Webinar on:
Cities, Climate Change and Technologies: An Introduction

25th February, 2015
1530 – 1700h (ICT)
Bangkok

Organized by:
Climate Technology Center & Network
Asian Institute of Technology
CTCN Webinar Series

An introduction to climate technologies…

- Cities
- Coastal management
- Disaster and early warning
- Poverty
- Waste
- Forestry
- Industry
- Energy
- Agriculture
- Transport
- Water
- Ecosystem based technologies
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- The presentations will be made available after the webinar
Cities are the future

50% of world’s population

600 cities generate 60% of global GDP
Cities are the future

- High population density
- Informal settlements
- High cost of living
- Pollution
- Vulnerability to disasters
- Etc.
Webinar agenda

Cities, Climate Change and Technologies: An Introduction

What this webinar is?
An introductory discourse on the inter-linkage between cities and climate change

Webinar objective:
To elucidate on issues in both climate change mitigation and adaptation, particularly focusing on the technological interventions (hardware, software and orgware) that cities can adopt as part of their efforts to combat, and build resilience to, climate change.
# Webinar Program

<table>
<thead>
<tr>
<th></th>
<th>Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview and statistics</td>
<td>10</td>
</tr>
<tr>
<td>Cities and climate change mitigation</td>
<td>18</td>
</tr>
<tr>
<td><strong>Question time</strong></td>
<td>15</td>
</tr>
<tr>
<td>Cities and climate change adaptation</td>
<td>18</td>
</tr>
<tr>
<td><strong>Question time</strong></td>
<td>15</td>
</tr>
<tr>
<td>Concluding remarks, key messages, &amp; additional resources listing</td>
<td>5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>*<em>81</em></td>
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</tbody>
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*9 additional minutes for introduction and change-over

**Webinar Facilitator**
Dr. Victor R. Shinde
Cities, Climate Change and Technologies: An Introduction

Overview and Statistics

Dr. Sangam Shrestha
Asian Institute of Technology
sangam@ait.asia
Dr. Sangam Shrestha
sangam@ait.asia

- Associate Professor in Water Engineering and Management, AIT
- More than 90 publications in journals and conferences
- Awarded the Takeda Techno-Entrepreneurship Award (2007), Japan for techno-entrepreneurial achievement for world environmental well-being.
Background

- >50% of world population, built assets and economic activities holds by cities.
- Cities responsible for > 70% of GHG emissions.
- Cities consume 80% of energy produced worldwide.
- 1 in 7 people in the urban centers live with inadequate provision for basic infrastructure and services
- Climate change poses serious threats to urban infrastructure, quality of life, and entire urban systems.

Source: IPCC-2013; World Bank 2011
Migration towards cities

Source: UN, Department of Economic & Social Affairs, Population Division-2011
Densely populated urban areas

Source: UCCR- Urban Climate-2011
Urban agglomeration and observed climate change

Trend period 1901 - 2012 (°C over period)

-0.47 to -0.41
-0.4 to -0.21
-0.2 to 0
0.01 - 0.2
0.21 - 0.4
0.41 - 0.6
0.61 - 0.8
0.81 - 1
1.01 - 1.25
1.251 - 1.5
1.51 - 1.75
1.751 - 2.5

City Population 2010
- 0.75 - 1 million
- 1 - 5 million
- 5 - 10 million
- 10 million or more

City population growth rate 1970-2010
- < 1%
- 1 - 3%
- 3 - 5%
- 5% +

Source: IPCC WGII AR5-2013
Urban agglomeration and projected climate change

For RCP 2.5 scenario

Source: IPCC WGII AR5-2013
15 of the world's 20 megacities are at risk due to rising sea level and storm surges.
## Cities and GHG emissions

<table>
<thead>
<tr>
<th>Population (Millions)</th>
<th>GHG Emissions (M tCO₂e)</th>
<th>GDP (billion $ PPP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. China: 1,192</td>
<td>1. USA: 7,107</td>
<td>1. USA: 14,204</td>
</tr>
<tr>
<td>2. India: 916</td>
<td>2. China: 4,058</td>
<td></td>
</tr>
<tr>
<td><strong>3. 50 Largest Cities: 500</strong></td>
<td><strong>3. 50 Largest Cities: 2,606</strong></td>
<td><strong>2. 50 Largest Cities: 9,564</strong></td>
</tr>
<tr>
<td><strong>4. C40 Cities: 393</strong></td>
<td><strong>4. C40 Cities: 2,364</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Source: World Bank, 2010*
Cities and climate change hazards

Source: UN-HABITAT-2011
Where we stand

• Despite these risks, many cities have not yet addressed climate change.
• Variety of reasons
• Cities can be places of innovation and efficiency.
• Together with their local authorities, cities have the potential to diminish the causes of climate change (mitigation) and effectively protect themselves from its impacts (adaptation).
Cities, Climate Change and Technologies: An Introduction

Cities and Climate Change Mitigation

Dr. Shobhakar Dhakal
Asian Institute of Technology
shobhakar@ait.asia
Dr. Shobhakar Dhakal
shobhakar@ait.asia

• Associate Professor in Energy Field of Study, AIT

• Coordinating Lead Author of Chap 12 “Human Settlements, Infrastructure and Spatial Planning” of WG III’s contributions to the AR5 (IPCC, 2015)

• Co-editor and Member of the Steering Committee, Second Assessment of Cities & Climate Change, Urban Climate Change Research Network, 2012

• Principal Scientific Reviewer of Global Environmental Outlook 5 (GEO-5). United Nations Environmental Program (UNEP), 2011
Contents

- Contribution of cities in GHG emissions
- Factors determining cities’ emissions
- Key urban sectors for emissions
- Options for mitigation in cities
- Cities actions and gaps
- Key barriers
- Opportunities and way forward
Urbanization rates in developed regions are higher compared to Asia and Africa, but developing regions are catching up.

The overall share developed and developing regions in the global urban population have gone through a structural change in recent decades.

- Urban areas account for between 71%-76% of CO2 emissions from global final energy use & between 67-76% of global energy use.
- Cities in non-Annex I countries have generally higher per capita final energy use and CO2 emissions than national averages.

Sources: Seto K, Dhakal S et al. (2014): IPCC AR5 WGIII Ch12
No single factor explains variations in per-capita emissions across cities

- Influenced by a variety of physical, economic and social factors, development levels, and urbanization histories specific to each city

- Key factors include:
  - income, population dynamics, economic structure
  - urban form, locational factors
  - choice of energy sources, mobility and housing infrastructure, technology and lifestyle

Sources: Seto K, Dhakal S et al. (2014) :IPCC AR5 WGIII Ch12
Urban population and urban land is expected to expand further

- Expansion of urban areas is taking place at twice the rate of urban population growth
- Global rural population will decline soon and all population growth will be in urban
- 55% of the total urban land in 2030 is expected to be built in the first three decades of the 21st century
- Nearly half of the global growth in urban land cover is forecasted to occur in Asia; 55% of the regional growth to take place in China and India

Sources: Schneider et al., 2009; Angel et al., 2011; Seto et al., 2011, 2012
Seto K, Dhakal S et al. (2014) : IPCC AR5 WGIII Ch12
The next two decades present a window of opportunity for mitigation as a large portion urban areas will be developed during this period

- The kinds of towns, cities, and urban agglomerations that ultimately emerge over the coming decades will have a critical impact on energy use and carbon emissions

Two sources of emissions: Construction of infrastructure and buildings (stock), usage of infrastructure and buildings (flow)

Problem “Lock-in”: Long life of infrastructure and built environment determines energy and emissions pathways including lifestyles and consumption patterns

Role of infrastructure

- The existing infrastructure stock of the average developed country resident is 3 times that of the world average and about 5 times higher than that of the average of developing country residents.

- The build-up of infrastructure in developing countries - if they catch up with per capita infra stock of developed countries - will result in significant future emissions (could contribute about one third of cumulative mitigation needed in 2010-2050 to stay under 2 degree C).

Sources: Müller et al., 2013
Seto K, Dhakal S et al. (2014) :IPCC AR5 WGIII Ch12
Key drivers for emissions from urban form are density, land use, connectivity and accessibility

- **Density**: Higher density leads to less emissions (i.e. shorter distances travelled)
- **Mixed land use**: Mix of land-use reduces emissions
- **Connectivity**: Improved infrastructural density and design (e.g. streets) reduces emissions
- **Accessibility**: Accessibility to people and places (jobs, housing, services, shopping) reduces emissions.

Sources: Seto K, Dhakal S et al. (2014) IPCC AR5 WGIII Ch12

Density is necessary but not sufficient condition for lowering urban emissions
Key urban sectors for GHG emissions

Key sectors
• Transport
• Buildings
  • Residential
  • Commercial
• Industries
• Waste
• Others such as land and agriculture

Sources
• Fossil energy
  • Electricity, oil, gas, coal and others uses
• Industrial processes
• Waste management
• Land/agriculture
Options for mitigation in cities

- **Avoid activities, e.g.**
  - Setting desired economic structure of cities
  - Better urban and spatial planning to reduce need for travel
  - Building design for less lighting and cooling/heating needs, passive ventilation
  - Generate less waste

- **Shift activities, e.g.**
  - GHG friendly lifestyle
  - Develop non-motorized and public mass transport system and discourage private cars
  - Sustainable construction materials, low carbon buildings
  - More renewable energy integration into urban energy system
  - Centralized heating and cooling systems

- **Reduce emissions e.g.**
  - Increasing energy efficiency from vehicles/travel modes thorough improving energy efficiency, fuel switching and infrastructure and technology
  - Reduction in fossil energy use
Successful implementation of urban-scale climate change mitigation strategies can provide health, economic and air quality co-benefits

- Urban areas continue to struggle with challenges, including ensuring access to energy, limiting air and water pollution, and maintaining employment opportunities and competitiveness

- Action on urban-scale mitigation often depends on the ability to relate climate change mitigation efforts to local co-benefits

<table>
<thead>
<tr>
<th>Mitigation measures</th>
<th>Economic</th>
<th>Social (including health)</th>
<th>Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact development and infrastructure</td>
<td>Innovation and productivity(^1)</td>
<td>Health from physical activity(^3)</td>
<td>Preservation of open space(^4)</td>
</tr>
<tr>
<td></td>
<td>↑ Higher rents &amp; residential property values(^2)</td>
<td>↑ Health from increased physical activity(^3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>↑ Efficient resource use and delivery(^5)</td>
<td>↑ Social interaction &amp; mental health(^7)</td>
<td></td>
</tr>
<tr>
<td>Increased accessibility</td>
<td>↑ Commute savings(^6)</td>
<td>↑ Health from increased physical activity(^3)</td>
<td>↑ Air quality and reduced ecosystem/health impacts(^8)</td>
</tr>
<tr>
<td>Mixed land use</td>
<td>↑ Commute savings(^6)</td>
<td>↑ Social interaction and mental health(^7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>↑ Higher rents &amp; residential property values(^2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sources: Seto K, Dhakal S et al. (2014) :IPCC AR5 WGIII Ch12
City examples

- Amsterdam (the Netherlands) – solar energy/ cycling/ electric vehicles
- Sino-Singapore Tianjin Eco-city (China) – new planned city with 90% Public Transport +cycling
- Masdar City (UAE) – new planned city, the low carbon city of the future!
Thousands of cities are undertaking Climate Action Plans and mitigation commitments

- Extent to which reduction targets are being achieved or emissions reduced are not clear
- Focus largely on energy efficiency
- Limited consideration to land-use planning strategies and other cross-sectoral measures

Sources: Baseline emissions, reduction targets, and population from self-reported data submitted to Carbon Disclosure Project (2013). GDP data from Istrate & Nadeau (2012). Note that the figure is illustrative only; data are not representative, and physical boundaries, emissions accounting methods and baseline years vary between cities. Many cities have targets for intermediate years (not shown).

Yet, their aggregate impact on urban emissions is uncertain because they are at early stage of implementation

Sources: Seto K, Dhakal S et al. (2014) :IPCC AR5 WGIII Ch8
Barriers for mitigation in cities

- Awareness
- Priority and local context
- Political will
- Capacity
  - Human
  - Financial
  - Institutional
  - Technical
- Governance
‘Governance paradox’ and need for a comprehensive approach

- ‘Systemic changes’ → have large mitigation opportunities but hindered by urban patterns of governance, policy leverages and persisting policy fragmentation

- Governance and institutional capacity are scale and income dependent, i.e., tend to be weaker in smaller scale cities and in low income/revenue settings

- The largest opportunities for GHG emission reduction might be precisely in urban areas where governance and institutional capacities to address them are weakest

- Mitigation options in urban areas vary by urbanization trajectories and are expected to be most effective when policy instruments are bundled

- For designing and implementing climate policies effectively, institutional arrangements, governance mechanisms, and financial resources all should be aligned with the goals of reducing urban GHG emissions

Sources: Seto K, Dhakal S et al. (2014) :IPCC AR5 WGIII Ch12
Opportunities

- Growing awareness in cities
- City’s political momentum and leadership
- Plenty low-hanging options- synergy with energy, transport, waste and pollution problems
- Declining cost and fast growing renewable energy deployment
- Evolving international and national financing and technology support mechanism for low carbon development
Question time
Cities, Climate Change and Technologies: An Introduction

Climate Change Vulnerability and Adaptation in an Urban Context

Dr. Vilas Nitivattananon
Asian Institute of Technology
vilas@ait.asia
Dr. Vilas Nitivattananon

vilas@ait.asia

- Associate Professor in Urban Environmental Management, AIT

- Principal researcher for IKI Project “Vulnerability and Adaptation to Climate Change in Coastal Cities of Southeast Asia”, 2011-2014

- Main contributing author, UNESCAP’s Sustainable Infrastructure Development in Asia, United Nations, 2007

- Capacity Development Advisor and Consultant for a number of international, national and local organizations
Contents

- Concerns regarding CC in the urban context
- Urban CC impacts
- Climate vulnerability and adaptation
- Specific urban areas and sectors
- Challenges and opportunities
- Co-benefits for urban development and management
Potential effects of climate change at urban level

Examples of potential effects of climate change at the urban level:

- Climate hazard: Decreased precipitation
  - Impact: Water scarcity
  - Vulnerable system: Food production
  - How this could affect a city: Reduced availability of irrigation water and yield decreases.

- Climate hazard: Higher temperatures
  - Impact: Reduced water oxygen concentrations and altered mixing
  - Vulnerable system: Water supply (lakes/reservoirs)
  - How this could affect a city: Reduced water quality for example through algal blooms, increase in treatment requirements

- Climate hazard: Increased heavy precipitation
  - Impact: Increased erosion and sediment transport
  - Vulnerable system: Water supply (reservoirs)
  - How this could affect a city: Sedimentation and decrease in water storage capacity and turbidity increase

- Climate hazard: Sea level rise
  - Impact: Storm surges, flooding
  - Vulnerable system: All
  - How this could affect a city: Damage to all coastal infrastructure

- Climate hazard: Higher temperatures
  - Impact: Snow and ice cover change
  - Vulnerable system: Water supply (rivers)
  - How this could affect a city: Change in peak flow timing and magnitude

- Climate hazard: Increased heavy precipitation
  - Impact: Flooding
  - Vulnerable system: Wastewater
  - How this could affect a city: Flooding of facilities causing damage and contamination of water bodies

- Climate hazard: Decreased precipitation
  - Impact: Reduced streamflow
  - Vulnerable system: Food production
  - How this could affect a city: Negative impact on coastal fisheries due to decreases in the outflow of sediment and nutrients

Source: SWITCH (2011)
What are concerns regarding CC in an urban context?

- **Cities and towns are critical players in CC**
  - They concentrate a large proportion of people most at risk from, and vulnerable to, negative CC impacts

- **Impacts are unlikely to be evenly spread among regions and cities, across sectors of the economy or among socio-economic groups**
  - The urban poor, and particularly those in informal settlements, are uniquely vulnerable

- **Moreover, the impacts of CC and disaster risk in rural areas influence migration patterns, which contribute to the growth of low-income urban settlements**

- **In short, cities are at the heart of the problems both in terms of the source of carbon emissions and the effects of CC**
  - However, co-benefits of climate mitigation and adaptation are potentially largest in cities
## Possible Impacts of Climate Change on Cities

<table>
<thead>
<tr>
<th>Projected Change in Climate Phenomena (Likelihood)</th>
<th>Consequences for Cities</th>
<th>Geographic Locations Most Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmer with fewer cold days and nights, more hot days and nights (virtually certain)</td>
<td>Exacerbation of the urban heat island effect, leading to increased risk of heat-related mortality and illness, especially for the elderly, chronically sick, very young, and socially isolated. Increased demand for cooling, and reduced energy demand for heating. Declining air quality in cities. Greater stress on water resources, including those that rely on snowmelt, from increased water demand, declining water quality. Wider geographical incidence of vector-borne diseases (for example, malaria spreading to higher-altitude cities). Less disruption to transport from snow or ice.</td>
<td>All, especially inland cities and cities reliant on snowpack for water supply.</td>
</tr>
<tr>
<td>Hot spells/heat waves — increased frequency (very likely)</td>
<td>Flooding, strong winds, and landslides. Disruption of public water supply and sewer systems, and adverse effects on quality of surface and groundwater. Damage and losses to physical assets and infrastructure: houses, public facilities, utilities. Increased risk of deaths, injuries, and illnesses (especially water-borne diseases). Disruption of transport, commerce, and economic activity. Withdrawal of risk coverage in vulnerable areas by private insurers. Water stress may be relieved (short-term benefit).</td>
<td>Coastal cities, those on riverbanks or marginal land in floodplains, mountainous regions.</td>
</tr>
<tr>
<td>Intensity of tropical cyclone activity increases (likely)</td>
<td>Greater stress on water resources, from increased water demand, declining water quality. Reduced energy supply from hydropower generation. Land degradation, with lower agricultural yields and increased risk of food shortages, and dust storms. Potential for population migration from rural to urban areas.</td>
<td>All, especially cities in regions unused to arid conditions.</td>
</tr>
<tr>
<td>Areas affected by drought increase (likely)</td>
<td>Permanent erosion and submersion of land; and costs of coastal protection or costs of relocation. Decreased groundwater availability because of saline intrusion into aquifers. Exacerbated effects of tropical cyclones and storm surges, particularly coastal flooding.</td>
<td>Coastal cities.</td>
</tr>
<tr>
<td>Rising sea level (virtually certain)</td>
<td>Note: As per IPCC, virtually certain refers to &gt;99 percent probability, very likely refers to &gt;90 percent probability, and likely refers to &gt;66 percent probability. Sources: Adapted from IPCC 2007 as cited in World Bank 2009, other sources include Rosenzweig and others 2011; World Bank 2009, UNEP 2009; Rosenzweig 2010.</td>
<td></td>
</tr>
</tbody>
</table>
What are possible urban CC impacts?

The impacts and threat potentials vary between cities depending on their characteristics:

- Geographical locations, e.g., cold or hot regions
- Specific geographical features, e.g., coast, mountain, etc.
- Area of CC impact hazard lands, e.g., unstable slopes, low lying areas
- Vulnerable population groups – related to capacities and available resources

Three likely impacts of CC on urban areas

- Flooding – sea level rise, increased/intensified rainfall
- Water scarcity – related to supply and/or demand
- Heat island effect – an occurrence where city’s buildings, roofs, paved areas and other infrastructure hold and retain solar heat

CC will have profound and complicated effects on urban areas and system

- **Direct effects** of climate change are those changes in the natural environment with immediate consequences for human habitation
- **Indirect effects** are the results of these direct effects when mediated through the economy
Asian cities at risk from sea level rise.
Adapted from UN-HABITAT 2008.

Source: UN HABITAT (2008)
How are urban areas vulnerable to CC?

- Climate affects human systems in three principle ways
  - It provides the context of outdoor human activities, most notably agriculture – major food supply to the cities
  - Climate affects the costs of maintaining controlled internal environments of human life and activities,
    - e.g., higher temperatures increase the cost of cooling and decrease the cost of heating
  - Climate interacts with other types of stresses on human system
    - e.g., drought can contribute to rural-urban migration, then increases stress on urban infrastructure

- Poor communities tend to have more limited adaptive capacities
  - The poor cannot afford adaptive technologies, e.g., improved building materials
  - Their ability to relocate to a less stressed environment is often limited by political/cultural constraints and resources
  - They are more dependent on local water and food supplies, with less ability to tap other markets when local resources are less productive
<table>
<thead>
<tr>
<th>Global and National Trends</th>
<th>Local Trends</th>
<th>Conditions Creating Vulnerability or Limiting Adaptive Capacity</th>
<th>Illustrations of Climate Change Impacts, If No Action Is Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inadequate urban economic development</td>
<td>Weak land administration and regulation</td>
<td>Deterrence of public and private investment and service provision, because of insecure tenure and/or illegality of settlement</td>
<td>Exacerbated flooding because of substandard drains blocked with uncollected garbage</td>
</tr>
<tr>
<td>Rural-urban migration leading to rapid urbanization</td>
<td>Creation of informal and unplanned settlements on marginal land (for example, floodplains, steep hillsides, or landfills)</td>
<td>Lack of economic assets (for example, property, money, or credit), political power, and education needed to adapt effectively</td>
<td>Mortality and property loss, both localized and distributed across multiple communities</td>
</tr>
<tr>
<td>Lack of affordable formal housing in urban areas</td>
<td><strong>Lack of secure land tenure</strong>*</td>
<td>Concentrations of vulnerable communities and economic assets exposed to extreme hazards (for example, flooding from heavy rains or storm surges in coastal areas)</td>
<td>Faster spread of communicable diseases (for example, cholera and malaria) from stagnant flood waters and compromised immune systems</td>
</tr>
<tr>
<td></td>
<td><strong>Lack of access to infrastructure and basic services (for example, water, sanitation, public health, or electricity)</strong></td>
<td>Structural weaknesses in housing and infrastructure, including inadequate drainage</td>
<td>Exacerbated poverty and barriers to economic development</td>
</tr>
<tr>
<td></td>
<td><strong>Overcrowding and stress on existing infrastructure</strong>*</td>
<td>Environmental degradation (for example, uncollected solid waste, untreated wastewater, contaminated waters near landfills, or reduction of protective ecosystem functions)</td>
<td>Increased stress on city services (for example, emergency response) in the future</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Public health concerns that weaken the adaptive capacity of an individual or community (for example, diarrhea or infant mortality)</td>
<td>Further social fragmentation</td>
</tr>
</tbody>
</table>

*The boldfaced local trends (lack of secure land tenure, lack of access to infrastructure and services, and overcrowding) are also actual features of informal settlements.

Sources: Sida 2007; Moser and others 2010; UNISDR 2009; Bull-Kamanga and others 2003.

Source: World Bank (2011)
How can urban areas adapt to CC?

- **At the policy and planning level**, activities can include revising master plans (e.g., for land use, and other sectors) to reflect any significant changes in landscape and natural resources (e.g., water supply), as well as related climate risks.
  - Other related actions might include development of new strategies, high level political initiatives, policy formulation, and new institutional structures.

- **In terms of strategic level or long-term investments**, cities can decide to invest in infrastructure and technologies to build resilience to CC, such as an improved road network in a highly populated floodplain.
  - These actions are sometimes more challenging to implement than planning efforts, because they often require substantial financial resources.

- **At the operational level**, climate change considerations can be integrated into day-to-day municipal operations and service delivery.
  - These actions can include responses to extreme weather events, such as closing certain roads, or adaptations to incremental change, such as painting bus roofs white to reflect heat during extreme summer temperatures.

- Incorporating or “mainstreaming” CC information and adaptation goals into existing plans and activities can be a low-cost, or even no-cost, step, allowing cities to address impacts systematically
  - without losing sight of existing issues or placing additional pressures.
An illustration of the possible adaptation responses to sea-level rise

Planned retreat

Accommodation

Protection
  - Hard
  - Soft

SOURCE: IIED (2009)
For specific sectors

Reducing risk and increasing the resilience of physical capital that has already accumulated in cities can be done in three possible ways:

- Reducing hazards in sites already occupied through installing protective infrastructure and complementary risk-reduction measures;
- Supporting better-quality buildings – e.g., through technical support and appropriate finance systems;
- Assisting those who live in the most dangerous sites to move to safer sites, as well as taking measures to increase the supply and reduce the cost of land for housing on safe and/or serviced sites.

Both public and private sectors can play significant roles responding to CC risks and impacts.
For specific areas

- The unique physical, social, economic, and environmental **composition of a city (or area)** influences the degree of risk and vulnerability of its residents.

- While recognizing that the specific assessment of urban risk will differ across cities based on **key factors** such as poverty levels, the pace of urbanization, and awareness surrounding disaster risk or CC,
  - a **general typology** including coastal cities, dryland cities, and inland and high-altitude cities may still be useful in considering the broader issue.

- Only 2% of the world’s land is in the **Low Elevation Coastal Zone (LE CZ)**, but this zone is home to 10% of the population, 60% of whom live in urban areas.
At risk: Population and megacities concentrated in low-elevation coastal zones (LECZ) threatened by sea-level rise and storm surges

Source: World Bank (2009b)
Strategies/Technologies
(from a study in coastal cities of Southeast Asia)

- **Structural flood protection**: polders and embankments, elevation of houses by landﬁlling, and/or building additional ﬂoors, structural improvement of riverbanks.

- **Non-structural flood management**: disaster and emergency preparedness for communities ﬂood, cleaning and dredging of waterways, improving solid waste management collection, relocation of illegal settlements along waterways.

- **Mitigating coastal erosion**: breakwaters to ward off inland sea ﬂow, mangrove reforestation, cribs and joints installation.

- **Hazard sensitive land use planning and management**: buffer zone, limited activities through permit.

- **Improving water supply**: water conservation, alternative sources, improvement of non-revenue water.
What are the challenges and opportunities?

Challenges

- Investment capacity with extra costs of CC adaptation and other more pressing priorities
- Different stakeholders normally work according to very different worldviews of adaptation—hamper holistic adaptation responses
- Local actions may be distorted, e.g., by investing in technologies, infrastructures and housing that only benefit a minority
- Limited funding for technical support and implementation, as well as baseline information and tools (for proper assessment and adaptation planning)

Opportunities

- CC creates a new opportunity to prioritize the important work of the city around a unifying goal of sustainability
- Utilizing and upscaling existing good practices related to disaster risks to deal with CC risk management and adaptation
- Mainstreaming CC with urban policies, plans and programs
- Potential tie-ins with CSR of private companies for CC adaptation projects
- Linkage with CC mitigation and other development priorities (maximizing synergies co-benefits)
Co-benefits are the benefits from policy options implemented for various reasons at the same time, acknowledging that most policies resulting in GHG mitigation also have other, often at least equally important, rationales (IPCC 2001).
CC for potential co-benefits?

- Key areas for planners can support and lead adaptation and mitigation activities in *traditional physical planning*
  - Land use plan and control
  - Environmental planning
  - Storm water management
  - Building and site design

- Additional areas related to *social, cultural and economic aspects* of urban development and management
  - Transportation plans and operations
  - Local economic development strategies
  - Solid waste management
  - Water and wastewater management
  - Public health program
  - Education program
Question time
Concluding remarks

• Cities have played a major role in the creation of the problem of anthropogenic climate change.

• Cities will form a central part of any response to climate change.

• No effective global collaborative agreement to tackle climate change can be delivered without the full involvement of cities.
Additional resources

• Interview with Dr. Shobhakar Dhakal on adaptation-mitigation synergies
  https://www.youtube.com/watch?v=Ofav54n0FCM&feature=em-upload_owner

• Interview with Prof. Kim Oanh on co-benefits of climate change mitigation
  https://www.youtube.com/watch?v=ULUSFfLn71U&feature=em-upload_owner
Thank you for attending this webinar.

Please take a moment to fill up the feedback forms

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