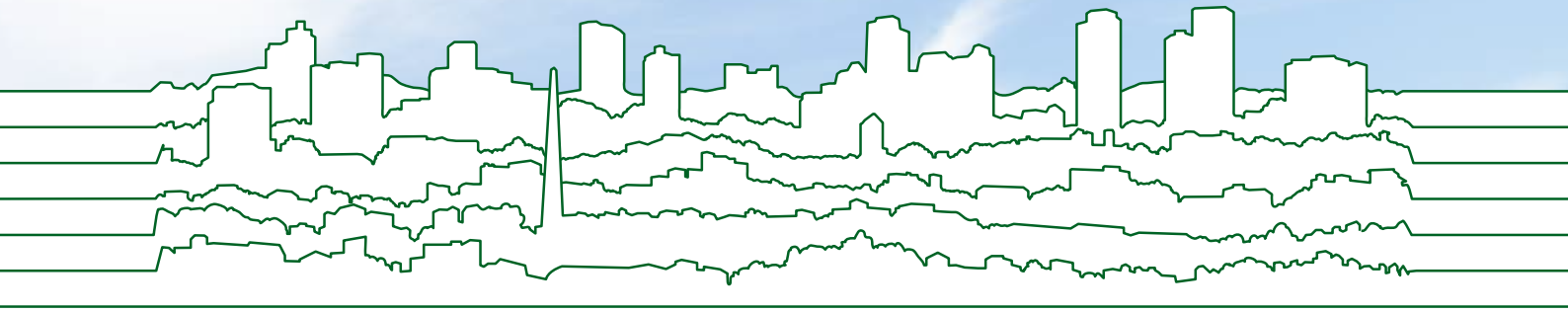
CITIES AND CLIMATE CHANGE INITIATIVE
TOOL SERIES

PLANNING FOR CLIMATE CHANGE

A STRATEGIC, VALUES-BASED APPROACH FOR URBAN PLANNERS



UN-HABITAT
FOR A BETTER URBAN FUTURE

epi ecoplan international, inc.

PLANNING FOR CLIMATE CHANGE: A STRATEGIC, VALUES-BASED APPROACH FOR URBAN PLANNERS
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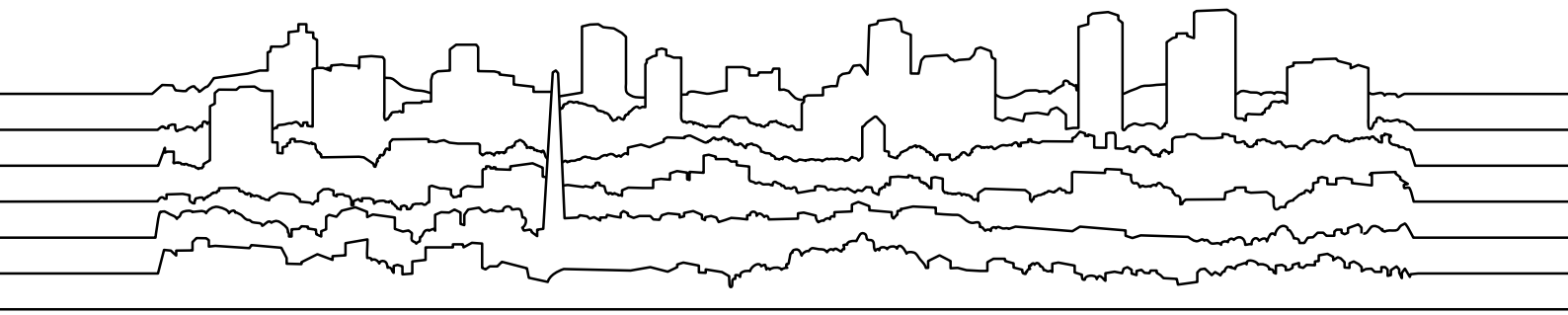

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A section of Port-Au-Prince, Haiti.
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Foreword

Cities and towns in developing countries face numerous challenges, including large proportions of people living in slums; expansion and dominance of the informal sector; inadequate basic services, especially water, sanitation and energy; unplanned peri-urban expansion; social and political conflict over land resources; high levels of vulnerability to natural disasters; and poor mobility systems. Two of the most severe challenges of our time, rapid urbanization and climate change, collectively aggravate these pre-existing challenges in a number of ways.

First, no city can be on a long-term path to more sustainable development without first addressing climate change. Without taking the impacts of climate change into consideration, today's development gains may be wiped out tomorrow.

Second, the ways our cities are planned and operate - as well as the lifestyles of people living in them – are major contributors to the greenhouse gas emissions that cause climate change. The dependency on fossil fuel for transport and electricity for heating, cooling, lighting, and other day-to-day activities increases in tandem with the growth of sprawling cities.

Third, urban growth will increasingly be driven by climate change induced rural-urban migration.

Fourth, rapid urbanization manifests itself in growing slum populations, increasing informality of tenure, and demand for housing and basic services, and creates pressure on land and ecosystems. Often, urban expansion takes place on sites that are most vulnerable to climate change related hazards.

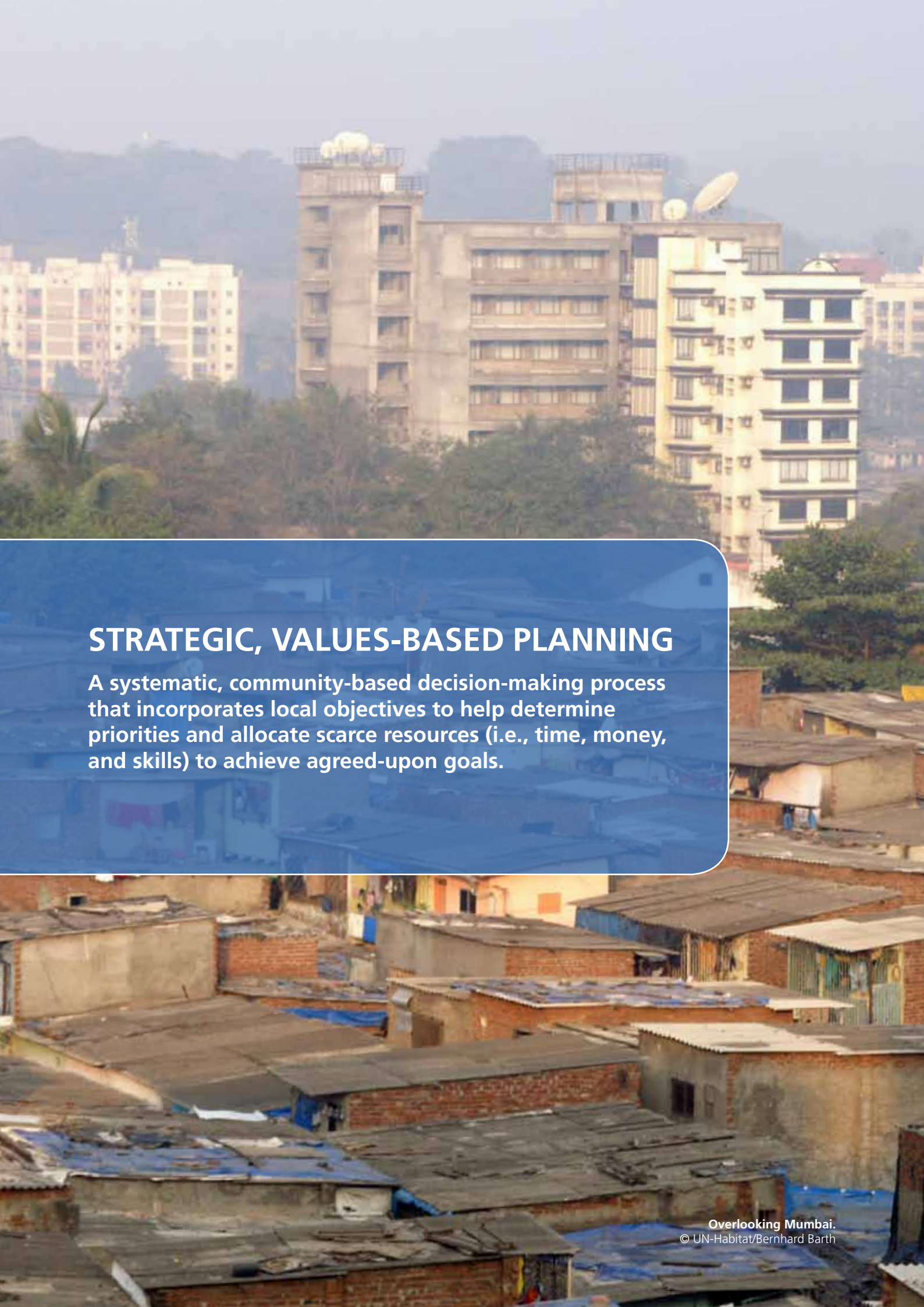
Planning for Climate Change: A Strategic Values-based Approach for Urban Planners was developed for city planners and other professionals to better understand, assess and take action on climate change at the local level. Targeting the needs of cities in low and middle-income countries where the challenges of planning for climate change are particularly high, the guide offers a strategic, values-based planning framework.

I would like to thank EcoPlan International and Compass Resource Management from Vancouver, Canada, for developing the original version of this guide in 2010, with input from an extensive peer review group. My gratitude as well to the Cities and Climate Change Initiative (CCCI) which tested the guide in numerous cities participating in around the world.

Based on its robust methodology and its flexible approach, I sincerely hope that this guide will contribute to better urban planning and ultimately to more economically vibrant, inclusive and resilient cities around the world.

Dr. Joan Clos

Under-Secretary-General and Executive Director,
United Nations Human Settlements Programme
(UN-Habitat)



STRATEGIC, VALUES-BASED PLANNING

A systematic, community-based decision-making process that incorporates local objectives to help determine priorities and allocate scarce resources (i.e., time, money, and skills) to achieve agreed-upon goals.

Overlooking Mumbai.
© UN-Habitat/Bernhard Barth

1 Introduction

Climate change has become one of the most significant challenges of the twenty-first century. While there may be uncertainty surrounding the scale, scope and pace of climate change, one thing is clear – cities and towns everywhere will be exposed to significant climate change-driven impacts.

Planning for Climate Change: A strategic values-based approach for urban planners was developed for city planners and other professionals to better **understand, assess and take action on climate change at the local level**. While climate change is a global issue, this guide is specifically intended for urban communities in low and middle-income countries where the challenges are unique and the stakes of planning for climate change are particularly high.

Adapting to new conditions brought by climate change will be challenging and will **demand strategic and creative thinking** from planners and others. To help those facing the challenge of developing and implementing their climate change adaptation initiatives, this guide is organized around four key planning themes:

- ✔ **Strategic:** All planning – physical, spatial, land use, environmental, economic – is more effective if it is strategic. Whatever the type of planning, all of it is ultimately about making the **best decision possible with the resources available**.
- ✔ **Values-based:** Good planning incorporates local community values, or objectives, in addition to the objectives that may be present in existing city plans and strategies. Such an approach helps to ensure that the city's particular social and economic challenges – like poverty, population health, water and sanitation – frame the planning process, and that **local objectives are used in the planning process**.
- ✔ **Participatory:** Engaging a variety of stakeholders beyond city staff and leaders in the climate change planning process helps to ensure more coordinated and appropriate actions are chosen and implemented. Participatory planning helps to ensure that the implementation actions that come out of the planning process have the **support of key city partners and stakeholders, are responsive to local community interests and values, and help to achieve a broader range of local development objectives**.
- ✔ **Integrated:** The realization of *Climate Change Action Plan* policies, programmes and projects is often more effective and achievable if they are **implemented or "mainstreamed" through existing city plans, strategies and processes**.

With these planning themes as the foundation, this guide is designed to:

1. Provide city planners with **practical tools for addressing climate change** through different urban planning processes;
2. Help city planners to **better plan for current and future climate change impacts** at the local level;
3. Support the **"mainstreaming" of climate change actions** into physical, spatial, sectoral and comprehensive development plans (e.g. city development strategy, city or town plan, economic development strategy);
4. Promote an **inclusive, participatory planning process that integrates city planning activities with local community participation and more structured, transparent and defensible decision-making;**
5. Support ongoing **capacity building** for urban planners and professionals from related fields.

1.1 WHO SHOULD USE THIS GUIDE

This guide is intended to be of particular benefit to four main groups:

1. The primary audience for this guide is **city planners working in cities in low and middle-income countries** who have a basic knowledge of climate change and the desire to address it. While the guide is targeted at local government planners in particular, it recognizes that **all types of planners** (disaster risk reduction, civil engineers, local economic development specialists, environmental experts, etc.) **at all levels** (e.g. local government, region, state, province) may find it useful. While the terms "planner", "urban planner" and "city planner" are used throughout this guide, they can be taken to represent all of these groups and individuals.

2. This guide also recognizes that many local governments may not have a designated staff member tasked with physical, spatial or town planning, let alone a planning department. Recognizing this, **professionals** working in the larger field of urban land management and social development (e.g. civil engineers, local health officials, local economic development officers, etc.) may also find this guide useful.

3. A third group that can use this guide are the **elected representatives, non-government professionals, civil society groups, donor agencies and private sector organizations** who individually and collectively affect how cities manage climate change risks, impacts and vulnerabilities.

4. Finally, a fourth group that can use this guide includes **academics** working in the field of urban planning and climate change, and **trainers** who provide capacity building and training services in the field.

Vehicular traffic along a street in Islamabad, Pakistan, 2006.
© UN-Habitat

Given the diversity of users, their differing capacities, available resources, experience, and the range of political contexts that they will find themselves in, this guide presents **a broad range of tools and information**.

Some of the material is more technical and may be beyond the capacity or experience of some users, while other materials are basic and may not be of great value to cities with more capacity and resources. Therefore, cities **should feel comfortable using materials as their situation allows**, and feel neither dissuaded by components that may be beyond their current reach, nor underwhelmed by materials or planning steps that they may have already completed.

We expect and hope that this guide has the flexibility to be used both as **a general resource and as a step-by-step planning guide**. With its modular planning cycle, we also hope that it can be used **in conjunction with the many other planning tools and resources** available.

1.2 HOW TO USE THIS GUIDE

This guide's **planning process** is organized around a four-module strategic planning approach that incorporates innovative decision-making tools with a participatory, community-based methodology. It can be used to **support city climate change planning processes** and as a stand-alone **capacity building resource** and **training tool**.

The planning process is organized into **four modules** that are illustrated in Section 4 Planning for Climate Change: The planning cycle. Each module asks a specific planning question and requires guide users to go through a corresponding set of individual **steps**, which are supported by 42 different planning **tools**. The planning tools are provided in a companion document, *Planning for Climate Change: A strategic values-based approach for urban planners – Toolkit*.

Additional supporting tools and supplementary information resources (guides, web sites, on-line tools and calculators, etc.) are provided in Appendix 2: Other resources.

A glossary of common climate change and planning terms and principles is provided in Appendix 3, while a summary of global climate change initiatives, city alliances and funding opportunities is profiled in Appendix 4.

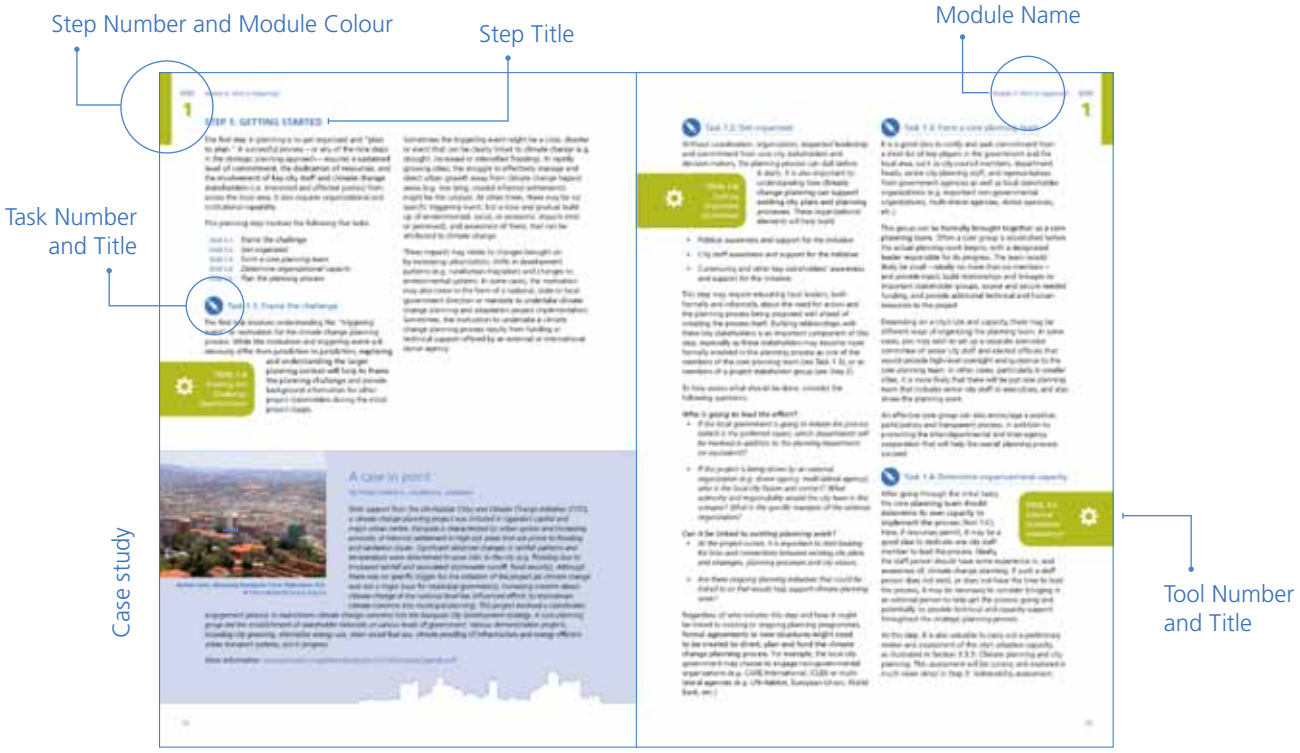
As illustrated, we have designed a navigation system so users can more easily navigate the guide to see where they are in the process at all times.

1.3 CLIMATE CHANGE ADAPTATION AND MITIGATION

Urban planners are involved in land use, infrastructure development and urban expansion, municipal service provision, growth management, environmental planning, solid and liquid waste management, housing and building development, and site design. Because climate change adaptation involves actions in these areas, this guide focuses on related activities, strategies, plans and policies.

Adaptation is a process through which communities **prepare to cope with an uncertain future climate**. While the specific measures vary greatly across sectors – ranging from physical land use plans that limit development in hazardous areas, to protecting and preserving certain ecosystems to minimize potential climate impacts (e.g. flooding and erosion) – there are four areas that are particularly important in climate adaptation planning:

- **Improving the adaptive capacity** (awareness, knowledge, skills and resources) of planning institutions and stakeholders.
- Addressing and managing the **socio-economic impacts of climate change, particularly their effect on vulnerable populations** (e.g. managing rural-urban migration, supporting economic resilience, improving local food security issues, upgrading emergency response systems).



- ✔ Enhancing the opportunity for **coordination and cooperation between and amongst climate stakeholders** at the city-level and between the local, regional, state and national governments.

- ✔ **Mainstreaming climate change adaptation** (and mitigation) into existing city plans, policies, programmes and planning processes.

Adaptation does not mean that the negative impacts of climate change will be completely avoided, only that they will be less severe than if no planning had occurred. A city with more adaptive capacity is also a more **resilient** city, able to better withstand, manage and reduce climate change vulnerabilities. Climate change resilience is often defined as the capacity of people, organizations and systems to prepare for, respond to, recover from and thrive in the face of hazards, and to adjust to continual change.

Mitigation activities, on the other hand, **help to reduce the rate or magnitude of climate change by helping to reduce human-generated greenhouse gas emissions.** Cities consume most of the global energy supply and subsequently are responsible for a significant proportion of the greenhouse gas emissions that are released into the atmosphere when fossil fuels are burned for energy generation. Land use practices that exacerbate global warming (e.g. deforestation) are often driven by urban expansion or consumption patterns. Therefore **cities must be leaders in mitigating climate change**, **reducing greenhouse gases used in energy systems** (e.g. the energy used for transportation, electricity, heating, industrial processes, and waste disposal) and **containing urban areas to minimize land clearing**.

While mitigation is not the primary focus of this guide, **it is a key component of climate change planning**. Planners can help to mitigate climate change by leading the way in reducing greenhouse gas emissions through actions such as:

- Supporting and leading more sustainable, compact urban design.

- Encouraging and facilitating new green building technologies and development (buildings are major energy consumers and greenhouse gas emitters in both their construction and operation).

- Improving transport networks with options that both reduce urban traffic congestion and support greener modes of transport (public transport, bus transport, cycling, walking, etc.).

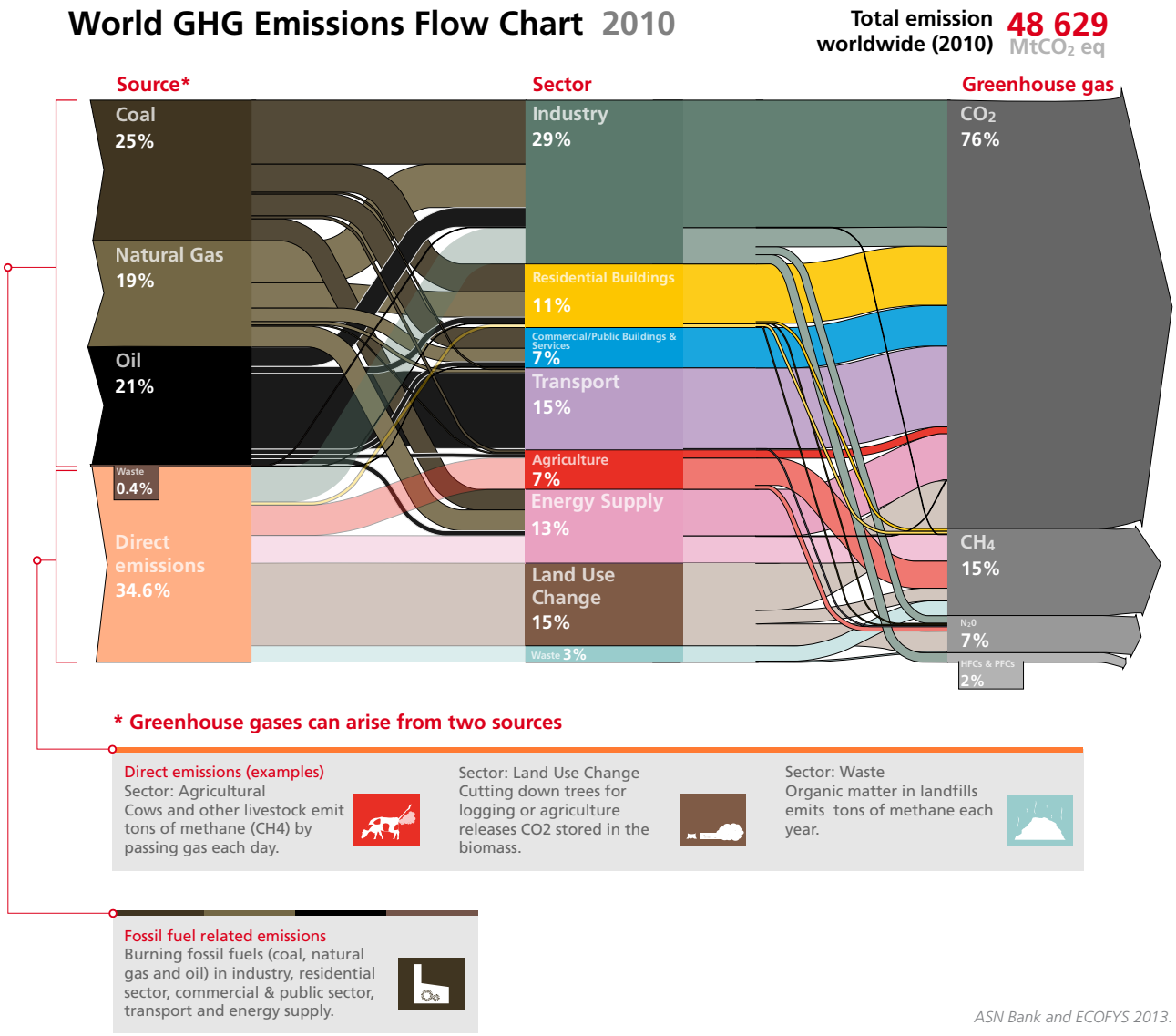
- Encouraging new technologies and development for the treatment of liquid and solid wastes (wastewater treatment plants and landfills are sources of energy that can reduce the reliance on other, higher emissions energy sources by using a powerful greenhouse gas, methane, that otherwise escapes into the atmosphere).

- Supporting sustainable energy production and distribution systems (e.g. urban solar and wind power, district energy systems).

- Supporting the conservation and rehabilitation of ecosystems for the mitigation services they provide (e.g. carbon sinks provided by forests).

Mangrove rehabilitation efforts strengthen resilience and protect biodiversity on the coast of Sorsogon City, Philippines.
© Sorsogon City

FIGURE 1: World greenhouse gas emissions flow chart (2010 data)



ASN Bank and ECOFYS 2013.

While cities definitely contribute to mitigation, the direction, mandate, resources and policy guidance to undertake broad-based mitigation activities most often come from higher levels of government (typically national governments). National standards for vehicle emissions and building codes are a few examples, as are carbon cap and trade or carbon tax regimes. Certainly, there have been many cases, especially in the developed world, where cities have been leaders of mitigation activities before there were national mandates for mitigation. Cities can also work together and lobby national governments to take action.

While even aggressive measures by one city acting alone will not have a significant effect on global greenhouse gas conditions, proactive steps by **many cities around the world may well slow climate change impacts**. Therefore cities should take measures to reduce greenhouse gas emissions within their sphere of influence. This is particularly true in growing urban areas in developing nations, where some urban populations are projected to increase significantly – even double – over the next 20-years. Paired with an increase in wealth, this population increase will have major impacts on emissions through urban expansion and redevelopment, increases in individual car ownership, changes in settlement patterns and pressures on municipal infrastructure. Global growth in greenhouse gas emissions will likely occur primarily in the building and transport sectors in low – and middle-income countries. Better urban planning and growth management today will help limit and mitigate future emissions, as well as increase the ability of urban areas to cope with the impacts of climate change.

Finding **synergies between adaptation and mitigation efforts** can help to facilitate action on climate change on two fronts at the same time. The strategic planning approach outlined in this guide includes a key step to prioritize climate adaptation actions by considering how they would (and could) also support mitigation. The accompanying tools will help urban planners to identify mitigation measures within their sphere of influence, and figure out **how to integrate them into existing city policy instruments** (e.g. city plans, programmes, guidelines).

1.4 KEY PRINCIPLES AND TERMS

Throughout this guide, you will read about several key principles for responding to climate change in cities and towns. This sub-section briefly introduces the most important principles and planning terms.

Most terms used in this guide are based on those used by the Intergovernmental Panel on Climate Change (IPCC), an intergovernmental scientific body tasked with evaluating the risk of climate change caused by human activity,[1] and by the United Nations Framework Convention on Climate Change (UNFCC). A more comprehensive Glossary of Terms in Appendix 3 supplements the following list of key terms. More information on some of the terms is also provided in the document itself.

- **Adaptation:** UNFCC defines adaptation as "the adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in processes, practices and structures to moderate potential damages or to benefit from opportunities associated with climate change". Adaptation does not mean that the negative impacts will be avoided, only that they will be less severe than if no planning had occurred.

- **Adaptive capacity:** The degree to which people, places, institutions and sectors are able to adapt to climate change impacts. Adaptive capacity typically is indicated by socio-economic and environmental factors and local realities that enable a city or community to adjust its system in view of current and future risks. It may also include factors and conditions that leverage new climate conditions to become new opportunities (i.e. more precipitation in particular areas may lead to new opportunities in urban agriculture or rain water harvesting).

- **Climate change:** A change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable periods.

- **Exposure:** How a city is exposed to changes in the climate: what changes can already be observed, what will the climate be like in the future? Exposure considers both current and projected changes based on a review of historic and current climate information (e.g. precipitation, temperature, extreme weather events) and projected climate scenarios for your city or region. It also identifies the climate change hazards associated with the change (drought, flooding, sea level rise, increased frequency in storms) their biophysical manifestations (groundwater depletion, landslides, riverbank erosion, coastal erosion, etc.), including their current and future magnitude and frequency. For coastal communities, climate change-driven sea-level rise and coastal inundation is also considered.

- **Impact:** An effect of climate change on the structure or function of a city or town.

- **Mitigation:** Activities that help to reduce the rate or magnitude of climate change by reducing human-generated greenhouse gas emissions or land use practices that contribute to climate change, such as deforestation.

- **Mainstreaming:** The process by which climate risks are considered in city plans, programmes, activities and policies, and by which adjustments are made to address the risks. Mainstreaming assumes that other projects can be enhanced – e.g. poverty reduction, urban sustainability – and their benefits increased by integrating climate planning with existing city plans and policy instruments (plans, strategies, programmes, guidelines). Mainstreaming helps to ensure that a city's plans and policies are not at odds with climate risks now and in the future.

- **Resilience:** The ability of a city or town and its citizens to withstand impacts and rebuild or re-organize itself when necessary.

- **Sensitivity:** The degree to which exposed people, places, institutions and sectors are impacted, either positively or negatively, by climate change today and the degree to which they could be impacted in the future. As with exposure, sensitivity may be immediately related to a change in climate (e.g. a change in city water supply due to climate change-related decreases in precipitation may leave 50 per cent of the population without drinking water for 20 hours per day during the dry season), or less direct (e.g. artisans depending on a steady water supply to dye fabric lose their livelihoods). The sensitivity analysis is based on the socio-economic and physical realities, which represent the underlying causes for a climate change impact (e.g. poverty situation, drainage design/technology limitations, undiversified livelihood sources).

- **Strategic planning:** A systematic, transparent and objective decision-making process to determine priorities, make wise choices and allocate scarce resources (i.e. time, money, skills).

- **Participatory planning:** A planning approach that works to involve all sectors of a community in city planning, including the private sector, community and local stakeholder groups and, most importantly, traditionally under-represented and vulnerable groups (such as women, youth, urban poor).

1 *The World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), two organizations of the United Nations, established the IPCC in 1988.*

- **Vulnerability:** Refers to the degree to which people, places, institutions and sectors are susceptible to, and unable to cope with, climate change impacts and hazards.

- **Vulnerable groups:** Traditionally under-represented communities including women, youth and marginalized groups, such as the urban poor, that are often more susceptible to climate change-driven impacts given their limited adaptive capacity and by living in or near particularly sensitive places (e.g. informal communities located on flood prone river banks or unprotected coastal areas).

In terms of planning principles, **UN-Habitat recognizes the importance of planners in guiding more sustainable and environmentally friendly urban development**, which itself is a critical component of planning for climate change.

At the heart of these new planning principles is the concept of broad-based sustainability, with environmental, social, economic and cultural dimensions. Effective planning for climate change requires that careful attention be paid to balancing these different dimensions of sustainability.

A balanced environmental, social and economic response to climate change – a paradigm shift towards sustainable urban development – is the underlying vision of this publication.

Ongoing construction of a water tunnel in Bugesera, Rwanda.
© UN-Habitat/Julius Mwelu

NEW URBAN PLANNING – THE VANCOUVER DECLARATION

At the World Planners Congress in Vancouver, Canada in 2006, a position paper on urban planning was released called the ***Vancouver Declaration***. It called for a new approach to urban planning focusing on sustainability and making the connections between people, economic opportunity and the environment. The approach is based around the following ten principles, all of which have climate change planning implications and underscore the fact that good urban planning supports and creates a foundation for climate planning.[2]

1. **Sustainability:** A practical focus on integrating social, economic and environmental considerations in human settlements development that considers the impact of today's developments on future generations.

2. **Integrated:** An integrated approach that combines and coordinates economic planning, physical planning and environmental planning to deliver efficiency and effectiveness by adding value through policies that support, rather than undercut, each other.

3. **Integrated with budgets:** A recognition that successful plans effectively link to private and public sector budgetary processes. Neither a plan by itself, nor unregulated market processes, can deliver more sustainable settlements.

4. **Planning with partners:** Plan with all sectors of the community with a stake in the place, including governments, private sector organizations, voluntary agencies and civil society. New Urban Planning fosters voluntary collaboration amongst all these actors.

5. **Subsidiarity:** While national governments have important roles in setting national urban development policies and programmes, subsidiarity recognizes the need for decentralization, with local governments playing a leading role, and the empowerment of community-based organizations for neighbourhood-level planning.

6. **Market responsive:** New Urban Planning understands market demand, particularly in land and property markets, and is aware of the dynamics and potential of the informal sectors. It is responsive, but not reactive.

7. **Access to land:** A supply of land in safe and accessible locations to meet the needs of all sectors of society is fundamental to achieving efficient and equitable settlements. Traditional town planning has too often under-estimated needs, particularly those of the poor. Equitable systems of land ownership and land management need to underpin successful urban planning.

8. **Appropriate tools:** Urban development regulation and control should be strategic, affordable, effective and sensitive to the needs of the poor while conserving essential ecological resources. New Urban Planning recognizes that rigid urban containment is not a feasible, equitable or affordable policy in conditions of rapid urbanization.

9. **Pro-poor and inclusive:** Successful planning is inclusive, pro-poor, recognizes diversity and promotes equality. Plans can and should be driven by the objectives and priorities as expressed by all groups in the city.

10. **Cultural variation:** New Urban Planning allows for a variety of outcomes according to cultural priorities and preferences.

2 *Adapted from:* ***Reinventing Planning: A new governance paradigm for managing human settlements. World Planners Congress, June 2006.***

2 Planning for Climate Change: A strategic, values-based approach

Addressing climate change can be a daunting challenge. When coupled with large vulnerable populations, informal land and housing development, infrastructure limitations and poverty, the challenge of responding to climate change in many of the world's cities can, at first, appear overwhelming.

With so many challenges already at hand, how can urban planners be expected to also plan for and take action on climate change? **Where does climate change fit in terms of a city's priorities? What other city plans should include and address climate change** (e.g. city development strategy, town plan, transport plan, local economic development strategy)? This guide will help answer these and other important climate change-related questions.

Installation of a solar-powered street light along Diversion Road in Sorsogon City, Philippines.
© UN-Habitat/Joselito Derit

2.1 THE PLANNING FRAMEWORK

This guide takes the approach that climate change planning can, and should, augment and be **integrated and mainstreamed with existing city plans, planning processes and development activities across all sectors**. Climate change is simply another piece of information that should be considered during every planning process, or when existing plans are modified and updated.

Fundamentally, **good city planning practices are, by their nature, also climate smart planning practices**. This is because most climate change planning actions are consistent with planners' responsibilities, including:

- **Minimizing risk** and improving land development activities that occur in or near flood, slope or coastal hazard areas.
- **Improving infrastructure** for storm water management, solid and liquid waste management, access to safe drinking water, and the movement of goods and people.
- **Protecting ecosystems** and environmentally sensitive areas in and around towns and cities.
- **Improving disaster risk reduction**, including the improvement of response capacities for disasters (particularly weather and climate-related events).
- **Supporting local economic development** to reduce poverty and improve quality of life.

To help integrate climate change planning into current planning and urban development initiatives, and make it easier for urban planners to take action on climate change, this guide is **organized around a four step strategic planning approach** that incorporates innovative decision-making tools with a participatory, local values-based methodology.[3]

3 *The strategic planning approach described here has been used for equally challenging planning processes, including local economic development planning, health services delivery, physical land use planning and environmental planning in both the developed and developing world by local governments, state and regional planning agencies, international organizations (including UN-Habitat) and the voluntary sector.*

Cable car Metrocable successfully improved the mobility of vulnerable communities in Medellín, Colombia.
© UN-Habitat/ A. Padros

This guide incorporates a strategic planning approach with the belief **that all planning** – spatial/physical, sectoral, environmental, organizational, economic, disaster preparedness, etc. – **is more effective if it is strategic**. This is because no matter the type of planning, all of it is ultimately about making the best long-term decision possible. To plan for climate change adaptation using a more strategic approach will not only help communities decide *what* to do, **but also *how* to do it and *when* to do it, making decision-making more transparent and objective**.

Integrating a values-based, participatory approach with strategic planning also helps ensure that **city and local stakeholder capacity** (human resources, time, financial resources, political leadership and governance, etc.), **local knowledge** and **community and local stakeholder interests** are considered when identifying and prioritizing climate actions and integrating them into sectoral and day-to-day planning activities.

This climate change planning process **is not linear**. Although it follows a step-by-step process, it is designed to let cities revisit steps as **new information becomes available, new stakeholders become involved**, or **other circumstances change**.

This guide is designed to allow users to **enter the strategic planning process at different steps or modules**. It is anticipated that guide users and their cities will:

- Be at **different stages** of climate change planning (e.g. some cities may be just starting to think about climate change planning, while others may have already completed a Vulnerability Assessment and can move on to later steps right away).
- Be using the guide for **different purposes** (e.g. one city may be using it to develop a broad city-level *Climate Change Action Plan*, where another city might be using it to support a *Vulnerability Assessment Report*).
- Have **different planning structures and processes** (e.g. some cities may have a sophisticated planning approach and supporting plans, while other cities may rely on higher levels of government to carry out city planning activities, or have limited and basic city planning controls and processes).
- Have **different resources and capacities** (e.g. some cities may have the human resources and skills to undertake a process themselves, while others may have to secure external funding or technical support).

It is important to note that there are **many climate change planning tools and guides available**. While none use this guide's strategic, values-based participatory planning process, areas where other guides can provide complimentary tools and other helpful resources are highlighted (see appendices 2, 4 and 5). There is a **wealth of valuable resources available** both online and in print. Guide users are encouraged to review and incorporate these resources into their own planning process wherever appropriate.

FIGURE 2: Planning for climate change

As illustrated, this guide's planning cycle is organized into **four modules** that correspond to the four key strategic planning questions:

WHAT IS HAPPENING?

WHAT MATTERS MOST?

WHAT CAN WE DO ABOUT IT?

ARE WE DOING IT?

Answering these questions requires users to go through a corresponding set of individual **steps**. Each of the nine planning steps is further broken down into more detailed **tasks**, many of which are supported by corresponding **tools**. The planning tools are provided in a companion document, *Planning for Climate Change: A strategic values-based approach for urban planners – Toolkit*.

The modules and their related steps are briefly outlined in Table 1.

TABLE 1: Guide organization and framework

MODULE	PLANNING STEP	KEY QUESTIONS
MODULE A What is happening?	1-Getting Started	- What needs to happen first?
	2-Stakeholders & Participation	- Who needs to be involved and how?
	3-Vulnerability Assessment	- How is your city exposed to climate change today and in the future? - How sensitive are your city's people, places and institutions to this exposure? - Who is most vulnerable and least able to adapt? - What sectors are most impacted?
MODULE B What matters most?	4-Issues and Objectives	- What does the community value? - How do their objectives inform climate change adaptation options and priorities?
MODULE C What can we do about it?	5-Option Identification	- What climate change adaptation options (projects, policies, programmes) can we undertake?
	6-Option Assessment	- What options best support community objectives and priorities (e.g., poverty reduction)? - How can options be integrated and coordinated with existing policy instruments and plans (i.e., mainstreaming)? - Are there any "quick start" options that could be implemented first?
	7-Implementation	- What is the best way to organize the final *Climate Change Action Plan* and implement plan actions?
MODULE D Are we doing it?	8-Monitoring & Evaluation	- How should the *Climate Change Action Plan* be monitored and evaluated see how effective it is? - What should be monitored and who should be responsible for evaluation?
	9-Adjust and Modify	- How cities be sure the *Climate Change Action Plan* stays relevant and effective in the face of changing climate impacts and risks?

2.2 TIME REQUIREMENTS OF CLIMATE CHANGE PLANNING

One of the challenges of understanding climate change planning is to determine how much time is required for each of the planning steps. While there are no hard rules regarding time requirements for each step of the process – **each planning process will involve different stakeholders, consider different climate change impacts and result in different actions** – developing a stand-alone *Climate Change Action Plan* could take as little as several months or as much as a year or longer.

Timelines will also vary depending upon:

- The **phase at which a city enters the planning process** (e.g. some may have completed a Vulnerability Assessment, while others might just be starting out).
- Local government **capacity, resources and authority.**
- The **scope of work your city is hoping to achieve** (e.g. a complete, stand-alone *Climate Change Action Plan* versus a *Vulnerability Assessment Report*).
- The **level of stakeholder and community engagement** you are aiming for.
- Where practical and possible, one method to reduce timelines is to **organize a series of multi-day workshops where several steps can be completed at once**. Typically, these events benefit from skilled facilitation and the involvement of local governments that function well (i.e. a local government with the capacity and the will to develop a plan and follow through with implementation). They also require preliminary work to help focus the sessions.

The figure illustrates some general timelines to consider. It is important to note that every planning step should be carried out regardless of community resources. While some communities may have additional capacity or financial resources, a more basic and simplified approach is perfectly acceptable (e.g. doing a half-day workshop with volunteer stakeholders is better than leaving out a step if you cannot, for example, hire a specialist consultant).

FIGURE 3: Climate Change Planning Process – Potential time requirements

STEP	ESTIMATED TIME	NOTES
Module A: What is Happening?		
Step 1: Getting started	2-3 months	Typically 2 to 3-months. If climate change planning is a new undertaking, this step could take more time.
Step 2: Stakeholders and participation	Ongoing	An ongoing task over the course of the project, with several days of meetings at the beginning to get organized.
Step 3: Vulnerability assessment	1-2 days + several months	A 1 or 2-day workshop followed by several months to a year of study. External technical support may be required at this step and could help speed the process.
Module B: What Matters Most?		
Step 4: Issues and objectives	1-2 days to several months	From a 1-day workshop with stakeholders, to several months or more. The greater the level of community engagement, the more time it will take.
Module C: What Can We Do About It?		
Step 5: Option identification	1-2 days	Initial options can often be identified in a 1 or 2-day workshop.
Step 6: Option assessment	1-2 days to several months	Options can be evaluated in a 1 or 2-day workshop with several days of advance preparation. More comprehensive assessment can take several months.
Step 7: Implementation	Several months	Depending on organizational capacity, development of the final Climate Change Action Plan can take several months. Actual implementation timelines will vary depending upon the scale and scope of the actions.
Module D: Are We Doing It?		
Step 8: Monitoring and evaluation	1 day + several months	Initial framework could be developed in a 1-day workshop. Development of full plan will likely take 1 or 2 months.
Step 9: Adjust and modify	Ongoing	Ongoing. As climate change impacts evolve and change, corresponding adaptation actions may require modification.

3 Climate Change: a review

This section explains, in basic terms, the challenges created by climate change.

The challenge of climate change provides a summary review of how and why climate change is affecting our planet's atmosphere and the biophysical cycles driven by it, such as water and air temperatures, weather and tides. This sub-section summarizes the most relevant and important information in the extensive and often overwhelming body of data and research around climate change.

Cities and climate change explains how the biophysical challenges triggered by climate change result in serious impacts on cities and towns and, most importantly, the people that live there. This sub-section explains how these impacts can affect vulnerable groups – the poor, women, children, etc. – more severely, and explains where, how and through what policies and programmes planners can respond to these impacts, prepare for future ones, and mitigate a city's greenhouse gas emissions.

3.1 THE CHALLENGE OF CLIMATE CHANGE

Climate change refers to changes to the average weather and weather variability of a region or the planet over time. It is measured by changes in temperature, precipitation, wind, storms and other indicators. Other important indicators, including sea level rise, are also used to measure it.

The key climate change indicator that scientists look to is the average surface temperature of the earth. Over the past 50 years, the global average temperature increased by 0.65°C.

Global ocean temperature is also an important factor to consider due to its effect on surface temperatures. The world's oceans are absorbing much of the heat added to the earth's climate system and, as the ocean circulates, much of that heat is released into the atmosphere, increasing the warming effect over time. As illustrated in Figure 4, **no regions are immune to rising temperatures**, though some have witnessed sharper increases in the last 25 years.

In its *5th Assessment Report* in 2013, the Intergovernmental Panel on Climate Change (IPCC) stated that, "Most of the observed increase in global average temperatures since the mid-twentieth century is *very likely* (>95 per cent) due to the observed increase in anthropogenic greenhouse gas concentrations." In other words, most of the global warming from the past 50 years is caused by human activity. The increase in carbon dioxide levels in the atmosphere – primarily from the burning of fossil fuels and land use change – is increasing global temperatures at a rate never before seen in human history.

Air Pollution, Nanjing.
© UN-Habitat/Bernhard Barth

FIGURE 4: Global and continental temperature change

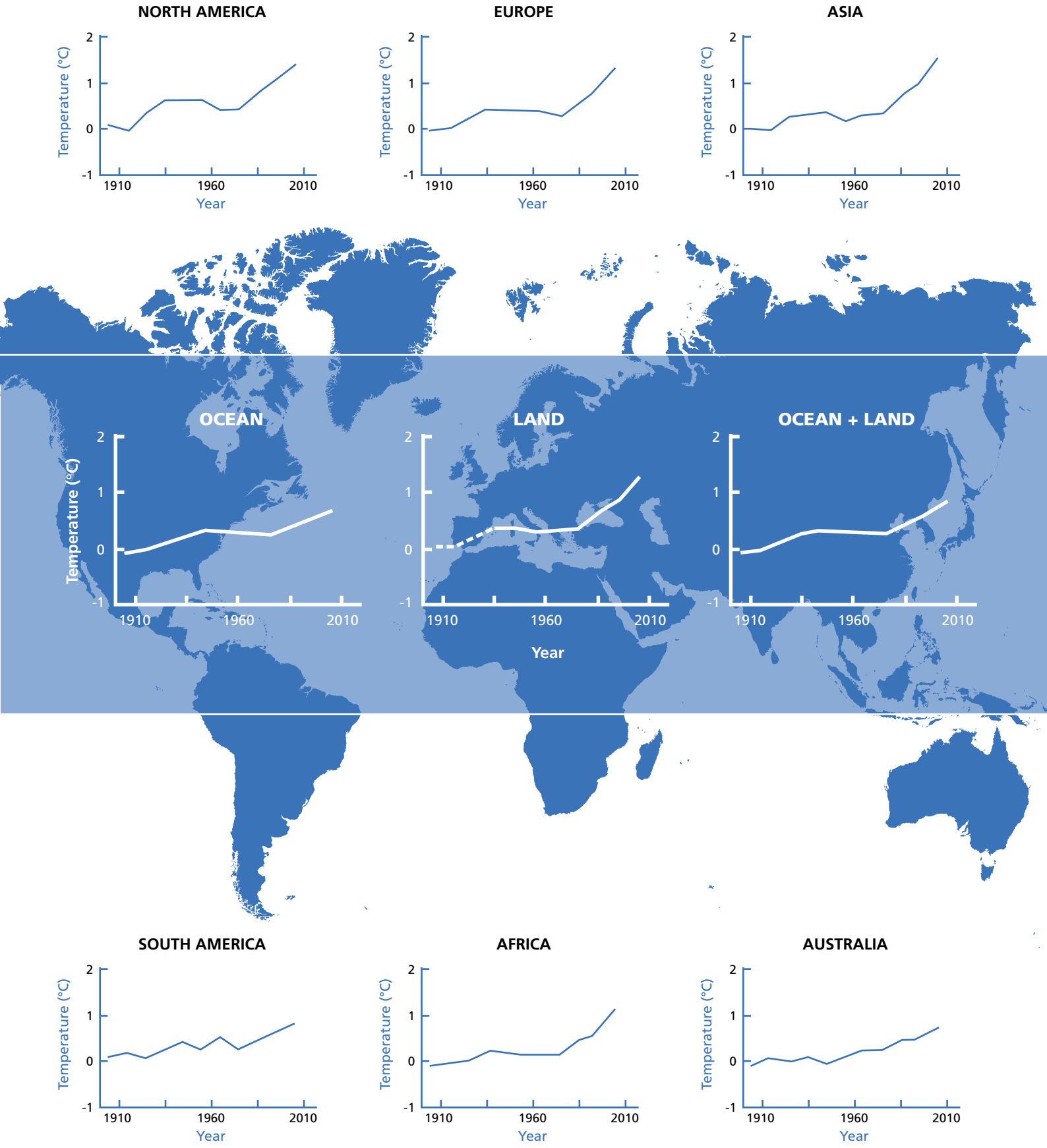
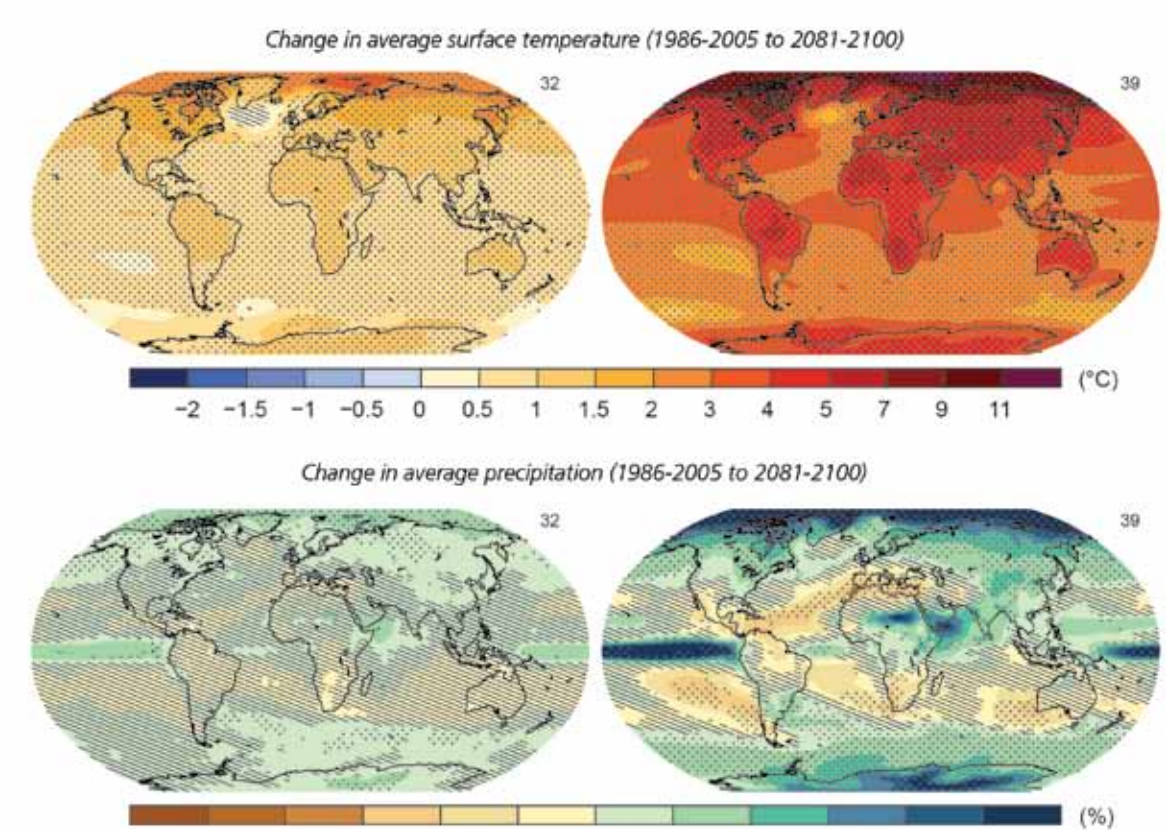


FIGURE 5: Predicting changes in temperature and precipitation



IPCC, 2013: Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA,in press.

The IPCC's Fifth Assessment Report also determined that global temperatures are likely to rise by 0.3 degrees to 4.8OC by the end of the century, depending on how much governments control carbon emissions. The first map in Figure 5 illustrates the change in average surface temperature — the best-case and worst-case scenarios to the year 2100. Both maps show the change from 1986. The lower map shows the change in annual precipitation, by percentage, from 1986 to 2100.

The changes in temperature and precipitation are leading to **increased storm severity** and extent, **extended drought conditions**, **sea level rise** and associated **coastal erosion and flooding**, and increased or intensified **flash flooding**, among other biophysical effects.

Of course, warming and related changes will vary from region to region around the globe. Given the dynamic nature of the climate system, this **regional variation** is uncertain and will continue to be researched and studied.

These changes to the earth's weather system will impact human settlements throughout the world, with particularly severe impacts in low – and middle-income countries where the capacity to manage impacts may be limited and vulnerable populations are larger.

BUILDINGS AND CLIMATE CHANGE – CHALLENGES AND OPPORTUNITIES

The challenge: According to the UN Environmental Programme, the buildings sector is the single largest contributor to global GHG emissions, with approximately one third of global energy end use taking place within buildings. The main source of emissions from buildings is the energy they consume for heating, cooling and lighting, but buildings are also major emitters of greenhouse gas emissions during their construction based on the materials used and construction waste. It is expected that total emissions from buildings in rapidly industrializing countries will surpass emission levels from buildings in developed countries in the near future.

3.2 CITIES AND CLIMATE CHANGE

Cities and towns are critical to climate change mitigation and adaptation. Globally, over 50 per cent of the population lives in cities. As major centres of consumption and production, they are great energy consumers and as a result, major greenhouse gas emitters. According to the International Energy Agency, buildings currently account for 40 per cent of energy use in most countries, with projections that demand in this sector will increase by 60 per cent by 2050. This is larger than either the transportation or industrial sector.

Urban populations are projected to continue growing rapidly, and cities are forecast to consume almost three-quarters of the world's energy production in 2030[4]. Non-OECD (Organization for Economic Cooperation and Development)[5] cities, many of which are located in the developing world, are becoming increasingly large energy consumers (and greenhouse gas emitters) as they develop and grow. This trend raises many climate change-related questions, particularly around how these cities will develop over time, and the considerable opportunities that exist for a development approach that considers both mitigation and adaptation.

Cities are complex systems. The energy that cities consume and the associated emissions they produce can be attributed primarily to building construction, cooling, heating and electrification, vehicle use, industry and manufacturing. Multiple urban planning considerations help to determine the level and intensity of these emissions, including how we arrange our cities (urban form), population densities (urban density), and how we move in and through cities (urban mobility). Additionally, how we manage the wastes we produce, both liquid and solid, can contribute to our greenhouse gas emissions or mitigate them. Urban planning is increasingly important in managing climate change because well-planned cities are better able to adapt to climate change and are more resilient to its negative impacts than unplanned or poorly managed cities.

Cities are also the hubs of economic, political and cultural activity, and centres of knowledge and innovation. With their assets and capacity, they will play a major role in developing and implementing climate change adaptation and mitigation actions and strategies.

3.2.1 *URBAN CLIMATE CHANGE IMPACTS*

The biophysical challenges generated by climate change give rise to additional and very real impacts on our cities and towns and the people that live in them. Of course, the impacts and threat potentials vary between cities depending upon:

- **Geographic location,** which will determine general exposure to climate change and the potential degree of related biophysical changes or impacts.
- **Specific geographic features,** which, in combination with their general global location, will help determine potential exposure (*Is your city located on the coast? On a river delta? On a major river? In an arid area where climate change exacerbates an already sensitive condition between urban water needs and scarce water resources?*).
- **Sensitivity to climate change hazards,** which can be determined by asking questions such as*, "How much development has occurred on steep or unstable slopes? Or on low lying, storm exposed or flood prone areas? What is the quality of development in those areas* (i.e. are developments in hazardous areas with poorly built informal settlements or are they higher quality developments built to national construction standards)*?"*

4 *World Energy Outlook 2010.*

5 *Founded in 1961, the OECD is an international economic organisation made up of 33 developed countries that seeks to stimulate economic progress and world trade. It defines itself as a forum of countries committed to democracy and the market economy that provides a setting to co-ordinate domestic and international economic policies of its members.*

The opportunity: There are significant opportunities to cost-effectively reduce building sector greenhouse gas emissions by using existing technologies that can cut energy consumption by 30 to 80 per cent in new and existing buildings (in both the developed and developing countries). If carefully planned, greenhouse gas mitigation strategies for buildings can stimulate the growth of new businesses and jobs, and contribute to other social development goals, such as better housing and access to clean energy and water. Urban planners can help realize this opportunity through their work on development control and regulation, influencing building standards and codes, and working with building developers.

- **Vulnerable populations.** Vulnerable groups – such as the poor, women, youth, the elderly – living in exposed, climate change hazard-prone areas are more likely to be affected by climate change impacts than other, less vulnerable groups. These groups are typically less resilient and have a lower adaptive capacity to effectively respond to climate change impacts due to limited resources.

The next table summarizes major climate change impacts in urban areas. Climate impacts are often categorized as *primary impacts* (i.e. those that are directly caused by a climate hazard) and *secondary or tertiary impacts* (i.e. those that are a result of the primary impacts). While not always the case, primary impacts are often biophysical, such as landslides or flooding, and secondary impacts are often socio-economic (that is, impacts on human lives and livelihoods). The table is followed by more detailed information on three particularly key impacts: increased flooding, decreased water supplies, and increased droughts and heat waves.

Three likely impacts of climate change on our cities and towns are described in more detail below. While there are certainly additional impacts generated by climate change, the three profiled below – flooding, water scarcity and the heat island effect – illustrate the range of climate impacts a community is exposed to. As noted, impacts in each category can be expected to vary depending upon the region, size of city, and level of development. Additional information on impacts can be found in Appendix 2: Other resources.

1. **FLOODING:** Climate change has the potential to increase flooding in three ways:

   - **Sea level rise and coastal inundation:** Climate change is causing higher sea levels due to increased and growing glacial and polar ice melt. It is also causing sea levels to rise by warming the oceans themselves, which causes their overall volume to increase. There are estimates by the United Nations that sea levels could rise between 18cm and 59cm on average by the end of the twenty-first century. In combination with the increased frequency and magnitude of marine storms (e.g. cyclones, typhoons, and hurricanes), storm surges associated with these events are becoming larger and more damaging. Currently, about 13 per cent of the world's urban population (around 360 million people) live in the low-elevation coastal zones (i.e. less than 10-metres above sea level) and an estimated 10-million people are currently affected each year by coastal flooding. Small island states in the Pacific are particularly threatened by sea level rise.

     The impacts of sea level rise on a given city will vary depending upon its location (i.e. sea level rise will not be uniform and forecasted rises are different around the globe) and level of development (i.e. some cities may have built sea walls or preserved protective coastal areas like mangrove forests, while other cities have coastlines that are more prone to erosion). Urban

Flooding in the Guerra Popular Avenue, Maputo, Mozambique.
© UN-Habitat/Nicholas Kajoba

TABLE 2: Climate change impacts

CLIMATE HAZARD	POTENTIAL PRIMARY IMPACTS	POTENTIAL SECONDARY IMPACTS
Increased Temperatures	- Groundwater depletion - Water shortages - Drought - Degraded air quality (smog)	- Water shortages - Distress migration to cities/towns due to droughts in rural areas - Reduced food supply and higher food prices - Potential energy price increases (e.g. from reduced hydro-electricity generation in places where it exists) - Exaggerated urban heat island effect - Increased energy demands for cooling - Need for higher or additional wastewater treatment - Population health impacts (e.g. increased mortality during heat waves, decreased access to food/nutrition)
Increased Precipitation	- Increased flooding - Increased risk of landslides or mudslides on hazardous slopes	- Reduced food supply and higher food prices - Property damage (homes and businesses) - Disruption of livelihoods and city/town economies - Damage to infrastructure not designed to the standards necessary to withstand the occurrences being experienced - Distress migration to cities due to floods in rural areas - Displacement and population movement from informal settlements built on steep slope hazard lands, etc. - Increased vector borne diseases (malaria, dengue, encephalitis) and water borne diseases (acute diarrhoea, cholera, dysentery)
Sea Level Rise	- Coastal flooding - Salt water intrusion into groundwater supplies in coastal areas - Increased storm surge hazard - Coastal erosion	- Displacement and population movement from coastal areas - Property damage (homes and businesses) - Damage to infrastructure not designed to the standards necessary to withstand the occurrences being experienced - Disruption of livelihoods and city/town economies - Reduced food supply and higher food prices - Population health impacts (e.g. injuries, increased mortality and illness) - Loss of productive/residential land due to erosion
Increased Extreme Weather Episodes (storms, cyclones, hurricanes)	- More intense flooding - Higher risk of landslides/ mudslides on hazardous slopes - Intense and disastrous wind speeds	- Property damage (homes and businesses) - Damage to infrastructure not designed to standards of occurrences being experienced - Population health impacts (e.g. injuries, increased mortality, distress) - Disruption of livelihoods and city/town economies - Reduced food supply and higher food prices

planners, of course, are key to determining appropriate actions to reduce vulnerability including: the location and scale of marine defences like sea walls; the identification and avoidance of development in sea level rise hazard areas (or ensuring that new development in hazard-prone areas can withstand storm surges and related hazards); and the identification and protection of shoreline areas (like mangrove forests) that provide a natural defence for storm surges and coastal flooding, while providing mitigation benefits.

- **Increased rainfall:** Intense, heavy rainfall events are likely to increase in frequency and magnitude in certain parts of the world because of climate change. Due to the large amount of impermeable surfaces (roads, buildings, paved areas) in cities and towns, places with inadequately designed or limited storm sewer and drainage systems will be faced with flooding during these storm events. There are potential health impacts, through an increased incidence of water borne diseases such as cholera, in areas where open sewage ditches or a combined sewer-stormwater system are overwhelmed during storms and introduce raw sewage into the floodwaters. There is a growing body of research that indicates increased rates of injury and death from flooding in urban areas (especially in Africa, Asia, Latin America and the Caribbean) that have inadequate drainage and flood protection systems.

  The impacts of increased/intensified rainfall will vary depending on the region (i.e. different regions are forecast to be more subject to increased/intensified rainfall than other areas) and the urban area's level of development and infrastructure. For example, some lesser-developed cities may have more pervious (i.e. unpaved areas) where rainfall can be more easily absorbed (absorption rates will depend on how dry or pervious land is). Other cities may have more developed storm water management systems and infrastructure with which to manage the increased and intensified rainfall events, although the intensity of the events may overwhelm even the most comprehensive systems. Urban planners are key to the development and upkeep of stormwater systems and can help to ensure that new roads, buildings and infrastructure include stormwater features (e.g. infiltration areas, pervious surfaces, impoundment areas, rainwater gardens) in those regions facing increased/ intensified rainfall episodes.

- **Increased/intensified river flooding:** Increased and intensified rainfall from storms ultimately leads to higher incidences of rivers overflowing their banks. In urban areas, particularly those in low-lying areas or river deltas, this type of flooding has been increasing. Increased river runoff as a result of climate change may be compounding this situation.

  As with the other areas explored in the flooding theme, the impacts of river flooding vary depending upon the region (e.g. some cities are located on river deltas, river confluences, or around larger rivers) and the level of development (e.g. some cities may have built protective dikes or controlled development in the flood plain). Urban planners are important for determining the location and scale of river dikes and other flood management systems. Local land use plans and enforcement can also regulate the location, type and scale of development in flood plains.

Seawall in Sorsogon City, Philippines
© UN-Habitat/Bernhard Barth

2. **WATER SCARCITY:** Access to clean water will be further threatened as a result of climate change. Lack of access to safe drinking water and adequate sanitation is a major cause of ill health and life threatening disease. In many towns and cities in the developing world access to potable water is not universally available and sanitation coverage is still low. Research indicates that by 2020 between 75 million and 250 million people could face climate change-driven water shortages in Africa alone. Similar scenarios have been projected for Asia. Many cities and towns will not only face increased water demands with population increases – brought about in part from rural migration from water scarce areas – but also water supply issues as their own freshwater sources are impacted by climate change. These problems will be further compounded in cities and towns with limited, poorly maintained or out-dated water supply systems and infrastructure.

   As with any climate impact, the scale and severity of potential impacts vary depending upon the region and where its water supply comes from (i.e. glacier-fed water systems will be impacted differently than non-glacier fed systems). As both a supply-side and demand-side issue, water scarcity also depends on the size of the city and its water consumption patterns and rates. It also varies depending on the efficiency of water management systems and many other factors, including upstream diversions of potable water. As urban planners are typically involved in the development of local land use plans, infrastructure plans and water plans, there are many areas where planners can address and incorporate climate change adaptation around water scarcity (e.g. water efficient development and conservation strategies, reusing non-potable or "grey water" for some urban applications like irrigation, as well as groundwater recharge or encouraging rain water capture and cisterns).

3. **HEAT ISLAND EFFECT:** Climate change will likely increase temperatures in most cities and towns in Africa, Asia and South America. Higher temperatures will be compounded in urban areas by the urban heat island phenomenon – an occurrence where a city's buildings, roofs, paved areas and other infrastructure hold and retain solar heat. This can make a city several degrees warmer than the surrounding rural areas, which have more green space and less heat absorbing materials. It is anticipated that towns and cities will be subject to more frequent and intense heat waves, which will directly impact the health and quality of life of urban residents. In Europe, Asia and North America, heat waves have proved to be associated with dramatic short-term increases in mortality for the elderly and very young.

   Heat island effects will vary depending upon the region and the level of development as some cities may have fewer paved roads and/or other surfaces that absorb solar energy. Urban planners can help mitigate heat island effects by expanding urban green spaces, developing urban forestry programmes where the number of trees in cities is increased, and supporting newer types of construction, including green roofs and walls.

TABLE 3: Major climate threats and some of the countries most at risk

THREAT	LOW INCOME	MIDDLE INCOME
Drought	Chad, Eritrea, Ethiopia, India, Kenya, Malawi, Mauritania, Mozambique, Niger, Sudan, Zimbabwe	Iran
Flood	Bangladesh, Benin, Cambodia, India, Lao PDR, Mozambique, Pakistan, Rwanda, Vietnam, Myanmar	China, Sri Lanka, Thailand
Storm	Bangladesh, Haiti, Madagascar, Mongolia, Vietnam	China, Fiji, Honduras, Moldova, Philippines, Samoa, Tonga
Coastal	Bangladesh, Mauritania, Myanmar, Senegal, Vietnam, Pacific Islands	China, Egypt, Indonesia, Libya, Mexico, Tunisia

Source: World Bank, 2010

3.2.2 *URBAN POPULATION VULNERABILITY*

While the impacts of climate change are felt around the world, they are **distributed unevenly, with some areas and people being affected more than others**. Vulnerability to climate change is also distributed unevenly in cities and towns, with some groups being impacted more severely than others. This sub-section describes three of the groups most vulnerable to climate change that will require additional consideration in any climate planning initiative – the urban poor, women, and the elderly and young.

- **Urban poor:** It is widely acknowledged that climate change has a disproportionate impact on the lives of people living in poverty. It is also widely known that the **urban poor often live in makeshift housing structures and in informal settlements** located in hazard-prone areas like floodplains, the coastal zone and on steep, unstable slopes; this makes the urban poor more at **risk from climate change impacts**. Due to this group's poverty, their capacity to reduce or avoid their exposure to direct and indirect climate change impacts is limited. In addition to hazard threats, this group's **risk is compounded by their more limited ability to cope with the consequences of any climate change impact** (e.g. illness, injury or loss of income, livelihood or assets). Simply put, poverty increases people's sensitivity to climate change impacts that increases risks; therefore people living in poverty and poor communities are most vulnerable to climate-change impacts.

  Food security risks for the urban poor are also likely to increase as climate change advances. In many places, a large percentage of food is still locally and regionally produced and shipped to nearby cities. Increasingly unpredictable seasons and extreme weather events such as droughts and floods may lead to crop failures or reduced harvests, which would impact access to food in the city. Declines in marine harvests have also been partly attributed to climate change and increasing ocean temperatures. **In all these situations, decreased harvests can lead to higher food prices, which disproportionately affect the poor**.

  Rural-urban migration and international migration is likely to increase as agricultural areas affected by climate change become more and more marginal. Accelerated urbanization further increases the pressure on local governments to provide housing and services for these climate change refugees. This segment of urban growth will increase as climate change impacts vulnerable lands.

- **Women:** In many poor, urban communities, women (and girls) are likely to **bear disproportionate hardships** with respect to climate change impacts. This is because climate change tends to impact the sectors that form the basis of livelihoods for which women are traditionally responsible, like food and agriculture (small-scale), water supply and gathering, and energy supply. Moreover, because of gender-based inequalities in terms of property rights, resources, access to information and socioeconomic roles, the effects of climate change will have a disproportionately severe effect on women. As a result of gender-based inequalities, women need to be involved in the process of adaptation and processes need to be designed to be supportive and accessible.

  Recent World Health Organization research[6] confirms growing evidence that women and men suffer different negative health consequences following extreme climate change-related events like floods, drought and heat waves. This research found that while disasters create hardships for everyone, natural disasters on average kill more women than men, or kill women at a younger age than men. The research found that "these differences persist in proportion to the severity of disasters, and also depend on the relative socioeconomic status of women in the affected country", but that the "effect was **strongest in countries where women have very low social, economic and political status**".

- **The elderly and the young:** The elderly and the young are less able to avoid the direct and indirect impacts associated with climate change due to their age and physical abilities. They are also less able to cope with any resulting injuries or illness. Urban heat waves have been shown to take a significant toll on elderly people and the very young. Many of the diseases that are predicted to become more common because of climate change, like malaria, have been shown to impact younger age groups more severely.

6 *Gender, Climate Change and Health. World Health Organization (2011), p.3.*

3.2.3 *CLIMATE PLANNING AND CITY PLANNING*

The connections between **good, sustainable city planning and climate change adaptation are strong and clear**. As mentioned at the beginning of this guide, **good planning practices are, by their nature, also climate smart planning practices**.

Regardless of the planning capacity of local governments, **almost any urban development or redevelopment initiative** (policy, programme, strategy or plan) **can, and should, consider climate change**. This process where current plans, strategies and policies are reviewed and expanded to include climate change adaptation and mitigation considerations is commonly referred to as **mainstreaming**.

Planners are directly involved in shaping and controlling physical land use and development patterns (urban form). Urban form is an important component of a city's adaptive capacity and resilience, and how sensitive people, places, institutions and sectors are to climate change exposures. From a mitigation perspective, urban form is also a major driver of a city's greenhouse gas emissions.

Important areas where planners can support and lead adaptation and mitigation activities in their traditional planning capacities include the following:

- **Land use:** Careful attention to physical land use and urban form is a way for planners to manage and adapt to the effects of climate change. For example, planners are involved in the designation of land uses and can help shape settlement patterns to reduce and minimize exposure to lands that are climate hazards (e.g. steep and unstable slopes, flood zones, coastal areas subject to sea level rise and storm surges). From a mitigation perspective, city plans that promote more compact development patterns can create supportive conditions for alternative energy systems (e.g. district energy) and efficient public transit systems, thus reducing energy consumption and its associated greenhouse gas emissions.

  As urban populations increase globally, **effective land use planning will become more and more important.** This is especially true in the developing world where municipalities have less control over the development processes. Slum developments and informal settlements present a major challenge, as they are often located in areas that are vulnerable to multiple climate hazards. Forward-thinking planning processes that acknowledge climate change can help to direct development and growth to more suitable areas and better manage growth now and into the future.

- **Environmental planning:** Planners play an important role in protecting and enhancing biodiversity, environmentally sensitive areas and ecosystems. In particular, planners can help relocate, minimize or prohibit development (planned and informal) in environmentally sensitive areas like estuaries, wetlands and important coastal habitats like mangrove forests. Keeping development out of these areas can help to improve a city's protection from river flooding and erosion, and marine storm surges and erosion.

  In addition to the environmental benefits of these actions (e.g. habitat protection), other climate benefits can also be realized. For example, urban green spaces can help to cool the air and provide shade to help limit urban heat island effects. Green spaces also act as carbon sinks to mitigate carbon emissions.

Cyclone-proof kindergarten in Vilankulo, Mozambique.
© UN-Habitat/Arianna Francioni

- **Storm water management:** Planners are critical to improving a city's stormwater management infrastructure that, in turn, is a key determinant in how resilient city is in handling and adapting to climate change-related rainfall and flooding episodes (i.e. more frequent and intense precipitation). While some development is unavoidable in climate change hazard risk areas, **planners can help to regulate and control building forms and design** (e.g. keeping living areas above flood hazard levels) and work to include stormwater management features in these areas (e.g. infiltration areas, pervious surfaces, impoundment areas). Urban planners also play a role in determining the location and scale of river dikes and other "hard" flood management systems.

- **Building and site design:** Local land use plans and development laws can be used to regulate the location, type and scale of development in climate hazard areas. **Numerous location and design features can be encouraged and/or required to make areas and buildings more resilient to climate impacts**. For example, living areas can be required to be located at a suitable height so that they are above flood hazard levels. Tree planting and other sun shading can be required to reduce urban heat island effects and improve occupant safety and wellbeing. Buildings can also be designed to withstand other potential climate change effects, including increased episodes of storm-related high winds. From a mitigation perspective, planners can encourage and promote more environmentally friendly building design to reduce energy and water consumption.

- **Disaster preparedness:** Increasingly, planners are playing a larger role in **disaster preparation**, such as ensuring that there is access for emergency services and that there are adequate community shelters and schools, regulations on back up sources of energy, and public warning and information systems.

  In addition to the more traditional physical planning activities described above, **the responsibilities of urban planners increasingly cross into other sectors.** Planners are more and more often supporting social, cultural and economic policy and programme areas, and are contributing to these areas as process stakeholders, technical supporters, policy developers, and project and policy implementers.

- **Transportation plans and projects:** The transport sector is typically responsible for about 1/4 of energy-related greenhouse gas production and private cars account for a significant proportion of that activity. As car ownership rates climb in developing countries and urban development continues to spread, further separating the distances between the places people live, work and shop, the greenhouse gas emissions associated with this travel will continue to rise. Planners can help mitigate greenhouse gas emissions by **working to reduce vehicle miles travelled and urban congestion** through strategies such as compact, high density, mixed-use development. Strategically planned development can also direct development to areas less vulnerable to climate change impacts.

- **Local economic development strategies:** Local economic health and well-being is a key component of both urban sustainability and climate change-resilient cities. Increasing income generating activities and improvement in economic activities helps to improve the adaptive capacity of more climate vulnerable groups. More climate friendly livelihoods can be identified and strengthened through such strategies. For example, green businesses involved in mitigating greenhouse gas emissions in addition to improving livelihoods and reducing solid and liquid waste can be identified and supported. Along with spatial elements (i.e. where should different business be permitted) and the underlying policy components, urban planners are critical to supporting local economic development strategy development and plan implementation.

- **Solid waste programmes:** Landfills can be large emitters of methane gas. Solid waste reduction initiatives and better management reduce these emissions and improve materials' recycling rates, improve livelihoods and living conditions, and generate valuable resources through initiatives like landfill gas capture or composting. In flood prone areas, a well-located landfill site can prevent contamination of natural aquatic areas and the water supply.

- **Wastewater management:** Urban areas generate large amounts of domestic and industrial wastewater. Historically, wastewater treatment plants are placed in the lowest areas of cities to allow flow with minimal pumping. With climate change, these areas may become more susceptible to flooding with catastrophic effects for cities and towns by causing the release of contaminants that can produce waterborne diseases.

- **Water supply management:** Water supplies are typically based on the demands of cities under historic weather patterns and may not withstand extreme or unusual periods of drought. Strategically planned storage reservoirs and water management can help mitigate climate effects resulting in water supply differences. Water supply management is of particular importance in rapidly growing cities in regions with limited, climate change-threatened water supplies.

- **Community health programmes:** A healthier population is a more climate change resilient population. Understanding this link and the obvious connections between urban form and public health, planners have a big impact on public health programmes and policies. From slum upgrades to urban sanitation programmes, and from service and infrastructure provision to land use management and controls that support more sustainable urban development, planners and public health workers share common goals.

- **Public education programmes:** The most successful city plans and strategies are developed with community input and, ultimately, community support. The outreach activities that planners typically undertake in all types of planning and policy development projects – community meetings, focus groups, surveys, open houses, town hall meetings, newsletters and advertisements, stakeholder working groups – present significant opportunities to educate and inform the public about climate change, its connections to the policy or programme area in discussion, and to the related climate change impacts and risks. An aware and engaged community is a critical component of almost any urban sustainability initiative or climate change adaptation and mitigation activity, particularly one that might involve limiting development in certain areas and/or requiring public investment and funding.

Some of the projects and initiatives that planners and allied professionals typically work on are outlined in Table 4. The list identifies typical city plans, summarizes their general purpose, and highlights their potential climate change adaptation and mitigation features. Note that this table will be referred to at several points in Chapter 4 Planning for Climate Change: The planning cycle, when considering what climate change options can be undertaken and, once they are prioritized, how they will be integrated or mainstreamed into existing policy instruments (city plans, strategies, programmes, guidelines).

It is also important to note that while urban planners are definitely key players, they should not be the only players involved in climate change planning. Knowing this, planners **should work to engage and involve other city and local government departments and agencies**, especially those involved in the urban sustainability plans outlined in this section. In addition to this, planners should also feel comfortable asking for outside expertise and assistance when and where required. Planning for climate change adaptation is not an easy process and **certain steps may require technical support and assistance** from climate specialists and other climate change stakeholders.

Community consultation in Kanyama, Zambia.
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DISASTER RISK REDUCTION

There is a very close relationship between disaster risk reduction and planning for climate change. Disaster risk reduction is formally defined in the United Nations International Strategy for Disaster Reduction as *"action taken to reduce the risk of disasters and the adverse impacts of natural hazards, through systematic efforts to analyse and manage the causes of disasters, including through avoidance of hazards, reduced social and economic vulnerability to hazards, and improved preparedness for adverse events"*.

If disaster risk reduction activities and planning are underway in your community, every effort should be made to **coordinate them with planning for climate change** so that they can also counteract the added risks arising from climate change.

A woman carries out her daily chores alongside a damaged seawall in Sorsogon City.
© UN-Habitat/Bernhard Barth

TABLE 4: City/town plans and climate change

TYPE OF PLAN	GENERAL PURPOSE	POTENTIAL CLIMATE CHANGE FEATURES
Town Plan City Plan Physical Land Use Plan	- Identifies areas (zones) for different types of development (i.e. housing, commercial, industrial, etc.) - Identifies development hazard areas (steep slopes, flood plains, etc.) - Provides long-term policy direction on land use and development, transport and overall community development	- Highlights development "hot spots" or "no development areas" where climate change impacts are likely to be most severe - Sets policy direction on "climate friendly" or "climate resilient" infrastructure and servicing (i.e. stormwater management) - Formally recognizes climate change and highlights related impacts (i.e. builds public awareness, political support) - Land capability, suitability and the feasibility of different development alternatives are analysed to determine appropriate spatial relationships that form the basis of generalized future land use maps
Storm Water Management Plan	- Improves storm water management, including drainage and infrastructure	- Identifies climate change-related storm water or flooding hazard areas - Directs new infrastructure to "safer" areas not as exposed to climate change impacts (i.e. can attract or pull development to serviced areas) - Accelerates investment in existing coastal and river flood defence programmes to protect existing development in flood prone areas - Identifies options to increase permeability of paved areas in drought prone and flood affected areas
Transport Plan	- Improves road, pedestrian, transit and bicycle connections and infrastructure	- Identifies and improves "weak links" in transport networks that are threatened by climate change impacts (e.g. bridges threatened by storm surges, roads subject to flooding) - Identifies and designates emergency transportation networks (e.g. roads and transport links that could be used during a climate change impact event to transport people, supplies and any required relief supplies) - Prioritizes transportation network improvements that improve transportation connections for climate vulnerable groups - Supports climate change mitigation through reduced traffic congestion, prioritizing non-motorized transportation
Local Economic Development Plan or Strategy	- Identifies and prioritizes economic sectors and opportunities - Identifies economic development priorities (e.g., jobs, capacity, infrastructure)	- Reduces urban poverty levels for key climate change vulnerable groups (e.g. women, children, urban poor) - Promotes "climate friendly" and/or "green development" opportunities
Informal Settlement Upgrade Plans	- Develops policies and plans to improve services, infrastructure and sanitation - Formalizes property ownership	- Identifies potential climate change impact risks (e.g. stormwater and flooding, slope failures, health) and responses to them (e.g. relocation, infrastructure improvements) - Identifies and relocates housing from high hazard areas and/or develops "planned retreat" or relocation strategy

TYPE OF PLAN	GENERAL PURPOSE	POTENTIAL CLIMATE CHANGE FEATURES
Public Health Plan	- Typically focuses on disease prevention and public safety improvements	- Identifies and prioritizes health risks (e.g. disease, accident) associated with climate change - Supports, facilitates and expedites infrastructure and planning improvements to reduce climate change related public health impacts (e.g. supports improved storm water and waste treatment facilities, supports urban greening to reduce heat island effects)
Disaster Risk Reduction Plan	- Improves disaster response preparedness - Improves early warning capacities - Identifies "hot spots" (i.e. areas and groups vulnerable to disasters)	- Identifies climate change disaster risks, likelihoods and adaptive capacity - Supports, facilitates and expedites infrastructure and planning improvements to reduce climate change-related disaster impacts - Ensures provision of adequate community shelters and schools, access for emergency services, introduces regulations on back up sources of energy and water supply
Sewer / Liquid Waste Management Plan	- Improves waste water/sewer management, including and infrastructure	- Identifies development or construction guidelines for "climate proof" facilities (i.e. facilities that are located and built to withstand and function during climate change impact events) - Identifies and prioritizes high risk areas where new facilities are most needed to reduce climate change impacts amongst vulnerable groups - Identifies options to reduce or reuse wastewater (grey water) for urban agriculture and horticulture
Energy Management Plan	- Improves energy generation options, distribution and conservation	- Identifies climate change-related risks to energy generation and distribution facilities - Supports climate change mitigation (e.g. green energy, conservation)
Water Management Plan	- Improves water supply, management and distribution - Improves water conservation	- Identifies climate change-related risks to municipal water supply, treatment and distribution and adaptive measures to counter them - Identifies water conservation and water demand strategies and tools to better manage and adapt to future potential water shortages
Solid Waste Management Plan	- Improves solid waste management, including collection, handling and infrastructure	- Supports climate change mitigation through improved materials recycling or reuse and, where practical and feasible, landfill emissions capture

Any of the plans or strategies identified in the table can be modified or revised to consider and address climate change – this type of integration is called **mainstreaming**. These changes can be made when plans are updated and revised, or when new plans and strategies are developed. Mainstreaming assumes that other programmes and projects – poverty reduction, urban sustainability, etc. – can be enhanced and their benefits increased by incorporating climate change considerations in the planned actions and supporting policies. Mainstreaming helps to ensure that a city's plans and policies are not at odds with climate risks now and in the future.

While this guide supports the development of **stand-alone** Climate Change Action Plans, many of the actions (programs, policies, activities) a Climate Change Action Plan identifies will still likely be integrated, implemented or "mainstreamed" into existing city plans, programs and policies. Having stand-alone Climate Change Action Plans may be beneficial in monitoring improvements in city resiliency and in marketing support for identified larger capital projects that require external funding or financing. In these cases, the Climate Change Action Plans are often used to help secure external funding support (e.g. from the Asian Development Bank, World Bank, bilateral agencies, etc.) by being direct in showcasing local climate change action priorities.

It is also important to consider the other determinants of adaptive capacity. A city's economic wealth, access to technology, existing infrastructure, current information and skills, and the strengths or weaknesses of its institutions all influence adaptive capacity. Increasingly, many studies indicate that human and social capital, such as education and social networks, and good governance (for instance, access to and participation in decision-making processes) also help to determine adaptive capacity. Sectors and jurisdictions throughout the world have begun the process of building adaptive capacity through diverse technical, legislative and social approaches. See Task 3.3 for more information on adaptive capacity.

In many cases, the development, implementation and ongoing monitoring of local government plans and strategies involve other stakeholders, including other levels of government (e.g. state, county, regional, national, federal and provincial governments), community organizations, non-government organizations (NGOs), academic institutions and local business associations or private sector partners. All of these groups and organizations play a role in planning for climate change.

PLANNING FOR CLIMATE CHANGE: A "LOW REGRETS" APPROACH

The World Bank estimates the total cost of adapting to climate change in developing countries will range between USD 75 and USD 100 billion per year. While this only represents 0.2 per cent of projected gross domestic product (GDP) of all developing countries, it equals about 80 per cent of the total disbursement of official development aid.

Given the cost of adaptation measures, the immediacy of other problems facing planners (e.g. sanitation, poverty reduction), and probable city budget constraints, **planners are encouraged to first consider so-called "low regrets" adaptation actions**.

Also referred to as "no regret" options, "low regret" adaptation options **enhance a city's adaptive capacity, reduce its vulnerabilities and deliver broad community benefits,** regardless of climate changes. These options contribute directly to larger, beneficial city development goals (e.g. improving storm and sanitary sewers, water supply upgrades) that a city may have already identified as important projects. Low regret investments not only address urgent community development issues, but also very likely contribute to the city's overall climate change preparedness and adaptive capacity.

See *Step 5: Option Identification*, for more information.

Source: Rasmu Heltburg et al. (2008). Addressing Human Vulnerability to Climate Change: Toward a "No Regret" Approach. World Bank. November.

4 Planning for Climate Change: The planning cycle

This chapter outlines the strategic, values-based climate change planning cycle. The chapter is broken into the four modules that correspond to the planning cycle's four guiding questions: ***What is happening? What matters most? What can we do about it? Are we doing it?***

Answering these questions requires users to go through a corresponding set of individual **steps**. Each of the nine planning steps is further broken down into more detailed **tasks**, many of which are supported by 42 corresponding **tools**. The planning tools are provided in a companion document, *Planning for Climate Change: A strategic values-based approach for urban planners – Toolkit*.

Again, it is important to remember that the planning process is **flexible and non-linear** and is designed for a range of situations and realities. It is anticipated cities will:

- Be at **different stages** of climate change planning (e.g. some may have already completed a Vulnerability Assessment as outlined in Module A).
- Be using the guide for **different purposes** (e.g. one city may use it to support development of a city-level *Climate Change Action Plan*, while another city may use it to support only one planning step (e.g. a *Vulnerability Assessment*).
- Have **different planning structures, processes** (e.g. some cities may have a sophisticated planning approach and supporting plans, while others may not) and **authorities** (e.g. some cities may have limited planning responsibilities, as the authority rests with state of provincial governments).
- Have **different resources and capacities** (e.g. some cities may have the human, financial and technical resources to undertake a process themselves, while others may have to secure external funding or technical support).

While cities where planning for climate change is more advanced might enter the process in Module 2 or later, they are strongly encouraged to **review the previous planning tasks** to ensure that they have adequately covered them. The same applies to users who may be using the guide to support only a single step of the planning process (e.g. Step 3: Vulnerability Assessment).

Module A

WHAT IS HAPPENING?

This module includes **three steps** and will help planners answer these questions:

STEP 1 *Are we ready to undertake a climate change planning process?*
STEP 2 *Who needs to be involved at the city and in the community and how can they be engaged?*
STEP 3 *How is climate change affecting the city and who is most vulnerable to these changes?*

The **first two steps in this module are the foundation for any successful planning process**. Many projects that stall will return to these foundational planning steps after failing to get off the ground.

After completing Module A, planners and stakeholders will:

- ✔ Have a shared, clear awareness of the need to address climate change in their city.
- ✔ Know which city, community and local stakeholders to involve and how to do it by completing their *Stakeholder and Engagement Plan.*
- ✔ Understand what is happening with climate change in the city through the creation of a *Vulnerability Assessment (*including where to source the information required for it)

The graphic illustrates this module's three planning steps and major planning tasks.

STEP 1: GETTING STARTED

The first step in planning is to get organized and "**plan to plan**." A successful process – or any of the nine steps in the strategic planning approach – requires a **sustained level of commitment**, the **dedication of resources**, and the **involvement of key city staff and climate change stakeholders** (i.e. interested and affected parties) from across the local area. It also requires organizational and institutional capability.

This planning step involves the following five tasks:

- *TASK 1.1: Frame the challenge*
- *TASK 1.2: Get organized*
- *TASK 1.3: Form a core planning team*
- *TASK 1.4: Determine organizational capacity*
- *TASK 1.5: Plan the planning process*

Task 1.1: Frame the challenge

The first task involves understanding the "triggering event" or motivation for the climate change planning process. While the motivation and triggering event will obviously differ from jurisdiction to jurisdiction, **exploring and understanding the larger planning context will help to frame the planning challenge** and provide background information for other project stakeholders during the initial project stages.

TOOL 1-A
Framing the Challenge Questionnaire

Sometimes the triggering event might be a crisis, disaster or event that can be clearly linked to climate change (e.g. drought, increased or intensified flooding). In rapidly growing cities, the struggle to effectively manage and direct urban growth away from climate change hazard areas (e.g. low lying, coastal informal settlements) might be the catalyst. At other times, there may be no specific triggering event, but a slow and gradual build up of environmental, social, or economic impacts (real or perceived), and awareness of them, that can be attributed to climate change.

These impacts may relate to changes brought on by increasing urbanization, shifts in development patterns (e.g. rural/urban migration) and changes to environmental systems. In some cases, the motivation may also come in the form of a national, state or local government direction or mandate to undertake climate change planning and adaptation project implementation. Sometimes, the motivation to undertake a climate change planning process results from funding or technical support offered by an external or international donor agency.

Aerial view showing Kampala from Nakasero Hill.
© UN-Habitat/Nicholas Kajoba

A case in point

GETTING STARTED – KAMPALA, UGANDA

With support from the UN-Habitat Cities and Climate Change Initiative (CCCI), a climate change planning project was initiated in Uganda's capital and major urban centre. Kampala is characterized by urban sprawl and increasing amounts of informal settlement in high-risk areas that are prone to flooding and sanitation issues. Significant observed changes in rainfall patterns and temperature were determined to pose risks to the city (e.g. flooding due to increased rainfall and associated stormwater runoff, food security). Although there was no specific trigger for the initiation of the project (as climate change was not a major issue for municipal governance), increasing concern about climate change at the national level has influenced efforts to mainstream climate concerns into municipal planning. This project involved a stakeholder engagement process to mainstream climate change concerns into the Kampala City Development strategy. A core planning group led the establishment of stakeholder networks at various levels of government. Various demonstration projects, including city greening, alternative energy use, clean wood fuel use, climate proofing of infrastructure and energy efficient urban transport systems, are in progress.

More information: www.unhabitat.org/downloads/docs/CCCIKampalaUganda.pdf

Task 1.2: Get organized

Without coordination, organization, respected leadership and commitment from core city stakeholders and decision-makers, the planning process can stall before it starts. It is also important to understanding how **climate change planning can support existing city plans and planning processes**. These organizational elements will help build:

TOOL 1-B Getting Organized Worksheet

- Political awareness and support for the initiative
- City staff awareness and support for the initiative
- Community and other key stakeholders' awareness and support for the initiative

This step may require educating local leaders, both formally and informally, about the need for action and the planning process being proposed well ahead of initiating the process itself. Building relationships with these key stakeholders is an important component of this step, especially as these stakeholders may become more formally involved in the planning process as one of the members of the core planning team (see Task 1.3), or as members of a project stakeholder group (see Step 2).

To help assess what should be done, consider the following questions:

Who is going to lead the effort?

- *If the local government is going to initiate the process (which is the preferred route), which departments will be involved in addition to the planning department (or equivalent)?*
- *If the project is being driven by an external organization (e.g. donor agency, multi-lateral agency), who is the local city liaison and contact? What authority and responsibility would the city have in this scenario? What is the specific mandate of the external organization?*

Can it be linked to existing planning work?

- *At the project outset, it is important to start looking for links and connections between existing city plans and strategies, planning processes and city visions.*
- *Are there ongoing planning initiatives that could be linked to or that would help support climate planning work?*

Regardless of who initiates this step and how it might be linked to existing or ongoing planning programmes, **formal agreements or new structures might need to be created to direct, plan and fund the climate change planning process**. For example, the local city government may choose to engage non-governmental organizations (e.g. CARE International, ICLEI) or multi-lateral agencies (e.g. UN-Habitat, European Union, World Bank, etc.).

Task 1.3: Form a core planning team

It is a good idea to notify and seek commitment from a short-list of key players in the government and the local area, such as city council members, department heads, senior city planning staff, and representatives from government agencies as well as local stakeholder organizations (e.g. important non-governmental organizations, multi-lateral agencies, donor agencies, etc.).

This group can be **formally brought together as a core planning team**. Often a core group is established before the actual planning work begins, with a designated leader responsible for its progress. The team would likely be small – ideally no more than six members – and provide input, build relationships and linkages to important stakeholder groups, source and secure needed funding, and provide additional technical and human resources to the project.

Depending on a city's size and capacity, there may be different ways of organizing the planning team. In some cases, you may wish to set up a separate executive committee of senior city staff and elected officials that would provide high-level oversight and guidance to the core planning team. In other cases, particularly in smaller cities, it is more likely that there will be just one planning team that includes senior city staff or executives, and also drives the planning work.

An effective core group can also encourage a positive, participatory and transparent process, in addition to promoting the inter-departmental and inter-agency cooperation that will help the overall planning process succeed.

Task 1.4: Determine organizational capacity

After going through the initial tasks, the **core planning team should determine its own capacity to implement the process** (Tool 1-C). Here, if resources permit, it may be a good idea to dedicate one city staff member to lead the process. Ideally, the staff person should have some experience in, and awareness of, climate change planning. If such a staff person does not exist, or does not have the time to lead the process, it may be necessary to consider bringing in an external person to help get the process going and, potentially, to provide technical and capacity support throughout the strategic planning process.

TOOL 1-C External Assistance Assessment

At this step, it is also valuable to carry out a preliminary review and assessment of the city's adaptive capacity, as illustrated in Section 3.3.3: Climate planning and city planning. This assessment will be cursory and explored in much more detail in Step 3: Vulnerability assessment.

THE IMPORTANCE OF THE PROCESS LEADER OR FACILITATOR

All climate change planning requires cooperation and collaboration amongst a wide range of city staff and departments, and external local and community stakeholders. Because of this – and the fact that stakeholders may disagree on issues and approaches – **having a good facilitator is critical**. A good facilitator creates a positive and cooperative working environment and helps to maximize group productivity and participation. A facilitator performs three main functions:

1. Assists the group to establish rules and procedures for the process;
2. Ensures that stakeholder communication is effective and fair; and,
3. Maintains group progress.

Much of the **success of the process depends on the skill of the individual(s) managing or facilitating it**. Sometimes additional training may be required or an outside facilitator may be necessary.

Strategic planning workshop in Buhcanan, Liberia
© EcoPlan International, Inc.

Task 1.5: Plan the planning process

Each city is unique in terms of its planning context (i.e. capacity, governance, leadership, policy, planning authority), current climate situation (i.e. threats, vulnerability, adaptive capacity), and stage of planning for climate change (e.g. some cities may have developed plans, while others may not have). Because of this, it is very likely that the **scope and expectations** for each planning initiative will be different.

It is important to be as clear as possible about the **scope or expectations for the project before getting started**. Do you intend to go through the entire process and develop a stand-alone *Climate Change Action Plan*? Or do you anticipate using the guide to support a more modest, but nevertheless critical step, like completing a *Vulnerability Assessment Report*? While the scope of the project can certainly change and evolve as you move through the process, having an idea of what you expect to achieve is important.

By having an **understanding of the potential end goal, it will be easier to design the planning process and ensure that there are the resources to complete it** (e.g. staff capacity and resources, political/organizational support, funding). To help design the process, ask yourself these questions:

- *What is the scope of the project (a Vulnerability Assessment Report, an update to one sectoral plan to include climate change actions, a stand-alone Climate Change Action Plan)?*
- *What are the potential connections and links to existing plans, strategies and programmes (i.e. what is the mainstreaming potential)?*
- *What is the potential time frame?*
- *What resources will be needed – time, money, effort and skills?*
- *Where is funding for the planning process going to come from and how much is likely to be available?*
- *Where is funding for implementation going to come from?*
- *What are the logistical and human resources challenges and opportunities of the local context (interest level of key stakeholders, political issues, communication issues, conflicts with other processes, bad experience of stakeholders with previous planning processes)?*
- *Is there a higher-level government programme for climate change planning that could be used to support your city's initiative? See National Adaptation Programmes of Action text box.*

NATIONAL ADAPTATION PROGRAMMES OF ACTION (NAPA)

Established through the United Nations Framework Convention on Climate Change's Least Developed Countries (LDCs) work programme, the National Adaptation Programmes of Action (NAPA) process is designed to help LDCs to address climate change adaptation, identify vulnerabilities, and prioritize short-term actions. Recognizing that many LDCs have a high level of vulnerability and a low adaptive capacity, the process is intended to increase knowledge and build networks that may help LDCs to prepare long-term adaptation plans. The NAPA process is not intended to be a substitute for broader, long-term climate change planning, but it does help LDCs to identify their immediate needs.

Although they are prepared at the country level, NAPAs incorporate community level information, and report on existing grassroots coping strategies. Each NAPA includes a summary of existing vulnerability and adaptation plans, and barriers to implementation. A vulnerability assessment is included, along with a list of priority actions and projects.

If your country has prepared a NAPA, it may be a useful source of information on the existing capacity, vulnerability and adaptation planning initiatives in your region or local area. However, the quality of NAPAs is variable, so they should be included as only one of many sources.

For more information on the NAPA process, including completed NAPAs, and a local action coping database see: http://unfccc.int/adaptation/knowledge_resources/ldc_portal/items/4751.php

Given the scale and scope of climate change, it is important to remember that the project **does not have to result in fixing everything**. For cities with limited resources and capacity, it might be better to engage in a more modest, initial planning exercise instead of attempting something that is too ambitious that may fail, or never be implemented.

Here, it is worthwhile for the planner leading the process to take some time to **review the planning process in its entirety** as a desk review exercise to become familiar with the planning process and to think about the questions you will be considering during the process:

MODULE A: What is happening?

- *Who are the city-level partners and local community stakeholders and how can they be involved?*
- *What are the city's major climate vulnerabilities and threats?*
- *What city plans and processes are underway or planned in the near future that could accommodate and benefit from climate change planning?*

MODULE B: What matters most?

- *What are the city development priorities based on existing plans and programmes?*
- *What do you think matters most to the local community and stakeholders?*
- *Do city objectives and goals match local community and stakeholder priorities?*

MODULE C: What can we do about it?

- *What are some climate change options that could be undertaken?*

MODULE D: Are we doing it?

- *How could they be implemented, monitored and evaluated?*

Going through the planning process in this manner will help flag potential issues, challenges and opportunities.

After you have completed Step 1, it may be helpful to go through a review checklist to ensure key tasks have been completed.

STEP 1: REVIEW CHECKLIST	✔	COMMENTS – *Why not? What are the issues?*
✔ Is there organizational and political leadership to support the process?		
✔ Is there commitment to complete and implement the plan or project?		
✔ Has a core planning team been formed and/or the individual responsible identified?		
✔ Has organizational capacity been considered?		
✔ Is outside expertise required? If so, has it been retained?		
✔ Are resources likely to be secured and/or secured easily – funding, time, human resources?		
✔ Is the project scope established?		

STEP 2: STAKEHOLDERS AND PARTICIPATION

In addition to engaging different city staff, departments and decision-makers, a participatory planning approach **engages different local and community stakeholders** so that their issues, views, concerns and values are included in the planning process. Stakeholder engagement also improves the planning process and **builds broader public awareness of, and support for, resulting climate change adaptations and mitigation actions**.

Local community stakeholders can act as ambassadors or messengers for the planning project, both within the local government and with the broader community. They can:

- Share information about the project (with their organizations and networks).
- Collect local climate change knowledge (exposure, sensitivity, adaptive capacity).
- Publicize any planning events (workshops and community outreach).
- Share results about the project (with their organizations and networks).

Local community stakeholders also play an important role throughout the planning cycle including:

- ✔ **Step 3: Vulnerability assessment –** where they will likely be key partners providing local community-level climate observations, technical input and review of outputs.
- ✔ **Step 4: Issues and objectives –** where they will help to identify local values and the community development objectives that will be used to assess and prioritize potential climate change adaptation options or actions.
- ✔ **Step 5: Option identification –** where they will help to identify potential climate change adaptation options.
- ✔ **Step 6: Option assessment –** where they will help to screen, assess and prioritize potential climate change adaptation options or actions.
- ✔ **Step 7: Implementation –** where they may be important players in implementing (and mainstreaming) some of the potential climate change adaptation actions.
- ✔ **Step 8: Monitoring and evaluation –** where they may be responsible for helping monitor certain climate actions and will likely assist in regular *Climate Change Action Plan* evaluation activities.

While engaging stakeholders can take more time and require more careful facilitation, their engagement provides better and more durable results. Why? Because it **engages not only those people who are most vulnerable** to climate change impacts, but also those sectors and organizations whose participation **will be critical to the implementation of resulting climate change actions**.

While local community stakeholders and their levels of participation will undoubtedly change over the course of a project, **getting the right ones involved from the beginning improves the odds of a successful outcome**. Stakeholder engagement generally will take two main forms:

- **A stakeholder advisory group –** this is a smaller group of key community stakeholders that will have continued involvement throughout the project; and
- **Broader community involvement –** outreach to the broader community carried out at various points in the project through a variety of means (e.g. community workshops, surveys, interviews, media).

The planning step involves the following four tasks:

TASK 2.1: *Identify stakeholders*
TASK 2.2: *Establish a stakeholder advisory group*
TASK 2.3: *Establish stakeholder advisory group procedures*
TASK 2.4: *Determine the level of broader community engagement*

Residents of the town of Harar in Ethiopia line up for water.
© UN-Habitat

Task 2.1: Identify stakeholders

Selecting local community stakeholders both to be part of a stakeholder advisory group (e.g. Climate Change Advisory Committee) and for broader, more general outreach is a critical step in the planning process and warrants careful thought.

The composition of the stakeholder advisory group will help to determine the level of community support for any resulting climate actions. Beyond senior city staff and decision-makers – who should be part of any stakeholder group – other typical stakeholders outside of local government include **representatives from groups that speak for broader, local community groups or interests, including vulnerable and traditionally under-represented groups (women, urban poor, youth)**.

TOOL 2-A Stakeholder Identification Worksheet

The stakeholder advisory group can include relevant **non-governmental organizations** (NGOs) and **community-based organizations**, **educational and academic institutions** with expertise or experience in climate change. It also may be valuable to include **regional governmental representatives**, because much planning needs to address impacts that are more regional in nature and that require inter-agency cooperation to address. Neighbouring municipalities and local governments should also be engaged where practical and feasible. In most countries, climate change information and data may be most available from national government institutions, especially those which represent their countries in global climate change discourse and negotiations. If possible, it would be good to involve these individuals as part of the advisory group and to allow the group to get updated information and relevant guidance from them.

Here, it is important to clarify that the **stakeholder group is an advisory group that helps support and improve project decision-making**. It is not, however, the decision-maker unless this is specifically stipulated and agreed to in the Terms of Reference (see Task 2.3). The purpose of the stakeholder group is to help represent a broad segment of the urban population affected by climate change in the planning process The group does provide critical insight into **what** decisions need to be made, **how** they should be made, and **why** some decisions should be made in a given way, but it is not typically a decision-maker.

Table 5 illustrates a number of sectoral stakeholders and the potential contribution they could make to the planning effort. **Please note that the table is not exhaustive.** There are additional groups and organizations that could be considered. Depending on individual capacity, groups may bring additional or fewer resources to the planning process.

LOCAL GOVERNMENT STAKEHOLDERS

Inter-departmental **cooperation and collaboration** at the city-level is crucial for successful climate planning, as multiple departments are likely going to be involved in the implementation of any adaptation project (e.g. planning, engineering, finance, health).

IDENTIFYING PROJECT CHAMPIONS

When identifying a stakeholder group, it is important to identify individuals who can act as project champions. A champion is an individual whose **energy, skills, political and administrative connections, or community profile can help to initiate and/or maintain the process, sustain commitment to the project** (staffing, resources, etc.) and help to ensure a good information flow between the stakeholder group, other project staff and the broader community.

Champions are **able to build connections and networks** with political, social and economic actors that have institutional power, organizational capacity and support. A champion may be a politically powerful person with the ability and capacity to effect change, who also happens to be climate-aware, is a community leader who can motivate and educate in vulnerable communities, or is a motivated planner (or other local government official) willing to put effort and time into the planning process. While a champion may not be evident at the beginning of the project and may emerge at later stages, they are important to identify, engage and support. **Having a champion will help to ensure success of the planning and implementation process and that long-term benefits are realized.**

Planning workshop in Barangay Cabid-an, Sorsogon City, Philippines.
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TABLE 5: Stakeholders and potential climate change planning contributions

STAKEHOLDER	POTENTIAL CONTRIBUTION – LINK TO CLIMATE CHANGE PLANNING
Government	
City departments (e.g. planning, engineering, transportation, finance, health)	Project leaders or coordinators. Technical expertise, policy and programme expertise, staff/administrative/logistical resources, funding and financial resources, vulnerability and risk assessment input, implementation support through existing planning programmes/ policies/initiatives, monitoring and evaluation.
Local government elected representatives	Project leaders or coordinators. Political support and leadership, technical expertise, policy and programme expertise, vulnerability and risk assessment input, implementation support through existing planning programmes/policies/initiatives.
Neighbouring local government representatives	Political support and leadership, technical expertise, policy and programme expertise, vulnerability and risk assessment input, implementation support through existing planning programmes/policies/initiatives.
District, regional and national governments	Climate change knowledge, staff and administrative support, funding, facilities and materials, outreach and communications, technical expertise, vulnerability and risk assessment input, critical implementation support (policy development, implementation and enforcement), monitoring and evaluation.
Local Area and Non-Governmental	
Environmental groups	Climate change knowledge, local knowledge, outreach and communications, technical expertise, funding channel, vulnerability and risk assessment input, implementation support, monitoring and evaluation.
Neighbourhood groups	Outreach and communications, local knowledge, vulnerability and risk assessment input, implementation support, monitoring and evaluation.
Local area leaders	Community credibility and support, local knowledge, outreach and communications, vulnerability and risk assessment input, implementation support, monitoring and evaluation.
Local religious groups	Community credibility and support, outreach and communications, vulnerability and risk assessment input, implementation support, monitoring and evaluation.
Under-represented groups (e.g. women's and minority groups)	Outreach and communications, vulnerability and risk assessment input, implementation support, monitoring and evaluation.
Public Sector	
Sector boards and authorities (health, education, transport)	Outreach and communications, implementation support (sectoral policy development, local knowledge, implementation and enforcement), monitoring and evaluation.
Educational institutions (technical schools, universities)	Staff and student support, climate change knowledge and technical expertise, facilities, outreach and communications, critical implementation support (policy development, implementation and enforcement), monitoring and evaluation.
International agencies	Staff and administrative support, funding, technical expertise, implementation support, monitoring and evaluation.

STAKEHOLDER	POTENTIAL CONTRIBUTION – LINK TO CLIMATE CHANGE PLANNING
Business and Labour	
Small and medium-sized businesses	Funding, facilities and materials, outreach and communications, implementation support, monitoring and evaluation support, local knowledge, vulnerability and risk assessment input, political-community support.
Trade and labour unions	Funding, facilities and materials, outreach and communications, monitoring and evaluation, vulnerability and risk assessment input.
Real estate developers	Funding, outreach and communications.
Banks, credit unions and other financial groups	Funding, facilities and materials, outreach and communications.
Chambers of commerce and business groups	Funding, outreach and communications, and administrative support.
News media	Outreach, communications, public education, and awareness raising.
Professional associations	Technical support, climate change knowledge (e.g. professional engineering or planning association members), outreach and communications.
Privately owned / managed utilities	Funding, facilities and materials, technology and infrastructure, expertise.

Some questions to consider when identifying stakeholders and determining the larger public processes include:

- *Have all relevant stakeholders been identified? Consider:*
  - *Their stake in the issue or vulnerability and sensitivity to climate change impacts (e.g. women, the urban poor)*
  - *Their stake in climate change mitigation (e.g. major emitters of greenhouse gas)*
  - *Their formal position (e.g. government authority)*
  - *Their control over relevant resources (e.g., money, expertise)*
  - *Their power to promote, hinder or block implementation (e.g. activist groups, lobby groups).*
- *What can they bring to the process (skills, knowledge, experience)?*
- *Who has the skills, interest, political will, credibility and/or commitment to do the work that must be done?*
- *Have they been invited to participate?*

Task 2.2: Establish the stakeholder advisory group

TOOL 2-B
Stakeholder Analysis Matrix

The optimal size of a stakeholder group depends on a common sense assessment of how many people are needed. If a group is too large, it is difficult to move forward and some participants might feel that they are not being heard. If it is too small, it might not be representative enough (within the local government and with the broader community) and may fail to generate support. Conventional wisdom suggests that a stakeholder advisory group of less than 20 people is most effective.

It is important to remember that not all stakeholders will be adequately represented in a meeting or committee setting. This is especially true for marginalized groups that are more vulnerable to climate change impacts. For this reason, **other forms of participation should be considered in the process to allow these voices to be heard** (e.g. "tea-time discussions", "on-the-street" intercept interviews, focus groups, etc.).

The key roles and responsibilities of stakeholder advisory group members include:

- Providing a link between local community stakeholders and the city.
- Representing local government departments (to ensure that city interests, planning processes, capacity, etc. is clearly understood by local community stakeholders.
- Representing broader, local community interests and interest groups, including climate-vulnerable groups (e.g. women), business groups, environmental NGOs, professional associations (e.g. professional planners associations), universities, national/regional government representatives, etc.
- Ensuring that any engagement process is inclusive and engages the most climate change vulnerable groups.
- Helping to act as community ambassadors, messengers or public liaisons for the project.
- Consulting with local government staff, public, stakeholder constituents (informally and formally).
- Providing reports, communicating decisions of the group to other partner groups and local community stakeholder organizations.
- Providing local knowledge and input for the determination of local climate change vulnerabilities and risks.
- Defining local climate change priorities and assessing potential trade-offs
- Getting support and commitment from key partners for implementation of climate change actions.
- Once the stakeholder group has been established, it is important to have a comprehensive introductory workshop where the group is:
- Introduced to the project, including project scope, timelines and expectations.
- Introduced to the city planning process and its abilities, capacity and limitations.
- Presented with their role in the climate change planning process .
- Given an overview of climate change, from global trends to local, city-level impacts and trends.
- After you have completed Task 2.2, it may be helpful to go through a review checklist to make sure you have included the right cross section of stakeholders in your advisory group.

STEP 2 – TASK 2.2: REVIEW CHECKLIST – STAKEHOLDER GROUP SELECTION	✔	COMMENTS – *Why? What are the issues?*
✔ Key decision-makers from local government departments and agencies		
✔ Political and community leaders who can act as "champions" of the planning effort		
✔ Individuals or climate-vulnerable groups		
✔ Traditionally under-represented groups – women's groups, informal economy		
✔ People who can represent more than one interest		
✔ Individuals or groups willing or able to play a leadership role in the planning process		

A case in point

PLANNING STAKEHOLDER GROUPS - ULAANBAATAR, MONGOLIA

As part of a Cities and Climate Change Initiative (CCCI) project, a 14 member stakeholder group was established to help lead, inform and guide a climate change planning initiative in what is probably the coldest capital city in the world. The stakeholder group includes representatives from the Ulaanbaatar local government, research and engineering organizations, NGOs and community representatives. The group was established to help guide participatory impact and vulnerability studies in a pilot neighbourhood called Ger, and to help build and strengthen institutional capacity and networking of stakeholders. Following the vulnerability assessment, the stakeholder group will help to prioritize climate change adaptation and mitigation activities.

More info: www.fukuoka.unhabitat.org

Ger area, an informal settlement, in Ulaanbaatar, Mongolia.
Anthony Knuppel on flickr.com, CC BY 2.0

Task 2.3: Establish stakeholder advisory group procedures

Clear operating terms or procedures are a critical component of a successful stakeholder group. Some key considerations include confidentiality, communications protocols, and rules for entering and leaving the group. **These terms of reference should be formally agreed to by the members of the stakeholder group** and, where necessary, periodically reviewed.

By answering the following questions, many potential expectations of the stakeholder group can be effectively addressed:

- *What is the group empowered to do (e.g. give advice and make recommendations)?*
- *What **process** resources does the group have (e.g. what is the budget for renting space, group administration, technical support)?*
- *What **implementation resources** does the group have, or might have, to work with (e.g. are there local or national government funds, donor funds, etc.)?*
- *Are there time constraints?*
- *What are the reporting procedures?*
- *What are the roles and responsibilities of each member of the group?*
- *Can new members join part way through? If so, what is the process?*

The answers to these questions will effectively make up your Stakeholder Group Terms of Reference.

MEDIA STAKEHOLDERS

Keeping the media informed and up-to-date on your climate change planning process can help to **generate positive media coverage and expand community awareness** of the initiative and the impacts of climate change in your community. The media should be invited to larger workshops and to cover any events you might be organizing. They should also be sent periodic project updates (i.e. news releases). As "influence makers", **media can be an important ally and stakeholder** in your larger climate change planning initiative.

Task 2.4: Determine the level of broader community engagement

Determining when and how the broader community (i.e. residents) is to be involved in the climate change planning process will be one of the first tasks of the stakeholder group. While local **community participation is critical to collecting and confirming information on local climate change impacts, risks and priority actions**, the best means of getting this information needs to be determined. It is also important to determine how this information can be collected and its use reported back to the wider community in the most cost effective and culturally appropriate manner.

Community learning, Siddhipur, India.
© UN-Habitat

Here, it is important to recognize that community engagement processes can be expensive and time consuming. It will be the stakeholder group's responsibility to determine **the level of local community engagement most appropriate for the project**, the methods to engage them, and the points at which the engagement is to occur.

Remember, too, that having **multiple forms of consultation at different steps of the process with different groups** can:

- Help to keep stakeholders interested and engaged in the process;
- Provide methods that some groups may feel more comfortable with (e.g. some people may feel intimidated at larger, more formal events);
- Help to generate and maintain media awareness.

Sometimes, engagement with the broader community will be extremely limited and generated primarily through the stakeholder group. This is one more reason to have a stakeholder group that represents a range of local community interests and voices.

While a detailed public participation plan is not typically required, the stakeholder group should develop a simple brief that outlines:

1. The **level of local community engagement** to be undertaken and why;
2. The **methods** to be used;
3. The **general timing** of community outreach; and
4. How information and input collected will be **reported back to the community** to maintain project transparency.

TABLE 6: Engagement – common goals and activities

POSSIBLE PUBLIC INVOLVEMENT – GOALS	PUBLIC INVOLVEMENT – ACTIVITIES
- Raise climate change awareness – greenhouse gas emissions, vulnerabilities, impacts, risks - Establish a common factual base of information - Gather advice, feedback and climate adaptation option ideas - Relationship building - Gain a better understanding of public opinion - Support communications and transparency	- Forums, open houses, town hall meetings - Workshops and focus groups - Stakeholder groups and advisory committees - Social media - Conventional media (press releases, articles, news stories) - Cell phone engagement (SMS messages) - Flyers or posters - Surveys (business, resident)

STEP 3: VULNERABILITY ASSESSMENT

Module A's third step, Vulnerability Assessment, is the biggest planning step from a technical perspective. Step 3 will determine the following:

- Your city's **exposure** to current and long-term climate conditions and hazards (e.g. temperature, precipitation, sea-level rise, the frequency and magnitude of extreme weather events).
- The **sensitivity** or degree to which your city's people (e.g. women, the elderly, urban poor, youth), places (e.g. coastal, river valley, specific infrastructure and facilities, ecosystems), institutions (e.g. governments, agencies, stakeholder organizations) and sectors (e.g. transportation, housing) are affected by climate change-related hazards and opportunities.
- Your city's **adaptive capacity**, or how resilient people, places, institutions and sectors in your city are, and their ability to adapt to current and future climate change stresses.
- What people, places, institutions and sectors are **most vulnerable** and least resilient to climate change (and potentially require the most attention in your *Climate Change Action Plan*)?
- Some **preliminary adaptation options**, or actions, to reduce identified vulnerabilities and to further evaluate in Module D, Step 6.

There are a number of different approaches that can be used to determine climate change impacts and assess your city's vulnerability. This guide's approach is based on UN-Habitat's Cities and Climate Change Initiative (CCCI); it was field tested in several locations in Southeast Asia and used as a training tool at the city level as well as for trainings for country-level, regional and global audiences. It emphasizes a less technical approach that is supported by good climate data to make it easy for local governments to apply. Having some mapping resources (e.g. geographic information systems – GIS) and staff or contracted support with climate planning knowledge and capacity is valuable at this stage.

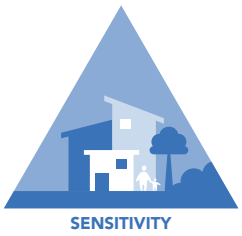
This planning step involves the following five tasks:

TASK 3.1: *Exposure analysis*
TASK 3.2: *Sensitivity analysis*
TASK 3.3: *Adaptive capacity analysis*
TASK 3.4: *Summary vulnerability assessment*
TASK 3.5: *Preliminary adaption options identification*

While the preferred approach is to consider the Vulnerability Assessment that results from this step as just **one step in the larger planning process**, the step's output could be used as a stand-alone product where circumstances dictate (i.e. limited project funding, limited capacity). In these cases, the *Vulnerability Assessment Report* that results from this step could be used as **input into other planning processes** (e.g. environmental plan, transport plan), as a public communications and **awareness-building** tool, or as a **fund-raising tool** to help raise funds (provincial/state, national, international) to carry out the entire planning cycle and complete a full *Climate Change Action Plan*.

Vulnerability is a function of exposure, sensitivity and adaptive capacity. The three terms are described below.

Exposure: How a city is exposed to changes in the climate: what changes can already be observed, what will the climate be like in the future? Exposure considers both current and projected changes based on a review of historic and current climate information (e.g. precipitation, temperature, extreme weather events) and projected climate scenarios for your city or region. It also identifies the climate change hazards associated with the change (drought, flooding, sea level rise, increased frequency in storms) their biophysical manifestations (groundwater depletion, landslides, riverbank erosion, coastal erosion, etc.), including their current and future magnitude and frequency. For coastal communities, climate change-driven sea-level rise and coastal inundation is also considered.



Sensitivity: The degree to which exposed people, places, institutions and sectors are impacted, either positively or negatively, by climate change today and the degree to which they could be impacted in the future. As with exposure, sensitivity may be directly related to a change in climate (e.g. a change in city water supply due to climate change-related decreases in precipitation may leave 50 per cent of the population without drinking water for 20 hours per day during the dry season) or less direct (e.g. artisans depending on steady water supply to dye fabric lose their livelihoods). The sensitivity analysis is based on the socio-economic and physical realities, which represent the underlying causes for a climate change impact (e.g., poverty situation, drainage design/technology limitations, undiversified livelihood sources).

Adaptive capacity: The degree to which people, places, institutions, and sectors are able to adapt and become more resilient to climate change impacts. Adaptive capacity typically is indicated by socio-economic and environmental factors and local realities that enable a city or community to adjust its system in view of current and future risks. It may also include factors and conditions that leverage new climate conditions to become opportunities (i.e. more precipitation in particular areas may lead to new opportunities in urban agriculture or rain water harvesting).

FIGURE 6: The vulnerability framework

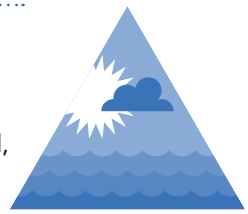
The vulnerability framework graphic (Figure 6) is a simplified illustration of how vulnerability is a function of exposure, sensitivity and adaptive capacity. Written as a basic formula, *Vulnerability = (Exposure + Sensitivity) – Adaptive Capacity*. As illustrated, where the two triangles representing exposure and sensitivity overlap creates vulnerability.

While community members' ability to limit their exposure to climate change might be limited, they can reduce their sensitivity and increase their adaptive capacity thus reducing overall vulnerability. The graphic is for illustrative purposes only. There are many possible scenarios with both exposure and sensitivity (e.g. high exposure-limited sensitivity; limited exposure-high sensitivity), and adaptive capacity.

Before beginning this step, it is important to work with both your core planning team and your stakeholder advisory committee to explain this step. They <u>all</u> need to **understand the basic vulnerability assessment framework and the terminology it uses**.

Land management in Medellin, Colombia.
© UN-Habitat/A. Padros

Task 3.1: Exposure analysis



This task will identify how your city is **exposed to changes in the climate today and how it could be in the future**. When completed, it will describe both current and projected changes, based on a review of historic and current climate information (precipitation, temperature, extreme weather events) and projected climate scenarios for your city or region. In the process it will help the core planning team to understand what relevant changes in climate the city is exposed to.

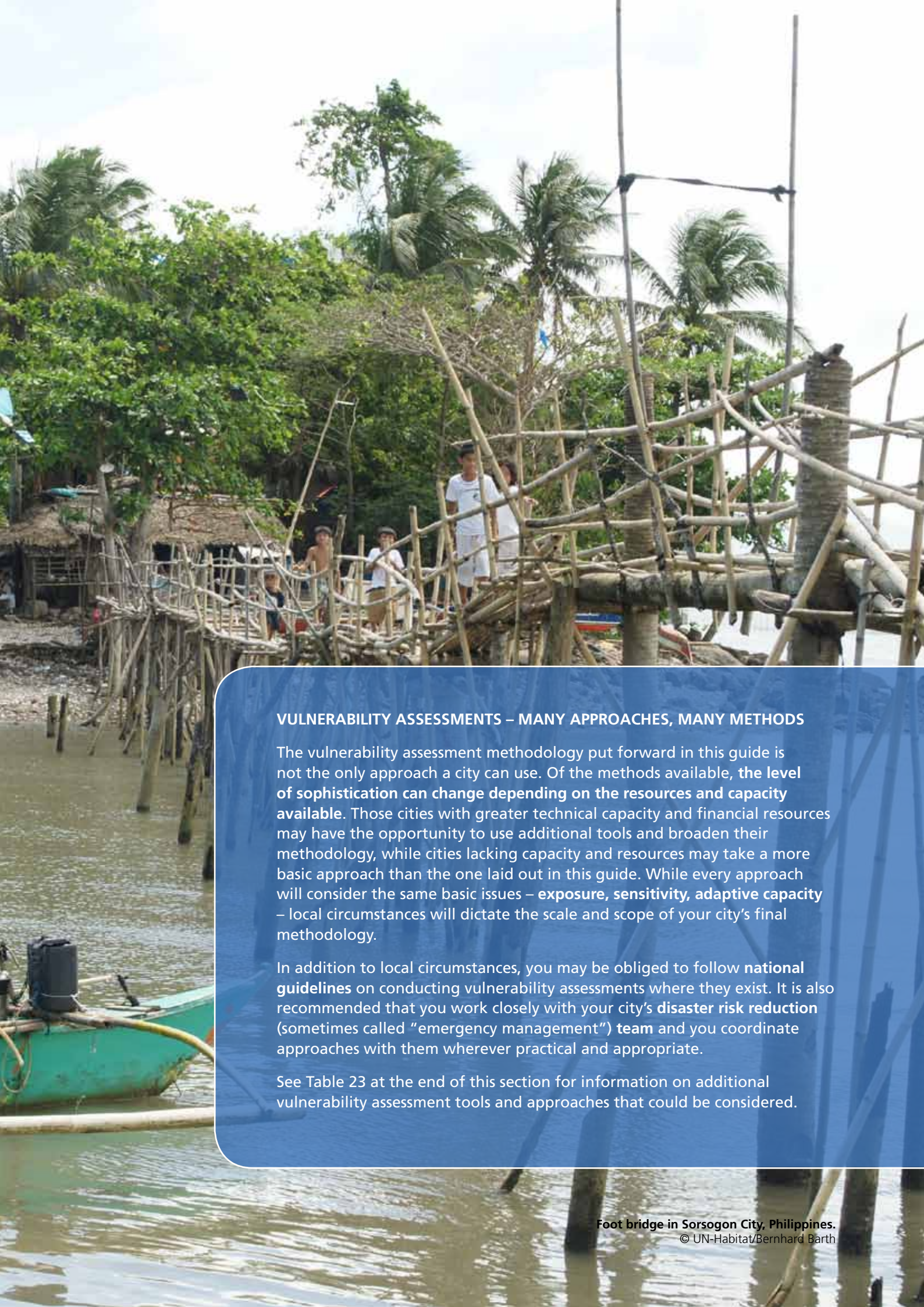
The task will identify associated **climate hazards (**drought, flooding, sea level rise, increased frequency in storms) and their biophysical manifestations (groundwater depletion, landslides, riverbank erosion, coastal erosion, etc.), including their current and future magnitude and frequency. This task will also lead to a preliminary identification of exposed people, places, institutions and sectors.

Some of the questions you will be answering in this task include:

- *How is the weather changing in my city?*
- *Are there more substantial, longer-term changes to the climate associated with these changes?*
- *Do these changes pose hazards now, or could they in the future?*
- *Who and what is exposed to the climate change hazards?*

Answering the questions will involve both your **core planning team** and **stakeholder advisory committee** (see Task 1.3 and Task 2.2). Depending upon available resources and capacity, outside technical support may also be required, particularly for the development of future climate scenarios. This task will also involve the collection of both technical data and community-based knowledge on local weather and climate.

TOOL 3-A
Weather and Climate Change Summary Table



VULNERABILITY ASSESSMENTS – MANY APPROACHES, MANY METHODS

The vulnerability assessment methodology put forward in this guide is not the only approach a city can use. Of the methods available, **the level of sophistication can change depending on the resources and capacity available**. Those cities with greater technical capacity and financial resources may have the opportunity to use additional tools and broaden their methodology, while cities lacking capacity and resources may take a more basic approach than the one laid out in this guide. While every approach will consider the same basic issues – **exposure, sensitivity, adaptive capacity** – local circumstances will dictate the scale and scope of your city's final methodology.

In addition to local circumstances, you may be obliged to follow **national guidelines** on conducting vulnerability assessments where they exist. It is also recommended that you work closely with your city's **disaster risk reduction** (sometimes called "emergency management") **team** and you coordinate approaches with them wherever practical and appropriate.

See Table 23 at the end of this section for information on additional vulnerability assessment tools and approaches that could be considered.

Foot bridge in Sorsogon City, Philippines.
© UN-Habitat/Bernhard Barth

The first step in your Exposure Analysis is to collect and review available weather and climate information. Tool 3-A provides a template for organizing this information and subsequent data that will be collected (illustrated in Table 10). **It will be referred to throughout this task.** When completed, the summary matrix will provide a summary of:

- Historical weather **trends**, including stakeholder and community observations;
- Longer-term climate change **scenarios**, including the level of uncertainty and confidence about these projections occurring;
- Principal local, city-level **hazards** (e.g. drought, sea level rise, increased precipitation and flooding) associated with current and projected climate changes;
- Major local, city-level **manifestations** (e.g. reduced crop yields, local flooding) associated with current and projected climate change hazards.

The collection of weather and climate information can begin with your core planning team and stakeholder advisory committee. Check with them to see if they have access to relevant local, regional or national weather climate change reports and studies. This will include historical weather/climate data, and future climate change projections and scenarios.

Because some technical work is required to carry out these first steps, now is a good time to determine whether you need to bring in someone with technical climate change skills and knowledge. A climate expert from a local university or government agency can **help to gather data, interpret historical trends and project future trends**. If you are able to get a climate specialist to assist, be sure to brief them on the work you have completed (Steps 1, 2, 3).

Two main types of weather and climate data will be collected:

- **Historical weather/climate data:** This information will provide historical data and will include annual and seasonal trends, averages (temperature, precipitation, etc.) and past extreme events (tropical cyclones, droughts, etc.). The collection and summary of historical data can be research intensive and fairly technical.
- **Future climate change projections and scenarios:** This information will provide projections of weather and climate changes for your city or region. Typically, climate change scenarios are based on either:
  - Historic climate trends that are extrapolated (i.e. projected) into the future; or
  - More complex climate model scenarios, typically developed using sophisticated, computer-based climate change models.

Both approaches have strengths and weaknesses. Using historic climate trends to forecast a potential future change is more straightforward, but can result in **less detailed results** than a climate model. Local climate models are very useful in the preparation of adaptation plans for cities, but they can also be complex, costly and involve climate science experts.

This guide suggests making use of available scientific climate observations (global, national, regional). If there are resources and capacity, additional computer-aided climate modelling could also be used to help develop local level climate scenarios. See the resources section for links to helpful on-line models, some of which are capable of providing regional level information.

Table 7 lists some potential data sources for climate information, which may include local, regional, national and international scientific sources.

WHAT'S YOUR CITY'S POLICY SITUATION?

As part of this task, all local government plans and policies that may include climate change-related policies or background research should be collected and reviewed (see Table 4 for a list of candidate plans and policies). The background research they may contain on your city's weather and climate could be very useful and potentially time saving.

The collected documents will also be used during Task 3, *Adaptive Capacity Assessment* to determine how well individuals, communities and the city government (and the state/provincial and national government) can respond and adapt to climate change risks. They may also provide climate adaptation options to revisit during Task 3.5 and in later planning phases (see Module C, Step 5: Option Identification).

TABLE 7: Climate change exposure (current and future) – information sources

DATA NEEDED	PURPOSE	POTENTIAL SOURCE/S
Past weather and climate data (e.g. seasons, local climate type/zone, temperature, precipitation, extreme weather events)	Show trends and the existing weather and climate data used by the city in planning. Also, this information will possibly indicate how climate change is occurring locally	- Government weather stations and agencies - Environment ministry or department (state/provincial, national, local) - Meteorological department (state/provincial, national, local) - Climate change office (or equivalent) - City/municipality profiles - Other studies (neighbouring local governments)
Climate scenario / projections (local/ national/ global)	Illustrate possible trends (and their likelihood) at the local level over the next 10, 30, 50 years	- National, state/provincial government (Environment ministry/department) - IPCC global projections - Academic Institutions
Impact reports of previous climate-related disasters	Identify potential climate related hazards and their impacts (e.g. storm surge flooding)	- Disaster management centre (or equivalent – national, state, local) - Social service department /ministry (or equivalent)

Once all climate-related data (historical and projected) has been collected and reviewed, summarize the information in Tool 3-A, columns 3 and 4.

The next stage of work is to present this information to **both the core planning team and the stakeholder advisory group** and to gather their own observations about changes to the local weather and climate. This will help to reinforce the findings and ensure that the research done so far is consistent with stakeholder's "on-the-ground" observations.

TOOL 3-B Climate Change Local Observation Template

Working with the stakeholder advisory group and core planning team, discuss the local weather-related changes that they have experienced and observed in their lifetime. Use Tool 3-B to record participants' climate observation information. Remember that climate related changes could be very broad, from changes to plant and animal populations, to drinking water availability and changes in crop yields. The figure provides an example of how a typical discussion might go during the initial assessment stage.

A WORD OF CAUTION – THE ROLE OF MULTIPLE INFORMATION SOURCES

Information sources used will likely range from community members (stakeholder advisory committee members) to scientific data, reports and experts (i.e. climate scientists). Scientific reporting is not necessarily a perfect substitute for local knowledge, nor is community input sufficient alone. **Both are required.**

Scientific observations are often regionally focused and may not account for unique circumstances at the local level. Before adopting scientific reporting as "true", validate findings with the stakeholder advisory committee. Conversely, use scientific reporting as a way to check local reporting. It is rare that community members track weather-related changes and impacts with accuracy, so citizen input can often benefit from the long-term trends documented in scientific studies.

FIGURE 7: Example climate change-related weather changes dialogue

[Note: The drought is the weather-related change and reduced drinking water is the impact. These differences and how to track them is discussed in later tasks.]

TABLE 8: Tool 3-B Climate change observation template (example)

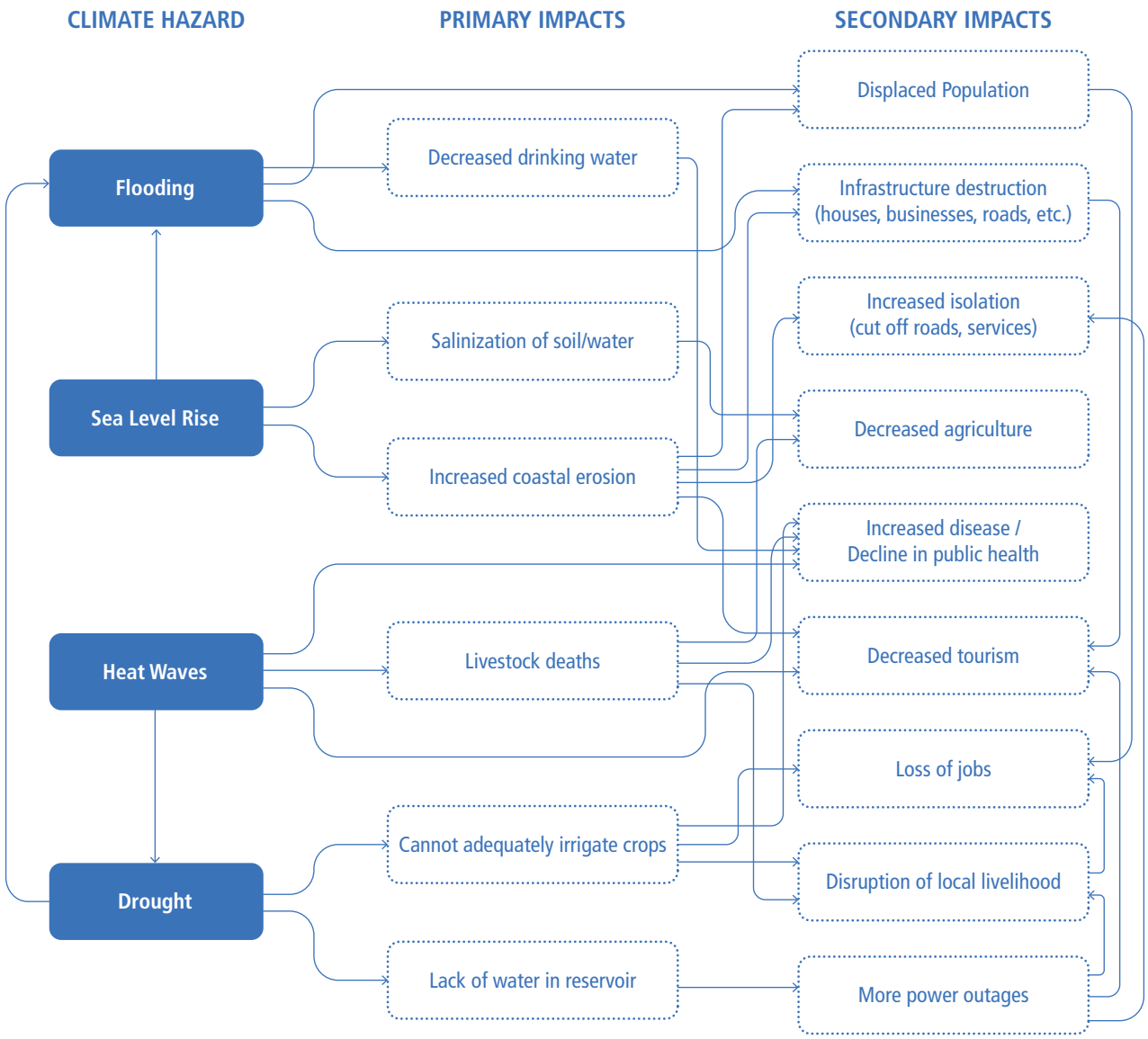
OBSERVATION	OBSERVATION DETAILS (TRENDS)
Longer drought season and less drinking water	- Began about 10 years ago - Getting longer - At first was one month and now two months
The river is flooding our neighbourhood during storm season	- Getting worse - Flooded area is larger - Places are flooded for longer periods
More power outages during hot season	- Power outages are longer and more frequent
Increased precipitation fills reservoirs and stormwater ponds	- Began noticing it about five years ago - More areas could now be supplied with water - Happens in the 3rd quarter of the year and not the 2nd quarter when rainy season is expected

After the stakeholder experiences and observations have been summarized and added to *Weather and Climate Change Summary* (Tool 3-A, column 3), the next step is to determine the **root causes, or climate change hazards,** of the observations. It is likely that numerous climate observations will stem from a limited number of major impacts or hazards (e.g. drought, flooding, heat waves, sea level rise).

A helpful tool for **visualizing and organizing** the observations and their root causes is called an **influence diagram** (Tool 3-C, illustrated in Figure 8). Influence diagrams can be developed with your core planning team and stakeholder working group, or as a part of broader community engagement activities. They can be very detailed or relatively simple. It is likely that they will not be linear, but instead will show how climate hazards and impacts are interrelated.

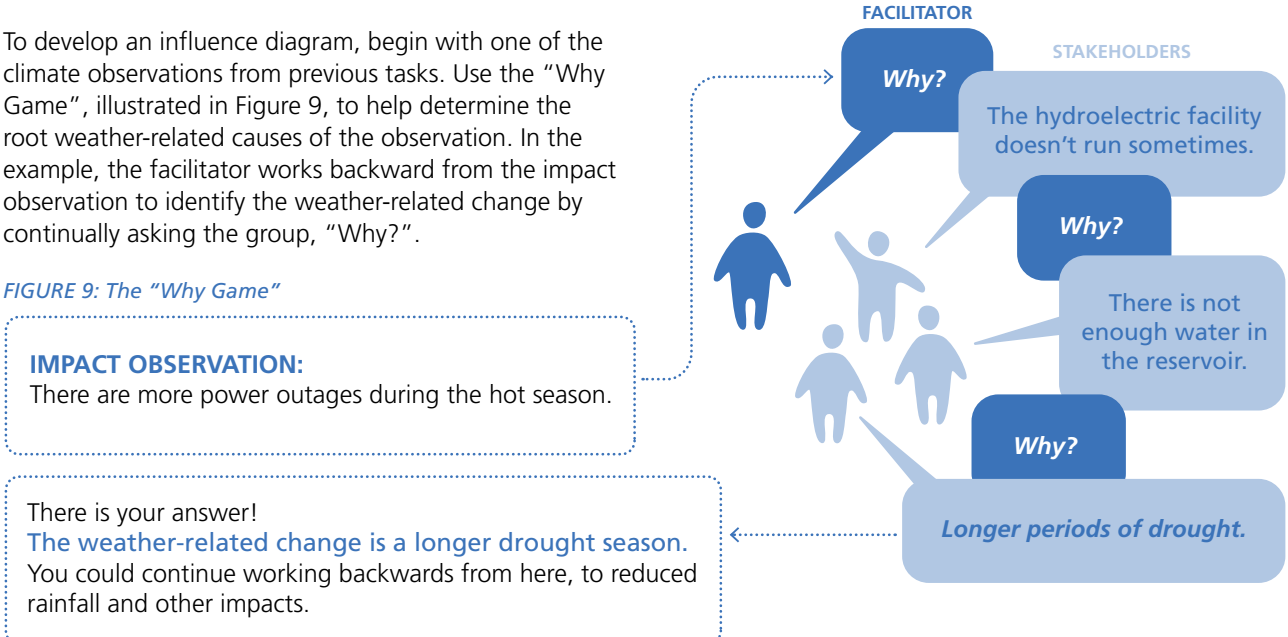
TOOL 3-C
Influence Diagrams

FIGURE 8: Tool 3-C Climate change influence diagram (example)



To develop an influence diagram, begin with one of the climate observations from previous tasks. Use the "Why Game", illustrated in Figure 9, to help determine the root weather-related causes of the observation. In the example, the facilitator works backward from the impact observation to identify the weather-related change by continually asking the group, "Why?".

FIGURE 9: The "Why Game"



Of course, the linkages between observations and climate hazards are not always as linear as presented in Figure 9. The facilitator should encourage participants to see (and draw) linkages between and amongst the observations and hazards, as illustrated in Figure 8.

Observations and hazards will vary from location to location. Table 9 provides examples of some climate observations and the underlying climate related change that is the cause of the observation. Here it is important to note that Table 9 illustrates a preliminary assessment. The impacts will be reviewed more thoroughly during the sensitivity assessment.

TABLE 9: Examples of climate change-related changes, primary and secondary impacts

LOCATION	CLIMATE RELATED CHANGE	PRIMARY IMPACTS	SECONDARY IMPACTS
Can Tho, Vietnam	Increased dry season temperatures coupled with drought	Reduce or eliminate crop yields	Poverty, food security, structural changes to economy, urban-rural migration
	Sea level rise during peak monsoon season	Flooding of agricultural lands and aquaculture facilities, destroys crops	Rural to urban migration as farming becomes too risky
Da Nang, Vietnam	Increase in typhoon occurrence	Riverbank and coastal erosion	Impacts to infrastructure and tourism economy
	Prolonged drought	Reduces agricultural production, reduced availability of water	Farmers switching crop patterns
	Sea level rise	Increased water levels in urban and coastal areas where tourism located	Carries waste/pollution to other parts of City, causing health risks
Quy Nhon, Vietnam	Flash flooding, storm surge	Inundation and saline intrusion, erosion	
	Prolonged drought	Less water availability	Less power generation capacity
Gorakhpur, India	Storms, heavy rainfall	Flooding	Clogs sewer system, vector born diseases, contamination of drinking water, limited power generation capacity
	Prolonged drought	Degradation of water bodies	Reduced water for crops / drinking
Surat, India	Coastal storms and cyclones, sea level rise	Flooding	Saline effect in drinking water, health problems, dislocation of poor located near rivers
Indore, India	Increased precipitation with increased variability and severity	Dry rivers during low rain periods	Water shortage, constraint on industry
		Flooding due to lack of stormwater management system	Increased demand for pumping power, but less generation due to upstream drought
		Vector borne disease related to precipitation variability	
Semarang, India	Precipitation variability	Flooding	Disruption of transport systems, economies, and livelihoods
	Sea-level rise	Coastal erosion and land subsidence	Impacts to fisheries and coastal homes, migration from coastal areas to other parts of City
	Drought	Water scarcity	Over-extraction of groundwater, inadequate water utility infrastructure, difficulty meeting power demand
Bandar Lampung, Indonesia	Longer dry season	Low water availability	Less rice production, hydroelectricity
	Extreme rainfall events during wet season	Flooding	Deforestation and mangrove destruction, stress on drainage systems
	Coastal erosion	Flooding	Salinization of water supply due to sea water inundation, soil salinization affects agriculture

Source: Asian Cities Climate Change Resilience Network (ACCCRN): Responding to the Urban Climate Challenge. Eds. Institute for Social and Environmental Transition, Boulder, Colorado, United States, p.60.

Use Tool 3-C to record the climate-related hazards and help to identify which climate change hazards and weather changes are most relevant to your city. Record these in Tool 3-A. This will likely require some changes and modification to the summary matrix, but will help narrow its scope to the most relevant climate change hazards and weather changes.

Now that the climate change hazards, historical trends (including stakeholder observations), and climate model scenario projections columns have been filled in on Tool 3-A, the remaining three columns are ready to be filled in.

- **Column 2: Extreme event or change to average?** Indicate the type of hazard in this column. Extreme weather events are those that worsen in severity and extent, and differ from changes to average conditions. Extreme events are things like storms and floods that are increasing in frequency and severity. A change to the average is a linear increase or decrease in precipitation, temperature, sea level rise, etc.

- **Column 5: Summary climate change projection:** This should be based on the documented understanding of historical trends, as well as on estimated changes using climate models (if possible), and any other available information. Specifics to include are:

  - **Direction (historical and projected):** *Is the level of change expected to increase at a greater rate in the future? Will it decrease? Remain the same?* Provide a summary assessment of which way the trend is going. This important step will help to focus adaptation efforts on the climate-related changes that are likely to have the greatest impacts.

  - **Uncertainty:** *How likely is it that the projections will actually occur?* If data from the Intergovernmental Panel and Climate Change (IPCC) was used, look for descriptions of "likelihood". IPCC scenarios are often characterized in terms of likelihood (i.e. probability) using terms like *virtually certain*, *very likely*, *likely and unlikely* (see *Glossary of Terms*). It is not important to figure out the exact probability, rather the goal should be to understand the full range of conditions that might arise for any given climate change hazard.

- **Column 6: Confidence:** *How confident are you about the accuracy of the summary projection? Does the data (evidence) collected support the same conclusion? Would gathering more information help, and should this be part of your plan?* Being transparent about your confidence is an important consideration when you allocate resources to both the climate hazards most likely to affect your community and the climate adaptation options best able to mitigate them.

- **Column 7: Exposure – who and what:** The final column will be explored further in the next tasks. It is useful at point, however, to start thinking about what known vulnerable populations (urban poor, women, youth, elderly etc.) might be exposed to these projected climate changes, and *how* they might be exposed (e.g. they live in an area exposed to certain climate risks, like exposed coastal areas). In addition to thinking about the people who are exposed, you can also note some preliminary ideas about places, institutions and sectors that might also be exposed. It would be useful to go back to the influence diagram (Tool 3-C) to gather ideas on who and what might be impacted by climate change.

Children playing on the bank of Teaone River in Esmeraldas, Ecuador.
© UN-Habitat/Francois Laso

TABLE 10: Tool 3-A Weather and climate change summary (example)

COLUMN 1	COLUMN 2	COLUMN 3		COLUMN 4
		Historical Trends		
Climate Change Hazard	Extreme Event or Change to Average?	Local / Regional Weather Data	Stakeholder Observations	Climate Model Scenario Projections *
Drought	Extreme event	Average length of summer dry periods increased by 15 days in last 30 years	Summer droughts lasting 4-5 weeks longer most years	Spring / Summer in year 2050: + 1.5°C temperature – 20mm precipitation – 18% soil moisture
Flooding	Change to average	Decrease in average regional precipitation during summer months	Some reports of higher spring flows in river	As above
Heat Waves	Extreme event AND change to average	Average summer Temp increased by 0.8°C in last 30 years	Hotter almost every year, sometimes much hotter	Summer in year 2050: + 2°C temperature
Sea Level Rise	Change to average	Global effect primarily driven by warming or polar regions.	None	IPCC projections of 5 – 20cm rise over next 50 years.

NOTES:

Extra rows to be added as required for all identified climate change hazards

** Climate projections can be from climate models or extrapolated from historical data. See Appendix 2: Resources for relevant climate model references*

Now that a list of current and potential future climate and weather hazards has been completed, it is important to identify the places **where these hazards occur** (i.e. the exposed locations) **and also where impacts are likely to be aggravated considering projected climate change**. For example, sea level rise is currently affecting a small coastal community, but will significantly affect all low-lying coastal areas over time.

When identifying hazard areas, the **people living or working in the area** should be identified. Exposed **places** (bridges, roads, schools, clinics, markets, etc.) and **institutions** (governments, stakeholder organizations) should also be noted. This analysis can build on the preliminary notes from Tool 3-A Column 7. In addition, and as illustrated in the sample table, the **corresponding sector(s)** that are impacted should also be noted. Use Tool 3-D (illustrated in Table 11) to record these observations.

TOOL 3-D
Overview - Exposed People, Places, Institutions and Sectors

COLUMN 5	COLUMN 6	COLUMN 7
Summary Climate Change Projection		
Projected Future Change Direction Uncertainty	Confidence	Exposure – Preliminary Notes on Who and What
- Generally increasing trend in length of dry season - Rate of change is uncertain, but expected to rise over time	High	- Farmers – reduced crop yields - City water supply – reduced reservoir levels
- Generally stable – frequency of spring floods to remain consistent over time - Influence of new developments in formerly undisturbed watershed areas unknown, but development increasing	Low	- Farmers – lost crops - Informal communities on flood plain/next to river
- Increasing trend in both the frequency and duration of heat waves	Very high	- City water supply – reduced reservoir levels - Older and younger people more susceptible to heat stroke
- General increase in local sea level - Rate of change over time is highly uncertain	Medium	- Farmers – reduced crop yields - Informal communities on coast – storm surge damage - Port – exposed to storm surges

TABLE 11: Tool 3-D Overview – exposed people, places, institutions and sectors (example)

CLIMATE CHANGE HAZARD	HAZARD AREA / LOCATION	HAZARD AREA – EXPOSED FEATURES (PEOPLE, PLACES, INSTITUTIONS)	EXPOSED SECTORS
Drought	- City-wide/Region-wide	- City reservoir, residents and businesses	- Water/Sanitation - Economy (formal & informal) - Health
	- Agricultural valley	- Farmers (some subsistence), women (majority of farm workers and market sellers)	- Agriculture - Economy (formal & informal) - Social
Flooding	- River valley lands	- Flood plain - Bridges X, Y, Z - Informal communities A, B	- Agriculture - Housing - Transport - Economy (formal & informal)
Heat Waves	- City-wide/Region-wide	- Elderly and young - Power Plant (air conditioning load leads to brown outs)	- Health
Sea Level Rise	- Coastal zone - River estuary	- Informal communities C, D - Fishing port - Estuary ecosystem	- Fisheries - Environment/Ecosystems - Housing

NOTES: Extra rows to be added as required. More detailed and specific information provided will make succeeding planning steps easier.

PLANNING FOR CLIMATE CHANGE – A SECTOR-BASED APPROACH

Sectors are thematic groupings that local and senior governments, and potential external funding agencies (e.g. United Nations, World Bank), typically use to organize planning and development work. The next planning module also uses sectors to help organize the climate change adaptation options that will be assessed. **Sectors can be broad and often overlap.** They can also be added to and expanded depending on local preferences and norms. The table provides descriptions of major sectors. Common sub-sectors that might be useful to use as separate individual, stand-alone sectors are in bold type.

TABLE 12: Example sectors

SECTOR	DESCRIPTION
Environment	This sector includes ecological systems, networks and landscapes, including forests (including urban forest), wetlands, coastal zones, watersheds, etc. The sector is sometimes referred to as **Ecosystems**.
Social	A large social welfare and development sector. It includes particular human communities, including the vulnerable populations that are critical to include in any climate change adaptation planning initiative (women, the poor, youth, the elderly). Common sub-sectors often treated as their own sectors include **Health and Nutrition, Disaster Risk Reduction** (DRR), **Education** and **Culture**.
Infrastructure	This sector includes all built physical systems, including items like water/sanitation, storm water and drainage, transportation, protective systems (dykes and seawalls), energy generation and distribution (power plants and transmission networks), and housing. Common sub-sectors often treated as their own sectors include **Water/ Sanitation, Housing/Settlements** and **Transportation**.
Institutional	Focuses on formal organization and management of governments, including local government policies, plans and procedures (i.e. legislative outputs), fiscal management, and the linkages between local government, civil society and the private sector.
Economy	This sector includes economic systems and formal economic sectors and livelihoods, including primary, secondary and tertiary economic activities. A common sub-sector often treated as its own sector includes **Fisheries/Agriculture**. Both the **formal** and **informal** economy should be considered.

Once you have created an overview of exposed places, people and sectors, it is extremely helpful to **map these features where practical and possible (Tool 3-E)**. Maps are powerful communication and project documentation tools. As a **documentation tool**, hazard mapping can illustrate climate change-exposed locations in a city and their features (people, places, institutions, sectors). As a **communication**, hazard mapping can raise awareness and facilitate discussion among stakeholders, external agencies and government officials.

TOOL 3-E
Hazard Mapping (Exposure Mapping)

If your city has good geographic information systems (GIS) data and capacity, this task should be relatively straightforward. It will involve the creation of a series of maps that illustrate exposed locations, such as flood plains, low-lying areas along the coast that are subject to storm surges and coastal erosion. As illustrated in Figure 10, the scale of the spatial analysis at this stage should be regional/metropolitan, which should provide a level of detail that is relevant for the awareness-raising and institutional engagement purposes. The map is from the *Ho Chi Minh City Adaptation to Climate Change Summary Report* prepared by the Asia Development Bank in 2010

Once base-level natural hazard potentials have been identified, they can be overlain with additional map layers illustrating important exposure variables, like population information (e.g. population density), major infrastructure (major roads, water supply, sanitation, sewerage, bridges), land uses (e.g. residential [housing], industrial, commercial), critical infrastructure (hospitals, major government offices), and key environmentally sensitive areas (coastline, wetlands, water bodies, conservation areas). Figure 11, from the *Ho Chi Minh City Adaptation to Climate Change Summary Report*, illustrates current and planned road infrastructure affected by projected extreme floods by 2050 *without* proposed flood controls in the Ho Chi Minh City area.

This additional hazard mapping analysis will be used in the next task to assess sensitivities and help to identify threatened areas when additional information about sensitivity is collected. It will also be used to help illustrate the type and degree of vulnerability for the different risk categories (i.e. people, places, institutions, sectors) and scales of risk to be defined in the next step.

Where capacity and mapping resources are sufficient, additional hazard mapping analysis could also include a more thorough evaluation of the potential economic impact of natural hazards, taking into account direct and indirect damages.

FIGURE 10: Ho Chi Minh City areas subject to flooding.

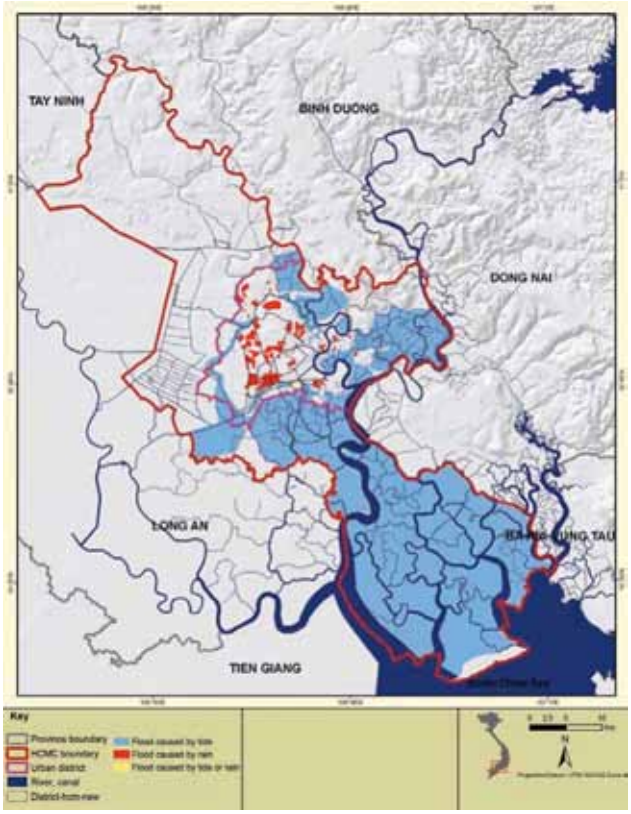
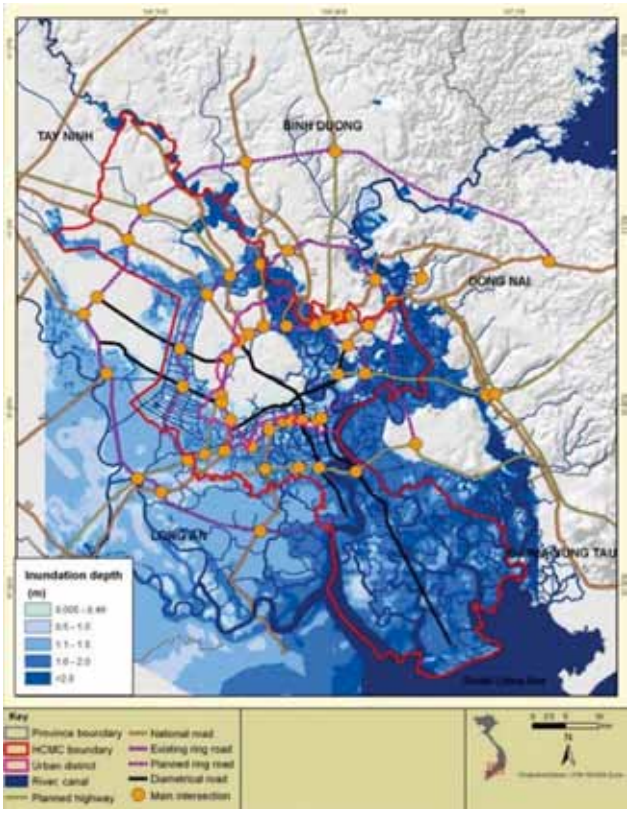


FIGURE 11: Current and planned road infrastructure affected by projected extreme floods by 2050 without proposed flood controls.



Task 3.2: Sensitivity analysis

By now, there should be an understanding of the key climate change hazards (e.g. floods, droughts, etc.). Hazard mapping also should have identified the locations of exposed places, people and sectors, and important exposure variables, like population (e.g. density), infrastructure (e.g. major roads, bridges, facilities), and land uses (e.g. residential, industrial, environmentally sensitive areas).

The sensitivity analysis will identify *how* these exposed people, places, institutions and sectors are impacted today and the degree to which they could be impacted in the future. It will answer these questions:

- What places, sectors and institutions are most sensitive to climate change exposure?
- Who lives in sensitive locations, and how sensitive are they to their exposure?
- Are there climate change "hotspots", or specific areas with multiple exposures and sensitivities?
- What degree of change will trigger a significant impact?
- Are there specific thresholds of concern?

Answering the questions will involve a number of overlapping analyses, the results of which will help to separate the minor **acceptable risks from the major risks** and to provide data to feed into the next task, the adaptive capacity assessment. In some cases, the work will be map-based and involve adding additional layers to the exposure maps created during the last task. Other work will involve desk-based research and assessment.

TOOL 3-F
Socio-demographic Sensitivity Assessment

The first task is to develop a larger socio-economic sensitivity assessment that focuses on identifying demographic, housing, welfare, and human development conditions in the city. This information will be used to determine the city's social sensitivity. Social sensitivity considers human populations that may be adversely (or positively) affected by climate change. In particular, this focuses on climate-related sensitivities in regard to public health, livelihoods, housing and mobility. Tool 3-F provides a framework for this assessment, while the next table identifies some of the key considerations and variables to be reviewed in this assessment task.

The main purpose of the socio-demographic sensitivity assessment is to **pull together and organize the data,** including mapping done in the exposure assessment, which will be used for other task activities. The assessment should summarize the socio-demographic considerations and variables that play an important role in understanding how exposure to climate hazards (i.e. sensitivity) is likely to be different in different parts of the city.

TABLE 13: Socio-economic sensitivity considerations and variables.

CONSIDERATION	VARIABLES	POTENTIAL DATA SOURCES
Demographics	- Gender - Proportion of children and elderly - Household literacy - Education levels - Proportion of economically active household members	- National censuses - Available household survey information collected by non-governmental groups and community organizations - City profile (if available) - Economic Development Strategy
Housing	- Materials - Condition - Number of occupants	- Available household survey information collected by non-governmental groups and community organizations - Field assessments and visual surveys - City Planning Department
Welfare and human development	- Average income (per capita or household) - Life expectancy at birth - Literacy rates (as proxy measure) - Poverty rates - Human Development Index	- Health Department (or equivalent) - Social Service Department / Ministry (or equivalent) - National, state/provincial government
Production and investment	- Land use areas – residential (housing), commercial, industrial, commercial - Infrastructure - Land values	- City profile (if available) - Economic Development Strategy - City Planning Department - Chamber of Commerce (or equivalent)

Conducting a Socio-Economic Sensitivity Assessment will provide a greater understanding of the people, places, institutions and sectors that are sensitive to climate change. You may wish to go back and update Tool 3-D with this new information.

The final document does not have to be extensive, but it is likely to include tables, graphs and, where practical and possible, maps that illustrate the variables shown on Table 13 and that provide a succinct socio-demographic profile of your city. In those cases where such profiles already exist, the work will mainly involve making sure that the information is up-to-date.

While not all information can always be presented spatially (i.e. on maps), where practical and possible all spatial data should be captured in a GIS geo-database to assist with future mapping activities. A geo-database is a digital map atlas and database of separate map layers, each featuring different information, that can be easily organized and analysed using GIS. For the socio-demographic sensitivity assessment, some information that may lend itself to mapping includes:

- Population densities (current and projected);
- Informal settlements;
- Vulnerable populations densities (e.g. poor households).

TOOL 3-G Sensitive Places Mapping

The next series of sensitivity assessments (Tool 3-G) involves data that can (mostly) be presented spatially. These simple sensitivity maps will build from and add on to the hazard mapping work in Tool 3-E and will incorporate the findings organized by Tool 3-F. If mapping capacities and resources exist, a single map with separate map layers for each topic could be developed to illustrate:

- Sensitive places: major infrastructure and facilities (hospitals, schools, government buildings, ports, airports, etc.), neighbourhoods located in exposed areas;
- Sensitive ecosystems: coastal areas, estuaries, mangrove forest, coastal dune habitat, rivers.

Mapping for sensitive places could also likely use existing city mapping to locate known development hazard areas, like steep slopes (typically < 20 per cent) and flood plains.

All of the mapping generated should be overlain with the exposure mapping. Locations where exposed areas overlap with sensitive populations and places could indicate areas where vulnerability may be particularly high. This will be analysed further and confirmed with some additional risk assessment activities in subsequent sections, including community-based sensitivity mapping.

TOOL 3-H Community-based Sensitivity Mapping

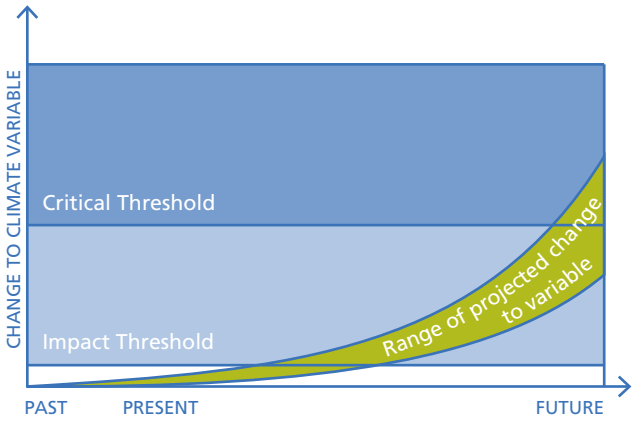
Community-based sensitivity mapping (Tool 3-H) can be used to complement and augment the desk-based sensitivity mapping. It should be carried out after completing the initial sensitivity mapping (Tool 3-G) and provides an opportunity to engage the broader community in the sensitivity assessment and to confirm findings at the local level. It also provides an **opportunity to involve the vulnerable populations** identified in the socio-demographic sensitivity assessment.

FIGURE 12: Tool 3-H Community-based sensitivity mapping (example). Community based maps can be hand drawn and later developed in a GIS if resources allow.

Participatory mapping, Maputo.
©UN-Habitat/Matias Spaliviero

With or without community and computer-aided mapping, some sensitivities may be less obvious and may require more detailed analysis. In particular, they may wish to understand the point at which changes to a climate variable begins to matter (i.e. the **impact threshold**), as well as the point at which a change to a climate variable will have a catastrophic effect (i.e. the **critical threshold**). Figure 13 illustrates this relationship.

FIGURE 13: The relationship between change to a climate variable and risk thresholds



All places, people, institutions and sectors have an **impact threshold** with regard to climate-related changes. While some cities may be more **resilient and better able to withstand some degree of change**, others may not. In some cases, the climate impact may already be imminent and the value of documenting thresholds may not seem relevant. However, in these cases it can help to focus attention on the need for important infrastructure investments or help guide disaster risk reduction planning.

In some cases, it is only necessary to have a qualitative, intuitive understanding of the sensitivity to climate change in order to assess and prioritize risks. For instance, **in some places it is clear that communities are already struggling to cope** with severe storms, floods and storm surges. Likewise, informal communities in low-lying coastal areas may already be experiencing the effects of sea level rise. In these cases, it might not be necessary to engage in very much more sensitivity analysis to know that action is required.

TOOL 3-I
Sensitivity Thresholds

Use Tool 3-I (illustrated in Table 14) to summarize all available information on thresholds for each identified hazard. Filling out this table may require assistance from the climate specialist or agency contacted as part of Task 3.1. It will also require working with your stakeholder advisory committee to help develop and confirm thresholds. Some information may be available from research carried out during Task 3.1 and the data sources identified in Table 7. Table 15 also provides a summary of other information sources.

Where mapping resources and skills exist, it may be worthwhile to **develop visualizations of potential climate change impacts**. Such visualizations can be very strong communication and awareness-raising tools, showing people the seriousness of what could happen in the future without planning and preparation.

As illustrated in the next figure, photo-realistic visualizations can be used to help stakeholders understand the impacts of climate scenarios and thresholds, and they are relatively easy and inexpensive to develop. The visualizations here show potential sea level rise scenarios in a coastal community in the Philippines, and how a 0.25 metre sea level rise that inundates 10 hectares of land may be not be considered serious if the land is thought to be of "low value". On the other hand, a 0.5-metre rise that inundates 200 hectares could be catastrophic for one or more neighbourhoods. Using visualizations to help understand the trade-offs involved, community stakeholders may decide to allocate scarce resources elsewhere within a 0.25 metre sea level rise scenario, but direct all resources to coastal defences within a 0.5 metre sea level rise scenario. The use of photo simulations with community-based mapping can help stakeholders to **identify thresholds, better visualize impacts, identify thresholds and determine preliminary climate change adaptation options**.

FIGURE 14: Photo simulations of sea level rise scenarios

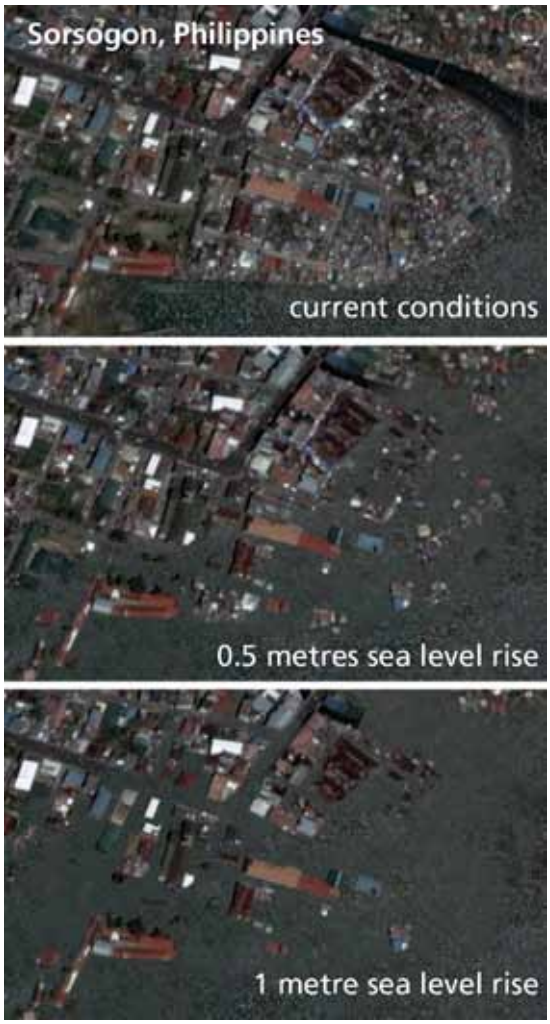


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TABLE 14: Tool 3-I Sensitivity thresholds template (example)

CLIMATE CHANGE HAZARD	SENSITIVITY THRESHOLDS	PRIMARY / SECONDARY IMPACTS	DATA SOURCES
Drought	- At river flows less than 100 m^3/s, reservoirs cannot be filled	- Domestic water supply - Power generation	- Engineering Department (or equivalent) - Power Company
	- Droughts of more than one month will require investments in irrigation (or a change to new crops)	- Reduced agricultural production	- Agriculture department or Ministry (or equivalent) - Agricultural organization / Farmers' groups
Flooding	- Dikes overflow with a river flow of greater than 100,000 m^3/s, which causes an increase in river height of 1.5 m at Low Bridge, threatening the vehicle deck. - Communities consider floods as catastrophic events when water levels of more than 70 cm persist in the settlement for two days, or more than 120 cm for one day, or any event that reaches more than 220 cm.	- Residential / Industrial area flooding	- Engineering department (or equivalent) - Transport department (or equivalent) - Community consultation
Heat Waves	- Clinics experience increased incidence rates (heat stroke, dehydration) at greater than 45°C for a week or longer.	- Community health: increased rates of heat stroke and respiratory problems	- Health department / clinics - Ministry of health (or equivalent)
Sea Level Rise	- At 0.5 m sea level rise – flood area is 10 ha - At 1.0 m sea level rise – flood area is 200 ha	- Residential and commercial area flooding	- Climate change office (or equivalent) - Engineering department (or equivalent)

The climate change sensitivity analysis of the city of Davao in the Philippines overlaid land-use maps with hazard maps to better understand and visualize which areas (and land uses) were most sensitive to climate change impacts. In this case, the hazard mapping looked at flooding/storm surge and landslide hazards, as well as drought, sea level rise and strong winds.

The maps provided the project's technical working group and the broader stakeholder advisory group a better understanding of potential future climate change impacts, including which particular settlements, infrastructure, ecosystems and businesses/commercial enterprises were likely to be most affected and sensitive to these climate change-driven hazards.

FIGURE 15: Hazard mapping Davao, Philippines

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Having identified a list of climate change **hazards** and **thresholds** to the extent your capacity allows, the next piece of analysis is to further understand the impacts. Understanding the potential consequences, and the likelihood or threat of them occurring over time, will help prioritize areas for action.

One of the final steps of the sensitivity assessment task is to pull of the information together and use Tool 3-J (illustrated in Table 15) to conduct a priority threat assessment, which will help to identify **which climate hazards your city is most sensitive to,** and which people, places, institutions and sectors are most sensitive. The approach is adapted from the method used in Sorsogon City, in the Philippines, as part of the Cities and Climate Change Initiative.

TOOL 3-J Sensitivity Assessment Summary

To complete the summary chart:

- **Columns 1-3:** The first three columns pull information from Tool 3-I.
- **Columns 4 and 5:** Take the initial list of sensitive people, places, institutions and sectors from Tool 3-D and **update it with any new information from the Socio-Economic Sensitivity Assessment (Tool 3-F).**
- **Column 6:** The sixth column deals with exposure. With the core planning team and/or stakeholder advisory group, refer back to the work done in Tool 3-A. For each climate hazard (e.g. drought, floods) create an estimate of the ***most likely*** **climate scenario** for a 20-year planning horizon. In some cases, a longer or shorter planning horizon may be appropriate – adjust as necessary.

TABLE 15: Tool 3-J Sensitivity assessment summary (example)

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
Climate Change Hazard (Tool 3-I)	**Primary / Secondary Impacts (Tool 3-I)**	**Thresholds (Tool 3-I)**	**Sensitive Features (people, places, institutions) (Tool 3-D)**	**Sensitive Sectors (Tool 3-D)**
Drought	- Reduced water supply - Reduced power generation - Reduced agricultural production	- At river flows less than 100 m^3/s, reservoirs cannot be filled - More than one month droughts will require investments in irrigation (or a change to new crops)	- City reservoir, residents and businesses - Farmers (some subsistence), women (majority of farm workers and market sellers)	- Water and Sanitation - Economy (formal & informal) - Agriculture - Economy (formal and informal) - Health
Flooding	- Residential / Industrial area flooding	- Dikes overflow with a river flow of greater than 100,000 m^3/s, which causes an increase in river height of 1.5 m at Low Bridge, threatening the vehicle deck.	- Flood plain - Bridges X, Y, Z - Informal communities A, B	- Agriculture - Housing - Transportation - Economy (formal & informal)
Heat Waves	- Community health: increased rates of heat stroke and respiratory problems	- Clinics experience increased incidence rates (heat stroke, dehydration) at greater than 45°C for a week or longer.	- Elderly and young - Power plant (air conditioning load leads to brown outs)	- Health - Economy (formal)
Sea Level Rise	- Residential and commercial area flooding	- At 0.5 m sea level rise – flood area is 10 ha - At 1 m sea level rise – flood area is 200 ha	- Informal communities C, D - Fishing port - Estuary ecosystem	- Fisheries - Environment/ Ecosystems - Housing

- **Column 7:** What are the potential socio-economic consequences in the future, **if the city does not do any *additional* climate change planning**? Think about how the city is currently being impacted by climate change (Tool 3-A) and how the climate exposure from Column 6 will affect the city in the future, taking into account trends like population growth or development plans. Also, be sure to look to any existing city planning documents that could influence the consequences. For example, perhaps flooding could impact a particular road, but the city's transport plan already calls for moving the road to higher ground. Note this down in Column 7. Finally, consider how climate change will impact the city's development objectives – will these impacts prevent key development goals from being met?

- **Column 8:** The last column evaluates how impacted, or how *sensitive,* the groups identified in columns 4 and 5 would be to the potential climate scenario from column 6. This is referred to in this tool as the **threat level**. Work with the core planning team to create definitions for high medium and low that are appropriate locally. See Table 16 for examples.

The sample scale in Table 17 can be used an example for developing definitions for high medium and low to be used in Column 8 of Tool 3-J. It is designed to be general and applicable in a wide variety of planning contexts. It can be used by the core planning team and/or stakeholder advisory committee and adjusted or augmented where necessary.

COLUMN 6	COLUMN 7	COLUMN 8
Exposure (Likely scenario for 20 year planning horizon) (Tool 3-A)	**Potential Future Consequences (with no additional climate change planning)**	**Threat level: Sensitivity of people, places, institutions and sectors to each hazard (See Table 16)**
- 1°C temperature increase - 15 mm precipitation decrease - 18% soil moisture decrease - Generally increasing trend in length of dry season - Rate of change is uncertain, but expected to rise over time	- Subsistence farmers will have reduced incomes – decreased income per person, difficult to reach development goals - Increased rural to urban migration of farmers – potential stresses on city services and infrastructure - Agricultural plan already calls for research into drought resistance crops, could lessen the impact - More frequent power outages in dry season + more power outages as dry season lengthens – impacts on businesses and commerce	High
- 15 mm precipitation decrease - Generally stable – frequency of spring floods to remain consistent over time - Influence of new developments in formerly undisturbed watershed areas unknown, but development increasing	- No large or frequent flooding predicted - New development plans require flood risk analysis prior to building	Low
- 1.5°C temperature increase - Increasing trend in both the frequency and duration of heat waves.	- Population trends predict more youth in coming decades –> greater number of high risk people during heat waves - Brown outs during heat waves impact commerce, safety – could impact development outcomes - Brown outs during heat waves would shut off air conditioning and could exacerbate public health issues	Medium-High
- General increase in local sea level - Rate of change over time is highly uncertain - IPCC estimates of 5-20 cm in next 50 years	- Not a major risk of residential flooding in the next 20 years - Informal community C (located on waterfront) already slated for relocation in the next 5 years (Housing Plan)	Medium-Low

TABLE 16: Threat level: example sensitivity scale

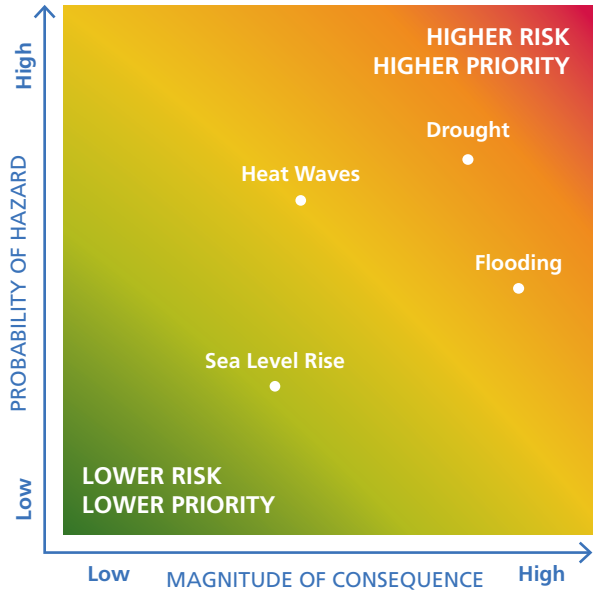
THREAT LEVEL	DESCRIPTIVE EXAMPLES (to be adjusted as required)
High	Examples: - Large numbers of serious injuries or loss of lives - Regional decline leading to widespread business failure, loss of employment and hardship - Major widespread damages and loss to environment and infrastructure, with progressive irrecoverable damage - Local government services would cease to be effective
Medium-High	Examples: - Isolated instances of serious injuries or loss of lives - Regional local economic development impacts and stagnation. Serious impacts on livelihoods - Severe and widespread decline in the quality of life within the community - Severe damages and a danger of continuing damage to infrastructure and environment - Local government services struggle to remain effective and would be seen to be in danger of failing completely
Medium	Examples: - Small numbers of injuries involving the public - Significant general reduction in livelihoods - Isolated but significant instances of environmental and infrastructure damage that might be reversed with intensive efforts - Local government services under severe pressure on several fronts
Medium-Low	Examples: - Minor injuries to public - Individually significant but isolated livelihood impacts - Minor instances of environmental and infrastructure damage that could be reversed - Isolated instances of government services being under severe pressure
Low	Examples: - Appearance of a threat but no actual harm to public safety - Minor impact on livelihoods - No or insignificant infrastructure and environmental damage - Minor instances of disruption to local government services

With climate exposures, sensitivities and threats identified and mapped, another helpful tool is to chart or plot the climate hazards on a simple table to graphically summarize threats (Tool 3-K). The activity can be a good method to engage a broader stakeholder audience as it is relatively easy to understand, and it can help stakeholders get a better sense of which hazard pose greater threats and are a higher priority. It is the **high threat-high priority hazards** that adaptation options should consider first.

Probability of threat (from low to high) is noted on the Y-axis, while the magnitude of potential consequences (using information from the threat assessment and community mapping) is noted on the X-axis. While there are some similarities to the previous tool, the activity can be easily repeated in community outreach activities to confirm threat findings.

TOOL 3-K
Climate Threat Plotting

FIGURE 16: Tool 3-K Climate threat plotting (example)



Task 3.3: Adaptive capacity analysis

Knowing the exposure and sensitivity of your city to climate change, the next step is to determine how well how people, places, institutions and sectors could adapt to these threats. This task will answer the questions:

- *How well can people, places, institutions and sectors respond and adapt to climate change impacts?*
- *What resources and capacity do they have to adapt?*
- *How resilient are people, places, institutions and sectors?*
- *What are the current adaptive capacities in climate "hotspots" by sector and with impacted people, places and institutions?*

Adaptive capacity, as defined in broad terms by the Intergovernmental Panel on Climate Change (IPCC), is the **ability or potential of a system to respond successfully to climate variability and change**, and includes adjustments in both behaviour and resources/ technologies.

This task considers three different types of adaptive capacity:

- ✔ **Independent capacity:** how well individuals or families are able to respond and adapt to climate hazards without assistance from the larger community or local government. Also referred to as "autonomous" adaptation.
- ✔ **Collective capacity:** how well are communities, neighbourhoods or other groups able to respond and adapt to climate hazards without assistance from government or other agencies and institutions.
- ✔ **Institutional capacity:** how well an established government is able to, or would be able to, respond and adapt to climate hazards (e.g. organizational systems, policies, regulations, human resources, technological resources)

At each level, the adaptive capacity to respond to a given climate change impact is based on the **level of awareness** of the risk or impact and the **resources available** to manage it. A city's economic wealth, access to technology, existing infrastructure, current information and skills, and the strengths or weaknesses of its institutions all influence adaptive capacity. Increasingly, levels of human and social capital, such as education and social networks, and good governance (e.g. access to and participation in decision-making processes) are also considered when determining a city's adaptive capacity.

Table 17 further outlines some of the determinants of adaptive capacity and how each type of capacity supports planners and planning in a climate context.

Reforestation program, Nairobi, Kenya.
© UN-Habitat

TABLE 17: Determinants of adaptive capacity and their relation to climate change planning

DETERMINANT	DESCRIPTION	RELATION TO CLIMATE PLANNING
Economic wealth and financial capital	- Municipal financial resources, resident incomes and wealth distribution, economic marginalization, fiscal incentives for climate risk management.	- Climate change adaptation actions require internal funding (and sometimes external support). Climate change vulnerability, and hence the level of adaption required, can be reduced in communities with less urban poverty and economic marginalization.
Access to information and technology	- Communication networks, computing tools, freedom of expression, technology transfer and data exchange.	- Climate change vulnerability and risk assessments are facilitated and improved by good technical data, data modelling capability, and the ability to share and distribute this information widely, freely and clearly.
Material resources and infrastructure	- Transport, water infrastructure, buildings, sanitation, energy supply and management.	- Well designed, constructed, sited, and managed infrastructure and services tend to be more adaptable or easier to adapt to climate change impacts and risks than poor resources and infrastructure.
Human resources and capacity	- Knowledge (scientific, "local", technical, political), education levels, labour.	- Climate change vulnerability and risk assessments are facilitated and improved by a scientific understanding and knowledge of climate change, combined with good local knowledge, and the human resources to undertake climate change planning work.
Organizational and social capital	- State-civil society relations, non-governmental and community-based organizations, relationships between institutions. - Modes of governance, leadership, participation, decision and management capacity.	- Climate change policy development, implementation and enforcement are further improved in a collaborative, cooperative environment where climate change stakeholders (government, non-government, vulnerable groups, etc.) are able to work well together. - Effective, efficient and community-supported climate change actions require a functioning local government that is capable and willing to enforce municipal laws, plans and regulations.

Adapted from: Eaking, H; Lemos, M.C. (2006). Adaptation and The State: Latin America and the challenge of capacity building under globalization. Global Environmental Change (16).

This task's first piece of work is to collect, review and summarize existing plans, policies and reports that will help to develop an understanding of the adaptive capacities of people, places and institutions. This could include information on:

- Existing **city plans and policies** (disaster risk reduction plans, land use plans, economic development strategies, capital works plans and facility reviews, etc.)
- **Relevant state, provincial and national level policies** (National Adaptation Plan of Action, disaster risk reduction strategies, etc.).

Remember, much of this data may have already been collected during previous tasks (see text box called "What's your city's policy situation?" in Task 3.1 and Tool 3-F: Socio-demographic sensitivity assessment).

A workshop with your core planning team and/or stakeholder advisory committee should also be convened where a discussion is held on how individuals and households (i.e. independent capacity), communities (i.e. collective capacity), and governments (i.e. institutional capacity) **have traditionally responded to extreme climate events and disasters** like flooding, droughts and major storms. Ask your planning team:

TOOL 3-L
General Adaptive Capacity Assessment

- *How have locations withstood or been impacted by these events?*
- *How well have people coped or managed?*
- *In more extreme events and disasters, was government response timely and effective?*

With background information collected and reviewed, use Tool 3-L to develop a qualitative overview perspective of your adaptive capacity, or to focus your assessment of adaptive capacity on a target sector as appropriate. **The tool is intended to get you started and will be followed by a more quantitative assessment of adaptive capacity to specific climate hazards (Tool 3-M)**. In consultation with your core planning team and stakeholders, work through the table for Tool 3-L. In the "Why" column, be sure to note where findings have been confirmed during community mapping (Tool 3-H) or other planning tasks and steps.

Remember, **a city's capacity to respond to a given climate change impact is based on its level of awareness, knowledge, resources, and skills** (see Table 17). More checkmarks in the yes column of Tool 3-L suggests a higher ability to respond to an impact. Determining capacity is not an exact science, so **some subjective judgement will be required**. **However, as you move into future planning steps this table can be revisited and refined.**

There are other, more sophisticated, methods to determine adaptive capacity. Depending on available resources, some options could include a quantitative analysis of socio-economic indicators (e.g. education level, literacy, wealth and access to technology) and adaptive capacity mapping. See Table 20 at the end of this section for a summary of some potential tools and references for these approaches. Some are more costly, time consuming and technically demanding approaches, but may provide a more appropriate level of detail for your needs.

TABLE 18: Tool 3-L General adaptive capacity assessment (example)

ADAPTIVE CAPACITY ASSESSMENT CRITERIA (Example)	YES	NO	WHY?
Economic wealth:			
Do you have access to adequate financial resources and funding?		✖	- Poor tax base and funding
Do the people in the affected area have resources to respond to a climate related hazard (e.g. access to basic transportation, adequate rations, ability to relocate temporarily, basic shelter)?		✖	- High risk areas overlap with informal settlements in many areas, e.g. coastal fringe, river front
Do you have adequate staff and allocated time to plan and implement adaptation actions?		✖	- Small staff, limited budget
Technology:			
Is there an ability to communicate directly with the people/ sector affected (e.g. basic communication infrastructure, a designated key point of contact, regular interaction, radio service, etc.)?	✔		- Existing Disaster Risk Reduction Plan established communication protocols, network and procedures (Plan collected during Task 3-A)
Infrastructure:			
Is there adequate transport, water infrastructure, sanitation, energy supply and management?	✔		- Good infrastructure facilities and network
Are major infrastructure and/or facilities located in hazard prone areas?		✖	- Key facilities (bridges, coastal highway, water treatment plant) located in hazard prone areas and poorly protected (no sea wall, low bridge and road base levels)
Do people in the affected area have access to safe, clean drinking water in the event of a hazard occurrence?	✔		- Good distribution and storage system - Access to bottled water in emergencies
Are there adequate medical services in close proximity?		✖	- Health clinics only - Regional hospital located 130 kilometres away

ADAPTIVE CAPACITY ASSESSMENT CRITERIA (Example)	YES	NO	WHY?
Information and Skills:			
Are decision-makers aware of a) climate change and b) potential impacts/risks in your jurisdiction?	✔		- Council presentation and training workshop
Are stakeholders in the area/sector aware there are current and/or potential impacts?	✔		- Good community information campaign (validated through Tool 3-H: Community Mapping)
Has this area/sector undertaken previous efforts to study or address the climate change driver and potential impact?		✖	- No Climate Action Plan or preliminary Vulnerability Assessment
Are there trained emergency response teams for this sector/ area?		✖	- Identified need in Disaster Risk Reduction Plan - No current funding
Institutions and Social Capital:			
Is there political willingness to allocate resources to build adaptive capacity?	✔		- Yes, but limited funds
Are there notable community/neighbourhood "leaders" that can quickly organize people in the event of a hazard occurrence?	✔		- Some are represented on stakeholder advisory group. - Others not on group identified in Task 2.1
Are there existing processes that you can integrate with?		✖	- No City Plan, Capital Works Strategy - Limited state and national climate change policy
Are there any existing area/sectoral plans, including emergency response plans that can be referred to?	✔		- Existing Disaster Risk Reduction Plan
Are there specific agencies, community groups and/or NGOs that have the mandate and skills to focus on the specific sector/area?	✔		- Represented on stakeholder advisory group (See Task 2.1)

Once Tool 3-L has been completed and there is a *general* understanding of the factors affecting adaptive capacity, a more quantitative assessment of adaptive capacity relative to specific climate hazards can be conducted (Tool 3-M). The results of the quantitative assessment will be used to assess overall vulnerability in later steps.

TOOL 3-M
Hazard-specific Adaptive Capacity Assessment

Tool 3-M uses a high (5), medium (3) and low (1) scale to assess adaptive capacity **relative to each climate hazard** (so, a major threat would require strong adaptive capacity in order to cope). Before beginning the tool, it is important to work with the core planning team or wider stakeholder group to create definitions of what constitutes a high-medium-low score.

GOVERNANCE, CLIMATE CHANGE AND INSTITUTIONS

Governance is a widely used term that can be defined as **how important decisions are made and carried out** by the institutional bodies that make them. These decisions are typically made by different levels of government – national, state/provincial, local – the agencies and organizations associated with them, and may often involve some of the stakeholder groups identified in Step 2 of this guide's planning cycle.

As a concept, governance is **directly related to climate change resilience and adaptive capacity**. Research work carried out by the Institute of Development Studies (IDS), UN-Habitat and other organizations has identified five areas where good governance practices have direct links to a city's adaptive capacity and overall climate resilience.

1. **Decentralized:** Evidence suggests that cities with some degree of **local-level decision-making authority** combined with **good working relationships** with national and state/provincial governments are able to implement policies and programmes more effectively and efficiently than cities where decision-making is centralized with higher levels of government. Hierarchical, top-down decision-making also often **fails to engage vulnerable groups and stakeholders**, precisely the people and groups that a good climate adaptation change programme should be designed to help.

2. **Transparent:** Sharing information with local stakeholders on climate change risks, sensitivities, vulnerabilities and adaptation options is important. **A transparent, open planning system not only engages important stakeholders, but also educates them** about the trade-offs that will be part of any climate planning process. Policies and administrative systems that support information sharing and transparent decision-making can also engage the media to further publicize the planning process and inform residents about climate change.

3. **Flexible:** Climate change is a dynamic process where **unanticipated problems can emerge quickly**, or climate-related disasters occur with a greater frequency or higher severity than a city has previously experienced. Accordingly, a city requires **flexible agencies and management systems** suited to responding to and anticipating these surprises. Evidence suggests that an inter-agency, inter-governmental body dedicated to tackling the potential and actual impacts of climate change (such as the core planning team set up in Task 1) is desirable.

4. **Participatory:** A large body of studies suggests that the involvement of poor and marginalized groups in **decision-making, monitoring and evaluation** is a critical part of improving the conditions in informal settlements or exposed locations. As climate change tends to **disproportionately affect the poorest and most vulnerable groups first and most severely,** engaging these groups in planning and decision-making is critical for building climate resilience.

5. **Experienced and connected:** Evidence suggests that cities experienced in developing **integrated, people-centred early warning systems** for extreme events are well placed to make progress toward climate change resilience. Cities also benefit from the experience of local, national and international NGOs and civil society organizations operating in the city, community-based groups and research organizations. External donor agencies and the availability of project financing for climate change resilience programmes helps to spur city authorities to act, but suitable systems must be in place to both utilize the knowledge held by partners and to reward these relationships.

From: Urban Governance for Adaptation: Assessing climate change resilience in ten Asian cities. (2009). Institute of Development Studies. University of Sussex, Brighton, UK.

TABLE 19: Tool 3-M Hazard-specific adaptive capacity assessment

ADAPTIVE CAPACITY FACTORS							
Hazard	**Threat level** (from Tool 3-J)	**Wealth:** *What wealth and financial resources are available to address this hazard?*		**Technology:** *What technology and related resources are available to address this hazard?*		**Institutions** *What institutions or teams are addressing this hazard? What policies already exist?*	
		Notes	**Score**	**Notes**	**Score**	**Notes**	**Score**
Drought	High	- Farmers have low incomes - Low government funds for assistance	L (1)	- New drought resistant crop types being tested locally	MH (4)	- Agriculture ministry has been responsive to droughts in the past - Multiple local agricultural NGOs with high capacity	MH (4)
Flooding	Low	- Federal, state and city funding for emergencies	H (5)	- Simple but effective housing upgrades (like stilts) exist	H (5)	- State Flood Management Plan - Local neighbourhood plans	H (5)
Heat Waves	Medium-High	- Funding for heat shelters - Increasing average incomes mean more people will be able to buy air conditioners	H (5)	- Air conditioning exists but is not widespread (30% of households)	M (3)	- Public health policy to open shelters at 45oC	H (5)
Sea-level rise	Medium-Low	- State funds to relocate waterfront settlements - Households cannot afford upgrades	M (3)	- Seawall technology exists - Simple housing upgrades (like stilts) exist	H (5)	- None	L (1)

Infrastructure: *What infrastructure is available to address this hazard? Can it withstand climate projections?*		**Information:** *What is the level of knowledge on this hazard? Is it distributed to the people who need it?*		**Social Capital:** *What social capital is available that could address the impacts from this hazard?*		**Average Adaptive Capacity Score** *(total score divided by number of Adaptive Capacity Factors)*
Notes	**Score**	**Notes**	**Score**	**Notes**	**Score**	
- Good irrigation systems on most farms	M (3)	- Information on drought resistant crops is not disseminated well to farmers	M (3)	- Farmers' cooperatives and networking groups share information	M (3)	18/6 = 3
- Dikes are currently in place, but will require upgrades for 20-50 year projections	H (5)	- Public information campaign and warning system in place	H (5)	- Communities and NGOs have helped each other during previous floods	ML (5)	30/6 = 5
- Public places like malls, schools have air conditioning - Heat shelters around the city	M (3)	- Public education through school system	MH (4)	- Seniors groups check up on other seniors	MH (4)	24/6 = 4
- None	L (1)	- Local NGO has started an information campaign to low-lying settlement. Currently, program has small reach	M (3)	- Community groups have offered to help build sea walls	H (5)	18/6 = 3

Negombo seawall.
© UN-Habitat/Bernhard Barth

A case in point

STEP 3: VULNERABILITY ASSESSMENT - ADAPTIVE CAPACITY IDENTIFICATION - NEGOMBO, SRI LANKA

With support from the UN-Habitat CCCI, an assessment team made up of local technical experts undertook a vulnerability assessment in Negombo, Sri Lanka. Following climate hazard identification, a threat mapping process and sensitivity analysis, the team undertook a quantitative adaptive capacity assessment using tools provided in the Participatory Vulnerability and Adaptation Assessment toolkit. Using secondary data sources, the team identified a set of relevant indicators to assess Negombo's adaptive capacity. These were modified through discussions with core stakeholders before being assigned value weights (between 0 and 1). Working through the weighted data allowed the assessment team to come up with an adaptive capacity score. Note that this project did not include qualitative measures, and did not include extensive community consultation, but resulted in a useable assessment considering the limited time and resources available.

More info: http://www.fukuoka.unhabitat.org/programmemes/ccci/pdf/Sri_Lanka_flyer_Aug2010.pdf

TOOL 3-N
Rapid Institutional Adaptive Capacity

Given the important role of governments in both preparing for and responding to climate change, a major component of the larger adaptive capacity assessment is an institutional assessment of the local government's adaptive capacity. Tool 3-N provides a template for conducting such an analysis, and is illustrated in Table 20. Such an assessment will help to identify how climate change affects local government service delivery and, ultimately, will support mainstreaming climate change adaptation options across city departments.

The assessment requires a closer look at the plans, strategies and programmes that are in place. Data gathering for the assessment should be made easier through the information collection that should have already been completed in the previous tasks. See Table 4 for a list of example plans with links to climate change planning.

The assessment (Tool 3-N) seeks to answer the following questions. Answering them will also help in future steps, particularly the identification of climate change adaptation options (Step 5), implementing the final *Climate Change Action Plan* (Step 7), and monitoring and evaluating plan outcomes and process (Step 8).

- *Which agencies are involved in climate change adaptation (or any field of disaster risk management)?*
- *How are they involved?*
- *What is their function?*
- *How are the agencies or institutions related to each other?*
- *What policies, programmes and projects are administered/managed by these agencies or institutions?*

Tool 3-M is based on a tool in the World Bank's *Climate Resilient Cities Primer*[7], which is also a useful resource for understanding institutional capacity for climate change resilience. According to the primer, a city's principal factors for adaptive capacity include:

- Existing disaster risk management policy and regulatory capacity;
- Land use management and building controls;
- Economic strength and diversification, and financial resources;
- Infrastructure standards;
- Availability of data, and technical expertise in analysing trends related to hazards.

7 World Bank (2008). *Climate Resilient Cities: A Primer on Reducing Vulnerabilities to Disasters.* Washington D.C.

TABLE 20: Tool 3-N Rapid institutional assessment questionnaire (example)

1) GOVERNANCE STRUCTURE AND CLIMATE CHANGE MANAGEMENT IN THE CITY			
Local government office structure: Does it have…	**Yes**	**No**	**Comments**
f) Disaster risk management manager?		✗	Early discussion of potential.
g) Environment, sustainability or climate change manager?		✗	In five-year strategic plan
h) Are a) and b) in the same department or do they have sufficient coordination and interaction?		✗	
i) If you answered no to questions a) and b), are these functions carried out by another individual on staff? If so, which position(s)?	✓		General manager
Other government office structure: Does it have…	**Yes**	**No**	**Comments**
j) Disaster risk management department?	✓		State level
k) Environment, sustainability or climate change department?	✓		State level
l) Do a) and b) have a sufficient level of coordination and interaction?		✗	The departments meet regularly and share planning responsibilities
m) If you answered no to questions a) and b), are these functions carried out by another department(s)? If so, which one(s)?		✗	
2) RESPONSIBILITIES FOR CLIMATE CHANGE AND DISASTER RISK MANAGEMENT			
	Yes	**No**	**Comments**
Responsibilities for disaster risk management clearly specified?	✓	✗	At state level, but local government level poorly specified / unclear
Responsibility for climate change management established?	✓	✗	At state level, but local government level poorly specified / unclear
What are the roles and functions of each department involved in disaster risk reduction and climate change?	Local government: General manager controls emergency management plans and oversees emergency response for small events. No responsibility for climate change at this point.		
What are the policies, programmes and services offered by departments involved in disaster risk reduction and climate change?	State level emergency response programme for larger events, state level climate change department coordinates with other departments to ensure climate change is included in as aspects of city planning and service delivery.		
Authority to contract for services if necessary?	✓		
3) EXISTENCE, CAPACITY AND EFFECTIVENESS OF A CITY'S EMERGENCY AND DISASTER RESPONSE PLAN			
	Yes	**No**	**Comments**
Does a disaster response system exist in the city?		✗	Major gap. A system needs to be developed.
Is the response system comprehensive for all natural hazards specified?		✗	
Is the disaster response system regularly practiced?		✗	
Is the disaster response system regularly updated?		✗	

Source: Adapted from Climate Resilient Cities: A Primer on Reducing Vulnerabilities to Disasters. World Bank, 2008.

Task 3.4: Summary vulnerability assessment

As described at the beginning of Step 3, vulnerability is a function of **exposure, sensitivity and adaptive capacity.** The next task pulls together the work done in steps 3.1 (exposure assessment), 3.2 (sensitivity assessment), and 3.3 (adaptive capacity) to identify the **most vulnerable places**, the **most vulnerable people**, the **most vulnerable institutions** and the **most vulnerable sectors** as specifically as possible. It is about narrowing down the information collected in previous tasks to understand the areas where climate adaptation efforts may need to be focused.

Use Tool 3-O to bring together data from earlier tasks, as illustrated in Table 21. The activity will be followed by another tool to re-evaluate the results and ensure that traditionally marginalized populations like women and other vulnerable groups (e.g. urban poor) are adequately addressed in the final vulnerability assessment (Tool 3-P).

TOOL 3-O
Summary Vulnerability Rating Matrix

The summary vulnerability rating matrix (Tool 3-O) and vulnerable populations by sector (Tool 3-P) can be viewed **as a synthesis of your** Vulnerability Assessment. This synthesis should identify the highest priorities (people, places, institutions, sectors) for adaptation planning and will be a major reference for future *Climate Change Action Plan* tasks.

To complete Tool 3-O:

- **Columns 1 – Climate change hazards:** Use the climate change hazards that have been used in previous tools.
- **Column 2 – Threat level:** Threat level is a rating of exposure and sensitivity that was completed in Tool 3-J. When filling out column 2 (threat level), use the values from the final column of Tool 3-J and assign scores using the following scale:
  - High = 5
  - Medium High = 4
  - Medium = 3
  - Medium-Low = 2
  - Low = 1
- **Column 3 – Adaptive capacity:** Use the values from Tool 3-M to fill in this column.
- **Column 4 – Relative vulnerability:** Finally, calculate the relative vulnerability by dividing the threat level by the adaptive capacity. Keep in mind that this is measuring vulnerability – so a **high score indicates high vulnerability** (a bad thing) and a **low score indicates low vulnerability** (a good thing). As illustrated, the relative vulnerability is highest when there is a combination of high threat level and low adaptive capacity.

This method gives a *relative* vulnerability estimate for each of the climate hazards. Where resources are available, other more sophisticated tools can be used to carry out more comprehensive, analytic assessments. More sophisticated (and time consuming and costly) tools are summarized in Table 23 at the end of this section. Tool 3-O is a simplified tool to help prioritize which climate impacts to address.

TABLE 21: Tool 3-O Summary vulnerability rating matrix (example)

EXPOSURE		ADAPTIVE CAPACITY	VULNERABILITY
Climate Change Hazard (Tool 3-J)	**Threat Level** (Tool 3-J)	**Hazard-specific Adaptive Capacity Status** (from Tool 3-M)	**Relative Vulnerability** (Threat Level divided by Adaptive Capacity)
Drought	High 5	3	5÷3=1.7
Flooding	Low 1	5	0.2
Heat Waves	Medium-High 4	4	1
Sea Level Rise	Medium-Low 2	3	0.7

The last step in this task is to review the sectors that have been identified as highly vulnerable and re-examine them to determine whether **traditionally unrepresented and vulnerable groups** (women, youth, urban poor) are at elevated risk in any of them. Filling out the matrix in Tool 3-P will require discussion with your core planning team and/or stakeholder advisory group. At this level of analysis, it will be subjective in places. More sophisticated (and time consuming and costly) tools are summarized in Table 23 at the end of this section.

TOOL 3-P
Summary Vulnerable Populations Rating Matrix

To complete Tool 3-P, first review Tool 3-O and identify the climate hazards that had the highest level of vulnerability associated with them (in the example above, these are heat waves, drought and sea level rise). Review Tool 3-J and compile a list of **sectors** that would be most affected by the priority hazards identified in Tool 3-O. Record these in Tool 3-P, column 1. In the next column, note their associated geographic locations. Here, it is important to note that some sectors occur in many areas and cannot be geographically isolated, like housing. Such subjectivity is fine. If you have completed community mapping or hotspot mapping, it should be brought back to support this work.

Go through each sector and note in columns three, four and five whether:

- Any **informal communities** or settlements are located in the geographic area(s) noted in column two;
- Any **livelihoods** (formal or informal) closely associated with vulnerable people are operating in, or associated with the geographic area(s) noted in column two;
- Any **vulnerable population health impacts** associated with climate change impacts on the particular sector.

As with the previous tools, use a scoring system for each column using a High to Low scale where High=5 and Low=1. The core planning team should work to create definitions for High, Medium and Low scores, as in previous tools. Add the scores for a relative vulnerable population impact score.

TABLE 22: Tool 3-P Summary vulnerable population ratings matrix (example)

SECTOR	GEOGRAPHIC LOCATION(S)	VULNERABLE POPULATION – SETTLEMENTS	VULNERABLE POPULATION – LIVELIHOODS	VULNERABLE POPULATION – HEALTH	VULNERABLE POPULATION IMPACT (relative score)
Water and Sanitation	- City reservoir - Central Business District - Neighbourhoods A, B, C	No	Limited. Some street vendors / informal economic activity	Significant. Water borne diseases reduced through improved water supply and sanitation	8
		Low (1)	**Medium-Low (2)**	**High (5)**	
Economy	- Agricultural area - Market - Harbour	Few	Yes. Extensive. Major informal economy employment centres	Limited	8
		Medium-Low (2)	**High (5)**	**Low (1)**	
Health	- City wide	Yes. Two major informal settlements	Limited	Significant. Life safety issues housing in climate hazard areas, heat stress from heat waves	12
		High (5)	**Medium-Low (2)**	**High (5)**	
Agriculture	- Flood plain - River estuary	Few	Significant. Subsistence and small-scale farming. Market sales.	Food shortages and food security issues	11
		Medium-Low (2)	**High (5)**	**Medium-High (4)**	
Ecosystems	- Estuary - River valley	No	No	Limited. Some water supply issues with salt water intrusion during storm surges.	5
		Low (1)	**Low (1)**	**Medium (3)**	

A "LOW REGRETS" APPROACH TO TAKING ACTION

Given the cost of adaptation measures, the immediacy of other problems facing planners (e.g. sanitation, poverty reduction) and probable city budget constraints, planners are encouraged to first consider so-called "low regrets" adaptation options. Low regrets options are planning projects and investments that contribute directly to larger community development goals (e.g. improving storm and sanitary sewers, water supply upgrades), regardless of the climate situation. These investments will not only address urgent community development issues, but will also very likely contribute to the city's overall climate change preparedness and adaptive capacity. Often, these investments are also already planned and/or part of an existing strategy.

Other low regrets options typically include repairing and strengthening existing climate change impact defences (e.g. dikes, diversion channels, reservoirs, conserving mangrove forests) – while ensuring that the changes do not result in any additional environmental impacts, as may be the case with some defences like sea walls – and "climate proofing" critical but vulnerable infrastructure located in hazard areas (e.g. power and water facilities, hospitals).

Low regrets options are further advisable given the uncertainty around future weather variability and climate change impacts. Climate change impacts will continue to occur, but their magnitude, location and effects will likely evolve as the global climate continues to change. By focusing on low regret climate change adaptations, uncertainty about future weather variability and climate can be overcome and managed effectively.

Construction of a water tunnel in Bugesara, Rwanda.
© UN-Habitat/Julius Mwelu

Task 3.5: Preliminary adaption options identification

The last task in this planning step is to identify preliminary adaptation options for the prioritized areas, sectors and vulnerable populations. Review the results from the last task to see where to focus efforts. For example, in reviewing the matrices completed in previous sections, it is apparent that climate change-related drought brings the highest threat and that the health and agriculture sectors are the most vulnerable sectors **and** are also the sectors where vulnerable populations are most affected.

The climate adaption options to address these vulnerabilities will be **prioritized** in Module C, Step 5 and Step 6. If you do not intend to create a full *Climate Change Action Plan* at this time, it is important to create a preliminary list of climate actions to be packaged into a *Vulnerability Assessment Report* (Tool 3-Q).

To begin creating a preliminary list of climate change options, you should revisit tasks 3.1 and 3.3 and the climate change-relevant city and state/provincial and national level plans and policies that were reviewed and summarized (disaster risk reduction plans, land use plans, economic development strategies, NAPAs, etc.).

- *Did any of these documents include actions (policies, programmes, activities) that could be implemented to mitigate identified risks and vulnerabilities? Are these actions still relevant/realistic when considering the Vulnerability Assessment findings?*

- *Have they been implemented?*

In cases where there are no planned or identified actions, there are several ways to start identifying potential climate change adaptation options to address the climate change vulnerabilities. Module C, *Step 5: Option Identification* provides an overview of some of these methods and a tool (Tool 5-A) to identify generic actions. See Table 28 in Module C, Step 5 for a list of other potential climate change adaptation actions. These actions may also lend themselves to mainstreaming and more rapid implementation. Also, review Section 3.2.3 for candidate urban plans and policy programme areas that would support climate change mainstreaming options.

After reviewing these, make a list of all potential actions and review them with the core planning team and/or stakeholder advisory committee. If you are not planning to move through the remainder of the planning cycle, it is recommended that you review Module C, steps 6 and 7, which provide an overview of assessment and prioritization tools, and an overview of how to best implement your short-listed actions.

When developing preliminary options, it is important to build on what you now know given the exposure, sensitivity and adaptive capacity assessment activities. The planning team could start by identifying and listing down "low-regrets" options that support mainstreaming adaptation actions into existing development plans and programmes (see text box). Preliminary actions should likewise start addressing the "awareness gaps" identified in the adaptive capacity assessment (Tool 3-L). A common awareness and understanding of climate change exposure, sensitivities and adaptive capacity amongst project stakeholders and external decision-makers (e.g. city council, mayor's office) is an important consideration for future planning tasks and activities.

Once you have preliminary adaptation options identified, the output of Step 3 can be written up as *Vulnerability Assessment Report*. Writing it up as a full report is particularly important if you do not anticipate or do not have funds available to carry out the full planning cycle. Tool 3-Q provides an annotated table of contents for a *Vulnerability Assessment Report*. While its level of detail does not need to be exhaustive, it should be comprehensive.

TOOL 3-Q
Vulnerability Assessment Report Outline

Although this guide's preferred approach is to consider the *Vulnerability Assessment Report* as one step in the larger planning process, it can be used as a stand-alone product where circumstances dictate (i.e. limited project funding, limited capacity). In these cases, it can be used as:

- Input into other planning processes (e.g. environmental plan, transport plan;

- A public communications and awareness-building tool;

- A tool to help raise funds (provincial/state, national, international) to carry out the entire planning cycle and complete a full *Climate Change Action Plan.*

It is likely that the *Vulnerability Assessment Report* will also be used in a full planning cycle to help secure additional funding for future planning steps and *Climate Change Action Plan* implementation.

FIGURE 17: Tool 3-Q Vulnerability Assessment Report – sample table of contents

TABLE OF CONTENTS

1. BACKGROUND AND OVERVIEW

1.1. RATIONALE

- What is the rationale for the Vulnerability Assessment Report?
- What is the assessment? How was it developed? Who developed it? Purpose and limitations.
- Cities and Climate Change – key issues and UN-Habitat's Cities and Climate Change Initiative (CCCI).

1.2. CITY PROFILE AND CONTEXT

- Brief overview
- Physical: geographic location, physical features, key economic/development sectors and livelihoods, land use and tenure.
- Socio-economic: demographic trends, urbanization trends.
- Governance: city structure, current urban planning and land management regime (challenges and ongoing work).

1.3. PLANNING CONTEXT

- City development priorities.
- City vision and mission (if available).
- City planning context, including existing climate change relevant plans and policies.

1.4. PLANNING APPROACH

- Planning framework, principles (participatory, strategic, value-based) and rationale.
- Process – Planning For Climate Change framework steps 1, 2 and 3.
- Stakeholders and engagement – who was involved and how?

2. VULNERABILITY ASSESSMENT

2.1 VULNERABILITY ASSESSMENT FRAMEWORK

- Process and findings highlights.

2.3 EXPOSURE

- Summary overview (e.g. past trends based on observations, future scenarios).

2.3 SENSITIVITY

- Summary overview (i.e. degree to which people, places, sectors are affected).
- Key risks.

2.4 ADAPTIVE CAPACITY

- Summary overview (autonomous / collective / institutional).

3. VULNERABILITY SUMMARY

- Specific vulnerability summary (highlights) focusing on people, places, institutions and sectors. Final organization will depend on the local context.

4. PRELIMINARY ADAPTION OPTIONS

- Summary of potential adaptation options (Note: in full planning cycle project, these options would be further assessed during Module C).

ANNEXES

A. GLOSSARY OF TERMS

B. LIST OF ACRONYMS

C. CONTACT LIST

- Project lead, core planning team, stakeholder advisory group, implementing agencies.

GREENHOUSE GAS ASSESSMENTS – AN OPPORTUNITY FOR PARALLEL GAINS

The Vulnerability Assessment methodology used in this guide focuses on climate adaptation planning. When identifying preliminary options to address key vulnerabilities (Task 3.5), it is important to investigate the potential for actions that include greenhouse gas emission reduction benefits (see steps 5 and 6).

Finding synergies between adaptation and mitigation efforts can help to facilitate action on climate change on two fronts at the same time. An important part of this is building a good knowledge base about greenhouse gas emissions in the city area. Plan developers may want to investigate the opportunity to undertake formal greenhouse gas assessments in parallel with Step 3. Guidance and procedures for undertaking such assessments include:

- The Global Protocol for Community Scale Greenhouse Gas Emissions (2012) is a joint initiative by the World Resources Institute, C40 and ICLEI, and is based on the International Standard for Determining GHG Emissions for Cities (United Nations Environmental Programme /UN-Habitat/World Bank, 2010). Visit www.ghgprotocol.org/city-accounting for more information.
- International Local Government GHG Emissions Analysis Protocol (ICLEI – Local Governments for Sustainability 2009).
- Guidelines for National GHG Inventories (Inter-governmental Panel on Climate Change, 2006).

These sources provide detailed guidance for undertaking baseline assessments of where and how urban areas generate greenhouse gases. Conducting a greenhouse gas assessment at this stage can provide the basis for developing targets and actions that can be integrated at multiple steps of the overall climate change planning process.

Manila skyline, Philippines.
© UN-Habitat/Bernhard Barth

STEP 3 REVIEW CHECKLIST - VULNERABILITY ASSESSMENT	✔
✔ Record stakeholders' perceptions of changing climates and trends (exposure)	
✔ Record stakeholders' perceptions of primary and secondary impacts driven by climate change (exposure)	
✔ Document the cause-and-effect pathways from changes in climate to impacts using influence diagrams (exposure)	
✔ Corroborate results of perceived climate changes and potential impacts using local, regional, national and/or international scientific reporting. Seek both historical trends and future model projections (exposure)	
✔ Document known thresholds and triggers for impacts (sensitivity)	
✔ Develop community maps with stakeholders to document specific locations of concern (sensitivity)	
✔ Develop risk ratings based on likelihood of occurrence and potential consequences	
✔ Rate current level of capacity and preparedness to deal with potential impacts identified (adaptive capacity)	
✔ Prioritize vulnerable sectors and people	
✔ Identify preliminary adaptation options for prioritized sectors and people	

There are many tools available to conduct a Vulnerability Assessment and use of them will depend on your resources and capacity. The table provides a summary of required resources and references for these approaches.

Many are more costly, time consuming and technically demanding approaches, but may provide the level of detail you seek.

Traffic congestion on Namirembe Road in Kampala.
© UN-Habitat/Nicholas Kajoba

TABLE 23: Vulnerability assessment tools

TOOLS	TECHNICAL CAPACITY	DATA NEEDS	TIME	COST $	PARTICIPANT REQUIREMENTS
Task 3.1: Exposure Analysis					
Focus groups	◕	◔	●	◑	●
Structured interviews	◔	○	●	◑	●
Scientific hazard assessment	●	●	●	●	○
Review other planning reports (e.g.,Disaster Management Plans)	◑	◑	◑	○	○
Field mapping GPS / GIS	◑	◑	◑	◑	◔
Surveys (written or Internet-based)	◑	◑	◑	◑	◑
Community perception elicitation	◑	○	◑	◑	◑
Climate change observation template	◑	◔	◑	◑	◑
Impact rating matrices (qualitative)	◑	◑	◔	◔	◔
* Influence diagrams	◕	◔	◑	◔	◑
Downscaling local projections from regional / global models	●	●	◑	◑	○
* Climate change trend matrix	◕	◕	◕	◕	◑
Task 3.2: Sensitivity Analysis					
Vulnerability index mapping	◕	◕	◕	◕	◕
* Neighbourhood vulnerability mapping	◕	◕	◕	◕	●
* Hot spot mapping	◕	◕	◕	●	◔
* GIS / Visualizations (e.g., sea level rise)	●	●	●	●	○
Task 3.3: Adaptive Capacity Analysis					
Qualitative assessment (criteria/question)	◔	◔	◔	◔	◔
Adaptive capacity mapping	◑	●	●	●	●
Individual versus collective	◑	●	●	●	●
Social vulnerability assessment	◑	●	●	◑	○
Quantitative assessment of adaptive capacity	◑	●	●	◑	○
Task 3.4: Summary Vulnerability Assessment					
Disaster risk mapping	●	●	●	●	●
Impact-specific quantitative exposure and sensitivity analysis	●	●	●	●	●

** Tools discussed in this guide - see Appendix 1*

Legend

○ *Indicates low requirement (e.g. Low technical capacity required)*

◔

◑ *Indicates medium requirement (e.g. Medium amount of time)*

◕

● *Indicates high requirement (e.g. High cost)*

ISSUES =
Community concerns, problems, challenges, opportunities

OBJECTIVES =
Definitions of community values that allow them to be used in the planning process

Small town in Kenya.
© UN-Habitat/Bernhard Barth

Module B

WHAT MATTERS MOST?

This module includes only **one planning step** and will help planners to answer the following question:

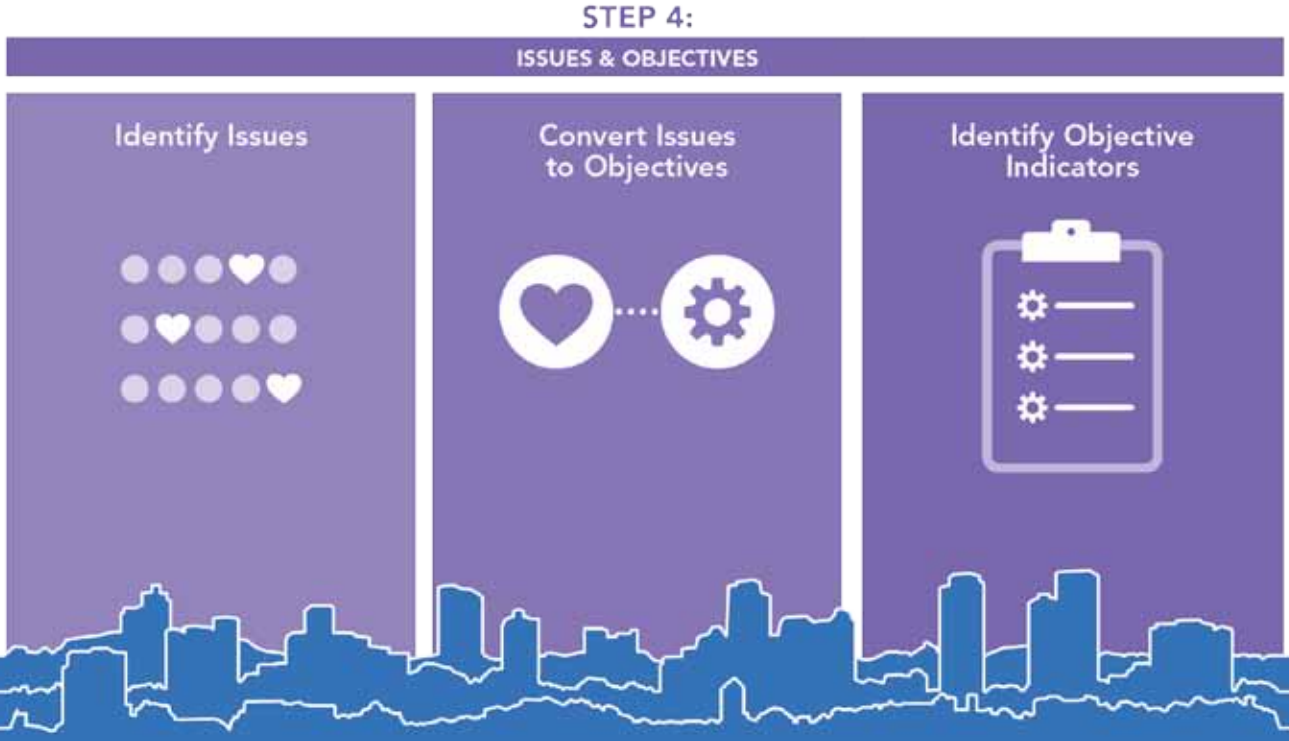
STEP 4 *What community and local stakeholder issues must be considered in addition to any existing city objectives when selecting and prioritizing climate change options, and how can they be identified?*

After completing Module B, planners and stakeholders will have:

- ✔ A clear list of *existing* city development objectives (from other plans and strategies) that must also be considered and used as part of the climate change planning initiative.
- ✔ A clear understanding of the local community issues and objectives (which may or may not be addressed by city planning objectives) and which ones matter most to the community.
- ✔ An understanding of which objectives (city-level and additional local community-level objectives) are most affected by, and relevant to, climate change adaptation planning.
- ✔ Indicators with which to compare and measure the objectives so they can be used to evaluate and prioritize climate change adaptation options.

Along with the **technical facts** about climate change uncovered in *Step 3: Vulnerability Assessment*, the objectives identified and/or refined in this module will be used in later planning steps to help identify climate change options and to help assess and prioritize them based on how well they meet the objectives.

The graphic illustrates the module's single planning step and major planning tasks.



STEP 4: ISSUES AND OBJECTIVES

Local community values matter. They are what city residents care about and are the foundation of **participatory, values-based planning**. Identifying these values and expressing them as objectives is a critical step that will:

- ✔ Ensure that the city is not **missing or under-representing important local stakeholder and community-level objectives** in its existing plans and strategies.
- ✔ Provide a **framework** to evaluate climate change adaptation options (i.e. objectives function as **evaluation criteria** for options).
- ✔ Help to ensure that important **local community groups** (women, the poor, youth, the elderly, the private sector) and other critical local stakeholders (the private sector, community organizations, local agencies) **are involved in the planning process.**
- ✔ Help to ensure the broader community (including vulnerable groups) better **understands the connections between climate change and community wellbeing.**
- ✔ Generate broader **community understanding of, and support for,** the climate change adaptation options that will be developed and prioritized during later planning steps.

In the context of this manual, **values** are incorporated into the planning process by determining the community's **issues** and **objectives.**

Issues are the concerns, problems, challenges, or opportunities that the broader community has identified as being important.

Objectives articulate and define these issues so that they can be used in the planning process. In some places, they may be referred to as goals. The objectives developed in this step will provide the basis for establishing planning priorities, making trade-offs between different climate actions, and prioritizing and sequencing the *Climate Change Action Plan*'s final list of climate change adaptation options.

In some cities, **much of the work involved in this module may have already been completed through earlier city planning processes** (e.g. city development strategy, city and town plans, transportation plans, local economic development strategies). City plans and strategies that were designed through a participatory process, in particular, may have identified local issues and characterized them as plan objectives. Ideally, these plans should have **already been reviewed and summarized** by the core planning team and stakeholder advisory committee in Step 1 and Step 3. This step will further review these documents and re-assess (and potentially refine) their planning objectives for use in the climate change planning process.

In other cases, there may be **more limited planning documents** or **city plans that do a poor job of identifying objectives**. These would include less participatory, "top-down" plans developed with little local stakeholder and community engagement. It would also include plans where specific **actions** (e.g. "build a new bridge over the river") have been used instead of more **general objectives that deal with the root issue** (i.e. "improve transport options across the river"). In these cases, refining and confirming the objectives with the core planning team and stakeholder advisory committee may take more time.

Whatever the context, it is nonetheless critically important to spend some extra time with this planning step to ensure the resulting objectives are:

- ✔ Complete and concise.
- ✔ Relevant to climate change planning in the local context.
- ✔ Appropriate.
- ✔ Measurable.

Well-constructed objectives will not only provide **direction and focus for decision-making**, but will also be used to help **monitor and evaluate climate change options** later in the planning process.

Step 4 involves the following tasks. Depending upon the city's local planning context, some of the early tasks may be combined or expedited.

TASK 4.1: *Identify and organize issues*
TASK 4.2: *Restate issues as objectives*
TASK 4.3: *Assess relevance of objectives to climate change*
TASK 4.4: *Identify gaps in objectives*
TASK 4.5: *Develop indicators for objectives*

A *VALUES-FOCUSED* APPROACH VS. AN *ALTERNATIVES-FOCUSED* APPROACH

Most approaches to planning and decision-making focus on determining ***what*** alternatives are available to solve a problem rather than ***why*** it is a problem in the first place. This type of thinking is referred to as an alternatives-focused approach, and it tends to be reactive.

In contrast, a values-focused approach is more proactive. It puts the emphasis on deciding **what is important to people** *(what are the local community's and stakeholder's interests and objectives?)* and then determines how best to achieve those objectives. Such an approach not only allows a better understanding of the climate change issues confronting the city, but it can also lead to the development of better, more creative climate change adaptation options or actions.

Why a values-focused approach?

Here are six reasons why a values-focused approach is preferred when planning for climate change.

1. **Facts and values –** The approach uses both facts (from Step 3: Vulnerability Assessment) and the equally important community objectives (from Step 4: Issues & Objectives) to identify, screen and prioritize climate adaption options. This will be described in more detail in Module C,
2. **Multiple perspectives –** The approach facilitates a broader understanding of the wide variety of perspectives that are important to consider when making climate change decisions. This includes the review and incorporation of different city plans and strategies.
3. **Holistic –** By involving a wider range of existing city plans and strategies, stakeholders and the public (not just the core planning team or stakeholder advisory committee), the approach is more inclusive and typically takes into account non-material aspects of community wellbeing.
4. **Local knowledge –** The approach uses multiple types of knowledge, expertise and qualitative information, not just the more scientific, quantitative information that may have been used in existing city plans and strategies.
5. **Participatory –** Acknowledging the different values that people hold can build common ground and enable a better, shared understanding of the climate change challenge. The likelihood that local residents will support the final climate adaptation options identified in your Climate Change Action Plan is higher if their local values have been taken into account in the design of the plan. It also provides an opportunity to address this gap if existing city plans failed to engage residents and stakeholders.
6. **Flexible –** The approach is structured in a way that explicitly addresses multiple objectives across a range of city planning concerns (land use, transportation, health, economic development, etc.) and is better suited for evaluating complex issues like climate change.

Task 4.1: Identify and organize issues

Planners need to work with the core planning team, stakeholder advisory committee and the broader community to understand and identify important local issues. Many of these issues (and associated objectives) may have already **been identified in existing city plans and strategies** and reviewed by the core planning team and stakeholder advisory committee in Module A.

If the local planning context includes a number of guiding city plans and strategies (e.g. city development strategy, city plan, transportation plan, environment strategy, local economic development strategy), **these plans should be reviewed again and re-assessed**. It is also important to consider any existing city plans and strategies no matter how old or out-dated, as they could still contain useful information.

When reviewing them with the core planning team and stakeholder advisory committee, it is important to answer these questions:

- *Have any of the existing city plans and strategies identified climate-change related issues and objectives?*
- *Do the objectives of existing city plans and strategies align with one another (i.e. are they consistent across the plans)?*
- *Are the objectives complete and concise (see Step 4.2)?*
- *Were the plans created with local community and stakeholder engagement (i.e. were they developed using a participatory planning approach)?*

If the core planning team and stakeholder advisory committee can answer yes to all these questions, it is likely that the remainder of this task and Task 4.2 can be skipped. It is recommended, however, that Task 4.2 be reviewed to ensure that the objectives from existing city plans and strategies are succinct statements that indicate how the city would like **to manage, minimize or mitigate a particular issue;** well-constructed objectives should describe the desired outcome.

For those cities with more limited existing plans, it is at this stage that a workshop can be organized with the core planning team and/or stakeholder advisory committee to review the work completed in Module A and identify community issues. The issues they identify **should be informed by the *Vulnerability Assessment Report*** (Step 3) and the early outreach conducted during Step 1, where some climate change and urban development issues might have already been identified. Use Tool 4-A to help organize the process.

TOOL 4-A
Issues Identification & Organization

It is important not to limit the identification of community issues to only climate change issues at this time, but to **encourage participants to identify *all* community development issues**. As some participants may question the importance of looking at broader city planning issues, it may be useful to remind the core planning team and/or stakeholder advisory committee of one of this guide's major themes: that **good city planning = climate smart planning**; what might first appear to be more general urban planning issues will likely be related to climate change planning. Each issue's relevance to climate change will be examined in a later task.

Once stakeholders have identified issues, the next step is to make sense of them by grouping and combining

SEPARATING ISSUES FROM ACTIONS

A common challenge in organizing issues is **separating the issues from actual climate change adaptation and mitigation *actions***. For example, someone might note on their issue card in Task 4.1, "build sea wall", while another person may suggest "plant more trees on city streets". Both of these are examples of climate actions.

Facilitators should note **which of the suggestions are actually *actions* and use them as a way to identify and understand the underlying issues**. Taking a similar approach to the "Why Game" (see Figure 9), the facilitator should identify the two examples as actions and ask people why they would pursue these actions. In these two examples, the underlying issues might be an increased incidence of coastal flooding during storm surges, and increasingly hot summers and dangerous urban heat island effects. These issues can be noted and organized in the appropriate grouping of issues.

Be sure also to record the action idea by moving it to a separate flip chart or wall area and let the group know that the idea has been put aside and will be revisited in Step 6: Option Identification.

similar ideas into general categories or themes. Be aware that some issues may fit under multiple categories or themes. Again, use Tool 4-A to help organize the process. Here, it might become evident that the issues naturally fit into sectors used in the Vulnerability Assessment, like the environment, housing, sanitation, health, economic development, transport or disaster preparedness. Other Vulnerability Assessment categories, like stakeholders impacted (people), location (places) and institutions impacted could also be used.

In organizing the issues, it may also become apparent that there are some related higher-level and lower-level issues. For example, one of the themes that might emerge is around the issue of poverty. There may be many similar issues related to economic development, capacity building, education and the like that may all be related to the larger issue of poverty. In this example, poverty could be moved to the top of the grouping as a higher-level issue, and the other issues organized beneath it.

Task 4.2: Restate issues as objectives

Once the issues are organized into general categories or sectors, it is time to convert them into objectives that can be used to guide the rest of the planning process.

TOOL 4-B
Issues to Objectives

To create an objective, convert one of the issues into a **succinct statement that indicates how you would like to manage, minimize or mitigate the particular issue.** The objective describes the desired outcome.

Creating an objective involves combining an action verb that describes a direction of preference (e.g. "*increase*", "*reduce*", "*maximize*"), with a description of the subject (e.g. "*reduce risk of coastal storm surges*", "*improve citizen's health*" or "*minimize urban poverty*").

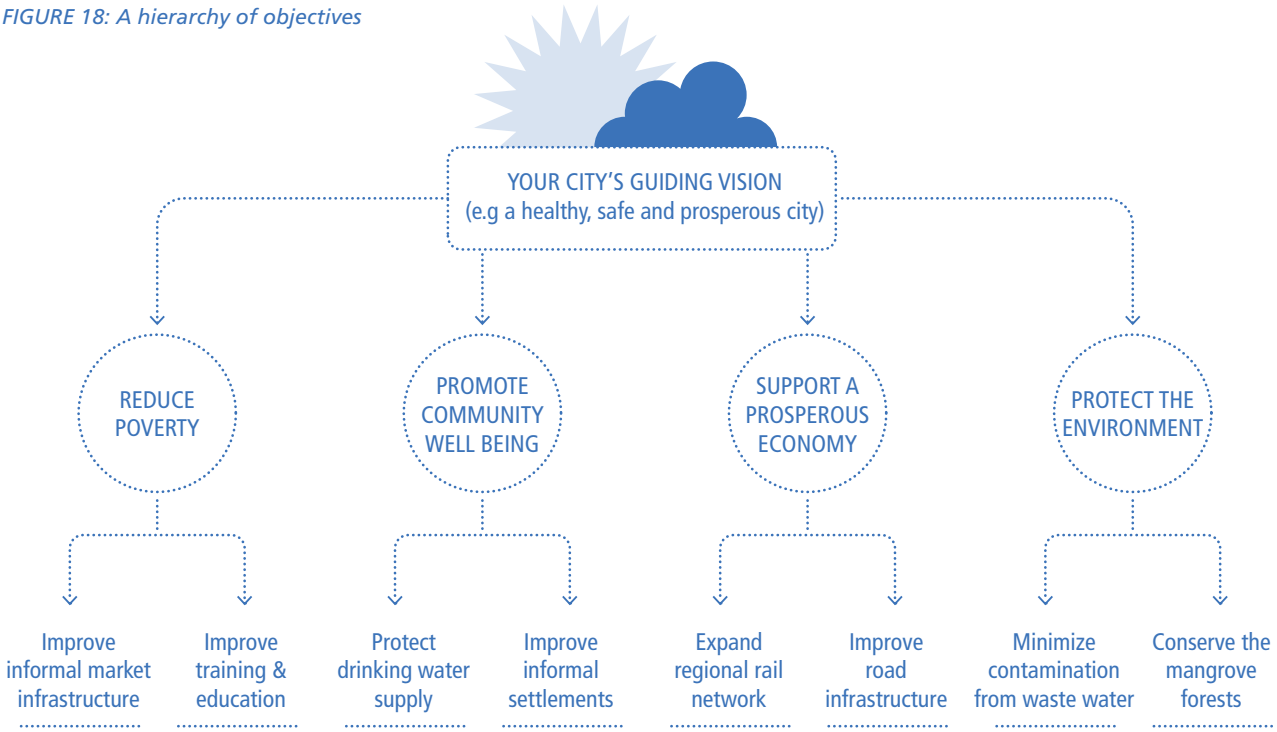
Objectives will be used later in the planning process to **help generate climate action options** and **as evaluation criteria to assess and prioritize th**e options. They act as a checklist to **make sure that climate change adaptation options that are identified actually address local community and stakeholder development issues**. If the set of objectives is incomplete or stakeholder interests are not represented, sub-optimal climate adaptation options with a lower probability of successful implementation may be identified in the next phase of the planning process. Furthermore, alienation of stakeholders due to the omission of their issues and interests might have a negative impact on the planning process.

Using Tool 4-B, convert each of the issues identified in Task 4.1 into objectives.

The next step is to revisit the objectives and begin organizing them into higher and lower levels as you did with the issues. In this case, the lower level objectives will become sub-objectives (i.e. supporting objectives).

The desired outcome of this step is a simplified hierarchy of objectives. Figure 19 illustrates an example of how objectives can be grouped and presented as objectives and sub-objectives. Some sub-objectives might contribute to multiple objectives, which is fine. Place each under the objective that it is most related to. Connections can be noted and discussed.

FIGURE 18: A hierarchy of objectives



WHAT'S YOUR CITY'S VISION?

Many cities have developed guiding vision statements that describe a future that the city is working toward. Often these vision statements are found at the beginning of city or town plans and are used in multiple planning documents (e.g. city development strategy, city plan, local economic development strategy, transport plan).

If your city has a vision statement, you may want to use it during this step to screen the objectives that come out of this step. *Do the objectives you develop in Step 4 support your city's existing vision statement?* It is likely they will, and they should.

It is important that there is **consistency between your city's guiding vision and the climate planning objectives that are developed during Step 4**. It will support mainstreaming of final outcomes of the plan and is part of integrating and coordinating city planning processes. You may also discover that your city's vision is out-dated and that it may need to be revised to include climate change considerations.

Bangkok skyline.
© UN-Habitat/Bernhard Barth

Task 4.3: Assess relevance to climate change

All cities should complete this task, including those who were taking objectives from existing city plans (i.e. those who skipped Step 4.2).

TOOL 4-C Objectives Analysis: Relevance to Climate Change

Once objectives have been identified and organized, the next step is to assess their relevance to climate change. In Task 4.1 it was useful to think of *all* city-planning objectives and not restrict stakeholders to thinking only of objectives related to climate change. This is because many objectives that at first do not seem related to climate change, such as poverty, are in fact related. In this task (4.3), the planning team will discuss the potential links to climate change for each objective and determine if they should be used in the remainder of the climate change planning.

Using a simple table or matrix such as Tool 4-C, go through both the main objectives and sub-objectives asking your core planning team and/or stakeholder advisory group: "*How is the objective affected by climate change?*" An example is illustrated in Table 24.

It is important to use the Vulnerability Assessment (Step 3) to understand the link between objectives and the risks and threats posed to them by climate change. If climate change is affecting objectives, discuss the current situation and note the main points on the worksheet (Tool 4-C). If the objective is not affected by climate change, it does not need to be there.

You should now have a list of objectives that are relevant to climate change. All other objectives can be set aside for the remainder of this planning process.

TABLE 24: Tool 4-C Objectives analysis: relevance to climate change (example)

OBJECTIVES		LINK TO CLIMATE CHANGE (RISKS, THREATS AND IMPACTS) FROM THE VULNERABILITY ASSESSMENT	AFFECTED BY CLIMATE CHANGE?	
Main Objective	**Sub-Objective**		**Yes**	**No**
Protect the environment	Conserve the mangrove forests	Development (upstream and on coastal plain) causing destruction of mangrove forests which buffer and protects some coastal areas from sea level rise and storm surges	✔	
	Minimize contamination from waste water	Stormwater from extreme storm events overloads sewers and sewage lagoons; increased raw sewage flows untreated into harbour	✔	
Support a prosperous economy	Improve road infrastructure	Roads susceptible to erosion and impassable during floods caused by extreme storm events	✔	
	Expand regional rail links	Not affected		✖
Promote community well-being	Improve informal settlements	Severe storms and flooding put informal settlements at river mouth at increased risk Increased landslide or slope failure risk on saturated steep slopes where informal settlements are also located	✔	
	Protect drinking water supply	Increased flood incidents caused by extreme storm events contaminate water supply Seasonal droughts reduce water supply	✔	
Reduce poverty	Improve education and training resources	Not affected		✖
	Improve informal market infrastructure	Major informal markets located in unprotected, hazardous area that is flooded during storm surges	✔	

Task 4.4: Identify gaps in objectives

Once the objectives are organized and assessed for their relevance to climate change, it is time to look for objectives that may have been overlooked but are typically considered in climate change planning, such as:

- Reducing or mitigating greenhouse gas emissions.
- Promoting sustainable resource management.

It is here where even those cities with multiple city plans and strategies might find that more specific climate change objectives have been omitted. Ask your core planning team and/or stakeholder advisory committee:

- *Are there any gaps in the list of identified objectives (e.g. is climate change mitigation addressed?)?*
- *Can any of the objectives be modified to include some of the ones that were overlooked?*

The purpose of this step is to assess whether you have **overlooked any climate change related planning objectives**. Although local values are the core of the objective identification process, it is important to analyse these objectives in a broader context to make sure that they are as comprehensive as possible.

It is also critical at this juncture to make sure that **vulnerable groups have been considered**, and their viewpoints and needs are not missing from your list of objectives hence it is important to review your *Vulnerability Assessment* (Step 3). The needs and objectives of women, youth and marginalized groups such as the urban poor must be included in the climate change planning process. Hopefully, Step 2: Stakeholders and Participation helped to identify these groups, involve them in the stakeholder advisory group, or determine other methods to get their input directly.

Task 4.5: Develop indicators for objectives

As part of a values-based planning process, the developed objectives capture the climate change-relevant issues that matter most to the community and to the city. To ensure that these objectives (i.e., the community values) are carried forward into the next planning steps, indicators need to be developed for them. These indicators, or measures as they are sometimes called, will be used to:

- Help to **identify** additional climate change options (Step 5).
- Help to **assess** the climate change options (Step 6) by measuring how well each action would support every one of the objectives.
- Help to **prioritize** the climate options (Step 6) by highlighting the actions that best **support the most important objective**, or best support **multiple objectives.**
- Help to form the basis of a **monitoring and evaluation** programme (Step 8) to make sure that the options are actually helping to meet the objective(s) they were intended to (i.e. how well is Action X improving housing conditions in informal settlements?)

Indicators should be **clearly linked to their objective**(s) and are often quantitative. Sometimes it may be challenging to determine a clear, measurable indicator for a given objective. This may be because no data is available, your capacity is limited in establishing an indicator, or because an objective cannot be adequately measured using quantitative data and must use more qualitative measures. As illustrated Table 25, there are three types of measures: *natural measures*, *constructed scales* and *proxy measures*.

CLIMACT PRIO: A SUPPORTING TOOL

The CLIMate ACTions Prioritization tool (CLIMACT Prio) is a climate awareness, decision support and capacity building tool for the prioritization and assessment of climate mitigation and/or adaptation actions at a local level. It helps decision-makers and urban planners to identify a decision criteria and set objectives to assess and prioritize climate actions. As with this guide's methodology, CLIMACT Prio is a decision support tool that does not necessarily identify an "optimal" solution. CLIMACT Prio supports the climate actions' analysis and prioritization process by also providing illustrations, graphs and visualisations that are automatically generated based on users' inputs.

The Microsoft Excel-based system requires the user to enter information through a guided menu of instructions. Developed by the Institute for Housing and Development Studies (HIS), CLIMACT Prio uses a structured decision-making approach similar to what this planning guide uses. It can be used in combination with this guide and provides a complementary tool to help urban planners structure and define the decisions under consideration. More information on the CLIMACT Prio tool and supporting users' manual can be found at: http://www.ihs.nl/research/research_projects/climact_prio_tool/

TABLE 25: Indicator types

Natural indicator	A natural indicator is one that provides quantitative information that can be used to evaluate how well an objective is being met. These are often official statistics. Example: Percentage of city with storm water system coverage.
Constructed scale	When hard data is not available, constructed scales are useful. Constructed scales use qualitative descriptions to evaluate how well an objective is being met. Each level of the scale is described rather than measured. Constructed scales are also referred to as descriptive indicators. The data can be gathered through surveys or structured interviews with experts. Constructed scales can use any type of scale, such as high-medium-low, or 1-10 (where 1 is low and 10 is high). This guide uses constructed scales in several places. In them, a "low" would typically be described as "no or little change from the current situation", while "medium" would describe a potential change to the "low" situation (i.e. where some progress has been made). "High" would describe a situation where a great deal of progress has been made over the "low" and the objective has almost been met. Example: - Low: No change from current situation. Government does not provide support when faced with floods or other emergencies. - Medium: Some change from current situation. Government response has improved and they are providing some support for people affected by emergencies. - High: Government provides excellent emergency response and support for people affected by emergencies.
Proxy indicator	Used when a measurable indicator is available that adequately reflects how well an objective is being achieved, though the indicator is only indirectly related to the objective. Example: Migration and population statistics can be used where climate change-related drought is driving rural residents and farmers to move to urban centres.

Natural indicators are used when a clear, *quantifiable* measure for an objective is readily available (e.g. percentage of city with storm water system coverage; amount of protected coastal mangrove forests; volume of greenhouse gas generated by transport sector).

For other objectives, natural measures may not exist. For example, the effectiveness of a local government's disaster response plan may be more difficult to measure quantitatively. In these cases, qualitative *constructed scales* (high-medium-low) in combination with expert judgement can be used. *Proxy measures* may also be helpful.

If you have technical resources and time, it is likely that you will develop quantitative indicators for your objectives. If you were using supporting decision tools, like CLIMACT-Prio (see text box), more quantitative indicators would likely be used.

Indicators will be revisited, refined and expanded to track your final *Climate Change Action Plan* actions in Step 8: Monitoring and evaluation.

Organizing objectives, South Korea.
© EcoPlan International, Inc.

TABLE 26: Examples of quantitative indicators

OBJECTIVE		AFFECTED BY CLIMATE CHANGE?	DESCRIPTION OF LINK TO CLIMATE CHANGE	INDICATOR
Objective	**Sub-objective**	**Yes**	**See Vulnerability Assessment (Step 3)**	
Protect the environment	Conserve the mangrove forests	✔	Development (upstream and direct) causing destruction of mangroves	Hectares of mangrove forests protected
	Minimize contamination from waste water	✔	Stormwater from extreme storm events overloads sewers and sewage lagoons; increased raw sewage flowing untreated into harbour	Water contamination levels (post storm event)
Support a prosperous economy	Improve road infrastructure	✔	Roads susceptible to erosion and impassable during floods	Number of days the market is inaccessible
Promote community wellbeing	Improve informal settlements	✔	Severe storms and flooding put informal settlements at river mouth at increased risk	Percentage of informal settlements with storm water system coverage
	Protect drinking water supply	✔	Increased flood incidents contaminate water supply Seasonal drought and water shortages	Days of undrinkable water (boil water advisory) Water reservoir level
Reduce poverty	Improve informal market infrastructure	✔	Major informal market located in unprotected, hazardous area that is flooded during storm surges	Market days lost to flooding

This guide is primarily written for locations that may not have significant quantitative data available (such as is shown in the example). Therefore, the remainder of the guide uses a less technical approach and mostly constructed scales with descriptive indicators. Some natural measures are also used.

TOOL 4-D Objective Indicators

Tool 4-D can be used to develop indicators for your objectives. Whatever types of indicator you decide to use, your core planning team and stakeholder advisory team should be involved in reviewing them. These groups could also be involved in developing the indicators. At this point, users should also be taking into account what data actually exists and is accessible (within resource constraints).

Table 27 illustrates how more descriptive indicators, or constructed scales, can be developed using Tool 4-D. The scale shown provides descriptions for high, medium and low. Given the qualitative and somewhat subjective nature of this approach, note that the scale also includes both L-M (low-medium) and M-H (medium-high) scores. Note also that the low description indicates "no or little change from the current situation". The simplified description of current conditions should come from the *Vulnerability Assessment*.

These indicators will be used in the identification and assessment of climate change actions in Module C: Step 6.

TABLE 27: Tool 4-D Constructed scale descriptive indicators (example)

OBJECTIVE		LOW	MEDIUM	HIGH
Objective	**Sub-objective**			
Protect the environment	Conserve the mangrove forests	No or little change from the current situation (use Vulnerability Assessment)	- Some mangroves lost	- No net loss of mangroves
	Minimize contamination from waste water		- Outfall contamination reduced during smaller storm events - Storm sewer system able to manage smaller storm events	- Storm water managed - Outfall contamination minimized during larger storm events - Storm sewer system able to manage larger storm event
Support a prosperous economy	Improve road infrastructure	No or little change from the current situation (use Vulnerability Assessment)	- Some coastal roads at risk from climate change protected	- Most coastal roads at risk from climate change protected - Work travel times reduced on improved roads
Promote community wellbeing	Improve informal settlements	No or little change from the current situation (use Vulnerability Assessment)	- Some land management improvements	- Number of houses in hazardous locations dropping
	Protect drinking water supply		- Some drinking water supply improvements	- Reduced incidents of drinking water contamination - Stable and affordable water price
Reduce poverty	Improve informal market infrastructure	No or little change from the current situation (use Vulnerability Assessment)	- Some informal market upgrades - Fewer days lost to market closures	- Market access and services better protected from climate change related flooding - Minimal days lost to market closures

STEP 4 REVIEW CHECKLIST – ISSUES AND OBJECTIVES	✔
✔ Collect and assess objectives from existing city's plans and strategies (e.g. city development strategy, city plan, transport plan, environment plan, local economic development strategy)	
✔ Identify additional community and local stakeholder issues and objectives where required (core planning team, stakeholder advisory committee, broader outreach)	
✔ Ensure women, youth and other traditionally marginalized and vulnerable stakeholders have been included in the identification of any additional community issues	
✔ Assess relevance of objectives and sub-objectives to climate change	
✔ Identify gaps in objectives	
✔ Develop indicators for objectives so they can be used to help assess and prioritize potential climate change actions in Module C.	

MILLENNIUM DEVELOPMENT GOALS AND INDICATORS

The *Millennium Development Goals* were adopted by all United Nations member states in 2000. The goals are broad, global goals that address essential dimensions of poverty and their effects on people's lives, including key related issues like health, gender equality, education and environmental sustainability.

As part of the larger *Millennium Development Goals* initiative, UN-Habitat developed and adopted the Habitat Agenda, which is effectively an expanded set of sub-goals for urban areas. As part of the initiative, UN-Habitat developed a number of indicators that can be used to track the progress of reaching both *Millennium Development Goals* and *Habitat Agenda* goals.

Some of these indicators may be relevant to your situation and your objectives. There are two main information sources that may be helpful:

- UN-Habitat's Urban Observatory monitors progress towards the *Millennium Development Goals*, through a network of global, national and local Urban Observatories. Work with your local Urban Observatory (where one exists) to identify indicators that are relevant, and for which data is already collected.
- A supporting guidelines document was also created that provides a rationale for the use of indicators, suggested methodologies to track them, and information on related gender considerations (an important aspect of planning for climate vulnerable groups).

While the indicators will be revised, the current guidelines are available here: http://ww2.unHabitat.org/programmes/guo/documents/urban_indicators_guidelines.pdf

Woman walking in the neighborhood of Cerro Santa Cruz in Esmeraldas, Ecuador.
© UN-Habitat/Francois Laso

Module C

WHAT CAN WE DO ABOUT IT?

This module includes **three steps** and will help planners answer these questions:

STEP 5 *What options are there to respond to climate change in our city?*

STEP 6 *How to assess, screen and choose the best options to ensure resources, time and capacity are used most effectively and efficiently?*

STEP 7 *How can we best implement the prioritized climate change options and assemble a Climate Change Action Plan?*

After completing Module C, planners and stakeholders will have:

- ✔ Identified, screened, assessed and prioritized climate change adaptation actions (i.e. projects, policies, programmes, actions) according to local objectives and vulnerabilities;
- ✔ Developed a stand-alone *Climate Change Action Plan* with a clear implementation framework; and / or
- ✔ Mainstreamed / integrated climate actions into existing policy instruments, plans and programmes (where practical and feasible).

While the entire planning process is cyclical and iterative, this is especially the case during *Step 5: Option identification* and *Step 6: Option assessment.* There are significant gains to be had in **assessing and re-assessing climate change actions against community objectives**, **technical realities** and the **local planning context**. The end result will be an **achievable, comprehensive and integrated** *Climate Change Action Plan* that recognizes and supports a city's most vulnerable populations.

The graphic illustrates the module's three planning steps.

STEP 5: OPTION IDENTIFICATION

Climate change options are the **project, programme and policy actions** that can be undertaken to reduce your city's vulnerability, develop its adaptive capacity and to build its overall resilience to climate change. Identifying the "long list" of potential options is the first step in developing the ultimate **"short-list" of prioritized options** that will make up a large part of your final *Climate Change Action Plan*.

Typically, the options identified during this step can be organized into four general categories:

- **Information and awareness:** general climate change information to help build community awareness, resilience and adaptive capacity.
- **Plans and regulations:** zoning, development review and approval, building codes and permitting.
- **Public investments and infrastructure:** facility and infrastructure upgrades, protective infrastructure, redevelopment and/or relocation of facilities/ housing/developments.

The scale and scope of each type of option depends upon available resources and the planning authority and mandate of the main plan organizer or "anchor" (see Step 7).

The tasks outlined in this step could be undertaken in different ways, depending on the time and resources available, and the overall scope and scale of the project. For example, a small project organized by a single person without a significant core planning team or stakeholder advisory group could complete this step as part of a **desk exercise**, synthesizing information available from city plans, reports and policies.

In those cases where there is a core planning team and stakeholder advisory committee, it would likely be the outcome of a **technical workshop**, involving the above-mentioned groups, additional city staff from multiple city departments (e.g. health, engineering, transport, etc.) and available climate change experts who could provide additional input, scientific knowledge and sector expertise.

Where resources and time permit, it could be organized as part of a larger **participatory group exercise**, engaging the broader community outside your stakeholder advisory group through community meetings and focus groups.

Regardless of the approach taken, by the end of this step, you should have a list of climate change options to be further refined, assessed and prioritized in *Step 6: Option evaluation*.

This planning step involves the following three tasks:

TASK 5.1: *Generate candidate options (projects, programmes, policies)*
TASK 5.2: *Organize options*
TASK 5.3: *Screen and rank options (preliminary feasibility)*

It is important to note that a city may create a comprehensive *Climate Change Action Plan* with a relatively large number of options that address **multiple vulnerabilities**, or may simply identify one or two key climate change options in a critical sector. In both cases, the challenge is to choose the options that will have the **greatest positive impact, given the level of importance of each objective** identified in Step 4, and that recognize the realities of finite time, money and human resources/capacity.

Fragile strucutures in Manzese, a densely populated neighbourhood in Dar Es Salaam, Tanzania.
© UN-Habitat/Suzi Mutter

Task 5.1: Generate candidate options (projects, programmes, policies)

Building a list of candidate options requires you to revisit some past tasks in addition to conducting some new work. Task 5.1 describes a number of actions that you can use to generate this "long list" of potential actions, which will be further narrowed down to a "short list" in subsequent tasks. Generally, when thinking about potential climate adaptation options, start wide and gradually narrow your focus to your specific location. See appendices 2 and 4 for links to helpful publications and resources.

TOOL 5-A Option Identification Worksheet

Begin by reviewing past work. At several points in the previous steps, potential climate change options and actions have been identified and, in some cases, summarized.

- **Task 1.5: Planning to plan** asked you to begin collecting any relevant city plans and policies to help understand the planning context. Did any of these include climate change options (planned and potential)?
- **Task 3.1: Exposure analysis** asked you again to collect, review and summarize related plans policies and reports. The goal of this activity was to understand how well individuals, communities and various levels of government could respond and adapt to climate change. However, in the process of reviewing them, you may have found some existing actions or options that could be expanded on or included in the *Climate Change Plan*.
- **Task 3.5: Identify preliminary adaptation options** asked you to begin brainstorming and develop long list of potential actions and options.
- **Tasks 4.1: Identify and organize issues** had you separate climate change actions from issues and put them aside for this task.

Reviewing these planning tasks can involve both your core planning team and stakeholder advisory group. After presenting a summary of the candidate climate change options from previous steps and tasks, challenge the group to identify additional actions. They should be challenged to "**think big**", to **be creative**, and to generate the **widest possible range of candidate climate change options**. No idea should be rejected or ignored at this stage; preliminary ideas will be honed down during later screening activities and preliminary evaluation, but it is important not to start out by limiting options. An initial action option that may seem impossible or too expensive at first glance may, in fact, turn out to be the source of new, creative options that are feasible.

It is useful to generate ideas from a number of perspectives. The following sections outline four ways to generate ideas:

1. Review existing plans and strategies
2. Consult existing option/action checklists
3. Build from the vulnerability assessment (Step 3)
4. Build from your objectives (Step 4)

Each of these methods is described in more detail on the following pages.

While generating climate action ideas, it is useful to keep in mind some key considerations and guidelines.

- ✔ In general, cities should begin by **repairing and strengthening existing climate defences** (e.g. conserving mangrove forests) and carrying out "low regrets" options that also contribute directly to larger community development goals (e.g. improve storm and sanitary sewers, water supply upgrades).
- ✔ High priority should also be given to "**climate-proofing**" **vulnerable infrastructure** located in hazard areas (e.g. power and water facilities, hospitals).
- ✔ New, large-scale engineering works should be avoided unless they are part of a more **comprehensive programme that includes spatial planning and land use regulation**.
- ✔ New infrastructure should be located in **less exposed and sensitive areas**.
- ✔ Focus on the location of major new infrastructure projects as the key to **guiding private sector growth** (i.e. if you are looking to pull development away from vulnerable areas, make investments in more climate safe areas; these public investments will "attract" additional private investment).
- ✔ Consider incorporating an **ecosystem based adaptation approach** that emphasizes the conservation and restoration of ecosystems to reduce the vulnerability and improve the resilience of ecosystems and people to climate change impacts.
- ✔ Integrate and coordinate with existing **disaster preparedness programmes** and initiatives where they exist.
- ✔ Climate change adaptation (and disaster risk reduction) can be integrated with **sustainable livelihoods approaches for more effective and sustained poverty reduction**.
- ✔ Remember that **smaller-scale, more incremental adaptation activities can be just as effective** as larger-scale, more "transformational" initiatives.

1. **Review existing plans and strategies:** Review the relevant city plans and strategies (e.g. city plan, town plan, transport plan, environment plan, local economic development strategy). Many might contain actions that could address climate sensitivity and improve adaptive capacity and city resilience.

2. **Consult existing option/action checklists:** The international community is well aware of the threats that climate change poses to cities and there are many resource guides and case studies that can be reviewed for potential climate change actions. More and more resources are becoming available all the time. One particularly valuable source of option ideas is Climate Tech Wiki (http://climatetechwiki.org), which offers detailed information about a wide set of adaptation (and mitigation) technologies. See Table 28 for a list of generic potential "first step" climate actions. Also review Section 3.2.3, which provides a list of candidate urban plans and policy programme areas that would support climate change mainstreaming options.

TABLE 28: Potential climate change adaptation options

CLIMATE CHANGE IMPACT	OPTIONS – POLICIES, PROGRAMMES, PROJECTS AND OTHER ACTIONS
Groundwater depletion	- Research underlying causes (e.g. increased runoff due to deforestation or other land use changes) - Groundwater recharging - "Low regrets" infrastructure upgrades and repair (e.g. ground water recharge/ impoundment areas) - Disaster Risk Reduction Plan
Water shortages	- Water management plan - Water conservation and awareness programme - Rainwater harvesting, groundwater recharge and improved infiltration - Engage with UN-Habitat's Global Water Operator Partnership building the resilience of water utilities[8] - Minimize system leaks and other water loss (e.g. surface reservoir evaporation) - Expanded or new reservoir capacity - "Low regrets" infrastructure upgrades and repair (e.g. reservoirs, water supply network)
Salt water intrusion into groundwater supplies in coastal areas	- Rehabilitation of coastal zone ecosystem and habitats (e.g. mangroves, dunes) - Water management plan - Water conservation and awareness programme
Increased riparian flooding and erosion	- Flood risk prediction and mapping - Rehabilitate urban wetlands and floodplains - Upstream rehabilitation of ecosystems - "Low regrets" infrastructure upgrades and repair (e.g. dikes, diversion channels, reservoirs) - Climate proofing vulnerable infrastructure in flood hazard areas (e.g. water, power, medical facilities)
Increased coastal flooding and erosion	- Coastal flooding risk prediction and mapping - Rehabilitation/protection of coastal ecosystems (dunes, mangroves) - "Low regrets" infrastructure upgrades and repair (e.g. dikes, diversion channels, reservoirs) - Climate proofing vulnerable infrastructure in hazard areas (e.g., water, power, medical facilities) - Improved, "climate safe" building codes for new development - Early warning system and evacuation plan for disaster events

8 *The Global Water Operators' Partnerships Alliance is a network of partners committed to helping water operators help one another improve their collective capacity to provide access to water and sanitation services for all. Water operators' partnerships are peer-support arrangements between two or more water or sanitation operators, carried out on a not-for-profit basis to strengthen their capacity.*

CLIMATE CHANGE IMPACT	OPTIONS – POLICIES, PROGRAMMES, PROJECTS AND OTHER ACTIONS
Increased flash floods	- Clean and repair existing drainage - Rehabilitate urban wetlands and floodplains - Rainwater harvesting, groundwater recharge and improved infiltration
Increased storm surge hazard	- Risk prediction and mapping - Land use plan - Disaster response plan – relief aid
Increased risk of landslides or mudslides on hazard slopes	- "Low regrets" infrastructure upgrades and repair (e.g. sewage, water supply, drainage systems) - Land use plan to identify and better manage development in hazard areas - Community awareness programme
Displacement and population movement from informal settlements vulnerable to climate change impacts	- Disaster response plan – relief aid - Land use plan for city extensions - Community awareness and education programme
Distress migration to cities/ towns due to droughts in rural areas	- Land use plan for city extensions - Integrate climate change concerns into local economic development plan - Disaster response plan – relief aid
Damage to infrastructure not designed to withstand climate change impacts being experienced	- Risk prediction and mapping - Improved, "climate safe" building codes for new development and renovations - Climate proofing vulnerable infrastructure (e.g., existing building stock, water, power, medical facilities)
Exaggerated urban heat island effect	- Tree planting programme - Building code to support sun shades, building openings, green roofs, white roofs etc. to reduce building temperatures - Awareness programme to support the adoption and use of different materials (e.g., white roofs, green roofs) - Increasing urban water bodies by maintaining, restoring and creating suitable bodies of water in the city environment - Development of urban wind corridors to improve air circulation and remove the heat from an urban area
Interruption of food supply networks and higher food prices	- Urban agriculture programme - Improved rural-urban linkages - Integration of food security into land use plans and other relevant city plans and strategies (e.g. local economic development strategy)
More favourable breeding grounds for pathogens (e.g. mosquitoes and malaria)	- Health promotion activities (e.g., awareness programme, community clean-up campaigns of drainage systems and other breeding grounds) - Improved training in health sector - Improved health infrastructure

3. **Build from the vulnerability assessment:** While a review of *Step 3: Vulnerability assessment* was carried out in Module B, it is worthwhile to **review it again, particularly if new stakeholders have joined the process**. Working systematically through each vulnerability identified in *Task 3.4: Vulnerable people, places, institutions and sectors*, ask your core planning team and stakeholder advisory committee to answer the following questions. As with earlier tasks like *Task 4.1: Issue identification*, it is important to use independent thinking techniques, "brainstorming" and other tools for generating candidate actions in an inclusive way. Using breakout groups – with each group developing actions for a single objective or sector – is often a productive approach if the stakeholder advisory group is large enough. It is common for stakeholders with similar concerns to be interested in detailing the same objective or sector. The result should be a set of actions to achieve a particular objective, or

multiple objectives if a sector approach is taken. Use the following questions to start a discussion:

- *How can we minimize the potential impact from climate change hazard _____ in the _____ sector/location?*
- *How can we increase our adaptive capacity and level of preparedness to deal with the potential impact?*

For example, flooding may have been identified as a possible effect of climate change. The stakeholder advisory group, in their work so far, may have already identified things like dikes, dams, building code updates and land use zoning updates as typical actions (see Table 28 for additional ideas). Sometimes such initiatives are already underway, but in other cases there may be a complete lack of any sort of planning. The brainstorming here would build on these responses and make them more locally relevant: "improve dikes along waterfront, manage dams on the river differently to account for increased precipitation, etc."

4. **Build from your objectives:** A final complementary way to generate candidate actions is to review the objectives that were generated from Step 4 and ask: "*What options could be undertaken to address the objectives?*" To do this, examine each objective separately and think about what options could be carried out to achieve that objective. Tool 5-B provides a framework for doing this. Add your list of potential actions to the final column of Tool 5-B, as demonstrated in the example.

TOOL 5-B
Objectives to Options Worksheet

TABLE 29: Tool 5-B Objectives to options worksheet (example)

OBJECTIVE		DESCRIPTION OF LINK TO CLIMATE CHANGE (from Vulnerability Assessment)	POTENTIAL OPTIONS
Objective	Sub-objective		
Protect the environment	Conserve the mangrove forests	Development (upstream and direct) is causing destruction of mangroves	- Rehabilitation of coastal zone ecosystem and habitats (i.e. mangroves) - Create environmental protection zone for remaining mangroves - Mangrove replanting programme (could be employment programme for urban poor) - Public education programme on benefits of mangroves - Development guidelines and enforcement mechanism for upstream development
	Minimize contamination from waste water	Stormwater from extreme storm events overloads sewers and sewage lagoons, increased raw sewage flowing untreated into harbour	- Clean-up and improved maintenance of existing drainage culverts (could be an employment program for urban poor) - Climate proofing vulnerable infrastructure (e.g. waste water plant) - "Low regrets" infrastructure improvements (e.g. sewage, drainage systems) - New flood protection infrastructure (e.g. diversion channels, stormwater impoundment and infiltration ponds, other infiltration) - Water quality monitoring programme (harbour) - Water quality early warning/alert programme for high pollution, "no fishing" days
Support a prosperous economy	Improve road infrastructure	Roads susceptible to erosion and impassable during floods	- Install better drainage culverts (could be an employment programme for urban poor) - Build dikes along the river - "Low regrets" infrastructure upgrades (e.g. dikes, diversion channels, drainage systems) - Improved hazard mapping - Climate proof exposed roads (e.g. raised road bed above flood level)

OBJECTIVE		DESCRIPTION OF LINK TO CLIMATE CHANGE (from Vulnerability Assessment)	POTENTIAL OPTIONS
Objective	Sub-objective		
Promote community wellbeing	Improve informal settlements	Severe storms and flooding put informal settlements at river mouth at increased risk	- Zone most vulnerable areas for non-settlement uses - Develop community warning and evacuation systems - Risk prediction and mapping - Disaster Response Plan – relief aid - New building codes – climate proof construction - Local economic development strategy with "green jobs" component
	Protect drinking water supply	Increased flood incidents contaminate water supply Drought – limited supplies in summer months	- Eliminate contamination sources by zoning industrial activity to new locations - Water conservation programme - "Low regrets" infrastructure improvements (e.g. water supply and treatment) - Climate-proof existing reservoir and facilities - Develop or expand reservoir to ensure adequate water supply during droughts - Build new reservoir in a safe area
Reduce poverty	Improve informal market infrastructure	Major informal markets located in unprotected, hazardous areas that are flooded during storm surges	- Local economic development strategy with "green jobs" component - Develop new informal market in accessible, hazard-free area - New building codes for permanent market facilities – climate proof construction - Monitor market days lost to flooding - "Low regrets" infrastructure upgrades (e.g. dikes, diversion channels) - Community warning and evacuation system - Disaster Response Plan – relief aid

Newly constructred residential flats built as a rehabilitation settlement to relocate slum dwellers in Nairobi, Kenya.
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MITIGATION OPTIONS

When identifying potential climate options, it is important to look for greenhouse gas mitigation options that would add to the list of options already identified. Sometimes referred to as "parallel gains", options with both adaptation and mitigation benefits generate multiple benefits.

It can often be helpful to scan the list of adaptation options already developed and ask: "Is there any way we can implement this option, *and* reduce greenhouse gas emissions at the same time?" Some examples of actions with combined adaptation and mitigation benefits include:

- Afforestation/reforestation of degraded watershed lands can help to reduce runoff and flooding (adaptation) and sequester carbon in growing trees (mitigation).
- Replanting or enhancing mangrove forests improves coastal flooding defenses (adaptation) and sequesters carbon in growing trees (mitigation).
- Improving agricultural and agro-forestry practices. For example, conservation tillage can improve water retention, nutrient recycling, crop productivity and ultimately food security (adaptation) and can simultaneously improve energy efficiency, reduce the reliance on fossil fuels and generate agricultural waste streams suitable for biofuels (mitigation).
- Land-use planning and zoning can be used to strategically reduce travel times between workers and workplaces (mitigation) and encourage settlement in less vulnerable locations (adaptation).
- Making waste water treatment facilities or landfill sites climate proof (adaptation) provides the opportunity to invest in technologies that capture methane or processes (such as composting) that reduce methane generation (mitigation).

There is increasing interest and funding opportunities for actions that have simultaneous adaptation and mitigation benefits.

Recycled car tires are used as containers for growing ornamental plants and vegetables in Las Acacias, Esmeraldas.
© UN-Habitat/Francois Laso

Task 5.2: Organize options

At this point you should have assembled a long list of candidate climate change options. Now it is time to organize the options, screen out those that are un-workable in your local context, and, if applicable, assemble options into sector-based groups or preliminary strategies.

Depending on the approach used to generate candidate actions, by either key vulnerabilities and/or objectives, some degree of basic organization is already emerging. But it is also very likely that your lists of actions will be long and messy. As a first step in getting organized, consider the following:

- *Which options are already being pursued/ implemented by local government through other plans and strategies?*
- *Which options are related?*
- *Are there duplicates that can be eliminated?*
- *Are there obvious connections and linkages between options where they could (and should) be combined?*
- *Are some options mutually exclusive?*
- *Are some options actually tasks within larger options? (e.g. "apply for government funding for dike construction" should be organized as a task within "build dikes")*
- *Do some options need to happen in a logical sequence (i.e. project phasing)?*

Options should be sorted into clearly defined categories. There is no right or wrong way to organize long lists, and flexibility may be needed to tailor to your needs. Options could be organized into categories by:

- **Sector:** Building off the Vulnerability Assessment (Step 3), use the identified sectoral categories of interest (e.g. water and sanitation, economy and livelihoods, health, agriculture and fisheries, housing, disaster risk reduction, ecosystems).
- **Location:** Building off community-based maps and "hot spot" maps (see Tool 3-F), use specific locations of concern such as areas prone to flooding, water shortage, etc.
- **Timing:** Some actions may need to be staged. For example, before building flood control structures it will likely be required to first update and modify settlement zoning/land use designations. It is often useful to further organize actions into short term (1-2 years), medium term (3-5 years) and long term (6+ years) categories. This is particularly critical when assessing larger infrastructure projects, as the useful life of existing infrastructure should be assessed to determine when modifications for adaptation should be incorporated.

  Timing also needs to consider the "urgency of need" for the particular option. See Tool 5-D.

- **Cost:** Some actions may be capital intensive and require national or international funding, while other less costly actions could, potentially, be funded locally through current budgets and programme areas, or mainstreamed with already funded initiatives.

For this guide, it is recommended to **organize the options by sector**, unless there is another structure that is better suited to your local context. One simple template to follow is to first sort by sector and then order the options by timeframe – short-, medium-,long-term. Tool 5-C provides a template for this organization.

TOOL 5-C
Organizing Options Worksheet

Go back to your Vulnerability Assessment (Step 3) to compare the results of Table 30 with the Vulnerable Sectors and Vulnerable Populations Rating Matrix (Table 22) to ensure that these sectors have been sufficiently addressed.

A landslide in Cerro del Barrio Lindo gatazo affects several houses built on hillsides in Esmeraldas, Ecuador.
© UN-Habitat/Francois Laso

TABLE 30: Tool 5-C Organizing potential actions by sector and timing (example)

	SECTOR	
TIME FRAME	**Water & sanitation**	**Economy & livelihoods**
Short-term Options (1 – 2 years)	A) Clean-up and improve maintenance of existing drainage culverts B) Storm water management system for informal communities C) Install better drainage culverts D) Develop community warning & evacuation systems E) New building codes	A) Local economic development strategy – "green" jobs B) Climate-smart employment programme (e.g. mangrove planting) C) Clean-up / maintenance programme for drainage culverts (employment programme) D) New building codes – climate proof construction E) Disaster Risk Reduction Plan F) Improved hazard mapping
Medium-term Options (3 – 5 years)	F) Repair and improvement of "low regret" infrastructure (dikes, diversion channels)	G) Climate proof exposed roads (i.e. raise road bed above flood level) H) Develop new informal market I) Build dikes along the river J) Repair and improvement of "low regret" infrastructure (e.g. storm water system)
Long-term Options (6+ years)		K) "Low regrets" infrastructure improvements (water supply & treatment) L) Climate proof existing reservoir and facilities M) Build new reservoir in a safe area

Task 5.3: Screen and rank options (preliminary feasibility assessment)

While a more detailed assessment of options will occur in Step 6, it is worthwhile to screen and rank options to create a shorter list to bring forward and to identify options that may be easily implemented in the very short-term (and do not require more detailed analysis in Step 6). This so-called "screening out" or "screening in" is the next level of getting organized.

In some cases, candidate options may be impractical. In other cases, some options may be more easily implemented, they would benefit multiple sectors and could be highlighted for immediate priority.

Some criteria to guide this first order screening include:

- **Stakeholder acceptability**: *What does your core planning team and stakeholder advisory team think of the option? Would local residents accept it in their area? Are there any material or cultural differences that may constrain the opportunity for this action in this location?*
- **Technical feasibility**: *Is the necessary design, implementation and maintenance support available for the option? If not, can it be acquired?*
- **Urgency:** *Is this action urgently needed, as it would address serious current risks and vulnerabilities?*

SECTOR		
Health	**Agriculture & fisheries**	**Ecosystems**
A) Health promotion activities (e.g. awareness programme, community clean-up) B) Urban heat island programmes (e.g. tree planting) C) Zone most vulnerable areas for non-settlement uses D) Develop community warning and evacuation systems E) Disaster Risk Reduction Plan	A) Urban agriculture programme B) Integration of food security into relevant plans and strategies (e.g. land use plan, local economic development strategy) C) Water conservation programme – drought awareness D) Improved rural-urban linkages E) Water quality monitoring programme (in harbour) F) Water quality early warning / alert for high pollution, "no fishing" days G) Drought warning system	A) Create protected area for mangroves B) Mangrove replanting programme C) Public education programme D) Development guidelines (upstream development)
F) Climate proofing vulnerable infrastructure (e.g. waste water plant) G) Improved health infrastructure H) Develop and implement new building codes – climate proof construction, urban heat island materials and shading, building ventilation, etc. I) Restoring and expanding urban water bodies	H) Expanded or improved reservoir I) New groundwater recharge infrastructure (e.g. infiltration ponds, wells) J) New flood protection infrastructure (e.g. diversion channels, storm water infiltration ponds) K) "Low regrets" infrastructure improvements (sewage, drainage systems)	E) Develop local standards and / or harmonize with state / national standards (if applicable)
J) Improved training in health sector K) Development of urban wind corridors	L) New reservoir in hazard-free area M) New sub-surface reservoir to eliminate summer water losses N) Eliminate contamination sources by zoning industrial activity to new locations	F) Eliminate contamination sources by zoning industrial activity to new locations

- **Ease of implementation**: *Can this action be implemented at the local government level, or does it depend on state/provincial or national support? Could it be implemented within a reasonable timeframe?*
- **Relative effectiveness**: *How well would the option work relative to other options?*
- **Cost**: *Is this a financially realistic option? Does the city have funding or potential access to funding to cover the costs?*
- **Mainstreaming potential:** *Would the option support, and could it be integrated with, existing local government planning and policy development? Is it something that could be introduced into other plans and projects (e.g. city economic development strategy, health and social development plan)?*
- **Multi-sectoral:** *Would the option address objectives in other sectors? For example, an improved reservoir would benefit the local economy sector and the health sector.*
- **What else?** *Are there local political, cultural or other considerations that should be considered that would make any one option more likely to be accepted or adopted over another?*

Use Tool 5-D[9] (Table 31) to support the screening and ranking of candidate climate change options. The tool simply involves rating individual actions using the

9 Adapted from CARE International (2009). *Mainstreaming Climate Change Adaptation: A practitioner's guide*. Vietnam.

screening criteria, or other criteria that are appropriate for the given context. Use the tool for each sector, beginning with the priority sectors highlighted in Tool 3-J (illustrated in Table 22), which identified particularly vulnerable sectors with significant vulnerable populations associated with them.

TOOL 5-D Screening and Ranking Options Worksheet

While you should aim to use the screening tool for each sector, it is recognized that time and capacity may be limited. In these cases, you should focus on the high priority vulnerable sectors identified in Tool 3-J.

As with previous tools in this guide, Tool 5-D uses a descriptive high-medium-low scoring system, where the higher the score, the better the particular option would perform based on the specific criterion. The scoring system is relative (i.e. it is meant to compare options to one another. It is also meant to promote discussion with the core planning team and/or stakeholder advisory group about the individual options and why people scored them the way they did. The scoring system is:

- High= 5 (Option very strongly supports criterion)
- Medium high = 4 (Option strongly supports criterion)
- Medium = 3 (Option somewhat supports criterion)
- Medium low = 2 (Option supports criterion only in a limited way)
- Low = 1 (Option does not support criterion)

TABLE 31: Tool 5-D Screening and ranking options worksheet (example)

AGRICULTURE & FISHERIES SECTOR		Stakeholder acceptability	Technical feasibility	Urgency	Ease of implementation	Relative effectiveness	Cost	Mainstreaming potential	Multi-sectoral	SCORE	RELATIVE RANK
Option A	Urban agriculture programme	3	4	1	3	3	5	4	5	28	3rd
Option B	Food security mainstreaming	4	4	1	3	3	5	5	5	30	1st
Option C	Water conservation programme	4	3	3	3	4	3	5	4	29	2nd
Option D	Urban-rural linkages	3	2	2	1	3	3	3	4	21	9th
Option E	Water quality monitoring	4	3	2	3	2	3	3	4	24	6th
Option F	Water quality alert programme	3	3	2	3	2	3	3	3	22	8th
Option G	Drought warning system	4	3	2	3	2	3	3	3	23	7th
Option H	Expanded reservoir	2	2	2	1	4	1	2	3	17	12th (tie)
Option I	Groundwater recharge	3	2	2	2	4	2	2	3	20	10th
Option J	New flood protection infrastructure	3	1	4	1	4	1	2	3	19	11th (tie)
Option K	"Low regrets" infrastructure	4	4	2	3	5	3	3	3	27	4th
Option L	New reservoir	2	1	3	1	3	1	3	3	17	12th (tie)
Option M	New sub-surface reservoir	3	1	2	1	5	1	3	3	19	11th (tie)
Option N	Zoning land uses	3	3	2	3	2	4	4	4	25	5th

It is recommended to score by criteria first (i.e. so stakeholder acceptability would be scored for all the options first). In the example table, "stakeholder acceptability" was scored first for each of the 11 options. The next table evaluates the different options identified for a single sector, agriculture and fisheries. As mentioned, this table would be replicated for each sector.

As illustrated in Table 31, options B, C and A are the highest ranked options. Should they remain highly ranked after more detailed analysis in Step 6, they **may be included in the Climate Change Adaptation Strategy**. At this early stage of assessment, each appears to be relatively straightforward to implement, and is technically feasible with a high degree of stakeholder acceptability.

The above scoring system can help to begin "screening in" and "screening out" options. While discussing each of the options, consider whether they are one of the following types of climate actions.

- **Common actions:** When combining actions or mainstreaming them into existing planning processes or initiatives, some actions may need to be a part of every strategy (e.g. public outreach and information). These options should be prioritized for further future analysis.

- **Quick starts options:** Some options might be obvious, simple ones that are easily implementable, have broad stakeholder support, and could be put into action relatively quickly to help put visible results of your climate planning work "on the ground". These so called "quick start" options still require more detailed evaluation, but are well suited for pilot projects or just simple projects that help to generate trust, motivation and momentum. Quick start actions should be prioritized for more analysis.

- **"Low regret" options:** So-called "*low regret*" adaptation options are planning projects and investments that both contribute directly to larger community development goals (e.g. improving storm and sanitary sewers, water supply upgrades, etc.) and support the objectives developed in Step 4 (e.g. *Conserve the environment, Support a prosperous economy*). See text box "A Low Regrets Approach to Taking Action" in Task 3.5.

- **Multi-sector options:** After using Tool 5-D for several sectors, some options will begin to emerge as "multi-sector" actions – those that score well across multiple sectors. These actions should be highlighted for further analysis as they can provide benefits in multiple areas.

- **Options that can be screened out:** Some options may have received very low scores, or may be deemed by the planning team to be completely unfeasible.

When addressing climate change, there is rarely one single "best" option or a "quick fix" option, especially when an urban area is trying to achieve so many different planning objectives.

After screening and ranking options across all sectors, take the top ranking options from each sector to the next step (the top 4 or 5). If you are still working with a large number of options (over 20) or sectors (and options) it is advisable to reduce the number of options to take over to Step 6. This can be done by prioritizing sectors or selecting fewer top ranking options.

Flood-proof elevated school in Maniquenique, Mozambique.
© UN-Habitat/Arianna Francioni

ADAPTIVE MANAGEMENT

Climate adaptation and building resilience is not a "one-off" activity, but is an ongoing process of learning and refining, and is applied to everything a city government does. It requires continually monitoring and assessing conditions and the impacts of actions to determine if they are achieving the expected results.

An adaptive approach is, by its nature, a resilient one that can cope with change. It is a useful approach to decisions made with imperfect knowledge and high degrees of uncertainty. It is an approach that promotes flexible decision-making that can be adjusted in the face of uncertainty – a major factor with a process as dynamic and complex as global climate change.

Adaptive management differs from traditional approaches that use the best available knowledge to make risk adverse decisions. Adaptive management aims to identify and embrace uncertainty and to use management actions (i.e. the programmes, policies and actions laid out in your final *Climate Change Action Plan*) as a learning opportunity.

Adaptive management is useful in the context of climate change and is supported by this guide. An adaptive approach is resilient and can cope with change. It is a useful approach to decisions made with imperfect knowledge and high degrees of uncertainty. The aim is to reduce uncertainty over time through a structured, iterative approach that involves monitoring, evaluation and adjustment of climate change options based on what has been learned.

See *Step 8: Monitoring and evaluation* to see how this guide uses an adaptive management approach.

Favela, Rio de Janeiro, Brazil.
© UN-Habitat/Bernhard Barth

STEP 6: OPTION ASSESSMENT

This planning step will assess and prioritize the screened options from Step 5 based on their ability to meet the objectives developed in Step 4. In this step, the core planning team and stakeholder advisory group will work through a structured evaluation process that will result in three different rankings for the options:

- A **direct rank** that organizes the options from "best" to "worst" based on discussions with your planning team and/or stakeholder advisory group prior to more detailed assessment.
- A **technical rank** based on how well the options would each help meet planning objectives.
- A **weighted rank** that considers what objectives matter the most, and assigns weights to them based on their relative importance.

Assessing options with the three scoring systems will not only help you decide which options have the most technical merit, but also which ones **best support the objectives that matter most to the local community.** It will also allow the core planning team and stakeholder advisory group to assess any trade-offs associated with them to help narrow the long list of options down to a **short-list** of options to be considered for the final Climate Change Action Plan.

Important and complex decisions, like assessing and prioritizing potential climate change adaptation options, can benefit from **structured decision-making**. This includes separating **facts** (technical information including uncertainty and risk) from **values** (preferences). This planning task contains three activities that, taken together, lay out a simple way to apply more structured decision-making to a multiple objective process.

The tools and level of detail of this assessment, like other steps in this guide, are not overly technical and use both qualitative and quantitative information. This section is designed for a range of capacities and a variety of users, but provides links to additional resources and tools for users seeking a more technical, quantitative assessment approach. Be prepared to take additional time and to customize the process to suit individual circumstances where necessary and practical.

Here, it is important to note that these tools are intended for **decision *support***; they are <u>not</u> intended to *make* the decision for users.

This planning step involves the following three tasks:

TASK 6.1: *Assess consequences of options (technical assessment)*
TASK 6.2: *Weight and rank options (value assessment)*
TASK 6.3: *Final review, refinement and decision*

Task 6.1: Assess consequences of options (technical assessment)

With a shortened list of potential climate change adaptation and mitigation options from Step 5, the next task is to continue to evaluate and analyse each of the options. As discussed, this guide provides three complementary methods of ranking the options. In Task 6.1, two of these methods will be covered – **direct ranking** and **technical ranking.** The third ranking method – weighted ranking – will be covered in 6.2.

TOOL 6-A Direct Ranking Options

The first activity is to direct rank the high scoring options from Tool 5-E. This can be done with your core planning team and stakeholder advisory group working together, or as individuals. The intent of this activity is to create a direct-ranked list of options to be used for more detailed assessment using tools 6-B and 6-C.

TOOL 6-B Technical Ranking Matrix

After completing the direct ranking of options, the next step is to carry out a more detailed assessment and **technical scoring** of the options. The technical scoring and comparison of options is carried out using a consequence table[10] (Tool 6-B, illustrated in Table 32). A consequence table is a simple ranking matrix that **illustrates the potential performance of each option on each objective**, measured using the indicators developed in Tool 4-D.

A well-constructed consequence table should convey all of the information needed to understand and compare options. It will also help to guide discussions on choosing between options and to identify potential trade-offs and uncertainties between options under consideration. A consequence table will also help to make discussions between stakeholders and decision-makers more transparent and objective, and help ensure that the final selection of options is based on a **common understanding of their expected outcomes** (i.e. how well each option meets each objective). It will also allow you to develop a **short-list of options** for final consideration by identifying and removing from consideration the relatively poorly performing options.

10 *A good place to learn about alternative evaluation techniques in more detail is: Hammond, J.S.,R. Keeney and H. Raiffa (1999). Smart Choices. Harvard Business School Press. Boston.*

In most cases, you will be able to work directly with your core planning team and stakeholder advisory group to fill out the consequence table for each sector. You can also fill it out as a desk exercise and then review it with these groups, which may be helpful if there is a large number of sectors for which to prepare Consequence Tables.

Similar to the method used in the Screening and Ranking Matrix (Tool 5-D), the matrix should be filled out by objective (i.e. row by row), which will let the core planning team and/or stakeholder advisory group see how each option compares to one another across each objective. A **new consequence table should be completed for each sector**. The example in Table 32 is for the agriculture and fisheries sector that was used in previous examples.

As shown in Table 32, each option is assessed on how well it meets each objective, using the **indicators** developed in Tool 4-D. The example above uses a **construced scale indicator** that has a high-medium-low scoring system. In Tool 4-D, definitions for what constitutes a high, medium and low score would have been developed.

The consequence table allows options and their potential **trade-offs** to be identified, reviewed and discussed. It can serve as the basis for discussing which *consequences* are *more* or *less important*, and which set of *trade-offs* is *more* or *less acceptable*.

In some cases you may have five or six, or more, different options to be evaluated using five, six or more different indicators. In such cases, your consequence table can become large, and the evaluation task daunting, especially as there will be individual consequence tables for each sector. In this case, it can be useful to eliminate options and objectives from the table where possible. To eliminate options, first look to see if there are any options

ASSESSING CONSEQUENCES – OTHER TOOLS

Where capacity, means and time permits, the assessment of options could use more analytical methods and tools, including predictive models and "expert judgement elicitations". Tools like CLIMACT-Prio (see text box, Step 4) can be used in tandem with more complex consequence assessment tools. Where resources are more limited, these tools could be used only to confirm and refine the high-ranking options that result from Step 6.

Available resources and capacity will largely drive your selection of the most appropriate method. If a budget and resources are available, focus resources on **high priority assessments with high uncertainties** – assessments where predictive models and expert judgements are most needed to help understand the consequences of an action.

TABLE 32: Tool 6-B Technical ranking matrix (example)

Sector: AGRICULTURE & FISHERIES	OPTION A	OPTION B	OPTION C	OPTION E	OPTION G	OPTION K	OPTION N
Protect the environment	M (3)	M (3)	MH (4)	M (3)	ML (2)	M (3)	MH (4)
Support a prosperous economy	H (5)	MH (4)	ML (2)	M (3)	L (1)	MH (4)	ML (2)
Promote community wellbeing	MH (4)	MH (4)	M (3)	MH (4)	ML (2)	MH (4)	M (3)
Reduce poverty	MH (4)	M (3)	L (1)	L (1)	ML (2)	M (3)	L (1)
Score	3+5+4+4= 16	14	10	11	7	14	10
Technical Rank	1st	2nd	4th	3rd	5th	2nd	4th
Direct Rank (Tool 6-A)	3rd	1st	2nd	6th	7th	4th	5th

Low (L)=1, Medium-Low (ML)=2, Medium (M)=3, Medium-High (MH)=4, High (H)=5

that have the *worst score* (or are tied for the worst score) on every objective indicator. **When you discover such an option, you can remove it from further consideration.** You can also simplify the chart by removing objectives; in some cases, all the options may score equally well on an objective, in which case it is not providing any additional value in your analysis and can be removed.

Often, the discussion about trade-offs will help to develop a **more refined or detailed option that better supports all of the objectives** (i.e. making trade-offs *within* the option). The discussion may also lead to **combining options**, or elements of options, into a new and improved option (or options) that better balance results across competing objectives (i.e. making trade-offs *between* options). For example, in Table 33 it might be that Option A and Option B could be combined to form a better option that scores *high* in meeting all of the objectives.

TABLE 33: Consequence table trade-offs within and between options

OBJECTIVES	INDICATORS	OPTION A	OPTION B	OPTION C	OPTION D
Protect the environment	*See Table 27*	*Trade-offs within options*			
Support a prosperous economy					
Promote community wellbeing					
Reduce poverty			*Trade-offs between options*		

A case in point

THE IMPORTANCE OF PRIORITIZING OPTIONS – DHAKA, BANGLADESH

The eastern part of Dhaka is extremely prone to flooding and has a rapidly expanding population. A 1992 project funded by Japan determined which flood protection measures were needed (including embankments, canal improvements, pumping stations and enhancing early warning system), but did not prioritize them. Given the limited resources available, and no clear indication of where to start, the city had not moved forward with any of the actions.

In 2011, the city embarked on a process to evaluate and prioritize the actions. Aided by the CLIMACT Prio decision support tool, which uses a similar approach to this guide, Dhaka determined which flood protection measures were most critical and should be implemented first based on local values.

Informal settlement along the water in Dhaka, Bangladesh.
eGuide Travel on flickr.com, CC BY 2.0

Stakeholders representing government, industry and community met and ***developed objectives*** *that would be used as evaluation criteria for the adaptation actions. In addition to effectiveness, objectives included employment generation, achievement of Millennium Development Goals, public and political acceptance, and cost. This group then came up with weighting for each of the objectives.*

This stakeholder group, as well as two groups of climate adaptation experts, then evaluated each of the potential actions relative to the objectives. This process produced a "score" and rank for each option. Using this method, the team came up with three flood protection measures that should be implemented first – protection of water retention areas, enhancing early warning system, and canal improvement.

More info: http://eau.sagepub.com/content/24/1/197

TABLE 34: Comparison of a range of evaluation tools and methods

TOOLS	TECHNICAL CAPACITY	DATA NEEDS	TIME	COST $	PARTICIPANT REQUIREMENTS
Task 6.1: Exposure Analysis					
Predictive modelling	●	●	●	●	○
* Expert judgement elicitations	◕	◑	◕	◑	○
* Local knowledge holder elicitations	◑	◑	◕	◑	●
* Consequence tables (the starting point for all tools)	◑	◑	◕	◕	◕
* Multi-criteria analysis (weighting & aggregation)	●	◕	●	●	◕
* CLIMACT-Prio	◕	◕	◑	◔	◕
Multiple accounts analysis / evaluation	◑	◑	◑	◑	◔
Cost benefit analysis	●	●	●	●	◔
Cost effectiveness analysis	●	◕	◕	●	◔
Socio-economic analysis	●	●	●	●	◑

** Tools discussed in this guide - see Appendix 1*

Legend

○ ◔ *Indicates low requirement (e.g. Low technical capacity required)*

◑ ◕ *Indicates medium requirement (e.g. Medium amount of time)*

● *Indicates high requirement (e.g. High cost)*

Task 6.2: Weight and rank options

To provide another method of analysis for prioritizing options, one that is more specifically driven by values, the core planning team and stakeholder advisory group can also **rank and weight each of the objectives.** These weights will be used to further refine the technical rankings, based on how important each objective is.

The approach described in this guide is quite simple and can be done using flip charts or pen and paper. For those with strong Excel skills, other more complex methods may be used, including the CLIMACT-Prio tool (see text box in Step 4).

TOOL 6-C Objective Ranking and Weighting

Tool 6-C (illustrated in Table 35) can be used to rank and weight the objectives. This task can be completed with members of your core planning team and stakeholder advisory group working as a large group. The activity involves participants ranking and weighting the objectives based on general descriptions of the possible "worst case" impacts and the possible "best case" impacts for each objective. These are the "value" weights – distinct from the technical data in the indicators – and will be used in the next activity.

In the activity, participants are asked to rank the impacts to the objectives by first placing a 1 in the "Rank" box associated with the objective they would like to move from "worst-to-best" *first,* thereby indicating the *change* in the objective that is most important to them, not the objective itself. Then place a 2 next to the objective they would move from worst-to-best *second*. And so on until they have ranked all objectives. Participants are then asked to weight their ranked objectives to get a better understanding of how much more, or less, important each of the objectives is in relation to one another.

ADDITIONAL ANALYSIS METHODS

The use of consequence tables is broadly derived from the field of Structured Decision Making*, which in turn has roots in the discipline of Decision Analysis and the sub-disciplines of Multi-Attribute Trade-off Analysis or Multi-Criteria Analysis. The CLIMACT-Prio decision support tool (see text box, Step 4) is based on the same disciplines and can be used to support this planning step.

There may be situations where the consequences are high, the trade-offs are complicated, and you need a more analytical approach to evaluate your strategies. In such cases – and provided you have the expertise and resources available – you can draw on additional tools from these disciplines, using your consequence table as the launching point. In general, these **tools involve structured methods for more explicitly weighting the importance of each objective**, normalizing the consequence table results, and ranking the options based on an aggregate score (e.g. swing-weighting, pairwise comparisons, etc.).

Alternatively, you can also draw more sophisticated tools from the discipline of economics. Again using your consequence table as a launching point, Cost Benefit Analysis, which seeks to derive a total net cost or benefit in financial terms by monetizing all consequences, or Cost Effectiveness Analysis, which seeks to find the least cost option to achieve a specified target benefit, can be attempted. Still other approaches, including Socio Economic Analysis, and Multiple Accounts Analysis / Evaluation, are also available broadly from the economics discipline.

The results from these more complex tools can be used as inputs into your consequence table. For example, the results from Cost Benefit Analysis, which measures effects that can be monetized, could be used in the consequence table alongside other impacts that cannot be monetized.

*Note: Visit the United Nations Environment Programme's MCA4climate (Multi-Criteria Analysis for climate change: developing guidance for sound climate policy planning) website at www.mca4climate.info/. The site provides insights on new aspects of economic thinking related to climate change policy-making, such as uncertainty and dynamics, and makes a series of recommendations on how to tackle critical and pertinent issues pertaining to climate policy analysis.

Evaluation process in Aceh, Indonesia.
© UN-Habitat

In the example, "protect the environment" is ranked as least important. The next lowest ranked objectives in the example are "support a prosperous economy" and "promote community wellbeing" which are tied. Both of the objectives have been given a weight of 2 indicating that they are considered to be twice as important as the lowest ranked objective.

After completing the objective ranking and weighting, use Tool 6-D to complete the **weighted ranking of the options** (see Table 36). To create this table, take the technical scores from Tool 6-B (Table 32), and multiply them by the new objective weights that were created using Tool 6-C (Table 35). This will give a **weighted score** for each option.

TOOL 6-D
Weighted Ranking Matrix

TABLE 35: Tool 6-C Objective ranking and weighting matrix (example)

RANK	WEIGHT	OBJECTIVES	WORST CASE	BEST CASE
4th	1	Protect the environment	Current conditions (from Vulnerability Assessment) - Mangroves increasingly threatened. - Increasing episodes of water pollution.	- No net loss of mangroves - Storm water managed - Outfall contamination minimized during larger storm events - Storm sewer system able to manage larger storm event
2nd	2	Support a prosperous economy	Current conditions (from Vulnerability Assessment) - Some coastal roads at risk from climate change protected	- Most coastal roads at risk from climate change protected - Work travel times reduced on improved roads
3rd	2	Promote community wellbeing	Current conditions (from Vulnerability Assessment) - Poor land management - Limited access to safe drinking water	- Reduced incidents of drinking water contamination - Stable and affordable water price - Number of houses in hazardous locations dropping
1st	4	Reduce poverty	Current conditions (from Vulnerability Assessment) - Poorly designed and functioning informal market - Days lost to market closures from flooding	- Market access and services better protected from climate change related flooding - Minimal days lost to market closures

TABLE 36: Tool 6-D Weighted ranking matrix (example)

	OBJECTIVE WEIGHT (From Table 35)	OPTION A	OPTION B	OPTION C	OPTION E	OPTION G	OPTION K	OPTION N
Protect the environment	1	3	3	4	3	2	3	4
Support a prosperous economy	2	10	8	4	6	2	8	4
Promote community wellbeing	2	8	8	6	8	4	8	6
Reduce poverty	4	16	12	4	4	8	12	4
TOTAL WEIGHTED SCORE		37	31	18	21	18	31	18
Total Weighted Rank		1st	2nd	4th	3rd	4th	2nd	4th
Technical Rank		1st	2nd	4th	3rd	5th	2nd	4th
Direct Rank (Tool 6-A)		3rd	1st	2nd	6th	7th	4th	5th

= Weighted scores for each objective added together (i.e., 3+10+8+16=37)

= Objective Weight (1) X Technical Score from Table 32 (3)

In the example shown in Table 36, Option A has a weighted score of 3 for the objective, "*Protect the environment*". The score was calculated by taking Option A's technical score for this objective from Table 32 (which in this case was 3), and multiplying it by the number in the objective weight column (1).

After completing this process for all of the options, add the weighted scores for each option together to get a **total weighted score.** Based on the scores for each option, you can then create a total weighted rank (i.e. the option with the highest weighted score is the 1st ranked, the second highest score is the 2nd ranked, etc.).

Once the weighted scores have been generated, they can be compared with the option's direct ranks (from Tool 6-A) and the option's technical rank (Tool 6-B). In the example above, the highest technically ranked options (options A and B) remain the highest ranked options across all methods (direct, technical and weighted). This indicates that they not only have technical merit (i.e. have high technical scores from Table 32), but also that their implementation would also support community objectives (i.e. what matters most to the community).

Options E, however may require additional discussion and review, as it ranked highly in the technical and weighted ranking, but was not direct ranked very highly. In all cases, the additional layer of analysis provided by the weighted ranking can provide a helpful discussion and decision tool. The following questions can be used to generate discussion.

- *Why did stakeholders direct rank the option so low?*
- *Is there a lack of connection between the objectives and the direct ranking of options?*
- *Could options G and E be combined (i.e. trade-offs between options)?*
- *Were trade-offs overlooked?*
- *Are there objectives that were overlooked (new or hidden objectives)?*

You may also wish to discuss the options that performed well on the direct rank but did not perform well on their technical scores and weighted scores.

- *Could the option be changed or improved?*
- *Is it worth taking the option forward to the next level of assessment?*

After these discussions, poorly scoring options will likely be removed from each sector's consequence table, and a **short-list of potential options** to include in the final *Climate Change Action Plan* should be beginning to emerge.

Here, it is important to stress again that tools 6-A, 6-B and 6-C are only decision *support* tools; they are meant to focus discussions, illustrate trade-offs, and make the decision-making process more transparent and objective. Collectively, the three scoring systems (direct, technical and weighted) provide an insight into the **technical facts** and **values** (i.e. the issues or objectives) that are a part of every decision we make, but are rarely examined objectively or transparently. A better understanding of these decision components should result in better decisions that can be clearly illustrated to stakeholders.

Once the review has been completed with all sectors, some common options (i.e. the same option across sectors) may be emerging. These are valuable, as their implementation can **address multiple objectives across multiple sectors**. They can also be well suited for a quick start activity and should be highlighted for priority review in the next task (Task 6.3).

Youth during a workshop on climate change in Iguiwaz, Morocco.
© UNDP, Baptiste de Ville d'Avray

Task 6.3: Final review, refinement and decision

The assessment thus far should have resulted in a more refined priority list of potential options across all sectors. Table 36 includes a summary of the option assessment methods completed so far, and can be useful to review before undertaking this task. In this task, additional analysis will be done on these remaining options (i.e. the "short list") in order to:

- Better assess mainstreaming opportunities
- Further refine your options and consider phasing issues
- Begin to organize options into general strategy areas (i.e. by sector or thematic groupings)

The goal for the end of this step is to decide on and begin to document the best climate change strategy (i.e. the combination of options to be pursued) for your planning context. With your core planning team and stakeholder advisory group, work through the following sections and questions.

Mainstreaming opportunities: Mainstreaming focuses on how climate change options can be integrated into pre-existing or emerging plans, programmes and policies. Reflecting on the results of your strategy development and evaluation tasks to date, consider the following questions. Be sure to track the answers, as they will be revisited in the next planning step.

- *Revisit Tool 5-D. Are there any high-ranking options that had high scores for their mainstreaming potential? If these options are still in consideration, should they be prioritized given their mainstreaming potential?*

- *Can any so-called "quick start" actions be simply handed over for immediate implementation as a part of existing department or programme responsibilities?*

- *Are there clear opportunities to link options to existing plans, policies and programmes? (Review Section 3.2.3,* Table 4 *and previous work done on mainstreaming)*

- *Have any new opportunities emerged to mainstream specific options into other plans, programmes or policy development initiatives?*

    - *New funding programmes (local government, state/provincial, national, international)*
    - *New city planning initiatives (e.g. transport plan, local economic development strategy, public health plan, disaster risk reduction plan)*
    - *New legislation or policy directives (e.g. greenhouse gas emissions reductions targets/ policies, disaster risk reduction policies)*

- *Do any of the actions identified to date require coordination with other initiatives or departments in order to maximize the potential for benefit, or minimize the potential for working at cross-purposes?*

Refine options: For any of your options to become a reality, they will need to go through a further level of **refinement** that looks at the real-world situation in terms of funding opportunities, planning constraints, political realities, capacity and other factors.

This additional level of assessment and refinement of your short-listed options will help to further confirm their importance to being included in the *Climate Change Action Plan* on which you will begin working in Step 7. It will also provide further rationale you can share with the government decision-makers (e.g. elected officials) who will likely approve the final plan. It will also make sure that the broader community not only understands the recommended options and how they meet their community objectives, but also supports them.

This section provides a list of guiding questions to undertake this analysis.

New options and information requirements

- *Are there any new options that have been identified and/or emerged through the combination of options into a single, refined option?*

- *Can any options be refined to more effectively meet your objectives, or address the associated climate change vulnerability?*

- *Have any uncertainties hindered your ability to effectively assess options? Can long-term data gathering (to more fully understand the uncertainties) be developed as a specific action?*

Planning constraints

- *Have you run up against firm planning constraints (e.g. zoning requirements, building codes) that constrain your ability to implement important climate change options?*
    - *Do you need to coordinate with other levels of government – regional, national – to revise policies or standards?*

Capacity

- *Has the option identification and assessment process uncovered capacity issues – lack of knowledge, skills, etc. – that will need to be addressed in order to successfully implement the options?*
    - *Are there specific capacity-building actions that need to be developed?*

- *Have you confirmed the technical feasibility of the option with someone with the appropriate technical skills and understanding?*

Funding

- *Does the potential cost of options identified to date exceed your available budget?*
  - *Do you need to prioritize the most important actions, or seek out other sources of funding that will be required?*
- *Could you partner with neighbouring jurisdictions or other organizations to share the costs of some options?*
- *Are there any national and/or international sources of funding that could be used for plan implementation?*
  - *Some funding sources may be identified in existing regional or national climate change plans – for example, your country may finance local projects as part of a national climate change adaptation strategy.*
  - *Are local projects identified through your country's National Adaptation Programmes of Action (NAPA) process eligible for Global Environment Facility funding?*
  - *For more information on international funding sources, please see Appendix 4.*

The final strategy will be developed during the next planning step, Step 7: Implementation.

STEP 6 REVIEW CHECKLIST – ASSESS OPTIONS	✔
✔ Assess consequences of options (technical scoring)	
✔ Weight and rank options (value scoring)	
✔ Assess short-listed options for mainstreaming opportunities	
✔ Refine short-listed options (additional feasibility screening)	

A case in point

STRATEGY EVALUATION – MAPUTO, MOZAMBIQUE

With support from the UN-Habitat Cities and Climate Change Initiative, a team carried out a preliminary assessment with stakeholder involvement of the impacts of climate change on the city of Maputo. Based on this assessment, the stakeholder group (made up of local government representatives, private sector and civil society actors, NGOs, and community members) developed strategies to address the impacts identified as threats to the people and infrastructure of Maputo.

Aerial view of the city, Maputo.
© UN-Habitat/Jesper Milner

Through a participatory strategy evaluation process, the stakeholder group appraised the potential benefits, costs and the likelihood of implementation using tools similar to the ones described in this guide. The evaluation identified the protection of threatened mangroves surrounding a vulnerable neighbourhood as a suitable pilot project. The aim of this intervention was to provide clear and physical limits of the mangrove area, and to make a recently approved master plan legally binding, including special provisions for the protection of endangered species.

More info: http://www.unhabitat.org/downloads/docs/CCCI_MaputoMozambique.pdf

STEP 7: IMPLEMENTATION

The last planning step in this module focuses on making sure things get done. It concentrates on moving from **ideas** (i.e. the short-list of priority options organized into strategy areas) to **actions** (i.e. a *Climate Change Action Plan* that will detail how and when the actions will be implemented).

Although, at the outset, implementation may appear to be one of the more challenging steps in the planning process, all the work completed up to this point should make final implementation relatively straightforward, effective and successful. This past groundwork includes:

- The planning networks and good relationships established by working with the stakeholder advisory group and core planning team.
- The additional outreach conducted with the broader community, including women, youth and traditionally marginalized groups like the urban poor.
- The stakeholder and community support for the short-listed options as a result of the participatory manner in which they were created.
- The well-researched and defensible *Vulnerability Assessment Report*.
- The multiple reviews and assessments carried out on the potential climate change adaptation options (including technical feasibility, value-weighted rankings, etc.).

All of these details will contribute to creating an effective and clear *Climate Change Action Plan*.

Unfortunately, it is also at this step where **plans often become derailed**, or worse, end up sitting on a shelf unused, gathering dust. It is precisely this lack of follow-through that has frustrated many participants in different planning process and made cynics of many stakeholders. Poor implementation has common causes, including:

- ✖ A poorly written and difficult to use final plan.
- ✖ A plan that is too vague and lacks clear roles, responsibilities and timelines.
- ✖ A lack of political will to act and implement the plan.
- ✖ Changes in organizational or political leadership just prior to implementation.
- ✖ Committed resources and funding failing to come through.

Paying close attention to these issues early in the planning process, as early as during *Step 1: Getting Started*, can increase the probability of successful implementation.

This planning step involves the following five tasks:

TASK 7.1: *Re-assess institutional and governance context*
TASK 7.2: *Identify and confirm the "anchor" department or agency*
TASK 7.3: *Link actions to established policy instruments (mainstreaming)*
TASK 7.4: *Finalize Climate Change Action Plan*
TASK 7.5: *Maintain learning and knowledge*

Task 7.1: Re-assess institutional and governance context

While developing the final *Climate Change Action Plan*, it is very likely that the lead project planner or facilitator will not have final decision-making authority to implement, authorize or adopt the final plan (or its mainstreaming recommendations). Levels of influence over decision-making will vary depending on the local political context, with some planners having substantial authority over decision-making and others having more limited roles and influence. In order to address these issues and, where necessary, work around them, it is important to identify these potential challenges.

TOOL 7-A
Institutional Governance Checklist

Even in cities where planners report to their political superiors – council, mayor, etc. – with reports and recommendations, the planner's influence will vary depending on a number of factors. These could include personal politics, and also how well understood and supported the planning process has been to date – a plan developed through a participatory process with good community, political and staff engagement is more likely to have the understanding and support of these important stakeholders.

To ensure that this support and awareness exists with your city's decision-makers, now is a good time to:

- Confirm project understanding and support with senior managers, decision-makers and city leadership.
- Determine the most effective and appropriate method of making the final *Climate Change Action Plan* "official" (i.e. Should council adopt it in a formal vote as an official city plan? Should city departments be required to "sign on" to it?).

As it is likely that some time has passed since the project was first launched, it may also be a good time to review the current governance and institutional situation, and to update those outside of the core planning team and the local government (particularly if these update activities with local government staff and elected officials outside of the core planning group have not been occurring regularly).

- *Has city leadership changed during the planning process?*
- *Are new elected leaders aware of and do they support the Climate Change Action Plan process?*
- *Have there been any staff changes or additions that need to be addressed (e.g. new senior managers, additional technical staff or resource people)?*
- *Have any new climate change-relevant policies, programmes, plans or laws emerged that need to be taken into account or addressed?*

These questions should be reviewed with your core planning team and stakeholder advisory group. Use Tool 7-A to help you organize the process.

An over view of informal settlement in Port-au-Prince, Haiti.
© UN-Habitat/Julius Mwelu

Task 7.2: Identify and confirm the "anchor" department or agency

The success of *Climate Change Action Plans* (and their mainstreaming activities) can often be traced back to a strong institutional foundation, namely the local government department or agency with primary responsibility for implementing the plan. These departments or agencies are often referred to as the "anchor" for the *Climate Change Action Plan* as they are the lead organizers that keep the project on-track. Ideally, the logical anchor agency or department has been leading the planning process to date, which will make this task easy to complete.

While identifying (or confirming) a body to fulfil this lead role may appear obvious to some, it is important to make sure that the lead department/agency has the capacity, resources and leadership necessary to actually implement the *Climate Change Action Plan* for which they will be responsible. The anchor department/agency must be able to:

- Manage and/or support other departments or agencies involved in strategy implementation.

- Maintain communications and networks with the core planning team and stakeholder advisory group, particularly where they may be involved in plan implementation.

- Maintain and build political support for the *Climate Change Action Plan* and maintain awareness of it through ongoing engagement with elected officials and community leaders.

- Monitor and evaluate the implementation of the *Climate Change Action Plan*, and where necessary, make adjustments.

- Maintain good working relationships with current and future funders and donors.

Re-examining current city planning and departmental responsibilities may help to identify where collaboration between departments could occur, and how the *Climate Change Action Plan* could be developed within existing organization and management capacities, constraints and financial resources. Choosing the right anchor will help to make all of the following steps easier to accomplish.

Once this task has been completed, it may be wise to ensure that the identified department or agency is officially committed to project implementation through a Memorandum of Understanding, or similar formal agreement. This is particularly important when the lead department or anchor agency was not the prime project planner.

Informal settlement, Yangon, Myanmar.
© Ecoplan International, Inc.

Task 7.3: Link actions to established policy instruments (mainstreaming)

As reviewed in *Step 6: Option Assessment* and discussed throughout this guide, formally linking actions to established policy instruments, plans, strategies and programmes is essential to ensure that the final *Climate Change Action Plan* is robust, integrated and sustainable. Stand-alone plans with no mainstreaming component are more vulnerable to funding cuts, shifts in political will, or being forgotten.

At this point, previous planning tasks (Step 1, Step 2, and the Vulnerability Assessment in Step 3, Tool 5-D, Task 6.3) should have already identified mainstreaming opportunities. Still, mainstreaming a *Climate Change Action Plan* into existing local government plans, procedures and related initiatives may take time depending on the process and time requirements of amending and updating subject plans and stragies. City capacity (human resources, time, financial resources) will also be a consideration. However, in time, as climate-friendly policies are integrated into policy and planning instruments across departments, climate smart planning will become entrenched and established as a part of regular, day-to-day city business.

Many cities that began climate change planning shortly after 1997's Kyoto Protocol have now established city climate change offices and departments and climate change policies and programmes across city departments, facilities and programmes. The mainstreaming of climate change planning is also evidenced by the many global networks helping to link, coordinate and support (financially and technically) climate change plannning at the local level – such as the Cities and Climate Change Intiative, C40 Cities Climate Leadership Group, and ICLEI. Together, these programmes and others represent the majority of cities across the globe.

At this point it is time to determine (or confirm) *how* and *where* actions will be linked, or mainstreamed into existing government policies, programmes and plans. Typical areas where climate change actions, particularly policies, can be included or formalized include:

- Physical land use plans or community plans, including city visions
- Development approval processes, including building codes
- Local economic development strategies and programmes, including livelihood projects
- Community health plans, including social development programmes
- Environmental management plans, policies and programmes
- Infrastructure plans (sewer, water, road, transit, etc.)
- Disaster response and management plans
- City and/or participatory budgeting processes
- City bylaws or laws

A more comprehensive list of city plans and policy programmes can be found in Section 3.2.3 , and in Table 4.

In some cases, existing city plans and policy documents are updated and revised at regular intervals. If these review periods do not correspond to the completion dates of the *Climate Change Action Plan*, it may take some time to update the subject plans and strategies.

In those cases where the city is not the lead agency (the "anchor"), it may be advisable to develop an agreement (e.g. Memorandum of Understanding) that stipulates **how, why** and **when** *Climate Change Action Plan* actions will be included in city plans and strategies when they are updated. A formal agreement is also important in cases where the anchor agency is not responsible for **changing, updating or amending** the subject plans, policies or programmes, or has **no formal authority to do so**.

To ensure that project partners involved in implementing the *Climate Change Action Plan* commit to their work, you may also wish to develop similar formal agreements with them (e.g. Memorandum of Understanding). This can sometimes be a particularly important consideration with higher-level governments (i.e. regional, state, provincial, national).

Mainstreaming activities and recommendations should be summarized and included in the final *Climate Change Action Plan*, even in those cases where the other plans are updated before the the *Climate Change Action Plan* is finalized.

Task 7.4: Finalize Climate Change Action Plan

The *Climate Change Action Plan* is a detailed document that outlines exactly what will occur during the implementation of **short-term options** (i.e. the options to be carried out in one to two years) and **medium-term options** (i.e. the options to be carried out in three to five years). Long-term actions (i.e. the options to be carried out in six years or more) will also be included, but not with the same amount of detail as will be provided for the short – and medium-term actions. The plan should also summarize any mainstreaming actions and quick start projects that were implemented during the planning process, before the final *Climate Change Action Plan* was finalized.

The final *Climate Change Action Plan* must be very clear in terms of what is required from different stakeholders, or external agencies for plan implementation. The final plan will not only communicate the rationale for the selection of actions, but it will also be used to help document progress (i.e. monitoring and evaluation) and to ensure that those working on the plan implementation actually carry out what they agreed to do. Because it is the primary mechanism to make sure that everyone plays their part in implementing the plan, the final *Climate Change Action Plan* must be well organized and user-friendly to ensure that all users can navigate and use it effectively.

A case in point

IMPLEMENTATION – ESMERALDAS, ECUADOR

The city and province of Esmeraldas are together considered to be one of the most vulnerable regions to the effects of climate change in Ecuador. In 2007, almost 60 per cent of the population lived in areas with medium to high risk of floods or landslides. With support from the UN-Habitat Cities and Climate Change Initiative (CCCI), a team carried out an assessment, with stakeholder involvement, of the impacts of climate change on the city of Esmeraldas. The CCCI team identified and analysed five models and nine emission scenarios for the area. From this assessment, a stakeholder group – including government and community representatives – evaluated a number of key climate adaptation actions. An important development has been the preparation of a participatory land use plan for the city, and the zoning of riverbanks. In addition, a participatory effort by citizens and professionals has resulted in a proposed reforestation plan for the city's hillsides, including a proposal to declare them protected woodlands. In coordination with the Ministry of Environment, the municipality is implementing an environmental management plan for the Teaone River.

Night-time cityscape in the center of Esmeraldas, Ecuador.
© UN-Habitat/Francois Laso

More Info: http://www.unhabitat.org/downloads/docs/CCCI_EsmeraldasEcuador.pdf

FINANCING CLIMATE CHANGE ACTION PLANS

Although adaptation is costly, it is far less expensive to proactively prepare for climate change than to pay for the consequences later on. Recent estimates of the costs of adaptation to climate change in low and middle-income countries are in the range of USD 70 billion to USD 80 billion annually*). The same report estimated that up to 80 per cent of these costs would occur in cities.

City governments can sometimes find it difficult to access adaptation funding for two main reasons:

- Limited capacity and experience dealing with some of the complexities in accessing information on climate finance, and associated difficulties applying for these programmes
- Funding programmes that are oriented toward national government levels

While tools – such as the United Nations Development Programme's Climate Finance Options website (http://www.climatefinanceoptions.org) – are making it easier to access information, most dedicated global funding for adaptation currently still flows through national governments, primarily based on priorities set in national climate frameworks, such as National Adaptation Programmes of Action (NAPAs). This is one more reason to ensure your *Climate Change Action Plan* is coordinated with your country's NAPA if one exists (see Step 1).

The final *Climate Change Action Plan* will be an important fundraising tool to help raise funds for plan implementation, especially for capital intensive actions (e.g. low regrets infrastructure upgrades and expansion). In addition to own-source funds (where they exist), potential funding avenues will likely include:

Higher-level government support/transfers: Provincial/national funds trust funds made available for local adaptation actions. Access to this may have specific requirements that have to be reviewed beforehand.

Multilateral and bilateral financing: Designed for the implementation of national strategies and programmes, access to these funds will likely go through, and be coordinated with, national governments and subnational authorities.

Grants and loans: Regional and international financial organizations, like the World Bank and the Asian Development Bank operate loan and grant programmes, some of which can be accessed by city governments.

Foundations, charities and non-profit organizations: Many large, international philanthropic foundations and charities (e.g., Oxfam, Care International), non-profit organizations (e.g., ICLEI) operate grant programmes. While many are linked to associated climate change planning support programmes, there are some opportunities to fund smaller-scale actions.

Private sector and public-private partnerships: In some cases, privately owned companies provide infrastructure services, like water treatment or public transportation, for cities. Some services and infrastructure are also developed and operated through public-private partnerships where the private sector builds and operates the facility for a fee charged to users. Both options provide financing possibilities for infrastructure-related adaptation options.

Carbon finance: Where climate actions include a greenhouse gas mitigation benefit (e.g. waste management that captures methane), some cities are exploring how emerging carbon markets can be used to leverage private and public funding.

Funding your *Climate Change Action Plan* will require careful planning and diligent work. See Appendix 4: *Global Climate Initiatives, Programmes and Funding* for more information.

**Economics of Adaptation to Climate Change, World Bank, 2010*

TOOL 7-B
Action Plan Worksheet

The first step in creating the larger plan is to create detailed action plans for the actions that made it into the final plan. The action plans will describe the actual tasks required to implement **each action** and be included as appendix material in the final *Climate Change Action Plan*.

As illustrated in the example in Table 37, each worksheet will detail the following information and answer the related questions:

- **City departments/agencies or institutions involved:** Who will be involved in mainstreaming the particular activity (i.e. updating the plan or strategy), implementing the activity, supporting it, funding it and monitoring it?
- **Project leader:** Who is the person responsible for implementing the action? Make sure to use only the person's title so that the plan can withstand staffing turnover. Sometimes more than one individual may be listed. In the example in Table 37, one person is responsible for implementing the programme, while another individual plays a leading role in the ongoing operations of the activity.
- **Resources required:** What resources (supplies, human resources, infrastructure and services, technologies, etc.) are required for the specific task?
- **Budget:** What is the approximate budget (estimate) for the task? How much is available? How much is to be sourced from elsewhere? What is the funding source(s)? If the activity has a revenue component to it, it should be noted.
- **Timeframe:** When will the activity be completed? General start dates (month or season and year) and estimated completion dates (month or season and year) are sufficient.

When the project implementation has begun, use the final two sections in the action plan to note progress and when the action is completed.

With the action plan components completed, the next task is to assemble the final *Climate Change Action Plan*. The final plan will essentially summarize the work completed to develop it, so getting it ready should not be too onerous – most of the hard work has been done! There may be countries where an outline has already been pre-defined by national governments for local governments. This should be checked and reviewed prior to using Tool 7-C.

TOOL 7-C
Climate Change Action Plan Table of Contents

The level of detail in the final *Climate Change Action Plan* does not need to be exhaustive, but it should be comprehensive. The key to successful implementation is a detailed, well-written, user-friendly plan. Aspects that are unclear, vague or left to interpretation may turn into problems later on. A well-written and well-organized plan can also be used by stakeholder groups in their work (as a resource tool, or advocacy tool) and can help ensure that city staff and implementing partners know what to do to keep the *Climate Change Action Plan* alive.

While there are many possible ways to organize your final *Climate Change Action Plan*, Tool 7-C provides a more standardized table of contents that can be used as template.

Newly constructed drainage, Kibera.
© UN-Habitat/Bernhard Barth

TABLE 37: Tool 7-B Action plan worksheet (example)

DESCRIPTION OF ACTION/ PHASE	INSTITUTIONS INVOLVED	PROJECT LEADER	RESOURCES REQUIRED
SHORT-TERM ACTION #1 **Urban Agriculture Programme** - Programme will identify and designate larger areas for urban farming in the city - Guidelines for smaller areas not requiring designation in City Land Use Plan - Public awareness and education component - Management Plan for larger areas to be developed with local Urban Farmers' Association	**Planning & Implementation** - City – Planning, Engineering, and Economic Development Departments - University – Department of Agriculture **Management & Operations** - Urban Farmers' Association (non-governmental organization) **Funding & Support** - City – through operations budget - Federal government – through national grant programme	**Manager, City Planning** – for project set-up and monitoring **Director, Urban Farmers Association** – day-to-day management of ongoing operations	**Planning support** To support Planning Department in the designation of lands as agriculture areas in City Land Use Plan, and Economic Development Officer to integrate supportive policies in Local Economic Development Strategy **Infrastructure support** Connection to municipal water source for irrigation, construction of cistern for rainwater harvest, storage shed(s)

BUDGET (EST.)	TIMEFRAME (EST.)	PROGRESS	COMPLETE

Expenses
- $7,000 expenses
  - Planning/Administration costs – $3,500
  - Infrastructure costs – $3,500
Revenues
- $600 annual plot leases (to cover ongoing maintenance and operations)
Funding to be obtained from provincial programme
	Start date – Winter 2013
	- Project implementation, funding secured, set-up
	End date – Spring 2014
	Production start-up
		To be filled out as major project components are worked on to track implementation progress
		- Guidelines for smaller plots 70% complete
			To be filled out when major project components are completed
			✔ Land designation
			___ Guidelines for smaller plots
			___ Formal amendment of Land Use Plan to include designated agricultural lands
			___ Formal update of Local Economic Development Strategy to include supportive policies
			___ Budget & Work Plan
			___ Infrastructure & servicing

FIGURE 19: Tool 7-C Climate Change Action Plan – sample table of contents

TABLE OF CONTENTS

1. BACKGROUND

1.1. RATIONALE

- What is the rationale for the Climate Change Action Plan?
- What is the plan? How was it developed? Who developed it? Purpose and limitations

1.2. CITY PROFILE

- Brief overview of city socio-economic and demographic trends
- Current urban planning and land management regime (challenges and ongoing work)

1.3. PLANNING CONTEXT

- City development priorities.
- City vision and mission (if available).
- City planning context, including existing climate change relevant plans and policies.

1.4. PLANNING APPROACH

- Planning framework, principles (participatory, strategic, values-based) and rationale
- Stakeholders and engagement – who was involved and how?

2. VULNERABILITY ASSESSMENT

- High-level summary and findings of the Vulnerability Assessment
- High-level summary and findings of Greenhouse Gas Assessment (if completed)

3. PLAN OBJECTIVES

- From the planning process (step 4, 6)

4. ACTIONS

- Summary descriptions of plan actions organized by sector and time frame (short-term 1 – 2 years, medium term 3 – 5 years, long-term 6 year or more)
- Full action plans will be provided in the Appendix
- Long-term actions will provide summary/ high-level overview only

5. COMMUNICATION AND AWARENESS ACTIVITIES

- How the plan and actions will be communicated to the broader public and stakeholders?
- How results will be communicated?

6. SUMMARY OF RESOURCE REQUIREMENTS

- Summary of short-term and medium-term requirements, including funding sources

7. MONITORING AND EVALUATION

- Based on Step 8 from planning framework

ANNEXES

- Action plans: each to provide an overview of the action (what it is, why it was selected, when it will be implemented, where, anticipated outcomes), cost, and how it will be mainstreamed into existing plans, policies or programmes
- Glossary of terms
- List of acronyms
- Contact lists: project lead, core planning team, stakeholder advisory group, implementing agencies

Task 7.5: Maintain learning and knowledge development

The final task in this planning step leads into Module D and, ideally, will continue beyond the completion of the final *Climate Change Action Plan*. It is important to maintain learning and knowledge development of all project stakeholders, including the stakeholder advisory committee, core planning team, elected officials, and relevant state/provincial and national agencies, ministries and departments.

It is important to provide progress updates about the *Climate Change Action Plan* to keep these stakeholders informed and engaged in climate change adaptation. If there is a problem with the implementation of the *Climate Change Action Plan* (e.g. funding does not materialize, policies are not adopted or integrated into targeted plans and procedures), these good relationships can prove useful in addressing these implementation challenges.

It is also important to try to maintain any planning and technical capacity developed through the project. Planning for climate change will continue as the *Climate Change Action Plan* is implemented and updated. Any new skills and capacity developed by the local government and stakeholders in developing the plan (e.g. new GIS mapping capacity, better participatory planning methods) will be extremely helpful for plan monitoring and evaluation, as will be discussed in the next module.

STEP 6 REVIEW CHECKLIST – ASSESS OPTIONS	✔
✔ Re-assess institutional and governance context	
✔ Identify and confirm the "anchor" department or agency	
✔ Formally link actions to established policy instruments (mainstream)	
✔ Finalize Climate Change Action Plan	
✔ Maintain learning, knowledge and capacity	

Housing programme accommodating displaced coastal communities, Philippines.
© UN-Habitat/Bernhard Barth

Module D

ARE WE DOING IT?

This module includes **two planning steps** and will help planners answer these questions:

STEP 8: *How can the progress of the Climate Change Action Plan be tracked to ensure it is having the anticipated impact, and that stakeholders are doing what they agreed to do?*

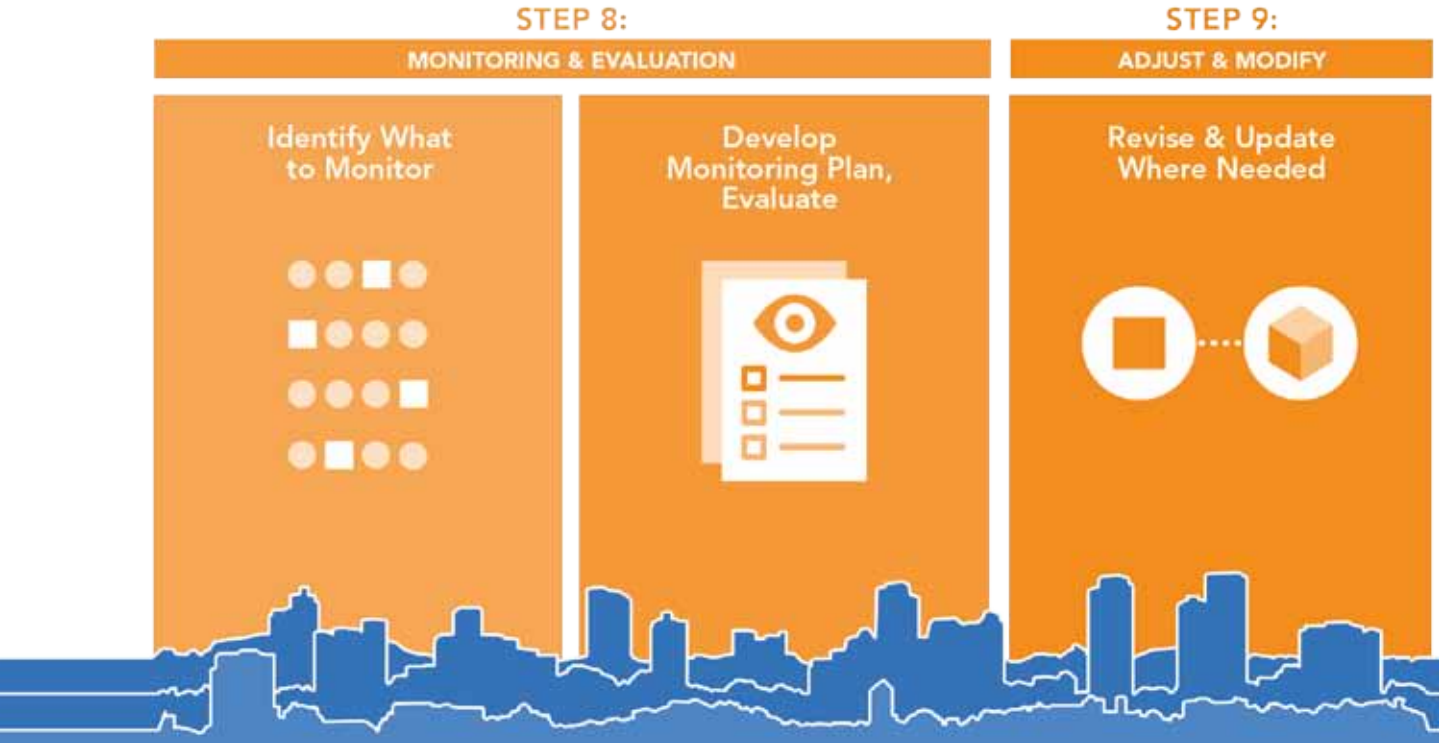
STEP 9: *How should new information be incorporated in to the Climate Change Action Plan or other needed changes be made?*

After completing Module D, planners and stakeholders will have:

- ✔ A clear understanding of what monitoring and evaluation are and why they are critical to the successful implementation of a *Climate Change Action Plan*
- ✔ Developed a monitoring and evaluation programme for the *Climate Change Action Plan* to monitor implementation progress, evaluate actions against plan objectives (i.e. is it making a difference?), and share results with stakeholders
- ✔ Developed a clear timeline for formal *Climate Change Action Plan* reviews

Asking "*are we doing it*?" is a fundamental step in gauging the success of a climate change planning process and the *Climate Change Action Plan* that was developed through it. The information gathered during these planning steps might indicate a need to adjust or fine-tune the *Climate Change Action Plan* to better meet community objectives and address climate change impacts.

The graphic illustrates the module's two planning steps.



WHAT IS MONITORING AND EVALUATION?

MONITORING: Strictly speaking, monitoring means to "observe" or to "check performance". Monitoring is a continuous process of collecting information and using indicators to gauge the progress and outcomes of the process or project. Regular monitoring allows the timely identification of successes or failures. There are two common forms of monitoring:

- **Process monitoring** checks that what was agreed on in the *Climate Change Action Plan* is actually getting done (e.g. has the city instituted an urban agriculture policy?).
- **Outcome monitoring** measures the results of *Climate Change Action Plan* activities in relation to the community objectives using indicators (e.g. the protection and restoration of coastal mangroves has helped reduce episodes of coastal storm-surge flooding by 20 per cent).

EVALUATION: Evaluation uses the information gathered from monitoring to determine if there are opportunities for changes and improvements to the process and actions. Evaluation, like monitoring, should promote learning. In the implementation stage of any *Climate Change Action Plan* activity, evaluation is used to determine if the action is meeting the objectives it was meant to address.

Slum upgrading programme in Nairobi, Kenya.
© UN-Habitat/Julius Mwelu

STEP 8: MONITORING AND EVALUATION

Often overlooked or downplayed, monitoring and evaluation is one of the most critical steps in the entire planning process. Some of the important questions that this planning step seeks to answer include:

- *Are project or programme stakeholders and agencies doing what they agreed to do in Step 7 – Implementation*?
- *Is the climate change adaptation project, policy or programme (i.e. the actions selected in Step 6) having the desired effect*?

Here, it is important to note that monitoring and evaluation is not conducted to find fault or be critical. It is a method of ensuring accountability and an adaptive management tool for improving plan outcomes. When conducted regularly, monitoring and evaluation provides timely and reliable information for adjusting and modifying specific *Climate Change Action Plan* actions, programmes or policies. When carried out properly, effective monitoring and evaluation will let you know when:

- Internal and external circumstances, including climate change vulnerability, exposure or sensitivity have changed (something that should be expected when dealing with a phenomenon as dynamic as climate change)
- Stakeholders, managers, or agencies tasked with specific *Climate Change Action Plan* implementation activities are not carrying them out as planned, or on time
- *Climate Change Action Plan* actions are not working, need adjusting or are no longer effective
- Potential climate change adaptation options are being missed

Monitoring and evaluation will help to ensure that changes in local priorities (i.e. community objectives) can be accommodated so that the *Climate Change Action Plan* remains responsive to community needs over time.

This planning step involves the following two tasks:

TASK 8.1: *Prepare monitoring framework and programme*
TASK 8.2: *Evaluate results of monitoring programme*

Task 8.1: Prepare a monitoring framework and programme

The monitoring framework and programme will help to determine what gets monitored, how, when and by whom. They will also identify how this information is shared with stakeholders, including partner agencies and organizations assisting with implementing certain *Climate Change Action Plan* actions, and the broader community.

The objective indicators, developed by the core planning team and stakeholder advisory committee in *Step 4: Issues and Objectives,* serve as the starting framework for monitoring the *Climate Change Action Plan*. They will likely need to be revised and updated at this stage in order to adequately measure the final plan actions, particularly if only descriptive indicators were developed (as was the case for this guide's example).

TOOL 8-A
Indicator Development

You may also need to develop some new indicators in order to monitor both **plan processes** (i.e. are people and agencies doing what they agreed to do?) and **plan outputs** (are the activities/actions having the desired results?). Some examples of process and outcome indicators are shown below.

- **Process Indicators:** Concrete and tangible activities carried out by project stakeholders in the implementation of specific *Climate Change Action Plan* activities. This could include things like:
  - The number of climate change adaptation or mitigation policies mainstreamed in other policy instruments (e.g. local economic development strategy, land use plan)
  - The creation of a new staff position or department at the city (e.g. climate change analyst, office of climate change)
  - The area of urban agriculture zones created

  The completion of these activities is also an indication of whether or not partners are doing what they agreed to do in the *Climate Change Action Plan* (i.e. are they keeping up with the implementation process?). Monitoring process indicators is sometimes referred to as compliance monitoring.

- **Outcome indicators:** The effects that can be attributed, at least in part, to specific *Climate Change Action Plan* activities. These effects are linked back to the original descriptive indicators developed for the community objectives (i.e. protect the environment, reduce poverty, support a prosperous economy, promote community well-being) and their related sub-objectives (see Table 24). Monitoring the outcomes of *Climate Change Action Plan* actions in achieving community objectives is sometimes referred to as impact monitoring.

Tool 8-A provides a framework for developing an initial list of indicators, and Table 38 is completed as an example.

To complete tool 8-A, begin by listing all the final actions from the *Climate Change Action Plan* in the first column. As a starting point for filling in the indicator columns, a good first step is to go back to Step 4 (Task 4.6) and review the indicators developed for the objectives and sub-objectives. Keep in mind that these were developed to do a high-level comparison of actions, and may not be detailed enough for actually evaluating how the action is performing once it has been implemented. These indicators may need to be refined, or supplemented with additional, new indicators.

Some questions to ask when assessing indicators are:

- *Is there a clear link to an objective or sub-objective?*

  The final *Climate Change Action Plan* actions were assessed and chosen largely based on their ability to help achieve community objectives. Indicators must be linked back to the main and/or supporting objectives so they can be used to help monitor whether or not plan actions are having the desired results/impacts on the objectives.

- *Is the indicator specific and measurable?*

  Can the indicator be easily tracked? Here, it is best to seek information and data already being collected by another party (e.g. national census, energy utility information). Standardized indicators also allow for maximum use of published data, minimizing the need for additional data gathering, information management and cost.

  In most cases, quantitative (statistical/number) indicators will best convey information about the state of climate change-related environmental, economic or social conditions. However, qualitative indicators can be used in the absence of other data, and can also be used to enhance understanding of local outcomes of the *Climate Change Action Plan*. Qualitative data can be more expensive to collect, as it may involve household surveys or other outreach programmes.

- *Are the indicators consistent?*

  Whatever the final indicators, it is important to be systematic and consistent in the information you collect for monitoring and evaluation purposes. Information not collected in the same manner (i.e. at different times, using different information sources, etc.) may not be comparable over time.

TABLE 38: Tool 8-A Indicator development (example)

ACTION	POTENTIAL PROCESS INDICATORS	POTENTIAL OUTCOME INDICATORS	RELATED OBJECTIVES AND SUB-OBJECTIVES
Water quality alert programme	- Alert programme implemented - Number of districts that have adopted the programme	- Number of hospital visits due to water quality issues	**Protect the Environment** Minimize contamination from waste water
Zoning land uses	- Has zoning been created/ updated - Has it been mainstreamed into existing city processes (development permitting etc.)	- Percentage of mangrove forest that is protected - Total hectares of mangrove forest (protected and unprotected)	**Protect the environment** Conserve the mangrove forests
Low regrets infrastructure improvements to markets (drainage, flood protection)	- Percentage of market area with storm drainage coverage	- Number of days per year market is closed due to floods	**Reduce poverty** Improve informal market infrastructure
Urban Agriculture Programme	- Land designation - Guidelines for smaller plots - Formal amendment of Land Use Plan to include designated agricultural lands - Formal update of Local Economic Development Strategy to include supportive policies	- Urban agricultural employment (number direct, number indirect)	**Reduce poverty**

Once indicators have been decided upon, it is important to establish benchmarks, that is, historical baseline information against which future monitoring information can be compared. This is critical to understanding how the *Climate Change Action Plan* is supporting the achievement of the identified objectives. Once established, these benchmarks are used to compare indicators over time.

Benchmarks can also be used to set targets, which some cities may find useful (or motivational). Table 39 provides examples of benchmarks. These benchmarks will become part of the monitoring framework in Tool 8-B.

TABLE 39: Example indicator benchmarks

INDICATOR	BENCHMARK 2013 (Current)	TARGET 2016
Hectares of mangrove forest	650 hectares	800 hectares
Hectares of protected mangrove forest	15% (protected)	30% (protected)
Percentage of market area with storm drainage coverage	17%	25%

The timing of monitoring will differ with each *Climate Change Action Plan* action, as will the nature of the objectives monitored and the indicators used. While some *Climate Change Action Plan* actions might lend themselves to shorter monitoring periods because indicators are gathered on a more frequent basis (e.g. building permits, traffic counts), others may have substantially longer periods. The amount of time involved in a particular *Climate Change Action Plan* action may be extensive in order to see results. For example, a large-scale infrastructure upgrade, or a mangrove and dune habitat restoration may take several years to complete. While the timing of monitoring may vary by action, a more thorough performance evaluation of **all** *Climate Change Action Plan* actions should occur on an annual basis.

It should also be noted that monitoring is a reflective process. The results obtained from monitoring should be fed back into the *Climate Change Action Plan*, influencing its future design and direction (e.g. new knowledge may lead to different actions being implemented to better meet *Climate Change Action Plan* objectives).

TOOL 8-B
Monitoring Framework Worksheet

Tool 8-B provides a template for a monitoring framework. The template should be completed for **each *Climate Change Action Plan* action**. In it, all indicators should be listed along with information about where and how relevant information pertaining to the indicator can be accessed or gathered. This is essential for the demonstration of transparency in data collection and analysis, and will help to ensure that the data collected is also relatively easy and cost-effective to gather.

Table 40 illustrates an example of Tool 8-B, completed for an example action – an urban agriculture programme – and its related objectives and indicators, baseline measures and targets. Additional columns can be added to indicate:

- **Reporting:** *How will data be reported (annual report, quarterly brief)?*
- **Logistics and data management:** *Where will data be stored, who gets access and how?*

MONITORING CLIMATE CHANGE VULNERABILITY

Climate change is a dynamic issue with many uncertainties around future exposure. While there is little doubt they will continue to change, climate patterns and impacts can change relatively quickly, particularly as global "negative feedback" loops are approached that will likely have major implications. For example, as permafrost melts it releases stores of methane that contribute to further warming.

Given these uncertainties and dynamic conditions, climate-change vulnerability should continue to be monitored in addition to monitoring the *Climate Change Action Plan* process and outcomes. Opportunities to link and coordinate monitoring should be explored and taken advantage of where they exist.

TABLE 40: Tool 8-B Monitoring framework (example)

ACTION: URBAN AGRICULTURE PROGRAMME								
Who is responsible for monitoring: City Planning Department (with support from Urban Farmers' Association)								
Objective	**Indicator(s)**	**Baseline Measure** (Current 2013)	**Target** (2015)	**Target** (2018)	**Data source**	**Data collection frequency**	**Data collection methods**	**Parties involved**
Support a prosperous economy	Area zoned for urban agriculture (hectares)	10 ha	30 ha	60 ha	City Planning Department (GIS, Land Use Plan)	Every 18 months	City – GIS data base	City
Promote community wellbeing	Number of urban farms (#)	15	45	100	City Planning Department (GIS, Land Use Plan)	Every 18 months	City – GIS data base	City
Reduce urban poverty	Urban agricultural employment (number direct, number indirect)	90 (140)	300 (500)	700 (1500)	Urban Farmers' Association (direct interviews and surveys)	Every 18 months	Urban Farmers' Association – direct interviews and surveys	Urban Farmers' Association

After a monitoring framework for each action has been completed, the next step is to develop some guidelines for the monitoring programme as a whole. One of the most important aspects of an effective monitoring programme is the establishment of documentation and communication procedures for *Climate Change Action Plan* monitoring. Here, several important questions should be answered:

- *How will the monitoring programme be documented and communicated?*
- *How will new staff be made aware of the procedures?*
- *What happens to the data collected? Where is it stored?*
- *Who has access to it?*
- *How and when will outcomes be communicated?*
- *How and when will outcome results be used and by whom?*

Answering these questions will provide future savings and benefits when the *Climate Change Action Plan* is evaluated and revised in years ahead. **A good documentation programme will help to make reporting consistent and reliable**. Since a great deal of information is gathered during the implementation of *Climate Change Action Plan* actions, the documentation programme can ensure that this information is available for future analysis, assessment and planning exercises.

Task 8.4: Evaluate results of monitoring programme

Evaluation analyses the information generated by the monitoring programme at selected times to determine:

- If *Climate Change Action Plan* actions are meeting community objectives efficiently, effectively, or at all.
- If there are opportunities for improving the *Climate Change Action Plan* by refining actions, introducing new ones, or involving new stakeholders and partners.

Unlike monitoring, evaluation is not a continuous and ongoing process. Instead, it occurs at strategic points during the implementation process. Typically, it should be coordinated with project phases, so that a formal evaluation is conducted at the end of the short-term action project cycle (i.e. 2-years) and the medium-term action project cycle (i.e. 5-years). Given the dynamic nature of both climate change and urban areas, a full, comprehensive evaluation should be conducted at least every five to six years.

Evaluation is like monitoring in that it should **promote learning** and is a **long-term process.** Like monitoring, the results of the evaluation should also be communicated both to the stakeholders and to the community in general.

Before an evaluation process is initiated, it is wise to first review and answer the questions below. They are similar to the questions asked at the outset of developing the monitoring programme.

- *Why is the evaluation being undertaken?*
- *What is the evaluation expected to achieve?*
- *What type of evaluation is most suitable – who will be involved (e.g. participatory, external expert-based, combined)?*
- *When is project evaluation to take place?*
- *How will the evaluation process be documented and communicated?*
- *How will the results be used and by whom?*

Evaluations should include the core planning team and stakeholder advisory committee where appropriate and feasible. As a participatory planning exercise, these groups should be involved in the design of the evaluation programme and should be presented with the results of the evaluation for comment and feedback.

In some cases, it might be important to have an external reviewer assist with or lead the evaluation, or evaluate certain actions, if the local situation makes it difficult for an objective analysis to be conducted internally.

With an effective monitoring programme in place, the evaluation process should be straightforward. As shown in Table 41, the evaluation will assess the outcomes (successes and shortcomings) of individual *Climate Change Action Plan* actions. The evaluation should consider the **adequacy, effectiveness and efficiency of actions** in the context of the local climate change situation (i.e. exposure, sensitivity, adaptive capacity, vulnerability) and the community objectives (i.e. are they being met?). Table 41 illustrates how the benchmarks and targets developed during the previous task can be incorporated into the evaluation process to evaluate how well actions have supported the achievement of objectives.

TOOL 8-C
Evaluating Actions Against Objectives Worksheet

Tool 8-D provides a series of questions that can be asked to help to evaluate the *Climate Change Action Plan.* The first set of questions pertains to individual actions from your plan and should be answered for each action. The second set of questions relates to the plan as a whole and should be answered once as they relate to the entire *Climate Change Action Plan.*

TOOL 8-D
Evaluation Questions

The second set of questions also considers the larger climate change context (i.e. vulnerablity) and how changes in local climate conditions (exposure, sensitivity, adaptive capacity) may warrant a more comprehensive review and evaluation of the *Climate Change Action Plan*.

See *Step 9: Adjust and Modify* for more information about more comprehensive updates that may be required to the *Climate Change Action Plan* based on the results of the evaluation.

TABLE 41: Tool 8-C Evaluating actions against objectives (example)

ACTION	RELATED OBJECTIVES AND SUB-OBJECTIVES	INDICATOR	BASELINE 2013	TARGET 2016	ACTUAL 2016	COMMENTS
Low regrets infrastructure improvements to markets (drainage, flood protection)	**Reduce poverty** Improve informal market infrastructure	Percentage of market area with storm drainage coverage	17%	25%	32%	Action exceeded expectations. This was due to _____
Zoning land uses	**Protect the environment** Conserve the mangrove forests	Hectares of mangroves	650 ha	800 ha	750 ha	Action fell short of expectations. This was due in part to _____
		Percentage of mangroves that are protected	15%	30%	20%	Action fell short of expectations. This was due in part to _____

TABLE 42: Tool 8-D Evaluation questions (example)

QUESTIONS TO ANSWER – FOR EACH ACTION	RESPONSES
Adequacy and effectiveness	
Has the Climate Change Action Plan action been satisfactorily implemented?	
Has the action adequately achieved its stated objective(s)?	
Have sufficient resources been organized to carry out the action?	
Have the leadership and capacities of the individuals and organizations involved been sufficient?	
Will the partnerships and networks formed in the process of implementing the action be sustained and strengthened?	
Have the adverse outcomes, both anticipated and unexpected, been adequately addressed?	
Can the results be sustained?	
Efficiency	
Could resources have been used differently or been substituted to produce more results within the estimated costs?	
Could the same results been achieved for less money or effort?	
Would a different action have produced the same or better results at a lower cost?	
Were the resources managed in the most efficient way possible to achieve the objectives?	
QUESTIONS TO ANSWER – FOR THE CLIMATE CHANGE ACTION PLAN AS A WHOLE	**RESPONSES**
Local Context and Conditions	
Have local climate conditions and circumstances changed (exposure, vulnerability, etc.)?	
Do the new climate conditions necessitate new or revised actions (phasing, scope, etc.)?	
Has new climate change information emerged that needs to be addressed (e.g. funding, resources, capacity, etc.)?	
Have local priorities changed (i.e. are community objectives being weighted differently)?	
Adjustment and recommendations	
How must the Climate Change Action Plan (overall and individual actions) be changed to better meet objectives?	
Have climate and/or community conditions changed so much that a complete review of objectives and actions is necessary?	

STEP 8 REVIEW CHECKLIST	✔
✔ Identify and confirm indicators to measure the success of Climate Change Action Plan actions in meeting objectives.	
✔ Develop a monitoring programme for measuring each indicator, specifying when the project monitoring is to occur.	
✔ Identify who is responsible for monitoring activities.	
✔ Ensure the results are communicated to core planning team, stakeholder advisory group, and other community/government stakeholders and Climate Change Action Plan partners.	
✔ Assess overall progress toward meeting Climate Change Action Plan objectives and plan outcomes during regularly scheduled evaluations.	

A case in point

COMMUNITY BASED MONITORING – CLIMATE ACTION PLANNING, NUNAVUT, CANADA

The Government of Nunavut, with the support of the Canadian Institute of Planners and Natural Resources Canada, coordinated the development of pilot climate change action plans in several northern Arctic hamlets. The need for improved monitoring of climate change trends and impacts was identified in many plans, and adopting a community-based approach was considered to be the best way to collect important information and simultaneously raise community awareness and develop skills and capacity, especially among the youth. Some of the actions included local observation of shoreline erosion, with a focus on storm surge events (event severity and duration, wave height, shoreline decrease) and a programme for community observation of extreme weather events and associated impacts on community infrastructure (emergency preparedness, water quality)

Community workshop in Nunavut, Canada.
© Compass Resource Management

STEP 9: ADJUST AND MODIFY

Climate change is a **dynamic issue**. Local exposure can change relatively quickly, particularly as global "negative feedback" loops are approached that will likely have major implications. For example, increased temperatures can cause an increase in water vapour in the atmosphere (as water is evaporated), which causes further warming. **Climate impacts will change** (and potentially speed up) over time and **new and different impacts may emerge, while existing exposure may increase**.

In addition to growing and changing impacts, it is very likely that **cities' knowledge and understanding of climate change will continue to grow** along with their **capacity to adapt** to it. Because of this, it is important to view your *Climate Change Action Plan* as a living document, one that requires regular updates and adjustments in order to adequately address a dynamic process like climate change.

Just as other city plans are updated regularly, climate change plans and strategies should be revisited and revised on a regular basis. With a good monitoring and evaluation programme in place, planners will be able to identify where and when adjustments to their *Climate Change Action Plan* need to be made. In some cases, fundamental changes may be required or community objectives may need to be revisited. In short, **adjustments and modifications are expected and should occur whenever new information or new priorities demand it**.

In addition to responding to the results of the monitoring and evaluation programme, some common reasons to adjust and modify a *Climate Change Action Plan* include:

- ✔ A new climate change officer, position or department is established in your city.
- ✔ A new climate change adaptation or mitigation programme is established at the state, provincial or national levels that establishes planning and mitigation goals (i.e. greenhouse gas emission reductions or caps) for local governments.
- ✔ New climate data and projections with ramifications for your local area (e.g. rapid sea level rise, revised precipitation or temperature trends).
- ✔ New funding for climate adaptation planning or option implementation
- ✔ Climate adaptation funding reductions or constraints, particularly if these reductions directly impact existing or planned projects in your *Climate Change Action Plan*.

As identified in the previous step, a formal monitoring and evaluation programme should be established that includes regular *Climate Change Action Plan* updates. Given the dynamic nature of climate change, a **formal full revision of the plan should occur every three to four years**.

Reclaimed disaster prone hills as a park after relocation of residents to a safer place in Rubavu, Rwanda.
© UN-Habitat/Julius Mwelu

Appendicies

APPENDIX 1: TOOLS

The following tools are designed to help planners, or other project facilitators tasked with climate change planning projects, to work through this guide's planning framework. The planning tools are provided in a companion document, Planning for Climate Change: A strategic values-based approach for urban planners – Toolkit.

While the tools are best used in conjunction with the planning framework, every process will be different and may not require that every tool be used. The tools can also be used to support discrete steps or smaller planning projects (e.g. Vulnerability Assessment, Stakeholder Assessment, Monitoring and Evaluation).

PLANNING FOR CLIMATE CHANGE TOOL LIST

Module A: What's happening?

Tool 1-A Framing the challenge questionnaire
Tool 1-B Getting organized worksheet
Tool 1-C External assistance assessment
Tool 2-A Stakeholder identification worksheet
Tool 2-B Stakeholder analysis matrix
Tool 3-C Stakeholder "Terms of Reference" worksheet
Tool 3-A Weather and climate change summary
Tool 3-B Climate change observation template
Tool 3-C Climate change influence diagram
Tool 3-D Overview – exposed people, places, institutions and sectors
Tool 3-E Hazard mapping (exposure mapping)
Tool 3-F Socio-demographic sensitivity assessment
Tool 3-G Sensitive places mapping
Tool 3-H Community-based sensitivity mapping
Tool 3-I Sensitivity thresholds
Tool 3-J Sensitivity assessment summary
Tool 3-K Climate threat plotting
Tool 3-L General adaptive capacity assessment
Tool 3-M Hazard-specific adaptive capacity assessment
Tool 3-N Rapid institutional assessment questionnaire
Tool 3-O Summary vulnerability rating matrix
Tool 3-P Summary vulnerable population by sector
Tool 3-Q Vulnerability Assessment Report table of contents

Module B: What matters most?

Tool 4-A Issues identification and organization
Tool 4-B Issues to objectives
Tool 4-C Objectives analysis – relevance to climate change
Tool 4-D Objective indicators (descriptive)

Module C: What can we do about it?

Tool 5-A Option identification worksheet
Tool 5-B Objectives to options worksheet
Tool 5-C Organizing options worksheet
Tool 5-D Screening and ranking options table
Tool 6-A Direct ranking of options
Tool 6-B Technical ranking of options matrix
Tool 6-C Objective ranking and weighting matrix
Tool 6-D Weighted ranking of options matrix
Tool 7-A Institutional - governance checklist
Tool 7-B Action plan worksheet
Tool 7-C Climate Change Action Plan table of contents

Module D: Are we doing it?

Tool 8-A Indicator development worksheet
Tool 8-B Monitoring framework worksheet
Tool 8-C Evaluating actions against objectives worksheet
Tool 8-D Evaluation questions

APPENDIX 2: OTHER RESOURCES

There are a large number of climate change adaptation and mitigation planning resources and tools available. This section highlights particularly useful, relevant and accessible resource documents and websites. Collectively, these resources would provide planners an effective resource library.

Please note that the list is by no means exhaustive. There is a wealth of information available and new tools emerging every few months. Planners should seek to "bookmark" key climate change planning websites (many of which are provided here) and work to stay current on available literature, case studies and tools.

PUBLICATIONS

Title:
Climate Resilient Cities - A Primer on Reducing Vulnerabilities to Disasters

Author:
The World Bank
1818 H Street NW, Washington, DC 20433, U.S.A
www.worldbank.org

Year:
July, 2009

Source:
http://siteresources.worldbank.org/INTEAPREGTOPURBDEV/Resources/Primer_e_book.pdf

Topic:
This guidebook and toolkit was prepared for local government in East Asia, to inform local officials about climate change. The publication aims to engage government and other stakeholders in a city assessment and participatory approach, in order to identify areas of vulnerability and identify possible solutions. It includes a toolkit for vulnerability assessment, identifying "hot spots", and is intended to motivate communities to develop adaptation, mitigation, and preparedness strategies in response to climate change impacts. Information on "sound practices" is provided, along with a list of additional resources.

Title:
A Toolkit for Designing Climate Change Adaptation Initiatives

Author:
United Nations Development Programme (UNDP)
Bureau of Development Policy Environment and Energy Group
One United Nations Plaza
New York, NY 10017, USA
http://www.undp.org/climatechange

Source:
http://www.undp.org/content/undp/en/home/librarypage/environment-energy/low_emission_climateresilientdevelopment/designing-adaptation-initiatives-toolkit/

Topic:
UNDP's climate change adaptation toolkit is aimed at a wide range of individuals and organizations, all of whom may all play a part in supporting and designing climate change adaptation initiatives.

Organized into four main sections, the toolkit builds on UNDP experiences supporting countries at the national, regional and community level. The toolkit also provides a useful range of tools, and an accompanying list of climate change resources.

Title:
Asian Cities Climate Change Resilience Network (ACCCRN): Responding to Urban Climate Change

Author:
Institute for Social and Environmental Transition (ISET)
948 North Street, Suite 9, Boulder, Colorado 80304, U.S.A.
www.i-s-e-t.org

Year:
2009

Source:
http://www.rockefellerfoundation.org/uploads/files/2d4557bc-6836-4ece-a6f4-fa3eda1f6c0c-acccrn_cop15.pdf

Topic:
The document profiles ten Asian cities that are part of the Rockefeller Foundation's ACCCRN programme. The case studies summarize each city's experiences, challenges and lessons learned, and provide an overview of the vulnerability and capacity context in each city.

Title:
Building Climate and Disaster Resilience into City Planning and Management Processes

Author:
The World Bank
Sustainable Development Department
East Asia and the Pacific Region
1818 H Street NW, Washington, DC 20433, U.S.A
www.worldbank.org

Year:
2009

Source:
http://www.preventionweb.net/files/12506_buildingclimateandEN.pdf

Topic:
Case studies are used to illustrate the ongoing application of the World Bank's "Climate Resilient Cities" framework, in East Asia, the Middle East, and Africa. The document provides an overview of the "Climate Resilient Cities" process, with information on the issues and challenges emerging as individual cities work through the process.

Title:
Handbook for Conducting Technology Needs Assessment for Climate Change

Author:
United Nations Development Programme (UNDP) and United Nations Framework Convention on Climate Change Secretariat (UNFCC)
One United Nations Plaza
New York, NY 10017, USA

Year:
2009

Source:
http://ncsp.undp.org/document/handbook-conducting-technology-needs-assessments-climate-change

Topic:
In this handbook, the role of low carbon technologies in meeting the climate change challenge is addressed by assessing technology needs in developing countries, with a view to both mitigation and adaptation. The process, known as a technology needs assessment, is essentially a systematic approach by which to identify, evaluate and prioritize technological means for achieving sustainable development ends.

WEBSITES

Title:
UNITAR Climate Change Programme (CCP)

Author:
United Nations Institute for Training and Research (UNITAR)
International Environment House
Chemin des Anémones 11-13
CH-1219 Châtelaine, Geneva - Switzerland
T: +41 22 917 8400
F: +41 22 917 8047
UN Switchboard: +41 22 917 1234

Source:
http://www.unitar.org/ccp/

Topic:
UNITAR (the United Nations body responsible for knowledge-sharing, training and capacity building) operates a Climate Change Programme, designed to build human capacity in developing countries to address the impacts of climate change. UNITAR's CCP website includes information about their programmes, along with links to other resources and useful publications.

Title:
Least Developed Countries Portal

Author:
United Nations Framework Convention on Climate Change (UNFCCC)UNFCCC secretariat
Haus Carstanjen
Martin-Luther-King-Strasse 8
53175 Bonn, Germany
Phone: (49-228) 815-1000
Fax: (49-228) 815-1999

Source:
http://unfccc.int/cooperation_support/least_developed_countries_portal/items/4751.php

Topic:
The UNFCCC's Least Developed Countries (LDCs) Portal provides information on National Adaptation Programmes of Action (NAPAs), the LDC fund, and detailed project information, including a database of local climate change coping strategies.

Title:
Cities in Climate Change Initiative

Author:
Sustainable Urban Development Network (SUD-net)
UN-HABITAT
PO Box 30030, Nairobi 00100, Kenya
Tel: +254 20 7623706
Fax: + 254 20 762 3477
E-mail: urban.planning@unhabitat.org
www.unhabitat.org

Source:
http://www.unhabitat.org/categories.asp?catid=550

Topic:
UN-Habitat's website provides an overview of the Cities in Climate Change Initiative, part of the Sustainable Urban Development Network (SUD-net). The website includes information on the experiences of the programme's pilot cities, along with a resource library, which includes up-to-date information and reports from UN-Habitat.

Title:
Adaptation Learning Mechanism

Author:
Global Environment Facility (GEF)
Energy and Environment Group
Bureau for Development Policy
United Nations Development Program (UNDP)
Tel: (212) 906- 6018
Fax: (212) 906- 6998
New York City, U.S.A.

Year:
Launched in 2008

Source:
http://www.adaptationlearning.net/

Topic:
The Adaptation Learning Mechanism is a knowledge-sharing platform developed to spread information about on-the-ground experiences, tools and relevant resources. The project focuses on adaptation practices, mainstreaming, and capacity building in developing countries. Resources are searchable by theme (e.g. education, coastal zone management, etc.), type (e.g. guidance and tools, research, training material, etc.), or by keyword.

Title:
MCA4climate (Multi-Criteria Analysis for climate change: developing guidance for sound climate policy planning)

Author:
United Nations Environment Programme (UNEP)

Year:
Launched in 2009

Source:
www.mca4climate.info/

Topic:
The site provides insights on new aspects of economic thinking related to climate change policy-making, such as uncertainty and dynamics, and will make a series of recommendations on how to tackle critical and pertinent issues pertaining to climate policy analysis.

Title:
Preparing Cities for Climate Change: An International Assessment of Urban Adaptation Planning

Author:
Department of Urban Studies and Planning
Massachusetts Institute of Technology
77 Massachusetts Avenue, 9-320, Cambridge, MA
02139-4307, U.S.A.

Source:
http://web.mit.edu/jcarmin/www/urbanadapt/index.htm

Topic:
The project is led by Professor JoAnn Carmin and the website profiles a comparative research project that is investigating the types of climate adaptation plans being developed internationally and the varying factors influencing the approaches cities and municipalities are taking to climate change adaptation planning. The website provides links to published research (updated as they become available) and information on international case studies.

Title:
Climate Decisions

Author:
Institute of Resources and Environment,
UBC School of Community and Regional Planning
Room 428, Lasserre Building, 6333 Memorial Rd,
Vancouver, BC, Canada, V6T 1Z2

Year:
Launched in 2008

Source:
http://climate-decisions.org/index.htm

Topic:
The website project is part of the University of British Columbia's component of the Climate Decision Making Centre at Carnegie Mellon University. The website provides an overview of structured decision-making processes and climate change adaptation, with a resource library containing links to other sites, toolkits and case studies.

Title:
Climate Change Group - International Institute for Environment and Development (IIED)

Author:
International Institute for Environment and Development (IIED)
IIED's Head Office
3 Endsleigh Street
London, England
WC1H 0DD
Tel: +44 (0) 20 7388 2117
Fax: +44 (0) 20 7388 2826
email: info@iied.org

Source:
http://www.iied.org/climate-change/home

Topic:
Through local, grassroots partnerships, and by working with regional and national government, IIED assists vulnerable communities in strengthening their capacity for climate change adaptation. Their website includes links to their national and local partners, along with information on IIED's key areas of focus, and links to an extensive publication library.

ON-LINE TOOLS AND DOWNLOADABLE TOOLS

Name of Tool:
The Climate Mapper

Organization:
United States Agency for International Development (USAID), National Aeronautics and Space Administration (NASA), Institute for the Application of Geospatial Technology (IAGT), University of Colorado, CATHALAC

Summary Description:
The Climate Mapper is a free "plug-in" for the NASA World Wind 3D virtual globe as well as the SERVIR-Viz virtual globe interface. The purpose of the Climate Mapper is to make the results of climate change models accessible to a broad user community. With the Climate Mapper, users can assess and compare climate change projections for the 2030s and 2050s against 3D visualizations of landscape. This should enhance vulnerability assessments as development planners consider adaptation strategies for projects.

Target group:
Planners, academic institutions, general public

Cost:
Free

Capacity Requirements:
Low to moderate

Web link:
http://www.iagt.org/focusareas/envmon/climatechg.aspx

Name of Tool:
Climate Change Data Portal

Organization:
World Bank

Summary Description:
Designed to provide an entry point to climate-related data and tools, the Climate Change Data Portal provides access to comprehensive global and country climate change data. It is intended to act as a knowledge-sharing platform to collect, integrate and display information relevant to climate change. Links are included to relevant global climate-related databases, and the portal contains historical and projected spatially referenced data, a webGIS visualization tool, and useful links to country-level information.

Target group:
Policy Makers and Development Practitioners.

Cost:
Free online tool

Capacity Requirements:
Low to moderate

Web link:
http://www.worldbank.org/climateportal

Name of Tool:
CI:grasp (Climate Impacts: Global & Regional Adaptation Support Platform)

Organization:
Potsdam Institute for Climate Impact Research (PIK) and Deutsche Gesell- schaft für Technische Zusammenarbeit (GTZ)

Summary Description:
Currently in active development, CI:grasp is an interactive information platform, including three main information layers designed to offer information on climate change, physical and socio-economic impacts, and adaptation options and experiences. Designed as an interactive and evolving tool, the website can be updated by users, who will be able to add ongoing projects to CI:grasp's online maps. The website will include links to additional climate change adaptation resources.

Target group:
Decision makers looking to integrate climate change adaptation planning within their ongoing projects, e.g. governmental agencies, sector specialists, development agencies, NGOs, etc.

Cost:
Free online tool

Capacity Requirements:
Moderate

Web link:
http://www.ci-grasp.org/

Name of Tool:
weADAPT (a platform that includes a range of climate change tools)

Organization:
Stockholm Environment Institute (SEI) e.a

Summary Description:
weADAPT is a climate change adaptation platform, combining a set of activities, tools and services developed in collaboration with the Stockholm Environment Institute (SEI), the University of Cape Town and additional partners. Tools include:

Climate Change Explorer (CCx), a software tool that enables the user to access and use local climate data, designed to enable non-expert users to look at a range of climate change projections, as part of a robust adaptation decision making process. CCx is available for download and provides downscaled projections for over 1000 stations in Africa and 300 in Asia from 10 global climate models. Guidance is provided to non-expert users interpret the data, and to assess its relevance in making adaptation decisions, incorporating uncertainty into the process.

wikiADAPT is a web-based knowledge sharing platform that incorporates information on other resources and documents and sharing experiences in adaptation research, practice and policy-making.

weADAPT's Adaptation Layer in Google Earth is designed as a user-friendly resource that presents a variety of climate change-related information (including videos and graphics) and makes it easy to find. Also under development is the Adaptation Decision Explorer, a decision support tool designed to screen adaptation options.

Target group:
Any interested decision-makers, e.g. project officers, planners, NGOs, donor agencies, policy makers, etc.

Cost:
Tools and resources are free to download and use. Some additional cost may be involved in accessing and processing input data for downscaling, and for analysing output downscaled data. Some support services – including training – are also offered through weADAPT.

Capacity Requirements:
Low to moderate

Web link:
http://www.weadapt.org/

Name of Tool:
Quality Standards for the Integration of Adaptation to Climate Change into Development Programming (CCA QS)

Organization:
United Nations Development Programme (UNDP)

Summary Description:
UNDP's CCA QS is designed to provide a concise, structured framework to incorporate climate change adaptation practices into existing and future development programming. The tool includes a framework for best practices, along with guidance in identifying climate change risks and opportunities, and integrating adaptation considerations and measures into development programmes and projects.

Target group:
Project and program planners and implementers

Cost:
Free to download and use

Capacity Requirements:
Moderate to high

Web link:
http://unfccc.int/adaptation/nairobi_work_programme/knowledge_resources_and_publications/items/5467.php

Name of Tool:
Adapting to Coastal Climate Change: a Guidebook for Development Planners

Organization:
United States Agency for International Development (USAID)

Summary Description:
Created as a companion to USAID's existing "Adapting to Climate Variability and Change" guidebook, this manual is designed to provide a more detailed and sector-specific guidance for responding to climate change impacts in coastal areas. The process requires an inclusive and participatory planning process lasting approximately 1-3 years.

Target group:
Coastal planners, practitioners, and policy makers.

Cost:
Free online resource.

Capacity Requirements:
Moderate

Web link:
http://www.crc.uri.edu/download/CoastalAdaptationGuide.pdf

Name of Tool:
CRiSTAL (Community-based Risk Screening Tool – Adaptation & Livelihoods)

Organization:
International Institute for Sustainable Development (IISD)

Summary Description:
Created to help project designers and managers, CRiSTAL is a screening process designed to integrate risk reduction and climate change adaptation into community-level projects. The Microsoft Excel-based tool is continually updated, based on feedback from ongoing training sessions. CRiSTAL's website contains links to other community-based planning resources, and adaptation planning resources.

Target group:
Project planners and managers working at the community level.

Cost:
Free online tool

Capacity Requirements:
Low to moderate (training workshops are available)

Web link:
http://www.cristaltool.org/

Name of Tool:
Statistical DownScaling Model (SDSM)

Organization:
Environment Agency, UK

Summary Description:
Developed as an open-source tool, the SDSM aims to provide daily, transient climate risk information. Historic and projected data is available for the 1961 – 2100 period, and although it has been primarily used for water resource management, it is applicable to multiple sectors.

Target group:
Decision makers seeking to incorporate climate change considerations into ongoing planning processes, e.g. local and regional government, NGOs, etc.

Cost:
Free online tool but requires registration

Capacity Requirements:
Moderate

Web link:
www.sdsm.org.uk

Name of Tool:
Climate Analysis Indicators Tool (CAIT)

Organization:
World Resources Institute (WRI)

Summary Description:
Part of a wider toolkit of country level climate change data, the CAIT database includes information on historical impacts, particularly from disaster events, along with a range of useful information on human development indices. Data may be manipulated by country, and cross-referenced with migration-related data. All major data sources are listed, along with related climate data resources.

Target group:
Decision makers seeking to incorporate climate change considerations into ongoing planning processes, e.g. local and regional government, NGOs, etc.

Cost:
Free online tool but requires registration

Capacity Requirements:
Low to moderate

Web link:
http://cait.wri.org

Name of Tool:
ClimateWizard

Organization:
The Nature Conservancy

Summary Description:
ClimateWizard allows users to:

- View historic temperature and rainfall maps for anywhere in the world
- View state-of-the-art future predictions of temperature and rainfall around the world
- View and download climate change maps in a few easy steps

ClimateWizard enables technical and non-technical audiences alike to access leading climate change information and visualize the impacts anywhere on Earth. The first generation of this web-based programme allows the user to choose a state or country and both assess how climate has changed over time and to project what future changes are predicted to occur in a given area. ClimateWizard represents the first time ever the full range of climate history and impacts for a landscape have been brought together in a user-friendly format.

Target group:
Decision makers seeking to incorporate climate change considerations into ongoing planning processes, e.g. local and regional government, NGOs, etc.

Cost:
Free online tool

Capacity Requirements:
Low

Web link:
http://www.climatewizard.org/

CLIMATE SCENARIO DATA AND MODELLING SOURCES

Name of Source:
IPCC Data Distribution Centre

Web link:
http://www.ipcc-data.org/

Summary Description:
The DDC provides climate, socio-economic and environmental data, both from the past and in scenarios projected into the future. Technical guidelines on the selection and use of different types of data and scenarios in research and assessment are also provided. The DDC is designed primarily for climate change researchers, but materials contained on the site may also be of interest to educators, governmental and non-governmental organizations, and the general public.

Name of Source:
Regional Climate Projections

Web link:
http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter11.pdf

Summary Description:
A comprehensive overview source of regional and sub-regional climate projections for many parts of the world, including Africa, Asia, Central and South America, and Small Islands.

Name of Source:
Canadian Climate Change Scenarios Network

Web link:
http://www.cccsn.ec.gc.ca

Summary Description:
A user-friendly website resource where users can download historical weather data, construct climate scenarios, access tools for statistical downscaling, and develop visualization maps for any region of the world.

Name of Source:
ENSEMBLES downscaling portal

Web link:
http://grupos.unican.es/ai/meteo/ensembles/index.html

Summary Description:
This tool helps users downscale projection results from Global Circulation Models to regional scale resolution. Some technical competency is required. One of the ENSEMBLES project's aims is maximizing the exploitation of the results by linking the outputs of the ensemble prediction system to a range of applications, including agriculture, health, food security, energy, water resources, insurance and weather risk management, which use high resolution climate inputs to feed their models. To cover the gap between the global coarse simulations and the regional high-resolution needs, downscaling techniques are required, both dynamical and statistical.

Name of Source:
Guidebook for Planners on Mapping Climate Change Vulnerability and Impacts Scenarios at Sub-National Level (United Nations Development Programme (UNDP)

Web link:
http://europeandcis.undp.org/lowcarbon/show/6ED21719-F203-1EE9-BEDC74A1971EB279

Summary Description:
Deigned for those working at the sub-national levels, this guidebook has been created by UNDP to help planners to identify and map the nature of current and future vulnerability to climate change. The guidebook is aimed at planners with little or no prior knowledge of climate change. Currently, the guidebook is still in draft form, with an up-to-date version provided at the website above.

APPENDIX 3: GLOSSARY OF TERMS

Most definitions used in this guide are based on those used by the International Panel on Climate Change (IPCC), the leading global climate change research organization. The glossary of terms below uses IPCC definitions.

Adaptation: Initiatives and measures to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation exist, e.g. anticipatory and reactive, private and public, and autonomous and planned. Examples are raising river or coastal dikes, and substituting more temperature-shock resistant plants for sensitive ones, etc.

Adaptation benefits: The avoided damage costs or the accrued benefits following the adoption and implementation of adaptation measures.

Adaptive capacity: A system's ability and efforts in both physical elements (infrastructure, material wealth, technology) and social/institutional elements (human capital, governance, institutional strength) to adapt to climate change impacts.

Adaptation costs: Costs of planning, preparing for, facilitating and implementing adaptation measures, including transition costs.

Anthropogenic: Resulting from or produced by human beings.

Anthropogenic emissions: Emissions of greenhouse gases, greenhouse gas precursors, and aerosols associated with human activities, including the burning of fossil fuels, deforestation, land-use changes, livestock, fertilization, etc.

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 ranging from months to thousands or millions of years. The classic period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant 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. In various parts of this report, different averaging periods, such as 20 years, are also used.

Climate change: Climate change refers to a change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes, external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, 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". The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition, and climate variability attributable to natural causes.

Food security: A situation that exists when people have secure access to sufficient amounts of safe and nutritious food for normal growth, development and an active and healthy life. Food insecurity may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food at the household level.

Greenhouse effect: Greenhouse gases effectively absorb thermal infrared radiation, emitted by the Earth's surface, by the atmosphere itself due to the same gases, and by clouds. Atmospheric radiation is emitted in all directions, including downward to the Earth's surface. Thus, greenhouse gases trap heat within the surface-troposphere system. This is called the greenhouse effect.

Greenhouse gas: Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary greenhouse gases in the Earth's atmosphere. Moreover, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine and bromine containing substances, dealt with under the Montreal Protocol. Beside CO_2, N_2O and CH_4, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride (SF_6), hydro fluorocarbons (HFCs) and perfluorocarbons (PFCs).

(Climate change) Impacts: The effects of climate change on natural and human systems. Depending on the consideration of adaptation, one can distinguish between potential impacts and residual impacts:

- Potential impacts: all impacts that may occur given a projected change in climate, without considering adaptation.
- Residual impacts: the impacts of climate change that would occur after adaptation.

Integration: An approach to climate change planning that considers larger and related sustainability issues (i.e. economic, social, governance, environmental, etc.).

Integrated planning and action can deliver efficiency and effectiveness by adding value through policies, programmes, plans and actions that support, rather than undercut, each other. See mainstreaming.

Likelihood: The likelihood of an occurrence, an outcome or a result, where this can be estimated probabilistically, is expressed in IPCC reports using a standard terminology defined as follows:

TERMINOLOGY	LIKELIHOOD OF THE OCCURRENCE / OUTCOME
Virtually certain	>99% probability of occurrence
Very likely	>90% probability
Likely	>66% probability
More likely than not	>50% probability
About as likely as not	33 to 66% probability
Unlikely	<33% probability
Very unlikely	<10% probability
Exceptionally unlikely	<1% probability

Mainstreaming: The process by which climate risks to city plans, programmes, activities and policies are considered and adjusted to address these risks. Mainstreaming assumes that other projects can be enhanced – e.g. poverty reduction, urban sustainability, etc. – and their benefits can be increased by integrating climate planning with them. Mainstreaming helps to ensure that a city's plans and policies are not at odds with climate risks now and in the future.

Mitigation: Technological change and substitution that reduce resource inputs and emissions per unit of output. Although several social, economic and technological policies would produce an emission reduction, with respect to climate change, mitigation means implementing policies to reduce greenhouse gas emissions and enhance carbon sinks

Participatory planning: A ground-up, community-based planning approach that works to involve all sectors of a community with a stake in climate planning, including local governments, the private sector, voluntary agencies and civil society.

Resilience: The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.

Sea level change/sea level rise: Sea level can change, both globally and locally, due to (i) changes in the shape of the ocean basins, (ii) changes in the total mass of water and (iii) changes in water density. Factors leading to sea level rise under global warming include increases in the total mass of water from the melting of land-based snow and ice, and changes in water density from an increase in ocean water temperatures and salinity changes. Relative sea level rise occurs where there is a local increase in the level of the ocean relative to the land, which might be due to ocean rise and/or land level subsidence.

Sensitivity: Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate variability or climate change. The effect may be direct (e.g. a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g. damages caused by an increase in the frequency of coastal flooding due to sea level rise).

Storm surge: The temporary increase, at a particular locality, in the height of the sea due to extreme meteorological conditions (low atmospheric pressure and/or strong winds). The storm surge is defined as being the excess above the level expected from the tidal variation alone at that time and place.

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

Vulnerability: Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

APPENDIX 4: GLOBAL CLIMATE INITIATIVES, PROGRAMMES AND FUNDING

Numerous international agencies and stakeholders recognize the critical role cities will play in climate action. This attention has resulted in the development of numerous initiatives that are looking to support and link cities in their climate planning. The table summarizes some of the larger initiatives.

INTERNATIONAL CITY PROGRAMMES AND INITIATIVES

Name:
Adaptation Fund

Organizing Agency/Institution:
United Nations Framework Convention on Climate Change (UNFCC)

Website / Contact:
www.adaptation-fund.org/

Notes:
The Adaptation Fund was established under the Kyoto Protocol to finance climate change adaptation projects and programmes in developing countries that are particularly vulnerable to the impacts of climate change. From 2010-2012, the fund dedicated more than US$165 million to increase climate resilience in 25 countries around the world.The Fund provides financial assistance for climate change adaptation projects.

Name:
Climate Investment Funds (CIF)

Organizing Agency/Institution:
United Nations Framework Convention on Climate Change (UNFCC)

Website / Contact:
https://climateinvestmentfunds.org/cif/

Notes:
CIF administers two trust funds that provide financial resources (grants and no/low interest loans) to developing countries in order to help them mitigate and manage the challenges of climate change.

The Pilot Program for Climate Resilience (PPCR) provides technical assistance and investments for climate adaptation planning and implementation. PPCR programs are led at the country (not regional) level and build on National Adaptation Programs of Action (NAPAs) and other national development programs and plans. As such, accessing these funds requires coordination with national level partners.

Name:
Global Facility for Disaster Reduction and Recovery (GFDRR)

Organizing Agency/Institution:
The GFDRR is managed by the World Bank on behalf of the participating donors and other partnering stakeholders

Website / Contact:
https://www.gfdrr.org/node/55

Notes:
GFDRR is a partnership of 41 countries and 8 international organizations committed to helping developing countries reduce their vulnerability to natural hazards and adapt to climate change.

GFDRR provides funds for a variety of climate change adaptation activities, including mainstreaming of climate change and disaster risk reduction into policies and plans, climate change and disaster risk financing and insurance, and funding for post-disaster recovery.

Name:
Global Environment Facility (GEF) and the GEF Small Grants Programme

Organizing Agency/Institution:
The GEF partnership currently includes 182 member governments, along with private sector and agency partners, including UNDP, UNEP, and the World Bank. For a full list of partners, see the GEF website, listed below.

Website / Contact:
www.thegef.org/gef/http://sgp.undp.org/index.php

Notes:
The GEF currently operates as an independent financial organization, and is the largest funder of projects intended to improve the global environment. The GEF provides grants to developing countries, and countries with economies in transition, in addition to non-governmental and community-based organizations.

A range of projects may be eligible for GEF funding, including programmes and projects related to climate change. In particularly, the Small Grants Programme provides funding for community based adaptation actions, especially those that focus on vulnerable people, places, institutions and sectors.

Additionally, GEF administers the Special Climate Change Fund on behalf of the United Nations Framework Convention on Climate Change.

For current funding policies, deadlines, and eligibility, see the GEF and Small Grants Programme's website, listed above.

Name:
Clean Development Mechanism (CDM)

Organizing Agency/Institution:
Kyoto Protocol

Website / Contact:
http://cdm.unfccc.int/index.html

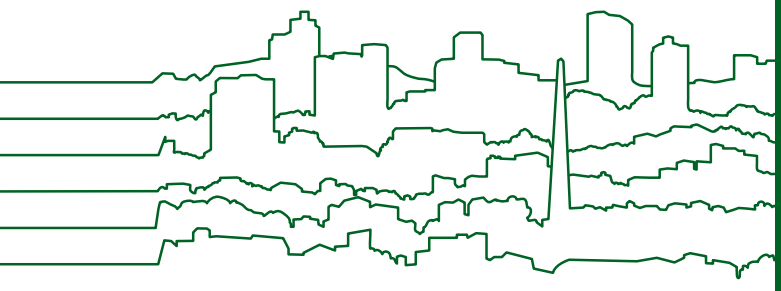
Notes:
The CDM was developed to create a financing mechanism to allow developed countries to pay for emissions reductions in developing countries. The mechanism is intended to encourage sustainable development and to reduce emissions, providing industrialized countries with some flexibility as they work to meet their emission reduction or limitation goals.

Projects that reduce emissions may be eligible for CDM funding; however it can be a complex process to navigate. Additionally, approved projects must provide additional reductions when compared to a "business-as-usual" scenario, and project funding must not result in funds being diverted from official development assistance.

Updated information on programme policy and guidelines is provided through the CDM website, listed above.

Planning for Climate Change: A Strategic Values-based Approach for Urban Planners was developed for city planners to better **understand, assess** and **take action on climate change at the local level**. Specifically targeted to the needs of planners and allied professionals in low and middle-income countries where the challenges of planning for climate change are particularly high, the guide's strategic, values-based planning framework:

- ✔ Promotes a **participatory planning process that integrates local participation and good decision-making**.
- ✔ Provides **practical tools for addressing climate change** through different urban planning processes.
- ✔ Supports the **"mainstreaming" of climate change actions** into other local government policy instruments.



UN HABITAT

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