Proceedings of the International Workshop on Best Practice of Climate Change Action Plan of C40 Cities in East Asia

December 2013

THE WORLD BANK

Australian Aid

CENTRE for LiveableCities SINGAPORE

C40 CITIES CLIMATE LEADERSHIP GROUP

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Forward by the World Bank

Cities, accounting for 70 percent of global greenhouse gas emissions, are at the forefront of action to combat climate change. What cities do individually and in unison can set the agenda for a low-carbon future. In particular, large Asian cities are experiencing rapid urbanization. The speed and scale of urbanization in East Asia provides an unprecedented opportunity to build new efficient and low-carbon urban infrastructure today, which would lock cities into a low-carbon growth path for decades to come.

Building large low-carbon resilient cities is a top priority for the World Bank Group. In 2011, the World Bank signed a memorandum of understanding with the C40 Cities Climate Leadership Group—a network of the world's megacities committed to implementing meaningful and sustainable climate-related actions—to accelerate climate change actions. This collaboration has been further strengthened through the AusAID funded project to apply best practice of climate change action planning of C40 cities to East Asian cities.

As part of this project, the workshop on City-scale Climate Action Planning in East and Southeast Asia was held on April 10-12, 2013, jointly organized by the World Bank, C40 Cities, and Singapore's Centre for Liveable Cities. Participants gathered in Singapore to share knowledge and experience on key challenges and successes related to implementing climate action plans, including five Bank-client cities in the East-Asia and Pacific (EAP) region that are also C40 member cities (Bangkok, Beijing, Ho Chi Minh City, Jakarta, and Shanghai), selected best practice C40 member cities (London, Melbourne, Singapore, Stockholm, and Tokyo), and other government agencies and institutes.

Containing urban emission growth requires an integrated multi-sector approach, particularly compact urban design, green mobility, and clean energy. Effective implementation of this framework requires all sectors and agencies to work together, along with a measuring, reporting, and tracking of city-level greenhouse gas emissions. Thus, the agenda of the workshop was structured to reflect the cross-cutting nature of the subject.

The workshop could not have been more timely. By bringing city policy makers and practitioners together, it provided a platform for cities to learn from each other and explore and implement most suitable approaches to mitigate greenhouse gas emissions in their own city. The workshop facilitated not only North-South, but also South-South exchanges of knowledge and experience on implementing low-carbon action plans at the city-level. This rich experience and the lessons learned on designing and implementing low-carbon action plans in the participating C40 cities are documented in these proceedings.

Going forward, we must take advantage of the knowledge gathered here, to spur us to undertake more actions and to get to implementation on the ground. It is our hope that this report will benefit cities around the world in their quest for a low-carbon development path.

John Roome
Director
Sustainable Development Department
East Asia and Pacific Region
The World Bank

Forward by Centre for Liveable Cities

Cities are at the front line of one of the most pressing issues we now face – climate change. At the same time, cities are very vulnerable to the devastating impacts of climate change, such as rising sea levels and more extreme weather events. As a small, low-lying city-state, Singapore too is very much exposed to the adverse impacts of climate change. With more and more people moving into cities every day, efforts to curb emissions at the city level will only grow in importance.

Before the term 'sustainable development' captured global attention, Singapore had already embarked on a sustainable path towards planning and developing our city-state since independence in 1965, even though our pioneering leaders did not call it as such. It was simply the logical thing to do to survive as a new, small country with a fast growing population but limited hinterland and almost no natural resources. In Singapore, planning ahead for the long term as well as integrated master planning and development are not just buzz words, but ingrained in our way of doing things. For example, land use and transport planning are integrated in both the strategic concept plan and shorter term master plan to optimise provision of infrastructure and services, and reduce commuting distances.

The solutions have to come from the cities themselves. Knowledge does not diminish, but grows, in the sharing of it. By pooling together our knowledge, we can find more effective solutions faster.

As part of Singapore's Ministry of National Development, the Centre for Liveable Cities (CLC) was established in 2008 with the mission to distil, create and share knowledge on liveable and sustainable cities. Drawing on Singapore's experience, we have developed the CLC Framework for Liveable and Sustainable Cities which offers a practical framework to developing high-density high-liveability cities. CLC also plays an active part in the international dialogue on liveable and sustainable cities, often bringing together the expertise of Singapore government agencies.

One good example is the City-scale Climate Action Planning workshop which we co-organised with the World Bank and C40 in Singapore in April 2013. The workshop brought together more than 40 participants to share a wide range of challenges and experiences from cities such as Bangkok, Beijing, Ho Chi Minh City, Jakarta, London, Melbourne, Shanghai, Singapore, Stockholm and Tokyo. CLC together with Singapore agencies – National Climate Change Secretariat (NCCS) and Land Transport Authority (LTA) – shared about Singapore's approach and experiences in urban planning, transport policies and institutional arrangements to address climate change. The workshop generated lively discussions on how the approaches and policies from one city could be adapted by another.

Cities can show the way towards a sustainable and liveable urban future. It is in our hope that this publication which captures the learning points of the workshop to support climate action, will be of value to a wider audience.

Khoo Teng Chye
Executive Director
Centre for Liveable Cities
Singapore

Acknowledgements

This report presents the proceedings of the International Workshop on Best Practice of Climate Change Action Planning of C40 Cities in East Asia, which was held in Singapore on April 10-12, 2013. The workshop was sponsored by the World Bank, with funding support from the Australian government. Co-organizers were the World Bank, in partnership with C40 Cities and the Centre for Liveable Cities (CLC) in Singapore.

From the World Bank, the study on Applying Best Practice of Climate Change Action Plans of C40 Cities to East Asian Cities' Quest for Low-Carbon Metropolitans, under which the workshop was held, was undertaken by a team led by Xiaodong Wang and comprising of Marcus Lee, Mansha Chen, Jeanette Lim, and Yun Wu. The organization team also included Pete Erickson from Stockholm Environmental Institute (SEI). The team received significant contributions from colleagues based in the field offices to engage the participants from East Asian C40 cities: Dan Xie in Beijing, Linh X. Le and Madhu Raghunath in Hanoi, Chanin Manopiwes and Pajnapa Peamsilpakulchorn in Bangkok, and Arlan Rahman and A. Yolina Kurniawati in Jakarta. The East Asian management team provided guidance and support: John Roome, Bert Hofman, Charles Feinstein, Abhas Jha, Vijay Jagannathan, Mark Lundell, Julia Fraser, Jennifer Sara, Franz Drees-Gross, and George Soraya.

From Singapore, we would like to thank CLC for its generous support in hosting the workshop and its assistance in bringing on board speakers from Singapore government agencies, who effectively shared their experiences in policy implementation. In particular, Jean Chia and Lau Ying Shan from CLC provided valuable inputs on the agenda and were impeccable in organizing and executing the workshop. We would also like to express appreciation to the Singapore Environment Institute, which co-sponsored the site visits to the TreeLodge@ Punggol public housing development estate and the Land Transport Authority of Singapore's Land Transport Gallery.

From C40 Cities Group, we would like to acknowledge Amanda Eichel, Seth Schultz and Amanda Ikert who provided strategic advice for the planning of the workshop and mobilized the extensive C40 network to bring in speakers from C40 cities. The meeting also benefited from the active participation of Yan Peng.
These proceedings were prepared by Pete Erickson, Xiaodong Wang, Yun Wu, Marcus Lee, and Jeanette Lim. Anna van der Heijden edited the report. Special thanks are also due to Dan Xie for coordinating the publication of this document.
Finally, the team wishes to acknowledge the generous support from the Australian government through the AusAID grant.

Abbreviations

AusAID	Australian Agency for International Development
BAU	Business as usual
BMA	Bangkok Metropolitan Administration
C40 Cities	C40 Cities Climate Leadership Group
CBEEX	China Beijing Environmental Exchange
CDM	Clean Development Mechanism
CER	Certified Emission Reductions
CHP	Combined Heat and Power
CLC	Centre for Liveable Cities
CNEEEX	Shanghai Environment and Energy Exchange
CO_2	Carbon dioxide
DKI	Special Capital City District of Jakarta
EAP	East-Asia and the Pacific
ESCO	Energy Service Company
ETS	Emissions Trading System
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GLA	Greater London Authority
GPC	Global Protocol for Community-scale GHG Emissions
HCMC	Ho Chi Minh City
IBRD	International Bank for Reconstruction and Development
ICLEI	Local Governments for Sustainability
IPCC	Intergovernmental Panel on Climate Change

JICA	Japan International Cooperation Agency
kgce	Kilograms of coal equivalent
Kl	Kiloliter
kWh	Kilowatt Hour
MRV	Measurement, Reporting, and Verification
n.a.	Not applicable
NCCS	National Climate Change Secretariat (Singapore)
NDRC	National Development and Reform Commission (China)
PV	Photovoltaic
REC	Renewable Energy Credits
SEI	Stockholm Environmental Institute
SMF	Sustainable Melbourne Fund
T	Ton (1,000 kg)
Tce	Tons of coal equivalent
tCO_2e	Tons of carbon dioxide equivalent
TMG	Tokyo Metropolitan Government
UNEP	United Nations Environment Programme
UN-HABITAT	United Nations Human Settlement Programme
Wp	Watt-peak
WRI	World Resources Institute

Executive Summary

The workshop on City-scale Climate Action Planning in East and Southeast Asia was held in Singapore during April 10-12, 2013. The main objective of the workshop was to share the experience and lessons learned from best practices of how to implement climate action plans in C40 cities, both from developed (henceforth called "resource cities") and from developing cities (henceforth called "focus cities"), and apply the knowledge to support East Asian C40 cities in their quest for low-carbon development.

Sponsored by the World Bank, with funding support from the Australian government, the workshop was co-organized by the World Bank in partnership with C40 Cities and the Centre for Liveable Cities (CLC) in Singapore.

The workshop was designed to exchange experience and draw lessons learned among the participants from both the resource and focus cities, with a focus on six key topics: (a) integrated land use and transport planning, (b) sustainable transport, (c) green buildings, (d) city-scale carbon cap-and-trade, (e) institutional arrangement for multi-sector interventions, and (f) measurement, reporting, and verification (MRV) of community greenhouse gas emissions.

Almost all the East Asian focus cities (Bangkok, Beijing, Ho Chi Minh City, Jakarta, and Shanghai) have set **low-carbon targets and developed climate action plans:**

- Beijing and Shanghai not only set more stringent energy and carbon intensity reduction targets than China's national level targets set for the 12th Five Year Plan period, but also went a step further to pilot carbon cap-and-trade mechanisms.
- The Bangkok Metropolitan Administration (BMA) has completed its Action Plans on Global Warming Mitigation from 2007 to 2012, with a target to reduce the city's emission by 15 percent below the projected emission level. Results showed that BMA has achieved its intended targets under four

out of five initiatives, but is falling behind in the transport sector. BMA is currently developing a Bangkok Master Plan on Climate Change for the next 10 years (2013-2023).

- Jakarta has committed to a 30 percent reduction in greenhouse gas (GHG) emissions below business-as-usual by 2030 and has developed a Regional Action Plan for Greenhouse Gas Emissions Decrease in Jakarta.
- Ho Chi Minh City is developing a Climate Change Adaptation and Mitigation Action Plan.

The focus cities, however, are faced with **challenges on how to implement** their various action plans to achieve low-carbon targets, which was emphasized during the workshop. A number of cities, for example, have run into difficulties coordinating the various relevant departments and agencies responsible for climate change mitigation and adaptation, particularly for integrated urban planning of land use, public transport, and green buildings. Many cities cited low staff capacity as a key barrier to developing plans, analyzing alternative policies, and implementing solutions. Some cities recognize the importance of public mass transport, but lack sufficient municipal financing to invest in capital-intensive public transport infrastructure. Public resistance can also be a major impediment, for instance when introducing congestion charges or when there is a strong desire by the public to own private vehicles. In addition, conducting a regular GHG emission inventory is not an easy task in a few cities. Above all, political commitment and leadership were identified as a prerequisite to the implementation of such action plans.

The resource cities (London, Melbourne, Singapore, Stockholm, and Tokyo) provided **examples of best practices** on how to tackle some of the challenges:

- Singapore has made remarkable achievements to transform from a third world country at independence to a world class metropolis in 40-50 years. It has embarked on policies and measures to reduce emissions by 7 to 11 percent below 2020 business-as-usual (BAU) levels. The government's focus has been on long-term urban planning, integrated land use and a people-centered public transport system, and well-coordinated institutions.
- Stockholm was the winner of the first European Green Capital award in 2010. It has set an ambitious target to be fossil fuel free by 2050. Key accomplishment include a district heating system using primarily (86 percent) non-fossil fuels and the city's achievement of 75 percent of commuters taking public transport in its inner city rush hours.

- Tokyo is piloting the first city-level carbon cap-and-trade, part of its effort to reduce GHG emissions to 25 percent below 2000 levels by 2020.
- In London, the Mayor's Climate Change Mitigation and Energy Strategy has committed to reduce London's CO_2 emissions by 60 percent from 1990 levels by 2025. This will largely be achieved through low-carbon energy supply and building retrofit programs. The municipal government provides guarantees and concessional financing to leverage large-scale commercial low-carbon investment.
- Melbourne aspires to become zero net emission by 2020. The innovative Sustainable Melbourne Fund provides low interest bank loans secured by a municipal charge on the property to repay loans for building retrofits.

These experiences and lessons learned pointed to a set of **success factors and principles** to plan and implement low-carbon cities:

- Overall, while low-carbon city actions and measures can vary depending on each city's circumstances, common success factors across cities emerge. These include (a) strong leadership and political commitment; (b) a clear vision, an ambitious target, and a realistic plan to achieve it; (c) effective and conducive policies and municipal financing; (d) institutional coordination and integrated planning; and (e) measurement of progress against targets.
- Cities need to develop the appropriate mix of policy instruments, balancing mandatory approaches with market-based mechanisms and incentives.
- The abatement cost curve methodology provides an analytical framework to set low-carbon targets and identify cost-effective priority abatement actions and investments to meet them.
- Urban planning needs long-term strategic plans. The transport sector has to be an integral part of planning, with high density development along the public transportation network. New town development needs to ensure direct access to the town center and walkability within the neighborhood.
- Three key success factors of sustainable urban transport include: (a) shifting more trips to public transport, which requires not only building an extensive public transport network, but also making public transport a choice mode by making it convenient for travelers and enhancing integration of the public transport system; (b) managing car-based travel demand—for example, Singapore adopted measures to curb car ownership

through a vehicle quota system and constrain car usage through effective road pricing; and (c) encouraging adoption of lower-emission vehicles. Singapore is providing rebates for low-emission vehicles. In Stockholm, 75 percent of the public transportation system runs on renewable sources.

- Building retrofit faces major barriers, as commercial building owners—usually multiple owners for one building—are reluctant to invest in energy efficiency measures. Shanghai municipal government is developing building energy efficiency benchmarks and provides financial incentives for building retrofit. They also have a mandatory requirement for large commercial buildings to install an on-line monitoring platform to track their energy consumption. Tokyo adopts cap-and-trade to retrofit large commercial buildings under its carbon cap-and-trade schemes. London focuses on government buildings first, using an ESCO model, while Melbourne provides its Sustainable Melbourne Fund to support financial institutions providing concessional loans to property owners for building retrofit.

- City-level cap-and-trade systems take time to design and implement; they can be challenging, but also attractive as a market-based instrument. The Tokyo cap-and-trade scheme needed 10 years to set up its MRV system and has had only nine trading transaction since its inception in 2010. There is, however, significant global interest and momentum for this option. Beijing and Shanghai are now also piloting carbon cap-and-trade schemes.

- Achieving low-carbon targets requires a holistic multi-sector approach; as a result, several cities are facing difficulties with institutional coordination. In Beijing and Shanghai, the municipal Development and Reform Commission is in charge of the carbon cap-and-trade pilots, as they have overarching mandates and responsibilities for city development. London set up a Project Delivery Unit to be in charge of the public building retrofit program.

- City-level GHG emissions inventories need a recognized, international standard, so that cities can measure and report on their emissions in a consistent manner. The Global Protocol for Community-Scale GHG Emissions (GPC), jointly developed by the World Bank, C40 Cities, ICLEI-Local Governments for Sustainability, and the World Resources Institute (WRI), advanced an international standard for measuring city greenhouse gas emissions. The frontier challenge in this area lies with measuring consumption-based emissions, which reveals different information than standard production-based GHG inventories.

The workshop was only one step of what could be a longer term effort on capacity building and policy development among the participating cities. As a next step, the World Bank is exploring tailored technical assistance and targeted capacity building for those East Asian C40 cities who expressed an interest in such assistance. In that regard, while these proceedings only document the rich experience presented at the workshop, lessons learned and relationships built at the workshop will carry on.

1. Context

1.1 Cities and Climate Change

Cities are at the forefront of action to combat climate change. More than half of the world's population lives in urban areas, and they are highly vulnerable to the impacts of climate change. In addition to being responsible for a significant fraction of global greenhouse gas (GHG) emissions, cities control many policy levers that are largely unavailable to national governments. For example, the zoning, planning, and infrastructure decisions made by cities (and other local government partners) have profound influence over cities' spatial development, transportation patterns, and building stock, all of which have significant implications for GHG intensities. Furthermore, by nature of their smaller size and simpler administrative and political structures, local and regional governments (including cities) may also be in a unique position to pilot some types of policies (such as carbon cap-and-trade) before roll-out at broader (e.g., national) scales. Given that East Asia is experiencing rapid urbanization, cities are in a position to take on an even greater role in mitigating climate change in the years to come. The speed and scale of urbanization provides an unprecedented opportunity to invest in low-carbon infrastructure to contain GHG emission growth in cities. The window of opportunity is narrow because urban form and infrastructure have long lifetimes. Introducing efficient low-carbon technologies into new urban infrastructure today would avoid locking cities into a high-carbon growth path for decades to come.

The workshop focused on a subset of cities that are part of the C40 Cities Climate Leadership Group (C40 Cities). C40 Cities is a network of the world's megacities committed to addressing climate change. Collectively, the C40 cities account for 18 percent of global GDP and 10 percent of the world's carbon emissions. Among all C40 participating and affiliated cities (58 in total), 32 cities have developed city-wide climate change action plans and set GHG emission reduction targets. On June 1, 2011, C40 Cities and the World Bank signed an agreement that will help cities accelerate activities to reduce GHG emissions and adapt to climate change during the C40 Cities Mayors Summit in Sao Paulo, Brazil. The East

Asia region has five C40 developing cities—Bangkok, Beijing, Ho Chi Minh City, Jakarta, and Shanghai, all committed to lowering their carbon footprint.

1.2 Workshop Objective

The workshop, titled City-scale Climate Action Planning in East and Southeast Asia, was held in Singapore on April 10-12, 2013. The objective of the workshop was to share and discuss experiences implementing climate change action plans in the participating C40 cities, with the goal that cities would apply the knowledge to achieve their low-carbon targets. The workshop focused first and foremost on the commitments, challenges, and experiences of the five cities in developing countries in East and Southeast Asia—Bangkok, Beijing, Jakarta, Ho Chi Minh City, and Shanghai—which here are called the five "focus cities." Together, these cities contain nearly 60 million people, almost as many people as are in the United Kingdom or France. The meetings also included representatives from five developed cities, recognized as leaders in climate action planning, called the "resource cities": London, Melbourne, Singapore, Stockholm, and Tokyo. These proceedings highlight the climate change mitigation plans and actions in these participating cities and document the experience and lessons discussed at the workshop.

Much has been written on city-scale climate action planning and other similar workshops and research programs have been conducted.[1] The body of knowledge and experience is growing rapidly and urban issues are increasingly prominent in international research and discussions on how to reduce global GHG emissions. Examples include the feature of spatial planning and public transit in the International Energy Agency's Energy Technology Perspectives scenarios; a chapter on urban infrastructure and spatial planning in IPCC's upcoming Fifth Assessment Report; and the submission of urban-focused Nationally Appropriate Mitigation Actions (NAMAs) by some countries in international climate change negotiations. Still, there is much to be learned, especially given the diverse social, economic, and environmental factors faced by cities around the world and the need to reduce global GHG emissions at rates far faster than currently planned.
The workshop in Singapore was an attempt to share on-the-ground, hands-on experiences and lessons learned on how to develop and implement action plans at the city level to mitigate climate change. Many of the developing country cities

[1] For example, readers may wish to follow the efforts of the Urban Climate Change Research Network (which released an assessment report on climate change and cities in 2011), the Fifth Urban Research Symposium sponsored by the World Bank in 2009, and the ongoing workshops sponsored by the C40 Cities Climate Leadership Group.

have set low-carbon targets; the challenge is how to develop and implement climate change action plans to achieve these targets. Containing urban emission growth requires an integrated multi-sectoral approach, in particular compact urban design, green mobility, and clean energy. Effective implementation of this framework requires all sectors and agencies to work together, as well as a measuring, reporting, and tracking of city-level GHG emissions. As such, the intent of this proceedings document is to share the key successes and challenges from these cities—what has worked so far, what is being tested or planned now, and what key challenges and constraints does each city face—so that other cities may gain knowledge on policy measures or processes, or simply be inspired.

We hope that this document will help to advance the conversation globally about how cities can implement climate action plans and measure progress towards goals, with a focus on three critical sectors where cities have significant influence over GHG emissions: urban form, transportation systems, and buildings. The document is structured around these three sectors. In addition, three cross-cutting issues related to climate action planning are discussed: carbon cap-and-trade; institutional arrangements for multi-sector interventions; and measurement, reporting, and tracking.

The workshop was sponsored by the World Bank with funding support from the Australian government. It was co-organized by the World Bank in partnership with C40 Cities and the Centre for Liveable Cities (CLC) in Singapore. CLC and the Singapore Environment Institute co-sponsored site visits to the TreeLodge@ Punggol public housing estate and the gallery of the Land Transport Authority in Singapore. The Stockholm Environment Institute provided technical support.

2. Overview—Key Successes and Challenges

2.1 Climate Change Commitments and Plans in Five East Asia C40 Cities

The five focus cities share a commitment to reduce GHG emissions. However, their approaches to climate action planning and implementation take many forms—from Bangkok's five-year climate action plan developed in partnership with stakeholders in 2007, to the long-term (to 2030) GHG reduction goal announced by Jakarta in 2009, to the carbon cap-and-trade systems being designed and currently piloted in Beijing and Shanghai, to the on-the-ground efforts in Ho Chi Minh to develop transit- and people-focused development along its VõVănKiệt Boulevard. Table 2.1 below provides an overview of GHG reduction targets, plans, and measures in the five focus cities, as outlined by the respective city representatives at the workshop.

Table 2.1 Overview of GHG Reduction Targets, Plans, and Measures in the Five Focus Cities

City	GHG reduction targets	Scope and coverage of GHG reduction target	Existing climate action plan	Key policies and measures in support of target	Other major climate action planning efforts
Bangkok	15% below business-as-usual (BAU) in 2012	Energy-related CO_2; CH_4 from waste	Bangkok Metropolitan Administration Action Plan on Global Warming Mitigation 2007 - 2012	Public transport; building energy standards	Now developing Bangkok's master plan on climate change 2013-2023
Beijing	18% reduction in CO_2 per GDP by 2015 from 2010 levels; hold industrial process emissions at 2010 level	CO_2 and industrial process emissions	Included in Beijing's *12th Five Year Plan* (2011-2015)	Industrial restructuring; energy efficiency, fuel switching away from coal; public transport	Emission Trading Scheme (ETS) under preparation for pilot

City	GHG reduction targets	Scope and coverage of GHG reduction target	Existing climate action plan	Key policies and measures in support of target	Other major climate action planning efforts
Ho Chi Minh City	None stated	None stated	Ho Chi Minh Action Plan for Climate Change Adaptation and Mitigation in Period 2011-2015	Energy efficiency, renewable energy, waste management	
Jakarta	30% below business-as-usual (BAU) by 2030, to 117 million tCO_2e	Energy-related CO_2; industrial process emissions; CH4 from waste	GHG reduction target is included in Jakarta's Spatial Plan 2030	New building energy codes; mass rapid transit-electronic road pricing; landfill gas recovery	Developing a *Regional Action Plan For Reducing Greenhouse Gas Emissions*
Shanghai	19% reduction in CO_2 per GDP by 2015 from 2010 levels	Energy-related CO_2	Included in Shanghai's *12th Five Year Plan* (2011-2015)	Industrial restructuring; industrial energy savings; low-carbon transportation; low-carbon buildings	ETS under preparation for pilot

2.2 Overview of Successes and Challenges in the Five East Asia C40 Cities

The participants from each focus city also shared their cities' key successes and challenges to date in implementing climate action plans. Several key themes that emerged are as follows:

- **Political commitment and leadership** are a prerequisite for success.
- **Effective and conducive policies** are the driver to achieve low-carbon objectives and create an enabling environment for private sector investment.
- **Municipal financing** in focus cities is generally in short supply for capital-intensive investments in low-carbon infrastructure, such as public transportation or building retrofit programs.
- **Institutional coordination** among the various relevant departments and agencies is often lacking in some focus cities, particularly for integrated urban planning of land use, public transport, and green buildings.

- **Staff capacity** is critical for developing plans, analyzing alternative policies, and implementing solutions. Nearly all cities have relied on external analysts (and funding) for support, especially in early stages, but most cities believe that long-term success will require greatly expanded local capacity.
- **Public opinions** have a strong influence in public policies, for example in the case of public resistance to road pricing or a strong desire by the general public in focus cities to own private vehicles.
- **Methods and systems for tracking and evaluating progress** are needed to help select the policies and measures with the highest likely benefits, then evaluate progress and make improvements. Cities have made different degrees of progress on tracking the success of their efforts.
- **Retrofitting and redeveloping** infrastructure in these megacities, each of which is over 6 million people, is extraordinarily challenging, but many opportunities remain to expand public transport and redevelop the cities in ways that lower per-person GHG emissions. Opportunities also exist to accommodate new (and still rapid) growth in lower-carbon infrastructure.

2.3 Roadmap for a Low-carbon Action Plan

Before detailed discussions of each theme, it may be useful to first introduce key steps to develop a low-carbon action plan at city-level as the following:[2]

1. Develop a baseline GHG inventory.
2. Establish a GHG reduction goal, based in part on a quantitative analysis of what reductions are possible.
3. Formulate policies and actions to achieve the goal.
4. Monitor and report GHG emissions.
5. Assess progress and revise the approach, as necessary.

Most of the discussions at the workshop focused on the third step of this process: the details of policies and actions—and how they are being implemented in the participant cities. These discussions are summarized in chapters 3 through 7.

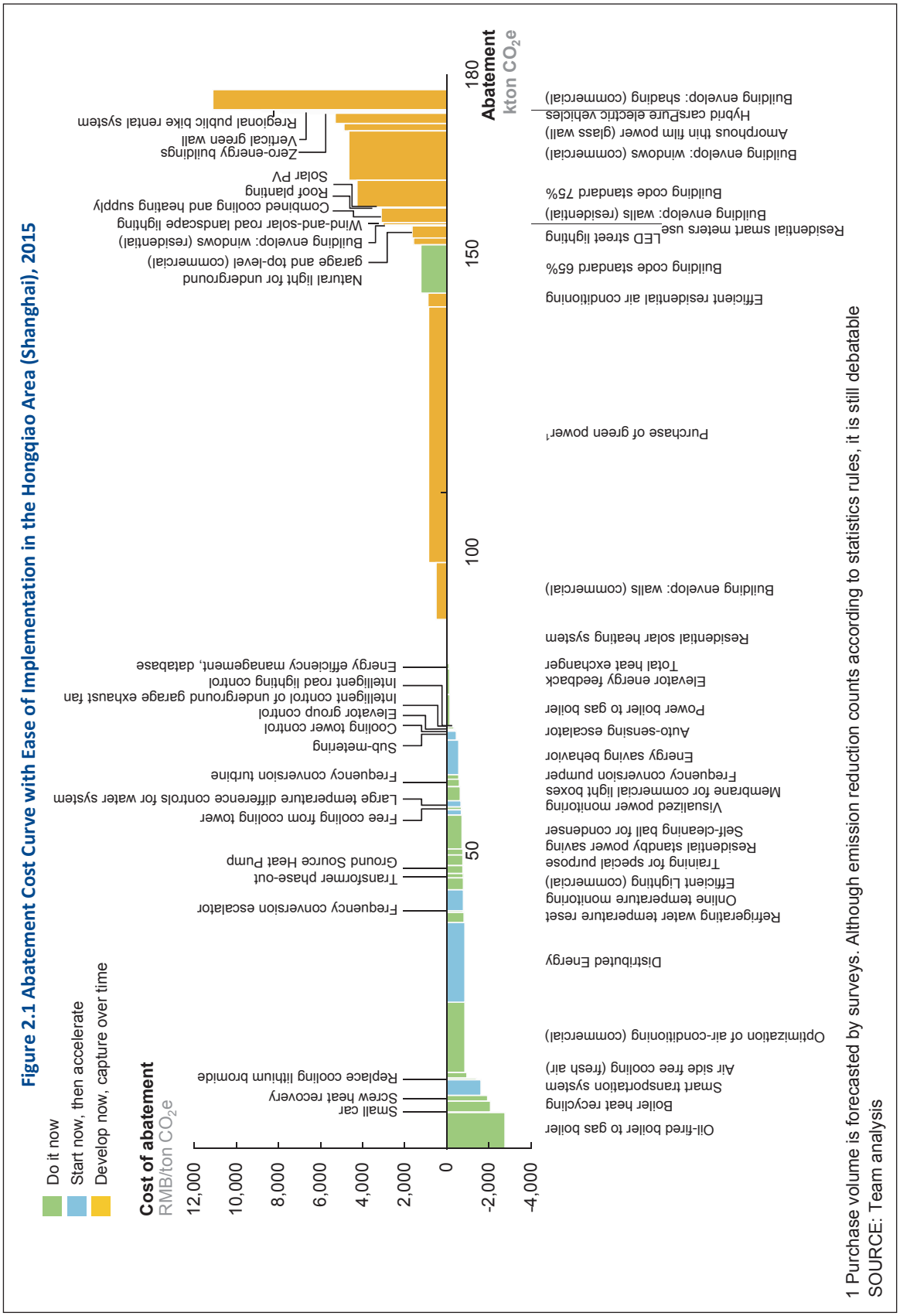
[2] These steps are adapted from two sources: a draft (July 2013) of the GHG Protocol Mitigation Goals Standard and the steps used by the City of London.

One session was also devoted to measurement and reporting (or steps 1 and 4) and is summarized in chapter 8.

As for step 2, before developing policies and actions in a sector it is important to set low-carbon objectives for the city, identify priority abatement measures, and define a cost-effective investment program. The GHG abatement cost curve can be used in this step as an analytical tool to provide a quantitative, fact-based analysis to help policy makers and business leaders identify and prioritize potential solutions. The cost curve outlines *when* to adopt *which* abatement technology at *what* costs.

At the workshop, the World Bank team presented the abatement cost curves and scenarios as an analytical tool to set low-carbon targets and identify cost-effective, low-carbon investments for achieving these targets, using a case study in Changning district in Shanghai, China (figure 2.1). The abatement cost curve developed under this analytical work allowed the Changning district government to make informed decisions about medium-term targets for CO_2 abatement and to identify priority actions and investments to meet them. The abatement cost curve analysis also provided a solid analytical underpinning for the technical assistance and investments selected for the IBRD/GEF Green Energy for Low-Carbon City in Shanghai Project to support Changning District in achieving its carbon-intensity-reduction target.

The next three chapters of this proceedings document summarize the experiences of each city as presented at the workshop, as well as the workshop discussions for each of the three key sectors: integrated land use and transport planning (chapter 3); sustainable transport (chapter 4); and green buildings (chapter 5). Subsequent chapters focus on cross-sector topics: city-scale carbon cap-and-trade (chapter 6); institutional arrangements for effective city-scale multi-sector climate action (chapter 7); and measurement, reporting, and tracking community GHG emissions (chapter 8). The document closes with a summary of key findings, lessons learned, and next steps (chapter 9).



1 Purchase volume is forecasted by surveys. Although emission reduction counts according to statistics rules, it is still debatable
SOURCE: Team analysis

RMB=Renminbi; CO_2e=carbon dioxide equivalent.

3. Integrated Land Use and Transport Planning

Cities have unique and significant influence over their patterns of development. Through comprehensive plans, zoning regulations, and other land-use policies, cities can control the types and location of buildings in the city. In growing cities, these choices can dramatically influence how (and how much) residents move around the metropolitan area. Residents in cities and neighborhoods with higher population densities and better transit access less often travel by personal vehicle and for shorter distances, leading to fewer GHG emissions compared to more sprawling, less dense areas.[3] Furthermore, several modeling studies have shown the potential emissions benefits of cities taking a more compact, transit-connected development path in the future.[4] Note that where the population density occurs (i.e., near transit and other services that help create walkable communities) may matter as much as or more than high average density across a metropolitan area, especially one without adequate transit.

3.1 Experiences in Focus Cities

Among the five focus cities, a wide-spread recognition exists of the opportunities involved with combining land use and transit planning, as well as of the challenges in doing so. Table 3.1 below shows population and density characteristics of the focus and resource cities. (Note that these population and density figures are based on international definitions of urban areas and may not correspond exactly to the population within each city's political boundary.)

[3] For examples, see Kennedy et al. 2009.

[4] For example, see Ewing et al. 2008; Hickman et al. 2011; Johnson et al. 2010.

Table 3.1 Population Characteristics of the Workshop's Cities

City	Population of urban area, 2010 (millions)	Population growth rate 2005-2010 (%)	Average population density of built-up area (people /km^2)
Focus Cities			
Bangkok	8.2	2.6	5,800
Beijing	15.0	3.9	14,500
Ho Chi Minh City	6.2	3.4	14,200
Jakarta	9.6	1.4	12,700
Shanghai	19.6	3.3	28,600
Resource Cities			
London	8.9	0.9	6,200
Melbourne	3.9	1.4	n/a
Singapore	5.1	3.5	10,700
Stockholm	1.4	1.7	3,600
Tokyo	36.9	0.7	n/a

Note: To enable comparability, population figures are taken from a single source (UN DESA 2011), using their definition of "urban agglomeration," which they define as "the population contained within the contours of a contiguous territory inhabited at urban density levels without regard to administrative boundaries." Metropolitan population density for "built up" areas is from Suzuki et al. 2013. The two sources may not use the same definition of territories.

Jakarta, the capital city of Indonesia with about 9.5 million people in the city itself, shared its land use and transportation planning efforts. The city faces increasing urban sprawl and challenges in maintaining mobility and transit access in the midst of its rapid population growth. A Jakarta representative described how daily inbound commuter traffic from the surrounding region has increased from 700,000 people in 2002 to about 1.1 million in 2010. Growth in employment has been strongest in the central business district of Jakarta, but residential growth has occurred primarily in the surrounding "Bodetabek" areas (named after the municipalities of Bogor, Depok, Tangerang, and Bekasi), at rates faster than transportation infrastructure development and primarily along roads rather than existing public transit corridors. Mobility in Jakarta is further exacerbated by poor quality pedestrian facilities, a low level of public transit services and integration with other modes, and a lack of a clear road hierarchy (trunk and feeder lines), which leaves vehicles to navigate a network of local roads with little opportunity for travel at higher speed. In response to these challenges, the city has developed Jakarta's Spatial Plan 2030. The Plan features development of more urban centers, steering of developments along transit corridors, encouragement of more vertical and compact development, and redevelopment and improvement in the kampungs (villages). To implement the plan, Jakarta plans greater control over land use through more active zoning (compared to the relatively ad hoc approaches that are common today), as well as

the use of incentives for landowners (such as reduced taxes and eased permitting) to promote high levels of pedestrian and transit connectivity.

Ho Chi Minh City described how in recent years much of its population growth has occurred in the outskirts of the city, contributing to an increasingly sprawling urban form. The city lacks major mass transit, and coupled with the rapid increase in car ownership, congestion has become a major issue. In response, city planners have been pursuing a new approach to combined land use and transportation planning along an existing major corridor, the VõVănKiệt boulevard, which extends from the city center to the area of rapid development in the eastern part of the city. Along this boulevard, the city is promoting more vertical, mixed use development at transit nodes, along with the development of a new, 25-km bus rapid transit (BRT) system. This project is described in more detail in the case study in box 3.2.

3.2 Experiences in Resource Cities

After presentations and discussions by the focus cities, the workshop included presentations by the resource cities of Stockholm and Singapore to share their experiences on urban planning.

Stockholm presented some of its recent efforts on promoting new pedestrian- and transit-oriented development near the city center. A number of urban areas around Stockholm have been identified for transformation and re-use, especially former industrial sites by the water. Stockholm is working to develop these sites to be walkable communities with a mix of housing, retail services, and employment opportunities, highly connected with rapid transit and bicycle facilities. Stockholm uses a three-tiered planning approach—master planning, district-level planning, and project (building-level) planning. For a case study on Stockholm's approach, see box 3.1.

Singapore, a city-state with a current population over one million people (living in an area of 714 square kilometers), described its extensive transformation in the last half-century: from a city plagued with poverty and pollution in the 1950s and 1960s to a global city that is one of the world's financial capitals and consistently receives high ratings for "livability." Singapore pointed to its first integrated land use and transportation plan, the 1971 Concept Plan, as one of the turning points. Prior to that, the city was growing very rapidly, but with limited public transport and relatively little consideration of the patterns of development. The 1971 Concept Plan laid out future residential new town

developments, along with plans for linking them with expressways and rapid transit. Since then (and in regular updates to the Concept Plan and Master Plan), Singapore has expanded transit infrastructure systematically with land development and travel demand. Other key features of Singapore's approach have been developing clear road hierarchies to facilitate road access to town centers while maintaining walkability within them; high integration between transit modes including the train (Mass Rapid Transit or MRT), bus, and taxis, and sheltered walkways and bikeways; and extensive use of financial incentives (such as a vehicle quota system and road pricing). Singapore's constraint in land area spurred the government to make smart choices and constantly innovate. Singapore's experience in integrated master planning and development—especially in land use and transport planning—may apply to other fast-growing cities in East and Southeast Asia, as well as in Africa and Latin America.

3.3 Discussion

Discussion among the cities focused on challenges inherent in megacities that have already established much of their urban form and spatial plans. One persistent challenge for some cities in developing countries is social inequity, with large segments of the population living in informal settlements. Developing housing for these populations in place can minimize the need to relocate the residents, but is highly difficult to do. Jakarta described a strategy currently being employed (e.g., in Pademangan Barat, North Jakarta) to consolidate land ownership in some informal districts. Although doing so brings its own considerations regarding social equity, the city noted that this approach can help enable coordinated redevelopment that includes green open space, mixed-use buildings, and a variety of market, public, and subsidized housing. Providing a mix of uses and transit access helps increase access to goods and services while reducing demand for trips by private vehicles.

Workshop participants discussed how a number of the world's large cities, especially those that have declining industrial activity, are redeveloping former industrial lands ("brownfields") with residential or mixed-use buildings. Developing these properties, as has been actively done in Stockholm (see the case study in box 3.1), can create walkable, pedestrian areas close to existing employment centers.

All cities agreed that integrated land use and transportation planning requires a significant level of staff capacity and resources, as well as developing planning structures that span the traditionally distinct disciplines of land use planning and transportation planning.

Box 3.1 CASE STUDY: Land Use and Transport Planning in Stockholm

Stockholm has pursued a strategy of urban planning that it hopes will reduce the need for energy and transportation while at the same time improving the quality of life for its residents.

Stockholm's strategy starts with a strengthening of the central city, by developing new city districts nearby the city center. Compared to the alternative of new development at the city periphery, new developments closer to the city center will have shorter travel distances suitable for walking and biking; good connections to the public transportation system and existing infrastructure (e.g., energy, communications, water and sewage); as well as a closeness to private and public services.

The second aspect of Stockholm's strategy is to focus on what it calls "strategic nodes," to steer development demand near the outskirts of the city to existing public transport corridors. Stockholm plans to strengthen these nodes with additional housing, workplaces, and services, making them attractive places that city planners expect will also have lower per-person transport demands than if housing, workplaces, and services were not located together.

The third focus of Stockholm's strategy is to connect the central city and the "nodes" with an effective, comfortable, and low-carbon public transportation system. Metro and commuter trains in Stockholm cover a large part of the Stockholm metropolitan area and they are based on electricity from non-fossil energy sources. Stockholm is expanding use of biogas and liquid biofuels in its bus fleet, and is further developing its bike lane system both in the city center and between city districts.

Lastly, Stockholm works to create a vibrant urban environment in all parts of the city including the city center, new city district developments nearby the city center, as well as in the attractive nodes in the outer part of the city. Stockholm likes to call itself "The Walkable City," and strives to enable people to live in a local community with mixed use surrounded by housing, workplaces, schools, daycare centers, shops, culture, walking and bike lanes, green areas, and other resources. They strive to make each neighborhood "a small city in the big city," where people satisfy most of their daily needs locally, but with the big city only a few minutes away with a fast and sustainable mode of transportation.

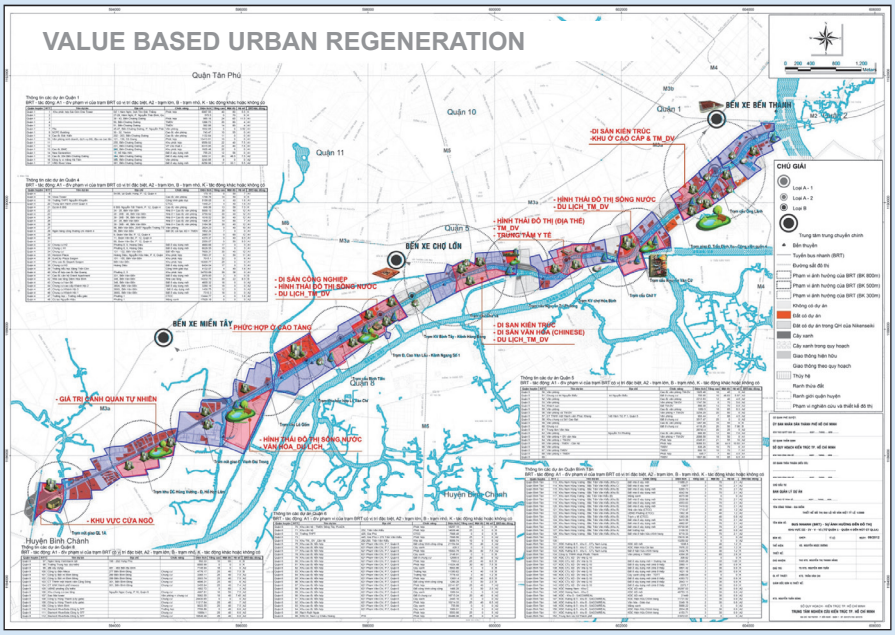
Stockholm's policy and planning instruments include a long-term vision ("Vision 2030"), a master plan for urban development and land use ("Stockholm City Plan"), an "Accessibility Strategy" for public transportation, and a city wide Bike Plan. Stockholm has found that combined land use and transportation planning for city districts requires an integrated approach where stakeholders and sectors of the city come together in order to create visions, programs, and plans for a variety of structures that meet the numerous needs of the area. Cooperation among stakeholders in this planning stage also helps establish strong relationships for an effective construction process later. Stockholm calls planning at this district level—below the master plan and above detailed plans—the "middle level," and has found it critical in its projects, including the large-scale city district Stockholm Royal Seaport. Stockholm believes that urban planning and land use on these three levels—master planning, holistic district programs, and detailed plans for building—all play a vital role in creating a city structure, infrastructure, and buildings that help create a low-carbon city.

Case study provided by Tomas Gustafsson, Senior Sustainability Strategist, Stockholm Royal Seaport Innovation, City of Stockholm.

Box 3.2 CASE STUDY: Urban Design in Ho Chi Minh City

Ho Chi Minh City is the most populous city in Vietnam and also the largest economic center in the country. The city has experienced rapid development and, along with its development, traffic congestion. To help address the congestion and steer more development toward the center of the city, planners have been pursuing a new approach along the VõVănKiệt boulevard, which parallels the Ben Nghe Tan Hu canal and runs into the city center. Planners envision a corridor of greatly expanded mixed-use urban development, people-friendly streets, and enhanced public transport connecting a series of nodes of new development. In addition, the project might help improve the quality of life in the blighted portion of the canal district and help make it a destination for visitors.

Figure B3.2.1 Land Use Policy and Incentives along the VõVănKiệt Boulevard are Supporting Connectivity with a New Bus Rapid Transit Line



Source: Tuan Anh Nguyen of Ho Chi Minh City (HCMC); a higher resolution map is available.

Ho Chi Minh City's approach to the project began with a week-long charrette in July 2011, hosted by the city's Department of Transport and the Department of Planning and Architecture. The stakeholders assembled a new design concept for the boulevard that featured opportunities for transit- and pedestrian-oriented developments, green space and public areas, and iconic design around proposed new transit stations. Since the charrette, the city (together with international partners) has conducted a feasibility study and prepared a development plan for the corridor. Figure B3.2.1 illustrates planned developments for the VõVănKiệt boulevard.

Still at the planning stage, it is perhaps too early to assess lessons learned from this effort and few data exist to assess the potential reduction in private vehicle travel or GHG emissions relative to business-as-usual development in Ho Chi Minh City. Nevertheless, city officials report that the charrette process was highly successful and that good quality research and analysis (including geographic information systems) have been critical to the success of the planning effort so far.

Case study adapted in part from Suzuki et al. 2013.

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4. Sustainable Transport

Planning compact, walkable cities helps reduce the need for passenger travel and also reduces the average length of that travel, as was discussed in chapter 3. This chapter discusses the development of public transport systems and promotion of energy efficient private vehicles that can reduce the energy- and carbon-intensity of those trips. Cities have significant control over public transportation systems and, to some extent, over private vehicle choice and fuel efficiency.

4.1 Experiences in Focus Cities

The discussion among the five focus cities centered on mass transit via rail, which several of the cities are currently expanding.

Beijing described the challenges it faces in dealing with enormous traffic congestion and urban air pollution. Although it has a 600 km rail (mostly subway) network that carries 10 million passengers per day, the network only accommodates 10 percent of the commuter trips into the central city from the suburbs. Adding to this challenge are the public's growing aspirations and expectations for owning private cars. To address congestion, the city is pursuing a new rail plan; it has identified the need for at least 1000 km more rail by 2030. While this plan is supported by Beijing's Transport Action Plan 2013-2030, the city faces a heavy investment and finance burden in implementing it. Beijing is also coupling the planned expansion of the rail network with policies to discourage and limit car use. Since 2011, the city has implemented a quota on car registrations, using a lottery selection system to give out vehicle ownership permits, capping the number of new registrations annually at 240,000 (out of 5.2 million currently on the road).[5] The city has also proposed a congestion charge to enter the zone within Beijing's second ring road, an area of about 60 km^2.

[5] Source: http://www.chinadaily.com.cn/china/2013-03/26/content_16345641.htm.

The charge, which the public has strongly opposed, would increase based on a vehicle's emissions intensity and vehicles that do not meet Euro 4 emission levels would be prohibited. The city has further implemented changes to its parking policies (and is piloting additional changes), eliminating free parking and using performance-based and market-rate pricing, with a portion of the parking revenue returned to improve local cycling and pedestrian facilities. These measures are intended to help counter the trend of dramatically declining cycling rates in Beijing from a share of nearly two-thirds in the mid-1980s to about 15 percent in 2010, which has been driven strongly by a reassigning of road space to cars. Parking rates in the most expensive districts have been increased from 2 yuan (US$ 0.60) to 10 to 15 yuan (US$1.60 to 2.40) per hour. Further pilots of increased parking rates have been proposed for the Zhongguancun, Guomao, and Jinrongjie areas of Beijing.

Bangkok described how prior city planning has led to an inadequate public transport system and a traffic crisis, where private cars are dominant, mass (rail) transit comprises less than 3 percent of trips, and buses and taxis make up about 37 percent of the nearly 20 million trips each day. Bangkok currently has about 36 km of elevated and 20 km of underground rail in operation, with an additional 83 km currently under construction and considerably more planned by 2030 as part of Bangkok's Mass Transit Master Plan. Bangkok also operates a BRT route, with plans for expansion. The city reports that the long lead times and high cost of these significant public transport investments have served as considerable barriers. In addition, Bangkok reported that limited inter-connection between the public transport modes is another obstacle to more commuters taking public transport. Bangkok shared that it has not been able to meet its targets.

4.2 Experiences in a Resource City

Singapore described how land transport is expected to comprise roughly 15 percent of Singapore's CO_2 emissions in 2020, the second largest sector in terms of emissions after industry. As about half of these emissions are from private cars and taxis, Singapore is working to shift more trips to public transport and manage car travel demand. Public transport currently comprises about 62 percent of peak trips, and the goal is to increase this to 75 percent by 2030, through enhanced integration of the public transit system (better timing and connectivity), giving buses priority on roadways, and (in particular) by expanding the rail network from 178 km today to about 280 km in 2021 and 360 km by 2030, double today's levels. If this level is achieved, Singapore expects that in 2030, 8 in 10 households would be within a 10-minute walk of a train station.

To further encourage a shift to rail, Singapore influences vehicle demand and usage through a number of methods, all of which were groundbreaking when introduced and since have been replicated elsewhere. These include a vehicle quota system, introduced in 1990, that limits the issuance of vehicle licenses (called a Certificate of Entitlement, or COE) and awards them through an open auction; a registration fee of 100 percent of the value of each vehicle; and electronic road pricing in the central business district and major expressways and arterials. In 2013, Singapore also introduced a new "feebate" system, with fees and rebates based on vehicle carbon intensity, as described in the case study in box 4.1.

4.3 Discussion

Discussion among the five focus cities for this topic centered on the funding of public transportation infrastructure, as well as the mechanisms and equity issues related to limiting car ownership. **Melbourne** and **Singapore** reported that their governments have primarily funded the capital cost of major new public transport infrastructure, while transit fares cover all (in Singapore) or a portion (in Melbourne) of operational costs. Debate focused on the high prices of vehicle licenses to limit vehicle registration in Shanghai and Singapore, and whether this further reinforces existing economic disparities and limits access to private vehicles only to the wealthy. Singapore stated that their narrative is that owning a car in Singapore is not an entitlement or a necessity—unlike health care, housing, education or access to public transport; instead, Singapore strives to meet the mobility needs of its residents. Singapore also stated that while an open auction for limited registrations (unlike a simple lottery) may further limit access to vehicles to lower income residents, it could help raise funds for investments in public transport or pedestrian infrastructure that is more heavily used by lower income residents. Vehicle registration policies (including registration fees, discussed further in the case study in box 4.1) are one of the few levers through which local jurisdictions can exert influence over the type of vehicles driven in their communities.

Box 4.1 CASE STUDY: Carbon Emissions-based Vehicle Scheme in Singapore

Since 1972, Singapore has had a tax on vehicle purchases (for either new cars or imported used cars) to deter vehicle ownership. Based on the open market value of vehicles, the tax was raised progressively from 35 percent when introduced to a high of 175 percent in the late 1980s. The tax is currently at 100 percent for cars and taxis, 15 percent for motorcycles, and 5 percent for commercial vehicles and buses. Singapore has estimated that without the tax (and the related quota on the number of registrations, introduced in 1990), the average rate of vehicle growth would have been about 6 percent annually since 1972, whereas with the tax and the quota the car population has grown at an annual rate of 4.1 percent (during a time when population growth averaged 2.2 percent).

In 2013, Singapore introduced a new aspect to the tax: an additional fee or, alternately, rebate (therefore called a "feebate") for vehicles based on their carbon emissions. For highly efficient hybrid cars, the rebate can offset a substantial portion of the 100 percent vehicle tax, whereas for very inefficient cars the new fee can add over US$ 10,000, as detailed in table B4.1.1. Because taxis tend to drive more miles than privately owned vehicles each year, they are charged or rebated 1.5 times the rate of private vehicles. To inform consumers, labels on cars for sale now include the emissions intensity of the car and the fee category. Singapore reports that one of the benefits of this approach is that it is "technology neutral" in that it does not favor one particular type of engine or fuel over another; each is assessed solely on carbon emissions, including emissions associated with electricity production (for electric cars).

Table B4.1.1 Structure of Carbon Emissions-based Vehicle Scheme for Cars

Band	Carbon emissions (g CO_2/km)	Rebate (-) or surcharge (+) in U.S. dollar	Sample vehicles
A1	0 to 100	-16,000	Toyota Prius
A2	101 to 120	-12,000	Honda Insight
A3	121 to 140	-8,000	Volkswagen Polo
A4	141 to 160	-4,000	Hyundai Elantra; Volkswagen Jetta; Honda Jazz
B	161 to 210	0	Toyota Corolla; Ford Focus (Galaxy); Chevrolet Cruze; Honda Civic; Mercedes-Benz E200
C1	211 to 230	+4,000	Mercedes-Benz E300
C2	231 to 250	+8,000	Mercedes-Benz S300L; Porsche Cayenne
C3	251 to 270	+12,000	Porsche 911
C4	271 and above	+16,000	Ferrari 458 Italia

Note: Rebates and surcharges are converted from Singapore dollars at a rate of S$ 1 = US$ 0.8. Taxis are subject to 1.5 times the listed rates.

The feebate system is currently scheduled to run through the end of 2014, at which point the success of the effort will be reviewed and the system assessed for its effect on purchasing decisions and progress towards Singapore's GHG emission reduction targets.

5. Green Buildings

Buildings use energy for cooling, heating, lighting, appliances, and for a growing number of electronic devices. In cities with high heating demands, GHG emissions associated with building energy use can be on a similar scale as emissions associated with transportation. Among all sectors, reduction in energy demand in buildings is generally seen as one of the most cost-effective opportunities to reduce a city's GHG emissions.

Since buildings generally last for decades, efforts to develop stringent standards for new building energy efficiency can avoid emissions well into the future, while efforts to retrofit existing, less efficient stock are also needed. Most focus cities have put in place mandatory building codes for new buildings, but building retrofit remains to be one of the most difficult market segments. The discussion at the workshop focused primarily on efforts to improve the energy efficiency of existing building stock, by improving energy efficiency of lighting systems, of HVAC (heating, ventilation, and air conditioning) systems, and of the building envelope (such as windows, walls, and building material).

Several challenges persist in improving building energy efficiency. Commercial building owners, often multiple owners for one building, are reluctant to invest in energy efficiency measures because (a) energy costs are a small share of operating costs; (b) building retrofit investments are perceived to have long payback periods; and (c) owners are reluctant to interrupt operation of the buildings for retrofit, especially in the case of commercial buildings.

Building energy efficiency projects also face the "split incentive" problem: investors in energy efficiency measures and the beneficiaries of energy savings are usually not aligned. For example, tenants typically pay the energy bills, so owners have little or no incentive to spend on energy efficiency investments. Understanding the interests of building owners, property management companies, renters, as well as ESCOs can help the development of policies and financing mechanisms targeted to the appropriate actors.

Furthermore, financial institutions can be reluctant to finance building energy efficiency investments due to perceptions about the (a) the small size of each project and high transaction costs; (b) high credit risks of energy service companies (ESCOs), who typically implement building retrofit projects but may not have major assets to offer as collaterals; and (c) the perceived high technical risks and concerns about the materialization of projected energy savings.

5.1 Experiences in Focus Cities

Globally, space heating is the greatest energy demand in buildings. Beijing and Shanghai are the focus cities with significant space heating needs, while the Southeast Asian cities of Bangkok, Jakarta, and Ho Chi Minh, given their lower latitude, have greater cooling needs (table 5.1). Accordingly, efforts in these Southeast Asian cities focus less on fuels for heating than on the use of electricity, including improvements in air conditioning technology.

Table 5.1 Potential Heating and Cooling Demand in the Five Focus Cities

City	Heating degree days	Cooling degree days
Bangkok	0	3884
Beijing	2842	840
Ho Chi Minh City	0	3745
Jakarta	0	3390
Shanghai	1703	1129

Note: Cooling degree days are calculated by subtracting 18 degrees C (65 degrees F) from the average daily temperature and summing only positive values over a year. Heating degree days are analogous but average daily temperature from 18 degrees C.

Source: Sivak 2009.

Bangkok's 2007-2012 climate action plan, for example, has focused on electricity conservation, especially behavioral measures such as more selective (reduced) use of electrical appliances, higher temperature settings on air conditioners, and purchase of lower-energy lighting and electronics with lower-energy "standby" modes. Although a relatively minor contributor to its reported GHG savings (about 2 percent according to city figures), Bangkok has also pursued an energy retrofit program for its public (BMA) buildings, for which it also developed building energy management software. The national Building Energy Code (BEC) also plays a role in the city, reducing energy use in both existing and new buildings. The city reports that more enforcement, as well as more training for building designers to meet the standards, is needed.

Shanghai reported that building energy represents about one-fifth of energy demand in the city, slightly over half of which is attributable to commercial buildings. The Shanghai and Beijing building energy standards for new residential and commercial buildings exceed the national standards set out in China's Eleventh Five Year Plan (2006-2010). The local government has also been advancing building energy retrofit policies for both residential and commercial buildings. For further information on Shanghai's commercial building energy system and retrofit policies, see the case study in box 5.2.

5.2 Experiences in Resource Cities

Buildings comprise about two-thirds of **Tokyo's** GHG emissions. For its existing buildings, the city has had a CO_2 emissions reporting program since 2002 for larger buildings, and since 2009 for smaller ones. Starting in 2010, Tokyo's cap-and-trade program (discussed in detail in box 6.1) began covering larger commercial buildings (as well as industrial facilities), each of which must meet an 8 percent reduction target compared to base year (2010) emissions, with permits allowed to be traded if they exceed that reduction target. Larger new buildings in Tokyo must meet energy performance codes that are stricter than national standards. Smaller existing facilities must report CO_2 emissions and present an emission reduction plan that is posted on the Tokyo Metropolitan Government website. At the workshop, Tokyo shared that their longstanding reporting program has been critical to allow them to analyze the current situation, design programs, set goals, and persuade stakeholders. It also reported that working with executive-level business managers has been important to create a larger constituency for action.

Melbourne has performed an extensive quantitative analysis of GHG abatement opportunities in the city using a standard abatement cost-curve approach and found that the majority of the potential reductions were in commercial buildings. As a result, much of its GHG reduction efforts are in this sector, especially in buildings constructed in the 1950s through 1990s with over 5,000 square meters of floor area. (Melbourne has been aided in this effort by a national policy implemented in 2010 that requires commercial office space of over 2000 square meters to provide and make publicly available a Building Energy Efficiency Certificate at time of sale or lease.) The corporate sector in Melbourne has expressed strong interest in green, energy-efficient buildings, but faces significant barriers to retrofits such as limited access to finance and split incentives between owners and tenants (owner controls the space and bears the capital costs but tenants pay the energy bills); regulatory barriers to combined

heat and power (CHP) and renewables; and lack of technical capacity in the area on building systems analysis and upgrades. To address these difficulties, Melbourne embarked on a flagship program called the 1200 Buildings program, which provides technical assistance, policy support, finance, and promotion for commercial building retrofits. About 160 buildings had or were undergoing retrofits as of early 2013. Financing is provided by the Sustainable Melbourne Fund (see also box 5.1). Melbourne is also conducting feasibility studies on CHP district heating hubs in selected areas.

5.3 Discussion

Discussion among the cities focused on details of building energy consumption and retrofit costs (including many of the details covered above), as well as on the underlying drivers for pursuing emissions reduction in the buildings sector. Shanghai stated that its efforts in the building sector were driven primarily by nationally prescribed limits on city-wide energy intensity and consumption. Bangkok's efforts are driven primarily by concerns over stability and security of energy supplies. Melbourne and Tokyo both stated that their efforts were driven primarily by climate policy and the cities' respective climate action plans.

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Box 5.1 CASE STUDY: Sustainable Melbourne Fund

The City of Melbourne has set a goal to achieve zero net GHG emissions in the municipality. As part of this goal, the city is seeking to catalyze the energy retrofit of 1200 non-residential buildings, representing 70 percent of the commercial building stock within the municipality.

The city found that the majority of its GHG abatement opportunities are in commercial buildings and that retrofits of those buildings can be highly cost effective. However, even cost-effective retrofits face barriers that often significantly limit adoption. For example, building owners and landlords have little incentive to improve building energy performance when tenants usually pay the energy bills (a "split incentive" problem). Tenants would save money from retrofits, but in general have limited willingness to pay for capital improvements that will remain with the building beyond their tenancy. Furthermore, Melbourne has found that capital for major retrofits had often been difficult to access because energy savings are not a conventional asset against which banks will lend.

To address these barriers, the City of Melbourne and the regional government of Victoria together created a new financial mechanism, the Sustainable Melbourne Fund (SMF).The fund provides building owners with the upfront costs of building energy retrofits, which are paid back through a surcharge on the building's property tax payable to the Melbourne City Council, which in turn forwards the payment to the lending institution. Loans provided are at lower rates and with longer terms those otherwise available in the market; the loans also stay with the property even if the building is sold. Building owners can collect part of the surcharge from building tenants, who can finance their portion through their lowered utility bills (Figure B5.1.1).

Figure B5.1.1 Financial Transfers in the Sustainable Melbourne Fund

While the City of Melbourne implements the 1200 Buildings program as a whole, SMF manages the development and operational delivery of the finance mechanism and is the primary contact for property owners seeking financing through this program. The environmental upgrade finance process works as follows:

1. Applicant (property owner) signs up to the 1200 Buildings program and submits an application to SMF.
2. SMF assesses the property owner's proposed environmental improvements for environmental upgrade finance eligibility.
3. Property owner secures funding for retrofit works from an Australian financial institution.
4. The City of Melbourne declares an environmental upgrade charge on the property owner's building.
5. The financier advances the property owner the upfront costs for the retrofit.
6. Property owner's payments are collected through the Melbourne City Council rates system.
7. The City of Melbourne forwards the collected charges to the financier.

This structure addresses both the access to capital barrier, because banks can lend against the surcharge (formalized in an "Environmental Upgrade Agreement"), and the split incentive problem, because owners and tenants enter into a cost-share agreement. Melbourne reports that challenges to setting up this funding model included high legal and administrative setup costs, but that, once established, other jurisdictions in Australia can use the same model. The city also found economies of scale in project costs: a significant workflow of projects is needed to enable learning and drive down retrofit costs. Other key lessons include a very strong need for financier engagement upfront, as well as a very strong tenant/landlord relationship. Having a third-party administrator—the SMF—qualify applications and work with the financiers to make the loan products available to the building owner customers also has been beneficial.

Box 5.2 CASE STUDY: Commercial Building Energy Data and Retrofits in Shanghai

China's national building codes require new buildings to reduce energy intensity by 50 percent compared to the baseline of buildings from the 1980s. By contrast, Shanghai's building codes require a reduction in energy intensity of 65 percent compared to the baseline buildings. Shanghai is also designing a cap-and-trade program for high-emitting facilities, including buildings that emit over 10,000 tons CO_2 annually.

To support implementation of building energy retrofits, the municipal governments provide a subsidy of 60 yuan (or US$9.5) per square meter for building retrofit or 500 yuan (US$80) per ton of coal equivalent (tce) energy savings for ESCOs investing in energy efficiency measures. For renewable energy in buildings, the municipal governments offer a subsidy of 14 yuan (US$2.2) per Watt-peak (Wp) for rooftop solar PV and 100 yuan (US$16) per square meter for geothermal heat pumps, and further mandate all buildings with less than six stories to install solar water heaters.

To support its energy reduction goals, Shanghai is implementing an online building energy monitoring system across the city and conducting hundreds of detailed building energy audits. Upon its completion in 2015, the online system will provide real-time energy data for 1,500 large-scale (greater than 20,000 m^2) commercial buildings, for which participation is mandatory. Within that same time frame, Shanghai expects to conduct detailed energy audits for about 1,000 of these buildings, which the city expects to comprise as much as 90 percent of commercial building energy use in the city. Shanghai is also planning to increase the penetration of rooftop solar thermal and solar PV by 2015.

Initial results from several hundred of the audits are presented in table B5.2.1 In comparison, in North America and Europe commercial building electricity consumption averages about 170 and 110 kWh per square meter, while primary energy consumption is around 80 and 40 kilograms of coal equivalent (kgce) per square meter, respectively.* Shanghai estimates that the energy savings potentials in buildings would average about 20 percent.

Table B5.2.1 Energy Consumption in Shanghai Buildings

	Electricity consumption (kWh/m^2)	Total primary energy consumption ($kgce/m^2$)	Data source
Supermarkets	294	122	Energy audits (about 400 in total)
Hotel	151	79	
Commercial office buildings	116	50	
Government office buildings	102	46	
Residential buildings	30	n.a.	Shanghai statistics platform

Installation costs of the online monitoring system are between 150,000 and 300,000 yuan (roughly US$25,000 to 50,000) per building and in most cases will include sub-metering (in some cases, dozens per building) to develop more detailed demand data. Data collected from private buildings will be available to the government but at this time is not expected to be made public.

** Based on figures 14.7 and 14.8 of IEA's Energy Technology Perspectives 2012 and assuming that primary energy consumption for electricity production is three times consumption.*

6. City-scale Carbon Cap-and-trade

Three cities (Beijing, Shanghai, and Tokyo) are pursuing emissions trading systems (ETS or "cap and trade") as a policy tool to help reduce emissions from some sources. Originally conceived and intended for larger geographic scales such as regions or countries (like the European Union's ETS) or at the state or provincial level, emissions trading at the city scale is being explored by several Chinese cities (as well as in Tokyo) as a pilot for eventual national systems.

A cap-and-trade program is a market-based mechanism for addressing absolute GHGs emissions. In a cap-and-trade system, total emissions of the group of covered emitters are subject to a single limit (the "cap"); permits ("allowances") are distributed to the covered emitters; and entities then must submit a number of permits equivalent to their emissions in each period (e.g., year) of the program. Emitters are allowed to buy and sell (trade) permits among themselves, which can increase the overall cost-effectiveness of the program to the extent that greater reductions can be made within particular entities for lower cost than at others.[6] Over time, the number of permits issued declines according to the cap.

Tallying emissions, buying and selling permits, and implementing GHG-reduction measures requires staff and resources, and in most cases, emissions trading is most efficiently applied to larger sources of emissions (e.g., over 10,000 tCO_2e annually). For this reason, city-scale cap-and-trade programs generally focus on industrial sources and larger (usually commercial) buildings and, in some cases, the power sector. They generally do not cover emissions from transportation or home heating (at least if not in a larger apartment building), as these emissions arise from burning fossil fuels at numerous individual sources.[7] Approaches to emissions from power production in the city-scale ETS vary, as is described below.

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[6] In some programs, such as Tokyo's, individual buildings are required to reduce their own emissions by a particular amount or pay a penalty fee based on their level of noncompliance.

[7] When addressed by regional and national programs, transportation and home heating tend to be covered at the point of fuel distribution, such as a natural gas or gasoline supplier.

6.1 Experiences in Focus Cities

Based on China's 12th Five Year Plan (2011-2015), China's national ETS begins with the pilot sub-national ETS to be designed through 2013 and implemented by 2014, and builds up to a national ETS after 2016. China is piloting carbon cap-and-trade in five cities (including Beijing and Shanghai) and two provinces. The pilot cities have submitted emission limits, allocation plans, and detailed implementation plans to China's National Development and Reform Commission (NDRC) by the end of 2012, which will now review and approve them. Local governments can propose the sectors to be covered and the level of the cap. NDRC is funding and coordinating the pilots and will be reviewing the successes and challenges of the different pilots before implementing a national system.[8]

Beijing's program covers enterprises or institutions with 10,000 tons CO_2 emissions or more annually (the program is only on CO_2, consistent with the coverage of China's national target). These facilities tend to be power and heat supply, manufacturing enterprises, and some larger commercial buildings. The program covers direct emissions from energy combustion and process emissions (e.g., from cement production), as well as indirect emissions from electricity consumption, and allows offsets from the Clean Development Mechanism (CDM)—with Certified Emission Reductions (CERs) converted to China CERs—and potentially other offsets. For more information about Beijing's cap-and-trade, see the case study in box 6.1.

Shanghai's program will cover industrial facilities emitting more than 20,000 tons CO_2 annually (direct or indirect CO_2) and commercial buildings and ports with emissions over 10,000 tons CO_2 annually. The largest emitters in the program are iron and steel plants, chemical plants, and power generation. The program is expected to cover roughly half of Shanghai's emissions.

6.2 Experiences in a Resource City

Tokyo's system covers facilities using energy of more than 1,500 kl of crude oil equivalent annually, which would be about 4,100 t CO_2 of crude oil, or less if a less carbon-intensive fuel such as natural gas is used. Primarily this covers commercial sector buildings, as Tokyo has less industry than Beijing or Shanghai. The cap is set for two distinct five-year periods. The first period (2010-2014) requires a 6 percent reduction, and the second (2015-2019) a 17 percent reduction. Individual facilities are required to reduce emissions by 8 percent

[8] As of April 2013, caps for the Beijing and Shanghai pilots had not yet been announced and so are not included in this document.

(buildings) or 6 percent (industrial facilities) in the first phase and may sell their permits for reductions beyond that level. Covered entities may purchase offset credits from small and midsize facilities within the Tokyo area, from larger facilities outside Tokyo, or from renewable energy credits (RECs). Tokyo's system is also linked with that of the adjacent city of Saitama. For additional details on Tokyo's program, see the case study in box 6.2.

6.3 Discussion

Table 6.1 compares key features of the three cap-and-trade programs discussed at the workshop.

Table 6.1 Key Features of the Three Cap-and-trade Programs Discussed at the Workshop

	Threshold	Numbered of covered entities	Primary sectors	Scope and coverage
Beijing	10,000 tons	400	Power generation, industry, larger commercial buildings	CO_2 only, both direct and indirect
Shanghai	20,000 tons (industrial) 10,000 tons (buildings/ ports)	200	Power generation, industry, larger commercial buildings, ports	CO_2 only, both direct and indirect
Tokyo	1,500 kl crude oil equivalent energy consumption (+/- 4,000 tons CO_2 if it was actually crude oil)	1300	Commercial buildings, industry	CO_2, both direct and indirect; non-CO_2 gases subject to monitoring and reporting only but may be used for compliance if reductions verified

Discussion among the participating cities focused on the rationale for pursuing cap-and-trade at a city level, as well as on the details of permit allocation and expected pricing. Participants generally saw cap-and-trade at the city scale as building technical capacity and developing the market structures (such as registries and trading platforms) needed to implement a cap-and-trade system at a broader (e.g., national) scale. Participants noted some limitations of cap-and-trade at the city scale, including leakage (i.e., tendency of city-scale systems to appear to reduce emissions by virtue of relocating industrial production outside the city boundary)[9]; more limited cost effectiveness due to the limited coverage (both geographically and sectorally, e.g., transportation); and higher proportional transaction costs for smaller systems.

[9] For example, Beijing representatives described how the city has met its energy-intensity targets (such as those in the 11th Five Year Plan) in large part due to changes in the industrial structure in the city, including the relocation of high energy consumption industries to other regions. Cap-and-trade could contribute to this trend, helping to reduce energy use and pollution in Beijing. However, whether city-scale programs would help meet China's national energy use and emissions goals is less clear, as relocated industries may increase CO_2 emissions levels in other cities or regions.

Participants discussed the means of distributing allowances to covered entities. All three systems use grand-fathering (allocating allowances based on historical emissions) for at least some fraction of the permits. Tokyo grandfathers all allowances, while Beijing uses a method that is a hybrid between grandfathering and benchmark-based allocation (for industry). Shanghai uses grandfathering as the general principle, but reports that updates may be made according to other criteria, such as industrial output growth (which would be similar to a benchmark-based system), though it may consider a transition to auctioning at some point in the future. Participants agreed that the expected pricing is (by design) dependent on the stringency of the caps, as well as on the use of offsets. In establishing their systems, all cities reported that involvement of external experts with detailed understanding and experience with ETS and market structures has been critical.

Box 6.1 CASE STUDY: Cap-and-trade in Beijing

Rapid urbanization in China has contributed to growing energy demand in China's cities. Concerns related to energy security, as well as vulnerability to climate change, have reinforced efforts to reduce emissions from energy use. In its 12th Five Year Plan for National Economic and Social Development (2011-2015), China has moved from regulatory approaches and forced closure of high-energy (and CO_2 emitting) facilities to more market based approaches, including the introduction of emissions trading.

Beijing's pilot emissions trading program is the product of a series of national policy directives. China's 12th Five Year Plan sets specific reduction targets for 2015: a 16 percent reduction in energy intensity per unit of GDP and a 17 percent reduction in CO_2 emissions per unit of GDP, compared to 2010. The Chinese government aims to establish a national emissions trading system after 2016 and has initiated pilot carbon-trading programs in seven provinces and cities, including Beijing, to promote learning for development of the national emissions trading system. Locations for the pilot programs were selected to reflect regional economic development diversity; each city can develop its own program design. The China Beijing Environmental Exchange (CBEEX), established in 2008, has had a key role in facilitating trading of environmental commodities, including CO_2. CBEEX provides assistance to the Beijing municipal government to build the emissions trading system. It also cultivates a market and platform for cooperation among buyers, sellers, and project developers.

The pilot programs are still in their infancy and Beijing has yet to release the detailed plan for the emissions trading system. It is anticipated that leading up to 2015, Beijing's program will cover companies with direct/indirect emissions exceeding 10,000 tons CO_2 per year averaged over 2009-2011 (about 400 facilities), a definition Beijing reports is consistent with their local definition of "key energy users" being those with annual energy consumption over 5,000 tce. Covered facilities are expected to be those in power and heat supply, manufacturing, and some from the services (tertiary) sector. Emissions covered include direct energy-related CO_2, indirect emissions from electricity combustion (most of which is imported from the North China Power Grid), and direct process emissions. Offsets will be allowed, China CERs, with other potential sources of offsets still under discussion. A limit on use of offsets may be introduced to help prioritize facilities' own reductions. Most allowances will be issued for free annually. Elements of the pilot program, including legal authority and systems for permit allocation, trading rules, monitoring, enforcement, and accountability will all serve to strengthen capacity-building for a national-level system.

Box 6.2 CASE STUDY: Cap-and-trade in Tokyo

With GHG emissions of 65 million tCO_2e per year, the City of Tokyo's emissions are comparable to Denmark and Sweden. The city has the vision to become a low-carbon city leader and its efforts are focused on reducing overall energy consumption of infrastructure through reductions in energy demand. In 2006, the Tokyo Metropolitan Government (TMG) set a target to reduce GHG emissions by 25 percent from the 2000 level by 2020. The city's Cap-and-trade Program is one of the cornerstone policies to achieve this target.

Early policy efforts of the TMG significantly contributed to laying the groundwork for the current cap-and-trade program. In 2000, two programs were established: (a) the Carbon Reduction Reporting Program, which created mandatory reporting requirements for large (and subsequently small/medium) sized facilities; and (b) the Tokyo Green Building Program. The reporting program, started in 2002 and revised in 2005, laid the groundwork for the cap-and-trade scheme by accumulating data and experience, and building relationships between facility managers, owners, and the TMG. Key elements included requirements for facility managers/owners to develop three-year plans to reduce emissions, a web-based and publicly available rating and reporting system, and a facility-specific energy efficiency diagnosis by TMG, ranking performance with comparable benchmark data in each building use category.

The two programs were followed by the Tokyo Climate Change Strategy in 2007 and a one-year intensive study, led by the Governor of Tokyo, to examine policies to meet the city's reduction target. In 2008, the Tokyo Metropolitan Assembly approved the Governor's proposal to establish the Tokyo Cap-and-trade Program with a start date of April 2010. The program is limited to large commercial and industrial facilities, but sets the stage for future reductions from a wider range of entities across Japan.

The Tokyo Cap-and-trade system sets a mandatory emissions cap on large commercial and industrial buildings that consume 1500 kl or more of crude oil equivalent (about 4,100 ton CO_2 in the case of crude oil, or less depending on fuel type). For the 2010-2014 compliance period, the emissions cap is set at 8 percent below base-year emissions for office buildings (and 6 percent for factories), and is anticipated to be tightened to a 17 percent reduction in the second four-year compliance period. This cap currently applies to 1300 facilities: 1,000 commercial and 300 industrial (buildings and factories). Entities are allowed to set their own base-year emissions level based on an average of any three consecutive years from 2002-2007. Regulated facilities have three options for meeting their compliance obligation: (a) energy efficiency, or renewable energy production on-site; (b) use of allowances purchased from other facilities; and (c) use of offset credits generated from eligible project types (emissions reductions at non-regulated facilities in Tokyo and surrounding areas or renewable energy credits). Facilities that fail to meet their target s are required to cover 1.3 times their shortfall, pay a fine of 500,000 yen (about US$ 5,000), and have their violation published publicly. The system allows for banking of allowances to the second compliance period, but not borrowing.

Commercial facilities make up close to 74 percent of the emissions under the cap and have an average base-year emissions level per facility of over 8,000 tons CO_2. Industrial facilities are larger with average base-year emissions of over 15,000 tons CO_2. Facilities that can demonstrate they are already top energy performers can reduce their compliance obligation. Building tenants are required to cooperate with building owner energy efficiency measures and large tenants are required to submit their own emission reduction plan.

In the first full year of the program (FY2010), on-site energy efficiency measures at covered facilities led to an estimated 0.3 million tons CO_2e in emission reductions. In FY2011, emissions from covered facilities dropped 2.1 million tons CO_2. Most of these reductions, however, occurred due to forced power cuts following the Great East Japan Earthquake. Measures for energy efficiency included management of air conditioning, lighting, heat and hot water systems, as well as building energy management, which may all have helped facility owners cope with the increased power prices and required cuts in the wake of the earthquake and power crisis. No allowances were traded in FY2011 and about 46,000 tCO_2 of offsets (about 2 percent of the total reductions) were purchased (most of which as renewable energy credits).*

Case study adapted in part from information on the TMG website, http://www.kankyo.metro.tokyo.jp, as well as from World Bank 2013.

* In FY2012, ten firms sold allowances totaling 6,700 tons CO_2. As in 2011, additional sales of offset credits occurred, the vast majority of which were as renewable energy credits: 22,000 t CO_2 in FY2012.

7. Institutional Arrangements for Effective City-scale Climate Action

The implementation of climate action plans or major related efforts, such as combined transportation and land use planning, requires extensive coordination among departments and across levels of city government, as well as with external stakeholders, be they researchers, the public, or business groups. The focus cities, as well as the resource cities, discussed institutional and governance structures that help advance climate action plans and policies.

7.1 Experiences in Focus Cities

Beijing described its governance structure whereby a working group was established to address climate change and energy conservation. This administrative working group is led by the mayor of Beijing, with the vice mayor as the deputy chief who oversees and coordinates the climate work of the Beijing Development and Reform Commission (BDRC), the Beijing Municipal Commission of Urban Planning (BMCUP), the Beijing Municipal Construction Commission (BMCC), the city's financial bureau, and a number of other departments (31 in total). Beijing's working group is responsible for detailing the GHG-reduction and energy saving targets and for assigning tasks to individual departments. Beijing's main climate policy focus has been to create market-based solutions, and it has established the China Beijing Environment Exchange (CBEEX) to establish the necessary market structures, such as the emissions trading system and (prior to that) an old motor vehicle replacement program. CBEEX constructed the trading platform for Beijing's ETS, and now assists other cities and provinces in China in setting up emissions trading systems.

Jakarta described its GHG-reduction goal, how the goal has been documented in the province's Spatial Plan 2030, and how individual government agencies such as BAPPEDA, the local development and planning agency, and BPLHD, the local environment agency, have been given responsibility for various aspects of plan implementation. Jakarta's planning work has been supported by the central government, a state university, and international aid organizations. For further details, see the case study in box 7.2.

7.2 Experiences in Resource Cities

London described its local governance structure and implications for climate action planning. London has one regional authority overseen by the mayor of London and the Greater London Authority (GLA), which is (broadly speaking) responsible for economic and social development, environmental improvement, and over-arching planning policy. London also has 33 local authorities, called boroughs, which are responsible for delivering typical local government functions, such as waste collection and disposal, education, public housing, and local planning policy, among others. The Mayor and GLA have set out a climate action plan with a goal of reducing London's CO_2 emissions by 60 percent from 1990 levels by 2025. GLA's role in implementing the plan is to lead by setting targets and demonstrating best practice (e.g., through its own building operations and procurement), working with national and local (i.e., borough) governments to address market failures and other barriers, and working with external stakeholders and partners to steer investment (and, where needed, financing) to emission-reducing projects. Broadly speaking, GLA's approach is to aim for influence along a spectrum of four types of interventions, as follows, with decreasing influence but increasing potential for impact:

- Procurement, or the management of the city as a corporate entity
- Policy control, to design and deliver programs
- Strategic leadership, to engage stakeholders and deliver change through the planning process
- Market development, to enable commercialization of low-carbon technologies.

For example, London's RE:NEW project, which has a target of retrofitting all London homes by 2025, is planned by GLA but delivered by the boroughs and external suppliers. GLA put in place a framework contract for central procurement of retrofit services and then provides coordination, legal and technical expertise, as well as coordination with national government and overall program promotion and branding. Within GLA, staff are organized into either a policy or a delivery team, though the teams work in the same office and coordinate closely.

Melbourne described how the City of Melbourne, with about 100,000 people, represents only a small fraction of the population of metropolitan Melbourne (4.2 million people), but is a center of significant economic activity and policy

influence. The City of Melbourne must therefore work in close partnership with the regional government of Victoria and other stakeholders. The City strives to serve as a catalyst for broader regional action by piloting a concept in the central city, in partnership with many stakeholders, fine-tuning the concept, and then applying it across the region. As in London, Melbourne stressed the specialized roles of different tiers of government. The City of Melbourne has set its GHG emission reduction goal (zero net emissions by 2020), identified the measures (largely commercial energy reduction) that are needed to meet the goal, and works with a number of other partners to implement those measures. An example is Melbourne's 1200 Buildings project (described in more detail in box 5.1), which required significant partnerships. In order for the financing system—the Sustainable Melbourne Fund—to be put in place, the City of Melbourne worked with the state government of Victoria to amend state legislation to allow the low-cost loans to be attached to the properties themselves (and repaid through a special collection by the Melbourne City Council) instead of to individual companies as would normally be the case. The City of Melbourne also had to negotiate with a large bank to secure low-interest loan financing. The City shared that a lesson from its experience in this case was the need to be careful about intellectual property, in order for the public (City) to maintain ownership of the design of the particular financial mechanism.

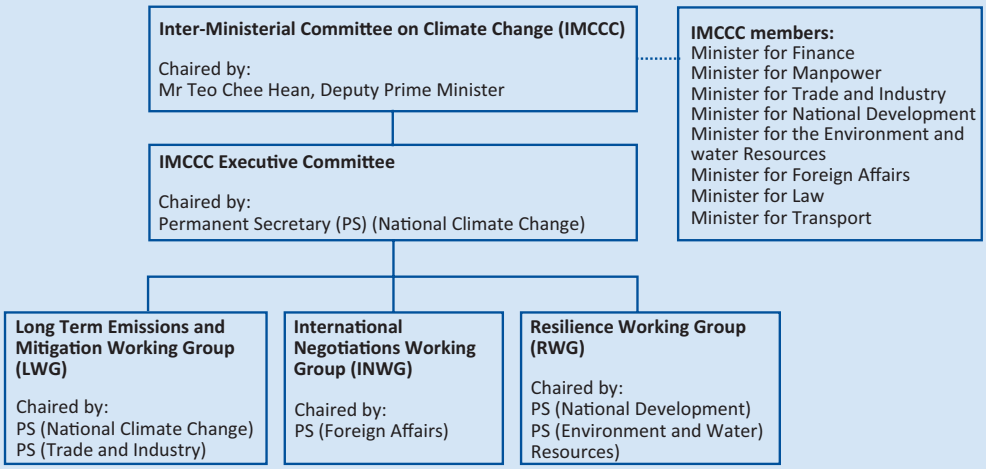
7.3 Discussion

Discussion among the cities focused especially on the role of city government in establishing roles and incentives for the private sector, including how to correct market failures. London described how the private sector in London wants the GLA to lead and set clear targets and requirements so that businesses "know where they stand." Echoing this sentiment, Melbourne emphasized the need for clear and transparent procurement requirements. London also commented that the GLA can access considerable funding from the national and European Union governments that can be used to guarantee low interest loans.

Box 7.1 CASE STUDY: Climate Action Planning in Singapore

As a city-state, Singapore's approach to climate action planning is unique, as it benefits from leadership and coordination from national governance: the National Climate Change Secretariat (NCCS) was formed in July 2010 under the Prime Minister's Office (PMO), to coordinate Singapore's domestic and international policies, plans, and actions on climate change. NCCS supports the work of the Inter-Ministerial Committee on Climate Change (IMCCC), which itself is supported by an Executive Committee comprising the Permanent Secretaries of the member Ministries. The IMCCC Executive Committee oversees the work of three working groups in the areas of mitigation, resilience, and international negotiations (figure B7.1.1).

Figure B7.1.1 Singapore Governance Structure for Climate Action Planning



Singapore's approach to climate change mitigation planning relies on partnerships between NCCS and other public sector agencies, as well as leaders from the business sector, academia, the media, non-governmental organizations (NGOs), and community groups, to discuss and enhance understanding on climate change-related issues. Examples of stakeholder collaborations include the following:

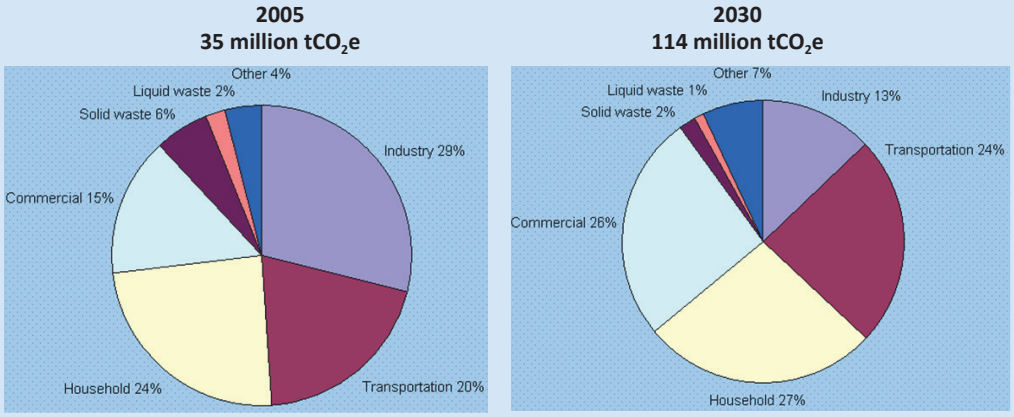
- **Public engagement.** To develop the National Climate Change Strategy (NCCS-2012) document, IMCCC undertook a five-month public consultation exercise to solicit public feedback on, and raise awareness of, Singapore's plans to tackle climate change. Policies and initiatives to address climate change are also supported by public outreach and education programs to raise awareness and engender action.
- **Partnerships with the Community Development Councils** (CDCs), which function as local administrations of districts, initiating, planning and managing community programs and organizing grassroots activities to promote community bonding and social cohesion. Singapore's CDCs work with public agencies on a range of outreach programs in areas such as energy efficiency, recycling, environmental awareness, and more sustainable lifestyles.
- **Corporate partnerships,** including the bestowing of a President's Award for the Environment, recently awarded to a company that improved its energy efficiency.

Box 7.2 CASE STUDY: Climate Action Planning in Jakarta

At COP-15 in Copenhagen in 2009, Indonesia announced a goal to achieve a 26 percent reduction in national GHG emissions relative to business-as-usual in 2020. At the same time at the Mayor's Summit, Jakarta announced a goal to reduce emissions by 30 percent from business-as-usual in 2030.

Jakarta's GHG emissions totaled 35 million tCO_2e in 2005, distributed primarily among the industrial, transportation, household, and commercial sectors (see figure B7.2.1). Emissions are forecast to be 114 million tons in a business-as-usual scenario in 2030, with commercial, transportation, and household emissions comprising growing shares. Jakarta's goal of a 30 percent reduction from business-as-usual therefore implies a reduction in over 30 million tons in 2030.

Figure B7.2.1 GHG Emissions Inventory and Business-as-usual Forecast for Jakarta



Jakarta's GHG reduction goal has been included into the province's Spatial Plan 2030. The Plan calls for Jakarta to reduce GHG emissions through new building energy codes, expansion of mass rapid transit, electronic road pricing, and landfill gas recovery, among other efforts. To supplement the Spatial Plan, Jakarta has also been preparing a Regional Action Plan for reducing Greenhouse Gas Emissions.

Jakarta has developed partnerships with a variety of institutions to develop and implement its plan. To help conduct its GHG inventory and business-as-usual forecast, Jakarta partnered with several external institutions: the National Agency for Assessment and Implementation Technology, the Bandung Institute of Technology, and Swisscontact, the Swiss Foundation for Technical Cooperation.

A number of government agencies in Jakarta have responsibility for implementing aspects of Jakarta's plan. These include BAPPEDA (the local development and planning agency), which coordinates development plans; BPLHD (the local environment agency), which manages technical aspects including GHG inventories and quantification; and the industry and energy agency.

Challenges for Jakarta have included limited technical capacity to conduct analysis (for example, to prioritize highly cost-effective GHG abatement options), coordination of the various local institutions, and procurement of bilateral and multilateral funding in cooperation with the central government.

Case study adapted in part from: Anggraini et al. 2011.

Box 7.3 CASE STUDY: Climate Action Planning in Bangkok

Bangkok was one of the first major cities in the world to develop a climate action plan. The Bangkok Metropolitan Administration's (BMA) Action Plan on Global Warming Mitigation 2007-2012 (Plan) laid out actions for Bangkok to undertake in several sectors. Half of Bangkok's greenhouse gas emissions are in transport; a third are from the production of electricity.

Bangkok undertook a rapid but participatory process to develop its action plan. The process began in May of 2007, with meetings between government (BMA) and private sector stakeholders to draft and sign the Bangkok Declaration on the Cooperation of Alleviating the Global Warming. Shortly thereafter, Bangkok's governor joined the C40 Cities group and began the preparation of the global warming action plan. A draft was released in June of 2007 (with a public hearing) and finalized in August 2007, when a steering committee was formed to oversee implementation.

The Plan called for a 15 percent reduction in Bangkok's emissions by 2012 (relative to business-as-usual) via actions under five broad initiatives: expand mass transit and improve traffic congestion; promote the use of renewable energy; improve building electricity and consumption efficiency; improve solid waste management and wastewater treatment efficiency; and expand park areas. By far, the greatest GHG reductions were targeted from the first initiative (expanding mass transit and improving traffic systems), followed by improvements in building electricity consumption efficiency.

In evaluating progress towards its targets, Bangkok has found that it has already over-performed in building energy efficiency by reducing emissions more than the target set in the Plan. However, reductions under the mass transit initiative have been only one-fifth of the targeted levels so far. The delays have been attributed to the challenges assigning and maintaining responsibilities among different levels of government (e.g., local and national) and to limited public support, especially with regard to the expansion of right-of-ways for public transport infrastructure.

Throughout the process of implementing its Plan, BMA has partnered with a number of external institutions, including the World Bank, UNEP, and the Japan International Cooperation Agency (JICA). Bangkok reports these partnerships have been essential, as has been capacity building of its staff. In 2013, Bangkok is starting work with JICA on a major update to its Plan, the *Bangkok Master Plan on Climate Change (2013-2023)*.

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8. Measurement, Reporting, and Tracking Community Greenhouse Gas Emissions

Most of the focus cities and all of the resource cities have (or are in the final stages of preparing) GHG reduction goals. Setting these goals, measuring progress towards them, and tracking the underlying drivers of changes in GHG emissions in each community requires GHG inventories and, at times, also other metrics. GHG inventories have become a standard tool for assessing a community's contribution to climate change and identifying GHG abatement strategies.

Methods for community scale GHG inventories have, in general, been built from national accounting methods set forth by the Intergovernmental Panel on Climate Change (IPCC). In recent years, many local inventories have started to depart from national methods to reflect the unique characteristics and policy influence of local jurisdictions. Most notably, many communities include the emissions associated with the production of electricity used in the community, even if (as is often the case) that electricity is produced outside the city boundary. This approach is included, for example, in an effort coordinated by workshop co-organizer C40 Cities, called the Global Protocol for Community-scale GHG Emissions (GPC), to develop a community GHG inventory standard.[10] A workshop representative from the World Resources Institute (WRI) described ongoing efforts to pilot the GPC and how it can provide the basis (and performance tracking) for city efforts to conduct future scenario analysis, set targets, create GHG-reduction action plans, and implement policies and measures. Although most communities begin their climate action planning with a GHG inventory, those methods are less consistent, as communities tend to use a wide variety of approaches for assessing abatement potential and tracking progress.

[10] The first draft of the GPC was prepared by C40 Cities and ICLEI Local Governments for Sustainability, in collaboration with WRI, World Bank, UNEP, and UN-HABITAT. For more information on the GPC, see http://www.ghgprotocol.org/city-accounting.

To address the issue of scope, WRI and the World Business Council for Sustainable Development (WBCSD) have introduced three levels of scope that can be considered for calculating GHG emissions from cities:

- *Scope 1*: *Direct* emissions produced *within* the city boundary.
- *Scope 2*: *Indirect* emissions produced outside the city boundary, which are a direct result of activities *within* the boundary; i.e., electricity consumption from a power plant located outside the city.
- *Scope 3: Upstream* or embodied emissions produced outside the inventory boundary and associated with the extraction, production, and transportation of products and services used within the city boundary. Specifically, scope 3 includes emissions from aviation or marine fuels used for air and sea transport, out-of-boundary waste decomposition, and electricity transmission and distribution losses. Embodied emissions from energy, water, building materials, and food may be reported as additional items but are not included.

8.1 Experiences in a Focus City

Shanghai is currently focusing its climate action planning efforts on its emissions trading system (ETS). Hence, measurement and tracking efforts are focused on entities that will be reporting CO_2 emissions under this system, representing roughly half of the city's CO_2 emissions (although Shanghai also has an intensity-based goal for all CO_2 emitted in the province). Entities covered by Shanghai's ETS must prepare a monitoring plan for how they plan to track their CO_2 emissions (direct and indirect) and submit it for approval. Each monitoring plan must contain details on the method and key underlying data used (e.g., material and energy flows, emission factors). For each industry sector, methods have been set forth by the Shanghai Environment and Energy Exchange, CNEEEX. Entities will report their CO_2 emissions to a central online reporting system, which will be third-party verified and then reviewed by the appropriate government department. Shanghai's tracking of progress on GHG emissions over time (following the as yet unannounced cap) will be conducted using the reporting system, though it is not clear whether or how data (including on underlying drivers such as industrial production and energy use) will be made public.

8.2 Experiences in a Resource City

London has conducted annual GHG inventories since 2000 and has also extended its GHG inventory back to 1990. These annual inventories have allowed the Greater London Authority (GLA) to track trends in its GHG emissions and helped inform setting of its ambitious long-term GHG reduction goals, e.g., a 60 percent reduction below 1990 levels by 2025. Broadly speaking, London's climate action process has been to:

1. **Develop a GHG inventory.** London has focused its inventory on energy-related CO_2, both from direct combustion of fuels (e.g., liquid fuels in vehicles, natural gas in buildings and industry) within the GLA territory, as well as indirect combustion to produce electricity used within the territory. London's official GHG inventory is therefore a relatively standard, "production"-based GHG inventory.
2. **Establish a GHG reduction goal,** based in part on analysis of what reductions are possible.
3. **Formulate policies and actions to achieve the goal.** For more on London's analysis of how it will meet its goal, see the case study in box 8.1.
4. **Monitor and report GHG emissions.**

London also tracks additional metrics to help it gauge trends in local and national drivers of GHG emissions (or emission reductions), such as local vehicle travel, average vehicle energy intensities, the carbon intensity of the national grid, and electricity generation capacity of local (distributed) renewables. Beyond its standard GHG inventory, London has also helped pioneer additional perspectives on the GHG emissions associated with consumption of goods and services in London, regardless of where the emissions are produced. For example, emissions associated with food consumed in London arise from energy to make fertilizers applied to fields, direct emissions from fertilizer oxidization in fields, enteric emissions from livestock, and fossil fuel combustion for farm and transportation equipment (among other sources), nearly all of which are released outside of London's borders. London has conducted estimates of the GHG emissions associated with consumption of food and all other goods and services consumed in London, with the intent that these additional perspectives may yield greater insight into the determinants of urban GHG emissions and new opportunities for policy intervention to reduce global GHGs, such as regarding diet, lifestyles, or use of low-GHG goods and materials.

8.3 Discussion

Discussion among workshop participants focused especially on the methods and rationale for accounting for GHG emissions released outside the city boundary but associated with consumption of goods and services within the boundary. Emissions associated with the life-cycle of goods and services can in various contexts be referred to as trans-boundary, supply chain, consumption-based, or Scope 3 emissions, with relatively minor distinctions between them. (In these proceedings the term "consumption" is used to describe them all.) Some of the advantages and limitations of both production- and consumption-based accounting, as applied to cities, are summarized in table 8.1.

Table 8.1 Production- and Consumption-based GHG Inventories for Cities: Advantages and Limitations

	Approach	Advantages	Limitations
Production (In some cases called geographic, or *scope 1 plus scope 2*)	Account for GHG emissions released within the city. Often includes emissions associated with electricity.	Easier to calculate based on more readily available data; better captures the GHG emissions associated with transportation and building energy, over which cities have significant influence.	In some cases driven strongly by nationally controlled sources (e.g., industry, ports) over which cities have relatively little influence; inherently penalizes cities with energy-intensive industries.
Consumption (In some cases called *trans-boundary, supply chain, or scope 3*)	Account for GHG emissions associated with goods and services consumed within the city, regardless of where the associated emissions are released.	Can provide greater information on how consumer choices affect global GHG emissions, giving a more complete picture of a community's contribution to global GHG emissions.	Tends to be data and resource intensive; also often based on regional or national averages, limiting the ability to track progress of local initiatives over time.

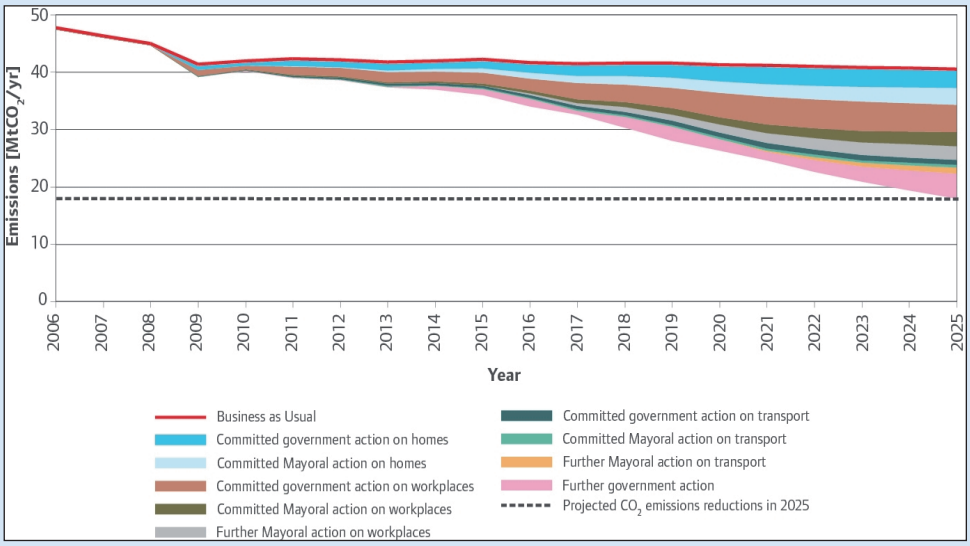
Box 8.1 CASE STUDY: Estimating GHG Reductions in London

A number of cities around the world have set ambitious, long-term GHG-reduction goals. However, few have analyzed or articulated how to reach them. London is one city that has, through detailed quantification of the contribution of policies and measures to the Greater London Authority's goal of reducing London's CO_2 emissions by 60 percent from 1990 levels by 2025 and 80 percent by 2050.

The Greater London Authority (GLA) began its analysis with a forecast of CO_2 emissions under a business-as-usual scenario absent further actions to reduce emissions. This forecast takes into account expected population and economic growth in London, national trends that will influence the energy intensity of vehicles and buildings, as well as the carbon intensity of electricity supply. Taking into account these trends, GLA expected London's emissions to hold relatively constant at roughly 40 million tons per year through 2025 (figure B8.1.1).

From there, GLA estimated the impact on London's emissions of recently announced and committed national government policies to reduce GHG emissions, such as further decarbonization of the electricity grid, the imposition of more aggressive building energy efficiency standards, as well as the potential impact of additional government policies under consideration to promote electric vehicles and further reduce the carbon intensity of the national grid. In figure B8.1.1, the potential impacts of these national policies on London's emissions in each sector are labeled as committed and further government action.

Figure B8.1.1 GLA Forecast of Annual CO_2 Emissions in London



$MtCO_2$=million tons carbon dioxide

Through this analysis, GLA found that additional city action would be needed, in particular the expansion of decentralized energy production and ambitious local building energy retrofit programs, as well as further actions to reduce emissions from transport through expansion of penetration of electric vehicles and major new investments in pedestrian and bicycling infrastructure.

Case study adapted in part from Greater London Authority, 2011.

References

Greater London Authority. 2011. “Delivering London’s Energy Future: The Mayor’s Climate Change Mitigation and Energy Strategy”. London.

9. Summary and Next Steps

The workshop aimed to share the best practices of climate change action plans in C40 cities, both from developed and developing cities, and apply the knowledge to support these cities' quest for a low-carbon development path. Correspondingly, this chapter summarizes the city specific challenges and key findings and lessons learned from both focus and resource cities, followed by next steps on how to apply the collected knowledge.

9.1 Challenges

At the end of the workshop, each of the five focus cities shared some thoughts on key themes and possible next steps. **Ho Chi Minh City** stressed the challenges it faces in conducting regular GHG inventories, in demonstrating the benefits of proposed actions, and in funding major projects. The city expressed interest in mechanisms for streamlining funding from international donors. **Bangkok** discussed how it too does not have an up-to-date GHG inventory, in part due to limitations in local data, and expressed a desire for national data, shortcuts, or accounting standards. Bangkok also discussed its unique political context, including transitions in local leadership, as well as unclear responsibilities between local and national governments on issues related to climate action. **Beijing** described how many of the workshop's discussions were relevant to Beijing as it prepares its ETS and discussed a desire for continued collaboration with funders and workshop attendees. **Shanghai** echoed Beijing's statements, as well as the need for increased analytical capacity to design its system and funding support for project implementation. **Jakarta** discussed, like Ho Chi Minh and Bangkok, the need for methodologies to measure their progress and design mitigation measures, as well as the need for support from the central government on climate action plan implementation.

Further, the focus cities noted that the experiences introduced by the resource cities have the potential to provide solutions to the challenges focus cities are facing. Table 9.1 identifies some of the barriers and potential solutions mentioned during the discussion.

Table 9.1 Challenges and Potential Solutions for Building Low-carbon Cities

Challenges	Potential solutions
A lack of institutional coordination	High-level political commitment and coordination Establishment of an inter-ministerial committee Secretariat housed in senior ministries with high-level authority, with adequate budget
Limited municipal financing for capital-intensive infrastructure	Strong political commitment Use of government funding for capital costs of public transport infrastructure, while transit fares cover operational costs Active engagement of local financial institutions and private investment
Low staff capacity	Strengthened peer-to-peer exchanges and sharing of knowledge and experience among countries Capacity building
Urban sprawl	Master plan to integrate land use, transport, and buildings Required sector coordination and stakeholder cooperation to implement the master plan Development of new city districts near the city center Steering of development demand near the existing public transport corridors
Traffic congestion and pollution	Policies to restrict private vehicles and expand public transport, with the aim to increase mobility and easy access to mass transit Clean vehicles and fuels
Lack of market demand for building retrofit	Disclosure of building energy consumption compared to building benchmarks, or building energy efficiency certificates Financial incentives Public financing mechanisms to engage local financial institutions with consumer financing or guarantee schemes

9.2 Key Findings and Lessons Learned

A number of **findings and lessons learned** emerged during the workshop.

- Overall, while low-carbon city actions and measures can vary depending on each city's circumstances, common success factors across cities emerge. These include (a) strong leadership and political commitment; (b) a clear vision, an ambitious target, and a realistic plan to achieve it; (c) effective and conducive policies and municipal financing; (d) institutional coordination and integrated planning; and (e) measurement of progress against targets.

- Cities need to develop the appropriate mix of policy instruments, balancing mandatory approaches with market-based mechanisms and incentives.
- The abatement cost curve methodology provides an analytical framework to set low-carbon targets and identify cost-effective priority abatement actions and investments to meet them.
- Urban planning requires long-term strategic plans. The transport sector has to be an integral part of the planning, with high density development along the public transportation network. New town development needs to ensure direct access to the town center and walkability within the neighborhood.
- Key success factors of sustainable urban transport include: (a) shifting more trips to public transport. This requires not only building an extensive public transport network, but also making public transport a choice mode by making it convenient for travelers and enhancing integration of the public transport system; (b) managing car-based travel demand. For example, Singapore adopted measures to curb car ownership through a vehicle quota system and constrain car usage through effective road pricing; and (c) encouraging adoption of lower-emissions vehicles. Singapore is providing rebates for low-emission vehicles. In Stockholm, 75 percent of the public transportation system runs on renewable sources.
- Building retrofit faces major barriers, as commercial building owners, usually multiple owners for one building, are reluctant to invest in energy efficiency measures. Shanghai municipal government is developing building energy efficiency benchmarks and provides financial incentives for building retrofit. They also have a mandatory requirement for large commercial buildings to install on-line monitoring platforms to track their energy consumption. Tokyo adopts cap-and-trade to retrofit large commercial buildings under its carbon cap-and-trade schemes. London focuses on government buildings first, with an ESCO model. Melbourne provides its Sustainable Fund to support financial institutions providing concessional loans to property owners for building retrofit.
- City-level cap-and-trade systems take time to design and implement; they can be challenging, but also attractive as a market-based instrument. The Tokyo cap-and-trade scheme needed 10 years to set up its MRV system and has had only nine trading transactions since its inception in 2010. There is, however, significant global interest and momentum for this option. Beijing and Shanghai are now also piloting carbon cap-and-trade schemes.

- Achieving low-carbon targets requires a holistic, multi-sector approach; therefore, several client cities are facing difficulties of institutional coordination. In Beijing and Shanghai, the municipal Development and Reform Commission is in charge of the carbon cap-and-trade pilots, as they have overarching mandates and responsibilities for city development. London set up a Project Delivery Unit to be in charge of the public building retrofit program.
- City-level GHG emissions inventories need a recognized, international standard, so that cities can measure and report on their emissions in a consistent manner. The Global Protocol for Community-Scale GHG Emissions (GPC), jointly developed by the World Bank, C40 Cities, ICLEI-Local Governments for Sustainability, and World Resource Institute (WRI), advanced an international standard for measuring city greenhouse gas emissions. The frontier challenge in this area lies with measuring consumption-based emissions, which reveals different information than standard production-based GHG inventories.

9.3 Next Steps

The workshop represented only one step of what could be a longer term effort on capacity building and policy development among the participating cities. Building on the momentum of the workshop, the participating cities would like to have: (a) more knowledge sharing and networking; (b) tailored technical assistance and capacity building to meet the specific needs of focus cities; and (c) support for policy dialogue and high-level engagement both at the city-level and with national governments for focus cities.

The focus and resource cities, the World Bank, C40 Cities, and the Centre for Liveable Cities all expressed they value continued networks of peer-to-peer learning among cities in East and Southeast Asia on climate action plans. As a next step, the World Bank is exploring tailored technical assistance and targeted capacity building for those East Asian C40 cities who expressed an interest in such assistance. In that regard, while these proceedings document the rich experience of the cities presented at the workshop, the lessons learned and the relationships built at the workshop will carry on.

Annex 1. Workshop Agenda

World Bank-C40-CLC
City-scale Climate Action Planning in East and Southeast Asia
AGENDA

April 10-12, 2013

The URA Center, East Wing, Training Room 1 (10th floor)

45 Maxwell Road, Singapore 069118, Singapore

Day 1

8:00 *Shuttle leaves M Hotel for The URA Centre, East Wing*

8:30-9:00 **Welcome, Introductions and Overview**

Speakers:

- World Bank: Xiaodong Wang, Senior Energy Specialist: Workshop Goals and Objectives
- C40: Seth Schultz, Director for Research, C40 Secretariat: Brief overview of importance of city-scale climate action planning efforts and status globally and C40 related initiatives
- Centre for Liveable Cities: Mr. Khoo Teng Chye, Executive Director: Welcome

9:00-11:00 **Session 1: Key Successes and Challenges of City Climate Action Planning and Implementation in East and Southeast Asia**

- Overview of key successes and challenges in Bangkok, Beijing, Ho Chi Minh City, Jakarta, and Shanghai [Short presentations by climate action lead from each of the five cities]

I. Beijing: Mr. Du Shaozhong, Chairman of the Beijing Environment Exchange

II. Shanghai: Mr. Bin Hui, Vice President of the Shanghai Environment and Energy Exchange

III. Ho Chi Minh City: Mr. Viet Trung Nguyen, Director, Solid Waste Management Division, HCMC Department of Natural Resources and Environment; and Ms. Nhung Xuan Luong, Deputy Director, Energy Management Division, HCMC Department of Industry and Trade

IV. Bangkok: Miss Panyalaln Thawonrat, Environmental Officer, Air Quality and Noise Management Division, Department of Environment, Bangkok Metropolitan Administration

V. Jakarta: Mr. Tauchid Tjakra Amidjaja, Environmental Management Agency, DKI Jakarta Provincial Government

- Good practices from Singapore and Stockholm

I. Singapore: Mr. Benedict Chia, Director, Strategic Issues, National Climate Change Secretariat

II. Stockholm: Tomas Gustafsson, Head of Environment and Sustainability, Stockholm Royal Seaport Development Administration

Moderator: Yan Peng, C40 Cities

Guiding questions:

- What have been the successes and challenges to implement climate action plans among the five cities?

11:00-11:15 Break

11:15-12:30 **Session 2: Urban Planning and Land Use: Opportunities and Lessons**

- Opportunities and lessons regarding policy and implementation

Speakers (10 minutes each):

- Ho Chi Minh: Mr. Tuan Anh Nguyen, Vice Director, Center of Architecture Research, HCMC Architecture and Planning Department
- Jakarta: Mr. Beni Agus Chandra, Head of Spatial Planning of Jakarta Provincial Government
- Stockholm: Tomas Gustafsson, Head of Environment and Sustainability, Stockholm Royal Seaport Development Administration
- Singapore: Mr. Julian Goh, Deputy Director, Centre for Liveable Cities

Moderator: Marcus Lee, World Bank

Guiding questions:

- What are the opportunities and best practices for integrated land use and transportation planning, especially for creating people and transit friendly urban form and creating mixed-use development

12:30-1:30 **Lunch**

1:30-3:00 **Session 3: Transport: Opportunities and Lessons**

- Opportunities and lessons regarding implementation of transport policies

Speakers (10 minutes each):

- Beijing: Ms. Liu Ying, Deputy Director of Beijing Transport Energy & Environment Center
- Bangkok: Mr. Thosapol Suparee, Chief of Traffic Signal Sub-Division, Department of Traffic and Transportation, Bangkok Metropolitan Administration
- Singapore: Mr. Poon Joe Fai, Deputy Director (Policy), Policy & Planning Group, Land Transport Authority

Moderator: LTA Mr. Poon Joe Fai

Guiding questions:

- What policies have been successful at implementing public transportation systems, such as metro and BRT, that increase mode share of public transport; reduce congestion; and discourage private vehicle driving?

3:00-3:15 Break

3:15-4:45 **Session 4: Building Energy: Opportunities and Lessons**

- Opportunities and lessons regarding implementation of building energy policies

Speakers (10 minutes each):

- Bangkok: Ms. Natnares Macharoen, Environmental Officer, Air Quality and Noise Management Division, Department of Environment
- Shanghai: Mr. Zhu Weifeng, Deputy Director, Shanghai Research Institute of Building Science
- Tokyo: Yuko Nishida, Planner , Urban and Global Environmental Division
- Melbourne: David Mayes, Manager of Strategic Planning

Moderator: Xiaodong Wang, World Bank

Guiding questions:

- How have cities adopted and enforced performance-based energy codes for new buildings?
- What policies and financing mechanisms have cities implemented to retrofit inefficient buildings?

4:45 Remarks by Mr. Bert Hofman, Director and Chief Economist, East Asia and the Pacific Region, World Bank: World Bank priorities on low-carbon cities

5:00 **Recap of Day 1: Summary of Key Themes / Lessons**

Moderator: Pete Erickson (SEI)

6:00 *Dinner at 8 Treasures, 282A South Bridge Rd*

8:00 *Informal gathering TBD*

Day 2

8:00 *Shuttle leaves M Hotel for the URA Centre, East Wing*

8:30-8:45 **Review of Day 1 and Overview of Day 2**

Moderator: Pete Erickson (SEI)

8:45-10:00 **Session 5: Integrated City-wide Policies / Cap-and-trade: Opportunities and Lessons**

- Opportunities and lessons regarding implementation of cross-sector, city-wide policies, especially cap-and-trade

Speakers:

- Beijing: Prof. Zhang Xiliang, director of the Institute of Energy, Environment and Economy at Tsinghua University
- Shanghai: Prof. Wu Libo, Executive Director, Center for Energy Economics and Strategies Studies and Deputy Director Center for Environmental Economics Studies at Fudan University
- Tokyo: Yuko Nishida, Planner, Urban and Global Environmental Division

Moderator: Marcus Lee, World Bank

Guiding questions: Key issues to be considered to set up domestic carbon cap and trade schemes include: trading participants (who trades with who—between enterprises, between buildings, or between districts, what are the eligibility criteria); trading platform; penalty; pricing mechanisms (how the pricing is determined, what is the range of pricing fluctuation, whether banking is allowed, etc.); regulatory mechanisms (who will be the regulator, what is the time period of the trading mechanism); and relationship with other trading mechanism, such as energy saving certificates trading and green electricity trading.

10:00-10:15 *Break*

10:15-12:00 **Session 6: Institutional Arrangements for Effective Climate Action Planning**

- Successful institutional and governance structures

Speakers:

- Beijing: Mr. Du Shaozhong, Chairman of the Beijing Environment Exchange
- Jakarta: Mr. Andi Baso, Head of Industry and Energy Agency, DKI Jakarta Provincial Government
- London: Michael Doust, Senior Project Manager, Greater London Authority
- Melbourne: David Mayes, Manager of Strategic Planning

Moderator: Mr. Benedict Chia, Director, Strategic Issues, National Climate Change Secretariat

Guiding questions:

- How have cities worked together across departments and levels of city government, and with external stakeholders, to effectively advance climate action plans and policies?

12:00-1:00 **Lunch**

1:00-2:45 **Session 7: Measurement, Reporting, and Tracking**

- How to measure and track and report emissions (e.g., using the Global Protocol for Community-scale GHG emissions), policy implementation and progress towards goals

Speakers:

- Shanghai: Mr. Bin Hui, Vice President of the Shanghai Environment and Energy Exchange
- London: Michael Doust, Senior Project Manager, Greater London Authority
- World Resources Institute (WRI): Dr. Wee Kean Fong, Senior Associate with the Greenhouse Gas Protocol, WRI

Moderator: Seth Schultz, C40

Guiding questions:

- How to create estimates of base year and reference case greenhouse gas emissions, as well as measure progress towards goals?

2:45-3:00 *Break*

3:00-3:45 **Session 8: Summary of Lessons and Next Steps**

Discussants:

- Delegation heads from Bangkok, Beijing, HCMC, Jakarta, Shanghai

Moderator: Xiaodong Wang, World Bank

Guiding questions:

- What city-wide policies or frameworks, from cap-and-trade to carbon taxes to highly integrated land use and transportation planning, have cities implemented?
- How can this initiative help C40 developing cities in East and Southeast Asia with follow-up technical assistance and further facilitate knowledge exchange?

3:45-4:00 **Closing**

Speakers:

- Singapore: Mr. Julian Goh, Associate Director, Centre for Liveable Cities
- World Bank: Xiaodong Wang, Senior Energy Specialist
- C40: Seth Schultz, Director for Research

4:00 Adjourn

6:00 Dinner, Pagi Sore, Amara Shopping Centre, 100 Tras Street

Day 3

7:45-12:30 Site Visits[11]

- TreeLodge@Punggol
- Land Transport Authority, Singapore

PROGRAMME FOR ENVIRONMENTAL EXPERIENTIAL LEARNING (PEEL): EXCLUSIVE CLIMATE CHANGE TRAIL

organized by the Singapore Environment Institute[12]
(http://www.nea.gov.sg/cms/sei/index.html)

Itinerary

0745 – 0800	Assemble at Pick-up Point Depart for the Treelodge@Punggol	M Hotel, 81 Anson Road, Singapore 079908
0900 – 1030	Presentation and Conducted Tour at the Treelodge@Punggol	Treelodge@Punggol
1100-1200	Tour of LTA Gallery	LTA Gallery
1200-1230	End of PEEL Depart and Travel back to Drop-off Point	M Hotel

[11] Co-sponsored by the Centre for Liveable Cities.

[12] Singapore Environment Institute is the training and knowledge division in the National Environment Agency. The Institute helps to promote Singapore as an environment hub by providing thought leadership in environmental sustainability and management for high-density, compact cities.

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