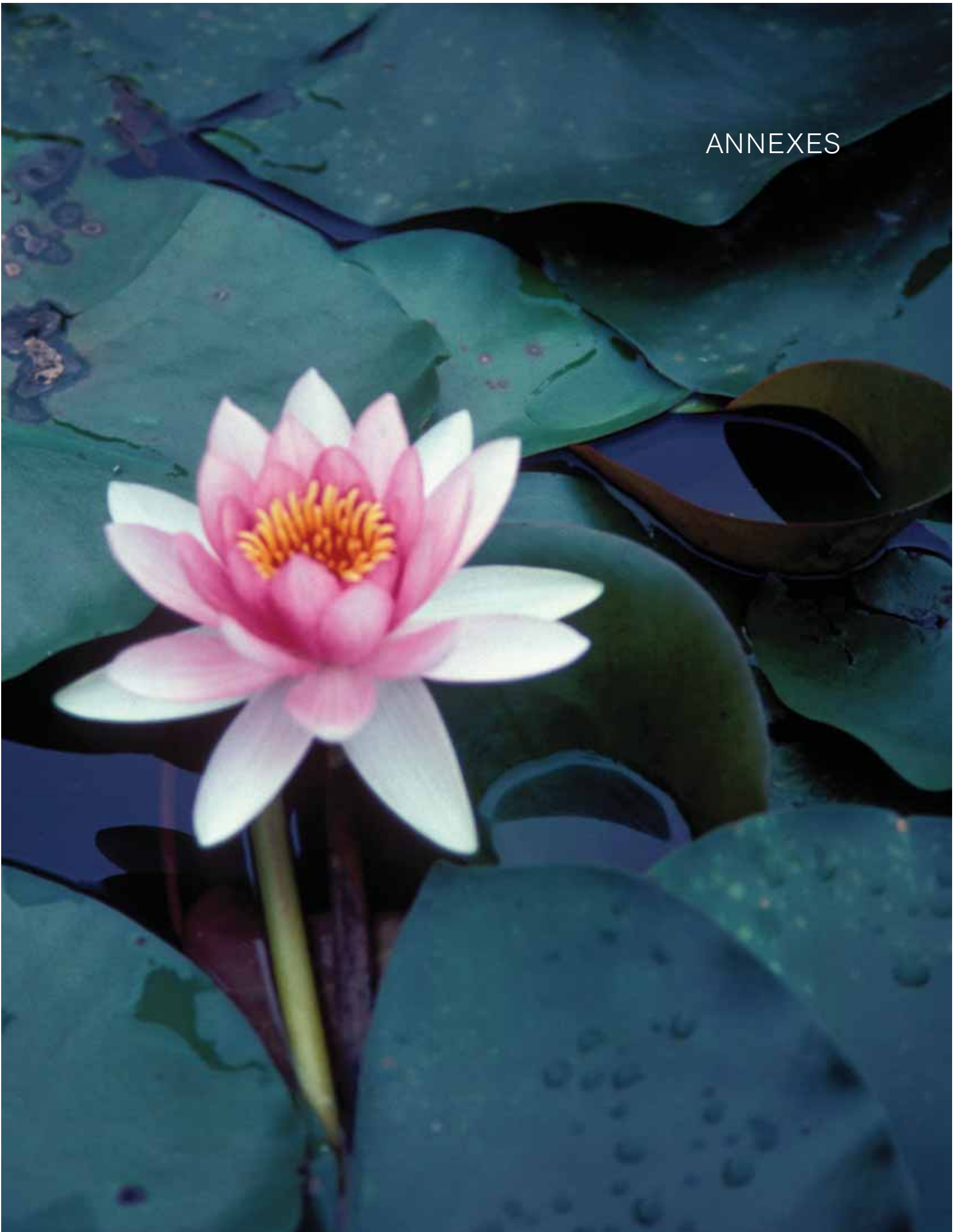


ANNEXES



Annex A/ Worldwide Programs and Organizations on Climate Change and Hazards

Asia-Pacific Partnership on Clean Development and Climate (AP6) is an international non-treaty agreement among Australia, India, Japan, the People's Republic of China, South Korea, and the United States announced July 28, 2005, at an Association of South East Asian Nations (ASEAN) Regional Forum meeting. It was formally launched on January 12, 2006, at the Partnership's inaugural ministerial meeting in Sydney. Foreign, environment, and energy ministers from partner countries agreed to cooperate on development and transfer of technology, to enable reduction of GHG emissions. Ministers agreed to a charter, communiqué, and work plan to “outline a ground-breaking new model of private-public task-forces to address climate change, energy security and air pollution.”

Berlin Mandate. A ruling negotiated at the first Conference of the Parties, which took place in March 1995, concluded that the present commitments under the Framework Convention on Climate Change are not adequate. Under the Framework Convention, industrialized countries pledged to take measures aimed at returning their GHG emissions to 1990 levels by the year 2000. The Berlin Mandate established a process that enabled the parties to take appropriate action for the period beyond 2000, including a strengthening of industrialized country commitments, through the adoption of a protocol or other legal instruments.

Bryd-Hagel Resolution. In June 1997, anticipating the December 1997 meeting in Kyoto, Senator Robert C. Byrd (Democrat of West Virginia) introduced, with Senator Chuck Hagel (Republican of Nebraska) and 44 other cosponsors, a resolution stating that the impending Kyoto Protocol (or any subsequent international climate change agreement) should not “(a) mandate new commitments to limit or reduce GHG emissions for the Annex I Parties [i.e., industrialized countries], unless the protocol or other agreement also mandates new specific scheduled commitments to limit or reduce GHG emissions for Developing Country Parties within the same compliance period, or (b) would result in serious harm to the economy of the United States.”

C40. Clinton Climate Initiative. Former President Clinton launched the Clinton Foundation's Climate Initiative (CCI) in August 2006, with the mission of applying the Foundation's business-

oriented approach to the fight against climate change in practical, measurable, and significant ways. In its first phase, CCI is working with the C40 Large Cities Climate Leadership Group, an association of large cities dedicated to tackling climate change—to develop and implement a range of actions that will accelerate greenhouse gas emissions reductions. With cities contributing approximately 80 percent of all heat-trapping greenhouse gas emissions to our atmosphere, while only comprising 2 percent of land mass, large cities are critical to winning this fight and slowing the pace of global warming.

Conference of the Parties (COP). The Conference of the Parties is the collection of nations that have ratified the United Nations Framework Convention on Climate Change (UNFCCC), currently over 150 strong with about 50 observer states. The primary COP role is to keep the implementation of the Convention under review and to take the decisions necessary for the effective implementation of the Convention. The first Conference (COP 1) took place in Berlin from March 28 to April 7, 1995, and was attended by more than 1,000 observers and 2,000 media representatives (also see Berlin Mandate).

International Council for Local Environmental Initiatives (ICLEI). ICLEI was founded in 1990. More than 800 cities, towns, provinces, and their associations are ICLEI members. ICLEI provides information, delivers training, organizes conferences, facilitates networking and city-to-city exchanges, carries out research and pilot projects, and offers technical services and consultancy. Several cities in both developing and developed countries have initiated their climate change management programs with ICLEI assistance.

Intergovernmental Panel on Climate Change (IPCC). The IPCC was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme. The IPCC is responsible for providing the scientific and technical foundation for the United Nations Framework Convention on Climate Change (UNFCCC), primarily through the publication of periodic assessment reports. The Fourth Assessment Report was published in 2007.

Kyoto Protocol. An international agreement, adopted in December 1997 in Kyoto, Japan, sets binding emission targets for industrialized countries that would reduce their emissions, on average, 5.2 percent below 1990 levels, between the 2008–2010 period.

Kyoto Flexible Mechanisms. The Kyoto Protocol creates three market-based mechanisms that have the potential to help countries reduce the cost of meeting their emissions reduction targets. These mechanisms are Joint Implementation (Article 6), the Clean Development Mechanisms (Article 17), and International Emissions Trading.

Montreal Protocol (on substances that deplete the ozone layer). An international agreement that entered into force in January 1989 to phase out the use of ozone-depleting compounds, such as methyl chloroform, carbon tetrachloride, and chlorofluorocarbons. Chlorofluorocarbons (CFCs) are potent greenhouse gases that are not regulated by the Kyoto Protocol since they are covered by the Montreal Protocol.

National Action Plans. National action plans are submitted to the Conference of the Parties by all parties outlining the steps that they have adopted to limit their anthropogenic GHG emissions. Countries must submit these plans as a condition of participating in the United Nations Framework Convention on Climate Change and, subsequently, must communicate their progress to the COP regularly.

Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC). The Secretariat comprises the United Nations staff responsible for conducting the affairs of the UNFCCC. In 1996 the Secretariat moved from Geneva, Switzerland, to Bonn, Germany.

United Cities and Local Government (UCLG). United Cities and Local Governments is an NGO and represents and defends the interests of local governments on the world stage, regardless of the size of the communities they serve. Headquartered in Barcelona, it is present in 127 of the 191 UN member states in seven world regions; UCLG's members include individual cities and national associations of local governments, which represent all the cities and local governments in a single country. Over 1000 cities across 95 countries are direct members of UCLG. With 112 Local Government Associations (LGAs), Europe boasts the largest number of LGAs, which represent about 80 percent of the total European population.

United Nations Convention to Combat Desertification (UNCCD). In 1977, the United Nations Conference on Desertification (UNCOD) adopted a Plan of Action to Combat Desertification (PACD). Unfortunately, despite this and other efforts, the United Nations Environmental Program (UNEP) concluded in 1991 that the problem of land degradation in arid, semiarid, and dry subhumid areas had intensified, although there were “local examples of success.” As a result, the United Nations Conference on Environment and Development (UNCED), which was held in Rio de Janeiro in 1992, supported a new, integrated approach to the problem, emphasizing action to promote sustainable development at the community level. UNCED also called upon the United Nations General Assembly to establish an Intergovernmental Negotiating Committee on Desertification (INCD) to prepare a Convention to Combat Desertification, particularly in Africa. In December 1992, the General Assembly agreed and adopted Resolution 47/188.

United Nations Framework Convention on Climate Change (UNFCCC). A treaty signed at the 1992 Earth Summit in Rio de Janeiro calls for the “stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” The treaty includes a nonbinding call for industrialized countries to return their emissions to 1990 levels by the year 2000. The treaty took effect in March 1994 upon ratification by more than 50 countries. The United States was the first industrialized nation to ratify the Convention.

World Mayors and Local Governments, the Climate Protection Agreement. The World Mayors and Local Governments calls upon all national governments to work through the UNFCCC to adopt commitments to stay within a 2°C threshold increase of the Earth's surface temperature. It specifically calls for a framework that will achieve a reduction of 60 percent GHG emissions from 1990 levels by 2050 globally, with industrialized countries to commit to 80 percent GHG reductions from 1990 levels. Building on the existing commitments of local government leaders and their associations—including the ICLEI Cities for Climate Protection Campaign, World Mayors Council on

Climate Change, the US Mayors' Climate Protection Agreement, C40 Climate Leadership Group, and the United Cities and Local Government (UCLG) Jeju Declaration—mayors and local governments set specific commitments to do the following:

- Reduce GHG emissions immediately and significantly;
- Implement subnational, national, and international frameworks that are complementary and enable local governments by providing resources, authority, and sufficient mandate to carry forward these roles and responsibilities;
- Build a sustainable energy economy through energy savings and the application of new and existing renewable and high efficiency technologies;
- Execute climate change adaptation and preparedness measures through local government planning, development, and operational mechanisms, prioritizing the most vulnerable cities;
- Advocate for local governments; and
- Call persistently for national governments to undertake binding carbon limits to rapidly and significantly reduce GHG emissions in the short term and by at least 60 percent worldwide below 1990 levels by 2050.

Annex B/ Sources of Technical and Financial Assistance

Technical assistance options are often available at the local level through academic institutions and universities that have existing expertise in aspects of climate change and disaster risk management, such as Geographical Information System mapping and hazard modeling. The private sector may be another option to partner with depending on the sector and type of technical assistance required. Another option is to seek assistance at the regional and/or national levels through government agencies and line ministries, such as the Meteorological Department or Geological Survey Department, to gain relevant data and advice specific to your city's typology. Twinning and partnering programs, such as the one featured by Milan and World Bank collaboration, is another way to obtain technical assistance from other cities at a reasonable cost.

The World Bank also provides technical assistance support to its clients on a range of development issues. Technical assistance helps client countries implement policies and programs and build institutional capacity. The technical assistance may focus on organizational arrangements, staffing methods, and technical, physical, or financial resources in key agencies. Specific to disaster risk management and climate change issues, the Global Facility for Disaster Reduction and Recovery also provides technical assistance to governments.

In addition to technical assistance, it is important that the city estimates its financing needs to implement its climate change strategy, as well as determines its options for financial assistance. Apart from a reassessment of priorities to allocate revenues away from counterproductive subsidies (e.g., energy and water) toward climate resilience, cities can also consider alternative instruments such as risk insurance facilities or catastrophe bonds.

Increasingly, as the issue of climate change is recognized as having become a development challenge that can wipe out years of growth, the mainstream development funds from multilateral or regional development Banks, and also sources of bilateral assistance, could become available for climate resilient sustainable development financing with adaptation benefits. A number of specialized climate funds are also emerging that can be useful sources of funding. Innovative city-level programs would receive attention from both these. Climate-related funds will include:

- The United Nations' Adaptation Fund, managed by the Global Environment Facility (GEF), is forecasted to be capitalized at US\$80–300 million per year between 2008–2012;
- Other GEF adaptation program;
- Global Facility for Disaster Reduction and Recovery to provide US\$15–20 million per year worldwide; and
- Mitigation financing with adaptation benefits, such as active carbon-related project funds (e.g. the World Bank's Carbon Partnership Facility).

Annex C/ Examples of Relevant World Bank Projects

The World Bank's role in providing *knowledge products, technical assistance, grants, and investment lending project* for climate change and hazard risk management projects has been increasing and deepening. Information and updates on active World Bank projects in East Asia and the Pacific Region can be found on the specific country page on the World Bank website (www.worldbank.org/eap) or by contacting the relevant country office. Below is a brief description of a few projects from the Bank's portfolio to illustrate the scope of interventions the Bank has been undertaking in collaboration with its clients on Climate Change and Disaster Risk Management.

The Global Natural Disaster Hotspots Project is an example of a *knowledge product* that maps six major natural hazards: cyclones, drought, earthquakes, floods, landslides, and volcanoes. This online, interactive tool provides a basis for identifying geographic areas of highest relative disaster risk potential in order to prioritize disaster risk reduction investments and better inform development efforts. To access the tool, visit <http://geohotspots.worldbank.org/hotspot/hotspots/disaster.jsp>

The **Climate Change Impact and Adaptation in Coastal Cities Project** is an analytical exercise that is being undertaken in collaboration with Japan Bank for International Cooperation (JBIC) and the Asian Development Bank, in which the Bank is focusing on a case study of the Bangkok Metropolitan Region. The study will provide information and *technical assistance* to Bangkok on the potential impacts of climate change on energy, transportation, water supply and sanitation, public health, and building and housing, and will offer the city a range of adaptation options.

The **Second Beijing Environment** project is an *investment project* with a GEF component aiming to reduce greenhouse gases in a cost-effective and sustained manner by decreasing carbon emission through the conversion of coal-burning, medium-sized boilers to natural gas; by increasing the efficiency of heating systems in buildings by upgrading maintenance and repairs, and by inculcating sound engineering and industry practices.

The **Mekong Transport and Flood Protection** project is another *investment project* that assists Vietnam with the rehabilitation of highways, including increased protection for certain flood-prone segments, and improves efficiency of the regional transport network in the Mekong Delta. The project will create positive externalities in terms of reduced vehicle emissions, which result from shorter travel time due to better maintained and planned roads.

The **Caribbean Catastrophe Risk Insurance Facility** is the first regional disaster insurance facility in the world and allows governments to pool risk and reduce individual premiums. The Facility was created with initial donor *grants* and provides liquidity to countries if hit by a hurricane or an earthquake. A similar initiative is now being developed for the Pacific. Applications at the city level could also be considered.

A *new business line* is under development—**ECO²: Ecological Cities as Economic Cities**. The model will look at a city through an integrated lens of efficient and sustainable spatial planning, transport, energy, water, and institutional capacity issues in an effort to create competitive and livable cities. The framework combines (a) integrated policy, regulatory, and institutional measures (in planning, utility management, and private sector and citizen engagement), (b) coordinated investments in key infrastructure systems, and (c) innovative financing options and incentives for implementation.

Annex D/ Resource Guide

This section provides an illustrative list of references, websites, reports, papers and original documents used in the development of this Primer. Where electronic access is available, this information has been provided.

NATURAL HAZARDS

Author	International Energy Agency (IEA)
Title	<i>World Energy Outlook</i>
Year	2007
Source	http://www.iea.org
Topic	These are detailed reports and up-to-date data on energy in the whole world.
Author	Intergovernmental Panel on Climate Change (IPCC)
Title	<i>Fourth Assessment Report (and previous Reports)</i>
Year	2007 (2001)
Source	http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf
Topic	Reports offer extensive information and data provided about climate change and forecasted impacts.
Author	PEW Center on Global Climate Change
Title	<i>PEW Center Summary of the IPCC Report Working Group III—Summary</i>
Year	2007
Source	http://www.pewclimate.org/global-warming-basics/ipccar4.cfm
Topic	This is a good summary of main results from the IPCC Report.
Author	United Nations Environment Programme (UNEP)
Title	<i>Climate Change Vulnerability and Adaptation in Developing Countries</i>
Year	2007
Source	http://unfccc.int/files/essential_background/background_publications_htmlpdf/application/txt/pub_07_impacts.pdf
Topic	This report discusses details of various adaptation options for different regions of the world.

Author	World Bank
Title	<i>East Asia Environment Monitor: Adapting to Climate Change</i>
Year	2007
Source	http://siteresources.worldbank.org/EXTEAPREGTOPENVIRONMENT/Resources/CCAM_FinalVersion06-19.pdf?resourceurlname=CCAM_FinalVersion06-19.pdf
Topic	This report presents details about expected climate change impacts in East Asia and current approaches to adaptation and financial measures.

DISASTER RISK MANAGEMENT

Author	Abarquez, I. and Murshed, Z.
Title	<i>Community-Based Disaster Risk Management: Field Practitioners' Handbook</i>
Year	2004
Source	Asian Disaster Preparedness Centre
Topic	This handbook was prepared by the Asian Disaster Preparedness Centre (ADPC). ADPC is a nonprofit organization supporting the advancement of safer communities and sustainable development, through implementing programs and projects that reduce the impact of disasters upon countries and communities in Asia and the Pacific.

Author	Economic Commission for Latin America and the Caribbean (ECLAC)
Title	<i>Handbook for Estimating the Socio-Economic and Environmental Effects of Disasters</i>
Year	2003
Source	http://www.eclac.cl/cgi-bin/getProd.asp?xml=/publicaciones/xml/4/12774/P12774.xml&xsl=/mexico/tpl-i/p9f.xsl&base=/mexico/tpl/top-bottom.xsl
Topic	Based on special disaster assessment endeavors since early 1970, ECLAC developed an assessment methodology to estimate the effects of natural disasters.

Author	Gurenko, E. and Lester, R.
Title	<i>Rapid Onset of Natural Disasters: The Role of Financing in Effective Risk Management—Insurance and Contractual Savings Practice</i>
Year	2004
Source	World Bank Policy Research Working Paper 3278, April 2004, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=610323
Topic	Gurenko and Lester provide a conceptual framework for designing a comprehensive risk management strategy for rapid onset natural disasters at the country level, with a particular emphasis on the role of catastrophe-loss funding. The authors discuss the key policy and technical issues involved in building financially sustainable catastrophe risk transfer and funding programs in disaster-prone countries and their links to risk mitigation. They also deal with the cognitive and political economy issues that are likely to arise and ways to accommodate them.

Author	Jackson, J.
Title	<i>Fatal Attraction: Living with Earthquakes, the Growth of Villages into Megacities, and Earthquake Vulnerability in the Modern World</i>
Year	2006
Source	Philosophical Transactions of the Royal Society, 364, 1911–1925
Topic	This paper describes the drastic increase in vulnerability of urban areas, particularly in developing countries due to their rapid population increase.

Author	Pelling, M.
Title	<i>World Disasters Report 2005</i>
Year	2006
Source	International Federation of Red Cross and Red Crescent Societies (IFRC), Geneva, 172–181
Topic	The World Disaster Reports provide the most authoritative data on natural disasters in each country. The information is used worldwide for a large number of purposes, such as to track the disaster trends.

Author	Red Cross/Red Crescent
Title	<i>Climate Guide</i>
Year	2007
Source	http://www.climatecentre.org
Topic	This guide presents five years of experiences from more than 30 Red Cross and Red Crescent National Societies, in particular in developing countries. The Guide relates the experiences of Red Cross/Red Crescent staff and volunteers all around the world trying to understand and address the risks of climate change

Author	Schipper, L. and Pelling, M.
Title	<i>Disaster Risk, Climate Change and International Development: Scope for, and Challenges to, Integration</i>
Year	2006
Source	<i>Disasters</i> , (2006), 30(1), 19–38
Topic	This paper reviews the theoretical and policy linkages among disaster risk reduction, climate change and development. It finds that not only does action within one realm affect capacity for action in the others, but also that there is much that can be learned and shared between realms in order to ensure a move toward a path of integrated and more sustainable development.

Author	Schmidt-Thomé, P.
Title	<i>Integration of Natural Hazards, Risk and Climate Change into Spatial Planning Practices</i>
Year	2006
Source	PhD Thesis, (2006), University of Helsinki
Topic	This thesis describes the current status of instruments for mitigating impacts of natural hazards and climate change, as well as their risks, and the integration of these factors into spatial planning. The thesis highlights the current paradigm shift of climate change mitigation to adaptation and uses this as a basis to draw conclusions and recommendations on what additional concepts could be incorporated into spatial planning practices. Sample multihazard approaches are discussed as an important approach that should be developed further. The thesis cautions that risk concepts are complicated and that their application in spatial planning has to be analyzed carefully.

Author	Sharma, A.
Title	<i>Assessing, Predicting, and Managing Current and Future Variability and Extreme Events and Implications for Sustainable Development</i>
Year	2007
Source	http://unfccc.int/files/adaptation/sbsta_agenda_item_adaptation/application/pdf/background_paper_on_climate_related_risks.pdf
Topic	This is a background paper. UNFCCC workshop on climate-related risks and extreme events under the Nairobi work program on impacts, vulnerability, and adaptation. Related to agriculture, food security, health, and coastal zones.

Author	Van Aalst, M. K.
Title	<i>The Impacts of Climate Change on the Risk of Natural Disasters</i>
Year	2006
Source	<i>Disasters</i> , (2006), 30(1), 5–18
Topic	This paper provides an overview of the relation between climate change and weather extremes, and examines three specific cases where recent acute events have stimulated debate on the potential role of climate change: the European heat-wave of 2003; the risk of inland flooding, such as recently in Central Europe and Great Britain; and the harsh Atlantic hurricane seasons of 2004 and 2005.

HOT SPOTS

Author	Earthquakes and Megacities Initiative
Title	Several papers on urban risk
Year	1998–2000
Source	http://www.emi-megacities.org/
Topic	The Earthquakes and Megacities Initiative (EMI) is an international not-for-profit scientific nongovernmental organization dedicated to the acceleration of earthquake preparedness, mitigation, and recovery of large urban areas (i.e., megacities). EMI serves as a catalyst for the delivery of scientific and technical knowledge to the end-users. EMI focuses its efforts on developing capacity in megacities of the developing world where the effects of earthquakes and other disasters could be devastating to the people, their economy, their culture, and their environment.

Author	Nicholls, R.J.
Title	<i>Coastal Megacities and Climate Change</i>
Year	2006
Source	<i>GeoJournal</i> , 37(3), 369–379
Topic	The paper describes the impact of climate change on the coastal megacities and identifies them as climate change hot-spots. The paper also advocates an integrated approach to coastal management.

Author	United Nations Development Program (UNDP)
Title	<i>The Global Risk Identification Program</i>
Year	2006
Source	http://www.gri-p.net
Topic	The Global Risk Identification Program (GRIP) targets areas of the world where disaster is a major factor in reducing sustainable development. GRIP was launched in June 2007 by UNDP to highlight the importance of disaster risk reduction (DRR) in achieving the Millennium Goals. Its objectives are an improved evidence base for disaster risk management and an increased adoption of risk evidence in disaster risk management and development processes. GRIP's partners are local institutions and governments, UNDP BCPR, the World Bank, the Government of Norway, DFID, USAID, IADB, Munich Re Foundation, UNISDR, Cabinet Office (JP), IFRC, ProVention

Author	World Bank
Title	<i>Natural Disaster Hotspots: A Global Risk Analysis</i>
Year	2006
Source	http://www.proventionconsortium.org/themes/default/pdfs/Hotspots.pdf
Topic	This publication focusing on reducing the risk and social, economic, and environmental impacts of natural hazards on vulnerable populations in developing countries.

Author	World Bank
Title	<i>Natural Disaster Hotspots: Case Studies</i>
Year	2006
Source	http://siteresources.worldbank.org/INTDISMGMT/Resources/0821363328.pdf?resourceurlname=0821363328.pdf and http://geohotspots.worldbank.org/hotspot/hotspots/about.jsp
Topic	This second volume of the Natural Disaster Hotspots project presents a series of case studies undertaken to support the global analysis, published in 2005 as <i>Natural Disaster Hotspots: A Global Risk Analysis</i> . The Hotspots initiative aims to provide information to inform development strategies and investments and to prioritize actions for reducing disaster risk. The initiative began in 2001 under the umbrella of the ProVention Consortium as a collaborative effort of the World Bank, Columbia University's Earth Institute, and a number of international partners.

CLIMATE CHANGE ADAPTATION AND VULNERABILITY

Author	Australian Greenhouse Office
Title	<i>Climate Change: Risk and Vulnerability—Promoting an Efficient Adaptation Response in Australia (Final Report)</i>
Year	2005
Source	http://www.greenhouse.gov.au/impacts/publications/risk-vulnerability.html
Topic	This report explores the risks to Australia from the impacts of climate change over the next 30 to 50 years. Within this, an analysis of comparative risks and their importance for identifying priorities for adaptation action and planning have been discussed.

Author	Baker, J.
Title	<i>Urban Poverty: A Global View</i>
Year	2008
Source	World Bank Urban Paper n.5 January 2008, http://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1169585750379/UP-5.pdf
Topic	This paper provides an overview on what has been learned about urban poverty over the past decade with a focus on what is new and what the implications are for the World Bank going forward in an increasingly urbanized world. The chapter on risks includes disaster and environmental risks at the urban level.

Author	Basher, R.
Title	<i>Making Disaster Reduction an Adaptation Policy</i>
Year	2005
Source	Integrated Development and Climate Policies: How to Realize Policies at National and International Levels Workshop, http://developmentfirst.org/Paris/DisasterReduction&AdaptationPolicy_Basher.pdf
Topic	The paper describes the linkage between climate change, increase in vulnerability, and increase in disaster risk.

Author	Dasgupta, S., Laplante B., Meisner C., Wheeler D. and Yan J.
Title	<i>The Impact of Sea-Level Rise on Developing Countries: A Comparative Analysis</i>
Year	2007
Source	World Bank Policy Research Working Paper 4136, www.worldbank.org
Topic	This paper presents a comparative analysis about sea-level rising in different developing countries. The results reveal that hundreds of millions of people in the developing world are likely to be displaced by sea-level rise within this century; accompanying economic and ecological damage will be severe for many. At the country level, results are extremely skewed, with severe impacts limited to a relatively small number of countries. For these countries (e.g., Vietnam, Egypt, and Bahamas), however, the consequences of sea-level rise are potentially catastrophic. For many others, including some of the largest (e.g., China), the absolute magnitudes of potential impacts are very large. At the other extreme, many developing countries experience limited impacts. Among regions, East Asia and Middle East/North Africa exhibit the greatest relative impacts.

Author	Hay, J.E., Warrick, R., Cheatham, C., Manarangi-Trott, T., Konno, J. and Hartley, P.
Title	<i>Climate Proofing: A Risk-Based Approach to Adaptation</i>
Year	2004
Source	Asian Development Bank
Topic	This report describes several case studies of adaptation programs that have been taken up for disaster risk management. The report provides a strong link between disaster risk management and climate change adaptation.

Author	European Environment Agency (EEA)
Title	<i>Vulnerability and adaptation to climate change in Europe</i>
Year	2003
Source	EEA Technical report No 7/2005, ISSN 1725-2237 http://reports.eea.europa.eu/technical_report_2005_1207_144937/en/EEA_Technical_report_7_2005.pdf
Topic	This report provides information on vulnerability in Europe, highlighting the need for adaptation; facilitates information sharing among EEA member countries and learning from 'best practices in vulnerability assessments and adaptation planning'; contributes to the discussion on adaptation strategies and policies at European Union and national level; and identifies current and future information needs, toward which the EEA and other organizations might be able to contribute.

Author	Huppert, H.E. and Sparks, R.S.J.
Title	<i>Extreme Natural Hazards: Population Growth, Globalization and Environmental Change</i>
Year	2006
Source	Philosophical Transactions of the Royal Society 1875-1888
Topic	The paper focuses on the extremely low-probability events that do not occur more frequently than once in millennia but can have a profound impact on humanity.

Author	J. Feenstra, Burton, I., Smith, J. and Tol, R. (eds.)
Title	<i>Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies</i>
Year	1998
Source	United Nations Environment Programme, Nairobi, and Institute for Environmental Studies, Vrije Universiteit, Amsterdam. (Version 2.0) http://dare.ubvu.vu.nl/handle/1871/10440
Topic	The UNEP methodology establishes a generic framework for thinking about and responding to the problems of sea-level rise and climate change. The user goes through the following seven guiding steps: (1) define the problem, (2) select the method, (3) test the method, (4) select scenarios, (5) assess the biogeophysical and socioeconomic impacts, (6) assess the autonomous adjustments, and (7) evaluate adaptation strategies. The last step is itself split into seven substeps. At each step, methods are suggested but the choice is left up to the user.

Author	Kok, M.T.J. and de Coninck, H.C.
Title	<i>Widening the Scope of Policies to Address Climate Change: Directions for Mainstreaming</i>
Year	2007
Source	Environmental Science & Policy, (2007), 587–599
Topic	This paper highlights that both mitigation and adaptation requires coordinated action to be taken by several sections of the society. The paper discusses that improved policy coherence and mainstreaming requires climate policies to go beyond the UNFCCC framework to realize its full potential and to better deal with possible trade-offs.

Author	Mitchell, J.F., Lowe, J., Wood R.A. and Vellinga, M.
Title	<i>Extreme Events due to Human-Induced Climate Change</i>
Year	2006
Source	Philosophical Transactions of the Royal Society, (2006), 364, 2117–2133
Topic	This paper highlights the importance of focusing on extreme events whose frequency may increase due to the impact of climate change.

Author	Morita, K.
Title	<i>Integration of Mitigation and Adaptation Policy Frameworks into the UNFCCC Process</i>
Year	2006
Source	11th Asia Pacific Integrated Model Workshop, Tsukuba, Japan
Topic	The paper discusses how adaptation policies have been dealt within policy and political contexts. The paper also describes the importance of adaptation in the context of developing countries and highlights the role of suitable adaptation at the global level.

Author	Mills, E.
Title	<i>Synergisms between Climate Change Mitigation and Adaptation: An Insurance Perspective</i>
Year	2007
Source	Mitigation and Adaptation Strategies for Global Change, (2007), 12:809–842
Topic	This article reviews the implications of climate change for insurers and provides specific examples of insurance-relevant synergisms between adaptation and mitigation in the buildings and energy sectors, agriculture, forestry, and land use.

Author	Nicholls, R.J, Hanson S., Herweijer C., Patmore N., Hallegatte S., Corfee-Morlot, J, Chateau J., and Muir-Wood, R.
Title	<i>Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes—Exposure Estimates</i>
Year	2007
Source	OECD
Topic	This global screening study makes a first estimate of the exposure of the world's largest port cities to coastal flooding due to storm surge and damage from high winds. This assessment also investigates how climate change is likely to impact each port city's exposure to coastal flooding by the 2070s, alongside subsidence and population growth and urbanization. The study provides a much more comprehensive analysis than earlier assessments, focusing on the 136 port cities around the world that have more than one million inhabitants in 2005. The analysis demonstrates that a large number of people are already exposed to coastal flooding in large port cities. Across all cities, about 40 million people (0.6 percent of the global population or roughly one in 10 of the total port city population in the cities considered here) are exposed to a 1-in-100-year coastal flood event.

Author	Perkins, B., Ojima D. and Corell, R.
Title	<i>A Survey of Climate Change Adaptation Planning</i>
Year	2007
Source	The John Heinz III Center for Science, Economics and the Environment, Washington, D.C. papers, http://www.us-ecosystems.org/NEW_WEB/PDF/Adaptation_Report_October_10_2007.pdf
Topic	The report explores adaptation planning resources available both in the United States and internationally. The report summarizes ongoing efforts to deal with those challenges. Eight existing adaptation plans and 18 adaptation planning efforts with a wide variety of impact areas are reviewed.

Author	Smit, B. (ed.)
Title	<i>Adaptation to Climatic Variability and Change: Report of the Task Force on Climatic Adaptation</i>
Year	2003
Source	Occasional Paper No. 19, Department of Geography, University of Guelph, Ontario, Canada, http://www.climate-adaptation.info
Topic	The report summarizes the results of the studies done by the Task Force on Climatic Adaptation in Canada.

Author	Satterthwaite, D.
Title	<i>Climate Change and Urbanization: Effects and Implications for Urban Governance</i>
Year	2007
Source	United Nations Expert Group Meeting on Population Distribution, Urbanization, Internal Migration And Development—Population Division Department of Economic and Social Affairs, United Nations Secretariat New York, 21-23 January 2008, http://www.un.org/esa/population/meetings/EGM_PopDist/P16_Satterthwaite.pdf
Topic	This paper focuses on the effects of climate change on urban areas in low- and middle-income nations and the implications for urban governance. It emphasizes how most adaptation to the likely climate change-related dangers over the next few decades fit well within a local development agenda.

Author	Smit, B. and Wandel, J.
Title	<i>Adaptation, Adaptive Capacity and Vulnerability</i>
Year	2006
Source	Global Environmental Change, (2006), 16, 282–292
Topic	This paper reviews the concept of adaptation of human communities to global changes, especially climate change, in the context of adaptive capacity and vulnerability. It focuses on scholarship that contributes to practical implementation of adaptations at the community scale.

Author	Srivastava, L. and Heller, T.
Title	<i>Integrating Sustainable Development and Climate Change in AR4</i>
Year	2003
Source	AR4 SCOP-2/Doc. 8, 12.VIII.2003
Topic	This is a preparatory document for the drafting of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

Author	United Kingdom Climate Impacts Program (UKCIP)
Title	<i>Climate Adaptation: Risk Uncertainty and Decision Making</i>
Year	2003
Source	http://unfccc.int/files/adaptation/methodologies_for/vulnerability_and_adaptation/application/pdf/united_kingdom_climate_impacts_programme_ukcip_.pdf
Topic	The report proposes a step-wise approach to vulnerability and adaptation assessment in a risk uncertainty decision-making framework. The framework and guidance aim to help decision makers and their advisers in identifying important risk factors and to describing the uncertainty associated with each. It aims to help them judge the significance of the climate change risk compared to the other risks they face, so they can work out what adaptation measures are most appropriate. There are questions for the decision maker to apply at each stage and tools that can be used. The report identifies methods and techniques for risk assessment and forecasting, options appraisal and decision analysis. There are eight stages in the framework: (1) identify problem and objectives, (2) establish decision-making criteria, (3) assess risk, (4) identify options, (5) appraise options, (6) make decision, (7) implement decision, and (8) monitor, evaluate, and review. The framework prescribes a circular process in which feedback and iteration are encouraged and emphasizes a sequential implementation of adaptation measures.

CASE STUDY SOURCES

Author	Agrawal, A.
Title	<i>The Role of Local Institutions in Adaptation to Climate Change</i>
Year	2008
Source	Social Development Department, the World Bank
Topic	The case study focuses on the role of local institutions in adaptation to climate change. It presents a conceptual framework to understand and classify the adaptation practices of the rural poor and the external support. It also includes recommendations on initiatives of local government for adapting to climate change.

Author	City of Cape Town
Title	<i>Framework for Adaptation to Climate Change in the City of Cape Town</i>
Year	2006
Source	http://www.erc.uct.ac.za/publications/Framework%20for%20adaptation%20to%20CC%20in%20the%20city%20of%20Cape%20Town%20-%20FAC4T.pdf
Topic	The report presents an overarching framework for a citywide consolidated and coordinated approach to reducing vulnerability to climate impacts.

Author	Cities Plus
Title	<i>Climate Change Impacts and Adaptation Strategies for Urban Systems in Greater Vancouver</i>
Year	2003
Source	http://www.sheltair.com/library/VOL%202%20citiesplus%20Climate%20Chg%20I%20and%20A%20Strategies%20by%20Urban%20System%20for%20Gr%20Van%20Aug%202003.pdf
Topic	The report presents influence diagrams of potential climate change impacts and illustrative adaptation strategies by urban system for the city of Vancouver.

Author	Clean Air Partnership
Title	<i>Cities Preparing for Climate Change: A Study of 6 Urban Regions</i>
Year	2007
Source	http://adaptation.nrcan.gc.ca/projdb/pdf/171e_e.pdf
Topic	This study incorporates the lessons learned from six early adopters and addresses these experiences by phase of the adaptation planning process

Author	Columbia Earth Institute
Title	<i>Climate Change and a Global City</i>
Year	2001
Source	http://ccsr.columbia.edu/cig/mec/0.1_Front_matter.pdf
Topic	This is a first report on the potential consequences of climate variability and change in the New York Metropolitan Area.

Author	Easterling, W.E., Hurd, B.H. and Smith, J.B.
Title	<i>Coping with Global Climate Change: The Role of Adaptation in the United States</i>
Year	2004
Source	Pew Center papers, http://www.pewclimate.org/global-warming-in-depth/all_reports/adaptation
Topic	This report presents a synthesis of the likely climate change impacts in the United States and the importance of adaptation. Main findings are the following: (a) adaptation is an important complement to GHG mitigation policies, (b) adapting to climate change will not be a smooth or cost-free endeavor, (c) managed systems will fare better than natural systems and some regions will face greater obstacles than others, and (d) proactive approaches to adaptation are more likely to avoid or reduce damages than reactive responses.

Author	He, J.F., Liu, J.Y., Zhuang, D.F., Zhang, W. and Liu, M.L.
Title	<i>Assessing the Effect of Land Use-Land Cover Change on the Change of Urban Heat Island Intensity</i>
Year	2007
Source	<i>Theoretical and Applied Climatology</i> , (2007), 90, 217–226
Topic	This paper presents a discussion on urban heat island effect with particular reference to China.

Author	ICLEI; King County, Washington; Climate Impacts Group
Title	<i>Preparing for Climate Change: A Guidebook for Local, Regional and State Governments</i>
Year	2007
Source	http://cses.washington.edu/cig/fpt/guidebook.shtml
Topic	The report is designed to help local, regional, and state governments prepare for climate change by recommending a detailed, easy-to-understand process for climate change preparedness based on familiar resources and tools. It provides a detailed step-by-step description of the bureaucratic process of constructing and implementing adaptation policy.

Author	International Strategy for Disaster Reduction (UN/ ISDR)
Title	<i>Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters (HFA)</i>
Year	2005
Source	http://www.unisdr.org/eng/hfa/hfa.htm
Topic	The Hyogo Framework for Action was the outcome of the World Conference on Disaster Reduction in Kobe, Hyogo Prefecture, Japan, in January 2005. The details of the conference, including the objectives, expected outcomes, and strategic goals are described in this document. The priorities for action, strategies for implementation and follow-up are also described.

Author	International Strategy for Disaster Reduction (UN/ ISDR)
Title	<i>Indicators of Progress: Guidance on Measuring the Reduction of Disaster Risks and the Implementation of the Hyogo Framework for Action</i>
Year	2008
Source	(UN/ ISDR-15-2008-Geneva), http://www.unisdr.org/eng/about_isdr/bd-isdr-publications.htm
Topic	This publication helps set priorities for implementing disaster risk reduction, while regularly monitoring and reviewing achievements against clear indicators. It can be used by national authorities, civil society and community organizations, regional inter-governmental institutions, technical bodies, and international and donor communities

Author	International Strategy for Disaster Reduction (UNISDR)
Title	<i>Words Into Action: A Guide for Implementing the Hyogo Framework</i>
Year	2007
Source	http://www.unisdr.org/eng/about_isdr/bd-isdr-publications.htm
Topic	This document was prepared to facilitate consultative processes to develop guidelines and policy tools for each priority area, with relevant national, regional, and international expertise. The Guide describes 22 tasks that are organized to help address and guide the implementation of the Hyogo Framework for Action's five Priorities for Action. Depending on the national situation, the tasks may provide good starting points for organizing action, or useful references against which to check existing policies and procedures. Different users can draw on the parts that are useful to them, adapting the tasks according to their particular needs.

Author	Islami, S., Aramaki, T. and Hanaki, K.
Title	<i>Development and Application of an Integrated Water Balance Model to Study the Sensitivity of the Tokyo Metropolitan Area Water Availability Scenario to Climatic Changes</i>
Year	2005
Source	<i>Water Resources Management</i> , (2005), 19, 423–445
Topic	This paper presents the water availability scenario in the Tokyo Metropolitan Area under future climatic changes. The paper finds that drought risk was observed to be increased significantly for the periods between April–July.

Author	London Climate Change Partnership
Title	<i>Adapting to Climate Change: Lessons from London</i>
Year	2006
Source	Greater London authority, London, http://www.london.gov.uk/climatechangepartnership/docs/adapting-climate-change-london.pdf
Topic	This paper presents 18 city case studies and recommendations from the London Climate Change Partnership. eighteen cities have been examined to understand how they are addressing climate risks that are expected to intensify in London over the coming decades due to climate change, such as flooding, high temperature, and limited water resources.

Author	Matz, N.
Title	<i>Financial Institutions between Effectiveness and Legitimacy—A Legal Analysis of the World Bank, Global Environment Facility and Prototype Carbon Fund</i>
Year	2005
Source	<i>International Environmental Agreements</i> , (2005), 5, 265–302
Topic	This paper presents a legal evaluation of the World Bank's leadership in climate change issues and analyzes the Global Environment Facility and the Prototype Carbon Fund.

Author	Milan Municipality
Title	<i>Expo 2015: Climate Policies and Programs, (Chapter 16)</i>
Year	2007
Source	http://www.milanoexpo-2015.com/imgup/File/Chapter%2016.pdf
Topic	This article contains all the policies, programs, and strategies on climate change designed for the Expo 2015 bid.

Author	Moser, C. and Satterthwaite, D.
Title	<i>Pro-Poor Climate Change Adaptation in the Urban Centers of Low- and Middle-Income Countries</i>
Year	2008
Source	Social Development Department, the World Bank
Topic	This report explains why urban areas in developing countries are likely to be disproportionately impacted by climate change. It describes the likely consequences of climate change, such as more intense and more frequent natural disasters in urban areas. It also presents the framework for planning adaptation practices for climate change impact and disaster risk management.

Author	New Zealand Climate Change Office
Title	<i>Coastal Hazards and Climate Change: A Guidance Manual for Local Government in New Zealand</i>
Year	2008
Source	http://www.mfe.govt.nz/publications/climate/coastal-hazards-may04/coastal-hazards-may04.pdf
Topic	This Guidance Manual is intended to help local authorities manage coastal hazards by (1) providing information on the effects of climate change on coastal hazards; (2) presenting a decision-making framework to assess the associated risks; and (3) providing guidance on appropriate response options.

Author	Rosenzweig C., Major, D., Demong, K., Stanton, C., Horton, R. and Stults, M.
Title	<i>Managing Climate Change Risks in New York City's Water System: Assessment and Adaptation Planning</i>
Year	2007
Source	<i>Mitigation and Adaptation Strategies for Global Change</i> (2007) 12:1391–1409 DOI 10.1007/s11027-006-9070-5
Topic	This report describes the climate risk management framework that the New York City Department of Environmental Protection (NYCDEP), the agency responsible for managing New York City's water supply, sewer, and wastewater treatment systems, has developed through its Climate Change Task Force. It is a government-university collaborative effort.

Author	Schibel, K.L. and Guerrieri, M.
Title	<i>Adaptation and Mitigation: An Integrated Climate Policy Approach—Report on the Mitigation Scan City of Venice</i>
Year	2006
Source	http://www.amica-climate.net
Topic	This report presents the framework and the application results of the Mitigation Scan done for the City of Venice. It is part of the AMICA Project, partially-financed by the European Union.

Author	Shaw, R., Colley, M. and Connell, R.
Title	<i>Climate Change Adaptation by Design: A Guide for Sustainable Communities</i>
Year	2007
Source	TCPA, London, http://www.tcpa.org.uk/downloads/20070523_CCA_lowres.pdf
Topic	This report presents the expected climatic change in the United Kingdom (UK) and the different adaptation options for the UK due to the scenarios of climate change.

Author	Stern, N.
Title	<i>Stern Review on the Economics of Climate Change</i>
Year	2006
Source	http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_Report.cfm
Topic	This Review focuses on the impacts and risks arising from uncontrolled climate change, and on the costs and opportunities associated with action to tackle it. The Review finds that all countries will be affected by climate change, but it is the poorest countries that will suffer earliest and most. The Review also examines the national and international policy challenges of moving to a low-carbon global economy.

Author	Tyndall Centre for Climate Change Research
Title	<i>Surviving Climate Change in Small Islands: A Guidebook</i>
Year	2005
Source	http://www.tyndall.ac.uk/publications/surviving.pdf
Topic	The Tyndall Centre for Climate Change Research has produced the booklet to discuss what lies ahead for the Pacific and what might be done. It is a practical guide that explains in layman's terms the threats, risks, and opportunities open to us in the Pacific, the first to be seriously threatened by climate change. The booklet contains sections on vulnerability assessment and adaptation plan development as well as an entire chapter on implementation.

Author	United Nations Development Program (UNDP)
Title	<i>Reducing Disaster Risk: A Challenge for Development</i>
Year	2004
Source	http://www.undp.org/cpr/disred/rdr.htm
Topic	This Report is premised on the belief that in many countries the process of development itself has a huge impact—both positive and negative—on disaster risk. It shows how countries that face similar patterns of natural hazards—from floods to droughts—often experience widely differing impacts when disasters occur. The impact depends in large part on the kind of development choices countries have made previously. This Report introduces a pioneering Disaster Risk Index (DRI) that measures the relative vulnerability of countries to three key natural hazards—earthquake, tropical cyclone, and flood—identifies development factors that contribute to risk, and shows in quantitative terms, just how the effects of disasters can be either reduced or exacerbated by policy choices.

Author	United Nations Environment Program (UNEP)
Title	<i>Vulnerability Indices for Planning Climate Change Adaptation</i>
Year	2006
Source	Training Workshop on National Adaptation Programme of Action (NAPA), http://www.unitar.org/ccp/samoa/UNEP%20VA%20Indices.pdf
Topic	This presentation provides the links between science and policy in adaptation and the referees for a protocol for vulnerability assessment.

Author	Viner, D. and Bouwer, L.
Title	<i>Linking Climate Change Adaptation and Disaster Risk Management for Sustainable Poverty Reduction</i>
Year	2006
Source	Vietnam Country Study, EU funded, 2006, Ref. MWH 475000177.001-4
Topic	This paper includes detailed information about Disaster Management System in Vietnam.

Author	Wisner, B.
Title	<i>At Risk: Natural Hazards, People's Vulnerability and Disasters</i> (2nd Ed.)
Year	2004
Source	Routledge
Topic	This book presents a very detailed in-depth discussion on the various factors that lead to a disaster, including the hazard, vulnerability and resilience. The book also discusses the coping mechanisms. The factors and actions that may reduce the severity of disasters are also described. The various international agreements and frameworks and their implications are also discussed.

Author	Yuen, B.
Title	<i>Squatters No More: Singapore Social Housing</i>
Year	2007
Source	<i>Global Urban Development</i> , (2007), 3, 1–22
Topic	This paper presents a detailed analysis of the social housing policy of Singapore since its independence. The paper highlights the importance of a holistic approach that has resulted in virtually no squatter population in Singapore.

CITY PROGRAMS (SOUND PRACTICE)

City	Albuquerque
Program	Albuquerque Climate Change Programs
Source	http://www.cabq.gov/sustainability
City	Albuquerque
Program	Albuquerque Green Programs Tools and Goals
Source	http://www.albuquerquegreen.com
City	Albuquerque
Program	Local Government Leadership and Tools
Source	http://www.coolmayors.org/common/11061/default.cfm?clientID=11061
City	Albuquerque
Program	Albuquerque Emergency Management
Source	http://www.cabq.gov/emergency
City	Hanoi
Program	On disaster management system in place
Source	http://www.aprsaf.org/text/wg_vietnam_info.html
City	Hanoi
Program	On disaster management system in Vietnam and in the Nam Dinh Province
Source	www.climatevarg.org/essd/env/varg.nsf
City	Jakarta
Program	PEACE. 2007. Indonesia and Climate Change: Current Status and Policies
Source	www.peace.co.id
City	Jakarta
Program	National Action Plan for Disaster Reduction 2006–2009.
Source	http://www.undp.or.id/press/view.asp?FileID=20070124-1&lang=en
City	Milan
Program	About EcoPass
Source	http://www.comune.milano.it/dserver/ecopass/index.html
City	Milan
Program	About Milan Expo 2015 bid
Source	http://www.milanoexpo-2015.com/

City	Milan
Program	About emissions inventory
Source	http://www.epa.gov/ttn/chief/conference/ei13/poster/caserini.pdf

City	New York City
Program	Climate change information about the New York Metropolitan area
Source	http://ccir.ciesin.columbia.edu/nyc/index.html

City	New York City
Program	Impacts of climate change in the New York Metropolitan area
Source	http://www.climatehotmap.org/impacts/metroeastcoast.html

City	New York City
Program	C40 Large Cities Summit on Climate Change, held in New York in 2007
Source	http://www.nycclimatesummit.com/

City	Rockville, Maryland
Program	Municipal government
Source	http://www.rockvillemd.gov/environment/sustainability/

City	Seattle, King County
Program	The Benchmark Report
Source	http://www.metrokc.gov/budget/benchmrk/

City	Seattle, King County
Program	Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments
Source	http://cses.washington.edu/cig/fpt/guidebook.shtml

City	Seattle, King County
Program	The 2006 Annual Growth Report: King County, Washington
Source	http://www.metrokc.gov/budget/agr/agr06/

City	Seattle, King County
Program	2007 King County Climate Plan
Source	www.metrokc.gov/exec/news/2007/pdf/climateplan.pdf

City	Seattle, King County
Program	Map Your Neighborhood Discussion Guide Washington State Emergency Management
Source	http://emd.wa.gov/myn/myn_organize.shtml

City	Seattle, King County
Program	Seattle All-Hazards Mitigation Plan, City of Seattle
Source	http://www.seattle.gov/emergency/

City	Seattle, King County
Program	Hazard Identification and Vulnerability Analysis, City of Seattle
Source	http://www.redmond.gov/insidcityhall/planning/mitigation/pdfs/hiva.pdf
City	Seattle, King County
Program	The Green Ribbon Commission Report
Source	http://www.seattle.gov/climate/report.htm
City	Seattle, King County, Washington
Program	King County Emergency Management
Source	www.kingcounty.gov/prepare
City	Singapore
Program	<i>The Singapore Green Plan 2012 (2006 Edition)</i> , Ministry of Environment and Water Resources, Government of Singapore (2006)
Source	www.mewr.gov.sg/sgp2012
City	Singapore
Program	Energy for Growth: National Energy Policy Report (2007)
Source	app.mti.gov.sg/default.asp?id=2546
City	Singapore
Program	Singapore National Climate Change Strategy (2007)
Source	http://www-gio.nies.go.jp/www/wgia/wg4/pdf/3_I_02_Wong_Singapore.pdf
City	Singapore
Program	<i>Singapore—Beyond Clean & Green, Toward Environmental Sustainability</i> , Ministry of Environment (2004)
Source	www.env.gov.sg
City	Singapore
Program	Ministry of Home Affairs
Source	http://www.mha.gov.sg
City	Tokyo
Program	Tokyo Climate Change Strategy, Tokyo Metropolitan Government (2007)
Source	www2.kankyo.metro.tokyo.jp/kikaku/kikouhendouhousin/data/ClimateChangeStrategyPress.pdf
City	Tokyo
Program	Tokyo 2020 Renewable Energy Strategy, Tokyo Metropolitan Government (2006)
Source	www2.kankyo.metro.tokyo.jp/kouhou/env/english/pdf/Tokyo%20Renewable%20Energy%20Strategy.pdf

City	Tokyo
Program	Urban Development Program—Tokyo Metropolitan Government
Source	www.metro.tokyo.jp and www.toshiseibi.metro.tokyo.jp

City	Venice
Program	Overviews of the Vulnerability of Venice to the Impacts of Climate Change and Sea-Level Rise, several papers
Source	www.feem.it

City	Venice
Program	On mitigation and adaptation specific activities
Source	http://www.amica-climate.net/



Contents of CD-ROM

The CD-ROM included at the back of this Primer includes:

- An electronic version of this Primer;
- 13 City Profiles;
- Agenda, presentations, and materials from the Makati Consultation Workshop (May 2008);
- Presentations and materials from the Green Cities Launch Workshop (July 2008); and
- Selected World Bank and UN reference documents from those listed in Annex D.

These are discussed below.

A/ CITY PROFILES

City Profiles of Sound Practice on CD-ROM accompany the Primer. This section gives a brief summary of the City Profiles and explanation of why the cities were selected for their efforts at addressing climate change impacts, consequences, and disaster risk management issues. The City Profiles on CD-ROM offer a more detailed presentation of the cities' initiatives, projects, and programs.

There are two types of City Profiles on the CD-ROM—long and short. The long profiles include a comprehensive analysis of a city's disaster management systems, and of climate change impacts. The short profiles are those that focus on a selected aspect of a city's climate and disaster management path, which has been highlighted, i.e., adaptation to climate change, mitigation of climate change impacts, or mitigation of disaster risks. A list of the Profiles and a brief introduction of each follows below.

LONG PROFILES include analysis of the following city programs:

- Albuquerque, New Mexico, USA;
- Jakarta, Indonesia;
- King County/Seattle, Washington, USA;
- Rockville, Maryland, USA;
- Singapore; and
- Tokyo, Japan.

Albuquerque, New Mexico, USA

Albuquerque is a high desert environment where secure and safe water is among the most important issues facing society. To assure water quantity and quality and to gain the support of citizens through behavioral change to become responsible water users are among the city's priorities. The Profile illustrates the relationships between the cause and effects of global warming and hazard management and how those impacts relate to and translate into actions that can and need to be coordinated and implemented.

The Albuquerque Climate Change Impacts and Disaster Risk Management programs are managed through the Sustainability Office of the city government and the different departments that form the climate change team and the Office of Emergency Management. Albuquerque has identified a set of priorities based on its learning and its association with local, national, and international organizations to determine a way forward.

This Profile presents an overview of Albuquerque's comprehensive approach, financing mechanisms, strategy development process, and accomplishments from information presented on the Albuquerque Web page that links to detailed explanation of what the city has achieved. The Profile presents information that documents and explains Albuquerque's vulnerabilities and the impacts it foresees in the near and long term, commitments to understand and respond to those changes, and Albuquerque's accomplishments to date.

The Albuquerque Profile focuses on the activity-based structure of its strategy, which includes:

- Efforts to secure a safe water supply;
- Greenhouse gas reduction;
- Renewable energy and biofuels;
- Urban forestry;
- Alternative transportation;
- Waste reduction and recycling;
- Energy conservation;
- Green building; and
- Partnerships and collaboration (emergency operations, community volunteers, and responsibilities and disaster risk management).

Albuquerque also follows a “no-regrets” approach to good urban management of limited and non-renewable resources. As Albuquerque Mayor Martin J. Chávez stated clearly, “We have to walk the walk,” meaning that change starts with the way the city manages itself. The city becomes the example of change and the resources needed to build in efficiencies and new technologies to reduce global warming and the hazards it may affect. Albuquerque rightfully advertises its comprehensive program.

The hazards that threaten Albuquerque, as presented in the Profile, include floods, fires, water security, drought, and extreme weather events including ice storms, heavy snows, and flash floods. To confront these hazards, the Office of Emergency Management was established. Climate change impacts may create more frequent and more intense events such as wildfires and flashfloods, harsher winters with more snow, and erratic precipitation patterns that may create water security and more

frequent disasters. The Profile highlights the local government structure that could build closer relations between the Office of Emergency Management and the Sustainability Office. One of the most interesting priorities established in Albuquerque for emergency management is the role of the community and the “neighbor-helping-neighbor” approach. This is a critical part of the all-hazards approach the Office of Emergency Management carries out and could work as well for the climate change impact efforts.

Jakarta, Indonesia

Jakarta, with a population of around 12 million and experiencing very rapid growth, is one of the largest cities in East Asia and is very vulnerable to several climate change-related hazards. The city has great sensitivity to the impact of climate change, particularly since 40 percent of the city sits below sea level. The city is also experiencing subsidence that may further lower the ground level of several parts of the city that are currently above sea level.

There are 13 rivers that pass through the province, of which 3 are inter-provincial rivers. The inter-provincial rivers are controlled by the Central Government, while the local rivers are controlled by the provincial government. Jakarta therefore experiences complex coordination in river management during intense rainfalls.

Jakarta has also experienced extensive loss of urban greenery that has magnified the problems with the urban heat island effect. This has contributed to other secondary undesirable effects such as increasing air-conditioning use and energy demand.

Jakarta has undertaken some adaption and mitigation programs in the transportation sector. Some major arterial roads have been classified as three-in-one during peak hours wherein only vehicles with at least three occupants are allowed on these streets. The three-in-one system is strictly enforced and has a salutary effect in modifying the driving habits of the residents. The city has implemented a rapid bus transit system and has constructed dedicated public transport corridors on several arterial roads to encourage greater use of public transportation. The rapid bus transit vehicles have low emissions and are operated at very frequent intervals. The city is currently planning to include more roads under the rapid bus transit system.

King County/Seattle, Washington, USA

King County/Seattle is a coastal environment sitting on a fault line that makes it vulnerable to not only sea-rise and extreme events, storm surges, and floods, but also earthquakes. This Profile is included for its comprehensive approach and program that may be a useful model to other cities now embarking on an active program to deal with climate change impacts and disaster risk management. The Profile has been organized into priority areas including:

- Making commitments;
- Team building;
- Learning;
- Developing strategies;
- Priorities setting; and
- Actions programs.

Especially important to the learning element is the working relationship with the University of Washington as its technical advisor.

The management of the climate change impacts and disaster risk management program is a joint effort of the King County Climate Change team comprised of key departments of the county government and the Sustainability Office of Seattle and its Office of Emergency Management. Based on work of the scientific support team at the University of Washington, climate change impacts were identified and presented in the 2007 King County Climate Change Plan and Seattle's Hazard Identification and Vulnerability Analysis. Knowledge of the projections became the basis for the plans that were developed and presented in the Profile.

King County expresses its proactive approach in its outreach and program materials it has developed to create consensus. The Profile is organized to present a snapshot of the King County and Seattle context. Both jurisdictions have prepared extensive information that documents and explains their vulnerabilities and the impacts they foresee coming in the near and long term, their commitments to understand and do something about those changes, what they identified to do, and how they will accomplish their plans as well as their accomplishments to date.

The Profile presents information from their documents selected to illustrate the relationships between the cause and effects of global warming and how those impacts relate to and translate into actions that can and need to be taken. The approach is a "no-regrets" approach that addresses the issues identified as good urban management. The approach is comprised of four priority areas of climate change impacts and issues:

- **Transportation choices.** King County's biggest source of GHG emissions is the transportation sector. Goal: Achieve by 2050 a climate stabilization target in government operations by reducing GHG emissions 80 percent below current levels.
- **Buildings and land use.** Goal: Ensure efficient land use and development by densifying designated urban growth areas to make communities more "walkable" and healthier and ultimately encourage people to drive less. In addition, it aims to protect the historic built environment, agricultural land, forestry, and open spaces as ecological buffers against global warming impacts by planning for and investing in major public works projects, including storm-water management, wastewater operations, and regional wastewater and reclamation service plans to protect marine and freshwater quality and to enhance the regional freshwater supply.
- **Environmental management.** Goal: Protect health, safety, and landscape from global warming impacts and related natural resource supply emergencies and threats, especially water; and capture methane emissions from landfills and sequester CO₂ emissions in forests through adaptation programs for public health and emergency preparedness to cope with severe climate events, flood hazards, drought, new diseases, and extreme heat.
- **Renewable energy.** Goal: Target the use of renewable energy resources in 50 percent of nontransit energy use by 2012 and 50 percent of transit fuel by 2020; be a market catalyst for increased use and availability of renewable energy resources; cut pollution; and reduce dependence on foreign oil.

Rockville, Maryland, USA

The Rockville Profile is included for its illustrative near-term set of activities that can initiate a program and build credibility for the city and confidence in the Rockville Team implementing it. Rockville is a small, inland town and part of the greater Washington, D.C. region.

This Profile highlights elements of the Strategy for a Sustainable Rockville (October 1, 2007).⁵³ What it offers is the opportunity to examine the goals and examples of a smaller town, with an estimated population of 53,710 (2005), and yet see that the issues and the solutions are similar. Climate change impacts are the result of an accumulation of effects from cities small and large alike. Though part of the greater Washington, D.C., area, Rockville has its own jurisdiction and responsibility for its climate change and hazard management programs. Consistent with other profiled U.S. cities, sustainability and emergency management are considered separate issues and dealt with by separate offices.

This Rockville strategy describes a significant number of actions that will move it closer to sustainability over the next one to three years. These examples represent Rockville's first steps and may serve as a reference for other cities just beginning to address similar issues. Important also is the identification of the lead city department(s) for each initiative:

- Air Quality, Noise, and Transportation;
- Environmentally Sensitive Development;
- Interdepartmental and Interagency Collaboration;
- Environmentally Preferable Purchasing and Contracting;
- Public Dialogue, Education, and Outreach;
- Natural Resources Stewardship;
- Water Protection and Conservation;
- Waste Minimization, Reuse, and Recycling;
- Energy and Climate Protection; and
- Community Aesthetics.

Singapore

Singapore is a large, highly dense coastal city with an estimated population of 4.59 million (2007). Singapore is highly vulnerable to hydro-meteorological disasters, rise in sea level, and transborder air pollution hazards. The city is also susceptible to teleseismic events. The Profile of Singapore has been included as a comprehensive description of the approach to disaster risk management and climate change in the city. The Profile provides information on the institutional mechanism and may assist other cities in initiating their climate change programs. The city recognizes the importance of involving all stakeholders to respond to climate change and has involved them in various platforms to ensure smooth implementation of the strategy.

The Singapore Profile describes in detail the environmental policy that was started to address some specific environmental hazard problems. The transition of these programs to climate change strategy is also described in detail. The Singapore Climate Change Strategy sets out how Singapore will address the various aspects of climate change by better understanding our vulnerabilities to climate change, identifying and assessing adaptation measures required for climate change, and mitigating GHG emissions.

In consultation with various government agencies, the Singapore National Environmental Agency, which has been designated as the nodal agency for climate change program, has commissioned a study of Singapore's vulnerability to climate change. These studies will assess the local and regional impacts and improve the resolution of the global assessment results such as the IPCC reports that are currently used. The studies are expected to better inform the various adaptation efforts and are expected to be completed by 2009.

The city has initially adopted a “no-regrets” approach focusing on mitigation and adaptation opportunities that are generally beneficial to clean environment and good urban governance. The city is in the process of initiating several mitigation programs aimed at controlling the extent of GHG emissions and aims to establish itself as a regional hub for economic activities in the field of carbon trading. As a part of the “no-regrets” approach, Singapore has identified improving energy efficiency as its key strategy for mitigating GHG emissions. Energy efficiency will not only reduce GHG emissions but also reduce the cost of living and doing business as well as enhance energy security. Therefore, with regard to the industry, buildings, households, and transport sectors, the government will actively support energy users to be more energy efficient through incentives and through regulations to provide consumer information and deploy appropriate technologies. The examples of the various mitigation and adaptation initiatives illustrate the institutional mechanism and implementation system that are required and their financial and regulatory framework.

Tokyo, Japan

Tokyo, the capital of Japan, is the most populous urban agglomeration in the world (consisting of Tokyo metropolitan region and adjoining urban areas) with a population of over 25 million, out of which the Tokyo metropolitan region has around 12.54 million. Tokyo has very high risk of earthquakes, tsunami, and typhoons. The last major earthquake in 1923 resulted in the deaths of over 141,000 people.

Tokyo is also one of world's largest industrial hubs. A major disaster could have global dimensions and could result in economic impact around the world. Therefore, protecting people's lives and property from disasters and keeping social assets safe are the basic issues for the development of the metropolis. The city has therefore provided strong emphasis on both disaster risk management and climate change impacts management as an overarching component of urban governance.

The Tokyo Climate Change Strategy is far more ambitious in its objectives and scope than Japan's commitment under Kyoto Protocol. The Profile describes the Tokyo Climate Change Strategy, a basic policy for the “10-Year Project for a Carbon-Minus Tokyo” launched in January 2007. The Profile includes the basic framework of climate change mitigation strategies that Tokyo Metropolitan Government intends to carry out over the next ten years. Representative measures from its 10-year project designed to cope with climate change are included in the Tokyo Profile:

- Review how energy should be used in cities, resulting in a shift toward a low-CO₂, low-energy society that allows people to lead an affluent, comfortable, urban life while minimizing energy use;
- Optimize the use of energy with respect to demand but with renewable energy sources such as solar and unutilized urban waste heat, thereby enhancing Tokyoites' energy independence;
- Push forward the passive use of energy that uses natural light, wind, and heat; and “green”

architecture that builds in performance and relationship between other buildings, structures, greenery, and local microclimate; and

- Create a new urban-style business through the development and subsequent spread of low-CO₂ social systems and technologies.

SHORT PROFILES include analysis of the following city programs:

- Dongtan, China;
- Hanoi, Vietnam;
- London, England, United Kingdom;
- Makati City, Metro Manila, Philippines;
- Milan, Italy;
- New York, New York, USA; and
- Venice, Italy.

Dongtan, China (The Chinese Eco-city)

China is experimenting with the development of Chongming Island as the location of Dongtan to be home to 500,000 by 2050. Dongtan aims to be the world's first purpose-built eco-city. The city is designed not only to be environmentally sustainable, but also socially, economically, and culturally sustainable. Its goal is to be as close to carbon neutral as possible, with city vehicles that produce no carbon or particulate emissions and with highly efficient water and energy systems. Dongtan will generate all of its energy needs from renewable sources, including biofuels, wind farms, and photovoltaic panels. Most of Dongtan's waste will be reused as biofuel for additional energy production, and organic waste will be composted. Even human sewage will be composted and processed for energy and composting, greatly reducing or entirely eliminating landfill waste sites.

Dongtan is located on Chongming Island at the mouth of the Yangtze River. The site is situated on 8,600 hectares (86 square kilometers or 21,250 acres) of agricultural land; it is adjacent to a wetland of international importance, and the city design incorporates a 350 hectare (3.5 square kilometers or 865 acre) buffer zone between the city and the wetland to minimize the impact of the development. The developed city will eventually cover just 40 percent of the total site area, with the remaining land used for agriculture and energy production, or returned to a wetland state.

The Shanghai Government is constructing a bridge and tunnel linking Chongming Island to the center of Shanghai. SIIC (Shanghai Industrial Investment Corp.), the largest international investment group company owned by the Shanghai municipal government, is developing the site. The city will be completed in three phases. Phase 1: one square kilometer (100 hectares or 250 acres) will be developed to accommodate up to 10,000 people by 2010. Phase 2: 6.5 square kilometers (650 hectares or 1,600 acres) will be developed to accommodate 80,000 people by 2020. Phase 3: 30 square kilometers (3,000 hectares or 7,415 acres) will be developed to accommodate 500,000 people by 2050.

The social sustainability plan includes integrating the current population (a small fishing community and agricultural workers) into the city design rather than displacing them. The strategy for attracting and determining who will make up the additional population and how they will move into Dongtan is

still being developed; however, in order to be socially sustainable, the population will need to come from a wide range of socio-economic backgrounds, as there will be jobs for every person able to work.

Hanoi, Vietnam

Hanoi is included in the Profiles because of its flood control programs. Hanoi is a medium-sized city that sits on the Red River. It is prone to increased flooding events. Applications for flood prevention and inundation preparedness, challenges and risks, and disaster management system coordination are listed in the Profile. The Profile also includes information about the Nam Dinh Province more broadly.

London, England, United Kingdom

London is included in the Profiles because of its mitigation and adaptation policies. The CD-ROM does not present all the measures, actions, and policies defined by London, but focuses on certain activities of much interest for cities in East Asia.

On the mitigation side, the London Low Emission Zone (LEZ) aims to improve air quality in the city by deterring the most-polluting vehicles from driving in the area. The vehicles affected by the LEZ are older diesel-engine lorries, buses, coaches, large vans, minibuses, and other heavy vehicles that are derived from lorries and vans, such as motor caravans and motorized horse boxes. Cars and motorcycles are not affected by the scheme. The LEZ commenced on February 4, 2008, for trucks over 12 tons, with different vehicles affected over time; tougher emissions standards are planned to be introduced in January 2012.

The adaptation strategy is based on risk management, and the idea that adapting to climate change impacts doesn't involve much that is outside of the normal purview of operations, and mostly focuses on "no regrets" policies. Major areas of the adaptation strategy plan are drought (water supply), flooding, and temperature increases; also air quality, economic, winter storm severity (extreme weather events), transportation.

The groundwork for the adaptation plan has been laid through several reports, including "London's Warming" (2002), "Climate Change and London's Transport Systems" (2005), and "Adapting to Climate Change: Lessons for London" (2006), all available from the city web site. The adaptation strategy for London is and will be a city strategy which will seek to mainstream climate issues through the Greater London Authority. Flooding, drought, and temperature increases are the main focus of the strategy, but other impacts such as air quality and winter storm severity will be addressed as well. An additional focus will be climate change events that occur outside of London itself, but have impacts in the city because the city serves as the country's financial center.

Makati City, Metro Manila, Philippines

Makati City is a part of Metro Manila and is considered to be the economic, political, and cultural capital of the Philippines. It is the most prosperous city in the country with its Human Development Index (HDI) approaching the HDI of Japan. The city experiences high seismic hazard and is also highly prone to hydro-meteorological and environmental disasters. Makati City has set up strong institutional mechanisms for facilitating action on climate change and disaster risk management. The city has set up the Makati City Disaster Coordination Council (MCDCC) as the apex body for planning disaster

risk management efforts in the city. The city has also set up the Makati City Environmental Protection Council (MCEPC) as the apex body for planning environmental and climate change management in the city. The Profile of Makati City includes a brief description of the city's demographic details.

Makati City has set up a strong institutional system for disaster risk management as well as climate change. The MCDCC has representation of all relevant departments of the national and city governments, in addition to the MCEPC. Similarly, the MCEPC has representation of all relevant departments of the national and city governments, in addition to the MCDCC. The institutional structure of these two bodies facilitates coordinated planning and also ensures that the cross-cutting issues are fully dealt with the two Councils.

The Makati City Profile describes the various salient initiatives on disaster risk management and climate change management. The climate change management strategy includes very ambitious targets for reduction of GHGs.

Milan, Italy

Milan is included in the Profiles because of its mitigation policies. Milan is a large, inland industrial city that developed an extensive climate change strategy, designed an innovative campaign to reduce congestion and pollution (Ecopass), and will host Expo 2015. For this important event, an extensive climate change management program has been initiated, which includes offset programs and carbon finance instruments application, as well as partnering and twinning with other cities in developing countries.

Milan is committed to drastically reducing its emissions; using the year 2000 as a reference point, it plans to cut them by 15 percent by 2012 and 20 percent by 2020. Milan's climate program focuses on cutting emissions from residential energy use and transport, yet it is also based on a programmatic approach that takes into account all the factors of producing, collecting, and absorbing emissions.

The city of Milan is promoting its own climate program specifically for Expo 2015. Milan intends to reduce emissions generated during the preparation, staging, and aftermath of the event. The broader targets of this program are to propose new mechanisms and projects to generate emission credits, attract ideas, and export the best technologies or sound practices and skills to other countries. The city of Milan is promoting new initiatives compatible with the Kyoto Protocol (carbon financing schemes) to design and test genuine applications to be shared and implemented jointly with other European cities and developing countries.

New York City, New York, USA

New York City has one of the most urbanized coastlines in the United States, making it particularly vulnerable to sea-level rise. New York City has developed an extensive and detailed program to combat climate change impacts: The Climate Change Action Plan includes both mitigation and adaptation. It includes a GHG inventory and is built on a comprehensive study of its vulnerabilities and climate change impact projections. The municipality-run program operates in partnership with specific agencies, Columbia University, NASA, and other competent offices. New York City also developed a consultation program called "stakeholder interactive approach."

New York City has been profiled for its governance system. The recently introduced long-term Planning and Sustainability Office is leading the climate change adaptation strategy and is linked to other agencies in the city and to other departments, such as Environmental Protection and Buildings.

Venice, Italy

The lagoon of Venice is an environment undergoing constant remolding due to erosion, sediment movement, human activity, and the effects of GHG emissions. In addition, global warming will produce a change in the local thermo conditions (in the next 50 years a rise in temperature of 0.7–4.1°C is foreseen for the Upper Adriatic (IPCC 2001)) and therefore in the currents.

In the last century, Venice sank 11 inches, mostly due to the pumping of groundwater and methane gas for local industries. But it is also affected by rising sea levels. The same tides that did not flood the city 100 years ago are now high tide events, or *acqua alta*. High water afflicts Venice mostly in the winter. A century ago, it happened 7 times a year, now it is more like 100 times. Venice is facing at least two significant challenges: city infrastructure, historical buildings, and homes must be saved; and the lagoon and its wetlands must be protected.

Venice manages its climate change impacts and disaster risk management programs through several mitigation and adaptation activities. The most quoted is certainly the approved plan to protect Venice, called MOSE (*Modulo Sperimentale Elettromeccanico*, or Experimental Electromechanical Module).

B/ CONSULTATION WORKSHOP PRESENTATIONS

A stakeholder consultation workshop was held in Makati City, Philippines, in May 2008 to discuss the Primer with cities across East Asia and to receive their feedback in the finalization of the document. The CD-ROM includes the final agenda from the workshop, plenary presentations made by various speakers (including a World Bank presentation on the contents of the Primer), and presentations made by break-out groups at the workshop on various aspects of the Primer such as the City Profiles, the Hot Spots exercise, overall usability, the links in the Primer between climate change and disaster risk management, and the general value added of the Primer beyond other resources already available.

C/ GREEN CITIES LAUNCH WORKSHOP

A global launch of the Primer was held in Pattaya, Thailand, on July 14, 2008, in collaboration with the United Cities and Local Governments Asia Pacific Congress (UCLG ASPAC). The CD-ROM includes presentations on Thailand, New York City, Singapore, London, Seattle, Incheon, Milan, and Makati, in addition to a presentation on the final Primer, a proceedings document on the workshop, a final agenda, and speaker bios.

D/ WORLD BANK RESOURCE DOCUMENTS

The CD-ROM also includes selected World Bank and UN reference documents, referred to in Annex D, Resource Guide.

Glossary

Adaptation. Adaptation is an adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderate harm or exploit beneficial opportunities. Various types of Adaptation can be distinguished, including anticipatory and reactive Adaptation, private and public Adaptation, and autonomous and planned Adaptation. Anticipatory Adaptation—Adaptation that takes place before impacts of climate change are observed. Also referred to as proactive Adaptation. Autonomous Adaptation—Adaptation that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems. Autonomous Adaptation is also referred to as spontaneous Adaptation. Planned Adaptation—Adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.

Climate. Climate in a narrow sense is usually defined as the “average weather,” or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system. The classical period of time is 30 years, as defined by the World Meteorological Organization. One popular phrase can help distinguish weather from climate: “Climate is what you expect. Weather is what you get.”

Climate change. Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), which defines “climate change” as: “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.” See also *climate variability*.

This glossary builds on definitions provided by sources including the Intergovernmental Panel on Climate Change Fourth Assessment Report, the International Federation of Red Cross and Red Crescent Societies, the United Nations Development Program/Global Environment Facility Adaptation Policy Frameworks, the United Nations International Strategy for Disaster Reduction, and the World Bank. Definitions have been shortened or adjusted to meet Primer requirements.

Climate risk management. An approach to systematically manage climate-related risks affecting activities, strategies, or investments, by taking account of the risk of current variability and extremes in weather as well as long-term climate change.

Climate variability. Climate variability refers to variations in the mean state and other statistics (such as standard deviations, statistics of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability). See also *climate change*.

Coastal erosion. Landward movement of the shoreline due to the forces of waves and currents. Coastal erosion can get worse due to sea-level rise and more intense storms associated with climate change.

Community-based disaster risk management. A process that seeks to develop and implement strategies and activities for disaster preparedness (and often risk reduction) that are locally appropriate and locally “owned.”

Complex disaster. A disaster that has no single root cause (such as a storm) but emerges due to a combination of factors, which may involve an extreme weather event, conflict and/or migration, environmental degradation, and other issues. Complex disasters are becoming more likely due to climate change, which may alter hazards and amplify underlying vulnerabilities.

Cyclone. See *tropical cyclone*.

Density. The number of people, dwellings, or the like, per unit area. Population density is often specified as the number of people per hectare of land area or per square kilometer of land area.

Disaster. A situation in which the impact of a hazard (such as a storm or other extreme weather event) negatively affects vulnerable individuals or communities, to a degree that their lives are directly threatened or sufficient harm is done to economic and social structures to undermine their ability to survive or recover.

Disaster (risk) management. A systematic process of implementing policies, strategies, and measures to reduce the impacts of natural hazards and related environmental and technological disasters. This includes, among other things, disaster risk reduction, preparedness, response, recovery, and rehabilitation.

Disaster preparedness. Activities that contribute to the pre-planned, timely, and effective response of individuals and communities to reduce the impact and deal with the consequences of a (future) disaster.

Disaster recovery. Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community.

Disaster rehabilitation. The set of actions taken after a disaster to enable basic services to resume functioning, to repair physical damage and community facilities, to revive economic activities and to support the psychological and social well-being of the survivors.

Disaster relief/response. Coordinated activities aimed at meeting the needs of people who are affected by a disaster.

Disaster risk reduction. Measures at all levels to curb disaster losses, through reducing exposure to different hazards and reducing the vulnerability of populations. Effective disaster risk reduction practices use a systematic approach to reduce human, social, economic, and environmental vulnerability to natural hazards.

Early warning. Providing timely and effective information about an imminent hazard that allows people to take action to avoid a disaster or prepare for effective response. Early-warning systems depend on a chain of things: understanding and mapping the hazard; monitoring and forecasting; processing and disseminating understandable warnings to political authorities and the population; and undertaking the right, timely actions in response to the warnings.

El Niño-Southern Oscillation (ENSO). An anomaly in sea surface temperature and atmospheric pressure in the tropical Pacific Ocean that occurs roughly every four to seven years and can lead to changes in seasonal rainfall in certain regions of the planet (large parts of Africa, Latin America, South East Asia, and the Pacific). An ENSO cycle includes two phases: El Niño and la Niña.

Extreme weather event. Weather that is extreme and rare in a particular place, such as extremely intense rainfall, extreme heat, a very strong windstorm. By definition, the characteristics of what is called “extreme weather” vary from place to place. Often it is defined as something that on average has happened less than once every 30, 50, or a 100 years. However, these events may occur at much more frequent intervals in the future due to the influence of climate change.

Global warming. The rise in average temperature on Earth due to the increasing amounts of greenhouse gases in the atmosphere. The media often use this term to refer to “climate change.”

Greenhouse gas. A gas, such as carbon dioxide and methane, that absorbs and re-emits infrared radiation. When pollution adds these gases to the Earth’s atmosphere, they trap more solar energy in our planet (like in a greenhouse) warming the Earth’s surface and contributing to climate change.

Hazard. A potentially damaging physical event that may cause loss of life or injury, property damage, social and economic disruption, or environmental degradation.

Heat island effect. A “dome” of elevated temperatures over an urban area or a part of an urban area caused by structural and pavement heat fluxes (heat radiation), and pollutant emissions.

Hot spot. A locale or area of high vulnerability to devastation due to impacts of climate change and natural disasters.

Hurricane. See *tropical cyclone*.

Hydro-meteorological. Natural processes or phenomena of atmospheric, hydrological, or oceanographic nature, which may cause the loss of life or injury, property damage, social and economic disruption, or environmental degradation. Hydro-meteorological hazards include: floods, debris, and mud floods; tropical cyclones, storm surges, thunder/hailstorms, rain and wind storms, blizzards, and other severe storms; drought, desertification, wildfires, temperature extremes, sand or dust storms; permafrost and snow or ice avalanches. Hydro-meteorological hazards can be single, sequential, or combined in their origin and effects.

Mitigation (Climate Change Management). Measures to reduce greenhouse gas concentrations in the atmosphere, and thus ultimately the magnitude of climate change. Measures include energy conservation, using renewable energy such as wind or solar energy instead of coal, oil, or gas; and planting trees that absorb carbon dioxide from the atmosphere.

Mitigation (Disaster Risk Management). Measures aimed at moderating or reducing the severity of disaster impact. The mitigation measures can be categorized as structural or nonstructural. Structural mitigation measures are intended to directly reduce the damage, save lives and protect property. They include such things as building retention walls, water reservoirs, and reforestation to avoid landslides. Nonstructural mitigation measures are intended to improve the ability to cope with the disaster. These measures include mock drills and improvement in preparedness. From the perspective of the climate change community, mitigation (disaster risk management) measures would be labeled as adaptation because they help reduce the negative impacts of climate change.

Monsoon. A seasonal prevailing wind in tropical and subtropical regions. It lasts for several weeks and leads to substantial changes in rainfall.

Natural hazards. Natural events that may harm people or their assets. Natural hazards can be classified by origin: geological (such as earthquakes and volcanic eruptions), hydro-meteorological (such as floods, heatwaves, storms), or biological (such as pests and locust swarms). Some natural hazards can be more likely to occur with human-induced climate change.

Plate tectonics. Mechanism of movement of Earth's plates. Plate tectonics is used to explain the global distribution of geological phenomena such as seismicity, volcanism, continental drift, and mountain building.

Precipitation. Rain, snow, or hail.

Reconstruction. See *disaster recovery*.

Recovery. See *disaster recovery*.

Ring of fire. A belt of seismic and volcanic activity roughly surrounding the Pacific Ocean. It includes the Andes Mountains of South America, the coastal regions of western Central America and North America, the Aleutian and Kuril Islands, the Kamchatka Peninsula, Japan, the island of Taiwan, eastern Indonesia, the Philippines, New Zealand, and the island arcs of the western Pacific.

Risk. The probability of harmful consequences due to interaction between hazards and vulnerable conditions.

Saltwater intrusion. Increase of salinity in underground freshwater located close to the coast. It can be caused by excessive withdrawal of water from the freshwater source (aquifer) or by sea-level rise.

Sea-level rise. An increase in the average level of the sea or ocean. The global sea level is rising as a result of increasing global temperature because: (1) melting of ice in mountains and glaciers leads to more water in the ocean, and (2) warmer water in the oceans expands, occupying more volume. Local sea levels are determined by a combination of the global sea-level rise and the local rise or subsidence of the land (for instance, due to geological processes).

Seasonal forecasting. Forecasting of probable weather conditions in a certain region during a certain period (for instance a month or a season) based on observed and projected oceanic and atmospheric conditions. These projections, sometimes months in advance, can help prepare for various emergencies, from hurricanes to malaria.

Seismic activity. Disturbances in the Earth's interiors resulting in release of energy. The release of energy produces earthquakes. Most seismic activities are associated with plate tectonics. Some seismic activities are also due to human actions such as construction of large reservoirs.

Sustainable development. Development that meets the cultural, social, political, and economic needs of the present generation without compromising the ability of future generations to meet their needs.

Tropical cyclone. A violent, rotating storm with heavy wind and rain. The most severe versions are called hurricanes (in the North Atlantic, the Northeast Pacific east of the dateline, or the South Pacific east of 160E) or typhoons (in the Northwest Pacific west of the dateline). Tropical cyclones only form and intensify above warm water and are probably becoming more intense due to the warming of the ocean surface caused by global warming.

Typhoon. See *tropical cyclone*.

Urban heat island effect. See *heat island effect*.

Vulnerability. The degree to which someone or something can be affected by a particular hazard (from sudden events such as a storm to long-term climate change). Vulnerability depends on physical, social, economic, and environmental factors and processes. It is related, for instance, to the places where people live, the strength of their houses, the extent to which their crops can survive adverse weather, or whether they have organized evacuation routes and shelters. Physical vulnerability relates to the built environment and may be described as “exposure”; social vulnerability is caused by such things as levels of family and social networks literacy and education, health infrastructure, the state of peace and security; economic vulnerability is suffered by people of less privileged class or caste, ethnic minorities, the very young and old, etc. They suffer proportionally larger losses in disasters and have limited capacity to recover. Similarly, an economy lacking a diverse productive base is less likely to recover from disaster impact, which may also lead to forced migration; environmental vulnerability refers to the extent of natural-resource degradation, such as deforestation, depletion of fish stocks, soil degradation, and water scarcity, all of which threaten food security and health.

Notes

1. A recent study Commissioned by the Natural Resource Defense Council (NRDC) shows that under business-as-usual conditions, with no new climate policies, the four cost categories—increased hurricane damages, residential real estate losses due to sea-level rise, increased energy costs, and water supply costs—will add up to \$1.9 trillion (in today's dollars), or 1.8 percent of U.S. output per year by 2100.
2. CREDEM-DAT database.
3. World Bank, *East Asia Environmental Monitor: Adapting to Climate Change*, (Washington, D.C.: World Bank, 2007).
4. Cities Alliance, *Guide to City Development Strategies: Improving Urban Performance*. (Washington, D.C.: Cities Alliance, 2006, p. 24).
5. Cities Alliance, *Guide to City Development Strategies: Improving Urban Performance*. (Washington, D.C.: Cities Alliance, 2006, p. 11).
6. World Bank, *East Asia Environmental Monitor: Adapting to Climate Change*, (Washington, D.C.: World Bank, 2007).
7. World Bank, *East Asia Environmental Monitor: Adapting to Climate Change*, (Washington, D.C.: World Bank, 2007, p. 2).
8. University of California research claims China overtook the United States as the worst producer of carbon emissions in 2006–2007; published research forthcoming in *Journal of Environment Economics and Management*.
9. UN-HABITAT, *State of the World's Cities 2006/7*. Nairobi, Kenya, 2006, p.136.
10. UN-HABITAT, *State of the World's Cities 2006/7*. Nairobi, Kenya, 2006, p.12.
11. Demographia *World Urban Areas*, Belleville, Illinois, 2007.
12. Van Aalst, M. K., “The Impacts of Climate Change on the Risk of Natural Disasters,” *Disasters* 30(1): 5–18, 2006.
13. Schipper, L., and M. Pelling, “Disaster Risk, Climate Change, and International Development: Scope and Challenges to Integration,” *Disasters* 30 (1): 19–38, 2006; and Pelling, M., *International Data On Disaster Risks*, World Disaster Report (IFRC, Geneva, 2006).
14. UN-HABITAT, *State of the World's Cities 2006/7*. Nairobi, Kenya, 2006, p.136.
15. Because understanding of some important effects driving sea-level rise is too limited, the 2007 IPCC report does not assess the likelihood, nor provide a best estimate or an upper bound for sea-level rise. See IPCC, *Climate Change 2007: Synthesis Report – Summary for Policymakers*. Assessment of Working Groups I, II, and III to the Third Assessment Report of the IPCC (IPCC: Cambridge University Press, 2007).

16. A combined effect of sea-level rise, storm surge, and flood from upstream watersheds makes impact of climate change and variability on coastal regions even worse. According to IPCC (2007), it is predicted that millions of people living in low-lying coastal communities in India could become displaced as sea levels rise by up to 0.5 meters over the next 65 years. Moreover, local and regional economies will be hit hard from chronic food and water insecurity and epidemic disease, as well as extreme weather events. Similarly, a recent World Bank report indicates that India will have 0.3 percent of its area and 0.5 percent of its population affected by a one-meter sea-level rise. See Dasgupta, S., B. Laplante, C. Meisner, D. Wheeler, J. Yan, *The Impact of Sea-Level Rise on Developing Countries: A Comparative Analysis*. Policy Research Working Paper 4136 (Washington, D.C.: World Bank, 2007).
17. Nicholls, R.J, S. Hanson, C. Herweijer, N. Patmore, S. Hallegatte, J. Corfee-Morlot, J. Chateau, R. Muir-Wood, *Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes – Exposure Estimates* (OECD, Paris. 2007).
18. For example, Bangkok accounts for more than 36 percent of national GDP.
19. IPCC, *Climate Change 2007: Synthesis Report – Summary for Policymakers*. Assessment of Working Groups I, II, and III to the Third Assessment Report of the International Panel on Climate Change (IPCC: Cambridge University Press, 2007).
20. IPCC, *Climate Change 2007: Synthesis Report – Summary for Policymakers*. Assessment of Working Groups I, II, and III to the Third Assessment Report of the International Panel on Climate Change (IPCC: Cambridge University Press, 2007).
21. UN/ISDR (United Nations International Strategy for Disaster Reduction). *Indicators of Progress: Guidance on Measuring the Reduction of Disaster Risks and the Implementation of the Hyogo Framework for Action* (UNISDR, Geneva, Switzerland, 2008).
22. IPCC, *Climate Change 2007: Synthesis Report – Summary for Policymakers*. Assessment of Working Groups I, II, and III to the Third Assessment Report of the International Panel on Climate Change (IPCC: Cambridge University Press, 2007).
23. Baker, J. L., *Urban Poverty: A Global View*, Urban Paper Series (UP-5) (Washington, D.C.: World Bank, 2008).
24. World Bank, *East Asia Environmental Monitor: Adapting to Climate Change*, (Washington, D.C.: World Bank, 2007).
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26. IPCC, *Climate Change 2007: Synthesis Report – Summary for Policymakers*. Assessment of Working Groups I, II, and III to the Third Assessment Report of the International Panel on Climate Change (IPCC: Cambridge University Press, 2007).
27. IPCC, *Climate Change 2007: Synthesis Report – Summary for Policymakers*. Assessment of Working Groups I, II, and III to the Third Assessment Report of the International Panel on Climate Change (IPCC: Cambridge University Press, 2007).
28. This applies to any of the IPCC scenarios.
29. IPCC, *Climate Change 2007: Synthesis Report – Summary for Policymakers*. Assessment of Working Groups I, II, and III to the Third Assessment Report of the International Panel on Climate Change (IPCC: Cambridge University Press, 2007).
30. IPCC, *Climate Change 2007: Synthesis Report – Summary for Policymakers*. Assessment of Working Groups I, II, and III to the Third Assessment Report of the International Panel on Climate Change (IPCC: Cambridge University Press, 2007).
31. IPCC, *Climate Change 2007: Synthesis Report – Summary for Policymakers*. Assessment of Working Groups I, II, and III to the Third Assessment Report of the International Panel on Climate Change (IPCC: Cambridge University Press, 2007).
32. IUCN, IISD, SEI, InterCooperation. 2003 quotes Girot 2002 and Folke et al. 2002
33. IUCN, IISD, SEI, InterCooperation. 2003.

34. IUCN, IISD, SEI, InterCooperation. The Resilience Alliance developed two workbooks for assessing resilience in social-ecological systems. The workbook project is an on-going effort with scheduled workshops, a developing database, proposals for creation of thematically based workbooks (e.g., a resilience assessment for coral reef systems), and development of companion volumes with supplementary background information. Key concepts provide a framework for assessing the resilience of natural resource systems and for considering management options to set the system on a sustainable trajectory. The practitioners' workbook has been developed specifically to provide guidance to people engaged in natural resource management through a set of activities designed to explore system parameters and management options for their own system of interest from a resilience perspective. The workbook for scientists emerged from case study comparisons and is intended as a guide for those already familiar with the basic concepts of resilience and systems dynamics. See *Assessing and Managing Resilience in Social-Ecological Systems: The Resilience Alliance Practitioner's Workbook*, and *Assessing Resilience in Social-Ecological Systems: A Workbook for Scientists* (www.resalliance.org).
35. Mostly, the return period substantially exceeds 10 years.
36. According to the U.S. National Oceanic and Atmospheric Administration (NOAA), it is probable that heat waves will become more likely and progressively more intense over the course of decades under current climate change scenarios (www.ncdc.noaa.gov).
37. With a total number of 120 million, China's floating population is not only the biggest migrant population but also one of the most mobile populations in the world.
38. If the head of government is selected by appointment, stakeholder engagement and consultations are less likely to occur. Climate change and disaster risk management strategies do need to have consultation and strong engagement to succeed.
39. Based on IPCC (2001), many scientists distinguish two basic kinds of Hot Spots in a map: (a) The *fingerprints* of global warming such as heat waves, rising seas, and the melting of mountain glaciers, which are indicators of the global, long-term warming trend observed in the historical record. Fingerprints are what researchers seek to detect and then to confirm that climate change is indeed underway. (b) By contrast, *harbingers*, such as exceptional droughts, fires, downpours, the spread of disease-bearing insects or other carriers, and widespread bleaching of coral reefs, may be directly or partly due to the warmer climate, but it is impossible to say for sure. Harbingers are events that are consistent, given our current scientific theories and models, with the kind of impacts projected to occur as global climate change proceeds. For more details, see <http://www.climatehotmap.org/criteria.html>
40. There are other similar initiatives. For examples, in the United States, the Climate Change Networks stated that "due in large part to the failure of the federal government to adopt policies to address climate change, states have enacted their own binding emission reduction requirements, and as a result of the state initiatives, it is the states, not the federal government that are at the cutting edge of mandatory climate policy in the United States" (<http://usclimatenetwork.org/stateaction/turning-the-tide/1-0-mandatory-climate-change-policy>). Moreover, the Regional Greenhouse Gas Initiative (RGGI) is the first multi-state GHG emissions cap-and-trade program in the United States. As members of RGGI, states voluntarily agree to a regional cap-and-trade program covering power plant carbon dioxide emissions. RGGI aims to cap these emissions at approximately current levels between 2009 and 2015, and then reduce this level 10 percent by 2019 (<http://www.rggi.org>).
41. Gurenko, E., and R. Lester, *Rapid Onset of Natural Disasters: The Role of Financing in Effective Risk Management*, Insurance and Contractual Savings Practice (World Bank Policy Research Paper 3278, Washington, D.C, 2004).
42. Gurenko, E., and R. Lester, *Rapid Onset of Natural Disasters: The Role of Financing in Effective Risk Management*, Insurance and Contractual Savings Practice (World Bank Policy Research Paper 3278, Washington, D.C, 2004).
43. Association of British Insurers, *A Future for Flood Plans*, July 2006. <http://www.abi.org.uk/BookShop/ResearchReports/A%20Future%20for%20the%20Floodplains.pdf>

44. Association of British Insurers, *Summer Floods 2007: Learning the Lesson*, November 2007. <http://www.abi.org.uk/BookShop/ResearchReports/Flooding%20in%20the%20UK%20Full.pdf>.
45. UN/ ISDR (United Nations International Strategy for Disaster Reduction). *Indicators of Progress: Guidance on Measuring the Reduction of Disaster Risks and the Implementation of the Hyogo Framework for Action* (UN/ ISDR, Geneva, Switzerland, 2008).
46. As of May 2006, 113 car models or 25 percent of the total car models in Singapore have been registered under the scheme.
47. For examples, see the maps of the Chicago's Center for Neighborhood Technology at www.cnt.org.
48. *Municipal World*, February 2007.
49. Presentation by Saroj Kumar Jha, entitled "Mainstreaming disaster reduction in poverty reduction: attaining and sustaining MDGs," Washington, D.C., World Bank, September 2005.
50. The level of investment required was estimated at \$224 billion or about \$15 billion per year. The annual damage in the Asian and Pacific region was equivalent to about two-thirds of global annual lending by the World Bank. Disaster-related lending by the World Bank over the past 25 years has totaled only \$20 billion for Asia and the Pacific.
51. Viner, D., and L. Bouwer, *Linking Climate Change Adaptation and Disaster Risk Management for Sustainable Poverty Reduction*, Vietnam Country Study (Vulnerability and Adaptation Resource Group, 2006).
52. The complete strategy is accessible at www.rockvillemd.gov/environment/sustainability.

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