



Climate Resilient Cities

Reducing Vulnerabilities to Climate Change Impacts and Strengthening Disaster Risk Management in East Asia's Cities

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Overview of presentation

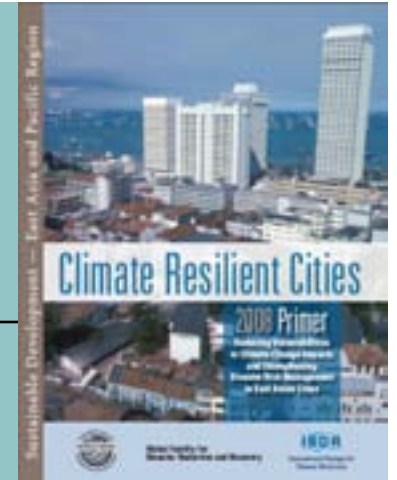
- Background and project inception
- The “Primer” – What is it? Why have one?
- Climate change and disasters in EA cities
- Objectives and organization of the Primer
- Hot spots and identifying priorities
- Creating a city information base
- City case studies and key lessons learned
- Conclusions and Q&A

Background

- Where did the demand for the project come from?
- How did the project take shape and how was the team selected?
- What methodology was adopted and how was this implemented?

What is the Primer?

- The Primer outlines city typologies
- It integrates climate change with DRM
- It presents a “hot spot” tool for identifying city-specific priorities for action
- It identifies both adaptation and mitigation strategies at the local level, based on learning from regional and global sound practices
- The Primer is applicable to a range of cities - from those starting to build awareness on climate change to those with climate change strategies and institutions already in place



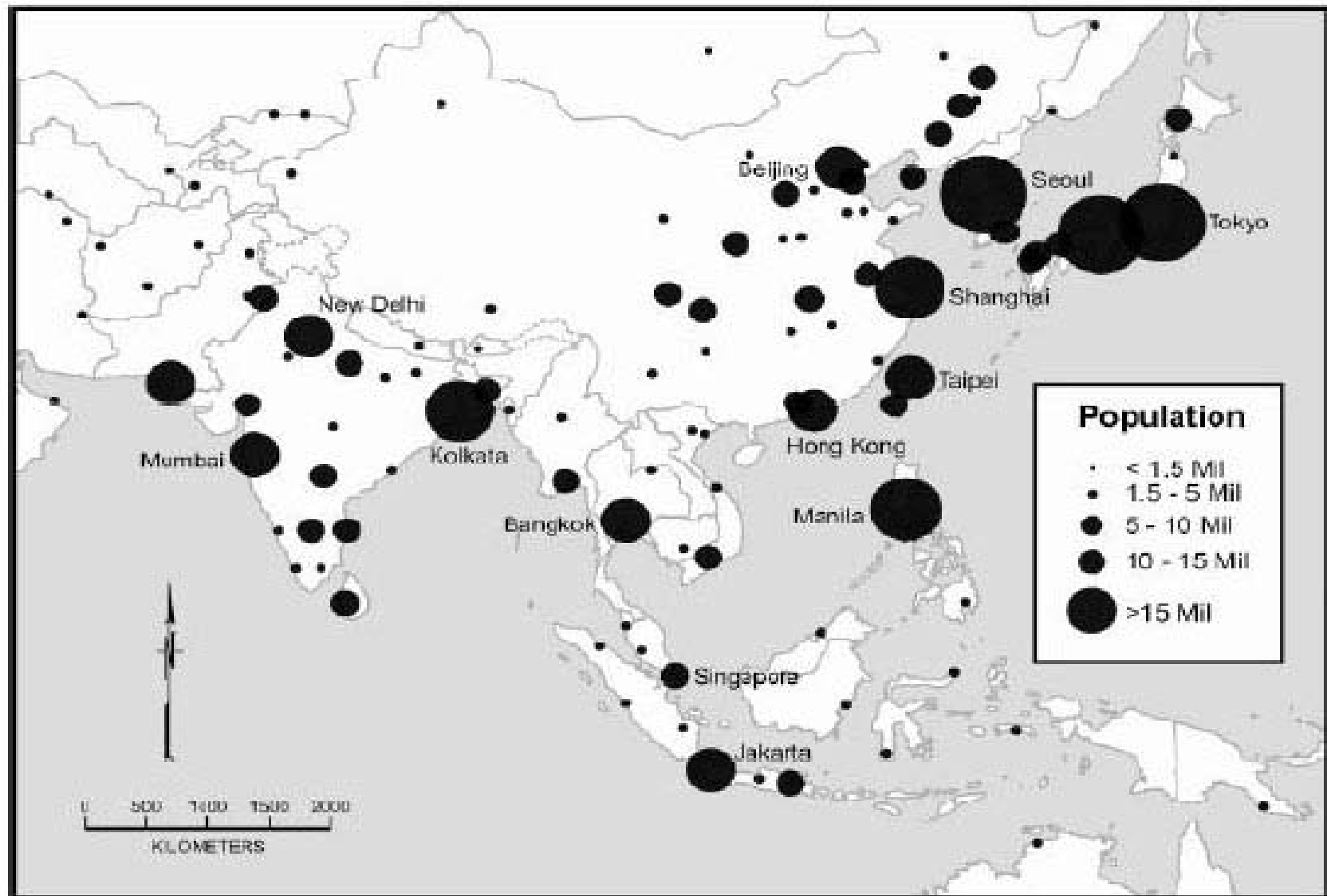
Why do we need a Primer?

- Climate change and its impacts are real
- Climate change impacts are felt at local level
- Climate change impacts and broader natural disasters can undermine sustainable development, growth, and poverty reduction
- Cities should be aware of risks to determine strategies to anticipate impacts
- Cities can adopt alternative, “cleaner” development paths to reduce future impacts

Why East Asia specifically?

- East Asia is urbanizing rapidly: 2 million new residents every month
- Climate change induced disasters in East Asia cities affect their economic growth and poverty reduction efforts
- East Asia cities are already vulnerable to multiple natural hazards – even without climate change impacts
- The need for a new way to develop and manage cities

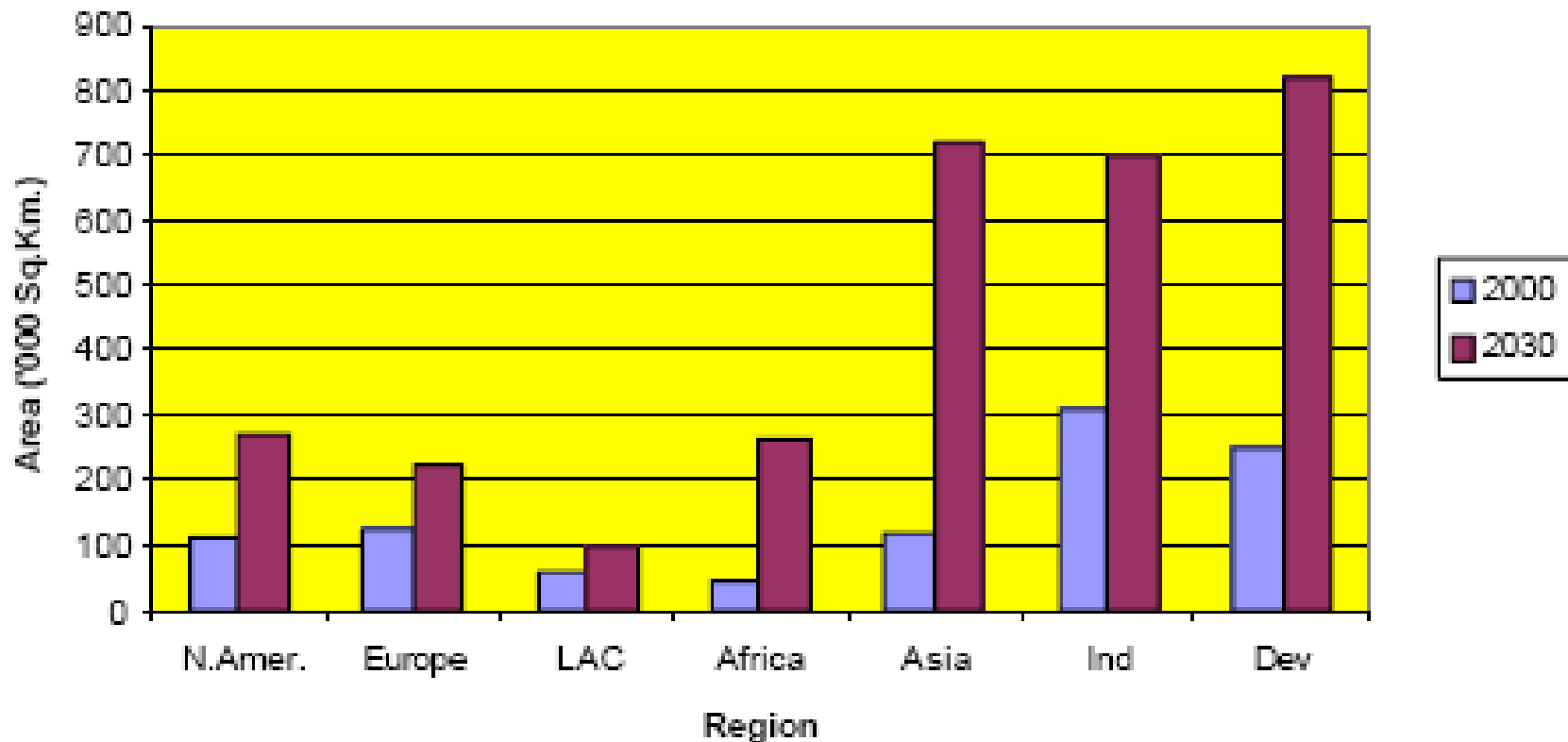
Asia's mega-cities



(Source: ESRI, 1998 and World Gazetteer 2005)

Urban growth needs to be climate-proofed

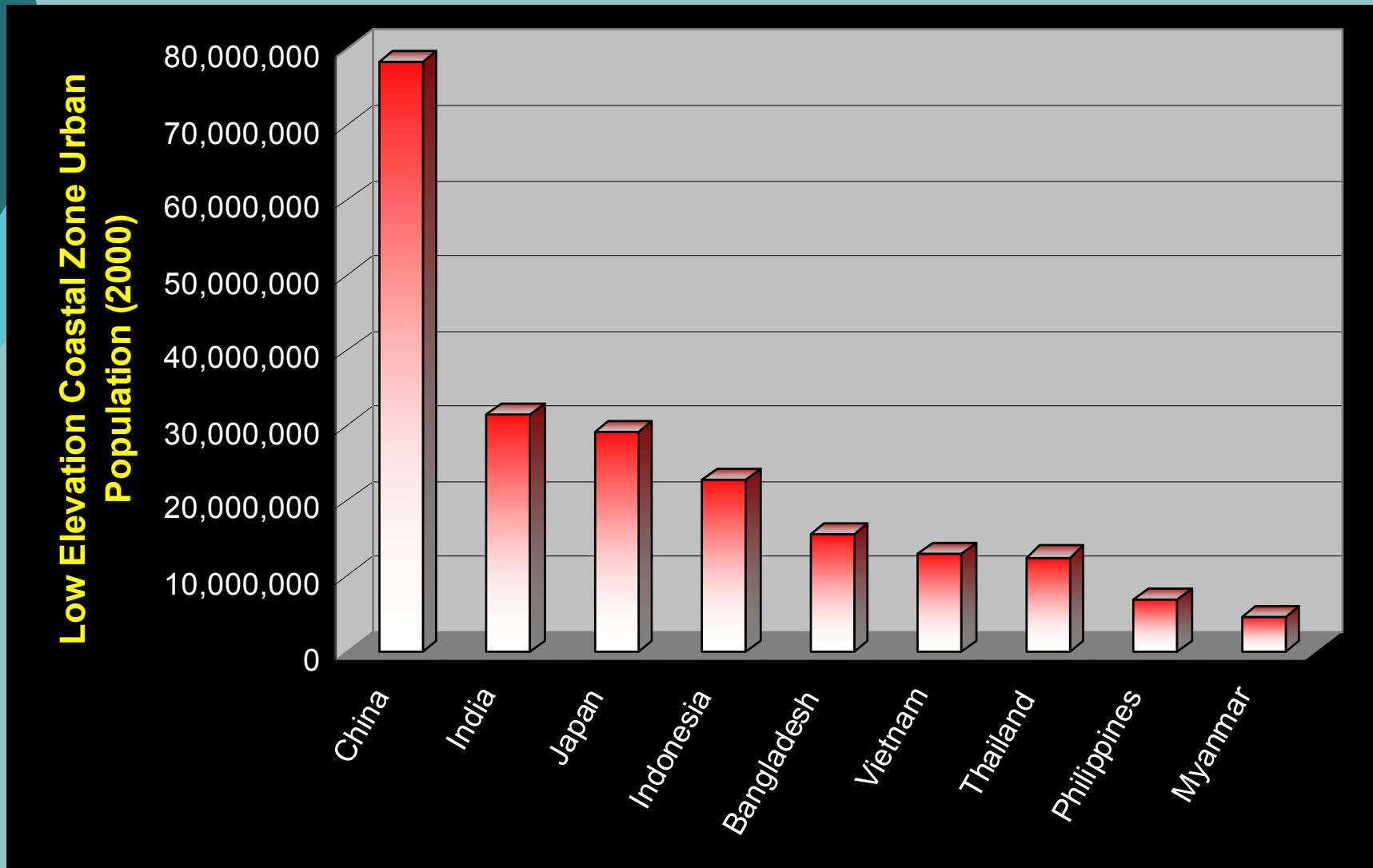
Built-Up Area Projections, 2000-2030 (by Region)



Source: Angel et al., 2005

If average densities continue to decrease, doubling of the developing world's urban population by 2030 will result in a tripling of their built-up areas.

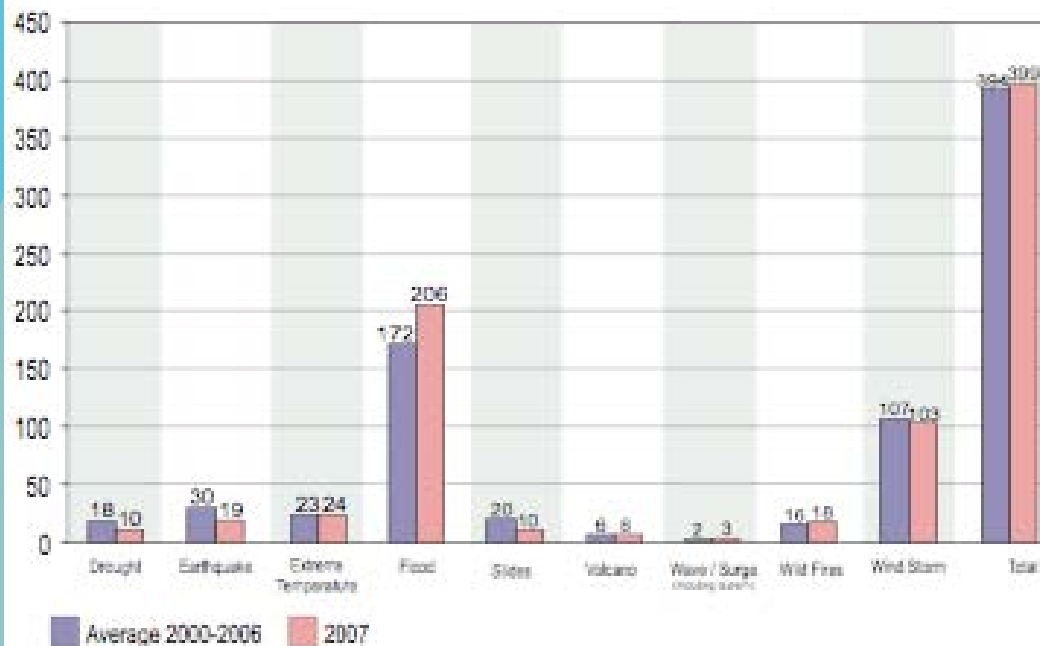
East Asia is at high risk for climate change impacts



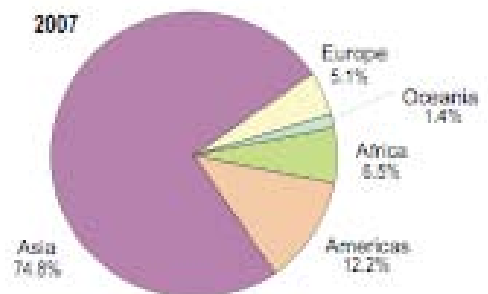
Source: SEDAC, Columbia Univ., 2007

East Asia is at high risk to natural disasters

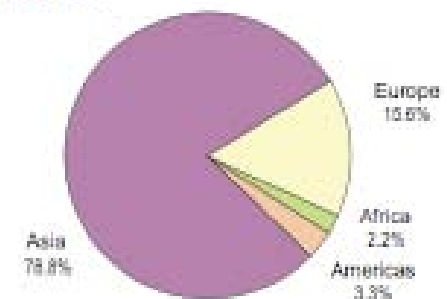
Natural disaster occurrence by disaster type



Percentage of people killed by natural disasters by region



Average 2000-2006



International Strategy for Disaster Reduction (UN/ISDR)
Tel: +41 22 9178908/8907
isdri@un.org
www.unisdr.org

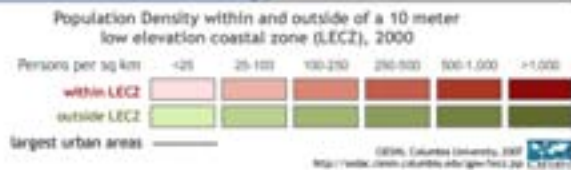


Centre for Research on the Epidemiology of Disasters (CRED), Department of Public Health
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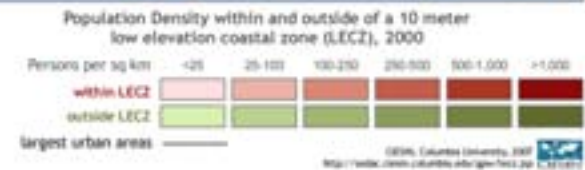
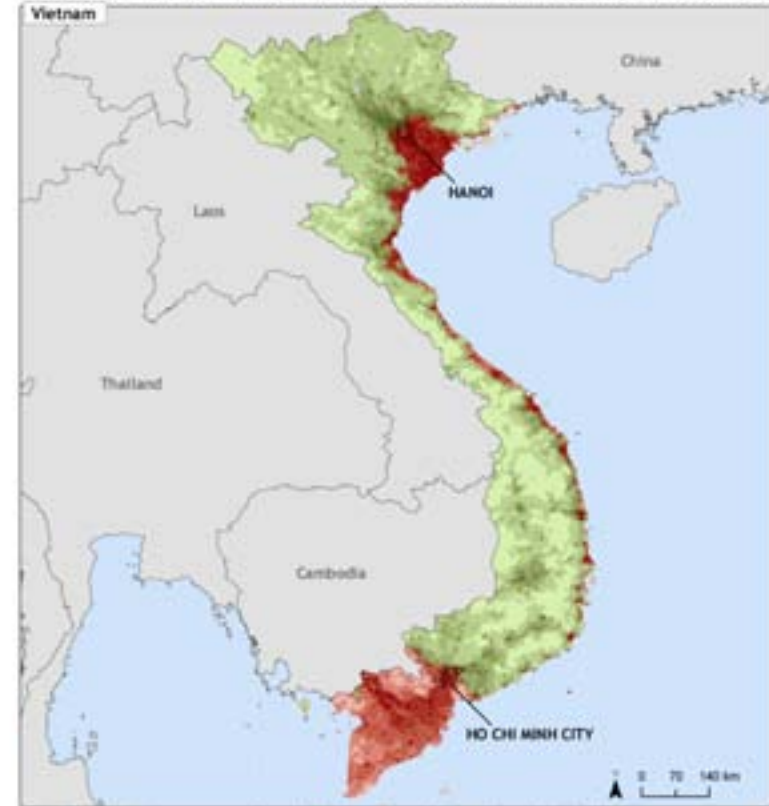
Source of data: EM-DAT: The OFDA/CRED International Disaster Database
www.emdat.be
Université catholique de Louvain
Brussels - Belgium

Major population centers are severely impacted

Population Density within and outside of a 10m Low Elevation Coastal Zone



Population Density within and outside of a 10m Low Elevation Coastal Zone



The Primer: Understanding how to reduce vulnerabilities



Objectives of the Primer

- To understand the issues and impact of climate change at the city level
- To engage in a participatory approach to establish vulnerabilities to potential climate change impacts
- To learn about the **why** and the **how** through illustrative examples from other cities
- To build resilience to future disasters into planning and design through **no-regrets** endeavors
- To understand the requirements for moving from theory to practice
- To engage in partnerships and shared learning with other cities facing similar problems

Organization of the Primer

- Section 1 - Understanding the Impacts of Climate Change and Disaster Risk Management
- Section 2 - Explaining Climate Change Impacts and Disaster Risk Management
- Section 3 - Assessment Exercise in the Determination of a **HOT SPOT**
- Section 4 - Creating a City Information Base
- Section 5 - Sound Practice Examples of Adaptation and Mitigation
- Section 6 – Conclusions
- Additional resources available

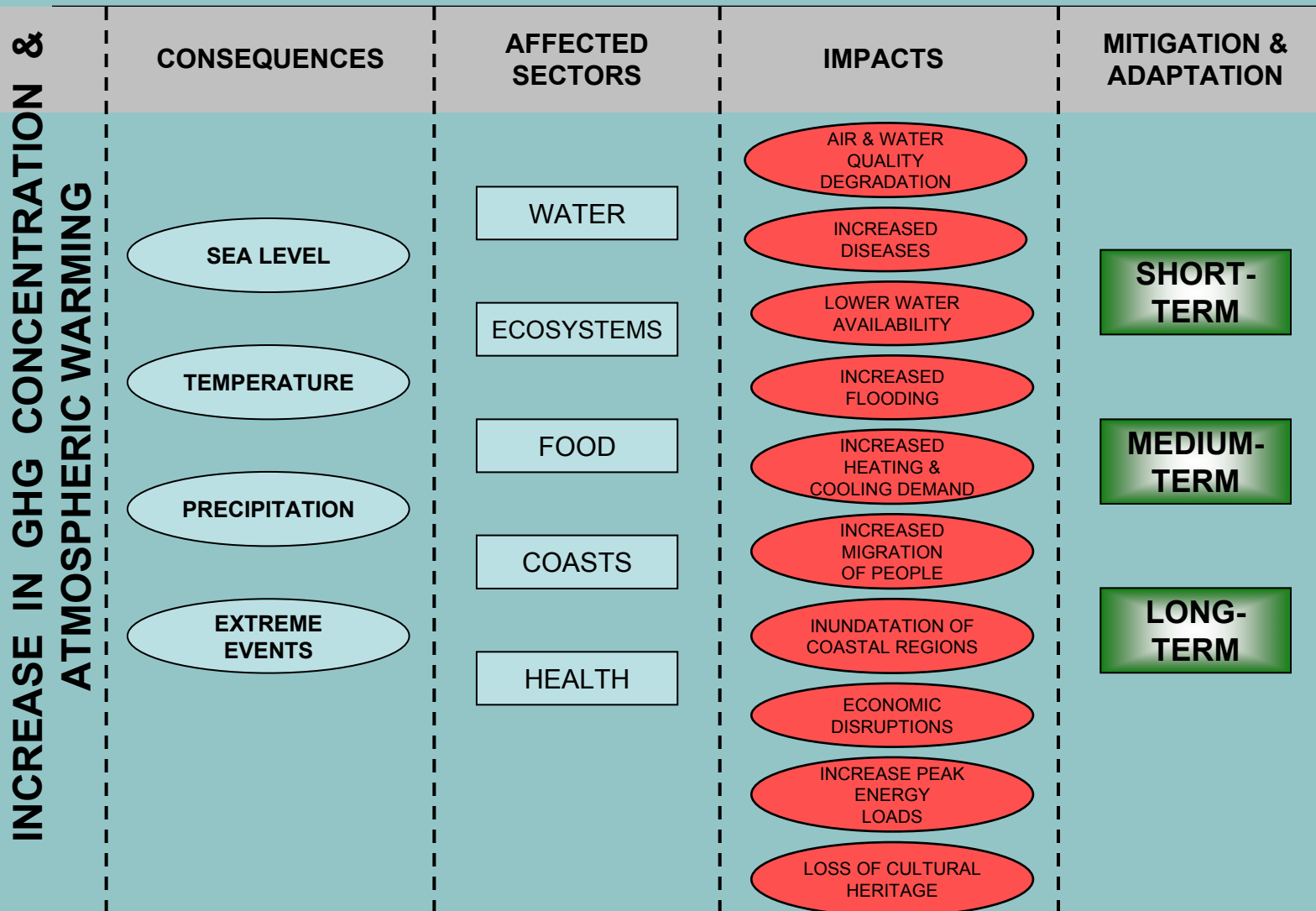
Climate Change and DRM

- Global climate change has implications for the EAP region. A projected 1 meter rise in sea level could lead to a 2% loss of GDP, and 1% agricultural land depletion. Vietnam, China, Myanmar and Thailand are expected to be most affected by sea-level rise (OECD, 2007).
- Climate change can thus, undermine EAP's progress in advancing economic growth and reducing poverty, and can compound environmental degradation and therefore there is now an urgent need to develop appropriate mitigation and adaptation responses.

Climate Change and DRM

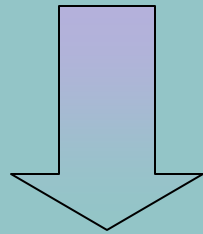
- Events of hydrometeorological origin constitute the large majority of disasters
- Climate Change exacerbates the outcome of hydrometeorological disasters
- CC can add new disaster risks (e.g. 30cm snow precipitation in Amman, heat waves in London, etc.)
- DRM includes earthquakes/volcanoes while CC also addresses gradual average changes in Climate. *DRM and CC adaptation greatly overlap and can strategically reinforce each other*
- HFA Objective: To promote the integration of risk reduction associated with climate change into strategies for reduction of disaster risk and adaptation to climate change

Climate Change and DRM



Climate Change and DRM

- Sea level rise
- Temperature
- Precipitation
- Resilience
- Extreme events

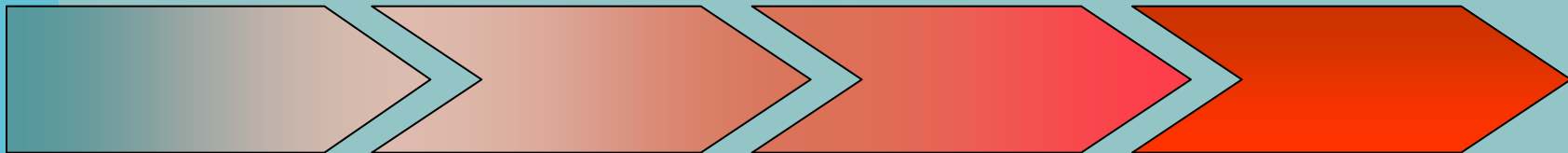


- Which are the effects and impacts?
- What are some mitigation and adaptation sound practices?

The Primer: The “Hot Spot” exercise

RESILIENT

HOT



“Given”

- Geographic location
- City size and growth rate
- Governance structure
- Disaster history

“Influentiable”

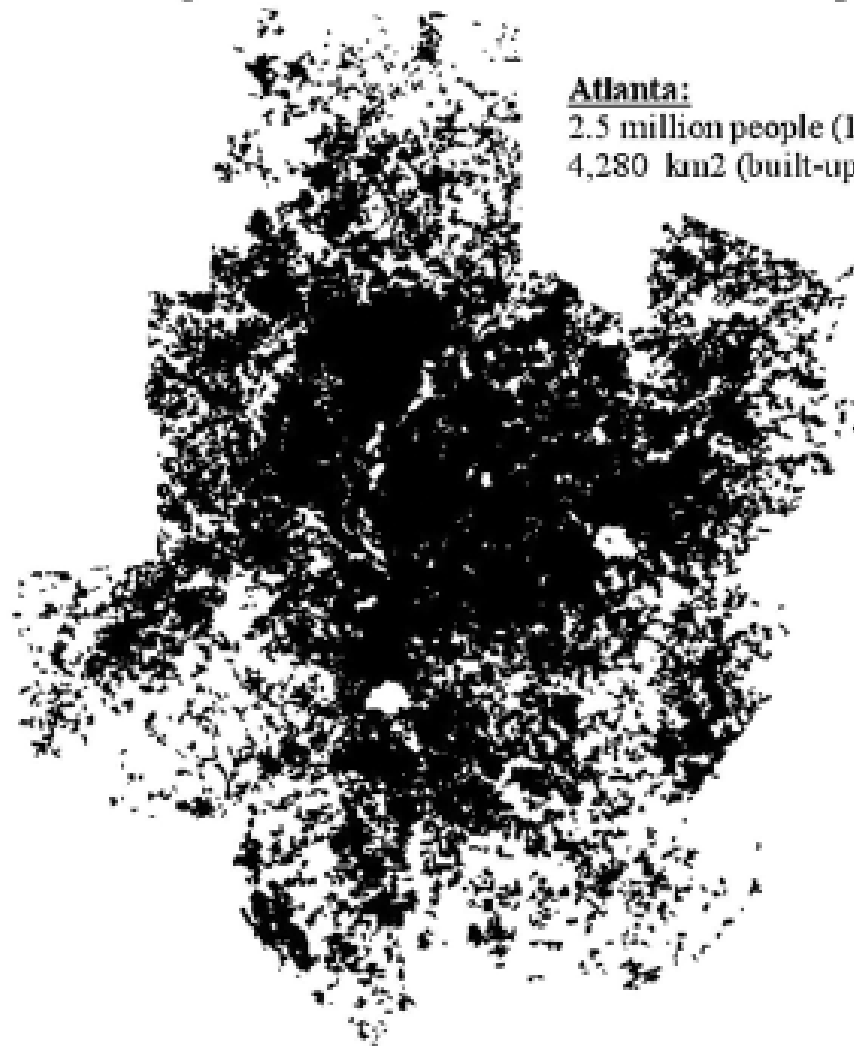
- City management
- Financial resources
- Built environment
- Disaster response systems
- Economic impact of disasters

City description and size

A. City description	
1. City location.	
a. In a coastal area? (Y or N)	
b. On or near mountain area? (Y or N)	
c. On inland plain? (Y or N)	
d. On inland plateau? (Y or N)	
e. Near to or on a river(s)? (Y or N)	
f. Near earthquake fault lines? (Y or N)	
B. Size characteristics of city	
1. Resident population (VH, H, M, or L) VH = Greater than 10 million H = 2 million to 10 million M = 0.5 million to 2 million L = up to 0.5 million	
2. Population growth during last 10 years (H, M, or L) H = Greater than 10% M = Between 2% to 10% L = Less than 2%	
3. Floating population (VH, H, M, or L) VH = Greater than 30% of resident population H = Between 20%-30% of resident population M = Between 10%-20% of resident population L = Less than 10% of resident population	
4. Area in square kilometers (km ²)	
5. Maximum population density (day or night) (H, M, or L) H = Greater than 2,000 persons per km ² M = Between 1,000 to 2000 persons per km ² L = Less than 1,000 persons per km ²	

Cities have a choice as to their physical footprints

The Built-up Area of Atlanta and Barcelona Represented at the Same Scale



Atlanta:
2.5 million people (1990)
4,280 km² (built-up area)



Barcelona:
2.8 million people (1990)
162 km² (built-up area)

Source: Bertaud, A., and T. Pode, Jr., Density in Atlanta: Implications for Traffic and Transit (Los Angeles: Reason Foundation, 2007).

Governance, management, and financial resources

C. Governance structure as related to disaster risk management	
1. Appointed head of government (Y or N)	
a. Term of assignment (Years)	
2. Elected head of government (Y or N)	
a. Term of elected officials (Years)	
3. Local government office structure: does it have...	
a. Disaster risk management department? (Y or N)	
b. Environment, sustainability or climate change department? (Y or N)	
c. Are (a) and (b) in the same department? (Y or N)	
4. Other government office structure (state, national): does it have...	
a. Disaster risk management department? (Y or N)	
b. Environment, sustainability or climate change department? (Y or N)	
c. Are (a) and (b) the same department? (Y or N)	
D. City management on climate change and disaster risk management	
1. Responsibilities clearly specified? (Y or N)	
2. Responsibility for climate change management established? (Y or N)	
3. Responsibility for disaster risk management established? (Y or N)	
4. Authority to contract for services? (Y or N)	
E. Financial resources	
1. Total budget	
2. From local taxes and levies (% of total)	
3. From state and national government grants & devolutions (%)	
4. From domestic market – bonds & loans (%)	
5. From international market (%)	
6. From external or multi-lateral lending agencies (%)	

Built Environment

F. Built environment	
1. Does the city have urban growth Master Plans? (Y or N)	
2. Does the city have urban development plans and land-use plans? (Y or N)	
a. Population in authorized development (% of total)	
b. Population in informal colonies (% of total)	
c. Population density of informal colonies (H, M, or L)	
H = Population of informal colonies >20% of total	
M = Population of informal colonies <20% but >10% of total	
L = Population of informal colonies <10% of total	
d. Population in old tenements and historical development (% of total or H, M, or L using ratings in 2c)	
3. Does the city have building codes? (Y or N)	
a. What is level of compliance? (% compliant buildings)	
4. Observed vulnerability of buildings in past natural disasters (extent of disruption of building functionality)	
a. Informal buildings (H, M, or L)	
H = Greater than 15% of informal buildings highly vulnerable	
M = Between 5% and 15% of informal buildings highly vulnerable	
L = Less than 5% of informal buildings highly vulnerable	
b. Historic buildings (H, M, or L)	
c. New & formal developments (H, M, or L)	
H = Greater than 5% of new & formally developed buildings highly vulnerable	
M = Between 1% and 5% of new & formally developed buildings highly vulnerable	
L = Less than 1% of new & formally developed buildings highly vulnerable	

The urban poor and marginalized are at greater risk and suffer most



Political and economic impacts

G. Political impact of disasters

- | | |
|---|--|
| 1. Is the city a national/provincial capital or where a large number of decision-makers live? (Y or N) | |
| 2. Is impact of disaster in the city likely to influence political activity in areas far away from affected regions? (Y or N) | |

H. Economic impact of disasters

- | | |
|--|--|
| 1. Is the city a major center of economic activity in regional or national context? (Y or N) | |
| 2. Do the following sectors have major activity in the city? | |
| a. Industrial sector? (Y or N) | |
| b. Services sector? (Y or N) | |
| c. Financial sector? (Y or N) | |
| d. Tourism and hospitality sectors? (Y or N) | |

Hazards and disaster response

I. Threat of natural hazards	
1. Earthquake? (Y or N)	
2. Wind storm? (Y or N)	
3. River flood? (Y or N)	
4. Flash rainwater flood or extreme precipitation? (Y or N)	
5. Tsunami? (Y or N)	
6. Drought? (Y or N)	
7. Volcano? (Y or N)	
8. Landslide? (Y or N)	
9. Storm surge? (Y or N)	
10. Extreme temperature? (Y or N)	
J. Disaster response system	
1. Does a disaster response system exist in the city? (Y or N)	
2. Is the response system comprehensive and equipped for all natural hazards specified? (Y or N)	
3. Is the disaster response system regularly practiced? (Y or N)	
4. Is the disaster response system regularly updated? (Y or N)	

Climate change impacts

K. Climate change impact	
1. Is the impact of climate change on the city known? (Y or N)	
2. Are the following sectors vulnerable to the consequences of climate change?	
a. Built environment? (Y or N)	
b. Cultural and religious heritage? (Y or N)	
c. Local business, industry and economy? (Y or N)	
d. Energy generation and distribution system? (Y or N)	
e. Health-care facilities? (Y or N)	
f. Land use? (Y or N)	
g. Transportation system ? (Y or N)	
h. Parks and recreation areas? (Y or N)	
k. Tourism? (Y or N)	
3. Is climate change assessment based on local studies instead of regional/global models? (Y or N)	
4. Does the city have a climate change strategy (maybe, as a component of national policy)? (Y or N)	
5. Does the city have climate change programs in place? (Y or N)	
6. If Yes, do the climate change programs consider:	
a. Mitigation? (Y or N)	
b. Adaptation? (Y or N)	
c. Resilience? (Y or N)	

Is your city a **Hot Spot**?

The Primer provides criteria for determination of a **Hot Spot** using its City Information Base:

- Vulnerability to different consequences of climate change in urban areas
- Preparedness and response capacity to different natural hazards in urban sector

Is your city a Hot Spot?

- Being a **Hot Spot** means that the city has a high level of vulnerability to climate change impacts and is at high risk of being affected by natural disasters
- Based on the completed Matrix and rating levels, the city should determine its **vulnerabilities** that lead to a Hot Spot characterization: the higher a city's vulnerability, the **hotter** the city is as a **Hot Spot**
- The greater the number of adverse conditions that are identified, the **hotter** the city's categorization is as a **Hot Spot**
- The level of **hotness** can be used to **prioritize** the city's vulnerabilities and to motivate integration of development plans with climate change impacts and disaster risk management

Building a city information base



How do you know what you think you know?

- Sound management is based on updated information
- A consolidated information document is a management product and tool – an impacts and consequences workbook
- A workbook is a reference document and a history updated over time
- It also includes Climate change impacts and consequences based on projections and predictions

Addressing Climate Change impacts and consequences

- The information base addresses
 - Existing formal and informal settlements, boundaries, infrastructure, services and facilities
 - Vulnerable populations, infrastructure, economic/commercial areas, schools and community facilities
 - Future growth sites, land resources
 - Capital investment requirement priorities
 - Entities and partners responsibilities
- Informed planning is supported through technical partners
- An information base supports short-, mid- and long-term initiatives

A City Information Base

- *The Workbook*
- *The participatory process*
- *The annotated maps*
 - City/community base map
 - City/community socio-economic profile map
 - City hazard profile map
 - The future growth map
 - City Institutional map

The Framework

Box 4.1 Recommended steps toward developing a planning framework

- (a) Review and confirm the City Climate Change and Disaster Risk Management Team.
- (b) Review and discuss the Climate Change and Disaster Risk Management Workbook preparation/update.
- (c) Identify partnerships and the preparation of a Partnership Support Guide.
- (d) Discuss and develop specific climate change mitigation, adaptation, and disaster risk management plans through the plan development question sequence.
- (e) Discuss and prepare a program results for the climate change mitigation, adaptation, and disaster risk management prepared plans.
- (f) Start-up the activities.

The Framework

Box 4.2 Recommended priority plan development questions

The designated team answers the following questions as a guide to policy and plan development:

1. What are climate change and/or disaster risk management priority actions?

- a. Identify the priority action for which the plan is to be developed.
- b. Establish the improvement to be implemented.
- c. Identify expected outcome of the priority action. Why are we doing this and what do we expect to be the results.

2. What is the strategy?

- a. For adaptation: Establish what can be done to adapt to the potential hazard before it becomes a disaster.
- b. For mitigation: Establish what can be done to lower the impact and reduce the vulnerabilities.
- c. For response: Establish what response plans, responsibilities and activities are necessary to deal with an event.

3. What equipment is necessary?

- a. What equipment is required to address the impact for preparedness and mitigation initiatives
- b. What new technologies?
- c. What else?

4. What is the budget?

- a. Should there be capital requirements for Plan Implementation, what sources are available and/or need to be created?
- b. Budgeting exercises are critical to dimension Plan design. It is far better to set realistic financial limits and implement activities over time than to design plans without a realistic idea of the costs to Plan implementation.

The Framework

5. What is the necessary training?

- a. The capacity of cities and their communities to prepare and implement plans is always a question. Therefore plans of necessity need to consider capacity building as part of plan preparation and implementation.
- b. Once specific capacity-building and training needs are identified sources of training support are to be identified from the Partnership Support Guide.

6. What practice?

- a. Climate Change and Disaster Risk Management Plan implementation and simulations are important elements and need to be built into Plan activities.
- b. Planned and unannounced drills are to be scheduled by the pertinent office carried out to identify issues in the plans, what worked and correct what did not. One does not "fail" a drill. The drills and simulations are to be implemented with the idea of learning.

7. What is the designated office/entity for management the Plan and what are its responsibilities?

- a. Each Climate Change and Disaster Risk Management Plan has responsibilities that different offices and entities will need to assume.
- b. Each committee will need written responsibilities and response plans as a record of what is to happen and by whom

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Building resilient cities: Learning from experience



Case study cities

- Case studies represent sound practices in cities from around the world
- Sound practices have wide applications
 - Should be effective
 - Should be sustainable
 - Should be transferrable
 - Should provide a monitoring mechanism
 - Should promote integration of DRM & CC with development policies

Case study overview

City	Geography	Population
Tokyo	Coastal, Very High EQ Hazard	34,250,000
New York	Coastal	19,712,000
Jakarta	Coastal, Moderate EQ Hazard	18,200,000
London	Coastal	8,300,000
Milan, Italy	Inland Plateau	5,000,000
Singapore	Coastal	4,400,000
Hanoi	Inland, River	1,800,000
Thua Thien Hue, Vietnam	Coastal	1,000,000
King County/Seattle	Coastal, High EQ Hazard	570,000
Albuquerque, USA	Inland Plateau	472,000
Venice, Italy	Coastal	270,000
Rockville, USA	Inland Plain	54,000
Dongtan, China	Coastal, Moderate EQ Hazard	--

What to extract from the profiles

City Profiles of Sound Practices (on CD)

Detailed Profiles

Short Profiles

WHY?

HOW?

**POLICY
DETAILS**

**IMPLEMENTATION
DETAILS**

COORDINATION

Sound practices and lessons

- 1. Organizational structure & Information Base**
- 2. Institutional mechanism**
- 3. Ownership by line departments**
- 4. Climate change strategy**
- 5. Public awareness**
- 6. Accounting and reporting of GHG inventory**
- 7. Hazard risk financing**
- 8. DRM system considering CC impacts**

Sound practices and lessons

- 9. Mitigation: Energy sector**
- 10. Mitigation: Transport sector**
- 11. Mitigation: Built environment & density**
- 12. Mitigation: Forestry and urban greenery**
- 13. Mitigation: Financial mechanisms**
- 14. Adaptation: Infrastructure**
- 15. Adaptation: Water conservation**
- 16. Adaptation: Public health**

Conclusions

- Key take-aways from today
 - You need to know what you are
 - **Hot Spot** assessment can be used to prioritize vulnerabilities
 - Specific action programs can draw upon experience of other cities
 - No-regrets strategies are important starting points
- Local governments have taken the lead in addressing their DRM & CC concerns and their consequences

Conclusions



Next steps

- Post-Pattaya
 - Synergies with other Bank programs (ECO2)
 - Downscaling CC impacts assessment to local level
 - Investment in mitigation/adaptation infrastructure
 - Climate change strategies/frameworks
 - Action plans at local levels

Questions & Observations??

