



# POLICY BRIEF

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## Transitioning Towards Climate Compatible Cities

Shobhakar Dhakal, Ashish Shrestha, Shaleen Singhal, Susie Moloney, Philip Vaughter, Rotchanatch Darnsawasdi, Sohee Minsun Kim, Chanathip Pharino, Eko Haryono

### Highlights

- Climate change actions in cities can be characterised as highly fragmented and divided into vertical silos, therefore, better communication between all branches of government is needed so all aspects related to mitigation and adaptation can be coordinated.
- Cities must develop a robust framework and indicators to track progress towards climate compatible development to ensure that cities are moving towards the most sustainable development pathways.
- Cities need to include both mitigation and adaptation frameworks into all of the cities' planning processes.

### What is Climate Compatible Urban Development?

A growing body of research highlights the increasing stress on environmental and built systems due to climate change, and that despite mitigation efforts, these systems will continue to be affected by climate change. Many cities are hotspots for climate change impacts (coastal cities face rising sea levels, while many cities across the world face floods and other extreme weather events) and global GHG emissions, hence it is imperative for cities to take a leading role in climate actions. In the last few years, cities have been at the centre of several key global development frameworks, not only the Paris Agreement on climate change, but also the Sustainable Development Goals (SDGs), the New Urban Agenda (2017-2030), and the Sendai Framework for Disaster Risk Reduction (2015-2030). Cities have also emerged strongly in national agendas: China's The National New-type of Urbanization (2014-2020), India's Smart

City Initiative, and others are putting urban areas at the heart of many national development agendas. Climate change is one of the key considerations for all these plans. Thousands of cities are developing climate actions in various forms and hundreds have explicit and well-defined climate change action plans. Others are ambitiously pledging, developing response plans, and implementing actions with support from research, policy, and practitioner communities. The IPCC's 5th Assessment Report has shown that incremental changes in urban environments will not be enough to offset dangerous temperature rises and knowledge gaps for transformative change in cities remain a challenge. Implementing effective mitigation and adaptation strategies is critical if cities are to reduce climate change impacts, which includes ensuring that urban development is climate compatible. With the world's urban population expected to double from 3.48 billion in 2014 to 6.3 billion in 2050, cities are the major contributors to the emissions causing climate change. Despite covering less than 2% of the earth's surface, cities consume over two-thirds of the world's energy and produce between 71-76% of global energy related CO<sub>2</sub> emissions and more than 60% of total greenhouse gas emissions combining energy generation, vehicles, industry, and biomass use (Seto et al., 2014). Cities are trying to address climate change mitigation and adaptation by quantifying emissions, setting greenhouse gas reduction targets, and developing vulnerability and risk assessments and adaptation plans. As understanding of climate risks became robust and extreme events associated with climate change become frequent, adaptation has become a core element of sustainable development. As part of this focus on the role of cities in responding to climate change it became clear that new urban development models and pathways are required, which can be described as 'climate compatible development'. This approach to urban development integrates climate threats and opportunities focusing on both climate mitigation directly and indirectly, while building climate resilient cities simultaneously. Climate compatible development as defined by Mitchell and Maxwell (2010), is a 'triple-win' strategy aiming to achieve low carbon emissions, build resilience, and promote development simultaneously.

Climate change is a multi-sectoral issue and addressing it requires mainstreaming climate concerns into all aspects of development. Therefore, the important question is "*whether the current climate actions taken by cities are good enough for cities to move toward climate compatible development?*" The recent IPCC (2014) AR5 Mitigation report has mentioned that the evidence of meaningful change in GHG mitigation from cities' actions is limited because these plans are either ineffective in formulation or at the early stage of implementation. It is therefore difficult to assess if cities are making significant progress in both mitigating climate change and adapting to the expected impacts of climate change. Adaptation plans are less prevalent than mitigation plans. As the role of cities in the post COP-21 world has highlighted, bottom up measures and actions are emerging, and as more and more cities are ambitiously developing climate change action plans there is an urgent need to track the effectiveness of their methods and implementation in shaping the climate compatibility of cities. A number of cities around the world have shown farsighted leadership in setting targets, as well as devising and implementing plans to reduce these greenhouse gas emissions. However, climate change brings both threats and opportunities in cities. Cities can reduce their greenhouse gas emissions while simultaneously addressing other pressing local environmental problems such as air pollution, waste, and transport, not to mention other challenges such as local economic development. Cities' mitigation interventions and targets can contribute to national targets of GHG reductions. Many cities, including Seoul, Stockholm, Toronto, Copenhagen, Mannheim, Nantes, Boulder, and New York are already taking actions on climate change, some even without national commitments, to lower the potential trade-offs between growth and environmental priorities. Under the framework of climate compatible urban development, with simultaneous mitigation and adaptation strategies, cities also have opportunities to achieve substantial co-benefits including public health improvements, cost savings through increased efficiency, energy security, and green jobs amongst others.

## Issues in Cities

Urbanisation, driven by growth in the urban population, economy, industrialisation and other socio-economic factors, will continue to escalate into the near future, especially in Asia. The implications of climate change on urban sectors, including effects on human health, built infrastructures, socio-economic, and ecological systems are becoming more frequent and intense. Furthermore, growth in many cities involves larger numbers of informal settlements living in vulnerable areas of cities, which are more likely to be affected first in any extreme climate events. An assessment by the OECD (2007), of 136 of the world's large port cities in relation to coastal flooding and extreme climate events showed that 40 million people (0.6% of the global population or roughly one in 10 of the total port city population) are exposed to a one-in-100-year coastal flood event. Most of the largest port cities are found in Asia (38%), among which 27% are located in deltaic settings, primarily within Asia (OECD, 2007).

Mitigation plans aim towards preventing further climate change which involve large scale responses across countries and sectors, while adaptation plans involve readjusting patterns of urban habitation, infrastructure provision and ways of living, as a certain amount of climate change is inevitable. These plans must be implemented at local scales to address specific local area needs. However, an effective climate change policy for cities means that both mitigation and adaptation are addressed in an integrated manner (World Bank, 2010). A key issue with current adaptation policy and practice is often shortsightedness, with an inability to focus on long-term climate variability, risks and resilience. Several lines of scientific research underscore the need for transformational change, however, in practice climate change programs struggle to shift from business as usual strategies (Brooks et al., 2011). There has been little effort in assessing the process and progress of mitigation and adaptation which is vital for transitioning to climate compatible cities. Adaptation tracking is a component of monitoring and evaluation that captures the extent to which adaptation is taking place as well as the success or effectiveness of adaptations in reducing vulnerability, from which a baseline of current action can be created and from which progress can be evaluated over time (Ford et al., 2013). The constraint in developing such a tracking framework is an absence of measurable indicators to define adaptation quantitatively, as well as the lack of a common framework for defining the data requirements to create comparable benchmarks.

Although policies on adaptation to climate change are relatively new in cities, adaptation economies are maintaining a steady trend of growth. A study by Georgeson et al. (2016) examining ten global megacities found that the adaptation economy constitutes only a small share of up to 0.33% of a city's gross domestic product, and the differences in total spent among developed and developing cities range from USD 18.6 million to USD 1,985.7 million. The climatic disaster losses in economic terms are greater in developed countries, however, fatalities and economic losses in proportion to GDP are higher in developing countries. It is essential that both mitigation and adaptation should be adequate and at the same time progress should be tracked in order to evaluate how the mitigation and adaptation is progressing. It is also essential that progress on mitigation and adaptation should be benchmarked and tracked to inform governance systems on status and gaps in climate action. This helps policymakers to improve decision making on climate finance and planning strategies.

## Tracking Climate Mitigation in Cities

Mitigation, in the context of climate change, is *“a human intervention to reduce the source or enhance the sinks of greenhouse gases (GHGs)”* (IPCC, 2014). Past GHG emissions have already put the planet on track for substantial changes in climate, and many scenarios lead to climate impacts that will harm human well-being and ecosystems, exceeding the ability of those systems to adapt (IPCC, 2014). COP-21

mitigation strategies for cities are usually expensive in the short term, because they are capital intensive (requiring changes in technology, urban transport, and collective infrastructure) which require fundamental changes to urban systems. A city's GHGs emission reflect the structure of a city, its energy sources, as well as its production and consumption patterns including its residents' lifestyles. Resource use, water consumption, wastewater production, toxic waste disposal, and solid waste generation all contribute to greenhouse gas emissions. The IPCC has issued guidelines to calculate national GHGs that include all emissions produced within given boundaries and a similar methodology is and must be followed at the city level (World Bank, 2010).

Low carbon development requires not only reducing emission in-boundary but also alleviating the emissions outside of a city boundary which are embedded in the consumption of goods and services in a city through the supply chain. Such concepts are necessary for avoiding emissions outsourcing. Tracing mitigation must involve overall reduction as well as sectoral mitigation by sources. A tracking framework must be able to show the state of mitigation, as well as action, impacts, and outcomes.

## Tracking Climate Adaptation in Cities

Adaptation is *“an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.”*<sup>1</sup>

Adaptations are classified into numerous forms based on their purpose, mode of implementation, or on the institutional form they take; they can be a range of activities and processes varying across contexts and across scales - local, national, or regional. Adaptation can be broken down into three broad categories (Brooks et al., 2011):

- (1) Addressing the adaptation deficit to increase the coping capacity of human societies and systems and recover from climate change impacts;
- (2) Adapting to incremental changes in existing climate-related risks to increase the coping capacity of societies in order to accommodate increased variability and extreme events;
- (3) Adapting to qualitative changes in climatic and environmental conditions, which focuses on transformational change to replace existing systems in order to ensure that development is viable and sustainable under climate change implications.

In general, adaptation strategies are reactive to experience of past or current climate events, but also they could be anticipatory to future possible events based on certain assessment(s) (Adger et al., 2005). Successful cities' adaptations can be attributed to its level of resilience, preparedness to minimise climate risks, and effective service provision.

UNFCCC Article 4 requires developed countries to assist developing countries that are “particularly vulnerable” to climate change – including Least Developed Countries (LDCs) and Small Island Developing States (SIDS) – in meeting costs of adaptation to its adverse effects. As a result, several funds have been established under the UNFCCC to provide financial resources for assessing, planning, and implementing adaptation measures in developing countries. Further funding is provided bilaterally and through multilateral institutions (including the World Bank and the Asian Development Bank) outside the UNFCCC framework. The largest sources of international public finance for climate mitigation in developing countries are the World Bank administered Clean Technology Fund (CTF) and Global Environment Facility (GEF), while the

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<sup>1</sup> Refer to: [https://www.ipcc.ch/publications\\_and\\_data/ar4/wg2/en/ch18s18-1-2.html](https://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch18s18-1-2.html)

EU's Global Energy Efficiency and Renewable Energy Fund (GEEREF) and the World Bank's Scaling up Renewable Energy Program (SREP) provide mitigation financing on a smaller scale. Developed countries are committed to support USD 100 billion (total public climate finance) to developing countries each year, with the amount of public climate finance projected to increase by USD 67 billion in 2020<sup>2</sup>. The largest sources of approved funding for adaptation projects are currently the Pilot Program for Climate Resilience (PPCR) of the World Bank's Climate Investment Fund and the Least Developed Countries Fund (LDCF) administered by the GEF. Given the rate of urbanisation in the developing world, especially in the Asia-Pacific region, targeting climate finances for mitigation and adaptation planning in cities should be made a priority with these types of funds.

## Need for Framework and Indicators for Climate Compatible Development of Cities

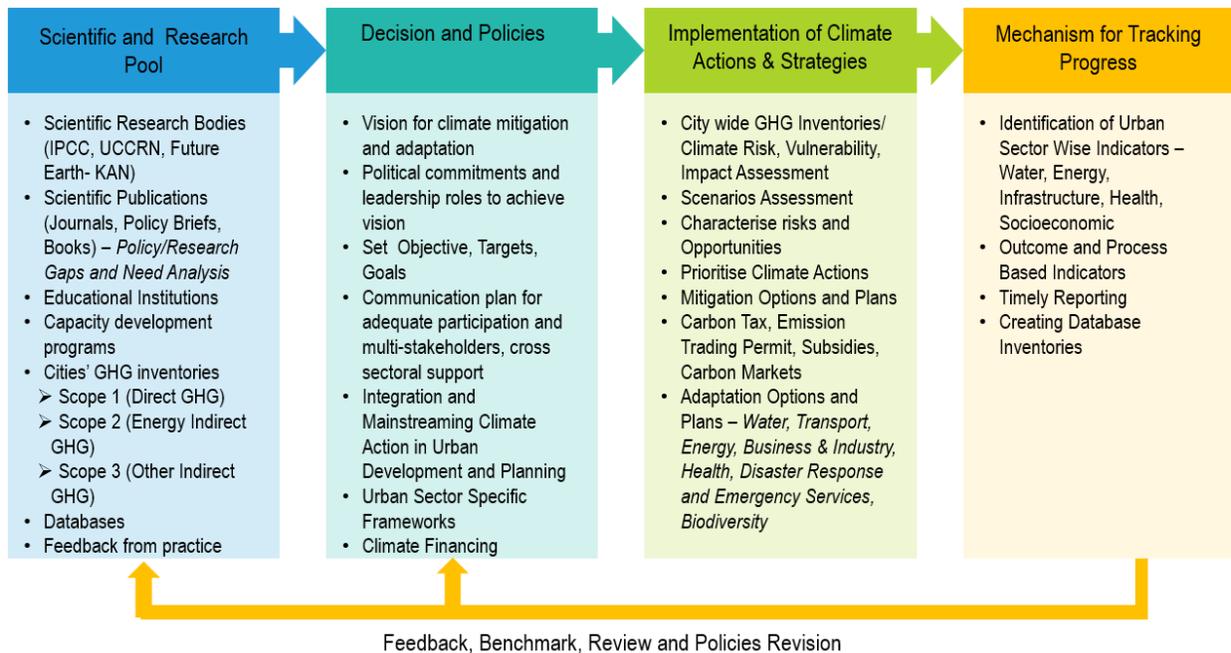
Approximately USD 340 billion is invested annually around the globe on climate change mitigation and adaptation, with these funds often allocated to national, regional, and local governments. A sizeable portion of these funds are expected to be geared towards cities, as adaptation strategies are aggressively being implemented under different projects as part of the climate change strategies in urban areas. Therefore, it is very important to ensure that climate investments are leading to climate resilient development in these urban areas.

It is also important to note that past studies have shown that evidence of achievements from climate change actions are often unclear. Policy makers and planners at different levels of government, as well as funding agencies, are now being involved in developing mitigation and adaptation plans in cities, placing local governments on the frontlines for implementation as well as accountability. This underscores the need to develop a robust framework and indicators to track mitigation and adaptation actions, spending, and progress to ensure that costs and benefits of mitigation and adaptation plans are distributed equitably and delivered effectively. Developing a common framework and indicators will help in setting precise targets, monitoring utilisation of funds, benchmarking progress across different scales (cities, regions, countries), evaluating policy interventions, developing future policies, and creating effective communication among stakeholders.

The overarching framework (*Figure 1*) for climate compatible development in cities, emphasises a mechanism for tracking progress in climate action which provides feedback on research to scientific communities and policymakers, to benchmark progress and improve their climate actions. In addition, cities' authorities need to establish systems of coordination among the scientific and research pools to mainstream climate action into urban development and planning, identify suitable indicators and frameworks, and create comprehensive databases of GHG inventories and timely progress.

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<sup>2</sup> Refer to, "Roadmap to US\$100 billion": <http://dfat.gov.au/international-relations/themes/climatechange/Documents/climate-finance-roadmap-to-us100-billion.pdf>



**Figure 1.** Overarching framework for Climate Compatible Development in Cities

Several indicators are available that are being implemented in climate change research and practice. Mitigation indicators are more straightforward compared to adaptation indicators. Mitigation indicators are based on the output or outcome for particular sectors following the mitigation interventions. A baseline is identified, and emissions prior to and following intervention are then estimated. 'Process based indicators' and 'outcome based indicators' are conceptual frameworks for adaptation indicators (Harley et al., 2008), including disaster resilience indicators (Cutter et al., 2010), vulnerability-resilience indicators (Moss et al., 2001), and aggregated vulnerability indices (Füssel, 2010). A set of indicators and frameworks to comprehensively include cities climate actions that can be tailored to individual cities has yet to be created.

## Conclusion

While cities are developing climate action plans, there is also a need for developing a tracking framework with appropriate indicators to assist and guide cities in mitigation as well as adaptation efforts. These must be formulated and selected carefully, as they will vary according to the context and the nature of mitigation and climate hazards, as well as the development process and goals in different cities. Crucial elements to any framework or indicators include: articulation of climate change goals and objectives; sectoral inclusiveness, complete representation and characterisation of interventions, in-boundary and out-boundary linkages, administration and institutional changes designed to facilitate mitigation and adaptation (e.g. processes associated with capacity building), and the evaluation of whether development outcomes (e.g. increased productivity, reduced disaster losses, etc.) have improved. As many cities in the Asia-Pacific region still are in the early stages of development associated with rapid emission rise, and are also vulnerable to climate risks, a common framework to track cities' efforts to address climate change would help not only cities themselves, but also their development partners.

## References

- Adger, W.N., Arnell, N.W., Tompkins, E.L., 2005. Successful adaptation to climate change across scales. *Global Environmental Change* 15, 77–86. doi:10.1016/j.gloenvcha.2004.12.005
- Brooks, N., Anderson, S., Ayers, J., Burton, I., Tellam, I., 2011. Tracking adaptation and measuring development, Change. IIED Climate Change Working Paper No. 1, November 2011.
- Cutter, S.L., Burton, C.G., Emrich, C.T., 2010. Disaster Resilience Indicators for Benchmarking Baseline Conditions Disaster Resilience Indicators for Benchmarking Baseline Conditions. *Journal of Homeland Security and Emergency Management* 7. doi:10.2202/1547-7355.1732
- Ford, J.D., Berrang-ford, L., Lesnikowski, A., Barrera, M., Heymann, S.J., 2013. How to Track Adaptation to Climate Change : A Typology of Approaches for National-Level Application. *Ecology and Society* 18(3):40.
- Füssel, H.-M., 2010. Review and quantitative analysis of indices of climate change exposure, adaptive capacity, sensitivity, and impacts, World Development Report. Potsdam Institute for Climate Impact Research (PIK), Germany. doi:10.1016/j.gloenvcha.2010.07.009
- Georgeson, L., Maslin, M., Poessinouw, M., Howard, S., 2016. Adaptation responses to climate change differ between global megacities. *Nature Climate Change* 6. doi:10.1038/NCLIMATE2944
- Harley, M., Horrocks, L., Hodgson, N., Minnen, J. Van, 2008. Climate change vulnerability and adaptation indicators, European Topic Centre on Air and Climate Change (ETC/ACC) Technical Paper 2008/9.
- IPCC, 2014. 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,., [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.)]. Cambridge University Press, Cambridge.
- Mitchell, T., Maxwell, S., 2010. Defining climate compatible development (Policy Brief). Climate Development and Knowledge Network.
- Moss, R.H., Brenkert, A.L., Malone, E.L., 2001. Vulnerability to Climate Change: A Quantitative Approach. U.S. Department of Energy.
- OECD, 2007. Ranking of the World's Cities Most Exposed to Coastal Flooding Today and in the Future. Organization for Economic Co-operation and Development.
- Seto, K.C., Dhakal, S., Bigio, A., Blanco, H., Delgado, G.C., Dewar, D., Huang, L., Inaba, A., Kansal, A., Lwasa, S., McMahon, J., Mueller, D., Murakami, J., Nagendra, H., Ramaswami, A., 2014. Human Settlements, Infrastructure and Spatial Planning, 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,., Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- World Bank, 2010. Cities and Climate Change: An Urgent Agenda. Urban Development Series Knowledge Papers. The World Bank, 1818 H Street NW, Washington DC 20433.