UN HABITAT
FOR A BETTER URBAN FUTURE

Annexure B – lecture notes
Module 3: Planning for Climate Change

1. Introduction

The basic outline of the course is as follows:

1. Introduction – including the learning objectives
2. Planning frameworks
3. Approaches to CC planning
   a. Ad hoc
   b. Strategic (stand-alone) plans
   c. Mainstreaming
4. CC planning process
   a. General process approaches
   b. Public participation
   c. Scenarios
5. Policy decision rules
6. Summary

The presentation is divided up to match the learning objectives. Short case studies are included within each section to illustrate the points made. Lecturer should also reference the extended case studies presented in other modules for Semerang and Durban, and use those. Also included in each section are suggested small group activities or discussion slides.

2. Planning Frameworks

To begin the class and get the students warmed up, the lecturer should engage the students in discussion regarding their perspectives on what the significant influences are on local planning for climate change. What policies in their experience have the most impact on whether and how climate change planning is happening in their home city/region/country?

Key points the lecturer should be sure come clear in the discussion:

- International treaties frame the actions of national governments, the goals they create for cities and the funding available to cities. Of these, the UNFCC is the key actor (see next slide), and the Kyoto Protocol and its successor agreements are the key documents.
- At the national level, there may be set policy frameworks unique to the country, and/or the country may have undertaken a NAPA (National Adaptation Programme of Action) and a NAMA (National Mitigation Programme of Action).
- Regional bodies may have prepared climate forecasts or given direction for how to prepare a local plan.

Each of these creates a policy framework within which the local plan must work. Now the lecture turns to looking at each of these in a bit more depth.

UNFCC, NAPAs, and Funding

UNFCC was adopted in 1992, and came into force in 1994. It has been ratified by 193 countries. While its primary goal is reduction of future greenhouse gas emissions, it has some influence on adaptation as well.

The first underlying principle places the greatest responsibility for fighting climate change on the countries that emitted the majority of gases – the developed countries. In this way it differentiates based on both history (who caused the problem) and capability (who has the resources to fix it).

The second underlying principle means that if an action or policy has a suspected risk of causing substantial harm to the public or to the environment, those who want to take the action must prove that it is not harmful. This is very different from how many government policies run, where typical policy assumes that everything will be okay, and litigants or activists must prove that harm will occur. The precautionary principle is important in climate change because it is virtually impossible, given the complexity of climate systems, to make projections with 100% scientific certainty. Instead, most scientific claims about climate change have some level of uncertainty involved. But the precautionary principle states that even when there is some uncertainty, precautions must be taken (Toth et al. 2001). This therefore provides the underlying premise for taking action on mitigation or adaptation even if the science contains some uncertainties.

Countries that participate in the UNFCC are divided into three categories (with some subcategories).

- The OECD countries plus Economies in Transition countries (mostly Russia and former Soviet states) are the Annex I countries. They are required to provide regular inventories of their emissions using 1990 as the base year for calculations, and to work toward reductions.

- Annex II countries are the most developed, and are required to support mitigation and adaptation activities in developing countries both financially and through transfer of technology.
- Non-Annex I countries are the developing countries. Of these, the 49 countries the United Nations classifies as least-developed are the particular focus for investments in adaptation.
- For updates and more background, see the website of the UNFCC: http://unfccc.int/2860.php

There are four main funding sources for developing countries to support adaptation activities, all managed through the Global Environment Facility.

The Special Climate Change Fund (SCCF) was established first, in 2001, and focuses on capacity building in developing countries. Included projects can address: adaptation; technology transfer and capacity building; energy, transport, industry, agriculture, forestry and waste management; and economic diversification.

The Least Developed Countries fund pays for specified countries to complete and implement a National Adaptation Programme of Action (NAPA). By 2011, 47 countries had submitted NAPAs, which indicates specific project needs for that country. Requests are quite specific. Bhutan, for instance, identified a need for "Reducing climate change-induced risks and vulnerabilities from glacial lake outbursts in the Punhakha-Wangdi and Chamkhar Valleys" in their NAPA, and have been funded almost $US 4 million toward a total project cost of $US 8 million. The next slide will present the NAPA for Burkina Faso as an case study.

The newest funding mechanism is the Green Climate Fund. Its purpose is: "to make a significant and ambitious contribution to the global efforts towards attaining the goals set by the international community to combat climate change. The Fund will contribute to the achievement of the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC). In the context of sustainable development, the Fund will promote the paradigm shift towards low-emission and climate-resilient development pathways by providing support to developing countries to limit or reduce their greenhouse gas emissions and to adapt to the impacts of climate change, taking into account the needs of those developing countries particularly vulnerable to the adverse effects of climate change." The Green Climate Fund has a new Secretariat set up in the Republic of Korea. See their website for updates: http://gcfund.net/home.html

The Adaptation Fund is managed by implementing agencies in most LDC countries. In Jamaica, for instance, it is the Planning Instutie for Jamaica, while in Rwanda it is the Ministry of National Resources. Projects that have been funded are quite varied, ranging from water management to food security to rural development to disaster risk reduction. Their website is: http://unfccc.int/cooperation_and_support/financial_mechanism/adaptation_fund/items/3659.php

Note: at this point in the presentation, the slides give the lecturer the opportunity to fill in information that is particular to their country, region, and locality. This will help demonstrate to students the relevance of the lecture. Slides the lecturer must fill in are designated with red text. If the lecturer prefers, these slides can easily be hidden or deleted.

Application of a NAPA in Burkina Faso

NAPAs are designed to be grass-roots based enumerations of critical needs, based on observed conditions rather than complex projections and scenario analysis. The planning process that Burkina Faso used is described below.

Case Study: Burkina Faso

By Professor Samuel Yonkeu

Ouagadougou, Burkina Faso

Details of the given challenges:

a) Challenge in relation to climate change in Burkina Faso

- Floods

- Droughts

- Heat

- Dust pollution due to wind of sand from Sahara

b) Where exactly did you recognize them?

These phenomena concern the entire country but Floods, Droughts and Dust pollution are more substantial and critical in cities (Ouagadougou, Bobo Dioulasso, etc.) than in the rural areas. Droughts is more appreciable in the rural areas (spécially in the northen part of the country).

c) Since when did you recognize them?

The first critical periods mention in the literature for floods is 1917 at Bobo Dioulasso but the situation become frequent during the last twenty years, notably in 1988, 1992, 1994 and 1999,, for droughts, 1908, 1921 then it become frequent 1970-1971, 1983/1984, 1990/1991, 1995/1996, 1997/1998, 2004/2005 . No precise information for Heat and Dust pollution due to the wind of sand.

d) How do you plan to cope with these challenges? And what kind of support do you need for this?

By the prevention (measures of adaptation and resilience), the anticipation in intervention. This supposes that we need a better knowledge of intervening conditions of these phenomena, a better knowledge of our physical and socioeconomic environment in order to know the sensitive zones and people susceptible of vulnerability. We must foresee and put in place systems of alert and organize committees and systems of intervention. We have a strong need of capacity building.

Planning Responses:

a) Who started the planning process?

The planning process was started by the Burkina government with the support of the Financial and Technical Partner

b) Why?

Because of the recurrent of the phenomena and for the respect of the different international conventions that the Burkina government had signed (UNCCC, Kyoto protocol). And also, because of the progress of the result obtained by the international scientific experts (IPCC, 2001) on the evidence of the causes and effects of the climate change.

c) How?

It started by the elaboration of the strategic document called, National Adaptation Action Programme (NAAP) for climate change vulnerability. The development of NAAP began by a bibliographic survey and holding, the 23, September 2005, of a workshop to harmonize the understanding of the methodology within the group of experts and to select sites of survey of the vulnerability and the adaptation to the climatic changes. An analysis based on several sources of data carrying on the deterioration of environment and using the SIG tool, permitted to select ten representative zones, of the point of view of vulnerability to the climatic changes in each of the three Phytogeographical domains of the country. Then the socioeconomic criteria, notably the poverty index of the population and some sociocultural considerations, have been applied. It permitted to retain five zones. For every site investigations have been achieved in a ray of 50 km. Session of information have been achieved to the attention of the different administrative and political responsible as well as of technicians of state decentralized services, of the development projects, of the NGOs and associations of producers. Thereafter, holding regional workshops permitted to select, on the participative way, a sample of eight to twelve territories villagers by zone, to train investigators on tools of the Participatory Rapid Appraisal (PRA) Method and to determine the sectors and the vulnerable groups.

A report on the assessment of the vulnerability and capacities of adaptation to the variability and to the climatic changes has been elaborated restored and validated to the central and regional levels.

It is this report that acted as basis for formulation of NAAP and the project files.

d) How will the results be implemented?

Base on the experience of the elaboration of the NAAP. Vulnerability to climate change and adaptation will be approached for different sectors of development.

(end of case study)

3. Approaches to CC Planning

There is no single right way approach to planning for climate change mitigation or adaptation. Different situations will be best served by different approaches. The task is to identify what will be right for your situation. The goal of this section of the module is to provide intellectual clarity and differentiate the approaches in a way that is practically useful.

The lecturer should note that the literature is not very consistent in how language is used, so that one article may use mainstreaming to mean focusing on technical specifications while in another it may mean using forecasts to review all policies. As the lecturer or students read the various articles in the suggested literature, they should verify exactly the definition of terms that author is using.

Our definitions:

In strategic planning for climate change, climate is the main topic. These are plans resulting from a stand-alone process in which collaborators write a specific plan to address mitigation, adaptation, or both. The comprehensive nature of the process allows consideration of the repercussions of climate across many systems, and can help to identify where policies will support each other (provide co-benefits) and where they may conflict (maladaptations). The best of these also provide a clear path for implementation, with specific actions to be taken and the parties who must take these actions, and timetables for when the action should occur.

Ad hoc approaches use major interventions as entry points to addressing climate (UN Habitat 2012). They do not use a full planning process, but instead address one opportunity at a time and insert climate considerations into the decision processes. Here, climate remains the main goal, but it is addressed in piece meal fashion as the opportunity arises.

Mainstreaming is defined here as reviewing the broad range of existing plans and policies to assure that they sufficiently address future climate conditions. The OECD defines mainstreaming as the integration of adaptation measures as part of a broader suite of policies

within existing development processes and decision cycles. (OECD 2008, p. 60). Climate becomes just one data point in the decision process.

Note that for our purposes it is helpful to differentiate ad hoc and mainstreaming, but in practice the differences may be quite subtle. The goal is to improve resilience to climate, and each of these approaches can be helpful in achieving that goal.

Each of these will be explored in the next slides.

Ad hoc approaches can come via a reactive basis, where a municipality responds to a funding opportunity, for example, or pro-actively as a leader or funder addresses a challenge for one particular issue. They can be very effective, and many cities prefer to approach climate change on this sort of case-by-case basis (Kern and Alber, 2008). When the problem is a technical one this may be particularly appropriate.

Examples of more technical issues that are more internal to the city, and therefore potentially easier to address through ad hoc mechanisms, are:

- choosing more energy efficient cars for municipal business; and
- designing a water treatment system that will work even with sea level rise.

Ad hoc approaches are quicker to undertake and can be targeted very tightly to the exact problem or opportunity that needs to be addressed. As a result, only the most affected departments or organizations need to be involved, which can also speed the issue along. The main drawback compared to strategic planning is that it is more difficult to comprehensively address issues, so that there may be interconnections between policies and conditions that get missed. Since ad hoc approaches rarely use public participation, there also may be less buy-in by the public who did not have a chance to be involved in a full strategic plan.

Strategic plans tend to be developed when there is access to secure funding, the opportunity to develop a new institutional structure, and strong political support for action (Kern and Alber, 2008). Because they address climate issues comprehensively, they can assist in exploring the connections across policies such as land use and transportation, and between policy goals such as adaptation and mitigation. In this way it is easier to discover where policies conflict, and how climate actions fit in the big picture. The process can also have extensive stakeholder engagement, which may create a stronger constituency for the plan to be implemented.

For actions that affect the public, such as changing land use or residential designs, it may be very appropriate to have a full plan with the opportunity to have public hearings and bring in grass-roots perspectives. But the planning process is itself time and resource consuming, and without significant internal political support and resources in staff time and/or significant outside NGO assistance, it may not be an effective approach.

As the plan itself is done, it is essential that it specifically include implementation techniques. It has been more common for adaptation plans, for instance, to spend most of their pages identifying risks and vulnerabilities, and have less to say on implementation. As policy becomes

more mature, it is quite important that plans focus on what will be done, rather than just the problems.

Mainstreaming

Huxtable and Yen (2009), writing for CARE International, describes mainstreaming in this way: "Mainstreaming climate change adaptation describes a process of considering climate risks to development projects, and of adjusting project activities and approaches to address these risks. The assumption is that the project has a goal related to poverty reduction, livelihood security, or improved well-being for target populations, and that the sustainability and impact of the initiative can be increased by integrating climate change. This is different from a "targeted" community-based adaptation project, where the explicit goal is to build resilience to climate change. Mainstreaming climate change adaptation can therefore ensure that development programs and policies are not at odds with climate risks both now and in the future." P. 22

They go on to note: "Mainstreaming climate change adaptation can achieve two main objectives:

- reducing the risks posed by climate change to project activities, stakeholders, and results, sometimes referred to as 'climate-proofing'
- ensuring that project or program activities maximize their contribution to adaptive capacity of target populations - and do not inadvertently increase vulnerability to climate change - through interventions designed to build resilience while achieving development goals

'Climate-proofing' is primarily concerned with protecting development investments and outcomes from the impacts of climate change. It increases the sustainability of projects by analysing the risks posed by climate change to project activities, stakeholders, and results, then modifying and/or adjusting project designs or implementation plans to mitigate those risks. For example, an increase in the frequency and severity of floods may require water pumps to be built above predicted flood heights in order to ensure the availability of safe water over the longer-term.

The second objective of mainstreaming adaptation recognises that development activities that seek to reduce poverty can build the adaptive capacity of target populations to climate impacts or inadvertently constrain it. By analysing vulnerability of these populations to climate change and adjusting project activities to maximise their contribution to resilience, the impact of development projects can be significantly increased. For example, the selection of technologies and crop varieties can make a major difference in the impact of an agricultural project. In a changing climate, production-oriented, high-input agriculture may actually increase vulnerability, as the varieties may not be suited to shifting rainfall patterns and the purchase of inputs may require credit, leaving farmers in a risky position in the event of crop failure. In this context, low-input techniques such as conservation agriculture, and varieties which are suited to the current and projected climate conditions, may be more appropriate." (Huxtable and Yen 2009, p. 22)

One useful approach for ad hoc and mainstreaming is to use a climate-lens on existing policies. The OECD (2009) recommends this process:

Applying a climate lens requires investigating current policies for the extent to which:

- A measure might be affected by climate change impacts;
- These impacts are addressed in existing planning; and
- Further adaptation is required to address future climate challenges and opportunities.

One example of this would be when considering a new water system for a favela, one should consider whether climate projections suggest seasonal droughts in the source river are likely to become worse over time, then examine whether the proposed policies are sufficient to address the projected droughts, and if not, consider investing in more water-conservation measures or a back-up water source for times of particular drought.

To begin to identify where climate can be mainstreamed into the government functions and built form of the city, the three main questions to consider are prevention of the risk, reduction of the harm, and improved response to an event. Almost any function of the city can be investigated asking these questions and using the anticipated climate conditions as the 'lens' to see if more can be done.

The next slides ask the students to first, use a climate lens to identify issues, and then seek specific answers to how to address those issues.

Mainstreaming can also mean assuring that climate is addressed in standard plans and regulatory documents. These may include:

- Medium/long-term urban/municipal development and strategic plans;
- Master plans;
- Strategic land-use plans;
- Development orders;
- Strategies and plans for water, solid and sanitary waste, energy;
- Management plans for coastal zones. (UN Habitat 2012)

Almost any existing plan or policy for a city can be looked at through a 'climate lens' to see if it can better address climate in the three ways identified in the previous slide. Examples include the plans and policies listed above.

In some circumstances, it may be better to choose to undertake a full climate change plan, while in others it may be better to go directly to mainstreaming climate concerns into existing plans. The UN Habitat (2012, p. 7) identifies key advantages of each approach in this way:

Stand-Alone Climate Change Plans

- May be required by national government
- Provide logical extensions of national plans
- Have flexible timing

- Bring together multi-sectoral team to plan and implement
- Increase visibility of issues and attract funding
- Provide comprehensive monitoring and evaluation
- Can improve coordination and avoid maladaptation

Mainstreaming

- Fits well into existing planning cycles, budgets, and planning hierarchy
- Clear existing responsibilities for policy implementation increases impact and institutionalization of policy
- May be a legal requirement to integrate climate change into development, land use or other plans
- Will ensure that climate change is treated as a cross-sectoral issue – prevents 'climate change silo.'

In summary, ad hoc approaches may be appropriate where the other options are difficult to get started, and can provide experience in implementing a climate lens on a particular issue. But by their nature, ad hoc approaches are limited in their effectiveness. It is more efficient to move toward mainstreaming climate change into policies and actions. This builds it into daily practice, rather than requiring reference to yet another plan. In reality, it may be very appropriate and helpful to start by preparing a stand-alone plan that outlines key climate projections, essential vulnerability analyses, and overarching practices. This then can provide the basis for mainstreaming into other plans, using a shared vision and forecasts. As a result, we encourage viewing these as supportive actions rather than replacements for each other.

4. Planning Processes

In this section of the module, we will discuss:

- Planning process to reduce greenhouse gases
- Planning process for adaptation
- A recommended combined approach
- The roles of participation and traditional knowledge in these processes
- How to reduce uncertainty, which is one of the major barriers to moving toward implementation
- A summary.

ICLEI has a very well developed process for how to count greenhouse gas emissions and then how to plan to reduce them. The basic steps they recommend include:

Note that the text in quotes is taken directly from the ICLEI website (http://www.iclei.org/index.php?id=10828), while the text following the quotes are additional notes based on general findings in the implementation literature.

1. *"Measure* their emissions of greenhouse gases, generated through the actions of their local government administration (government emissions) and through the actions of the community they serve (community emissions)," ICLEI has produced an International Protocol that describes how emissions at the local government as well as the community can be measured with some specificity. This Protocol has the advantage of having been widely reviewed and providing comparability across governments. It can, however, be complex to implement. It is available at http://www.iclei.org/index.php?id=ghgprotocol
2. *"Commit* for an emissions (government or community) reduction target with respect to a base year and a target year." For LDCs, this may mean commit to minimizing increased emissions as part of sustainable development, rather than commit to reductions.
3. *"Plan* their actions (e.g. energy efficiency in buildings and transport, introduction of renewable energy, sustainable waste management) at the government and community level to reach this committed reduction target." There is increasing information available about specific actions that can be taken – see reading list for some ideas.
4. *"Implement* their Local Climate Action Plan" Implementation will be more likely if the initial plan identifies which agencies have to do what, includes those agencies in the determination, and looks for ways to avoid maladaptation – policies which achieve one goal while getting in the way of others
5. *"Monitor* emissions reductions achieved by their mitigation actions." In many ways this is the hard part, as there is rarely money to go back and monitor outcomes. It will be helpful to think about how to allocate monitoring and evaluation funds from the start.

Adaptation also has its own fairly well developed process. A good example is from the US National Research Council (2010), p. 10:

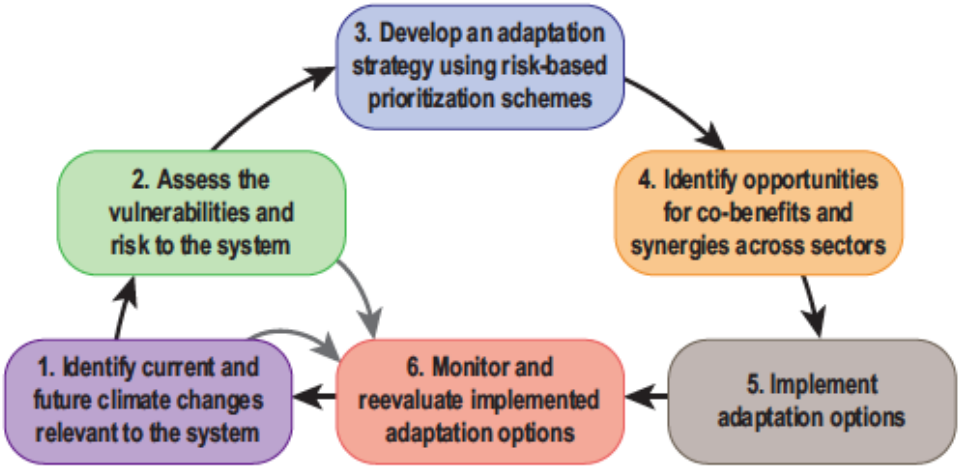

FIGURE S.1 The planning process is envisioned to incorporate the following steps: (1) identify current and future climate changes relevant to the system, (2) assess the vulnerabilities and risk to the system, (3) develop an adaptation strategy using risk-based prioritization schemes, (4) identify opportunities for co-benefits and synergies across sectors, (5) implement adaptation options, and (6) monitor and reevaluate implemented adaptation options.

The adaptation planning process is essentially a risk-management strategy. Because knowledge about climate as well as about the efficacy of interventions and policies undertaken will change and develop over time, it is helpful if adaptation is iterative and flexible. This brings in the importance of monitoring and evaluation, shown in the original diagram. What is not shown in this particular process is the role of the public or the stakeholder group. It is essential that each step be participatory, and include both collaboration with stakeholders and feedback from the broader public. We will discuss co-benefits in the next section of the module.

This strategic plan process is demonstrated in the Durban case study in Module 1.

Many climate plans will address both greenhouse gas reduction and adaptation to future conditions. In these cases, UN Habitat (2012, p. 25-26) suggests that the appropriate process for a strategic climate plan should involve seven main tasks, as follows:

1. "Engaging stakeholders: ensuring that all relevant parties are aware of the challenge of climate change and committed to addressing it;
2. Understanding the local climate change impacts: identifying climate threats to the town or city;
3. Identifying local contributions to climate change: a first step towards reducing greenhouse gas emissions;
4. Assessing vulnerable areas, people and sectors: analyse patterns of vulnerability to identify the critical locations and groups in need of enhanced resilience;
5. Participatory strategic planning for climate change: mobilising stakeholders to create an overall vision;
6. Putting plans into practice: implementing the plans;
7. Monitoring and evaluation: ensuring that the desired outcomes are achieved."

Note that the base of each of these is in public participation and collaborative planning. It is important to have two kinds of public engagement. The first is an on-gong collaborative process that includes experts and representatives in a long-term process with regular meetings – the *core stakeholder group* or advisory group. Buy-in early in the process and throughout increases the likelihood that the outcome will be just, and will be supported by the full range of stakeholders. These people bring expertise and commitment, which is essential to the eventual up-take of the policy. The core stakeholders group or advisory group will usually consist of 6 – 8 paid or professional persons who have time to regularly attend meetings and are committed to the outcome of the process. Examples include those listed above, and may also include directors of infrastructure, community representatives, health officers, women's rights organizations, mayor's representative, and more. It is important that community representatives who are deeply familiar with the particular issues of the poor, women, youth, or other particularly vulnerable groups are engaged in the core team. Along with justice issues, these parties will also bring local knowledge to the group, which can be quite important (as the next slide shows). The convener may need to actively work to balance out power issues within the group to assure a just outcome and that local knowledge and local needs are given appropriate consideration.

The second kind of participation is *public consultation* -- outreach to the broader public. These are people who are interested, but do not have time or inclination to spend hours in meetings on the topic. Public workshops and other more creative approaches will be needed at various points along the process to get feedback from the broader public, with particular attention again to the poor and more vulnerable populations. This feedback is essential because the collaborative process is not guaranteed to be fully representative of the broad public, so periodic check-ins to be sure the project is on track to meet a range of needs is essential.

Bangkok, for example, prepared a local climate action plan (2007). It publicizes its stakeholder group, with each representative signing the document. They chose to do a big public event that broadcast its goals and expectations very publically. Other communities chose to put in place smaller, ad hoc and less visible, but perhaps as effective, programs.

At this point, the lecturer may wish to stop for discussion. Questions might include:

- Who would need to be on a climate planning stakeholder group in your city or town?
- If you compare this to the overall population, who do you think is underrepresented? How could that be addressed?
- What sorts of public participation events are likely to work in your city to get broader feedback?

Traditional knowledge: Traditional knowledge brings benefits to the planning process (IPCC 2012). “Integration of local knowledge with additional scientific and technical knowledge can improve disaster risk reduction and climate change adaptation (high agreement, robust evidence). Local populations document their experiences with the changing climate, particularly extreme weather events, in many different ways, and this self-generated knowledge can uncover existing capacity within the community and important current shortcomings. [5.4.4] Local participation supports community-based adaptation to benefit management of disaster risk and climate extremes.” (IPCC 2012 p. 16)

The slide presents two examples of where traditional knowledge reduced the impact of climate variability, and by implication could help reduce the impact of climate change. Please see lecture notes for more information on these. Some details for each are provided below, along with the source for the examples.

2004 Tusnami: “Just before the Indian Ocean tsunami struck in 2004, numerous people were attracted to the shoreline by the unusual spectacle of fish flopping on the sea floor exposed by the sea’s withdrawal. Not the Moken and Urok Lawai peoples of Thailand’s coasts and islands, the Ong of India’s Andaman Islands and the Simeulue community of Indonesia; they all knew to head rapidly inland to avoid the destructive force of the sea. The small villages of the Moken and Ong were completely destroyed, but their inhabitants escaped unscathed. Even more striking was the displacement of more than 80,000 Simeulue people beyond the reach of the tsunami; only seven people died. This surprisingly efficient response, striking in its contrast with the frightening losses suffered elsewhere in Indonesia, was acknowledged by the granting of a United Nations Sasakawa Award for Disaster Reduction to the Simeulue people.”*Source:* Elias, Rungmanee and Cruz, 2005, quoted from Gyampoh et al. pg. 70.

Offin River Basin: In this study, the researchers surveyed the local people regarding their practices during drought seasons, and found that one of the common adaptation techniques is to use rainwater harvesting during the dry seasons. With intensification of climate change, it is suggested that this indigenous practice be strengthen and supported for the whole year, rather than just particularly dry seasons. The other key traditional adaptation was to keep some trees among the farm fields, but for a variety of reasons recent practices have worked against this, and farmers have been removing trees. Policy should work to remove those barriers. The research demonstrates that understanding both what worked in the past, and what are the barriers to the practice now and in the future, can provide more sustainable climate solutions. "The partial success of the use of traditional knowledge in coping with climate change leads to the conclusion that a healthy relationship between scientific knowledge and traditional or indigenous knowledge – which both have their limitations – is desirable, especially in developing countries where technology for prediction and modelling is least developed. Whereas most precipitation models and records mainly focus on changing amounts of precipitation, indigenous people also emphasize changes in the regularity, length, intensity and timing of precipitation." Gyampoh, Idinoba and Ndi Nkem 2009.

Managing Uncertainty

From a policy perspective, climate uncertainty can be characterized as a function of magnitude, direction, and timing of change (Joshi et al., 2011). Magnitude is a function of total emissions and the interactions of those emissions with the complex climate system. Generally this is discussed as a 2 degree global change, or 4 degree global change, etc. Recent estimates suggest that a 4 degree global change is likely (Betts et al. 2011, see also IPCC 2012). What is more important locally is how that global change will be experienced regionally, and this varies enormously based on geography. The direction of impacts is fairly well known for temperature and sea level rise, but in many locations precipitation patterns and totals are harder to predict, as the systems they are based on are very complex (IPCC 2012). Perhaps the most difficult issue is timing. Over the next 10-15 years there is a high degree of consensus about what the likely levels of impacts are, but beyond that, different assumptions and different models show quite different timing patterns (Betts et al. 2011).

Research suggests that uncertainty over the level of change is a key reason for difficulties in getting policymakers to take action on climate change (Bedsworth and Hanak, 2010; Moser and Ekstrom, 2010). It is important, therefore, to have strategies in place to address the uncertainty. Two general types are those that seek to improve the information through using climate scenarios, and those that seek to manage the policy process to build in resilience to uncertainty. Each of these is explored in this section.

The first way to reduce uncertainty is through improving information about expected climate. The IPCC uses different levels of expected emissions and human development to create 6 specific scenarios, called the SRES or IPCC scenarios, that they use to project likely future climate under that scenario (see Nakicenovic et al. 2000, also referred to by the IPCC as SRES 2000). Scenario development can be done in ways that provide a great deal of expertise and regionally targeted information. The most common way would be to interpret (downscale) global

climate models based on the SRES scenarios, for your region. The climate models will give varying projections based on their underlying emissions assumptions as well as their particular approach to modeling. While this provides very useful information, it requires extensive resources and expertise and can be difficult to communicate effectively to decision-makers once complete.

A simpler approach to forecasts involves a search through existing studies that may have been made for your region, and then mapping out the different scenarios reported in these. For instance, the IPCC provides regional projections that give a strong indication of what can be expected. If a local university or other groups have also done projections for the region, these can be compared as separate scenarios and then decisions must be made about which one to use, or some numbers in between. Note that the level of precision needed to make policy may not be all that great, and the desire to get 'exact' projections can significantly delay a planning process. Instead of seeking new and precise estimates, the OECD recommends "The key here is not so much to develop perfect information on the system of concern, but to ensure sufficient information to enable thoughtful consideration of policy options." (OECD p. 57).

A second major way to reduce uncertainty is through matching the timing of policy to the timing of the intervention. Even given the uncertainty in timing noted above, in the one to two decade time-frame that most plans work, the locally-experienced impacts of climate change are likely to be relatively small compared to the impacts of natural climate variability (IPCC, 2012).

Stafford Smith et al. explain that for the next 10-15 years, scenarios are fairly stable and certain, because the global climate change we can expect is based on emissions we have already done. After that, it depends more on the societal choices we make now and over the next few years. "Runaway" is a high emissions scenario, resulting high global warming. Stabilization suggests that policy steps to reduce global emissions are taken now to halt increases, but that overall levels do not drop. Recovery implies that globally, mitigation is taken so seriously that emissions levels actually decrease, resulting in a much more stable climate.

Ultimately, it is important to match the intervention to the anticipated time of the climate change. For very short term choices such as which crops to plant, considering climate change is not important. The importance of adaptation increases as the time frame of the investment increases. For large scale, long time frame investments that are fixed in place it is most essential that climate change be factored into specifications.

Hallegate (2009) proposed a variety of ways that policies can be designed to reduce the impact of uncertainty. The first is something we talk about later in this presentation – no-regrets solutions, or policies which achieve other goals of the municipality while also benefiting climate change adaptation. These have a positive economic return even under current climate conditions, while preparing the built form for a changed climate. Urban forests are a good example.

The second approach is to choose strategies which can be easily adjusted as climate conditions change. The aim, as Hallegatte notes, is to reduce the cost of being wrong about the future. An example in urban planning is preventing development in an area that projections suggest will be

underwater in the future. If the next-generation of projections are less dire, it is easy to open that land for settlement at that time.

The third approach is the safety margin approach, and is particularly relevant for large infrastructure. The idea is to use standards for construction that build in a margin of error, or a margin of climate change, into the specifications. For instance, as Hallegatte reports, Copenhagen is now using run-off figures that are 70% larger than their current levels when calculating requirements for new pipes, to deal both with increased population and with increased climate impacts. As noted above, this is particularly important for inflexible infrastructure where it will be very difficult and expensive to go back in and adjust it if climate impacts increase.

Hamin and Abunnasr (2012) report on an additional approach, that of incremental interventions. For instance, it is not too difficult to do a certain amount of tree planting now to reduce urban heat island and improve air quality, and as heat waves intensify, plant more trees to increase the impact of the policy. With incremental approaches one can match the amount spent on the policy with the level of experienced climate change, and also test just how effective the initial project was before going forward.

One of the challenges of climate uncertainty is that it is experienced in a coupled human-ecological system, where there is a great deal of complexity in the interrelationships. An experimental approach to implementing polices can help reduce uncertainty, since the realities of implementation always bring unanticipated outcomes. Urban greening also serves as an example here – models can suggest how much cooler trees may make an area, or how much air pollution they can absorb, but until the trees are in and interacting with the people and the local ecology, the real outcomes are uncertain. In this case, the argument is that it is best to start small and evaluate how effective a policy has been, to float a 'trial balloon' so to speak, that the results can be tested, evaluated, and then used to inform a wider implementation. An example is beginning with a pilot of providing rain barrels to residents to address drought issues, and monitor and evaluate (M&E) to see how well the policy is working before going to full-on implementation.

A final approach mentioned by Hallegatte is soft strategies, institutional responses that will help manage the uncertainty. A good example is using a longer planning horizon for plans, or implementing a warning system that encourages effective evacuation. The cost is low and implementation occurs only when needed.

Barriers to Implementing CC measures

Urban planning in the developing world has played a limited role in consciously reducing vulnerability to climate change (Biesbroek, et al., 2009). The International Council for Local Environmental Initiatives (ICLEI) sums up the reason for the lack of action that: 'while the changing nature of disaster risk is well analysed and increasingly addressed at international and national levels of debate and decision-making, efforts to provide direct and practical guidance to local government policy-makers and planners on how to reduce exposure and increase resilience … have been few' (ICLEI, 2010 p. 1). Because resilience is not made practical,

planning practices are often unsustainable – in fact, planners' everyday decisions could even increase people's exposure to risks and hazards, as opposed to building resilience (Pelling, 2003).

Further to a lack of practical understanding, cities in the developing world face many challenges when addressing issues of climate change. Local governments are torn between introducing long-term environmental concerns into planning processes, and attending to pressing short-term socioeconomic development priorities such as access to housing and services, food and water security, poverty eradication, natural resource management, and transportation needs (Parnell, et al., 2007 p. 358). Where the day-to-day needs of people are scarcely being met, issues of sustainable development are given only momentary attention and are difficult to reconcile with more immediate priorities (Halsnæs, et al., 2007, p. 66; Roberts, 2008 p. 523). Yet climate change is expected to exacerbate these developmental stresses.

Other problems are insufficient human and financial resources to dedicate to climate change issues, inability to adapt technologically to climate change, failure to incorporate climate change considerations into political and administrative decision making, and the lack of a political champion to drive the climate change programme (Roberts, et al., 2012). Then there are many sceptics arguing that the science is still too uncertain to be included in planning research, education and practice, but Dessai, et al., (2007 p.1) argue this is not reason enough to exclude climate change from the planning agenda, for often planning decisions with a long-term impact are based on the best current estimates of risk and uncertainty (Lowe, 2004 p. 76), and uncertainty is omnipresent in all other global phenomena – the economy, geopolitics and health.

At the local level, identifying where the barriers to forward movement are in your particular city will assist you in knowing where efforts need to be directed. Moser and Ekstrom (*2010*) categorize the barriers to adaptation planning into these categories:

Leadership, whether in the government or grass-roots level activism. Leadership is particularly essential when there is no regulatory mandate or local public demand for action.

Resources, including technical information such as regional climate forecasts as well as staff time and expertise.

Communication and information is particularly understood to be public participation and the flow of communication among those responsible for action. There is a sense in the article that this is a top-down flow of information from agencies to the public as well as cross-flow among members engaged in a CCA planning process. Note that in this formation, technical information needs are included in the resources category above.

Values and Beliefs, especially regarding risk and how it should be managed and what concerns have standing. Although not explicit in the original framework, for our purposes, belief (or lack thereof) in the anthropogenic causes of climate change would be categorized here.

To some extent, a deficit in one of these can be made up for by using that which you do have – they are fungible, to a limited extent. Strong upward communication about climate risks can help to create and support leadership. Getting technical information from universities, for

instance, can reduce the need for internal resources to prepare climate projections etc. Conscious reflection on what you have and what you need may help you identify these sorts of opportunities.

Short Case Studies:

Bangkok: Bangkok organized their plan accordingly:

1. The general goal;
2. Specific objectives; and
3. Specific actions to be taken to reach those objectives.

The lecturer can use this slide on Bangkok to discuss with students:

- What sorts of actions would be useful for mitigation in your city? What other benefits would those actions provide (economic development, public health, etc.)?
- What more information would be required for these policies to really implement them (hint: responsible agencies, where funds can come from, timelines, etc.) ?

Cape Town: The City of Cape Town undertook a very early effort at adaptation planning, called the *Framework for Adaptation to Climate Change in the City of Cape Tow*n. Their Environmental Planning Department commissioned the study to respond to short and medium term impacts of climate change. The list above is the steps they took to create the plan, and is fairly representative of the process that many cities take.

An important point is that they did not try to identify very precise climate scenarios or forecasts. Instead, they took existing projections for the region to generally identify the key threats, and then identified how these would affect the city and its residents. That became the basis to design policy.

The steps they followed were:

Analysis Steps:

1. Assessment of current climate trends and future projections
2. Undertaking a vulnerability assessment
    a. Identify current vulnerabilities (in each sector and for cross-cutting themes) based on current climate risks and trends
    b. Identify future vulnerabilities based on future climate scenarios and risks
3. Strategy formulation
4. Development of adaptation options
5. Evaluation of priority adaptation strategies
6. Programme and project scoping and design
7. Implementation
8. Monitoring and evaluation of interventions

Key impacts identified in the plan were:

- Increased water stress in the City due to forecast reduction in rainfall and increased evaporation due to increased temperature.
- A rise in sea-level will increase the vulnerability of beaches, shorelines and coastal developments and infrastructure to storm surges and erosion.
- Increased temperatures could lead to changes in fire intensity and frequency, which may also trigger the destruction or migration of sensitive plant and animal species that are already at the limits of their temperature and rainfall tolerance.
- The impacts of severe storms may result in damage to infrastructure.
- Health and livelihoods may be indirectly affected, especially through the risk of fires and changes in air pollution. (City of Cape Town 2006 p. 3)

The lecturer can use this opportunity to ask students if this is similar to what is needed in their city or region.

5. Prioritizing Actions

There are a variety of ways to choose among policies, given different goals and priorities. Among the ones most commonly used in climate planning are the following, each of which will be further described in following slides.

The first thing policies should do is not get in the way of other goals, including not increasing greenhouse gas emissions and not preventing robust adjustment to changing climate in the future – both of these are called ‘maladaptation’

The next step is choosing no-regrets solutions, or policies which achieve other goals of the municipality while also benefiting climate change adaptation. These have a positive economic return even under current climate conditions, while preparing the built form for a changed climate. (Hallegate (2009). Urban forests are a good example.

The second approach is to choose strategies which can be easily adjusted as climate conditions change. The aim, as Hallegatte notes, is to reduce the cost of being wrong about the future. An example in urban planning is preventing development in an area that projections suggest will be underwater in the future. If the next-generation of projections are less dire, it is easy to open that land for settlement at that time.

The third approach is the uses projected climate to create the climate-justified, and is particularly relevant for large infrastructure. The idea is to use standards for construction that build in a margin of error, or a margin of climate change, into the specifications.

Other goals include choosing policies that benefit the neediest and those that can be easily included into regular operations.

Maladaptation: Maladaptation is defined as business-as-usual development which, by overlooking climate change impacts, inadvertently increases exposure and/or vulnerability to climate change. Maladaptation could also include actions undertaken to adapt to climate impacts that do not succeed in reducing vulnerability but increase it instead. Maladaptation can also be adaptation that interferes with mitigation, thus increasing the long-term need for more adaptation.

Maladaptation occurs as unanticipated consequences of other actions. Examples include the shifting of risk from one place or social group to another, unmanaged urban expansion that adds population in vulnerable areas, building sea walls that encourage people to locate their homes on beaches that will eventually be at risk for hurricanes.

Actions that make individuals or communities more resilient but do that by increasing the use of fossil fuels may be considered maladaptive, as they just create more climate change over the long term. Examples include increased air conditioning or more use of private automobiles to avoid excess heat days.

One of the largest barriers to getting action on climate adaptation is simply that it seems very far away in time, while there are very pressing issues affecting developing countries today. Research suggests that the best way to overcome this barrier to focus on policies that bring benefits now – low and no-regrets actions.

These are actions that provide benefits regardless of climate change. Examples include:

- Limiting maladaptation
- Investments in development that enhance social capacity
- Actions that reduce local pollution or destruction of habitat, that enhance water conservation or improve public health

The IPCC gives the above three as examples of no-regrets actions – those that remove active problems for adaptation (maladaptation), those that enhance social capacity, and those that improve public health, as well as improving resilience to climate change.

The IPCC (2012, p. 16 – 17) suggests:

> "Measures that provide benefits under current climate and a range of future climate change scenarios, called low-regrets measures, are available starting points for addressing projected trends in exposure, vulnerability, and climate extremes. They have the potential to offer benefits now and lay the foundation for addressing projected changes (high agreement, medium evidence). Many of these low-regrets strategies produce co-benefits, help address other development goals, such as improvements in livelihoods, human well-being, and biodiversity conservation, and help minimize the scope for maladaptation.

> Potential low-regrets measures include early warning systems; risk communication between decision-makers and local citizens; sustainable land management, including land use planning; and ecosystem management and restoration. Other low-regrets measures include improvements to health surveillance, water supply, sanitation, and irrigation and drainage systems; climate-proofing of infrastructure; development and enforcement of building codes; and better education and awareness."

The OECD reports:

> Measures can be designed to provide net benefits regardless of climate change (these are known as "no regrets"). They can also be designed to provide net benefits under a variety of climate scenarios ("low regrets" measures) or can, on the other hand, depend on projections of changes in climate to justify their benefits (known as "climate justified" measures). "No regrets" or "low regrets" adaptations are justified under current (or historical) climate and are even more justified when climate change is taken into account. No regrets adaptations include removing or limiting maladaptation (again, ensuring that climate change is taken into account). Investments in development, particularly those that enhance the capacity of a society to adapt to climate change, are "no regrets" adaptations. The category also includes other measures, such as reduced pollution and destruction of natural habitats, water conservation and enhanced public health systems. Indeed, promoting development makes sense anyway and will reduce the vulnerability of future societies to climate change. However, as noted above, some development paths can reduce vulnerability more than others. Exact projections of climate change may not be necessary to justify "no regrets" adaptations. General knowledge that climate is changing may be sufficient. OECD 2009 p. 57

Co-benefits are what makes some actions low or no regrets. They are simply the additional benefits a policy will achieve above and beyond its climate resilience benefit. Alternatively, climate resilience can be a co-benefit of a policy to improve public health, for instance. Generally, climate planning seems to have the most likely co-benefit relationship with public health, sustainable development, and disaster risk reduction. In particular, many of the policies for good land use planning also increase resilience to climate change (Blanco 2009). Where there are blocks in political leadership and resources are limited, it may make sense to approach climate change by wrapping it together with other locally-pressing issues, such as public health improvements, sustainable development, or disaster risk reduction. In this way climate resilience can be improved without focusing on climate projections. In particular, many cities that are undertaking mitigation actions expect to see economic development benefits, with the development of new businesses and green jobs (CDP 2012).

Examples of polices that work well this way include:

- Urban greening – improves current public health by providing cooling, but also helps the urban area to manage intense rains or/and more intense heat waves

- Emergency alarm systems – help people prepare for storms now, and makes the city more prepared for increased storms in future.

Sometimes an action that is planned to benefit current conditions will need some adjustment to make it fit to future conditions. An example is the construction of a new sea wall – the sea wall may be needed now to manage existing flooding conditions, but should be made higher to address sea level rise in the future.

Climate-justified adaptations are designed to address infrequent or long-term events (such as low-probability extreme events), and the benefits to be received are further in to the future than with no-regrets or low-regrets policies. While no-regrets type benefits are easier politically, for long-lived infrastructure and for other policies that have very long-term impacts, integrating climate in from the start is essential in protecting human life and investments over the long term.

This is sometimes called the 'safety margin approach,' and is particularly relevant for large infrastructure. The idea is to use standards for construction that build in a margin of error, or a margin of climate change, into the specifications. For instance, as Hallegatte (2009) reports, Copenhagen is now using run-off figures that are 70% larger than their current levels when calculating requirements for new pipes, to deal both with increased population and with increased climate impacts. As noted above, this is particularly important for inflexible infrastructure where it will be very difficult and expensive to go back in and adjust it if climate impacts increase.

Vulnerability analyses taken early in the planning stage should indicate the groups and neighborhoods who are most vulnerable to climate change. Many of these are likely to be the poorer communities, and thus actions to improve resilience should address these poorer, more vulnerable members first. This occurs through a combination of urban planning to improve conditions, and community capacity strengthening to strengthen individual households and develop greater ability to respond to disaster.

For instance, Moser & Satterthwaite undertook a household level "participatory climate change adaptation appraisal methodology" and "urban level rapid risk and institutional appraisal" alongside a process of consultation with key stakeholders and policymakers in identifying pro-poor climate adaptation policies for cities in Kenya and Nicaragua. This provides access to information across the scales of implementation and impact. Key findings in that study implicated some larger urban poverty issues as also relevant to resilience to climate change, namely, that uncertain land tenure increases climate vulnerability. Moser and Satterthwaite (2008) found the specific policies listed above can be implemented to improve housing for the poor, and also increase their climate resilience. In general, studies recommend that while using a 'climate lens' on existing policy, it is appropriate to use a 'pro-poor' lens on the climate lens.

Short Case Study: Cape Town

An example of seeking policies that provide multiple benefits is being followed by Cape Town in the 2006 adaptation plan described in a previous slide.They have been experiencing much more significant air pollution in the urban area in recent years. Their plan reports:

> "Climate change projections indicate two trends: firstly, a reduction in the number of days on which it rains, and secondly an increase in the number of days with a temperature inversion. Both of these trends will increase the frequency of brown haze days. Inversion frequencies are higher in drier winters, and with a doubling of CO2 are expected to increase by 25% ….. Of the pollutants, particulate matter poses the most serious health risk as it can penetrate deep into the lungs and has been linked to respiratory problems and cancer ……
>
> Assuming "business as usual", it was estimated that health effects due to exposure to ambient pollutant concentrations resulting from burning emissions, will increase during the next decade in the range of 3-22% for Cape Town (Scorgie & Watson, 2004). From the current trends and forecasts it can be assumed that climate change will lead to an increase of 5-10% in inversions over the next fifty years, which in turn will lead to 5-10% more brown haze days or pollution episodes." City of Cape Town 2006 p. 47

To solve this problem, the key strategy for the City of Cape is the reduction of greenhouse gas emissions. This has been prioritised by the City of Cape Town, as is evident from the recently drafted Energy and Climate Change Strategy for the City (City of Cape Town, 2006b).

Other recommendations:

- Enforce the diesel & industrial black smoke legislation.
- Introduce measures to reduce the number of smoking petrol vehicles.
- Initiate discussions with the oil industry about the potential benefits from fuel reformulation.
- Initiate the upgrading of air pollution control capacity in the Cape Metropolitan Council.
- Initiate the development of an air quality management system for Cape Town.
- Existing national air pollution legislation should be re-assessed, as much of it is outdated.
- Human resources at the Air Pollution Division should be increased.
- Adequately qualified and experienced human resources should be obtained.
- The necessary budget should be allocated for facilities to test and monitor emissions.
- The Air Pollution Division should be given sufficient power to be able to enforce standards and have a say in metropolitan planning. City of Cape Town 2006 p 48.

Short Case Study: Addis Ababa

By Professor Kumelachew Yeshitela (PhD)

Addis Ababa, Ethiopia

Details of the given challenges:

What challenges (droughts, floods, storms etc.) in relation to climate change did you recognize in your city/country?

- Drought and floods (flash flood) are climate change related challenges in Addis Ababa.
- Where exactly did you recognize them? Drought occurs quite frequently and is expressed by absence of rain which affects urban agriculture and the supply of drinking water. Flood usually occurs in low lying areas of the city and along river banks in the southern part of Addis Ababa.
- For how long have floods been noticed? More than a decade.
- How did you recognize them? Drought is recognized by shortage of drinking water supply and power failure as the city is dependent on hydroelectric power supply. Flood is recognized by the damage to infrastructure and lifelines and sometimes claims human and domestic animals life
- How do you plan to cope with these challenges? What form of support is needed for this?
- Identifying flood risk sites and resettling people farm from the sites; covering riverbanks with vegetation; implementing sustainable storm water management system. There is a need for early warning system, and post disaster rescue and rehabilitation.
- There is no climate planning policy in Addis Ababa, Ethiopia.

Responses:

- Identify flood risk sites
- Resettle people and farms at highest risk
- Cover riverbanks with vegetation
- Implement sustainable stormwater management
- Develop early-warning system & post-disaster plans

Short description:

Addis Ababa has finalized its climate change adaptation program and submitted to the FEPA. Priority issues and sectors are identified in this program. Accordingly, climate change strategies and programs are formulated for the following sectors public health; women, children and youth; labour and social; environmental protection; water and sewerage; agriculture; beautification and park; sanitation; road and transport; and education. Among the strategies stated is identifying frequent flood affected areas and protecting areas from flood hazards, which are stated under the labour and social sector.

6. Summary

Summary: Effective Processes

We can summarize the slides above by suggesting that a successful effort needs to incorporate climate policies into existing processes, and should identify the ways that policy brings benefits today. Additional factors from the literature on barriers to implementation suggest that it is very helpful to have clear objectives for the policy or the process, and leadership to guide it.

1. Establish clear objectives – why are you undertaking a climate effort, and what will be gained from it?
2. Incorporate climate policies into existing management goals and procedures (mainstream it).
3. Identify co-benefits associated with selected measures.
4. Manage uncertainty.
5. Have strong leadership to guide the process.

At this point it may be helpful to stop and elicit student discussion of how different this is from other policies. When seeking a new planning instrument, for instance, are these the same factors needed for success? How different is climate from other planning processes? Do students have examples of each of these conditions from a climate initiative, or from some other policy initiative?

Planning's role: As a profession dedicated to the public interest, planning cannot ignore the warning signals of climate change projections. Local governments are the best positioned to take action against the impact of climate change, for they are closest to where the consequences of climate change will evolve (Pelling, et al., 2009b p. 43; Puppim de Oliveira, 2009, p. 253; UNISDR, 2010, p. viii). Urban planning is essential to local government capacity to respond effectively to climate change and other sustainable development challenges (Davoudi, et al., 2009 p. 15). Urban planning therefore ought to play a more prominent role in implementing climate change adaptation and mitigation measures in this environment. This is because 1) planning is considered to create order, reduce conflicts among activities, and seek to benefit all of society; 2) no new institutions need to be created as many cities have urban planning departments; and 3) planners already play a significant role in defining the form, structure, and function of cities (Sanchez-Rodriguez, 2009 p. 203; Roy, 2009; Parnell, et al., 2007; Laukkonen, et al., 2009).

The goals of a resilient city need to be built into sustainable development planning policies, strategies and interventions, and adaptation and mitigation measures need to be embedded in the everyday practices of urban planning (Coaffee, 2009 p. 87). If urban planning is to fulfil the 'switchboard role' for mainstreaming climate change adaptation and mitigation measures into sustainable urban development, then planners will have to make stark choices in choosing the preferred spatial configuration of urban areas (Davoudi, et al., 2009 pp. 13-16; Crawford, et al., 2008 p. 4575) while land use planning – with its influence on the location and density of

development – will be a fundamental tool for implementing this spatial design (Pizarro, 2009 pp. 33-34). Furthermore, planning needs to raise awareness of the increase in extreme events and everyday risks associated with climate change, and improve access to information and advice. Community-led planning is essential to identify and monitor extreme weather events, reduce risks and prepare for disasters. To reduce the risk for future disasters, it is vital to design and enforce appropriate built environment and public health standards, and institutionalise a range of social safety nets. Massive relocations may however be unavoidable as a last resort (Pelling, et al., 2009b p. 49; ALNAP & ProVention, 2009 pp. 23, 27; Parnell, et al., 2007 pp. 358-360).

“Adapting to climate change is at its core a call for planning” according to Blanco, et al. (2009 p. 158), and furthermore adaptation is the ‘type of planning that fits naturally the agenda of urban and regional planning’.

In conclusion:

- Good urban planning integrates climate change concerns.
- Planning practices that build resilience and sustainability should be mainstreamed into planning strategies, frameworks and plans.
- A sound planning process which links to global and national frameworks, is integrated across sectors, and builds on local development priorities can make a difference for adaptation and mitigation while addressing current and future needs of the city and its citizens, including the most vulnerable.