CityLinks Primer

on Subnational Approaches for Low Emission, Climate Resilient Development

ICMA is pleased to present the *CityLinks Primer on Subnational Approaches for Low Emission, Climate Resilient Development.* The Primer is an introduction to the key principles and practices of low carbon, climate resilient development. It includes resources and organizations which provide more in-depth guidance on planning and implementation. The Primer is a tool for local government officials, as well as development practitioners and international donor organizations to support the critical work being undertaken at the sub-national level toward a low carbon, climate resilient and sustainable future.

The Primer was developed in collaboration with our partner, *The Institute for Sustainable Communities (ISC),* and funded by the *United States Agency for International Development (USAID)* through the ICMA CityLinks project. ICMA's flagship program, CityLinks, is on the forefront of convening local governments around the world to plan jointly for climate related events. ICMA's members, professional managers in local government, have eagerly embraced city-to-city partnerships to share knowledge and best practices with their counterparts in other countries. Partnerships and friendships enrich all participants and frequently endure after project funding ends.

This Primer comes as ICMA celebrates the 100th anniversary of the association and the professionalization of local government management in the United States. Idealism, foresight, innovation and evidence-based solutions have been hallmarks of the local government management profession for the last 100 years. And they will remain its hallmarks throughout the 21st century. Sustainability in the face of climate change and building climate resilient communities will be a fundamental goal for our worldwide membership and the growing global networks of cities ICMA supports. More severe and more frequent weather events have caused widespread destruction, and rising sea levels are prompting careful analysis of development decisions. As local government officials give more attention to creating livable, sustainable and resilient communities, ICMA has stepped up research, training and education in these areas.

It is our hope that this Primer will encourage collaboration between international development stakeholders and city officials. ICMA understands that cities learn best from other cities and the Primer offers opportunities for knowledge exchange among cities across the globe focused on emissions reductions and climate resiliency.
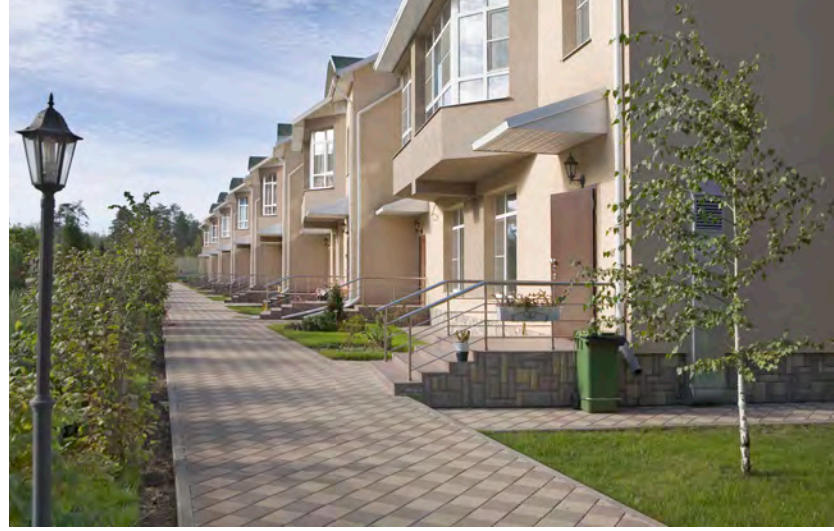
David Grossman
CityLinks Director

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ADB	Asian Development Bank
ACCRN	Asian Cities Climate Change Resilience Network
ASEAN	Association of Southeast Asian Nations
BAU	business as usual
BRT	bus rapid transit
C40	C40 Cities Climate Leadership Group
CCCI	Cities and Climate Change Initiative of UN-Habitat
CCI	Clinton Climate Initiative
CCRD	climate change resilient development
CDIA	Cities Development Initiative for Asia
CDKN	Climate and Development Knowledge Network
CO2eq or CO2e	The amount of CO_2 which would have the equivalent global warming impact as a given quantity and type of greenhouse gas
CoM	Covenant of Mayors
EC-LEDS	Enhancing Capacity for Low Emission Development Strategies
GEF	Global Environment Facility
GGBP	Green Growth Best Practices
GHG	greenhouse gas
Gt	gigatons
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICLEI-SA or ICLEI	ICLEI-Local Governments for Sustainability
ICMA	International City/County Management Association
IGES	Institute for Global Environmental Strategies
IIED	International Institute for Environment and Development
IISD	International Institute for Sustainable Development
IPCC	Intergovernmental Panel on Climate Change
ISC	Institute for Sustainable Communities
ISET	Institute for Social and Environmental Transition

ISO	International Organization for Standardization
JICA	Japan Investment Cooperation Agency
LC2	Low Carbon Livable Cities Initiative
LEAD	Low Emissions Asian Development program
LECRD	low-emission and climate resilient development
LEDS	low emission development strategy
LEDS-GP	Low Emission Development Strategies Global Partnership
NAMA	Nationally Appropriate Mitigation Action
NAPA	National Adaptation Plan of Action
NGO	non-governmental organization
OECD	Organisation for Economic Co-operation and Development
PPP	Public-Private Partnership
SEAP	Strategic Energy Action Plan
SEI	Stockholm Environment Institute
SLD	shared learning dialogues
UCLG	United Cities and Local Governments
UCCRN	Urban Climate Change Research Network
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN-Habitat	United Nations Human Settlements Programme
US$	United States dollars
USAID	United States Agency for International Development
USG	United States Government
WRI	World Resources Institute
WWF	World Wildlife Fund

Introduction

1.1 Urbanization, Climate Change, and Sustainable Development

More than half the world's population now lives in cities, and urban populations are expanding rapidly. Each week, the world's urban population increases by another 1.3 million people. If current trends continue, the world's urban population will reach nearly 5 billion by 2030 and 6.3 billion by 2050, with 90% of the increase in developing countries.[1] To meet this unprecedented level of growth, the world will need to build the equivalent of a city of one million people every five days from now until 2050.[2]

Rapid urbanization is contributing to dramatic increases in the emissions of carbon dioxide (CO_2) and the other greenhouse gases (GHGs) that drive climate change. Human activities that are concentrated in urban areas, such as electricity generation, transportation, manufacturing, and waste management consume large quantities of fossil fuels, producing increasing amounts of energy-related emissions as urban areas expand across the globe. Cities now consume about two-thirds of the world's energy and account for a similar amount of global energy-related CO_2 emissions.[3]

As GHG emissions continue to rise and average global temperatures increase, climate change effects on urban areas are intensifying. In many cities, heat waves are becoming more common and last longer. Heavy rainfall events are more frequent and severe, leading to dangerous flooding. Torrential runoff is producing life-threatening mudslides in cities located in hilly areas. In regions with prolonged droughts, city water supplies are dwindling. Sea level rise is flooding low-lying coastal areas, damaging wetlands and polluting groundwater. These extreme weather events and sea level rise threaten urban infrastructure, natural resources, and human well-being, with risks continually increasing.[4] Many city leaders now recognize that a sustainable growth pathway is not possible without addressing climate change, and are looking for guidance on cost-effective ways to reduce their city's GHG emissions (mitigation) and build climate-change resilience (adaptation).[5] The CityLinks *Primer on Subnational Approaches to Low Emission, Climate Resilient Development* responds to this need by providing a concise overview of concepts and approaches for those who are new to this topic.

> ### Defining Urban
>
> Urban areas offer a range of services and facilities and span a range of forms, including central cities, peri-urban areas, city-regions, traditional suburbs, mega-cities, towns, metropolitan and micropolitan areas, and small- and intermediate-sized cities. Census bodies in different countries define "urban" differently based on a range of factors that vary for different countries, such as administrative criteria, population size, population density, the predominance of non-agricultural workers, and the concentration of infrastructure.
>
> Source: USAID. 2013. Sustainable Service Delivery in an Increasingly Urbanized World Policy. Washington DC: United States Agency for International Development (USAID).

High Costs of Delaying Action

With so many immediate and pressing problems facing cash-strapped city managers, climate change may not be a high priority. However, experience shows that investments now will help reduce, and may even avoid, costs and damages that will become higher over time as climate change worsens. According to one analysis, Tanzania's ability to adapt to climate change is now US$ 100 to 150 million per year, but could increase rapidly in future years if adaptation is delayed, reaching US$ 1 billion per year by 2030, and potentially more if increasing development is factored into the estimate. The authors reached the sobering conclusion that without adaptation, "...the combined effects of current climate vulnerability and future climate change are large enough to prevent Tanzania achieving key economic growth, development and poverty reduction targets, including the planned timetable for achieving middle income status."

Source: Watkiss, P. et al (2011). The Economics of Climate Change in the United Republic of Tanzania. Report to Development Partners Group and the UK Department for International Development. Published January 2011. Available at: http://economics-of-cc-in-tanzania.org/

1.2 The Primer and USAID's Policy on Sustainable Service Delivery in an Increasingly Urbanized World

This primer serves as a supporting document to USAID's urban policy, entitled *Sustainable Service Delivery in an Increasingly Urbanized World Policy.[6]* The policy is designed to support the capacity of Missions "to promote service delivery that attains large-scale benefit to urban residents in a sustainable manner over the long-term."[7] To achieve this vision, the policy is centered around four key development principles:

1. Ensuring Political and Financial Sustainability
2. Advancing Accountable, Pro-Poor Service Delivery Models
3. Fostering Market Orientation and Public-Private Collaboration
4. Supporting Municipal Resilience

Principle 4, Supporting Municipal Resilience, means embedding climate change considerations in all aspects of city planning, management, and service delivery. This primer provides an overview of concepts and practices for low emission, climate resilient strategies that can help cities achieve this objective.

1.3 Contents and Organization

The primer covers topics that emerged as priorities from interviews with leading practitioners and a focused literature review, drawing primarily from documents by the United States Agency for International Development (USAID) and U.S. Government (USG) on climate resilient, low emissions development, as well as syntheses of climate change knowledge produced in 2013 and 2014 by the International Governmental Panel on Climate Change (IPCC), the world's leading body of climate change experts. The primer is not a compendium of all programs currently underway. Rather, it is meant to provide a "roadmap" to the most promising approaches.

The information in the primer is built around examples of best practices in cities in developing countries, where the term cities applies broadly to government levels below the national level, including regional, state, provincial, district, and city levels. The contents of subsequent sections of the primer are outlined below:

Section 2 provides a general introduction to urban low emission development strategies; approaches that integrate mitigation, adaptation and sustainable development; the potential for cities to help national governments meet their GHG emissions reduction targets; and promising mitigation measures for cities.

Section 3 focuses on implementation challenges and opportunities in the areas of governance, financing, stakeholder engagement, and knowledge sharing. Each subsection is organized by challenges, opportunities, and key actions.

The last section provides a summary of key messages, annexes, and a glossary. Annex 1 is a list of the practitioners interviewed, and Annex 2 provides links to related programs and initiatives and their organizations.

1 UN. 2014. World Urbanization Prospects: The 2014 revision.

2 Seto, K.C., B. Güneralp, and L. Hutyra, 2012. Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. Proceedings of the National Academy of Sciences of the United States of America.109:16083–16088.

3 IPCC. 2014. Summary for Policymakers, In: Climate Change 2014, Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. http://www.ipcc.ch.

4 IPCC. 2012. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY, USA, 582 pp. http://www.ipcc.ch.

5 IPCC. 2014. Chapter 12: Human Settlements, Infrastructure and Spatial Planning. Working Group III. IPCC 5th assessment report. Intergovernmental Panel on Climate Change (IPCC). http://www.ipcc.ch.

6 USAID. 2013. Sustainable Service Delivery in an Increasingly Urbanized World Policy. Washington DC: 2013.

7 USAID. 2013. Sustainable Service Delivery in an Increasingly Urbanized World Policy. Washington DC: United States Agency for International Development (USAID).

Low Emission, Climate Resilient Urban Development

2.1 Low Emission Development Strategies (LEDS)

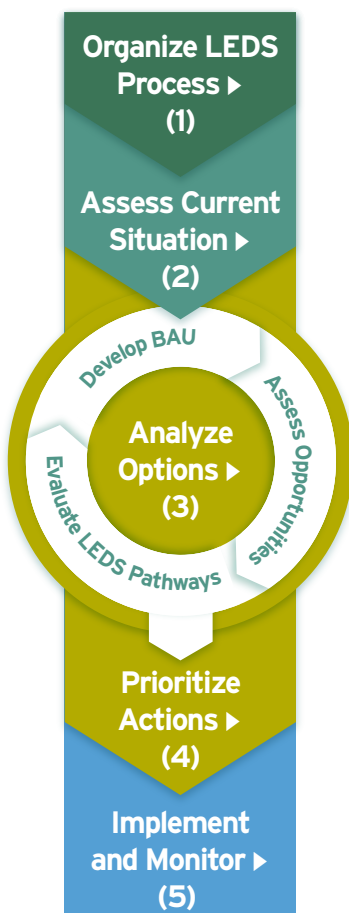A "low emission development strategy" or LEDS is a voluntary and non-binding strategic analysis and planning process that identifies specific actions to promote economic growth in ways that will lower GHG emissions trajectories while also supporting sustainable development (see box below). Such strategies not only help organize effective mitigation actions, but they build investor confidence and mobilize financing.[8]

The five major process phases of a LEDS are:

1. Organize the LEDS process
2. Assess current situation
3. Analyze options
4. Prioritize actions
5. Implement and monitor

The amount of time needed for initial LEDS development varies

Figure 1

Organize LEDS Process ▶ (1)

Assess Current Situation ▶ (2)

Develop BAU

Assess Opportunities

Analyze Options ▶ (3)

Evaluate LEDS Pathways

Prioritize Actions ▶ (4)

Implement and Monitor ▶ (5)

What is a Low Emission Development Strategy (LEDS)?

A LEDS is a country owned and led process that includes a strategic framework that articulates concrete actions, policies, programs, and implementation plans to advance economic growth, improve environmental management, and meet development objectives. This framework provides a foundation for achieving long-term, measurable greenhouse gas emission reductions as compared to a business-as-usual development pathway.

A robust LEDS could include the following elements:

- A country's integrated development goals and objectives, national greenhouse gas inventory, and economic and resource data
- Long-term projections of business-as-usual economic growth and greenhouse gas emission pathways
- Alternative development scenarios that achieve economic and development goals while slowing the growth rate of greenhouse gas emissions and support climate change resilience
- Prioritized policies, programs, and measures—identified through broad stakeholder engagement—that support the low emission development scenarios
- Implementation plans and monitoring strategies

Source: Enhancing Capacity for Low Emission Development Strategies. November 2013. 2 pages. Collin Green, USAID's Office of Global Change and Alexia Kelly, U.S. State Department, Office of Global Change. http://en.openei.org

depending on local circumstances, objectives, and priorities (e.g., the LEDS for Bangladesh took six months, while the LEDS for South Africa took three years).[9] In general, the most useful and cost-effective way to develop a LEDS is to take advantage of existing planning and policy frameworks such as development and land-use plans. A LEDS is not static, however, and development and implementation of a LEDS is a long-term, iterative process that is updated as needed to reflect changing circumstances, such as changes in development priorities, technological improvements, etc.

2.2 Urban LEDS

Most LEDS are national strategies, but there is growing interest in developing subnational LEDS, particularly at the city-level (see Table 1). An urban LEDS reflects and builds upon national policies and programs. At the same time, city-level implementation of a LEDS benefits from the control that a city government exercises over public funding for infrastructure, public services, and environmental protection, along with its ability to revise building codes and other regulations to reduce energy use.[10]

Table 1: Examples of Cities Developing a LEDS

City	Country
Recife	Brazil
Rio de Janeiro	Brazil
Bogotá	Colombia
Huila	Colombia
Batumi	Georgia
Gori	Georgia
Kutaisi	Georgia
Poti	Georgia
Rustavi	Georgia
Tbilisi	Georgia
Zugdidi	Georgia
Maharashtra	India
Thane	India
México City	México
KwaDukuza Municipality	South Africa
Steve Tshwate Municipality	South Africa
Muangklang	Thailand

Source: Table created by the authors, primarily from information in GGBP. 2014. Best Practices Synthesis: A Summary of Subnational Green Growth Approaches in Different Countries and Regions (http://www.ggbp.org) and the Urban LEDS Newsletter, March 2014 (http://urbanleds.iclei.org).

Georgia

Development of Urban LEDS

Background

Georgia's Second National Communication to the UNFCCC projected that the country will see a 275% increase in GHG emissions from the energy sector between 2006 and 2025 to meet the growing energy demands of the country's expanding industry, transport, and residential sectors. A lack of institutional capacity and policies that promote energy efficiency and conservation contributes to the rise in emissions. The problem is exacerbated by outdated, inefficient energy production, transmission and distribution systems. GHG emissions and air pollution also hinder Georgia's ability to compete in regional and global markets, slowing the country's economic growth and development.

To address these issues, several municipalities in Georgia have become signatories to the European Union (EU) Covenant of Mayors (CoM), which helps increase cities' access to international financial resources, including EU grants and donor programs. Eastern Partnership countries that are Signatories designate a Covenant National Coordinator (CNC) to assist in developing their policies and management programs. Georgia has two national ministries as CNCs, the Ministry of Energy (MOE) and the Ministry of Environment and Natural Resources Protection (MENRP), each with responsibility for tasks that fall under their own area of expertise. The Ministry of Environment also coordinates the country's Low Emission Development Strategy (LEDS). The Ministry considers coordination of national and local mitigation efforts and the alignment of the LEDS and the CoM a priority. The CoM provides technical assistance to local stakeholders and the CNCs to help Signatories voluntarily commit to a 20% reduction in CO_2 emissions by 2020 through activities that promote energy efficiency, renewable energy and clean transport.

The CoM requires signatories to prepare local emissions reduction plans, known as Sustainable Energy Action Plans (SEAPs). The Georgia EC-LEDS program, with funding from USAID/Caucus, provides support to cities developing SEAPs. A SEAP involves conducting a Baseline Emission Inventory (BEI), projecting the increase in CO_2 emissions by 2020, and setting the city's emission reduction target. A key advantage the COM commitment and fulfilling the COM requirements, including developing, implementing and monitoring the SEAP, is that it provides opportunities to compete for EU grants for modernizing a city's infrastructure and implementing other development plans. For example, the EU's regional Sustainable Urban Demonstration Projects (SUDeP) program provides co-financing for demonstration projects and similar activities. In 2014, the Sustainable Development and Policy Center (SDAP), in partnership with Rustavi municipality and Winrock International, won a SUDeP grant to increase the efficiency of three kindergartens and promote additional investments through communications and outreach.

Low Emission Strategy of the City of Tbilisi

The Tbilisi SEAP supports the priorities of Tbilisi's Strategic Plan for Future Development of the Capital City. Short, medium, and long term mitigation examples for the transport and buildings sectors in the existing SEAP are outlined in the table below.

The strategy for municipal infrastructure covers six sub-sectors and focuses on methane capture from municipal landfills and waste water treatment plants; burning or using captured methane as an energy source; increasing the energy efficiency and share of renewable energy in the outdoor lighting sector; and developing green spaces throughout the city.

Key Strategies for the Transport and Building Sectors

Time Frame	Transport	Buildings
Short-term	Rehabilitate and develop transport infrastructure (2011–2015)	Increase efficiency of heating systems and the share of renewable energy in the heating (geothermal energy, biomass and solar energy) sub-sector within the municipal building stock (kindergartens, policlinics) (2011–2015)
Medium-term	Increase share of public transportation by development of an electric transport network (2012–2018)	Apply the same measures to other public buildings (e.g., schools, state agencies) (2014–2017)
Long-term	Decrease use of private cars and encourage low emission cars with restrictions and incentives (2018–2020)	Increase energy efficiency and the share of renewable energy in heating for the residential building stock (2015–2020)

Source: Information from the Tbilisi SEAP

Lessons Learned:

Financing: Georgian cities can receive external financing, but this must be approved by the Ministry of Finance, and approval can be difficult. The SEAP provides a framework for channeling national and international climate financing into city projects.

Technical Capacity: A lack of data and technical expertise were major barriers to calculating emissions. To overcome the lack of emissions data for its initial analysis, Tbilisi used the Long-range Energy Alternatives Planning System (LEAP) simulation software for its Baseline Emission Inventory (BEI) and emissions projections. LEAP creates a model of an energy system according to user specifications, and is widely used for energy policy analysis and climate change mitigation assessments. It tracks energy consumption, production and resource extraction in all sectors of an economy and accounts for both energy sector and non-energy sector GHG emission sources and sinks. National-level "starter" data sets for LEAP combine historical energy balance data (International Energy Agency), emission factors (IPCC), population projections(UN), development indicators (World Bank), non-energy sector GHG sources and sinks (WRI) and energy resource data (the World Energy Council).

Champions: Involvement of the mayor can be critical for engaging the private sector in SEAP activities. As required by the CoM, Tbilisi is currently monitoring and simultaneously revising its existing SEAP, with the support of EC-LEDS and in coordination with the Municipal government. The new Mayor established a SEAP committee that is chaired by the Deputy Mayor and supported by the Economic Development Office and other relevant City Departments.

While the National coordinators are still defining their roles, a first and critical step is linking the local SEAPs with the national LEDS through common data and assumptions, linking of planning tools and considering how to remove barriers to implementing the SEAP strategies and scaling up SEAP strategies nationally, especially in the required sectors of transport and buildings. As part of the INDC process, which will be built on the foundation of the LEDS, the German government is supporting development of a Vertical Nationally Appropriate Mitigation Action (V-NAMA) in the transport sector. A V-NAMA will be designed to address the policy and financing gaps both locally and nationally in developing and implementing sustainable transportation, and will thus strengthen the ties between local SEAPS and the national LEDS in the transportation sector.

Sources:

Tbilisi City Hall. 2011. Sustainable Energy Action Plan for the City of Tbilisi, 2011–2020.
http://mycovenant.eumayors.eu/docs/seap/1537_1520_1303144302.pdf.

EU Covenant of Mayors, www.covenantofmayors.eu.

USAID EC-LEDS-Georgia, http://www.usaid.gov/georgia/environment.

International Mitigation Partnership. 2014. Case study of Georgia for the Global Good Practice Analysis.
http://www.mitigationpartnership.net

Government of Georgia. 2009. Second National Communication on Climate Change under the United National
Framework Convention on Climate Change. http://unfccc.int/resource/docs/natc/geonc2.pdf.

LEAP brochure, http://www.sei-us.org/Publications_PDF/SEI-LEAP-brochure-Jan2012.pdf.

2.3 Low Emission, Climate Resilient Development Strategies (LECRDS)

Increasingly, LEDS are integrated with adaptation strategies and planning processes to create "low emission, climate resilient development strategies" or LECRDS.[11] The overall goal of these approaches is to strengthen the social, economic, and environmental conditions that will help cities reduce emissions, increase climate resilience, and promote sustainable development.[12]

Integrating national and subnational LEDS and LECRDS serves to enhance planning, development, and implementation of a strategy. National governments help strengthen local institutions and build local capacity, while actions at local levels help reinforce national policies.[13] See box below.

A number of donor programs and initiatives support low emission, climate resilient development and LECRDS planning and implementation. For example, *USAID's Climate Change and Development Strategy (2012–2016)* has the objective of "enabling countries to transition to climate-resilient low emission sustainable economic development."[14] USAID's *Climate-Resilient Development Framework* provides a step-by-step process for systematically including climate considerations in development planning and decision-making based on a "development-first" approach.[15]

The goal of the EC-LEDS program is "to support developing countries' efforts to pursue long-term, transformative development and accelerate sustainable, climate-resilient economic growth while slowing the growth of greenhouse gas emissions."[16] The LECRDS program of the United Nations Development Programme (UNDP) helps governments develop and strengthen policies, institutions, and governance to support integrated green growth, low-emission and climate resilient development (Green LECRDS), and to access financing.[17] See Annex 2 for links to related programs and initiatives and their implementing organizations.

2.4 LECRDS and Green Growth

Because a LECRDS identifies options for transitioning to a low emission and climate resilient economy in the context of a country's national development priorities, these strategies support green growth objectives. A number of national and subnational governments highlight the green growth benefits of these strategies. See the following case study for a description of how Vietnam's National Green Growth Strategy guides development of green growth plans by the country's 63 provinces.

Mexico City's LEDS Reflects México's National Climate Change Strategy

In 2013, the Federal Government of México released a National Climate Change Strategy combining mitigation, adaptation, and sustainable development. The strategy's goals are to: 1) realize the country's GHG emissions abatement potential; 2) realize national adaptation potential; 3) assess the impacts of GHG abatement and adaptation actions on the national economy; 4) identify co-benefits of mitigation and adaptation actions; and 5) develop a strategy for implementation of identified actions. This national strategy is helping support development of a LEDS for México City.

Source: Federal Government of Mexico. 2013. National Climate Change Strategy, 10-20-40 Vision. http://mitigationpartnership.net/sites/default/files/encc_englishversion.pdf

Vietnam

Vietnam's National Green Growth Strategy Guides Subnational Green Growth Planning

Background

A rise in climate change impacts and accelerating GHG emissions are threatening Vietnam's economic stability and the well-being of its citizens. Vietnam's rapid economic growth is driving the country's increasing GHG emissions. Between 2000 and 2010, Vietnam's energy-related emissions doubled to over 100 million tons of CO_2eq. Emissions are projected to more than double again by 2020, reaching over 250 million tons, with the increase driven mostly by rising income and energy use in the industrial, transportation, and power sectors. Vietnam is experiencing serious climate change impacts, including an increase in the frequency and intensity of storms and flooding—both inland flooding from heavy rainfall and inundation of coastal lowlands from sea level rise and greater storm surge.

Climate Change and Vietnam's Green Growth Strategy (VGGS)

To respond to these challenges, Vietnam established its VGGS in 2012; and in March 2014 the government approved the National Green Growth Action Plan (NGGAP) for implementing the VGGS from 2014 to 2020. Specific objectives of the VGGS are to: 1) restructure the economy to use energy and natural resources more efficiently; 2) increase the development and use of advanced technologies for reducing GHG emissions; and 3) improve living standards and promote a green lifestyle through employment in green industries, investment in natural capital, and development of green infrastructure.

To help implement the VGGS, the NGGAP requires each of the country's 63 provinces to develop a Provincial Green Growth Action Plan (PGGAP). The Provincial People's Committees and centrally managed cities are charged with developing local projects and directing the onsite implementation of the VGGS. They are also required to integrate the local PGGAP into their province's annual plan and five-year socio-economic development plans. PGGAPs are now underway in ten provinces: Lao Cai, Thanh Hoa, Hai Phong, Quang Ninh, Bac Ninh, Ha Tinh, Quang Nam, Ben Tre, Da Lat City, Binh Thuan, and Ninh Thuan.

Lessons Learned

Early experience with implementation of the VGGS through the local PGGAPs indicates a number of best practices and areas for improvement:

- Encourage participatory approaches from planning through implementation
- Provide a clear mandate and authority at the provincial level to facilitate implementation
- Present a clear business case and develop market-mechanisms (e.g., eco-taxes, a carbon tax) and financial instruments to encourage private sector involvement
- Improve communication and coordination between national institutions, local authorities, and international donors
- Develop a platform for shared learning among provinces and between provinces and international donors
- Mobilize financing through a combination of public, private and international financial resources and consider market-mechanisms to promote private sector investment.

Sources:

Socialist Republic of Vietnam. 2012. Vietnam National Green Growth Strategy.
http://www.greengrowth-elearning.org/pdf/VietNam-GreenGrowth-Strategy.pdf.

LEDS Global Partnership Case Study: The Subnational Integration of the Vietnam Green Growth Strategy.
http://en.openei.org/wiki/LEDSGP/publications.

Asia LEDS Partnership. 2013. Vietnam's National Green Growth Strategy.
http://lowemissionsasia.org/sites/default/files/pdf_file/Asia%20LEDS%20Partnership%20Case%20Study%20-%20Vietnam%20GG%20Strategy%20-%20March%202013.pdf

World Bank and Global Facility for Disaster Reduction and Recovery. 2011. Climate Risk and Adaptation Profile for Vietnam. http://sdwebx.worldbank.org/climateportalb/doc/GFDRRCountryProfiles/wb_gfdrr_climate_change_country_profile_for_VNM.pdf.

2.5 Urban GHG Emissions

Comprehensive and consistent data sets of urban GHG emissions do not currently exist, and as a result, there are few assessments of global urban GHG emissions.[18] In fact, cities report that the lack of transparent baselines and the capacity to calculate them or to compile and update GHG inventories is a significant barrier to mitigation progress.[19] The box below describes a new protocol developed for this purpose.

Global Protocol for Community-Scale Greenhouse Gas Inventories (GPC)

To help address the need for consistent protocol for measuring urban GHG emissions, the World Resources Institute (WRI), C40 Cities Climate Leadership Group (C40), ICLEI-Local Governments for Sustainability (ICLEI-SA), and others developed a methodology, known as the Global Protocol for Community-Scale Greenhouse Gas Emission Inventories (GPC) to provide cities with a common method of emissions accounting. It is the first global standard to measure GHG emissions by cities, and is expected to become a widely used standard for cities to measure and report their GHG emissions.

Source: http://www.ghgprotocol.org

2.6 Potential Emissions Reductions by Cities

Because of the lack of empirical data on urban emissions, a recent analysis used a modeling approach to examine the global GHG reduction potential of cities. The analysis focused on the building, transport, and waste sectors because in these sectors mayors exert strong control over policies that influence emissions, such as energy standards for buildings, urban planning, and public transportation.[20]

The model is built upon a reference (baseline) scenario of the future economy, energy patterns, and GHG emissions in the absence of aggressive urban climate action, while also considering recently adopted national policies, such as vehicle efficiency standards in China, the EU, and the US. The reference case is compared against an urban action scenario that assumes the application of a set of aggressive technologies and practices to curb urban energy use and GHG emissions. Abatement potential is then calculated as the difference between the two scenarios.[21]

Results of the analysis indicate that if cities took more aggressive efforts to reduce emissions in the building, transportation, and waste sectors, they could potentially reduce annual GHG emissions by an additional 3.7 Gt CO_2eq by 2030 over what national policies and actions are currently on track to achieve. By 2050, cities could cut annual GHG emissions by an additional 8.0 Gt CO_2eq over projected national reductions (see Figure 2).

Based on these results, cities cumulatively have the potential to reduce emissions by more than 140 Gt CO_2eq by 2050,[22] an amount estimated to equal to more than half of the emissions resulting from today's global annual use of coal.[23]

Figure 2: GHG emissions for reference scenario and potential avoided emissions for urban action scenario.
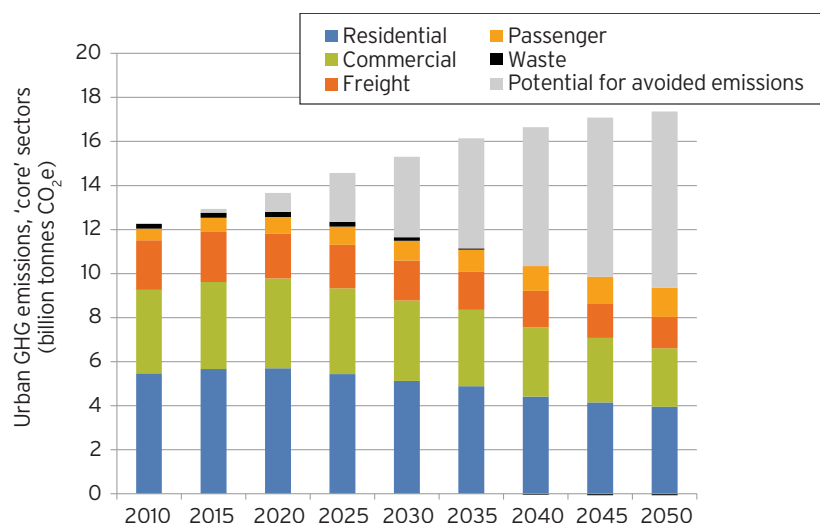
Source: Erickson P., and K. Tempest. 2014. Advancing Climate Ambition: How City-scale Actions Can Contribute to Global Climate Goals. Working Paper No. 2014-06. Stockholm Environment Institute (SEI). www.sei-international.org

Table 2: Estimated Annual Mitigation Potential of Selected Measures in the Building, Transport, and Waste Sectors

Sector	Technology/Practice	Annual Mitigation Potential (Gt CO$_2$eq 2)		Share of Total Mitigation Potential (%)	
		2030	2050	2030	2050
Buildings, residential	New building heating efficiency	0.6	1.2	16	15
	Heating retrofits	0.4	0.5	12	7
	Appliances and lighting	0.4	0.9	12	11
	Fuel switching/solar photovoltaics (PV)	0.1	0.2	3	3
Buildings, commercial	New building heating efficiency	0.3	0.5	7	7
	Heating retrofits	0.2	0.2	6	3
	Appliances and lighting	0.3	0.7	8	8
	Fuel switching/solar PV	0.1	0.2	3	3
Subtotal, buildings		**2.4**	**4.5**		
Transport, passenger	Urban planning-reduced travel demand	0.2	0.5	5	6
	Mode shift and transit efficiency	0.4	1.0	11	12
	Car efficiency and electrification	0.2	0.9	7	11
Transport, foreign freight	Logistics improvements	0.1	0.2	2	3
	Vehicle efficiency	0.1	0.3	3	4
Subtotal, transport		**1.0**	**2.9**		
Waste	Recycling	0.2	0.3	4	4
	Landfill, methane	0.0	0.3	0	4
Subtotal, waste		**0.2**	**0.6**		
TOTAL		**3.7**	**8.0**		

Source: Erickson P., and K. Tempest. 2014. Advancing Climate Ambition: How City-scale Actions Can Contribute to Global Climate Goals. Working Paper No. 2014-06. Stockholm Environment Institute (SEI). www.sei-international.org

2.7 Effective Mitigation Options for Cities

The analysis by Erikson and Tempest (2014) also helps identify specific actions in the three sectors evaluated. Table 2 provides estimates of the mitigation potential of options in the urban building, transport, and waste sectors. According to the data in the table, the most promising options in each of these sectors are as follows:

Building Sector: Greater heating efficiency in new urban buildings, heating retrofits in existing urban buildings, and high energy-performance standards for lighting and appliances in urban buildings.

Transport Sector: Mode shift and transit efficiency for urban residents, including expansion of public transit networks, investment in non-motorized transportation options, improved car efficiency and electrification, and urban planning to reduce travel demand, such as transit oriented development (TOD).

Waste Sector: Recycling and operating landfills with highly-effective methane collection systems (and, where possible, use that methane to create energy).

⁸ See OpenEI.org for toolkits, resources and a sample process for developing a LEDS based on proven best practices. This website, building on a review of similar methodologies and experiences with LEDS internationally, serves as a generalized framework to guide countries through the development of LEDS.

⁹ ClimateWorks Foundation. 2009. Low Carbon Growth Plans, Advancing Good Practice. Project Catalyst, August 2009.

¹⁰ LEDS-GP. 2014. Integrating National and Sub-National Climate Action. Prepared by Ecofys for the Low Emissions Development (LEDS) Global Partnership Working Group on Sub-National Integration. Working Draft, December 2014.

¹¹ There are a number of analogous terms—e.g., climate-resilient LEDS (USAID's Climate Change Resilient Development program); climate resilient development pathway (Denton et al. 2014, for IPCC).

¹² Denton, F., T.J. Wilbanks, A.C. Abeysinghe, I. Burton, Q. Gao, M.C. Lemos, T. Masui, K.L. O'Brien, and K. Warner. 2014. Climate-resilient pathways: adaptation, mitigation, and sustainable development, pp. 1101–1131 in Fields et al. (eds.) Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. http://www.ipcc.ch.

¹³ LEDS-GP. 2014. Integrating National and Sub-National Climate Action. Prepared by Prepared by Ecofys for the Low Emissions Development (LEDS) Global Partnership Working Group on Sub-National Integration. Working Draft, December 2014.

¹⁴ USAID. 2012. Climate Change and Development Strategy. Washington, DC: USAID.

¹⁵ USAID. 2014. Climate-Resilient Development: A Framework for Understanding and Addressing Climate Change. United States Agency for International Development Global Climate Change Office, Washington, DC: USAID.

¹⁶ Fact Sheet: Enhancing Capacity for Low Emission Development Strategies. http://www.state.gov/documents/organization/152281.pdf.

¹⁷ See http://www.undp.org for numerous in-depth guidance documents prepared by UNDP's Green LECRDS program.

¹⁸ Seto, K.C., B. Güneralp, and L. Hutyra, 2012. Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. Proceedings of the National Academy of Sciences of the United States of America.109:16083–16088.

¹⁹ UNFCCC. 2014. Updated compilation of information on the mitigation benefits of actions, initiatives and options to enhance mitigation ambition. Technical examination process to unlock mitigation potential for raising pre-2020 ambition in urban environments. Addendum 2: Urban Environment. United Nations Framework Convention on Climate Change. TP/2014/13/Add.2.

²⁰ Erickson P., and K. Tempest. 2014. Advancing Climate Ambition: How City-scale Actions Can Contribute to Global Climate Goals. Working Paper No. 2014–06. Stockholm Environment Institute (SEI). www.sei-international.org

²¹ Details on the methodology are in the Appendix to Erickson P., and K. Tempest. 2014. Advancing Climate Ambition: How City-scale Actions Can Contribute to Global Climate Goals. Working Paper No. 2014–06. Stockholm Environment Institute (SEI). www.sei-international.org

²² Erickson P., and K. Tempest. 2014. Advancing Climate Ambition: How City-scale Actions Can Contribute to Global Climate Goals. Working Paper No. 2014–06. Stockholm Environment Institute (SEI). www.sei-international.org

²³ Special Envoy's Report to the UN Secretary-General, completed in partnership with C40 Cities Climate Leadership Group and the Stockholm Environment Institute. http://unenvoy.mikebloomberg.com/

Implementation Challenges and Approaches

3.1 Governance and Institutions

Challenges

One of the key challenges facing cities that are developing and implementing climate action plans is fragmentation among government operations and poor coordination of authority among levels of governance and across ministries and departments. Experience shows that weak governance can be one of the greatest impediments to successful implementation of mitigation and adaptation measures.[24] Challenges include:

- Poor integration vertically among levels of government and horizontally across sectoral ministries
- Limited local role in development of national policies that are implemented at subnational levels
- Lack of local authority to carry out national climate policies
- Differences between national and subnational priorities.

Opportunities

Multilevel Governance

Multilevel governance coordinates and integrates policies and programs vertically (e.g., aligning national and subnational levels) as well as horizontally (e.g., across ministries) to help ensure that policies and plans are aligned and mutually reinforcing.[25] This kind of integration is considered especially important for complex policy challenges like climate change. As the OECD has observed, "Advancing governance of climate change across all levels of government and relevant stakeholders is crucial to avoid policy gaps between local action plans and national policy frameworks (vertical integration) and to encourage cross-scale learning between relevant departments or institutions in local and regional governments (horizontal dimension)."[26]

Vertical Alignment

Vertical governance involves coordination between city departments and local, regional, and national policy frameworks. The OECD has observed that " . . . national governments cannot effectively implement climate strategies without working closely with regional and local governments as agents of change. On the other hand, to take action, cites cannot be effective and do not operate in isolation from other parts of government. Local governmental authority to act in areas related to climate change is often 'nested' in legal and institutional frameworks at higher scales."[27]

The Colombia Low Carbon Development Strategy facilitates vertical integration through national, megacity, department, and municipal levels. The following case study describes Colombia's multi-level strategy.

In East Africa vertical integration occurs from regional to national to subnational levels in countries along the Lake Victoria Basin (Kenya, Tanzania, Uganda, Burundi, Rwanda). At the regional level, the East African Community (EAC) climate change office, the Lake Victoria Basin Commission (LVBC), and the Regional Center for Mapping Resources for Development (RCMRD) are working with national agencies to coordinate climate change and environmental approaches and frameworks and to share regional climate data, funding, knowledge management, and other resources to help support national programs and activities. National frameworks and policies are rolled out and implemented at the local level through a variety of community-based climate change adaptation programs.

Horizontal Alignment

México City's Climate Change Program: The government of the Federal District of México City has been a leader in climate action planning in México. In 2008, México City established the Programa de Acción de Cambio Climático (PACC). The PACC set an emissions reduction target of 7 Mt CO_2eq for 2012 relative to the 2008 emissions inventory of 37 Mt CO_2eq. A LEDS was an integral part of the program.[28]

The PACC noted that "climate change cuts across and brings together the main components of México City's environmental and development policies, including those related to energy, water, mobility, soil conservation, economic development, waste generation and management, vulnerability, and environmental education."[29] To promote horizontal alignment among institutions and governance structures associated with implementation of the PACC, México City created the Interinstitutional Commission on Climate Change in 2010, with the primary responsibility of coordinating actions across all ministries.

In June 2011, the legislature of México City passed the Mitigation and Adaptation to Climate Change and Sustainable Development Law. The law established new legal tools and institutions to support climate actions and mandated all parts of the city government to prepare their own development and sector plans and report on their climate change budgets and expenditures. This had the effect of institutionalizing the city's climate program, establishing it as a long-term priority.[30]

The PACC was so successful that by 2012, México City exceeded its target by over 10%, achieving a reduction of 7.7 Mt CO_2eq over the four-year period.[31]

Colombia

Multilevel Governance through Vertical Integration

Background

Colombia is an upper-middle income country with the fourth largest economy in Latin America. Though its economy has grown more than 4% per year for a decade, climate change is posing risks to sustainable development. Severe flooding in 2010–11 prompted the country to consider ways to integrate the effects of climate change into its long-term policy planning. Climate change was included in Columbia's National Development Plan for 2010–2014, the country's main strategic policy document, and a new institutional structure was created to improve planning and coordination of the country's climate actions. Colombia is now engaged in multiple efforts to build resilience to climate change while working to curb emissions and pursue options for low emission development.

National System on Climate Change

In 2008, Colombia's highest national planning authority, the National Council for Economic and Social Policy (Consejo Nacional de Política Económica y Social; CONPES), began developing a new national climate change policy and action plan for Colombia. A lack of integration and coordination among governance structures and institutions was proving an impediment to effective climate action, and therefore planning focused on creating a new institutional structure for coordinating climate change actions horizontally across different ministries and vertically from national to local planning authorities. In 2011, CONPES released its climate strategy, the Institutional Strategy for the Articulation of Policies and Actions in Climate Change (known as CONPES 3700). The plan created the National System on Climate Change (Sistema Nacional de Cambio Climático, SISCLIMA), and moved responsibility for coordinating national climate policy from the Ministry of Environment and Sustainable Development to the National Planning Department, an institution directed by the President, with political power and influence across ministries. This reform linked the SISCLIMA directly to the President's office and provided a strong basis for coordination among ministries. Perhaps most importantly, the SISCLIMA integrated mitigation and adaptation into the government's main planning process.

In addition to introducing a new institutional structure, CONPES 3700 laid out the policy basis for developing four strategies: a funding strategy, a National Adaptation Plan, a National Strategy for Reduced Emissions from Deforestation and Forest Degradation (REDD+), and the Colombian Low Carbon Development Strategy (Estragia Colombiana de Desarollo Bajo en Carbono, ECDBC). Together, these strategies constitute Colombia's national climate change policy.

Implementation at the Megacity Level

At the megacity level, in Bogotá, mitigation efforts focus on transportation, the fastest-growing sector in Colombia in terms of energy use and GHG emissions, primarily because of rapid growth in private motorization rates, which has increased urban traffic congestion and air pollution. Bogotá has developed a number of innovative ways to address its transportation issues. The city's world-renowned TransMilenio bus rapid transit (BRT) system carries 2.1 million passengers per day and operates at a profit. The city is now complementing the BRT system with transit oriented planning. Transit-Oriented Development (TOD) encourages public and private development around transit stations to create neighborhoods with high-quality pedestrian amenities, frequent public transit service and mixed-use development (retail, housing, commercial, services, public space, etc.).

To support its TOD planning, Bogotá is developing a vertically-integrated nationally appropriate mitigation action (V-NAMA) for TOD under the United Nations Framework Convention on Climate Change (UNFCCC). The TOD V-NAMA is expected to reduce the growth of driving in Colombia by 25–36% through changes in land use and travel patterns, and reduce annual GHG emissions by 3.6 to 5.5 Mt CO_2eq by 2040.

TOD implementation requires horizontal integration across institutions responsible for housing, land use and transport, as well as vertical integration between national and subnational policies and authorities. This is achieved through the low carbon strategy, ECDBC, which serves as Colombia's NAMA policy framework.

Implementation at the Department Level:

In the Department of Huila, Colombia's largest department (similar to a state or province), USAID's EC-LEDS and Forest Carbon, Markets and Communities (FCMC) programs are supporting development of mitigation and adaptation plans as part of an overall climate-resilient strategy. Huila's social, economic, and environmental conditions, combined with projected increases in temperature and declines in precipitation, mean that Huila is highly vulnerable to adverse impacts from climate change.

In 2012 the Huila Departmental Government launched the Huila 2050: Vision for Climate Change program to develop a climate action plan for the department. Plan development involved an integrated and inclusive process with activities coordinated by a new Departmental Climate Change Council (DCCC) government and the regional environmental authority (Corporacionde Alto Magdalena (CAM)), which serves as a technical secretariat within the DCCC. Also included in the planning process were the government of the City of Neiva, the department's capital, and representatives from universities, NGO's, and coffee and cattle producers. National entities in charge of climate change, including the National Planning Department, Ministry of the Environment and Sustainability, and Institute of Hydrology, Meteorology and Environmental Studies (Instituto de Hidrología, Meteorología y Estudios Ambientales), provided technical and political support.

This process resulted in a comprehensive, five-year Climate Change Action Plan for Huila, released in October 2014, making Huila the first department

Benefits of TOD NAMA Implementation (CCAP, 2013) (Figure 1)

Alternative Transport | Safety | Social Inclusion | Accessability | Sustainability | Green Spaces

Efficient & Sustainable Landuse and Transport | Transit System Financial Sustainability | Preserve Transit & Walk Mode Shares | Better Quality Of Live and Competitiveness

Source: CCAP (2013) http://mitigationpartnership.net/sites/default/files/colombia_gpa_long_0.pdf

in Colombia to have its own climate plan. Huila's plan integrates LEDS and sustainable landscape approaches. It is intended as an "umbrella project" that will unify institutions, projects, and sectors of Huila around the common goal of assuring climate-resilient development. The plan has five main programmatic components:

1. Water
2. Biodiversity and Ecosystem Services
3. Agricultural Production and Food Security
4. Energy Resources
5. Resilient Environments

The plan also includes four crosscutting areas for the integration of climate change considerations in the political, educational, communication, and management processes of the department: Territorial Zoning; Education and Training; Communication, Science and Technology; and Risk Management. A new Climate Observatory within the CAM will coordinate, implement, and monitor the Plan, and will build a central platform of information and climate monitoring to facilitate coordination among various agencies. Plans are now underway to apply the departmental-level Huila process at the municipal level, beginning with Huila's capital, the City of Neiva.

Lessons Learned:

Though still in early stages, a number of best practices are apparent from Colombia's experience with a multilevel governance structure for addressing climate change:

■ Create an institutional structure that explicitly links government institutions addressing climate change with institutions involved in development planning.
■ Create formal and informal mechanisms to coordinate ministries that oversee climate-sensitive sectors.
■ Promote stakeholder engagement and partnerships at all levels, and maintain ongoing communication both during planning and implementation.
■ Provide national and regional support to help build subnational capacity.

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Local Control

Some local governments are developing legal authority for local control.

México's 2012 Climate Change Law (LGCC) distributes responsibilities for climate planning and implementation among the country's three levels of government and put in place mechanisms for fostering coordination among the different governing bodies. The LGCC established the National System for Climate Change to promote vertical integration and the Inter-ministerial Climate Change Commission to foster horizontal coordination across sectors. Links with subnational governments occur through state and municipal climate action plans. The law also included specific provisions for developing low-emissions activities such as renewable energy and energy efficiency projects.[32]

Rio de Janeiro's 2011 Municipal Law on Climate Change and Sustainable Development established city government authority for local climate actions and emission reduction targets. See the following case study for a description of Rio de Janeiro's Low Carbon City Development Program.

Key Actions To Improve Governance

As illustrated by the preceding examples, best practices for governments to consider addressing governance and institutional challenges are:

- Apply multi-governance principles and concepts to integrate governance structures and institutions both horizontally and vertically
- Consider creating an inter-agency coordinating body to strengthen management of climate planning and programming
- Clearly define roles and responsibilities across levels of governance; both for planning and implementation (actors and authorities may differ for the two categories of action)
- Develop a local climate law (or other mandate) to establish local authority for climate planning and implementation
- Institutionalize effective climate programs for long-term sustainability.

Brazil

## Rio de Janeiro's Low Carbon City Development Program and Municipal Law on Climate Change

Background

The City of Rio de Janeiro is the administrative capital of the State of Rio de Janeiro in southeast of Brazil. In 2009, the city was home to over 6 million people, with 11.8 million living in the greater metropolitan area, making the Rio de Janeiro metropolitan region the second largest urban area in Brazil. In recent decades, Rio de Janeiro faced a faltering economy, degrading infrastructure, and a decline in environmental quality. Growing energy demand further strained the economy, while rising GHG emissions contributed to poor air quality and declining health among city residents. Public transport was slow, poorly distributed, and expensive. At the same time, the city government (Prefeitura) was weak and ineffective. The Prefeitura had limited investment capacity and high debt costs. Channels of communication between city residents and the Prefeitura were considered inefficient and the government was characterized by poor management

practices and excessive "red tape." These problems prompted reforms embodied in the city's 2016 Strategic Plan, passed by the Prefeitura in 2009.

The 2016 Strategic Plan laid out dozens of specific actions to improve city conditions and governance. The 2011 Municipal Law on Climate Change and Sustainable Development established city government authority for local climate actions and emission reduction targets to promote Rio's development as a low carbon city. Voluntary targets were established to reduce the city's GHG emissions by 16% and 20% of 2005 levels by 2016 and 2020, respectively.

A Low Carbon City Development Program (LCCDP) was established under the Mayor's Office to serve as a coordinating framework and management structure for the city's emission reduction actions (interventions). An intervention is any activity from any sector that reduces emissions,
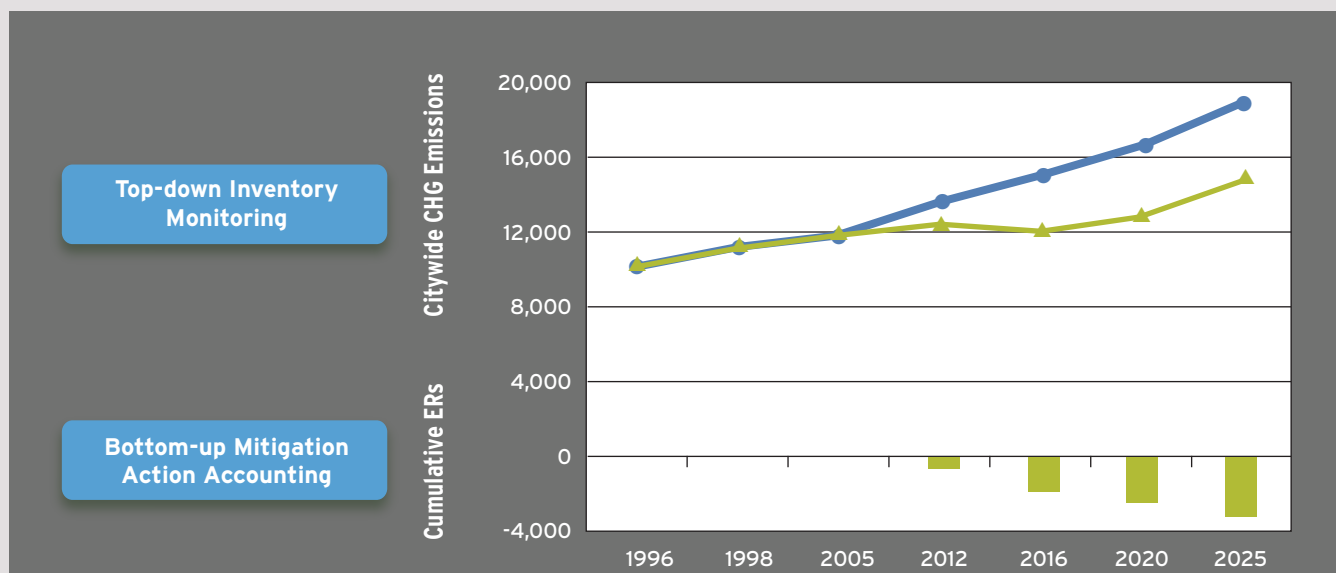
including both policies and projects. The LCCDP provides a common process for assessing, registering, monitoring, and verifying the interventions. It establishes clear program roles, processes for program planning and evaluation, and a five-step program process for evaluating each intervention.

An advantage of the LCCDP approach to calculating emission reductions is that each intervention is considered individually. The more common "top-down" approach calculates a city-wide GHG inventory, which can vary considerably with different input assumptions, such as the growth of major emitting industries. The LCCDP's approach makes it possible for the city to track individual low carbon investments and climate change mitigation actions across all sectors of the city over time.

The LCCDP has earned ISO accreditation, which allows Rio to participate in climate finance at both national and international levels. Climate finance is essential for encouraging future investments in the city's low carbon development. Interventions under consideration for 2012–2016 include green building certification, recycling, reforestation and urban tree planting, bike lanes, and finishing the city's bus rapid transit system.

Lessons Learned:

Participants have identified a number of strengths of the LCCDP, including:

- A well-defined framework of roles and processes to plan, implement, monitor, and account for mitigation actions
- An organizational structure that can be replicated in other cities
- Potential to expand over time to include a wide range of city activities
- Participation and engagement of city staff and stakeholders with a working group of technical experts
- A high-level mandate and leadership from the Mayor's Office.

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3.2 Financing

Challenges

Nearly 80% of cities report that lack of financing is the greatest barrier they face in tackling climate change.[33] Primary challenges include:

- High upfront costs of infrastructure actions
- Lack of control over access and disbursement of funds (e.g., international climate funds channeled through national offices, national government control of funds for local implementation)
- Attracting investors.

Even when financing is available through intergovernmental transfers, cities may lack authority to disburse funds or make decisions about funding for local mitigation and adaptation priorities. In addition, there may be a lack of support among residents and decision-makers for using domestic funds for climate financing because climate change impacts may appear less pressing than more immediate urban concerns. This can delay climate actions, increasing costs and damages.[34]

Opportunities

There are a number of ways that cities can address financing barriers; several guidebooks, websites, and organizations provide details on types of financing options available to cities for climate change programs.[35] This section outlines a number of low-cost options that are generally the first step in financing because they are more immediately accessible than national or international funding.

Leveraging and Redirecting Municipal Funds

There are often opportunities for cities to redirect or leverage funds from other municipal programs to support climate actions. For example, on average cities have direct control of 75% of environmental funding, which can be used to support mitigation or adaptation measures tied to environmental protection.[36]

Bogotá's Bus Rapid Transit (BRT) system, TransMilenio, was partially financed with funding originally set aside for highway programs. This also helped support the city's green policies by redirecting funding for road development to energy-saving mass transit.

Vertically-Integrated Nationally Appropriate Mitigation Actions (V-NAMAs) help integrate projects vertically among levels of government.[37] As of the end of 2014, V-NAMAs were under development in Indonesia (waste management) and South Africa (energy efficiency in public buildings) under the Bankable V-NAMA project managed by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).[38] A V-NAMA supporting Bogotá, Colombia's TOD program integrates national and subnational urban planning, with a goal of reducing traffic growth by 25–37%, while also improving air quality and living conditions.[39]

"No-Regrets" and "Win-Win" Opportunities

Actions considered "no regrets" options generate net social and/or economic benefits independent of climate change, while "win-win" strategies provide both direct benefits and co-benefits. For example, the use of green infrastructure[40] is widely recognized as an effective "no regrets" strategy. Green roofs provide both adaptation benefits (e.g., water conservation) and mitigation benefits (e.g., reducing the use of air conditioning on hot days).

The EThekwini Municipality (Durban, South Africa) Community Ecosystem Based Adaptation (CEBA) program integrates mitigation and adaptation in a project to restore natural ecosystems with the goal of creating "cleaner and greener" neighborhoods less dependent on costly utilities. It is a type of "no regrets" approach because CEBA activities address future climate change, while also providing immediate social and economic assistance that will be beneficial with or without climate change. The program is even helping develop a new sector of Durban's green economy.[41]

Urban agriculture illustrates a "win-win" strategy that can help support adaptation while also generating mitigation co-benefits.[42] For example, although Quito, Ecuador's AGRUPAR program for urban farmers was not designed as a climate change project, the program provides both mitigation and adaptation benefits.[43] Adaptation is promoted by providing farmers with seeds and training to help improve their agricultural production. Mitigation is supported because urban farming reduces transportation needs.

The case study on Thailand illustrates one example of a "win-win" opportunity by exploring the co-benefits of an urban LEDS.

Thailand

Co-Benefits of Urban LEDS in Muangklang

Background

In response to an upward trend in the country's GHG emissions, the Royal Thai Government developed a Low Carbon Initiative to help the country's cities, municipalities, and communities achieve reductions in their GHG emissions. The municipality of Muangklang was selected as a pilot. Muangklang is a small municipality with 13 communities, located in the Thai province of Rayong. Government leaders in Muangklang are strong proponents of low-carbon development to promote sustainability.

A number of national policies and plans facilitated the development of Thailand's Low Carbon Initiative. The 11th National Economic and Social Development Plan (2012–2016) calls for a paradigm shift to a green, low carbon society and the development of a GHG registry, carbon market, carbon fund, and measurement, reporting, and verification (MRV) system. The National Master Plan on Climate Change (2011–2050) focuses on enhancing resilience through low-carbon economic development.

The Low Carbon Initiative lays out a nine-step process for becoming a low-carbon city:

1. Survey the city's primary economic and social activities
2. Prepare a GHG inventory for each key emitting sector
3. Identify emission reduction measures and technologies in the main emitting sectors.
4. Analyze and select measures and technologies for reducing emissions
5. For each of the main emitting sector determine emissions under a business as usual scenario, and emissions if mitigation measures and/or technologies are adopted.
6. Set GHG reduction targets at the city level
7. Create an action plan
8. Implement the action plan and monitor progress and results
9. Review targets, direction, measures, and the action plan.

The Low Emission Strategy of Muangklang Municipality

Under the leadership of a forward-looking local government committed to sustainability, the Muangklang Municipality tested this 9-step process. The municipality engaged stakeholders from key sectors across the municipality's 13 communities to determine the main emitting sectors, identify emission reduction options, and determine emissions with and without the selected measures. A detailed GHG inventory was developed for commercial and residential buildings, transportation, waste, agriculture, and forests. Stakeholders set a voluntary target to reduce per capita GHG emissions by 5% annually (100 kgCO2e per year) within five years, and by 10% (200 kgCO2e per year) within ten years. To meet these targets, stakeholders developed the low emission strategies outlined in the table below.

The Muangklang LEDS identified a number of co-benefits expected from the mitigation measures. For example:

■ The municipal waste separation belt, which will reduce methane emissions, also will reduce solid waste disposal costs, generate new revenues from the sale of recyclables, and extend the life of the municipal landfill.

■ The constructed municipal rice mill for local processing and consumption will reduce emissions by avoiding rice transport and also will provide new income for small-scale farmers, reduce dependence on prices in the rice market and purchases from outside the municipality, and increase food security for local communities.

Sector	Strategies
Buildings	Encourage commercial building and homeowners to select energy efficient products receiving the "Energy Label No.5" efficiency rating; raise awareness on energy saving behaviors; and adopt clean energy in public buildings.
Transport	Add public buses and improve routes to minimize personal vehicle use; convert public fleets to run on natural gas and biofuels; and encourage city residents to use bicycles.
Waste	Install a municipal waste separation belt to sort organic waste and recyclables from general waste prior to landfill disposal to reduce landfill methane; and install a biogas digester.
Agriculture	Convert unused land areas to rice fields; and construct a municipal rice mill for local processing and consumption, to reduce emissions from transporting rice from elsewhere.
Urban Greenways	Increase the area dedicated to public parks; and green and improve pedestrian routes to promote exercise and reduce motorcycle use.

Lessons Learned:

Muangklang is now actively networking with other small cities in Thailand to share its experiences.

- Supportive national policies can catalyze the shift towards low a carbon society. National entities can help build readiness and capacity at the local level.
- Local governments play an important role, and local leaders must have understanding and political will to engage stakeholders in behavior change.
- Involving diverse local stakeholders throughout the process is essential—from the initial survey to selecting mitigation measures to monitoring progress and results.
- Communicating good practices and demonstrating co-benefits from GHG mitigation measures within and across localities compels stakeholders to act to help achieve goals.

Financial Management Skills

Senior Environmental Evaluator at the World Bank, Richard Carlos Worden, notes that an important way to for cities to facilitate decentralization of funding is by, "…ensuring cities and provinces have the fiduciary controls and safeguards in place so that they are seen as credible enough to effectively manage funds channeled directly to them." Some recent global programs and initiatives are responding to this need.

The Carbon Finance Capacity Building (CFCB) Program, an initiative of the World Bank Institute and C40, facilitates local access to carbon finance by raising the awareness of city officials and other stakeholders; highlighting projects for potential implementation; supporting institutional networking; and advising on project implementation. The CFCB provides continuous on-site, expert support and financing for each participating city for three years.

Creditworthiness

At present, only 4% of the world's 500 largest cities in developing countries are considered creditworthy in international financial markets. Therefore, international donors as well as local governments are looking for ways to improve financial management and related skills of city staff. To address this need, the World Bank's Low Carbon Livable Cities (LC2) initiative has a *Creditworthiness Academy* that has already helped 66 cities in 22 countries improve financial management and increase access to capital.[44]

The Kampala Capital City Authority Credit Worthiness Initiative in Uganda seeks to improve local revenue collections; financial management and credibility; promote regulatory reforms to support municipal borrowing; and obtain city credit rating. The initiative has resulted in a 110% increase in city revenue collections in 36 months, helping to finance emissions reduction projects (e.g., eco-stoves, solar street lights).[45]

Integrated National and Subnational Financial Arrangements

Local communities are developing innovative ways to better integrate national and subnational financial arrangements. National governments are finding that engaging subnational governments to develop these approaches helps gain buy-in from local stakeholders as well as build local capacity.

The Local Climate Adaptive Living Facility (LoCAL) in Bhutan is a program for establishing a dedicated financing facility that helps direct global adaptation finance to a country's local governments.[46] A Memorandum of Understanding (MOU) between LoCAL and the national government regulates the facility and ensures full national ownership. LoCAL then connects to the existing national intergovernmental fiscal transfer system, and supplements capital grants to local governments with performance-based climate resilience grants.

In January 2014, one of the first of two LoCAL pilots was established with The Royal Government of Bhutan through an MOU with UNDP, UNEP, and the United Nations Capital Development Fund (UNCDF). The parties agreed to seek out opportunities to complement each other's initiatives—UNDP for governance and capacity building, UNEP for the environment, and UNCDF for fiscal decentralization and local investments. The government also revised the national budget codes to allow for climate change-related expenditures to be labeled and tracked. A system of planning guidelines and performance measures enabled the Bhutanese Treasury to disburse resilience grants to four local governments, which are implementing numerous adaptation projects.

The Jawaharlal Nehru National Urban Renewal Mission in India provides central government funding for public investment in infrastructure to 65 target cities. To access funds, however, state, urban local bodies (ULBs) and parastatal agencies must reach an agreement with the national government for achieving governance reforms. By linking national funding with local reforms, the approach provides some decision-making control to subnational governments, rather than exclusive top-down control by the national government, and aligns policies across levels of government. The program has worked well as a funding mechanism and a way to encourage reforms. However, some implementation difficulties have led to the conclusion that, "Where ULBs lack the capacity to implement projects, or where there are other challenges to implementation, such as political consensus, citizen approval and land acquisition; there can be significant delays that are not addressed by the mechanism."[47]

Public-Private Partnerships

Public–private partnerships (PPPs) are a way to fund a project based partially or totally on private participation. The level of participation of private sector depends on the type of PPP

arrangement.[48] USAID forms PPPs in developing countries throughout the world through its Global Development Alliance (GDA) (see http://www.usaid.gov/gda). The newly-formed Cities Climate Finance Leadership Alliance is a global partnership promoting collective action to attract and mobilize investment in climate change activities in cities in low- and middle-income countries. Partners include development agencies, governments, international banks, nonprofit organizations, and international and regional climate programs (see http://www.goldstandard.org /the-cities-climate-finance-leadership-alliance).

Key Actions For Financing

- Put municipal fiduciary controls and safeguards in place to demonstrate capacity for effective fund management

- Establish creditworthiness of city government financial operations to promote access to international financing

- Institute specific measures to better integrate national and subnational financial institutions and processes

- Look for opportunities for leveraging and redirecting funding from related, fully-funded programs and departments (e.g., environmental funding)

- Consider V-NAMAs and other ways of tapping into established international funding mechanisms.

- Consider using successful projects as demonstrations to attract investors

- Look for champions in the private sector who will promote PPPs.

Using Demonstration Projects to Attract Investors

Most cities report difficulties engaging the private sector in LEDS programs. A major reason is that investors believe there is a high level of risk associated with LEDS projects.

In Vietnam, wind energy advocates supported an integrated planning approach to develop a LEDS, with support from the U.S. EC-LEDS program. Vietnam's energy sector contributes 35% of the country's GHG emissions, and therefore the country's significant wind energy resources could help reach the country's Green Growth Strategy target of a 20-30% reduction in energy sector emissions by 2030. However, real and perceived financial risk has been a significant barrier to investment in wind projects. To help reduce risk and attract financing for wind energy projects, Vietnam's local and national decision-makers used an integrated planning framework to align goals across economic sectors and across local and national policymaking levels. According to project staff, the LEDS framework helped reassure investors, while also delivering near-term GHG emissions and promoting the country's long-term green growth and development goals.

Source: Bilello, D., J. Katz, S. Esterly, and M. Ogonowski. 2014. Advancing Development and Greenhouse Gas Reductions in Vietnam's Wind Sector. http://nrelpubs.nrel.gov.

3.3 Stakeholder Engagement

Challenges

Experience shows that stakeholder engagement is critical throughout the process of LEDS development and implementation. Involving stakeholders helps build consensus and trust between stakeholders and decision-makers. Cities are exploring a number of innovative ways to generate stakeholder interest and participation in LEDS programs.

Opportunities

Benefits of Local Knowledge

By securing community buy-in and local ownership of climate projects and initiatives, national governments gain access to local knowledge and insights.

Sorsogon City, Philippines is one of the pilot cities in UN-HABITAT's Cities and Climate Change Initiative (CCCI). The initiative promotes enhanced climate change mitigation and adaptation in developing country cities. As part of developing the city's first climate plan, Sorsogon held focus groups with community members to learn about their experiences and insights about adaptation needs. Through the focus groups, the city learned that families were developing their own adaptation measures on an ad hoc basis because of severe damage from increasing coastal storms, high storm surges, and tidal flooding. An important adaptation strategy was what they called the "bayanihan way." Community members explained that this involves families helping one another without a fee. The "bayanihan way" was the approach used to reconstruct damaged homes to better withstand coastal storms and to reforest mangrove areas that

serve as a breakwater. Because of the "bayanihan way," no external help was needed and adaptation costs were minimal.[49]

Local Champions

The Mekong-Building Climate Resilient Asian Cities (M-BRACE) Project is a partnership between the Institute for Social and Environmental Transition (ISET), Thailand Environment Institute, and Vietnam's National Institute for Science and Technology Policy and Strategic Studies. The project developed its climate-resilience strategy through a process of multi-stakeholder interactions led by local government. The project's success was aided by stakeholder collaboration throughout the project; approaches that balanced national technical expertise and on-the-ground knowledge of local actors; flexibility and responsiveness; and local champions.[50]

High Level Leadership

Initially, government agencies in México City showed little interest in the climate action plan created in 2008 because they didn't consider climate change a priority. However, leadership and engagement by the President's Office encouraged local agencies to participate.[51]

Multi-Stakeholder Decision-Making and Participatory Approaches

Development of the México City Climate Action Program (2008–2012) was supported by technical assistance from the World Bank and other international organizations, and was undertaken with the participation of experts (academics, consultants), citizens, and civil servants. The program was designed in a series of planning meetings through evaluations

of conditions and scenarios and by building consensus among the stakeholders involved. City government civil servants, civil society associations, academics, businesses, and others came together to discuss actions to reduce emissions in the energy, water, transport, and waste sectors, as well as adaptation and environmental education and communication that would help the city's residents to understand the nature and risks of climate change and how citizens can contribute to mitigation, adaptation, and reduction of vulnerability.

The emissions reduction and adaptation options were analyzed in terms of cost, technical feasibility, environmental benefit, social and economic impact, and barriers to implementation. Final decisions were based on two parallel consultations. One elicited the opinions of the different city departments and decentralized agencies since the proposed actions would involve almost the entire city government structure in their implementation. Simultaneously, there was an open citizen consultation that sought comments, criticisms, and suggestions from the general public.[52]

The Participatory Development Programme in Urban Areas (PDP) in Egypt is a collaboration between the Egyptian Ministry of Planning, the Egyptian Ministry of Local Development, the German technical corporation GIZ, and the German Financial Cooperation Development Bank, along with the cities of Cairo, Giza, and Alexandria, as well as a number of NGOs.

The PDP includes climate change adaptation and urban resilience components that address the negative consequences of climate

change for poor and informal urban areas in the greater Cairo region. This effort includes:

- Development of a participatory and community-based adaptation strategy for informal areas, in collaboration with national and local partners
- Awareness-raising among local residents, civil society, ministries, public agencies, and local administrations
- Implementation of small-scale development measures in informal areas using a participatory approach involving local residents
- Climate change vulnerability assessments, including assessing meteorological observations and making projections for four informal urban areas in the greater Cairo region.

Stakeholder Support

A strong stakeholder group can help build long-term capacity. It is also an advantage if partnerships are established with organizations with an interest in sustained engagement. One approach is for stakeholders to organize their interactions and collaborations through "affinity groups" of shared interests.

Key Actions To Engage Stakeholders

Cities engaged in climate planning should create programs to involve stakeholders throughout the program's planning, implementation, evaluation, and follow-on activities. The first step for engaging stakeholders is to enlist the support of a "champion" from the community, along with high-level leadership from a government agency.

Once a champion is on board, the next step is to work with this person to identify and meet other stakeholders, including a broad range of individuals from the government, NGO's, civil society organizations, local business, community groups, and others.

Experience indicates a number of activities that can encourage stakeholder participation:

- Present information at public forums to raise awareness
- Conduct focus groups and other interviews with local community members to explore concerns and insights in depth
- Use participatory approaches to involve stakeholders throughout the project
- Enlist feedback from stakeholders on an ongoing basis
- Look for opportunities to sustain stakeholder groups to ensure long-term support for the project/program.

The box below indicates potential stakeholders for LEDS development.

3.4 Knowledge Sharing

Challenges

Many cities report a need for information and skills to support LEDS development and other climate change activities. Knowledge networks, partnerships, and exchanges are proving essential for addressing information and training needs. A number of them are developing to support LEDS development and other mitigation and adaptation activities. Some of the major programs are outlined below, along with examples.

Opportunities

Knowledge Networks and Platforms

The LEDS Global Partnership (LEDS-GP), founded in 2011, conducts collaborative, peer learning forums and networks to increase coordination, information exchange, and cooperation among countries and international programs working to advance low emission climate resilient growth. The partnership brings together leaders and practitioners from more than 120 countries and international institutions in three regional platforms—Asia, Latin America, and Africa—which facilitate exchanges at the country, regional, and global levels.[53]

The World Bank Institute's Climate Change practice (WBICC) is helping build regional networks that connect development practitioners to networks of peers facing similar climate change challenges. WBICC's approaches include *structured learning* that helps transfer "how to" knowledge to practitioners, and builds awareness and support for policymakers; *collaborative governance,* which involves convening networks of practitioners across countries and regions to share good practices and form coalitions to find common solutions for strategies, policies and investments; and *scanning for innovative solutions* from within and outside the Bank that draw knowledge from applied research and successful development pilots, projects, and policies.[54]

The Carbonn Cities Climate Registry (cCCR) is the global platform for local governments to report local climate information (e.g., energy and climate commitments, government and community GHG emissions, and mitigation and adaptation actions). The registry is a product of the Local Government Climate Roadmap, a broad coalition of government

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Potential LEDS Stakeholders

For governments, a LEDS can be used to: 1) present a long-term vision on climate and development, and a strategic low-carbon development pathway; 2) establish a policy framework in which policies across different sectors are put in place and aligned; and 3) increase awareness on climate change with stakeholders.

For private sector stakeholders, a LEDS can: 1) identify what is needed to establish a favorable investment climate for low-emission development actions; and 2) indicate how the government will support a favorable investment environment (e.g., using regulatory frameworks or policies).

For international stakeholders, a LEDS can help: 1) identify needs in terms of finance, capacity building, technology and institutional arrangements, and coordinate donor support; and 2) function as a reporting platform.

Source: van Tilburg, X., L.Würtenberger, H. de Coninck, and S. Bakker. 2011. Paving the Way for Low-Carbon Development Strategies. Energy research Centre of the Netherlands.

networks that advocates for city and subnational governments.[55]

Peer-to-Peer Exchanges

India's Jawaharlal Nehru National Urban Renewal Mission encourages knowledge sharing and partnering to help integrate national and subnational policies and programs. The Peer Learning and Knowledge Sharing Network (PEARL) enables experience-sharing and networking among city officials in 65 cities. The PEARL network is designed to facilitate cross learning and knowledge sharing on urban reforms, city governance, and urban infrastructure projects. PEARL provides a forum for sharing knowledge and experiences in implementing urban reforms and improving city governance. Among its activities are a website, newsletters, best practice documentation, and workshops.[56]

City-to-City Learning Exchanges

The CityLinks Program, funded by USAID and implemented by ICMA, is based on the premise that cities learn best from other cities. The program creates peer-to-peer learning opportunities for cities to help them better adapt to climate change, threats to food security, and access to water and sanitation.[57] See the following case study for a description of a CityLinks project.

The Institute of Global Environmental Strategies (IGES) in Cambodia works on behalf of the Regional Secretariat to help national ministries develop city networks to link local and national policies and programs. The city networks use a uniform integrated framework of climate and environmental indicators to systematically track and rate each city's progress.

Twinning Partnerships

Maynilad and Manila Water provide water services to residents in the southern and northern parts of metropolitan Manila, respectively. Climate change has affected their operations by decreasing water supply, water quality, and wastewater services. To address this concern, USAID Waterlinks, a regional network of water operators, implemented activities with United States partners, including the Palm Beach County Water Utilities Department in Florida and the National Center for Atmospheric Research in Boulder, Colorado. This "twinning partnership" facilitated mentoring between partners and enabled shared access to innovations, practices, technologies, and capacity building. Participants agreed that the project was successful because of its demand-driven, resource-sharing nature.

CityLinks

Partnership Examples

Background

CityLinks is based on the premise that well-managed cities are the key to efficient service delivery, economic growth, sound management pf resources, community health, and political stability—and that cities learn best from other cities. The CityLinks program is designed to allow city officials in developing and transitioning countries to draw on the resources of their international counterparts to find sustainable solutions tailored to the real needs of their cities. CityLinks is funded by the United States Agency for International Development (USAID) and implemented by ICMA.

Importance of Regional Cooperation

Cities and counties by themselves are seldom able address regional issues; consequently they often work together to deliver services such as transportation and waste management. However, coordination on climate policies that span beyond their borders remains relatively uncommon. It is imperative that local governments take a more prominent role in setting regionally relevant climate policy. Climate change action requires cooperation and integration across all jurisdictions. It is not enough to develop policies that apply solely to traditional city jurisdictions and to rely on traditional urban structures in this process. Metropolitan-wide policies and coordinated approaches across both local and international borders will be necessary to implement successful climate strategies.

Climate Partnerships

Through CityLinks, ICMA has been working with the Durban Adaptation Charter (DAC) and the Southeast Florida Regional Climate Compact to look at a regional approach to tackling shared climate challenges.

Through the CityLinks program, Durban, South Africa was paired with Broward County and Fort Lauderdale, Florida because of the similar climate change challenges each region faces. Officials from Durban were able to get an in-depth look at how counties in Southeast Florida are working together at the regional level to address climate change.

The Southeast Florida Regional Climate Change Compact, supported by the Institute for Sustainable Communities, is an agreement between Broward, Miami-Dade, Monroe, and Palm Beach counties to coordinate mitigation and adaptation activities across county lines. The counties recognize that the very high vulnerability of the Southeast Florida region to sea-level rise requires collaboration. Achievements include:

- Joint policies to influence climate/energy legislation and funding at both the state and federal government levels
- Development of Adaptation Action Areas (AAA) by the Florida State Legislature designating areas in the region especially vulnerable to climate impacts. This involved the use of a critical planning tool for sea level rise
- Development of a Regional Climate Change Action Plan and workshops to aid implementation of the plan
- Annual summits to review progress and discuss strategies.

Leaders from Fort Lauderdale and Broward County made an initial trip to Durban to gain insight into its climate challenges and political environment. Following that, a delegation of local government officials from Durban traveled to Florida to examine the technical and policy solutions Fort Lauderdale and Broward County are implementing to address climate change. Particularly interested in

the governance model of the Southeast Florida Regional Climate Compact, the delegation met with community members who were integral to its formation. Discussions and site visits throughout the week addressed flooding, storm water management solutions, ecosystem restoration, coastline management, and public/private sector engagement.

As a direct result of these exchanges, Durban has established the Central KwaZulu-Natal Climate Change Compact (KZN), modeled on the Southeast Florida Regional Climate Change Compact. The KZN Compact aims to provide a forum through which participating local governments can engage with each other and cooperate on integrated climate change adaptation responses in order to reduce vulnerabilities and increase resilience of their communities. The compact also serves as a platform for capacity development, exchanging lessons, coordinating efforts, and gaining better access to support and funding from local and international funders.

Capitalizing on the success of the two compacts, the CityLinks program also paired Durban with Dar es Salaam, Tanzania. Working directly with the Association of Local Authorities in Tanzania (ALAT),

an ICMA affiliate, in conjunction with officials from Durban, CityLinks hosted a capacity building workshop for elected officials and leading municipal staff to discuss climate challenges in Tanzania. At the conclusion of the workshop the heads of local governments present signed a resolution to:

Create a local government climate change governance structure and coordination mechanism in order to share lessons between local authorities in Tanzania, to enhance our capacity and implement climate change actions in the context of national policies and legislation. Through this we have committed to create local climate committees in all local governments that will report to regional climate committees of representatives that in turn will report to a national climate committee of local authorities coordinated by the ALAT leadership.

By utilizing existing ALAT resources and reporting structures, the committees will have a foundation to begin from and will ensure that processes are not onerous or duplicative. Municipalities or national governments interested in setting up similar regional structures can learn more through the CityLinks website (www.icma.org/citylinks).

Lessons Learned:

- Peer-to-peer learning is an effective knowledge sharing approach. Among its advantages, it helps build local capacity while also reducing or even eliminating costs for outside technical experts.
- Climate challenges do not stop at political borders. Finding innovative and locally applicable ways to cooperate regionally is critical to the successful implementation of sub-national climate change interventions.
- Successful regional compacts demonstrate the value of regional governance structures that coordinate planning, technical collaboration, and policy-making among cities within a region that shares common climate change threats.

Shared Learning Dialogues (SLDs)

The Gorakhpur District in Uttar Pradesh, India is the most flood-prone district in eastern Uttar Pradesh. To help decision makers plan for more frequent and intense flooding, the START-CDKN team held a number of SLDs, horizontally, across departments, and vertically, from departmental to district to state and higher levels of government. This involved a structured and iterative process of workshops and round table discussions, with each iteration involving various departments, individually and collectively. The active capacity-building of local authorities to deal with climate-related uncertainties contributed to the program's success.[58]

The Public Private People Partnership for Climate Compatible Development (4PCCD) in Maputo, Mozambique is a CDKN-supported project created opportunities for dialogue among government, business, and community stakeholders. Local communities were consulted about their experiences and, through this exchange, became fully engaged in the implementation of priority actions. The participatory planning also helped mobilize local in-kind resources to leverage existing government budgets.[59]

Study Tours

A number of Urban-LEDS cities took part in the Urban-LEDS European Study Tour hosted by the cities of Almada, Portugal; Copenhagen, Denmark; and Hannover, Germany. The tour was to facilitate knowledge-pooling and exchange between city representatives from all Urban-LEDS countries involved in the program: Brazil (Recife, Fortaleza, Belo Horizonte), India (Panaji), Indonesia (Balikpapan, Bogor), South Africa (Kwadukuza), and Europe (Gaziantep, Warsaw, Zagreb).

The tour was designed to address specific interests of the Urban-LEDS cities. For example, a stop in Almada, Portugal responded to the interest of KwaDukuza Municipality, South Africa to increase energy efficiency in street lighting. A visit to an Almada wastewater treatment plant was arranged because of Recife's interest in biogas production and use for electricity and heat production. Recife was also interested to learn more about how Almada manages its green areas and plant nurseries, and thus the group visited the Parque da Paz ("Peace Park"), which is popular with citizens and serves as the "green lung" of the city, contributing significantly to reduce flooding in the city center. Warsaw, Poland was preparing a public procurement for 130 electric buses, and wanted to learn from Almada about their electric bus system, Flexibus, for the old city center. In the host city of Copenhagen, Balikpapan, also a coastal city, observed their urban planning and stakeholder engagement for the city's harbor regeneration and redevelopment. In Hannover, Gaziantep, Turkey and Panaji, India focused on the city's mechanical and biological waste treatment facilities and landfill.

Leveraging Study Tours

A water conservation project in Dubuque, Iowa, was the inspiration for an award-winning program in Townsville, Queensland, Australia, thanks to an exchange program managed by ICMA.

In late 2011 and early 2012 Cindy Steinhauser, assistant city manager in Dubuque, Iowa, and Greg Bruce, executive manager of the Integrated Sustainability Services Department in Townsville, participated in a reciprocal exchange, visiting each other's cities as part of the Sustainable Communities Fellowship Program funded by the U.S. Department of State's Bureau of Educational and Cultural Affairs and managed by ICMA.

During his visit in the United States, Bruce observed the initiatives incorporated into the Smarter Sustainable Dubuque program. Townsville went on to replicate the water conservation portal that had been implemented in Dubuque. As a result, the Australian municipality won the Infrastructure Partnerships Australia's prestigious National Infrastructure Award for Smart Infrastructure in March 2013.

Key Actions For Knowledge Sharing

These experiences suggest the following actions will help promote successful knowledge sharing for urban LEDS:

- Determine knowledge sharing activities based on stakeholder needs and priorities. At the beginning of any project or program, conduct a needs assessment to determine what kind of knowledge is needed— e.g., topics, target audiences, potential individual participants, etc.

- Engage participants in designing networks and exchange programs.
- Monitor and evaluate networks and exchanges to determine effectiveness and make changes as needed.
- Consider opportunities for institutionalizing effective networks.

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35 e.g., Glemarec, Yannick. 2011. Catalyzing Climate Finance: A Guidebook on Policy and Financing Options to Support Green, Low-Emission and Climate-Resilient Development. United Nations Development Programme (UNDP), New York, NY; http://www.covenantofmayors.eu/IMG/pdf/Financing_Opportunities_Matrix.pdf; http://www.climatefundsupdate.org the joint United Nations Development Programme/World Bank Climate Finance Knowledge Platform, at http://www.climatefinanceoptions.org provides comprehensive information about financing options. The site also has a "community of practice page" for users to discuss climate financing for cities.

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37 GIZ. 2013. Sub-national involvement in NAMA development: Current and emerging practice towards vertical integration. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

38 GIZ. 2014. Vertically Integrated Nationally Appropriate Mitigation Actions (V-NAMAs). Policy and Implementation Recommendations. V-NAMA Project, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

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40 Green infrastructure uses vegetation, soils, and natural processes to perform the same functions as physical infrastructure, such as water supply pipelines, storm water drainage systems, etc. (e.g., green roofs, vegetated watersheds).

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51 World Bank. 2011. Mexico Case Study: Climate Change, Disaster Risk And The Urban Poor: Cities Building Resilience For A Changing World.

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53 www.ledsgp.org

54 http://wbi.worldbank.org/wbi/

55 http://www.citiesclimateregistry.org

56 ICLEI Case Study #141–2012, JNNURM/India.

57 www.icma.org/citylinks

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59 Anton, B., Cambray, A., Dupar, M., Westerlind-Wigstroem, A. and Gogoi, E. (2014). Close to home: subnational strategies for climate compatible development. Working Paper. Climate and Development Knowledge Network (CDKN).

Climate-proofing using low carbon, climate resilient development strategies will help cities reduce their GHG emissions, protect vital services from climate change impacts, and sustain economic growth. USAID's Urban Policy and Climate-Resilient Development Framework provide principles and an analytical tool to help achieve this objective. Based on the interviews and literature review conducted by the author, this primer identifies the following specific actions as particularly promising:

1. *Low emission, climate resilient development strategies (LECRDS)* support urban climate proofing by integrating mitigation, adaptation and sustainable development, promoting the goal of embedding climate change considerations in all aspects of city planning and programming.
2. *Multi-level governance* strengthens governance through vertical and horizontal integration of governance structures and institutions. Strong governance helps reduce investor perceptions of risk, facilitating private-sector investment and PPPs. To have lasting impact, local institutions need political leadership committed to providing services, as well as the capacity to implement, operate, and expand services.
3. *Low-cost financing options* include "no cost" and "win-win" strategies that provide benefits with or without climate change; leveraging and redirecting city budgets to support climate activities (e.g., environmental protection funding); improving municipal financial management and international creditworthiness; leveraging private-sector financing; and developing PPPs.
4. *Stakeholder engagement* is important throughout project planning and implementation. Community and government champions facilitate this process and help gain community support. Institutionalizing stakeholder processes helps ensure long-term engagement.
5. *Knowledge sharing* through city-to-city learning, knowledge networks, and other knowledge-sharing approaches can play an important role in building a city's capabilities cost-effectively.

USAID's Washington, DC urban and global climate change specialists can help Missions to support cities developing and implementing low emission, climate resilient strategies. These experts can help cities to strengthen governance, identify low-cost financing options, improve financial management and creditworthiness, engage stakeholders, and build knowledge-sharing opportunities.

The CityLinks program, led by ICMA with support from ISC, and funding from USAID, provides support to Missions and their urban partners through city-to-city knowledge exchanges. Annex 2 provides links to a number of other organizations supporting cities seeking to develop low emission and climate resilient strategies.

Interviews

Name	Title	Organization	Date of Interview
Lee Baker	Chief of Party	USAID Adaptation Project Preparation Facility for Asia and the Pacific (ADAPT Asia-Pacific)	August 12, 2014
Ranell Dedicatoria	Program Manager	ICLEI-Local Governments for Sustainability (ICLEI)	July 28, 2014
Catherine Diomampo	Project Officer	ICLEI	July 28, 2014
David Dodman	Senior Researcher	International Institute for Environment and Development (IIED)	July 10, 2014
Richard Friend	Senior Scientist	Institute for Social and Environmental Transition (ISET)	August 1, 2014
Stelios Grafakos	Lead Climate Change Specialist	Institute for Urban Management	June 12, 2014
Somayya Ali Ibrahim	Program Manager, Urban Climate Change Research Network (UCCRND)	Center for Climate Systems Research Earth Institute at Columbia University/NASA GISS	July 18, 2014
Sandra Khananusit	Regional Technical Officer, USAID Low Emissions Asian Development Program	ICF International	July 3, 2014
Pradeep Nair	Implementer	ISC; USAID's Low Emissions Asian Development (LEAD) program	July 1, 2014
Shom Teoh	Task Manager; Senior Policy Researcher	Institute for Global Environmental Strategies (IGES)	July 28, 2014
Richard Carlos Worden	Senior Environmental Evaluator	World Bank	August 12, 2014

Additional Information

Programs and Initiatives Supporting National LEDS

Program/Initiative	Description
Enhancing Capacity for Low Emission Development (EC-LEDS)	U.S. Government initiative, led by USAID, to provide tailored assistance and capacity building activities to enable up to 20 developing countries and emerging economies to develop and implement LEDS programs. Based on its success at the national level, the program is expanding to cities. https://www.ec-leds.org
Low Emission Capacity Building (LECB) Programme	Global initiative to support national climate change mitigation efforts, low emission development strategies and enhanced measuring, reporting and verification systems. www.lowemissiondevelopment.org
Asia Low Emission Development Strategies Partnership (Asia LEDS Partnership)	Promotes and supports low-emission development across the Asia and Pacific region through peer-to peer learning, knowledge sharing, and improved coordination and cooperation among governmental and non-governmental partners. http://www.AsiaLEDS.org.
The USAID Low Emissions Asian Development (LEAD) program	Works with Asian governments, businesses, and others to prepare and implement LEDS. Provides analytical tools, models, training, demonstration projects, and scientific support for LEDS at the regional, national, and local levels. http://lowemissionsasia.org/

Programs and Initiatives Supporting Subnational LEDS and LECRD

Program/Initiative	Description
Compact of Mayors (CoM)	Launched in September 2014, the goal of the CoM, with over 2,000 cities as members, is to reduce the world's GHG emissions by 454 million tons a year by 2020–equivalent to the carbon dioxide emissions from 130 coal power plants– through knowledge sharing and transparent and accountable measures. http://www.un.org/climatechange/summit/wp-content/uploads/sites/2/2014/09/CITIES-Mayors-compact.pdf
The Climate Group States & Regions Alliance	Network of sub-national government leaders from around the world that shares expertise and influences the international dialogue on climate action. http://www.theclimategroup.org/programs/states-and-regions/
C40 Cities Climate Leadership Group (C40)	International network of mega-cities interested in taking action on their emissions. Supports city governments in creating policies and alliances to accelerate the uptake of climate-friendly technologies and influence the market place. http://www.c40.org
Urban-LEDS	The Urban-LEDS program, implemented by ICLEI with UN-Habitat support mobilized by the European Commission, aims to facilitate the transition to low-emission urban development in cities in emerging economy countries. The program works with two Model Cities in each of four participating countries to formulate and adopt an Urban-LEDS, and then the Model Cities share their experiences with Satellite Cities. Model Cities include Rajkot and Thane, India; Balikpapan and Bogor, Indonesia; KwaDukuza and Steve Tshwete, South Africa; and Fortaleza and Recife, Brazil. http://urbanleds.iclei.org

Program/Initiative	Description
UNDP Green, Low Emission Climate Resilient Development Strategies (LECRDS)	Includes three initiatives under its *Signature Programme Supporting Integrated Climate Change Strategies* that help governments develop and strengthen policies, institutions, and governance to support integrated green growth, low-emission and climate resilient development (Green LECRDS) and to access financing. http://www.undp-alm.org/supporting-integrated-climate-change-strategies
ICLEI- Local Governments for Sustainability (ICLEI) Climate Program	Promotes actions for cities to become "sustainable, resilient, resource efficient, biodiverse and low-carbon, and to develop an inclusive, green economy." ICLEI's global climate initiatives include Low Carbon City http://archive.iclei.org/index.php?id=10828 and Resilient City http://archive.iclei.org/index.php?id=10832
Low Emission Development Strategies Global Partnership (LEDS-GP)	Founded in 2011 to enhance coordination, information exchange, and cooperation among countries and international programmes working to advance low emission, climate resilient growth. Partnership brings together more than 120 countries and international institutions through peer learning, collaboration forums and networks. Now has over 1700 members from governments, bilateral and multilateral donors, universities, NGOs and the private sector from Africa, Asia and the Pacific, Latin America, North America and Europe. www.ledsgp.org
The LEDS-GP Working Group on Subnational Integration	Founded in 2013 by Low Emission Strategies Global Partnership (LEDS-GP) members to identify ways to improve integration of climate action plans and policies between national and subnational levels. The group intends to support and bring together partners for activities to make the case for vertical collaboration between national and subnational actors and cross-learning between subnational actors, and to identify tools. www.ledsgp.org/planning/NationalSubnationalLEDS
UN-Habitat Cities and Climate Change Initiative (CCCI)	Supports development of pro-poor approaches to climate change policies and strategies, and develops and distributes methodologies to city managers and practitioners. Also promotes collaboration by local authorities and global, regional, and national networks. Participating cities include Kampala, Uganda; Esmeraldas, Ecuador; Maputo, Mozambique; and Sorsogon, Philippines. http://unhabitat.org/urban-initiatives/cities-and-climate-change-initiative/
UN-Habitat–Down to Earth: Territorial Approach to Climate Change (TACC) Program	The TACC Program is part of a partnership between the UN and subnational governments for fostering climate friendly development at the subnational level. http://www.undp-alm.org/territorial-approach-climate-change-tacc
World Bank's Low Carbon Livable Cities Initiative (LC2)	LC2 helps cities plan and finance low carbon programs to support "smart, sustainable, green, and inclusive growth." Provides suite of tools and activities tailored to each city's specific needs and level of progress, ranging from GHG inventories and assessments to low-carbon investment planning and financing solutions. Goal is to work with 300 of the largest developing country cities by 2017. Partners include the World Bank, the Clinton Global Initiative, C40, The Rockefeller Foundation, and others. http://www.worldbank.org/en/news/feature/2013/09/25/planning-financing-low-carbon-cities
Global Environment Facility (GEF) Sustainable Cities Program	Launched in September 2014, the GEF has committed US$100 million to "establish a common platform for cities to access and share solutions on climate change adaptation and mitigation, energy, transport and water." http://www.thegef.org/gef/CC/sustainable-cities
Clinton Climate Initiative (CCI)	Collaborates with partners worldwide to increase the climate resiliency of participating communities and create replicable and sustainable models for others to follow. https://www.clintonfoundation.org/our-work/clinton-climate-initiative.

Adaptation: The process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities; adaptation activities build resilience to the unavoidable impacts of climate change.

Business as Usual (BAU): A phrase used to indicate current conditions; see Emissions Scenario for meaning of BAU in context of climate change.

Carbon dioxide equivalent (CO2eq): A measure used to compare the emissions from various greenhouse gases based upon their global warming potential.

Climate change: A shift in weather averaged over decades or centuries due to natural variability or because of human activity.

Conference of the Parties (COP): Supreme body of the UNFCCC, comprising countries with right to vote that have ratified or acceded to the convention.

Emissions scenarios: Describe future releases to the atmosphere of greenhouse gases, aerosols, and other pollutants, along with information on land use and land cover, based on assumptions about driving forces such as patterns of economic, population growth, and technology development. In addition to their use as inputs to climate models, emissions scenarios are used in research on mitigation. For information on IPCC's scenarios, see http://sedac.ipcc-data.org/ddc/ar5_scenario_process/scenario_background.html.

Energy efficiency: Ratio of the useful energy output of a system, conversion process or activity to its energy input.

Energy efficiency improvements: Reductions in the energy used for a given energy service (e.g., heating, lighting).

Fuel switching: Replaces inefficient fuels with cleaner and economical alternatives (e.g., solar).

Green infrastructure: Vegetation, soils, and natural processes that perform the same functions as physical infrastructure such as water supply pipelines, storm water drainage systems, etc. (e.g., green roofs, vegetated watersheds).

Green growth: Involves promoting growth and development while reducing pollution and GHG emissions, minimizing waste and inefficient use of natural resources, maintaining biodiversity, and strengthening energy security. It requires further "decoupling" of environmental impacts from economic growth, and greening of consumption and production patters, while reducing poverty and improving health and job prospects. Green growth means making investment in the environment a new source of economic growth (OECD Green Growth Strategy, 2009).

Green technology: Technology designed to reduce or reverse the effects of human activity on the environment, such as energy-efficient technologies (e.g. wind power, solar power, hydropower, biofuels).

Mitigation: Actions to reduce the amount of greenhouse gases released into the atmosphere and to recapture greenhouse gases currently in the atmosphere and sequester them in ecosystems.

Nationally Appropriate Mitigation Action (NAMA): Voluntary emission reduction measures reported by national governments in developing countries to the UNFCCC. NAMAs can be policies, programs or projects implemented at national, regional, or local levels.

Resilience: The capacity of a system to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.

Strategy: Provides the overall direction and vision for an initiative or program.

Strategic planning: A systematic decision-making process to determine priorities and allocate resources (i.e. time, money, skills) to achieve agreed-on objectives.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987).

Sustainable services: Public services provided through public and private entities in which host country partners and beneficiaries take ownership of development processes, including financing, and maintain project results and impacts beyond the life of the USAID project. Such services include those funded by user fees (e.g., water, wastewater, energy and public transportation), as well as services typically paid through general revenue funds (e.g., education, health care, and public housing services) (USAID. 2013. Sustainable Service Delivery in an Increasingly Urbanized World).

CityLinks Primer

on Subnational Approaches for Low Emission, Climate Resilient Development