholders involved in the building life cycle – from architects to occupants. For instance, the Innovative Demonstrations for Energy Adaptability in NYC is an example of showcasing state-of-

²⁵² <https://www.energysaving.gov.hk/en/home/index.html>

²⁵³ <https://bec.org.hk/resource-centre/eerguide>

the-art technologies in buildings energy efficiency. In the case of Hong Kong, the Zero Carbon Building is a similar project showing what green building designs can achieve.

On-going research and development is also essential to encourage innovation and develop location-specific solutions. The Shenzhen Institute of Building Research and the Tsinghua University Building Energy Research Centre are examples of dedicated research hubs for relevant studies.

4.1.3 Main Gaps and Possible Enhancements for Hong Kong

With the benefit of our workshops and desk study, we set out the gaps considered to be of greatest significance to Hong Kong and how they could be filled.

Strengthening (Rescaling) Energy Labels for Electrical Appliances

According to the list of products²⁵⁴ (as of July 2018) registered under MEELS, 46% of room air conditioners, 43% of refrigerating appliances, 38% of compact fluorescent lamps, 60% of washing machines, and 74% of dehumidifiers are rated as the most energy efficient “Grade 1”. While we recognise the Government’s effort in revising the grading standards in November 2015, we are of the view that the current grading does not sufficiently discriminate the energy performance of these products to enable informed consumer decisions.

Taking into account technological advancement and improvement in product design, the grading thresholds should be updated from time to time to ensure that the top-performing products are properly separated out from the pool of “energy efficient appliances”. This approach is seen in Australia’s Energy Rating Label, which added four extra stars to its original six-star rating system to indicate “super efficiency”; and the incorporation of the “A+”, “A++”, and “A+++” in the EU energy labels. Notably, from 2021 onwards, the EU energy label grading will be rescaled for 5 product categories (fridges, dishwashers, washing machines, TVs, and lamps) to empty the “A” rating category initially and make room for more energy efficient models²⁵⁵.

The 5-yearly MEELS reviews could be used not only to cover the grading standards, but also to extend the scope of MEELS to cover a wider variety of product categories, possibly those covered at present by VEELS.

In workshop 3, an issue raised was that if there were only one or two products in the top category this may lead to an excessively high premium over products in the lower categories. However as long as consumers and procurers are free to make final decisions this should not be an issue, as they can take into account relative operational cost savings and higher upfront costs. Moreover, with time, more top-performing products are likely to come onto the market.

Apart from mandatory energy labels, several of the cities studied also included minimum energy performance standards to remove the least efficient models from the market. This will be further discussed in Section 4.6: Buildings/Appliance Standards.

One-stop Shop Website

²⁵⁴ https://www.emsd.gov.hk/energylabel/en/search/product_list1.html

²⁵⁵ <https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficient-products>

Hong Kong's energy efficiency information on the whole remains scattered between the ENB/EPD website²⁵⁶, EMSD^{257, 258} and BD²⁵⁹ websites. Information that is fragmented and not easy to find can be frustrating to users and increase costs, as expert advice may be needed. It may also hamper the ability of non-professionals to engage effectively in discussions. Moreover, there is a dearth of information from the Government in the public domain as to best practice in terms of retrofitting buildings.

The division of information across different government websites reflects the compartmentalisation of responsibilities: energy efficiency in buildings is currently in the remit of various government departments. It may not be a major goal for each of those departments. By jointly developing a website, this may foster joined-up thinking regarding this goal.

Information provision could be improved in Hong Kong to help businesses and the public find information easily – including energy saving measures/tips, policy related to energy efficiency, incentive/loan schemes for improving energy efficiency etc. The website may also benefit through being constantly updated and reviewed to ensure useful information.

To demonstrate government leadership and showcase exemplary best practices, improved government data transparency (e.g. disclose environmentally-related indices, report progress in energy savings and outcomes of retrofit projects) on the website may also be beneficial.

4.1.4 Conclusions

One important gap relating to information and education provision is to enhance the grading standards of the MEELS energy labels.

Having simple-to-use websites that contain all relevant information in the right place will also be convenient for users to navigate around energy efficiency policies and information.

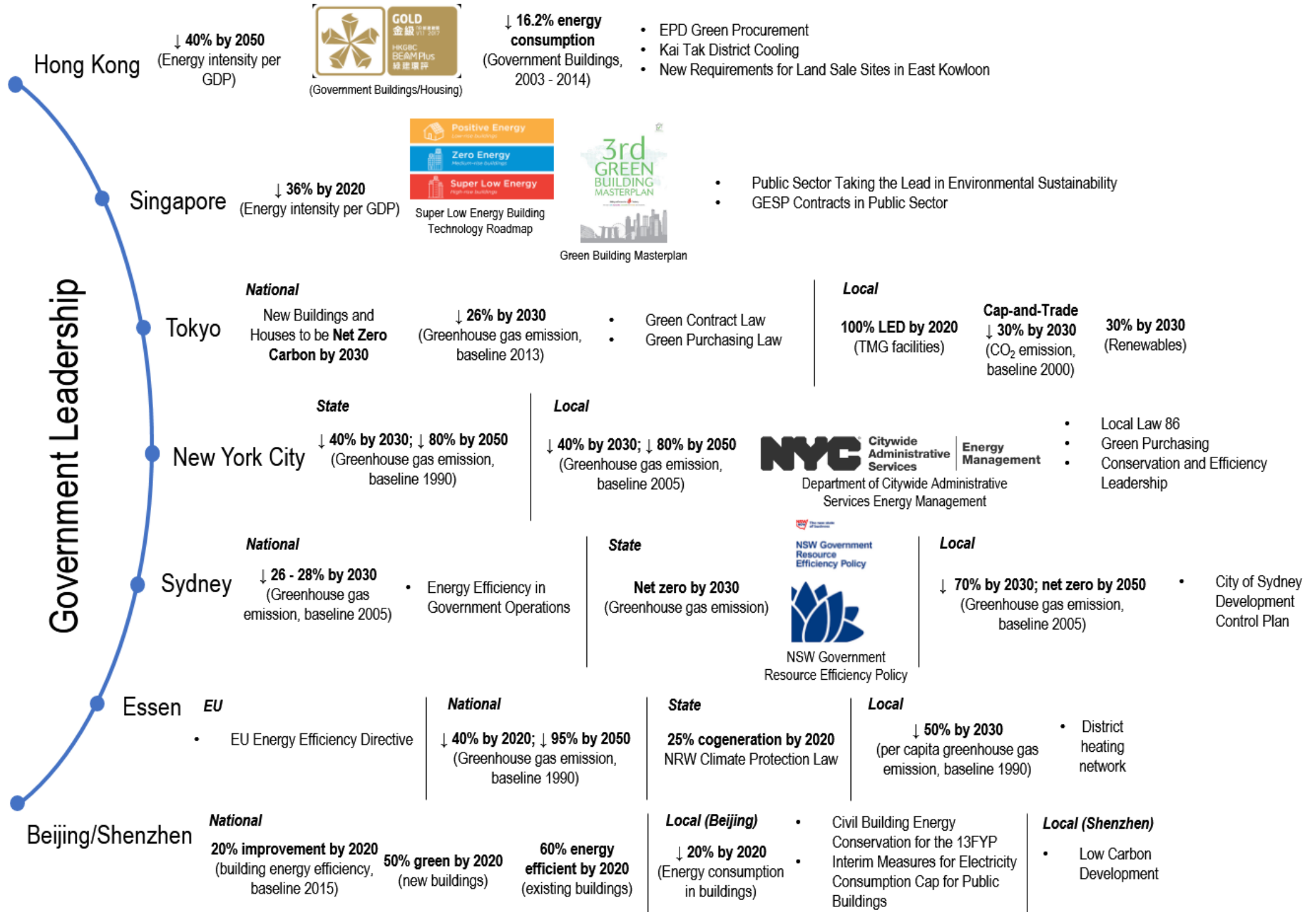
²⁵⁶ <http://www.energysaving.gov.hk/en/home/index.html>

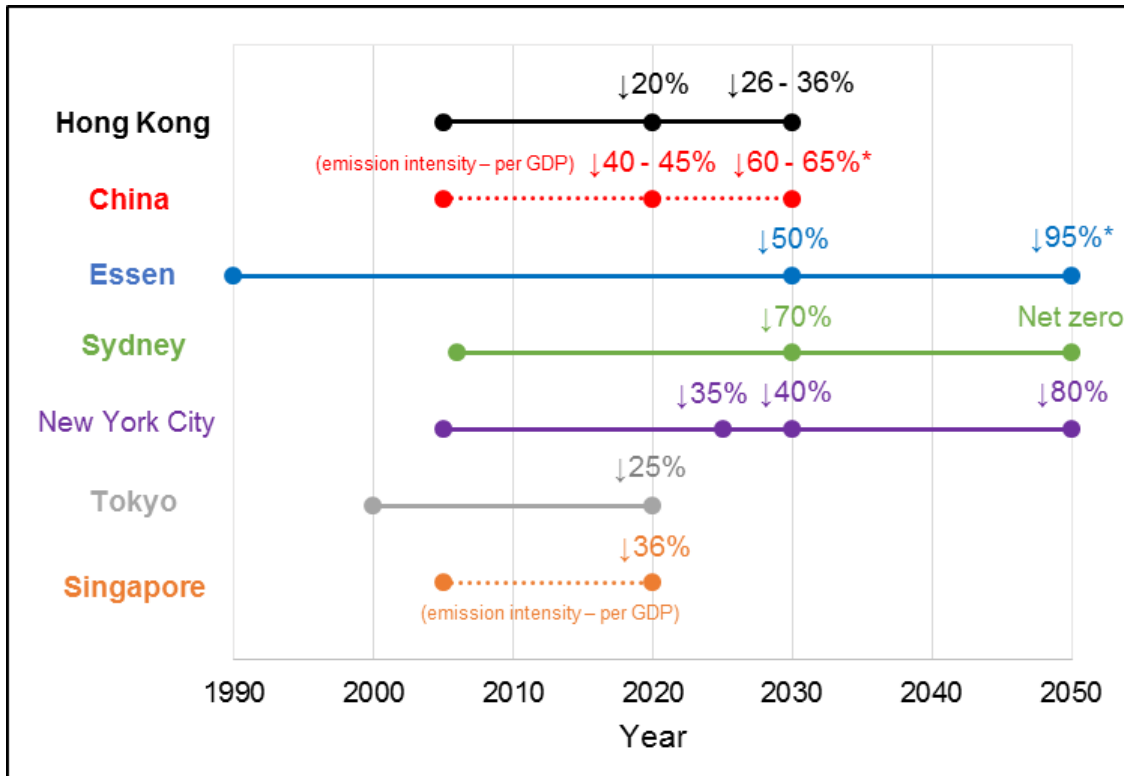
²⁵⁷ <https://www.emsd.gov.hk/energyland/en/home/index.html>

²⁵⁸ <http://ee.emsd.gov.hk/eindex.html>

²⁵⁹ https://www.bd.gov.hk/english/documents/code/e_ottv.htm

4.2 Government Leadership: Targets and Own Operations





Remarks: Unless otherwise specified, target shown are local (city-level) emission targets
 *National emission target

Figure 2. A comparison of GHG emission reduction targets (absolute and intensity) between the cities studied

4.2.1 Importance of Government Leadership

Government leadership serves to fulfil a number of key aims.

- Establishing a vision of the future. This gives businesses and the community certainty in terms of the direction to progress and develop towards. A clear vision provides the assurance that investments made today are future-proof, which can enable swifter and bolder action in terms of energy efficiency.
- As governments are typically the single largest owner and developer of buildings in any given jurisdiction, energy efficiency standards for public buildings are important for improving the energy efficiency of the overall building stock of a city. Moreover, learning can be taken from these buildings and disseminated to others.
- Communicating a message to the private sector of the importance of action.
- Not only is government a large owner of buildings it is also a large consumer of products. Green public procurement policies help drive market demand for energy efficient buildings and appliances.

4.2.2 Common Policy Approaches and Other Significant Policies across Cities

From reviewing the policies of the seven cities, we set out here the common approaches taken within the category of government leadership policies. We also describe notable policies which may not be used across the board but appear to be impactful in cities and relevant to Hong Kong.

Targets

A common approach of providing leadership is setting carbon emission and energy targets. All cities have overarching 2030 carbon emissions targets. Essen, NYC and Sydney have further established 2050 targets.

However, the existence of targets in itself is only part of the picture; the ambition of the target is critical too. C40 Cities' *Deadline 2020* research concluded that in order to deliver on the goals of the Paris Agreement, global cities have to peak greenhouse gas emissions by 2020 and average net zero emissions by 2050²⁶⁰. Sydney stands out for committing to reach net zero emissions by 2050, whilst Essen commits to a 95% reduction and NYC to 80% by 2050. Hong Kong currently has a 2030 target to reduce greenhouse gas emissions intensity by 65-70%, estimated to be by 26-36% in absolute terms, from its 2005 level.

In addition to having an overarching decarbonisation target, specific supplementary targets can provide greater clarity in terms of actual changes that need to be made, bridging the gap between the overarching goal and practical operations. Tokyo, Beijing and Shenzhen stand out by having sets of specific targets. They include targets relating to building energy use intensity and LED lighting penetration. Hong Kong currently has a target to reduce energy intensity per unit of GDP by 40% by 2025 from a 2005 level.

Standards for Public Buildings

Standards for public buildings are another common approach. Most cities have standards for public buildings – many are in the form of requiring government buildings to attain a minimum grade through the local green building rating system, e.g. Green Mark, LEED, NABERS, and China Three Star Rating. Beijing and Shenzhen furthermore have Energy Use Intensity (EUI) requirements for public buildings; Essen has ambitiously set a target for all public buildings to be built in the passive house standard.

NYC's LL86 is unique in that the trigger for the requirement is the proportion of public funding used for a building project. This expands the coverage of the requirements to buildings which the government partially owns or funded. Moreover, the requirements take on a tiered approach. The more public funding used for the building, the higher the energy efficiency requirements.

Many cities have a size threshold which determines whether a public building is subject to energy efficiency requirements – and those that fall below the threshold are not subject to requirements. A tiered approach as in NYC, however, establishes a more comprehensive coverage of public buildings.

In Hong Kong, new government buildings with construction floor area over 5,000 m² with central air-conditioning, or buildings over 10,000 m² are required attain at least BEAM Plus Gold.

Public Procurement Requirements

²⁶⁰ <http://www.c40.org/researches/deadline-2020>

Mandatory green public procurement requirements are present in NYC, Sydney, and Tokyo. Procurement policies apply for electrical appliances and construction-related products. Tokyo's policies are more comprehensive in that they embed environmental considerations not only to products but also in commissioning services.

4.2.3 Main Gaps and Potential Enhancements for Hong Kong

Long-term Vision and Specific Supplementary Targets

Hong Kong currently lacks an ambitious long-term decarbonisation target beyond 2030. However, the Government is commencing a public consultation through the Council for Sustainable Development to inform Hong Kong's long-term decarbonisation strategy and to establish the 2050 target. Considering Hong Kong is part of the Steering Committee of C40 Cities, one possibility could be to set an ambition broadly aligned with the spirit of C40's *Deadline 2020* recommendations – global cities to average net zero emissions by 2050. This may give the private sector and community the clarity and certainty for action towards a low carbon future.

While Hong Kong has an energy intensity target as set out in the Energy Saving Plan For Hong Kong's Built Environment 2015~2025+, the plan does not provide much guidance as to what and how much needs to be done in buildings, or how this target fits into the other targets or the goals of the Paris Agreement. In September 2017, NYC released a blueprint for aligning the city with the 1.5°C temperature increase ambition of the Paris Agreement. Hong Kong could take on NYC's approach to comprehensively examine and set out what actions are needed, including from the buildings sector, in order to align with the goals of the Paris Agreement. Building on that, evidence-based specific and measurable short-term targets can be established to help guide and facilitate necessary actions from the buildings sector. Such supplementary targets should provide greater clarity as to how to operationalise and move towards the overarching objective. Specific targets could be in the form of EUI reduction, or a proportion of the city's building stock to attain and maintain a certain building rating level by a certain date, as in Beijing and Shenzhen.

Hong Kong's current energy intensity target is in terms of per unit GDP, in line with the national commitment, which does not enable simple interpretation as to the actual actions and absolute reductions needed. Once again, clarity as to the actions needed can be enhanced if targets were in simple and straightforward terms such as absolute carbon emission reductions, EUI reductions, green building certification achievements, or penetration rate of certain technology types. Tokyo, Beijing, Shenzhen, and Singapore for example have clear and straightforward targets for buildings.

Enhance and Leverage Leadership from Government Buildings

Given the Government is a large owner of buildings, enhancing standards for public buildings through implementing tiered requirements can help to more significantly transform the buildings stock – so that new public buildings under the size of 5,000m² construction floor area would also be subject to minimum energy efficiency requirements.

For existing buildings, we acknowledge the Government's continuous work on improving buildings energy efficiency mainly through retro-commissioning of public buildings. To ensure the goals of energy efficiency and carbon reduction are aligned also among the property management arm of public premises, environmental KPIs should be imposed for departments such as the Government Property Agency. The Government can also

tap into public residential buildings, take on an active role to promote energy efficiency amongst residents and homeowners.

Another issue to address is the continued energy management of existing government buildings. While new public buildings are subject to requirements as described above, existing buildings are not. In New South Wales, the approach is to require public buildings not only to achieve, but also to maintain, a minimum NABERS rating. The Government may wish to consider a similar approach, so that once in operation, buildings are also required to maintain a minimum level of energy efficiency.

With the Government taking an active role to improve its building stock, not only does this help transform the overall building stock of Hong Kong, but it can be leveraged to pilot innovative approaches. Through the Innovative Demonstrations for Energy Adaptability program, for example, NYC actively seeks to implement and trial innovative technologies and approaches across the City's building portfolio, with the goal of informing larger-scale deployment of energy solutions. The city government shares the results of the demonstration projects with its agencies and other interested parties. In Singapore, there is a Public Sector Taking the Lead in Environmental Sustainability programme, where government buildings are subject to higher energy efficiency requirements. Public buildings in Beijing and Tokyo are also subject to special requirements which serves leadership and demonstration purposes.

Government leadership and showcasing can usefully inform and encourage action across the city as a whole.

Enhancing Public Procurement Requirements

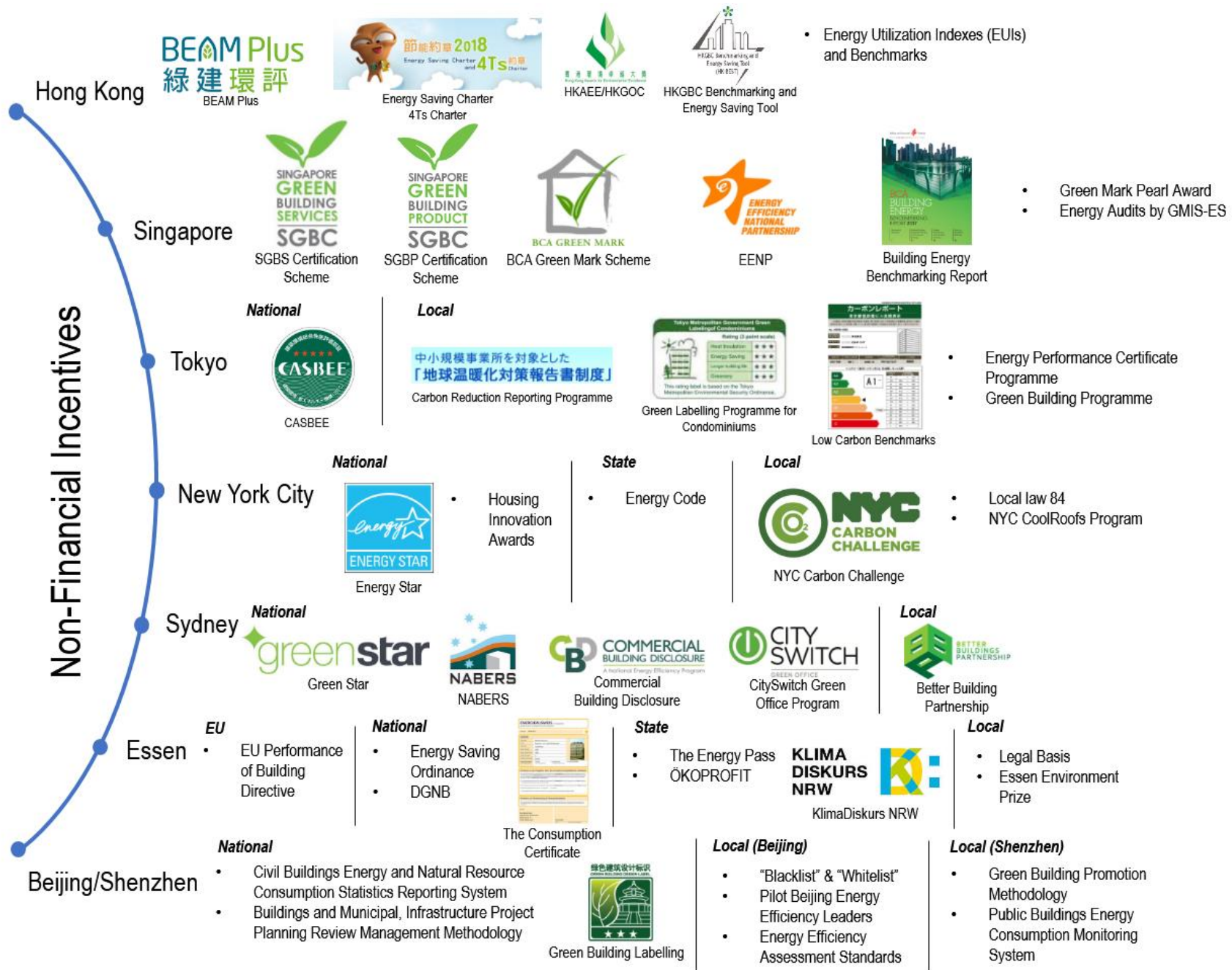
Given the scale of the Government's operations and that it is one of the largest consumers of goods and services, public green procurement requirements could be reinforced to take on board energy efficiency considerations, especially in building and construction supplies and electrical appliances. The requirements can also be expanded to cover more than just product procurement. For example, this could be in the form of requiring all premise rentals involving the Government, whether it is the tenant or property owner, to make use of green leases with energy efficiency considerations.

At the moment, the Government's green procurement standards are partially voluntary. This is another area for enhancement. This could be strengthened by making more requirements mandatory as in Japan, or at least requiring regular and public reporting. Not only should this help to improve Government operations but it should also stimulate the market for energy efficient products both in terms of local production and imports.

4.2.4 Conclusions

Our conclusions are around the benefits of clearer and more specific targets as well as government not only taking a leadership role in terms of its buildings and procurement, but also in publishing good case studies and making the most of the learning involved. This is connected with the provision of information measures explored in the previous section.

4.3 Non-financial Incentives



4.3.1 Importance of Non-financial Incentives

There appears to be two main underlying aims for these policies which are essentially about bringing market pressures to bear through transparency or joint action.

- Encouraging business action through peer pressure by having public reporting systems in place, businesses underperformers, landlords or tenants, may be incentivised to improve their energy efficiency performance, and strong performers recognised. Awards and certification schemes also have a similar effect.
- Spurring collaborative efforts between businesses this may be done through partnership programmes, sharing knowledge and lessons learnt among businesses, building owners, property managers as well as occupants.

They can be potentially useful in addressing the limited incentives on the part of landlords to invest in energy efficiency as energy savings often accrue to the tenant.

4.3.2 Common Policy Approaches and Other Significant Policies across Cities

Green Building Rating Systems

All cities/countries studied have their own green building rating system. Some are more widespread outside their country of origin than others e.g. Leadership in Energy and Environmental Design (LEED), while some emphasise the actual operational energy consumption of the building, e.g. the National Australian Built Environment Rating System (NABERS) scheme, and the operation rating under the China Three Star rating system.

Cities may also encourage the uptake of such rating systems through incentive schemes as well as regulatory requirements. For example, Singapore requires large new buildings to achieve a minimum score on the Green Mark scheme, and Beijing has set targets for a percentage of new and existing buildings to be certified according to the “Three Star” rating system.

In Hong Kong, the Government encourages the uptake of the Building Environmental Assessment Method (BEAM Plus) rating by giving gross floor area (GFA) concessions to green or amenity features to new buildings.

There is little evidence to suggest that rating schemes on their own without such incentives are impactful. Hong Kong’s BEAM Plus Existing Buildings Scheme is a case in point.

Competition and Award Schemes

Award schemes and competitions are commonly used in the cities studied, providing recognition and spurring competition in implementing energy saving measures. These schemes can be tailored to address the barriers in the local context. For example, the Singapore Green Mark Pearl Award Scheme was aimed at addressing the landlord-tenant split incentive issue by specifically recognising efforts by landlords to engage with their tenants to be energy-efficient.

Hong Kong has a number of award schemes in place. The most well-known is Hong Kong Awards for Environmental Excellence (HKAEE), and the Energywise certificate dedicated to recognise energy reduction efforts by companies.

Public Disclosure of Buildings Energy Performance Data

All cities studied require mandatory submission of buildings energy consumption data, and some cities then disclose the data publicly on government websites. It may be that the act of disclosure itself drives improved performance.

However, mandatory reporting is particularly important to enable robust benchmarking. Cities like Tokyo and Singapore have developed energy/carbon intensity benchmarks for various building types from the buildings energy consumption data submitted.

In Hong Kong, data from 10-yearly mandatory energy audits are reported to the Government and is disclosed online. This only covers central building services installations, not that from individual premises. However, little information is provided about these buildings with no categorisation of buildings so it is of limited assistance in terms of benchmarking.

Progress in Energy Efficiency & Benchmarking Performance

Another key aspect for non-financial incentives is data that will enable progress to be understood, and benchmarking of performance. There are two aspects of the system:

- Tracking progress in terms of the energy performance of buildings; and
- Businesses being able to see how their buildings perform in comparison with other. This enables a business case to be made for action.

Cities like Singapore and Tokyo collect building energy consumption data from commercial and certain public buildings. The information is used to develop city-specific benchmarks for various building types. Sydney goes one step further in its Commercial Buildings Disclosure (CBD) and requires buildings to acquire a NABERS rating and a lighting assessment to obtain a Building Energy Efficiency Certificate (BEEC) that will be valid for 12 months.

Looking at different approaches, the defining considerations as to the strength of the benchmarking system appear to be:

- How robust is the data collection system?
- How extensive is the data – from all buildings or just commercial and residential? Shared areas only or tenanted areas too?
- Categorisation of buildings so that relative performance can be understood.
- Putting summary performance information into the public domain, and presenting data in the correct format.

Voluntary Partnerships

Cities often have voluntary partnerships, initiated by the government or private sector, to establish a learning network and facilitate knowledge transfer between participants. However, the impacts of these are often hard to measure.

In Sydney, the CitySwitch Green Office Programme supports commercial office tenants to improve office energy efficiency through events, provision of toolkits, case studies and information on best practices. The city also has a Better Buildings Partnership targeting property owners and managers to improve the environmental performance of buildings.

New York City's Carbon Challenge requires participants to voluntarily reduce their building-based GHG emissions by 30% or more over the course of ten years. The city

government publishes detailed case studies with emission reduction efforts from participants that met their challenge early.

In Hong Kong, there are two voluntary charters related to energy efficiency: the Energy Saving Charter that encourages participants to adopt energy saving measures, and the 4Ts Charter to set transparent targets within a timeline for businesses. However, these are not supported by routine sharing of information and experience.

4.3.3 Main Gaps and Possible Enhancements for Hong Kong

Having looked at what is common and what is exemplary through our desk study and research, the following are highlighted.

Transparency of Building-level Data

In Hong Kong, the only building-level data disclosed is the EUI of central building services installations from the mandatory energy audit reports submitted to the EMSD every 10 years. As the EUIs only show the energy consumption from shared facilities it is hard to compare energy performance between different buildings with the limited amount of information disclosed.

EMSD provides aggregated sector-level data on an annual basis through Energy End-use Data, but the data is not sufficiently granular for analysis and comparison on a building level. The EUI Benchmarks issued by EMSD in 2011 are not perceived as transparent and reliable by workshop participants.

Having an inventory of building energy consumption data will help the Government and/or the industry to develop accurate building EUI benchmarks for Hong Kong. It would be useful to be able to understand the energy performances of different building types in Hong Kong which could be the basis for future policy directions – making decisions based on the current energy performance of various building types.

A possible data collection method is to implement a mandatory reporting system for building energy consumption/intensity data looking not only at the central building services, but also the energy consumption by tenants, covering all existing buildings in Hong Kong.

This can be done in two ways:

- a) Mandatory disclosure to the Government, and provision by the Government of good benchmarking data for different categories of buildings, which tenants and others can make use of; or
- b) Public disclosure of the energy performance of existing buildings in both shared and tenanted areas.

To address concerns for data privacy or commercial confidentiality, a shift towards this level of transparency could be achieved using a phased approach like in Singapore's BEBR: mandatory disclosure to government with anonymised building energy performance data for benchmarking combined with voluntary public disclosure. The types of buildings covered can also be expanded in different phases.

It was agreed at our workshops that a set of comprehensive, accurate, open, and transparent benchmarks for building energy performance is of paramount importance to businesses. This will not only allow building owners to understand their buildings' energy

performance, but can also help facility managers build a business case for improving their buildings' energy efficiency if they are underperforming.

Looking across the cities studied, there are generally two ways to disclose information as to benchmarks: anonymised disclosure for self-benchmarking (e.g. Singapore's Building Energy Benchmarking Report), or open disclosure for public scrutiny (e.g. Tokyo's Carbon Reduction Reporting Programme). Building owners may not be fully confident in disclosing their data publicly at the initial stages, so implementing the benchmarks in a phased approach, starting from anonymised and aggregated data, and transitioning towards a set of open and transparent benchmarks may be more realistic.

The set of benchmarks should also be properly categorised for a fair comparison of different types of buildings but should not be overly divided to a point that the benchmarks become too granular to be useful.

Also of importance is that the data/benchmarks are published and presented in the right format for them to be useful to the public and businesses.

Performance-based Green Building Rating System

As the vast majority of certified buildings are under the BEAM Plus New Buildings assessment, they are not required to assess the actual environmental performance after the buildings are built. Currently, there is also little incentive for existing building owners to perform a BEAM Plus Existing Buildings assessment.

This may be improved by encouraging the use of a performance-based green building rating system that takes into consideration the operational efficiency and the maintenance of buildings, for example, the BEAM Plus Existing Buildings Version 2.0 Selective Scheme (Energy Use), or reference the NABERS scheme that requires measurement and verification of the actual energy consumption of buildings. This can act as a validity check for the operational energy performance of newly constructed buildings, to ensure that the buildings are performing on par with their design specifications.

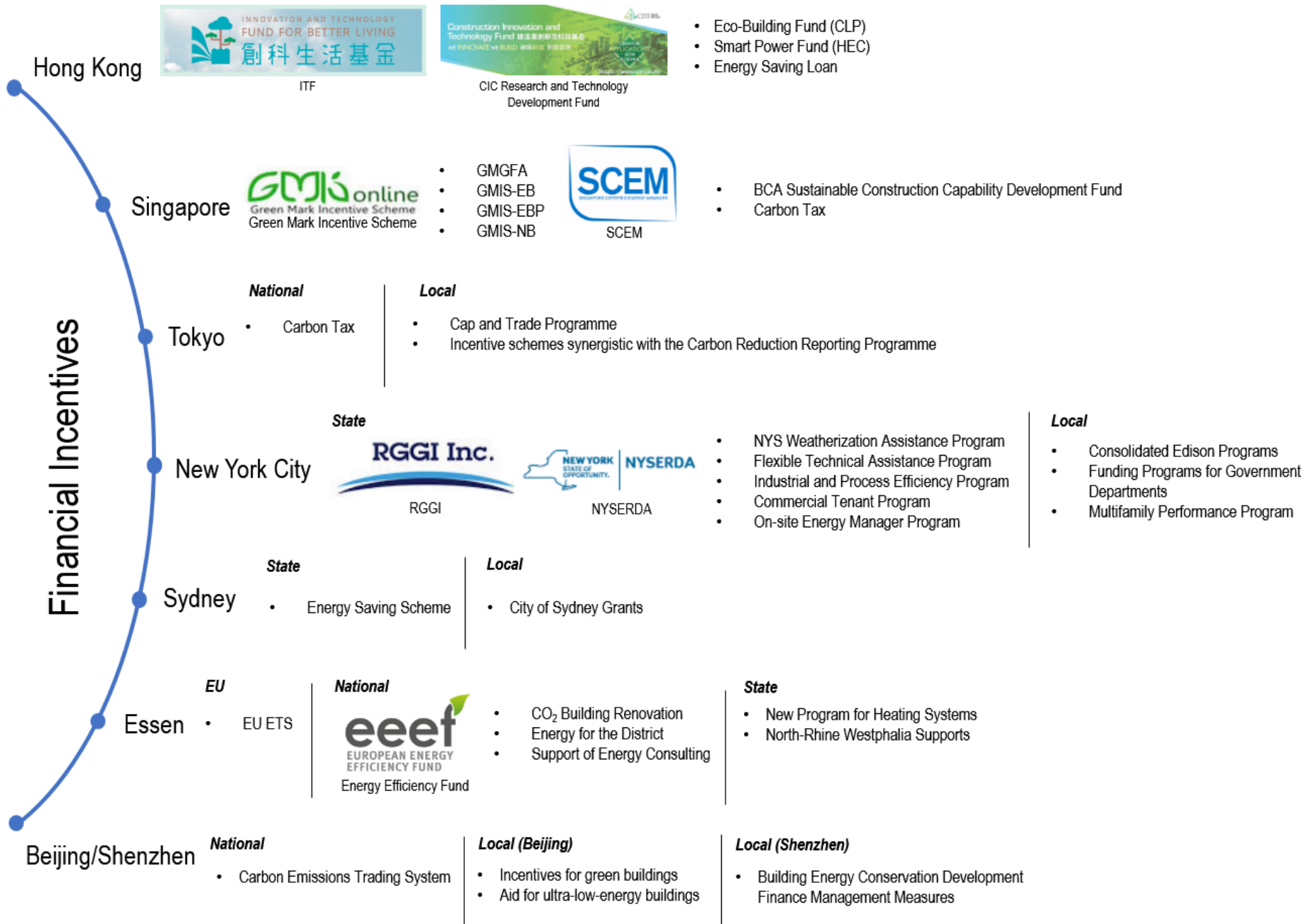
Such a rating scheme will also be synergistic with the mandatory reporting and disclosure system aforementioned, by providing a standardised assessment of the energy performance of buildings, and incentivising existing buildings to increase their energy efficiency.

4.3.4 Conclusions

This category is all about using non-prescriptive and non-financial policy measures. It is aligned with what may be regarded as a Hong Kong preference to use such measures and to minimise on-going operational financial commitments on the part of the Government. The measures that stand out most from the practice of other cities is public reporting of energy utilisation, and the use of a performance-based rating scheme as in the NABERS scheme. This will bring market pressures to bear. It should be noted that since the publication of the EUI for buildings undergone energy audit online in Hong Kong has not led to directed shaming of companies or building owners included in the database.

The complexities involved in public reporting and/or rating schemes lie in: categorising building types, enabling businesses to explain performance variations, and persuading businesses that reporting in this manner may be preferable to stricter regulatory approaches. The categorisation issue relates to all forms of benchmarking, and Hong Kong would be able to build on and refine categories used in existing datasets.

4.4 Financial Incentives



4.4.1 Importance of Financial Incentives

Financial incentives for energy efficiency serve to fulfil two key purposes.

- First, financial incentives such as carbon pricing can internalise environmental costs to remedy the issue of externalities. This essentially restores the economic system so that environmental costs are factored into financial equations and disincentivise operating in an environmentally detrimental way.
- Second, financial incentives enable energy efficiency investments by reducing upfront costs. They soften the impact of the split incentive which weakens the pressure on property owners to invest.

Ultimately, financial incentives aim to encourage energy efficiency by making it more economically attractive to improve energy performance of buildings.

4.4.2 Common Policy Approaches and Other Significant Policies across Cities

From reviewing the policies of the seven cities, we set out here the common financial incentive approaches, as well as other policies that stand out.

Grants, Discounts and Rebates to Support Capital Investment

Subsidies, discounts, and rebates to support energy efficiency investment are common across cities. They vary in how they are offered and administered, typically linked to how the energy sector and buildings sector are regulated locally. For example, many of the financial incentives in NYC are offered through the local utility company Consolidated Edison, whereas in Singapore almost all incentives are offered through the government body BCA. The Energy Saving Scheme of NSW takes a unique approach in that the government has established a mandatory requirement for electricity retailers to purchase energy saving certificates, which are generated for every unit of energy saved through energy efficiency initiatives. This creates demand and monetary value for energy savings achieved in buildings through completing upgrade projects with costs paid for by adjusted electricity bills.

Grant Schemes to Support Audits and Professional Input

Schemes that alleviate capital expenditure for building improvement works and acquisition of technologies and appliances are standard. Some cities, however, have financial incentives programmes that cover aspects beyond improvement works and technologies. They include a training grant to learn energy efficiency and building management skills in Singapore, and cost sharing to hire a full-time on-site energy manager in NYC. In effect some cities take a broad view on energy efficiency incentives and support on-going and continuous energy efficiency management in addition to one-off capital expenses.

Gross Floor Area (GFA) Concession

These are generally to support good design of new buildings, and are a key part of the system in Singapore and Hong Kong. In Singapore, private developments or redevelopments that attain Green Mark Gold Plus are eligible for 1% additional GFA over and above the plot ratio control. Those that achieve Green Mark Platinum receive 2%. This is a tiered approach which rewards additional GFA proportionate to and based the Green Mark rating achieved.

Currently, Hong Kong provides up to 10% GFA concessions for completing an assessment and registration with BEAM Plus. The award is not linked to achieving BEAM Plus ratings.

Carbon Pricing Mechanisms

These systems may be seen as “nudging action” in terms of not only capital investment but active on-going energy management such as retro-commissioning of cooling systems. This involves additional costs for energy, as opposed to “carrots” in the form of grants, discounts and rebates. All the cities studied, with the exception of Sydney, have carbon pricing mechanisms in place or planned. Singapore’s carbon tax will be effective beginning in 2020; Japan has a nation-wide tax on fossil fuels and Tokyo has a cap and trade scheme; the Regional Greenhouse Gas Initiative (RGGI) affects NYC; Essen is subject to the European Union Emissions Trading; Beijing and Shenzhen both had pilot emissions trading schemes and will be subject to China’s national emissions trading scheme when it comes into full force.

The carbon pricing mechanisms in operation vary. Some programmes cover the supply-side, such as RGGI and the Japanese carbon tax, while some cover the demand-side such as the Tokyo cap and trade programme. But no matter the design, a price on carbon ultimately – either directly or indirectly – places costs on GHG emitting activities hence encourages energy efficiency.

Tokyo’s cap and trade scheme is unusual in that it directly targets large commercial buildings, rather than doing so indirectly through the power sector. Buildings have to meet a continuously shrinking emissions cap and can earn saleable credits by achieving emissions reduction beyond the compliance level through undertaking renewable energy and energy efficiency initiatives. According to official reports, this led to a 26% reduction in greenhouse gas emissions from covered buildings between 2010 and 2016 – a significant reduction over this time span.

This study did not involve a detailed analysis of carbon-pricing mechanisms and their relevance to Hong Kong, because of the complexity of these options. This is better done through a separate study.

4.4.3 Main Gaps and Possible Enhancements for Hong Kong

Taking on board the experiences and trends in the studied cities, and considering the policy framework in Hong Kong, we identify the following areas for enhancements under the theme of Financial Incentives.

Linking Incentive Schemes with Actual Building Energy Performance

Under Hong Kong’s current scheme, additional GFA is awarded to new buildings for meeting a number of criteria – but not linked to actual energy efficiency achievements. The GFA concession can become more effective in stimulating energy efficiency improvements by taking on a tiered approach as in the case of Singapore. Additional GFA can be awarded proportionately to actual energy efficiency achievements – potentially linked to levels of achievements under the BEAM Plus scheme, or for simplicity, linked to achievements under the Energy Use category within the BEAM Plus scheme.

Issues as to ensuring buildings are actually built and operated according to the claimed energy efficiency level are often raised. As is the case in Singapore, a mechanism can be established where the property developers submit a deposit to the Government upon

being granted additional GFA, which will be returned upon the Government receiving evidence that the building is built and operated to the proposed energy efficiency level.

Grants and cash incentives, awarded in proportion to the level of achievements, is another possible financial incentive tool. In Shenzhen, grants are awarded to buildings after successfully receiving a green building certification. For achieving Bronze, Silver, Gold, Platinum level certification through Shenzhen's local scheme, a building will receive a grant capped at 5, 15, 30 and 60 CNY respectively per square meter. For the national one-star, two-star, three-star level certification, a building will receive a grant of no more than 10, 20 and 50 CNY respectively per square metre.

In addition to GFA concession and grants, tax incentives can also be used as a tool to stimulate energy efficiency in new buildings. A tiered approach principle where the level of award is proportionate to the level of achievement might have much greater impact.

In many cities including Hong Kong, many of these financial incentives have an emphasis on new buildings. New buildings are significant: by 2030, new buildings built after 2015 will account for 20% of the building energy demand in Hong Kong. It is often many are estimated more cost effective to develop energy efficient buildings in the design and construction phase compared to retrofitting an inefficient building to bring it up to the same level of energy efficiency. However, existing buildings also need incentives for significant transformation. Grants and tax schemes can be utilised to award existing buildings to achieve and maintain high levels of energy efficiency. These can be linked to the different tiers of BEAM Plus Existing Buildings certification, for example. Such schemes can also serve to incentivise new buildings to continue to operate in an energy efficient manner throughout its lifetime.

Increase Diversity and Coverage of Financial Support

In Hong Kong, the majority of financial incentives for energy efficiency in existing buildings are from funds established by the two utility companies under the Scheme of Control Agreements – covering retrofitting, retro-commissioning, and implementation and acquisition of technologies and appliances. Free energy audits are also provided by the utility companies. And the Government allows accelerated tax deduction for investing in energy efficiency technologies.

Under the Scheme of Control Agreements, the New Smart Power Fund/New Eco-Building Fund will subsidise retro-commissioning, retrofitting, and the installation of efficient technologies in communal areas of buildings. The Community Energy Saving Fund will assist customers upgrade to use efficient appliances through subsidies and rebates. These funds will be important towards incentivising action, though it may be that these funds are insufficient and need to be supplemented by the Government.

Grants, discounts and rebates involves payment for investment even where the investment produces monetary savings for the proponent of the project. An issue that arises is who is best placed to meet the costs of these subsidies, customers of the power company or the Government. Some businesses suggest that for equity reasons it would be better for the costs to be borne by the taxpayer to avoid a cross-subsidy from electricity customers to building owners and property developers.

In all the cities we looked at, incentives for ongoing energy efficiency management and continuous improvement appeared to be weaker. The Energy Saving Certificates approach, as in New South Wales, places monetary value on actual energy savings achieved and creates a standing incentive system for continuous improvement. However additional costs to electricity retailers in purchasing certificates which can be

transferred to customers raises equity consideration of a transfer of value from electricity consumers towards property owners and would need to be suitably addressed.

Singapore's Green Mark Incentive Scheme for Design Prototype provides financial support for design, in-depth simulation and modelling for innovative approaches that demonstrates achieving energy savings of at least 40% from requirements. A scheme such as this could support continuous improvements and expedite the development and uptake of best buildings design approaches.

Explore Different Carbon Pricing Options

The price of energy is one of the key factors in the financial viability and attractiveness of investing in energy efficiency of buildings. It makes returns from energy savings more valuable. Research done through BEC's Energy Efficient Retrofits Guide²⁶¹ has found that most retrofit technologies and initiatives already bring net monetary savings through its lifetime. With increased energy prices, even more retrofit initiatives will accrue net savings, the financial returns will be greater and the payback periods shorter. Hong Kong's electricity tariff is lower than many other international cities, including Singapore, Tokyo, New York and Sydney²⁶². The issue of adjusting energy costs, however, is a sensitive issue as it has wide-ranging social and economic implications which must be fully considered.

Carbon pricing mechanisms are increasingly utilised as a tool, as we can see its presence in the seven other cities studied. However there are a number of ways to do so, which are not analysed in this paper in any detail. Given global trends and in light of the scheduled launch and development of China's national emissions trading scheme, how Hong Kong – government, businesses and community – be affected by the scheme will be an important area for further analysis. Implicit forms of carbon pricing already exist, for example in the increased electricity tariff from a changing electricity grid fuel mix from coal to gas. The impact of such policies and other policies in place are important considerations in deciding on how far these other measures are needed.

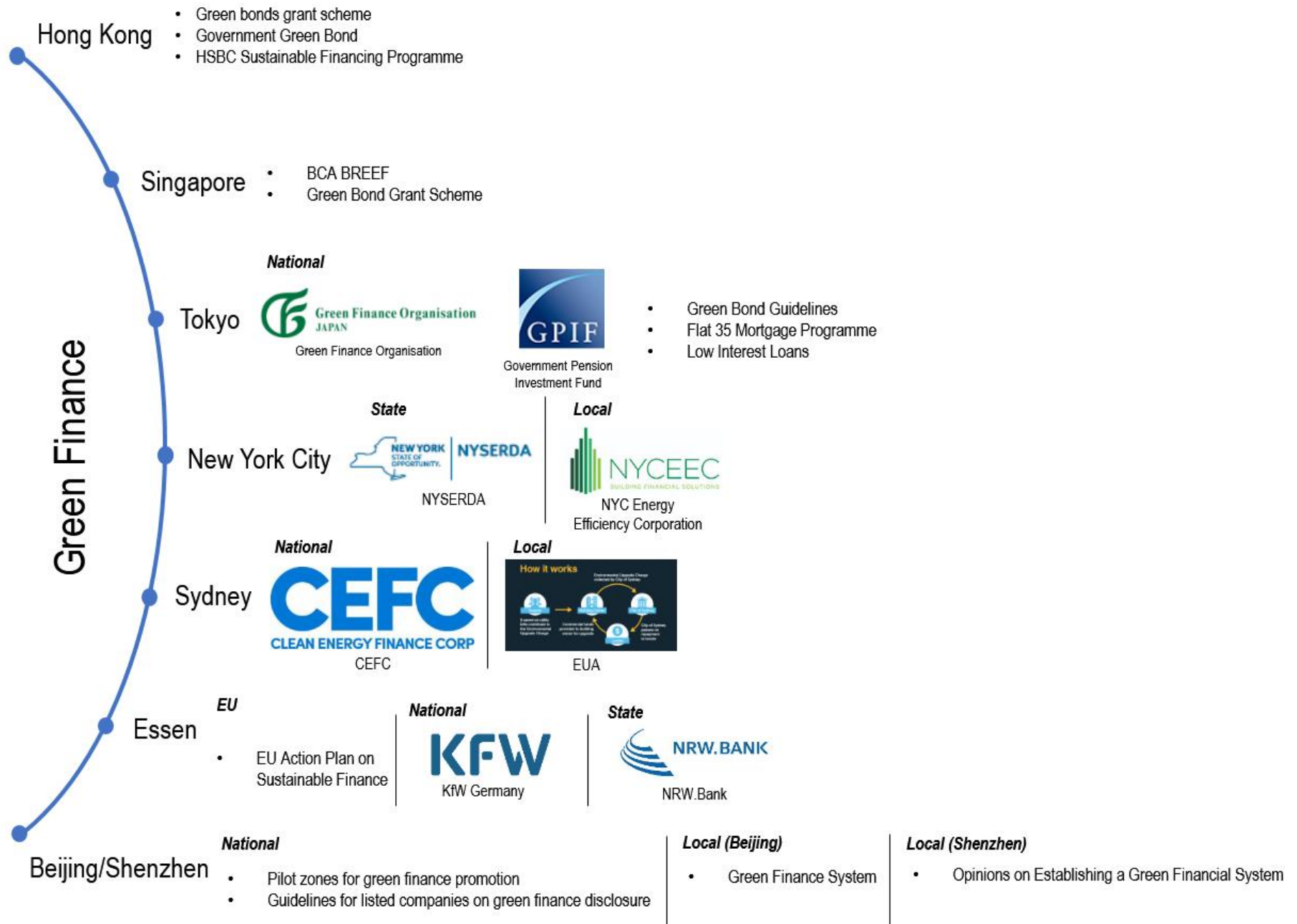
4.4.4 Conclusions

In terms of gaps and possible enhancements for Hong Kong, greater proportionality between rewards for energy efficient new buildings, greater financial incentives for on-going energy management in existing buildings, and for prototype buildings stand out for further consideration as to policy enhancements. Issues arise such as: who should pay for such incentive payments, possible detrimental impacts of higher energy prices, as well as the best approach for carbon-pricing, if this is needed among other policies. These issues require further in-depth consideration.

²⁶¹ <https://bec.org.hk/resource-centre/eerguide>

²⁶² <https://www.legco.gov.hk/yr17-18/english/panels/edev/papers/edev20171212cb4-325-6-e.pdf>

4.5 Green Finance



4.5.1 Importance of Green Finance

Green finance policies are typically designed to address a number of barriers: higher perceived risk or uncertainty as to returns of investments, smaller scale investments which may require consolidation of projects, and possibly even lower returns.

4.5.2 Common Policy Approaches and Other Significant Policies across Cities

From reviewing the policies of the seven cities, we set out here the common approaches identified, as well as other policies that stand out.

Policy Support for Green Bonds

There is increasing recognition of the potential for green bond issuance to help finance a sustainable, low carbon future. It is estimated that USD\$ 90 trillion (HK\$ 702 trillion) in investment is needed between 2016 and 2030 to meet the goals of the Paris Agreement and sustainable development. Many of the cities studied are taking action to develop and stimulate the green finance market. For example, Singapore has introduced a scheme to offset all of the costs attributed to obtaining external verification for green bonds issuance; the state-owned NRW Bank in Germany has issued green bonds including for energy efficiency measures; and Japan's Ministry of Environment issued green bond guidelines to ensure credibility of green bonds.

Hong Kong has also taken action. The Government has committed to a green bond issuance programme where proceeds will be used to fund green capital works. The Green Bond Grant Scheme will cover the expenses of certification.

Many of the cities studied are taking the steps as described above: establishing guidelines for green bonds, issuing sovereign green bonds, and encouraging issuance of green bonds through incentives – both financial and non-financial.

Green Loans

Loans are common instruments for financing energy efficiency. Discounted loans, usually low interest or sometimes interest free, are either offered by energy financing corporations, or directly by government bodies.

In Japan, owners/occupiers of houses that meet environmental standards can enjoy fixed-rate mortgages, and there are discounts linked to the level of energy efficiency of the house. New York State Energy Research and Development Authority and NYC Energy Efficiency Corporation offer loans. Through the EUA mechanism, the Sydney government arranges for commercial lenders to finance energy efficiency projects, repays the commercial lender in advance and allows building owners to repay the government at a discounted rate and over a longer timeframe. The Sydney government in effect plays a facilitation role and absorbs part of the interest costs. The loan is secure for the financial lenders due to the government's involvement, and the government does not need to directly invest its own public capital.

Under the Scheme of Control Agreements, interest-free Energy Saving Loan Funds has been established in Hong Kong to finance energy efficiency initiatives. Banks can top up funds available from the utility companies, in which case utility companies will reimburse borrowers for interest accrued from banks. For example, the HSBC Sustainable Financing Programme provides low interest loans starting from HK \$1,000,000 for businesses who seek to use eco-friendly products and adopt green business strategies.

Green Investment Bank Approaches

Entities dedicated to financing energy efficiency and environmental projects help to expedite and increase the scale of energy efficiency improvements in buildings, and to make investments with commercial rigour. These green investment bank entities not only serve to originate loans but can also provide guarantees for ESCOs.

In NYC and Australia, there are statutory corporations whose mission is to provide finance for energy efficiency projects – NYC Energy Efficiency Corporation (NYCEEC) and Clean Energy Finance Corporation (CEFC), respectively. NYCEEC was established by NYC and endowed with an initial sum of funds. It has continued its operation through its revolving loan fund framework and has attracted additional capital from private, public and philanthropic sectors over time. NYCEEC offers a range of financial products for energy efficiency activities. CEFC is credited with a sum from the Australian government each year. In addition to loans, CEFC grant funds projects and developments. CEFC influences the developments in the private sector on behalf of the government by its investment direction. The Japan Finance Corporation also provides low interest loans for energy efficiency projects. However its objectives are not exclusive to the environmental mission.

As an example, NYCEEC has made notable progress in spurring energy efficiency investments. Since 2012, it has supported upgrading more than 200 buildings and led to energy savings of 21 million MMBtus.

4.5.3 Main Gaps and Possible Enhancements for Hong Kong

Taking on board the experience in the studied cities, and considering the policy framework in Hong Kong, we set out below possible areas for enhancement in Hong Kong.

High Standards for Green Bonds and Green Loans

The International Capital Market Association's Green Bond and Green Loan Principles as well as Hong Kong's Green Finance Certification Scheme place an emphasis on transparency of use of proceeds that contribute to positive environment effects. However, the "greenness" of the bond is not rigorously assessed or ranked. So bonds that fund projects that achieve small energy efficiency improvements and those that lead to significant energy efficiency improvements aligned with the Paris Agreement, are both labelled as green. At the moment, it is for investors to scrutinise the bonds.

Climate Bonds Standard and certification is an exception, but it has less subscribers and usage of this is not incentivised as the Green Finance Certification Scheme is.

For green finance policies to support a maximum 1.5°C or 2°C temperature rise, Hong Kong can consider establishing a mechanism to assess and distinguish the extent of the positive environmental effects resultant from green bonds and loans. High standards as to "greenness" could be linked to the incentive structures such as the Green Bond Grant Scheme.

Green Investment Bank

Although the utility companies provide funds for energy efficiency, and private institutions are increasingly willing to finance green projects via the green bonds and green loans movement, the phenomenon of project proponents having difficulty accessing finance still exists. Many energy efficiency projects are perceived to have

uncertain or low return on investments or the scale of investments are too small to be commercially attractive.

A green investment bank, or a similar entity with a focused mandate to provide finance for energy efficiency and environmental projects, can be established to address this issue. Not only can a green investment bank provide easy access to finance for proponents of energy efficiency projects, it can offer financial services such as de-risking energy efficiency investments through analytical work and securitisation. Green investment banks can also support ESCOs to perform energy efficiency works.

Other potential benefits of a green investment bank is to support the green bond market development, draw in investors for environmental projects in Hong Kong, and can also lead to developing Hong Kong as a hub for green technology companies.

Loans/Mortgage Discounts

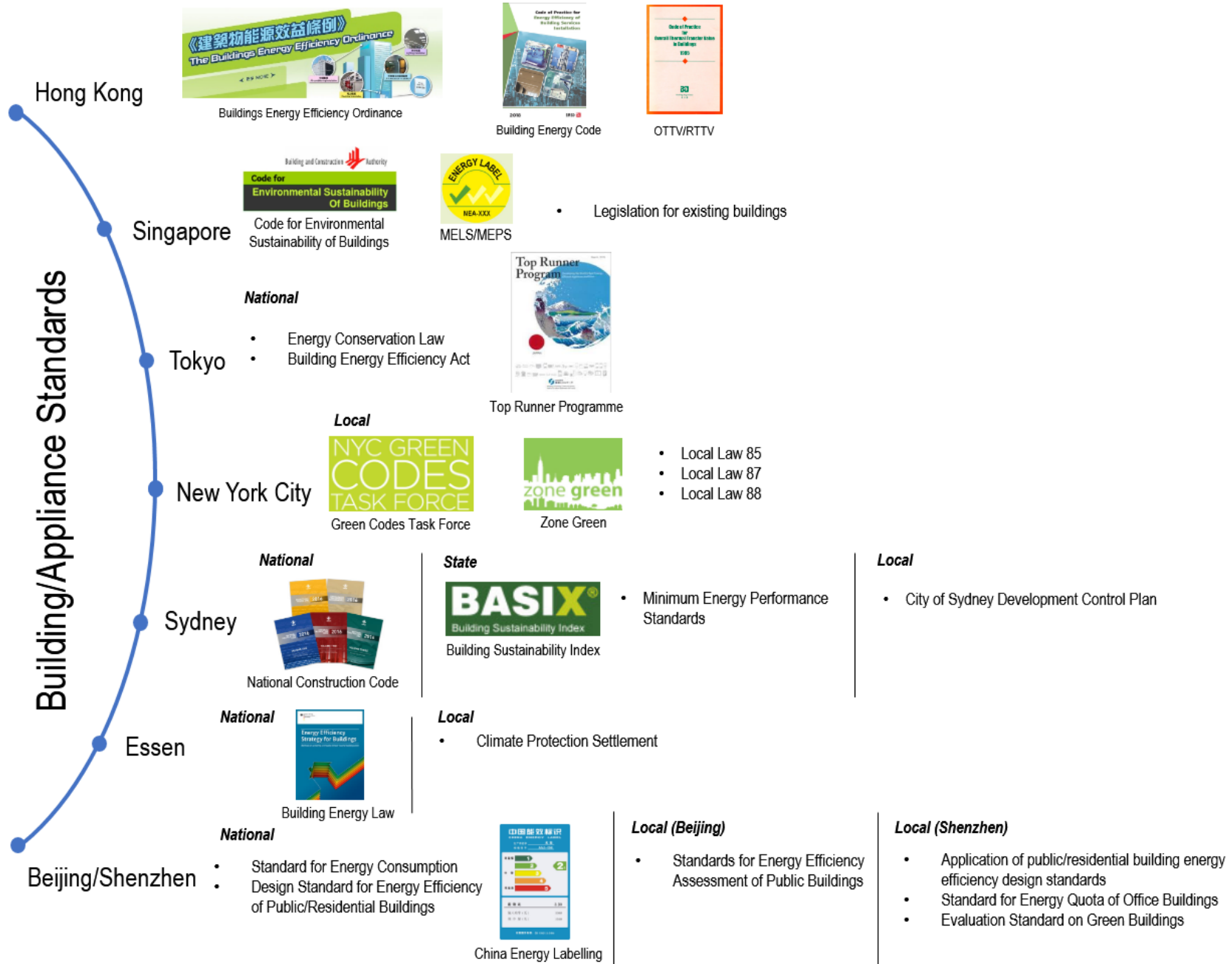
The Energy Saving Loan Fund offered by the two power companies should benefit from regular reviews to ensure uptake and sufficient funds. Should the funds be insufficient, the Government can supplement the loan funds.

Other possibilities are offering loans directly for energy efficiency works as is done in New York City and Tokyo – particularly for the energy management opportunities identified under energy audits. Another possible approach is that of Sydney's Energy Upgrade Agreements, where the government partners with financial institutions to provide finance to proponents of projects absorbing some of the interest costs. Tokyo's mortgage interest discounts for purchasing energy efficient homes may also be impactful in Hong Kong.

4.5.4 Conclusions

Green finance policies have considerable momentum behind them at present including in Hong Kong. However, the set of policies that would best direct finance to projects aligned with a maximum 2°C or even 1.5°C temperature rise appear to still be in development. Three main solutions that stand out relate to tiered systems to incentivise green bonds with higher incentives for more impactful policies, support for green loans, and consideration of a Green Investment Bank or Fund.

4.6 Buildings/Appliance Standards



4.6.1 Importance of Buildings/Appliance Standards

Statutory requirements for the minimum energy performance of buildings and electrical appliances generally aim to raise the overall level of energy efficiency of new buildings, though to some extent they also influence retrofits in existing buildings.

These standards are useful in addressing the split incentive issue. They require developers to build to a certain level of energy efficiency in buildings, who may not otherwise do this as it is ultimately the owners and occupiers that benefit from energy efficiency.

Building standards are generally regarded as the backbone of the system in terms of energy efficiency. The Building Codes of Australia 2006 and 2010, for example, are estimated to have contributed to more than 9% reduction in buildings energy consumption since 2006 compared to a business-as-usual growth pathway²⁶³.

Electrical appliance manufacturers may also not be inclined to focus on energy efficient models, as they do not obtain the benefit if customers do not understand or care sufficiently about the energy performance between different models.

4.6.2 Common Policy Approaches and Other Significant Policies across Cities

Statutory Environmental Standards for Buildings

All cities studied have building standards relating to the environmental (including energy performance) specifications of buildings. The specifications generally prescribe the energy performance of the building envelope (e.g. façade and fenestration) and building equipment (e.g. HVAC and lighting). There is a degree of variability as to the scope and requirements of the building standards. This study does not seek to compare the prescribed values of these building standards because, in particular for buildings envelope requirements, it is difficult to compare thermal performance requirements of buildings located different climatic zones. The whole building modelling approach (i.e. thermal transfer values) used in Hong Kong and Singapore are especially hard to compare.

Some key differences which we have noted are highlighted below. Singapore ties part of its building energy codes to the assessment criteria of the Green Mark Scheme and requires certain buildings to achieve a minimum Green Mark score.

New York City requires not just major retrofitting works, but renovation or alteration projects of all sizes, for the portion of the building under renovation or alteration, to meet the latest Energy Conservation Code requirements. The city also mandates buildings to conduct mandatory energy audits together with retro-commissioning every 10 years under Local Law 87.

In Hong Kong, the Buildings Energy Efficiency Ordinance (BEEO) requires all new buildings as well as major retrofitting works of existing buildings to comply with the Building Energy Code (BEC) which sets out the energy performance requirements of buildings services installations (lighting, electrical installation, air conditioning systems, and lifts and escalators). Existing buildings are also required to carry out mandatory energy audits every 10 years.

Thermal performance of buildings in Hong Kong is regulated by the Buildings Department (BD) and guided by the mandatory overall thermal transfer values (OTTV)

²⁶³ http://www.cityofsydney.nsw.gov.au/data/assets/pdf_file/0003/241437/Energy-Efficiency-Master-Plan-Foundation-Report.pdf

for commercial buildings and voluntary residential thermal transfer values (RTTV) for residential buildings. These performance-based values are calculated on a whole building basis from energy modelling, which is different from a prescriptive approach for components like windows and walls as done in cities like New York City and Sydney.

Minimum Energy Performance Standards for Electrical Appliances

Countries like Singapore, Japan, Australia and the US have minimum energy performance standards for electrical appliances which usually include air conditioners, lamps and white goods.

In Japan, the Top Runner Programme sets mandatory energy efficiency improvement targets by a certain target year (3 to 10 years ahead per product) for more than 20 categories of electrical appliances. The improvement targets are reviewed after the target year taking into consideration of technological limitations, for example the different sizes and power ratings of products. Instead of setting a minimum energy performance standard (MEPS) for appliances, the Japanese government adopted a weighted average target approach. This means not every single product from a manufacturer has to meet the improvement targets – only the average of all products has to.

Hong Kong currently does not have minimum energy performance standards for electrical appliances.

Green Codes Task Force and Zone Green (New York City)

Convened by the NYC Mayor Michael Bloomberg in 2008, the task force consists of 200 voluntary industry experts, charged with recommending changes within any of the City's codes and regulations to make buildings more sustainable. It was asked to consider not only what new requirements should be created, but also which impediments to sustainability should be removed.

Building on the Green Codes Task Force's recommendations, Zone Green is a set of amendments to zoning regulations, accompanied by supporting City and State legislation, to remove impediments to the construction and retrofitting of green buildings.

4.6.3 Main Gaps and Possible Enhancements for Hong Kong

Coverage and Strength of Building Standards

The Building Energy Code (BEC) prescribes the performance of building services installation of new buildings and major retrofitting works covering an area of at least 500 m², or involving the addition or replacement of major component of a central building services installation.

Thermal transfer values are considered separately with a mandatory requirement for the building envelope in relation to commercial buildings but not residential buildings. The latter is simply encouraged through a GFA concession.

From ad hoc discussions with experts and practitioners, it appears that the OTTV/RTTV standards are not regarded as stringent. Feedback from our workshops suggests that they are not difficult standards to meet and are not driving change in the design and construction of buildings. The awareness of building insulation/thermal transfer values constraints within the industry are low in general. Currently standards are set on a whole building level requiring application of a complex building energy model to test compliance.

This issue could be addressed by extending the scope of BEC to include building envelope components, or by enhancing the standalone OTTV/RTTV standards, so that it applies not only on a building level but also prescribes the thermal performance of the components like walls, windows, floors and roof.

The drawbacks of this prescriptive approach is that it may reduce overall flexibility in the building design, but the advantages are that all the key players – from architects to contractors – can benefit from a set of clear and easily understandable requirements. In the cities/countries studied, Japan and Singapore have adopted the performance-based approach while New York City, Sydney, and China have prescriptive standards for various building envelope components.

The alternative approach to adding prescriptive standards would be to tighten the current OTTV/RTTV values on a whole building basis.

Another challenge that arises in respect of standards, for instance window-to-wall ratios, relates to customer preference in favour of floor-to-ceiling windows. Our workshop participants suggest that in practice this design reduces functionality because of excessive light, discomfort from the heat or cold, and difficulties arranging furniture well. There were mixed views as to whether regulatory standards should require certain wall to window ratios.

Retrofits: Removing Thresholds

In terms of existing buildings, there is currently little incentive for existing building owners to undergo deep energy reduction retro-commissioning and retrofits. Even with financial incentive schemes in place, it may be that for some buildings (e.g. multi ownership residential buildings) occupiers/owners will not invest significantly in energy efficiency because of the split incentive issue. The Government could start by, for example, requiring action in relation to the energy management opportunities identified from the mandatory energy audits, or removing the threshold for “major retrofitting works” to mandate all renovation works to comply with the BEC.

A similar approach is done in New York City where Local Law (LL) 87 requires large buildings to carry out retro-commissioning together with energy audits, and LL 85 mandates alteration or renovation projects of all sizes to meet the latest Energy Conservation Code requirements, for the work contained within those projects.

Our workshop suggested that more radical measures may be needed on this front. One solution would be for the Building Energy Code to mandate improvement in energy performances of existing buildings. This is not a common practice in other cities/countries studied except in China, where the Standard for Energy Consumption of Building has set “required” and “recommended” energy performance values of buildings²⁶⁴.

Continued Review and Amendment of Building Regulations

In Hong Kong, there is currently a 3-yearly review of the Building Energy Code of which the latest revision was published in November 2018. We also acknowledge that the Buildings Department is conducting a review on OTTV/RTTV as at October 2018, but the detail and the scope of the reviews are not clear.

It is apparent that regular reviews should enhance the buildings energy efficiency standards. Another important aspect is to revise the regulations that may be barriers to

²⁶⁴ http://www.shaoyang.gov.cn/UploadFiles/file/20180212/20180212084829_2322.pdf

energy efficient buildings. For instance, from our discussions with industry experts and also mentioned in our 2017 Policy Submission²⁶⁵, the current calculation for GFA concessions of shading structures discourages property developers to incorporate such features in building design.

One possible way is to include this in the 3-yearly Building Energy Code review, but to look beyond the code itself and extend the scope to cover the wider set of building regulations and standards.

Inclusion of Minimum Appliance Standards

There are currently no minimum energy performance requirements for electrical appliances in Hong Kong, so it is still possible for consumers to purchase and use models that are relatively inefficient.

To increase the overall level of energy efficiency on the demand side, Hong Kong could consider setting minimum standards, like in the countries mentioned above, to remove the least energy efficient electrical appliance models from the market. The initial standards could include energy intensive appliances like air conditioners and refrigerators, and be expanded to cover a wider range of appliances at later stages.

4.6.4 Conclusions

Building standards are a fundamental part of the policy landscape in all the cities studied. It is difficult to compare the stringency of these standards and this is not covered by this report in any detail, other than to flag up that thermal transfer values appear to be lower than necessary for highly energy efficiency buildings. Considering the cost needed to retrofit the building envelope, improving the energy efficiency at the design and construction stages of buildings will be more cost-effective than substantial retrofits in the later stages of a building lifecycle. Further technical study would be useful to understand these standards further and how far they could be improved.

For existing buildings, Hong Kong's statutory standards for retrofits only apply to large scale projects. Lowering or even removing the threshold for retrofits can ensure that when building equipment are replaced, only the compliant energy-efficient models will be procured.

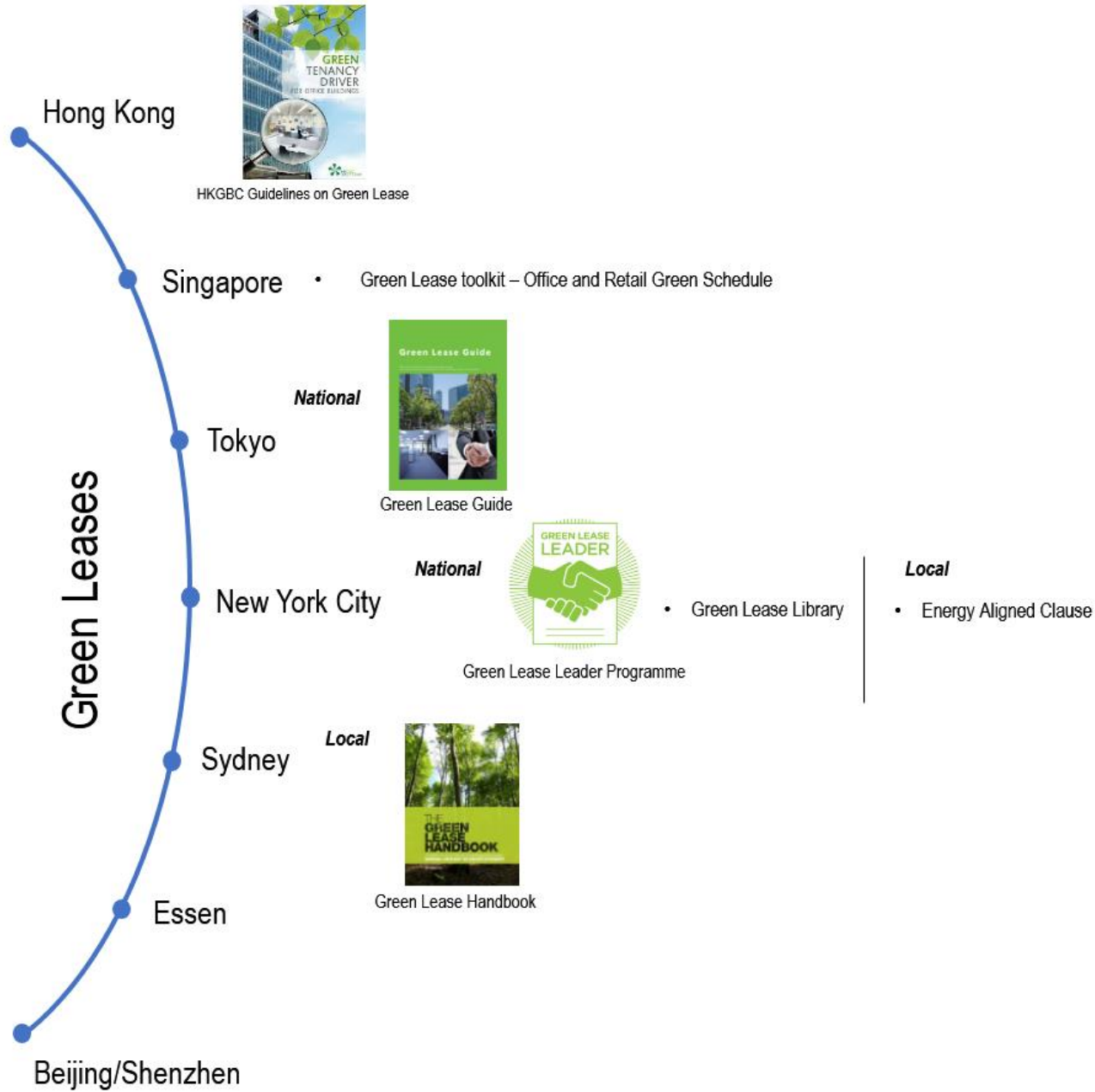
Other emerging points include:

- Extant regulations, such as in relation to shading, have a negative impact on energy efficiency. A NYC-type taskforce to review outdated regulations may help resolve this issue.
- As to appliance standards, Hong Kong, compared to some cities studied, has limited differentiation between models though for our purposes in this section, the absence of a minimum standard for appliances is noted.

Hong Kong is unusual in the separate responsibility for buildings envelope and technologies by different government departments, creating the possibility that neither of them takes full responsibility in improving the energy efficiency on a whole building basis.

²⁶⁵ https://bec.org.hk/files/images/BEC_Topical_Digest/Issue_28/Summary_Policy_Submission_2017.pdf

4.7 Green Leases



4.7.1 Importance of Green Leases

Addressing the Split Incentive Issue

A green lease is a lease agreement that incorporates green measures, or lease clauses that help achieve energy efficiency and other sustainability goals in a tenanted premise. These lease clauses set out how a premise is to be occupied, operated and managed in a sustainable way and are predominantly applicable to commercial buildings. It addresses the split incentive issue and the need for co-operation between landlords and tenants.

The introduction of these clauses into ordinary lease agreements can help with better building management. These clauses mostly pertain to the collection and sharing of sustainability information, the adoption of targets, management plans, sharing energy savings that arise from investment, and other aspects of facilitating building upgrades.

Addressing Risk and Uncertainty

Another contractual approach is known as an energy service contract. These contracts are generally between an energy consumer and a specialist in energy management. By contracting out the management of energy usage, a better assessment of risk can be conducted by an expert in energy management. Also, the risk is transferred to the expert through the contract.

Energy service contracts are often major, long-term projects and therefore require structured project management. If the proposed companies have little experience with such projects, they should initially be considered for less comprehensive projects or energy service contract models.

4.7.2 Common Policy Approaches and Other Significant Policies across Cities

Most cities have some provision of a set of voluntary green lease guidelines supported by organisations such as Singapore's Office and Retail Green Lease Schedules, and Hong Kong's Green Tenancy Driver for Office Buildings. Such measures are generally in the form of guidance and information. Amongst the seven cities reviewed, Sydney has the most notable green lease policies. However, there seems to be an absence of legally-binding policies to increase or govern the uptake of green leases.

Sydney

Over 60% of all leases²⁶⁶ in Sydney had best practice clauses²⁶⁷ (i.e. green clauses) by 2013, a marked increase of 15% from 2009. The Better Buildings Partnership (BBP), a collaboration launched by the Lord Mayor of Sydney in 2011, brings together leading private and public sector landlords to implement green leases.

The government takes a more proactive and binding approach. For government buildings, the Green Lease Schedule²⁶⁸ must be incorporated into a lease as outlined in the Energy Efficiency in Government Operations policy to which government operations are required to comply with²⁶⁹. The GLS serves a two-fold purpose²⁷⁰: 1) Impose legal obligations to achieve stipulated NABERS Energy (Office) ratings²⁷¹ by establishing

²⁶⁶ <http://cdn.sydneybetterbuildings.com.au/assets/2018/09/BBP-Leasing-Factsheet-v08.pdf>

²⁶⁷ <https://www.energy.gov.au/sites/g/files/net3411f/green-lease-schedule-guidance-notes-2010.pdf>

²⁶⁸ Summary of Green Lease Schedules available at the end of the chapter.

²⁶⁹ <https://www.energy.gov.au/government-priorities/energy-productivity-and-energy-efficiency/government-buildings>

²⁷⁰ <https://www.energy.gov.au/sites/g/files/net3411f/hvac-factsheet-green-leases.pdf>

²⁷¹ National Australian Built Environment Rating System (NABERS) is a national rating system that measures energy, water, indoor environment and waste of Australian buildings, tenancies and homes.

mechanisms for achieving energy efficiency objectives; and 2) provide a legally enforceable management framework to deal with issues relevant to achieving NABERS rating target, and actively prevent failure to achieve or maintain the achievement of specified NABERS rating targets (usually 4.5 stars).

The National Green Leasing Policy (NGLP) developed by the Australian government is the first nationally consistent approach to drive reduction in environmental impact of buildings. It also aids the successful implementation of GLS because the NGLP ensures maximum consistency across various Australian jurisdictions. In 2012, the government published an all-encompassing Green Lease Handbook for tenants and landlords in commercial office leases.

Singapore

Buildings pertaining to the commercial sector consume 38% of the total energy, 50% of which is contributed by the tenants²⁷². In 2014, the Building and Construction Authority (BCA) created a Green Lease Toolkit that aims at improving transparency and accountability through setting out environmental objectives on the management of the tenanted premise. The Toolkit sets out fully editable standard clauses²⁷³ to suit the particulars of the landlord and tenant.

BCA's own Green Mark Pearl Award (as mentioned in sections 3.1.3 and 4.3.2) takes green leases into account as one of the assessment criteria.

New York City

To tackle the split incentive problem, the New York City Mayor's Office convened a working group that specifically aimed at addressing the concerns of landlords and tenants in terms of energy efficiency retrofits – landlords preferred predictable energy savings for the sake of certainty, while tenants were concerned about bearing extra costs in case of underperformance²⁷⁴.

The end-result of the working group was the Energy Aligned Clause²⁷⁵, a set of clauses that would benefit both parties from energy savings, by relying on predicted energy savings by a professional energy specialist, and an expense pass-through to protect tenants if the retrofit underperforms.

4.7.3 Main Gaps and Possible Enhancements for Hong Kong

The split incentive issue (as explained in section 2.9) is one of the major barriers to energy efficiency improvement, regardless of jurisdictions.

In Hong Kong, landlords have little incentive to invest in energy efficiency upgrades within tenanted premises as the resulting energy savings would only benefit the tenant. This problem is exacerbated by the usual office lease term being 3 years, typically shorter than the payback periods of major energy efficiency retrofits, combined with reinstatement clauses. As a result, it is also not in the interest of tenants to invest in improvements to their premises.

²⁷² <https://www.straitstimes.com/singapore/environment/new-green-lease-guide-launched-for-commercial-landlords-and-tenants>

²⁷³ <https://www.bca.gov.sg/Sustain/sustain.html>

²⁷⁴ http://www.nyc.gov/html/gbee/downloads/pdf/eac_presentation.pdf

²⁷⁵ http://www.nyc.gov/html/gbee/downloads/pdf/eac_overview.pdf

As tenants typically pay²⁷⁶ landlords in buildings with centralised systems a fixed fee for water, centralised air conditioning and operational costs of shared areas, they are not incentivised to alter their own consumption behaviour. As for older buildings with split-type air conditioners, this is less of an issue, but the short tenancies would still hinder investment in more expensive air conditioner models that are energy-efficient.

Currently, there are almost no measures aimed at dealing with the split incentive or short tenancy problem, except for HKGBC's Green Tenancy Driver for Office Buildings²⁷⁷, a set of voluntary guidelines to encourage landlord-tenant collaboration on energy consumption reduction. The statutory Building Energy Code (BEC) regulated by EMSD is probably the most important measure. However this mainly impacts new buildings and has some limitations as discussed in the previous section.

The incentive structure can be reconfigured by changing lease terms and encouraging green leases. Our research to date suggests that without a push in this direction, landlords will be reluctant to address this because of: a) reluctance to change standard lease conditions which property portfolio managers are familiar with; b) uncertainty for tenants regarding running costs, as they may prefer certainty rather than paying for actual usage; c) costs of sub-metering and metering energy usage for cooling.

Possible enhancements to the policy framework include:

Simplify Guidance and Provide Training on Green Leases

This can be done starting with a review of the green lease clauses used in cities like Sydney and New York, identifying and explaining individual clauses which can be inserted into agreements, focusing not only on sustainability managers but also on commercial teams dealing with contracts and lawyers.

Capacity building and discussion sessions involving key stakeholders – e.g. landlords, tenants, lawyers, ESCOs – that will be able to identify and address issues specifically relevant to the Hong Kong property market.

Trialling and Exemplifying

Trial green leases in government owned or leased buildings and provide lessons learnt during the process, detailed case studies, and analysis of impact. For example the “pay-per-use” air conditioning at the Hong Kong Science and Technology Park, or the NYC Energy Aligned Clause type model could be actively promoted.

Incentivising Landlord-tenant Collaboration

This may include a multitude of government-initiated schemes, such as:

- Providing financial incentives for longer tenancy terms without reinstatement clauses.
- Require performance-related reporting of energy usage in tenanted parts of buildings (see section 4.3 for more details) which may encourage the use of green leases. The installation of smart meters and sub-meters will be needed to enable a better collection of data for reporting and analytics.

²⁷⁶ However, when tenant sub-metering is available, landlords may bill tenants according to the actual power consumed. An example is Hong Kong Science and Technology Park's “pay-per-use” air conditioning for its tenants, see https://loop.wwf.org.hk/user_files/file/2015%20Activity/20150519_Seminar/04%20HKSTPC-MorrisChan_HKSTP-Phase3.pdf

²⁷⁷ <https://www.hkgbc.org.hk/eng/got.aspx>

- Using award schemes to reward landlords who take measures to reduce energy usage by involving and collaborating with tenants.
- Support and take up part of the risks of ESCOs/energy specialists through loan guarantees, unless the risks are linked with bad business decisions, as well as partnership models to advertise or encourage their usage.

4.7.4 Conclusions

The high uptake of green leases in Sydney suggests that a proactive government enacting strong governmental policies is essential. Academics opined that it may be particularly useful in places like Singapore and Tokyo, where strong governments coincide with highly concentrated commercial property activities²⁷⁸. This provides yet another opportunity for the Government to reflect on their necessity and stance in promoting green lease that will likely alleviate the split incentive issue and in the long run, reduce adverse effects to the environment.

²⁷⁸ <https://www.tandfonline.com/doi/pdf/10.1080/09613218.2016.1142811> p. 670

5. Drivers and Enablers

The research question we have asked ourselves for this section is: what are the relevant drivers and enablers that have led to effective energy efficiency policy frameworks being put in place in other cities?

Rather than analysing the explicit impact of these drivers, which is not possible without more detailed research, we highlight some factors in this chapter that emerge to be influential. These drivers and enablers were discussed in our workshops and broadly agreed by the participants.

5.1 Identified Energy Efficiency Drivers

With reference to the IEA's Energy Efficiency Governance report, our city analyses (see Chapter 3) and other engagement activities with experts and stakeholders such as workshops and interviews, we have identified and grouped various drivers that induce implementation of energy efficiency policies below.

5.1.1 International and National Level Policies

For example, China's climate change policies including the Emissions Trading Scheme appears to have led to action at a city level. The Chinese Central Government also provides subsidies for buildings to be constructed to higher energy efficiency standards, addressing to some extent the upfront capital cost issue. The Paris Agreement and the respective Intended Nationally Determined Contributions (INDCs) are also one of the overarching drivers.

5.1.2 Climate Change Leadership

It appears soft reputational benefits are significant drivers for cities as well as for businesses. This relates back to the "branding" of a city. We learned for example that Shenzhen's local government, especially under the previous mayor but also under the current leadership, has shown significant leadership in developing Shenzhen as a green and low carbon city. Essen, which went through a process of re-creation, had taken pride in being the green capital of Europe. New York City also strives to be a national and international leader in climate change, for example being the first major US city to divest pension funds from fossil fuels.

The C40 Cities Climate Leadership Group is another notable example of cities trying to showcase and collaborate on climate change actions.

5.1.3 Public Health

Cities seem to be increasingly driven not just by public interest in healthier cities – primarily air quality – but also bidding to attract talent by offering a healthy, liveable environment. This comes across as a particular driver in Shenzhen with its innovative, high-tech sector attracting people from across China who are willing to pay for higher standards in terms of lifestyle and comfort, although not necessarily for air quality alone.

5.1.4 Economic Development and Competitiveness

It appears that this has been a driver in Germany with a recognition that energy must be

used more economically and efficiently²⁷⁹.

Singapore also stands out in an export-led perspective in terms of skills and knowledge on green buildings. This is shown in its efforts to skill up the workforce and gain international recognition for its efforts. The 2nd Green Building Masterplan puts emphasis on R&D and Singapore as an international leader in Green Building capability.

5.1.5 Energy Security

The pursuit of energy security is inevitably linked to energy reliability (e.g. chances of intermittency, dependence on imported resources). Enhancing energy efficiency reduces energy consumption, which in turn reduces the demand for energy sources, while maintaining the same amounts of output. Renewable energy is another important aspect as to improving energy security, but falls out of the scope of this study and will not be discussed in detail here.

The 1973 Oil Crisis and the 2011 Fukushima disaster was a major driver in Japan as the threat to the nation's energy security became real, drawing attention to what can be done in terms of energy savings to reduce reliance on imported energy sources.

5.2 Enabling Features – Good Energy Efficiency Policy-making

In examining the policy frameworks of our selected cities and our desk study, three main themes emerged as enablers of effective energy efficiency policy-making²⁸⁰ as follows:

5.2.1 Institutional Capacity for Long-term Planning

- **Institutions with responsibility for long-term policy-making on climate change and broader issues:** setting long term targets using modelling approaches, data, in the face of uncertainty.
- **Skills in the use of evidence/analytical capacity:** using evidence, data, and projections in policy-making.
- **Policy evaluation:** post-hoc collection of data and reviews of progress.

We have highlighted these components, which may be at a city or a national level, as most significant for the reasons we explain below.

In China, where it appears that good progress is being made on the policy front, strengths appear to be a history of long term planning with the support of a number of institutions. These institutions include the National Development and Reform Commission (NDRC)²⁸¹, the remit of which includes sustainable development, and an established practice of long term economic planning. This appears to have facilitated decision-making, which allows planning to bear for higher upfront costs in return for longer term health and climate change benefits.

Similarly, Singapore's Green Buildings Masterplans often receive recognition for being one of the best in the world. Its Civil Service College programmes²⁸² appear to place considerable weight on data analytics and other skills that underpin policy analysis and evaluation.

Using data and analysis well to make decisions that may involve trade-offs is potentially

²⁷⁹ <http://www.bpb.de/politik/wirtschaft/energiepolitik/153722/energiewende>

²⁸⁰ Perspectives of the Energy Transition, IEA (2017) p.114

²⁸¹ <http://en.ndrc.gov.cn/mfndrc/>

²⁸² <https://www.cscollege.gov.sg/Programmes/Pages/Default.aspx>

critical in terms of climate change. For example, higher building standards may raise housing prices. One way to enable action and avoid deadlock because of competing interests is to go through holistic analyses to weigh up the relative costs increases against longer term benefits, and identify if adjustment measures are necessary.

5.2.2 Inter-departmental Coordination

This includes:

- Approaches that allow for decisions as to trade-offs between goals and to look at impacts across the board, for instance, if the poor are affected by prospective environmental policies, the proponent can work with finance departments to compensate; if health and safety may be affected, the relevant departments can work collaboratively on solutions that can address the problem.
- Capacity to implement in a holistic way, so that when one department makes a decision, it cannot be offset by actions or policies implemented by another department.
- Clear responsibility on the part of individual departments. Co-ordination also requires a clear allocation of responsibilities.

This aspect of a system which some refer to as horizontal co-ordination²⁸³ was flagged up in many of our workshops and discussions, and is also highlighted in the IEA Energy Efficiency Governance Handbook²⁸⁴ as a key part of good governance. One example given in Hong Kong where improvement is possible, is the relationship between the Buildings Department (BD) with its remit centred on safety, the Electrical and Mechanical Services Department (EMSD) with its focus on energy efficiency, and the Environment Bureau (ENB) with a remit which includes climate change. BD's focus on other goals may have led to building envelope standards requiring lower levels of insulation and energy efficiency than what is optimal.

There appear to be two ways utilised by cities to address this issue: either a structure to enable co-ordinated and aligned approaches, or establishing a single unit that takes responsibility for energy savings across the board.

For example in Singapore, the Building and Construction Authority has a set of objectives which are about safety, quality, sustainability and friendliness in its goals. The Green Building Masterplan provides a vehicle for bringing these goals together. Hong Kong has also established a Steering Committee on Climate Change since 2016 – however the progress and work of the Committee has not been made public. Regular reporting and KPIs by each bureau/department may enable us to tell whether a co-ordinated system has been operationalised. The misaligned goals aforementioned between BD/EMSD/ENB on buildings energy efficiency could be one of the issues for the Committee to look into.

Systems of engagement: networks and partnerships

- Proper channels to involve and develop policies with relevant stakeholders in early stages of policy making to de-myth and explain misconceptions, as

²⁸³ Cities and Climate Change: The role of institutions, governance and urban planning
https://www.researchgate.net/publication/254888120_Cities_and_Climate_Change_The_role_of_institutions_governance_and_urban_planning

²⁸⁴ https://www.iea.org/publications/freepublications/publication/gov_handbook.pdf

- well as to enhance acceptability.
- However, it is also important to note that without a focus on consensus in the decision-making process may lead to stagnation.

Our hypothesis for further consideration is that forums and platforms for informed dialogue and partnerships with stakeholders is critical for effective action. But at the same time, an approach that seeks consensus can be problematic.

This relates back to the first enabler (5.2.1 Institutional Capacity for Long Term Planning) that analytical capacity to make decisions based on evidence and to addressing trade-offs, might be a way of achieving consensus despite competing interests.

As an example, Tokyo, before its implementation of the Cap and Trade Programme, has initiated five stages of stakeholder engagement from drafting to implementation, and organised issue-oriented discussion and negotiations with the focused industry groups²⁸⁵.

Our researcher from ICF also identified that Shenzhen, in recent years, has been able to develop a policy framework and development environment where higher upfront costs are borne with longer term health and climate change benefits. This is facilitated not only by political will from local government leadership, but also by an institutional structure whereby business lobbies and developers have a role to play, but do not have the capacity to hugely shift government policy priorities.

²⁸⁵ <https://www.tandfonline.com/doi/abs/10.1080/09613218.2011.596419>

6. Conclusions

6.1 Effective Implementation of the Policy Recommendations

In the previous chapters, we have placed our focus on public policies and the role of governments on buildings energy efficiency.

While public bodies are an integral part of the discussion, other key stakeholders in the private sector – from property owners/users to the finance sector – also have crucial roles to play in terms of enabling a smooth and effective implementation of public policies.

To set out a clearer picture of this process, we have related the key roles of different stakeholders to the policy recommendations under each of the seven categories set out in the report, and summarised corresponding actions that can be done in the table below.

Proposed Enhancement in the Policy Framework	Property Owners	Property/ Facility Managers	Tenants	Construction Companies, Architects & Designers	Finance Sector
1. Information and Education Provision					
Strengthening/ Rescaling energy labels for electrical appliances	Understand and be aware of the energy labels, set internal guidelines to procure only the most energy efficient electrical appliance				
One-stop-shop government website	Utilise the easily accessible information (e.g. regulations, energy efficiency information and guidelines) on the one-stop-shop website, and share industry best practices and lessons learnt at online platforms				
2. Government Leadership: Own Operation and Target Setting					
Long-term vision and specific supplementary targets	Support the Government's long-term and specific targets, and align business strategies and operations with the targets			Communicate the targets to project proponents and develop building designs that are aligned with such targets	Finance projects that align with or will contribute to such targets
Enhance and leverage leadership from government buildings	Leverage case studies and lessons learnt from energy reduction measures/strategies in public buildings, which can be referenced by private commercial and residential buildings				
Enhancing public procurement requirements	Reference and adopt environmental aspects and assessment criteria of the public procurement list where applicable				

Proposed Enhancement in the Policy Framework	Property Owners	Property/ Facility Managers	Tenants	Construction Companies, Architects & Designers	Finance Sector
3. Non-financial Incentives					
Transparency and buildings-level data	<p>Collect and disclose energy consumption and/or intensity data at the building and unit levels</p> <p>Privacy issues will need to be addressed, so disclosure can be done in an aggregated or anonymised way as a first step</p> <p>Understand the relative energy performances of their buildings or premises from the benchmarks, and build business cases to improve energy efficiency</p> <p>Energy efficient premises, associated with a lower electricity tariff or a lower rent, could be attractive to tenants</p>			Use the benchmarks as design guidelines or targets for the overall energy efficiency of new buildings	Energy efficiency benchmarks can be a key environmental performance indicator of companies to investors, and assist investors in making informed decisions
Performance-based green building rating system	Apply for rating schemes dedicated for landlords or whole buildings		Apply for rating schemes dedicated for tenanted areas	Take into account operational energy efficiency when designing buildings	Rating systems provide a standardised assessment of buildings energy efficiency
4. Financial Incentives					
Performance-related awards for buildings	(If applicable as one of the criteria of the award) Maintain the level of energy efficiency of the building during its operational phase			Design the energy efficiency of new buildings according to the targeted level of GFA concession	
Increase diversity and coverage of financial support	Assess the energy performance of the building (e.g. through energy audits), identify the opportunities for improvement, and apply for the financial support schemes				
Carbon pricing and electricity tariffs	Properly factor in the external cost of carbon from various sources, which will help improve business decision making				The payback period for energy efficiency upgrades will be shortened, which may be more attractive to investors

Proposed Enhancement in the Policy Framework	Property Owners	Property/Facility Managers	Tenants	Construction Companies, Architects & Designers	Finance Sector
5. Green Finance					
High standards for green bonds and green loans	<p>Project proponents have to disclose the energy efficiency improvement of the projects funded by green bonds and green loans, and be rated according to the standards</p> <p>Project with high standards (better ratings) may be able to attract more investors or be eligible for higher rewards in an incentive structure</p>			<p>These standards will provide more insights as to the “greenness” of the bonds and loans</p>	
Green investment bank	Easier access to energy efficiency financing, especially for SMEs who may face difficulties in addressing the upfront capital costs			Help de-risk energy efficiency investment	
Loans/mortgage discounts	Apply for the low interest loans/mortgages to carry out energy efficiency improvements			Provide discounted interest rates for energy efficiency improvement projects to incentivise actions on this front	
6. Buildings/Appliance Standards					
Enhance coverage and strength of building standards	Enjoy reduced energy consumption and costs due to improved building designs in terms of energy efficiency for new buildings			Build and design buildings in compliance with, or exceed, the new codes and regulations	
Remove threshold for retrofits	Carry out energy efficiency retrofits according to the code (e.g. when old building equipment/systems need to be replaced)				
Continue the review and amendment of building regulations	Provide expert opinion and industry experience to facilitate the Government’s review process				
Include minimum appliance standards	End-users will not be able to purchase the least energy efficient electrical appliance models on the market				

Proposed Enhancement in the Policy Framework	Property Owners	Property/ Facility Managers	Tenants	Construction Companies, Architects & Designers	Finance Sector
7. Green Leases / Energy Service Companies (ESCOs)					
Simplify guidance and provide training	Trial and adopt green leases with tenants, and improve buildings energy efficiency through ESCOs if suitable		Liaise with landlords to agree on green lease terms		
Trialling and exemplifying	Experiment innovative landlord-tenant collaborations to improve energy efficiency, analyse their impacts, share knowledge and lessons learnt with the sector				
Incentivise landlord-tenant collaboration	Apply for such incentive schemes (e.g. tax concession and initiate the process of landlord-tenant collaboration				

6.2 Suggested Directions for Future Studies

Residential Buildings

Enhancing buildings energy efficiency is a long-term development goal that requires continuous effort towards research and development, policy making and negotiation, and changes in end-user behaviours. Commercial buildings generally have a larger potential for energy efficiency enhancements given its centralised ownership and building systems (e.g. air-conditioning, lighting, and building management systems). Facility and property managers can implement energy saving initiatives relatively easily. However, in the case of residential buildings, issues arise – for example from reaching agreement under multiple ownerships or with Owner’s Corporations – complicate the process of data collection and further energy consumption reduction initiatives. We suggest further research and engagement on this front to identify relevant energy efficiency enhancement strategies and related policy implementation, particularly during the design and operational phases of residential buildings.

Non-electrical Energy Consumption in Buildings

This study primarily focuses on the use of electricity in buildings, given that in 2016 the emissions from electricity consumption outweighed the emissions from towngas²⁸⁶ by a factor of 22 and 7 for the commercial and residential sectors respectively. Considering Towngas and liquefied petroleum gas (LPG) accounted for 12% and 30% of the total energy consumption of the commercial and residential sectors respectively in 2016 (see Figure 3 below), we suggest further studies on reducing the consumption of non-electrical energy sources in buildings, for example, using high efficiency gas appliances²⁸⁷.

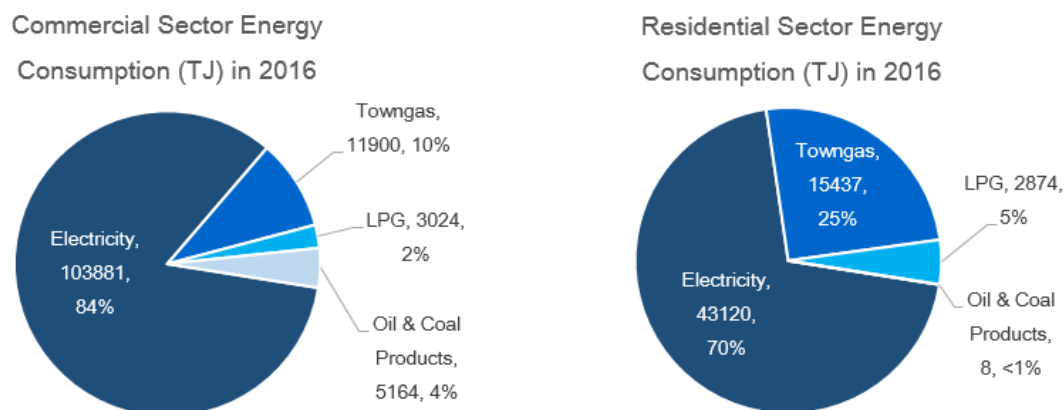


Figure 3. Energy Consumption of Commercial and Residential Sectors in 2016²⁸⁸

²⁸⁶ Including emissions from the production and consumption of Towngas

²⁸⁷ http://bec.org.hk/resource-centre/eerguide_nonmodelled#24

²⁸⁸ Data from EMSD Energy End-use Data 2018 and Hong Kong Energy Statistics 2017

Acknowledgements

This project, *Investing in Buildings Energy Efficiency: How to Enhance Hong Kong's Policy Framework*, is the work of BEC's Policy & Research team and supported by the Energy Advisory Group.

BEC would like to thank Konrad-Adenauer-Stiftung for the generous funding, ICF International Consulting (Beijing) Company Limited for the city research of Beijing and Shenzhen, workshop participants, as well as other contributors that had greatly helped with the content and development of this research paper.

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Mr Andrew Wells	Lai Sun Development Company Limited
Ir Calvin Tang	Schneider Electric (Hong Kong) Limited
Mr Ricky Liu	Siemens Limited
Ms Joey Lau	Swire Pacific Limited
Dr Raymond Yau	Swire Properties Limited
Mr Victor Kwong	The Hong Kong & China Gas Company Limited
Mr Warren Wu	The Hongkong Electric Company Limited

Ordinary Members

Mr Sébastien Pivet	A. S. Watson Retail (HK) Limited
Mr Phil Healey	Active Energy Management Limited
Mr Freeman Cheung	AECOM Asia Company Limited
Mr Calvin Yip	CEDS Limited
Mr Patrick Loo	Charter Queen Limited
Mr Chris Lau	China Harbour Engineering Company Limited
Ir Priscilla Wong	Chinachem Agencies Limited
Mr Ernest Ip	CN Innovations Solar Holdings Limited
Mr Jonathan Yau	Cundall Hong Kong Limited
Ms Li Fan	EBP Hong Kong Limited
Mr Tyler Holland	En-trak Hong Kong Limited
Mr Victor Seeto	ExxonMobil Hong Kong Limited
Mr James J. Chang	Geb Impact Technology Company Limited
Mr Y.W. Tsang	Hongkong International Terminals Limited
Mr Ryan Lee	Hongkong Land Limited
Ms Juanna Yin	Jinchat Engineering (HK) Company Limited
Mr Dicken Poon	Leigh & Orange Limited
Ms Mei Ling Lew	Mayer Brown JSM
Mr Simeon Cheng	MTR Corporation Limited

Mr Simon Shum	Netsphere Solution Limited
Dr Vincent Cheng	Ove Arup & Partners Hong Kong Limited
Ir Chris Ting	PCCW Limited
Mr David Hu	SGS Hong Kong Limited
Mr Gary Chan	Sino Land Company Limited
Mr August Tiu	The Baroque on Lamma Ltd
Mr Jonathan Lam	TUV Rheinland Hong Kong Limited
Ir Chris Chong	Veolia Environmental Services China Limited
Ms Martha Hao	Wise Ally Holdings Limited
Ms Carmen Wong	Yau Lee Holdings Limited

Workshop Participants (company name arranged in alphabetical order)

Workshop 1 (23 April 2018)

AECOM Asia Company Limited
 Airport Authority Hong Kong
 BASF East Asia Regional Headquarters Limited
 CLP Power Hong Kong Limited
 CN Innovations Solar Holdings Limited
 Cundall Hong Kong Limited
 EBP Hong Kong Limited
 Friends of the Earth (HK) Charity Limited
 Gammon Construction Limited
 Hong Kong Productivity Council
 Hong Kong Science and Technology Park Corporation
 Intertek Testing Services Hong Kong Limited
 Jinchat Engineering (HK) Company Limited
 Konrad-Adenauer-Stiftung
 Schneider Electric (Hong Kong) Limited
 Siemens Limited
 Swire Properties Limited
 Technological and Higher Education Institute of Hong Kong
 The Hongkong & Shanghai Banking Corporation Limited
 The Hongkong Electric Company Limited
 Toshiba International Procurement Hong Kong, Limited
 Wise Ally Holdings Limited
 World Wide Fund for Nature Hong Kong

Workshop 2 (11 June 2018)

Carbon Care Asia Limited
 CLP Power Hong Kong Limited
 Gammon Construction Limited
 CLP Power Hong Kong Limited

CN Innovations Solar Holdings Limited
Cundall Hong Kong Limited
EBP Hong Kong Limited
Friends of the Earth (HK) Charity Limited
Gammon Construction Limited
Hongkong Land Limited
ICF International Consulting (Beijing) Company Limited
Konrad-Adenauer-Stiftung
The Hong Kong University of Science and Technology
The University of Hong Kong
TSE Foundation
World Wide Fund for Nature Hong Kong

Workshop 3 (16 July 2018)

Active Energy Management Limited
BASF East Asia Regional Headquarters Limited
Blue Sky Energy Technology Limited
Carbon Care Asia Limited
Chinachem Agencies Limited
CLP Power Hong Kong Limited
En-trak Hong Kong Limited
Gammon Construction Limited
Hongkong Land Limited
Jinchat Engineering (HK) Company Limited
Konrad-Adenauer-Stiftung
Schneider Electric (Hong Kong) Limited
Sun Hung Kai Properties Limited
The Hong Kong & China Gas Company Limited
The Hongkong Electric Company Limited
The Hong Kong University of Science and Technology
World Wide Fund for Nature Hong Kong
Yau Lee Holdings Limited

BEC Staff

Mr Simon Ng	Director – Policy & Research
Ms Maya de Souza	(previously) Assistant Director – Policy & Research
Mr Jonathan Ho	Assistant Manager – Policy & Research
Mr Wayne Wong	Senior Officer – Policy & Research
Mr Peter Chow	Intern
Ms Sophie Emmett	Intern
Ms Violet Law	Intern
Ms Shaneika Lee	Volunteer

Annex A: City Studies Template

1. Information and Education Provision

Information, education or targeted capacity building schemes for building owners, tenants, professionals or the general public related to buildings energy efficiency (e.g. training courses, online resources on energy saving measures knowledge sharing platforms, centralised information databases on building energy consumption).

This includes free or subsidised energy audits and advisory services, smart metering, and energy efficiency benchmarks. Energy performance labels or information for electrical appliances should also be included. Please note if the policy stipulates that poorly performing products are *banned from selling or are required improve their energy efficiency*, it should be categorised under “6. Buildings/Appliance Standards”. Information that provides *competitive advantages* should be categorised under “3. Non-financial Incentives”.

This category also acknowledges subsidy schemes for research and development projects, and public educational initiatives such as school programs and demonstration areas/projects to showcase efforts on buildings energy efficiency innovations.

2. Government Leadership

Government initiatives to demonstrate leadership (e.g. energy consumption reduction targets, retrofitting existing buildings, energy-efficient city planning etc.) in buildings energy efficiency of government owned or operated buildings.

This also includes public procurement, for example minimum/mandatory energy performance standards for government-owned buildings that are built/leased, and/or electrical appliances used in government departments.

Government-set city/state/nation-wide greenhouse gas and energy consumption reduction targets are included here.

3. Non-financial Incentives

Incentives that encourage improvements in buildings energy efficiency without direct or indirect provisions of cost subsidies (e.g. competition/award schemes, certification schemes for green buildings or energy efficiency, or voluntary charters made public).

This also includes mandatory disclosure of building energy consumption and publicly accessible databases that contain the energy performance (transparent or semi-transparent with anonymised data), of different buildings.

Please also include industry-led programmes here like “voluntary agreements” or government supported pledges and charters.

4. Financial Incentives

Incentives that directly encourage buildings energy efficiency improvements through reducing relative costs (e.g. tax concessions, grants, free or discounted appliances, gross floor area bonus and subsidy schemes).

Carbon pricing policies that indirectly support investment and/or behavioural

changes such as emission trading schemes, cap-and-trade programs and taxes/levies are also included here.

5. Green Finance

Policy measures that directly or indirectly support the finance sector to fund investment in building energy efficient buildings or carrying out retrofits, or improved infrastructure.

This may be done through government-led or industry-led support for green bond issuances, support for responsible investment, Green Investment Banks, low interest loan schemes.

6. Buildings/Appliance Standards

Government-mandated standards related to buildings energy efficiency (e.g. building energy codes, mandatory energy audits/retrofits) in sets out requirements for a specific type of buildings (commercial, residential etc.) or to all.

Please note that buildings standards specifically dedicated to government buildings are categorised under “2. Government Leadership”, and voluntary building standards are categorised under “3. Non-financial Incentives”.

This also includes minimum energy performance standards for electrical appliances. Here, we stress on standards that limits sales of products: appliances that do not meet the requirements will be abandon from sale in the market.

7. Green Leases

Government or industry-led support schemes for promoting, encouraging or incentivising the use of green leases. This may include guidelines on setting up green leases, best practice or case study sharing, and support for tenant-landlord collaborations such as the involvement of energy service companies (ESCOs) or energy specialists to carry out retrofitting.