Urban Climate Change Adaptation and Resilience

Module 2: Understanding Climate Change and Local Climate Impacts
To the Facilitator: For this module series you will need to arrange the classroom so that the participants can easily move their individual tables or seats together to engage in group work. The module uses a combination of collaborative activities and facilitator-led discussions, and so the participants will need to be able to shift from their small groups to the plenary efficiently and without interrupting the flow of the modules.

Module 2 is meant to follow module 1 after the lunch break on the first day of the training series. Modules 1 and 2 complete the first day of training. Thus the discussions and material in module 2, which cover a great deal of material, should be expanded depending on the outcome of module 1. Allow AT LEAST 3 hours for module 2.

FACILITATOR NOTE (IMPORTANT!!!) The second part of this module depends on the inclusion of climate and meteorological information specific to the area where the training is taking place. Therefore you should research and prepare some slides to be added that show actual and projected impacts for your area. Potential sources of information include

--National level climate change documents (NAPA, NAMA)
--Projections/analysis conducted by universities/NGOs
--Case studies/anecdotes that describe the local or regional
experience with climate change

The master for this presentation includes material developed for both Indonesia and the Philippines. Before the module is presented the local facilitation team should remove material irrelevant to the training site and add additional material described above.

Estimated TIME: 3–4 hours

Materials Needed:
--Whiteboard and markers
--Flipchart
In this module we will be discussing the concepts of global warming and climate change before describing regional and local manifestations of climate change. The module proceeds from a general description of global warming and climate change at the local level, explaining some of the scientific basics of global warming and climate change. An understanding of the physical processes of climate change is important for local policymakers and stakeholders because they should be able to describe these processes to other stakeholders. Experience shows that effective climate change adaptation and resilience policy documents and plans include general discussions and definitions of global warming and climate change processes so that all stakeholders using these policy documents and plans can have a shared understanding of what is meant by these terms. Thus an important outcome of this module will be the ability to effectively communicate information about climate change.

The module in part two then moves into the local impacts of climate change, specific to the region where the training has been delivered. Experience and research on adaptation both clearly indicate that effective climate change adaptation and resilience begins with a localized understanding of the impacts of climate change and the need for local action. Without this localized understanding of what climate change means for the local economy and for the community, the issue may not become a priority for local decision makers and policy makers.
Part three of the module provides some practical guidance on the types of climate information that is generally included in CCAR planning and policy documents.

The **Learning Objectives** of this module are to:

- Describe the difference between global warming and climate change
- Identify the major human activities associated with global warming
- Describe the types of “sudden shocks” and “slow onset” risks of climate change likely to affect urban areas in the Asia-Pacific region
- Identify possible direct and indirect impacts likely to be associated with climate risks in your area
- Explain clearly and concisely to policy makers and other stakeholders the potential impacts of climate change in your area
- Describe the basic information needed to begin a climate adaptation planning effort
From Last Module: This is a review of the basic topics covered in the first module. Depending on the circumstances, the facilitator could engage the participants with questions about the previous module.

--Why are we all here? We are here because we recognize that climate change is going to have significant impacts on our country, our city, and our homes in the future. We understand that there is a great deal of uncertainty about the impacts, but it is certain that there will be impacts. Therefore we’ve gathered in this course to work together to discuss how we are going to adapt to climate change and build resilience in our cities to meet the coming challenges.

--We then briefly went over the content and objectives of the course. Briefly, one of the purposes of the course is to help you develop the tools and skills necessary to become a leader and innovator in addressing climate change in your agency or organization. Another objective is to develop a network of likeminded professionals in other agencies and organizations so that you can work together in the future to develop and implement CCAR strategies. The course will also provide guidance on how to assess vulnerabilities to climate change, how to develop strategies for addressing those vulnerabilities, how to craft effective project proposals to support those strategies, and lastly how to identify funding options.
We also learned that climate change is not a sectoral issue, but rather that it will impact entire urban systems. This means that CC impacts will be felt at all scales, and that they will cross agency and jurisdictional lines. It also means, as we mentioned, that we don’t have a great deal of information about the specific nature of CC impacts. Impacts will be direct and indirect, they will ripple through our city systems, there will be physical and socio-economic impacts, and they will be experienced in different ways by different groups. Thus it is no single agency’s responsibility to address climate change. Rather it requires a systems approach.

In addition to the importance of adopting a “systems thinking” approach to addressing climate change impacts, we discussed some other key concepts related to climate change adaptation and resilience building. To reiterate, adaptation and resilience building are participatory processes that embody principles of good governance, such as transparency and accountability. Ensuring broad-based participation will enable your adaptation and resilience team to use all of the resources available at the municipal level, and it will help build support and ensure the sustainability of CCAR efforts. We also understood that it is important to incorporate CCAR into standard procedures of government administration, and that it is also important to coordinate local CCAR efforts with national and international efforts.

Lastly we talked about the outcomes of the course. This course is very much task-oriented. We want to lay a foundation for CCAR efforts in your municipality, and to build local capacity to plan and carry out participatory vulnerability assessments that lead to the formulation of adaptation strategies.
Today’s Agenda. Here in the introduction briefly discuss the topic of the current module. The “agenda” slide describes a general overview of the topics for the day. Today’s material focuses mainly on climate change. The module moves from a general overview of climate change and climate science at the global level, to a more localized view of climate change and its impacts in your area. When thinking about local adaptation and developing your CCAR-DRR strategy, there are several key points to bear in mind, and so please think about these over the course of this module.

The first key point is that research and experience indicates very clearly that a major factor in the success of local adaptation is to develop a local understanding of the impacts of climate change. We often think about climate change as a global issue, but your task (and we will talk more later on about this), is to make the issue local. You have to be able to explain it in a way that connects with the experiences of local people and local leaders. This will help build support for climate adaptation and resilience.

A second, related point is that when developing your CCAR-DRR plan, you will need to describe climate change so that all stakeholders that are using the CCAR-DRR have a shared understanding of the term and what it means. Remember that many stakeholders may not be familiar with climate change, so your plan needs to provide a general, accessible overview. This discussion will describe climate change at the broadest level, and will narrow the focus to local impacts. Thus as we go over the course of this module, you may want to take notes for material that can be added to your CCAR-DRR plan.
This diagram is a general overview of the entire CCAR-VA process. We are currently in the first stage of the process, which is to identify climate threats. As we noted in the previous slide, the CCAR-DRR plan, and related vulnerability assessments are policy documents, and so both require a thorough explanation of the principle climate threats facing your city or region. In this module we will provide an overview of what is meant by the term “climate change”, and then we will provide some guidance to help you identify the principle climate threats in your city.
The first section of the module describes the physical processes associated with global warming and climate change. The section also provides an overview of the Intergovernmental Panel on Climate Change (IPCC) and its series of Assessment Reports.
VIDEO RESOURCE IN ENGLISH ONLY

By now everyone is probably aware of climate change. In this section we’ll provide a general overview of the issue that will provide a foundation for the topics we are going to be discussing throughout the rest of the modules.

The video for this slide is approximately 9m20s. The video will start when you click on the powerpoint slide. In case it does not start, you can access the video online by using the link that is contained at the bottom of these speaker notes. It was produced by the Intergovernmental Panel on Climate Change (IPCC), and though the video has a date of 2013, it is discussing a massive report that was released in 2014. This is the Fifth Assessment Report (known as the “AR5” for short). The IPCC releases a report approximately every 6 or 7 years. The 4th assessment report (AR4) was released in 2007. So the AR5 will serve as the standard of our understanding of the climate system and climate change for the next few years.

After the video is completed you should ask the participants for comments. Are there any questions about what was covered in the video? Below we’ve included a summary of some of the more important and relevant points.
The video describes how the IPCC works; the main function of the IPCC is to review the current state of knowledge on climate change and develop some broad conclusions. This video indicates some of the evidence used to determine past climate regimes, using ice core samples. These ice cores, and other sources of data, show a close link between carbon dioxide (CO2) concentrations and temperature.

CO2 concentration in the industrial era has increased 40% since pre-industrial times, mostly because of human activities, and atmospheric CO2 levels are at their highest level in the past 800,000 years. Each of the last three decades has been warmer than all preceding decades since 1850.

Effects are evident in shrinking ice sheets and glaciers and the decreasing extent of sea ice in the arctic.

The video mentions positive feedbacks (non self-regulating), which is an important concept to discuss with the participants to make sure that they understand what that means and implies. The first feedback mentioned in the video relates to decreasing snow and ice cover. Snow and ice reflect a great deal of the sun’s radiation back into space, and so it leaves the planetary system without causing warming. However, when the snow and ice melt, less radiation (sunlight) is reflected, and more is absorbed. This causes the planet to heat up. Thus there is a positive feedback loop: the more ice that melts, the more radiation is absorbed by the land. The more radiation that is absorbed by the land, the hotter the planet becomes. You might ask the participants if they have ever noticed the difference between wearing white clothes and dark clothes on a sunny day. The dark clothes make you feel much warmer if you are standing in the sun, because they actually absorb more energy from the sun. The lighter clothes reflect more energy, so you don’t heat up as much.

A key point that is made in the video is that even if emissions are decreased drastically, the warming of the climate will continue into the future because of the greenhouse gases (GHGs) that are already present in the atmosphere. This means that climate change impacts will happen even if the global community is able to take aggressive steps to stop emissions of GHGs. Therefore it is important for governments, organizations, and individuals to understand and prepare for potential climate change impacts.

The video also discusses sea level rise; one of the important and definitive conclusions is that we will have to adapt to in the Pacific and East Asian regions. The facilitator can emphasize this point and actually write it on a whiteboard or chalk board when it is mentioned in the video.

The video also mentions the RCP (Representative Concentration Pathways; these
are different sets of assumptions concerning future greenhouse gas concentrations used by the IPCC) scenarios for modelling; this would be a good time to briefly discuss the concept of modelling and the RCP scenarios as the video concludes that modelling data and scenarios are used for making projections used in CCA and resilience planning. The RCPs basically describe alternative futures in terms of GHG emissions. One of the RCPs is a “business as usual” scenario, which means that our emissions of GHGs will continue to increase in the future. Another RCP features a world in which we have successfully decreased our GHG emissions. There are others as well. These RCPs are then fed into climate modelling programs, which are complex computer programs that provide projections about what the future might be like under the different scenarios.

Source: IPCC (2013). Available online at http://www.youtube.com/watch?v=6yiTZm0y1YA
Now let’s move into some more details about how global warming and climate change work. We base most of this discussion on the findings of the Intergovernmental Panel on Climate Change (IPCC).

-- Discuss the basics of the most recent report, the AR5. The AR5, or Fifth Assessment Report was the topic of the video clip we just watched. The AR5 was finalized and released in 2014. It is an overview of almost 10,000 peer-reviewed studies on global warming and the changing climate, and represents the state of the art of knowledge on these topics. The AR5, like previous reports, has three parts. The first part is the scientific analysis. The second part is called “Impacts, Adaptation, and Vulnerability”, and discusses potential socioeconomic impacts of climate change. The third part is entitled “Mitigation and Climate Change”. It is hoped that the AR5 will pave the way for a global, legally binding treaty on reducing carbon emissions at the UN Climate Change Conference in Paris in late 2015.

1. Established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme

2. Open to all members of the United Nations and World Meteorological Organization.
3. Claims neutrality; the IPCC embodies a unique opportunity to provide rigorous and balanced scientific information to decision makers. By endorsing the IPCC reports, governments acknowledge the authority of their scientific content. The work of the organization is therefore policy-relevant and yet policy-neutral, never policy-prescriptive.

4. More than a thousand volunteer scientists from around the world – working at universities, government labs, and nongovernment organizations– produce the reports. The scientists evaluate available information on climate change and draft and review assessment reports.

The mission of the IPCC. The facilitator may choose to discuss the various aspects of this mission with the participants. One of the key points that should come out is that the IPCC aggregates and assesses current research on climate change. It is not a research institution by itself.

The report pictured, along with the link, is the working group 1 report from the AR5. This describes the physical science of climate change. The participants would likely also be interested in the report of IPCC Working Group II, which was released in 2014 as well. This report covers impacts, adaptation, and vulnerability from climate change. It has chapters for every region on the planet, including Asia.


In addition to the regional chapters, there is a great deal of information that would be of interest to the participants, including chapters on urban areas, human health, livelihoods and poverty, adaptation planning, etc. Both of the reports mentioned here (the summary for policy makers AND the full report) are included on the resources CD that is provided to participants.

Climate Change vs. Global Warming: These two terms are related, but they are fundamentally different. Sometimes they are confused, but the difference between these is relatively straightforward and simple to understand.

--“Global Warming” refers to the overall warming of the Earth’s atmospheric system. As you can see from the graph there is a general upward trend in average global temperature closely associated with measured increases in Greenhouse Gas (GHG) emissions, such as carbon dioxide and methane. These gasses serve to “trap” heat in the atmosphere, so the overall temperature at the surface of the earth and in the lower atmosphere increases.

--“Climate change” refers to how this global warming is manifested at the sub-global scale. What are the local effects of increased climate instability? Because of the complexity of the atmosphere, the changes are not always as simple as just an increase in temperature. There are all sorts of geographic variables, including ocean currents, topography, atmospheric circulation, etc. that influence how these higher global temperatures are expressed locally. In fact, some areas may experience more intense colder weather, and in some places snowfall totals may actually increase. However, all of these are local or regional manifestations of an overall warming trend.
TOPIC FOR DISCUSSION: Ask the participants for examples of climate change that they have heard of or encountered.

--One of the important concepts that we are going to be building on throughout this module is thinking about “systems,” or systemically. Many of you probably inherently think in terms of systems; after all, cities are systems, and as planners your job is to think about the functioning of that system. But sometimes we get too focused on the individual parts of the system, like being in a tunnel (aka silo thinking). This can limit our creativity in approaching problems. So in this module series we are going to stay focused on systems, which in the long run will help us achieve our goal of increasing resilience to climate change.

First graph is from US National Oceanic and Atmospheric Administration (NOAA) and shows that 2010 was the hottest year on record. The graph was released in 2011 and was sourced from http://www.huffingtonpost.com/peter-h-gleick/the-graph-that-should-be-_b_808747.html

The impacts of climate change will be manifested in many different ways. One way of understanding different types of impacts is to think in terms of sudden onset and slow onset. Another way of thinking about impacts is to think in terms of direct and indirect impacts. These are sometimes referred to as primary and secondary impacts.

This is an x-ray of a broken leg. This is an example of a sudden onset injury; it is very easy to diagnose and the symptoms are immediate. Some climate change impacts are like a broken bone in that you can easily observe their impacts and what the cause is. In the image here there is an obvious problem: the leg is broken. If any of the participants have been in this situation before you know that this can impact you in a number of different ways, not just in terms of the physical pain, but in terms of your capabilities as well.

Ask the participants in what ways a broken leg might impact your life. There are direct impacts, but are there indirect impacts as well? For example, you might not be able to drive an automobile, which might cause you to alter your patterns of getting around. And it may prevent you from picking your children up from school, or fulfilling other commitments. Those additional “systems” experience indirect effects. So there are “ripple impacts” (also referred to as “cascading impacts”) as well; in this way we can see that a broken leg not only affects you, but also the entire system.
Suggest to the participants that they think about sudden impacts of climate change and the direct effects these impacts have. Then ask them to think about the indirect impacts that follow on after the direct impacts have occurred. The facilitator may choose to illustrate these direct and indirect impacts with a “concept map” using a flipchart, or may ask the participants to do in their groups.

The image of the broken leg is from http://stopcuttingcorners.ca/tag/ski-safety/
Example: Super-typhoon Haiyan is an example of this type of sudden, direct impact. By some accounts, this was the most powerful tropical storm ever recorded. Most of us are probably familiar with the impacts of this typhoon. Scientists say that one of the factors that contributed to the strength of this storm was abnormally high sea-surface temperatures. This is important for typhoons because they are fueled by high sea-surface temperatures: the higher the surface water temperature, the more powerful the storms can become.

This illustrates part of the complexity of climate change impacts. The direct, sudden onset impacts are the easiest to perceive. However, there are also longer time-scale processes of change that interact with shorter-term events such as a tropical storm. In this case, at least three longer term processes need to be taken into consideration when discussing tropical storms.

1. The AR5 predicts that there will be more storms in the future.

2. The AR5 also predicts that storms will be increasingly intense, and that the average size and intensity of storms will increase. One factor contributing to this is the aforementioned gradual increase in sea surface temperatures, which increase evapotranspiration, which is essentially the “engine” that powers a tropical storm.

3. Gradual sea level rise. Sea level rise increases coastal erosion, but it also enhances the height of storm surges and storm tides (the
“storm tide” is the combined effect of storm surge and normal tidal action).

Therefore one of the takeaway points to bear in mind is that, even if we feel like we’ve made adequate preparations for events like tropical storms today based on past occurrences, these preparations may not be adequate into the future due to the shifting baseline effect. In other words, because of climate change the threats we currently face will in many cases in all likelihood be more intense in the future.
ASK: Does anyone know what this is? It is an image of a breast cancer cell. Most of us probably have personal experience with cancer. We know that cancer is deadly, but it can often take years, if not decades, to develop to the stage where it is life-threatening or fatal to its host. We also know that these systemic impacts will increase, and they will spread to other subsystems and compromise their functioning, until the entire system ceases functioning.

An example of this is sea-level rise. Sea level rise is caused by two basic processes associated with global warming. The first is that increasing temperatures are causing glaciers and ice cover to melt, which adds to the overall volume of the oceans. The second process is thermal expansion. As water warms up, it expands a little bit. In a glass of hot water this might be difficult to notice or measure, but the oceans have so much water in them that thermal expansion is a significant factor in sea level rise.

Many ‘disasters’ are actually just a dramatic manifestation of these slow on-set processes or changes (the “new normal” phenomenon). The key is to identify and prevent or reduce risks from whatever source -- natural or man-made, climate-related or not, or others that are exacerbated just by having more people, places, and things in harm's way.

--ASK: What kinds of data do we need to analyze slow on-set climate change risks or impacts? What kinds of expertise or information do we need that are different from sudden on-set disasters?

Image of a breast cancer cell. Source from
Sea level has been rising slowly for decades at a fraction of a centimeter per year. It will continue to rise, but at an increasing rate. In this way it is like the slow onset of cancer. This graph indicates that sea level rise over the past 25 years has been at the higher end of IPCC model projections that were produced in 1990. This is a chance to emphasize the point that climate scientists can make “educated guesses” about the future impacts of climate change, but all of the factors that influence climate are so complex that there is always an element of uncertainty. This uncertainty comes from a number of different sources, including

-- It is hard to predict demographic, economic, and social trends into the future. These have a big bearing on climate change
-- We don’t know how successful our leaders will be in mitigating greenhouse gases in the future
-- The oceanic-atmospheric system is extremely complex, and although our understanding of it has increased tremendously over the past two decades, there are still a lot of processes we don’t fully understand.

-- Point for discussion: Thinking about slow on-set versus sudden shocks, do we need to think about these in different ways? Do they call for different responses on the part of city governments? What sorts of resources and capabilities are needed for each? How is your municipality dealing with these?

-- Point for discussion: What constraints does uncertainty create for adaptation planning? Do these constraints mean that communities, cities, and countries should not adapt?
Sudden shocks may require a great deal of expenditure at one time, as well as real time coordination of efforts. **Slow onset changes require longer term commitment, coordination, and planning.**

Graphic is from http://www.skepticalscience.com/sea-level-rise-predictions.htm
Direct versus indirect impacts. The last principle for us to bear in mind is that some things impact us directly. Let’s think back to our example of Super Typhoon Haiyan. You can easily imagine its direct impacts.

--But there are also indirect impacts, and these can also be sudden or gradual. But these are the types of things that don’t strike our system directly; rather they strike things that influence our system. Particularly relevant to cities is the price of food.

--Point for discussion: How can/does climate change cause food prices to rise? There are easy answers and more complex answers to this question, such as …? For example, one very direct impact would be that if there is an extended drought in the country that caused agricultural production to decline, the price of food would increase because the supply is decreased. A more indirect impact might be if there climate change impacts in another country (possibly even on the other side of the world) that disrupts food production there, demand on the international market for food exports would increase, thus increasing the price. How might this affect food security in your country? Which groups would experience the greatest impacts from this indirect effect?
The graphic on this slide depicts the Food and Agriculture Organization’s (FAO) world food price index. The food price indicator here is relative to 2004 prices. The graph shows a number of events that affect supplies, including the Russian ban on grain exports and the 2010 Pakistani floods that destroyed a large amount of grain reserves, along with the price of food, which rises when there is an event that decreases global food supply. Also shown here are a number of violent political events, including the revolutions of the Arab Spring. The implication is that these events are at least in part related to the rising price of food. Therefore, there is a connection between climate change and political instability, because impacts of climate change can impact food production. There is a growing consensus that climate change contributed to an unprecedented drought in Syria between 2006-2011 that led to civil unrest that eventually became the Syrian Civil War.


This slide describes some potential impacts of rising temperatures.

--China’s food supplies will be insufficient by 2030, and so they will have to buy food on international markets.

**ASK:** what impacts might this have elsewhere?

--Lao, Cambodia, Thailand, Vietnam could potentially see a 4-6 degree temperature rise by 2050. The number of malnourished children in the region may increase by 9-11 million.

**Discuss** the interdependence of natural systems like the climate and socio-economic systems.
Discussion. The facilitator should ask the respondents to provide examples of each of these. Ask the participants what the potential direct and indirect impacts of each of these would be in their cities or regions. Bullets will come up individually. Some examples include:

--Temperature Variations or “Swings”

Direct impacts

- Water quality
- Water availability
- Food storage
- Worker productivity and health
- Transport system reliability
- Energy demands for cooling and production
- Institutional impacts
- Tourism

Indirect impacts

- Ability to pump water if electricity systems fail
- Food availability
- Spread of disease
- Long distance transport
- Regional energy demand
Impacts on productivity
Product availability from other regions.

--Sea Level Rise and Coastal and Riverine Impacts

Direct Impacts

Salinization of coastal aquifer
Water treatment
Waste disposal facilities
Low lying infrastructure and land areas
Change in the dynamics of streams and estuaries
Local agriculture
Ports
Migration of coastal populations

Indirect impacts

Water availability from coastal sources
Global transport systems
Population inflows

--Impacts: More intense rainfalls and Drought

Direct impacts

Water supply reliability
Water supply turbidity
Design standards for water infrastructure
Reliability and safety of existing supply
Sewerage infrastructure
Water rights systems
Supplies for marginalized populations

Indirect impacts

Availability of water rights systems/perceived legitimacy of existing water rights systems. For example, if certain users have an existing legal/traditional entitlement to a certain volume of water from a water source regardless of base flow or reservoir level, and the rainfall/recharge regime changes, the overall distribution of water may become contested.

Major floods and droughts
Allocation of water
Food costs and availability
Transport
Communication network
Availability and costs of inputs for weather-dependent economic sectors

National and global economies
Next let’s look at exactly what we mean when we talk about global warming.

--NOTE: The video is 8m5s. It is embedded in the powerpoint presentation so it will start after you click on the screen. However, if it doesn’t start after a moment, you can view it from the internet by using this youtube link: https://www.youtube.com/watch?v=sJ0eN_93i4k&list=LLdgzvr3CCHhFrixwC7RURpSw&feature=c4-overview.

Topics discuss include

--Defining the greenhouse effect and why it is important
--Explaining changes in greenhouse gases
--Over the past 100 years global temperature has increased about 1 degree Celsius.
--Every decade since the 1970s has been warmer than its predecessor
--Shortwave and longwave radiation

When the video is over you should check for understanding. Ask the participants if they have any questions about the greenhouse effect and how it works. Ask the participants if they would be able to explain the greenhouse
effect to their colleagues or superiors. It is important to be able to competently and succinctly explain the phenomenon in order to develop support for CCAR. If time permits, the facilitator may ask the participants to develop a working explanation for the greenhouse effect as a group. Ask the participants if this definition is useful to them. It may be on some level, but experience has shown that one of the most important factors in building sustained support for CCAR is to be able to related climate change to the local context. In other words, what does the greenhouse effect mean to local decisionmakers, leaders, businesspeople, and other stakeholders?
What Human activities are causing CO2 Emissions? We are currently emitting somewhere between 35 and 50 gigatons of CO2 per year. According to many estimates, in order to stay below a critical threshold of 2 degrees warming, we can only emit 565 more gigatons of carbon dioxide, which is approximately 12-15 years at current rates. In order to reach sustainable levels, we would need to cut emissions by 5% per year for the next 20 years.

Direct emissions are those caused in the production process or in the conversion of energy to products, or in the production of energy. Indirect emissions are caused by associated activities. For example, the true emissions associated with the manufacture of a plastic toy include direct emissions from the manufacturing of the toy and transporting the toy to the shop, but also indirect emissions, such as those caused by the extraction and processing of the oil used to make the plastic in the first place. On this chart indirect emissions refers mainly to the energy costs associated with each of the sectors in the analysis.

This data is from 2010 and is among the most recent data available. The source of the graphic is http://journalistsresource.org/studies/environment/climate-change/united-nations-ipcc-working-group-iii-report-climate-change-mitigation#, but as noted in the graphic the data is from the IPCC AR5.
This table demonstrates the correlation between atmospheric CO2 and temperature over the past several hundred thousand years. The point to be made here is that there is a clear connection between CO2 and other greenhouse gases, and that global temperatures have exhibited a clear upward trajectory since the onset of the industrial age, and that trend is continuing. According to some estimates, the trend will accelerate.

This graphic depicts carbon dioxide measurements alongside temperature measurements. The CO2 and temperature information is derived from ice cores, which provide a record of atmospheric conditions. Notice the right hand side of this graph. In the past 150 years, carbon dioxide emissions have increased at an unprecedented rate to levels not experienced in the previous 500,000 years. This suggests that global average temperatures will continue to increase in the future. This is the very definition of “global warming”.

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<th>CO2 (ppmv)</th>
<th>Temperature (°C)</th>
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<td>280</td>
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USAID Adapt Asia-Pacific
The next slide shows how emissions in Asia have increased dramatically. They are increasing more rapidly than any place else on the planet, whereas emissions in most of the rest of the world are remaining steady or in fact decreasing slightly. For example, over the past decade China’s emissions have grown by approximately 10% per year, whereas India and Japan in 2012 experienced increases of 7% and 6% respectively. At the same time, in the US and the EU, emissions decreased by 4% and 1.6% respectively. The units are million metric tons.

---Point for discussion: Why are Asia’s emissions increasing so rapidly?


This part of the module focuses on regional projections and impacts of climate change in the Asia-Pacific region. The facilitator should include information from the country where the training is taking place. We have included some information for the Philippines and Indonesia; make sure to remove what is not needed and add what is needed.

Please refer to the instructor guidebook for suggestions of what type of information to include in this section.
VIDEO RESOURCE IN ENGLISH ONLY.

If conducting training with a non-English speaking audience, the facilitator may choose to omit the video, or translate it.

Preparing for future climate….This video is 12 minutes long. It describes the different scenarios used by the IPCC. This is important because it demonstrates the uncertainty of the future, and how the future path is really outside the control of the participants, but they have the responsibility of dealing with the problem.

The video discusses the A1B, B1, and A2 scenarios for future greenhouse gas emissions. These are commonly used scenarios which provide the inputs for climate models, and they represent possible development paths at the global scale that were used for the IPCC’s 4th assessment report. The 5th Assessment Report (AR5) uses a different set of scenarios, called “Representative Concentration Pathways” (RCPs). Here we focus on the AR4 scenarios because they are still used in most current national climate change policy documents and guidance. The A1B scenario assumes that there will be rapid economic growth and a rapid introduction of new, efficient technologies, so emissions of greenhouse gases will continue to increase until about 2050, and
then they will decrease. The B1 scenario assumes aggressive mitigation measures and has greenhouse gas emissions dropping to below 1990 levels by the year 2100. The A2 scenario has emissions of greenhouse gases continuing to increase throughout the 21st century, and presumes continued population growth, little international cooperation to decrease emissions, and high economic development.

These scenarios provide information about future GHG emissions that is fed into sophisticated computer models to develop projections of future oceanic-atmospheric conditions.

--Ask if there are any questions about the video resource.

Some key points

--Range of development scenarios. What are they? There are three of them mentioned in the video; these are commonly used scenarios and were developed by the IPCC, but there are other scenarios as well. They represent possible development paths. B1, A1B, and A2

Source: Pacific Institute for Climate Solutions (2012). Available online at http://www.youtube.com/watch?v=dS4ft5QTyxA&list=LLdgzvr3CHxhFriwC7RURpSw&feature=c4-overview

(accessed: 1/30/2014)

VIDEO RESOURCE IN ENGLISH ONLY. If conducting training with a non-English speaking audience, the facilitator may choose to omit the video, or translate it. However, the messages from this video are central to the themes of this course.

Introductory video. Cities and Climate Change Initiative. The introductory video is from UN Habitat and focuses on specific impacts of climate change on Southeast Asian cities. Before the video begins, ask the participants to pay particular attention to the types of issues that their cities are facing. There is a list of questions on the first slide of the section. The participants should record their answers; make it clear that this information is important for later stages of the module.

The video is available at http://vimeo.com/89591162 and is 7m50s in length. It is embedded in the slide, but in case it doesn’t work open a browser and paste the URL. Questions to ask after (or before) the video might include:

--What sorts of impacts are the cities facing?
--Are the impacts direct or indirect?
--Are the impacts chronic or acute?
--Does your city face any of these issues? Which ones?
This slide demonstrates the importance of downscaling projections. The AR4 and AR5 projections for the future are based on Global Climate Models (GCM) that produce projections at approximately 300-kilometer resolution (left side of diagram). This is very coarse scale, and provides only a general idea of what the future might hold for cities and regions. To have a clearer idea, GCMs need to be downscaled, which refers to a complex process of inputting local information into the models at finer resolution. Rigorous downscaling is difficult and is likely beyond the capabilities of most municipal governments. Another problem is that not all GCMs are created equal; some don’t provide reliable outputs for regions that have significant topographical variation or which experience seasonal monsoons.

Fortunately many central governments in the Asia Pacific have ongoing downscaling projects. For example, the Philippines provides downscaled projections for the future at approximately 25km resolution (right side), which is far more useful to local stakeholders and decision makers. In addition, some universities have developed downscaled projections for certain areas. Larger cities may have the resources to commission downscaled projections as well.
As climate change impacts the Asia-Pacific Region, cities will face some critical challenges. This slide presents an overview of some of the most common issues that are expected for Southeast Asia. We will discuss these in greater detail in a few minutes.
What challenges do secondary and smaller cities face? Discuss each of these points with the participants.
Changes in precipitation intensity. One expected effect of climate change will be an increase in precipitation intensity: a larger proportion of rain will fall in a shorter amount of time than it has historically. Blue represents areas where climate models predict an increase in intensity by the end of the 21st century, brown would be a projected decrease. We see projections for 2081-2100 based on two different “representative concentration pathways” (RCPs). The map on the right is a projection based on an “aggressive mitigation” future. This means that it displays projected changes assuming that the countries in the world have succeeded in reducing current C02 reductions dramatically. The map on the right displays a projection based on a “business as usual” future, in which GHG mitigation has not made much progress. In other words, this scenario assumes that GHG emissions will continue to increase. Currently the scenario on the right seems to be more similar to the reality that is currently unfolding. The map is from the AR5.

http://www.hko.gov.hk/climate_change/proj_global_e.htm. The source of these maps is the IPCC’s AR5.
Changes in dry days. New research suggests that by the end of the 21st century some parts of the world can expect as many as 30 more days a year without precipitation. Note that Malaysia and Indonesia are projected to see more dry days.

**Topic for Discussion:** What sorts of direct and indirect impacts might drier days have on your city?

These increases are in degrees Celsius. There are two sets of projections on the right hand side. These are for two different greenhouse gas concentration trajectories (Representative Concentration Pathways). These pathways are possible future GHG concentrations that are used for modelling and research, as we mentioned earlier. There are four in total (2 shown here) and they are named for the possible range of radiative forcing values in the year 2100 relative to pre-industrial values. The 2.6 scenario assumes the most aggressive actions to limit greenhouse gases, peaking between 2010 and 2020 with emissions declining substantially after. The point to be made is that even with the most aggressive action, which is unlikely, there will still be warming.

The second scenario shown here, 8.5, assumes that emissions will continue to rise throughout the 21st century.

Potential topic for discussion: Ask the participants which of these RCPs seems most realistic to them. Should the representative concentration pathways affect how we plan?

the Fifth Assessment Report of the Intergovernmental Panel on Climate Change
Global warming is manifested in changing climatic conditions. Climate change depends on a variety of factors ranging from those at the global scale, like atmospheric circulation patterns, to local scale factors like topography. But there are some general trends, including an increased incidence of extremes in terms of high temperatures as well as rain. Since 1950, extreme hot days and heavy precipitation have become more common. There is evidence that anthropogenic influences, including increasing atmospheric greenhouse gas concentrations, have changed these extremes.

The map depicted on this slide comes from a study conducted at the University of Hawaii in 2013. The study looked at historical temperature data from all over the world and compared the historical average high temperature from observations, to temperature projections in the future. The goal of the study was to identify the date in the future when the future AVERAGE temperature would surpass the historical HIGH temperature. The study labeled this point “climate departure”. As we can see from the map, “climate departure” tends to be expected sooner at areas near the equator than elsewhere in the world. This means that most of Southeast Asia will experience a new climate regime within a generation.


The paper can be accessed at http://www.nature.com/nature/journal/v502/n7470/full/nature12540.html
This slide shows dates for “climate departure” in Indonesia.

Though generally framed as an environmental issue, for Indonesia the specter of human-induced climate change must be thought of as a multidimensional challenge as it has immediate and long term economic, strategic, and social implications. In terms of economic effects, there are two basic scalar clusters at which the effects of climate change will be felt. The first is at the local, household, and individual level. According to World Bank figures, in 2011 43% of Indonesians, more than 100 million people, lived on less than US$2 per day. Empirical and model-based research indicates that climate change has already affected rainfall patterns in Indonesia, decreasing the length of the rainy season in many places and concentrating precipitation over a shorter period of time. This has the double effect of increasing uncertainty in terms of planting and harvesting schedules while inflating the risk of flooding and other weather-related perturbations.

In addition, studies indicate climate change is and will continue to affect fisheries throughout the world, with Indonesia being among the hardest hit. One study in particular conducted in 2010 estimated that catches could decrease by as much as 40% in Indonesia’s exclusive economic zone. Though larger-scale businesses will certainly suffer, these changes will unfortunately fall hardest on those with the lowest capacity to cope, the tens of millions of
Indonesians that derive their livelihoods from the land and sea. Not only is their productive capacity in jeopardy, but decreased purchasing power due to rising prices threatens to undue many of the impressive strides Indonesia has made in combating poverty.

At the national level the economy stands to suffer because of the aggregate effects of the aforementioned dynamics combined with the country's overall reliance on primary sector activities. Recent research conducted by the International Food Policy Research Institute indicates that for every one-degree increase in minimum temperatures, rice yields could decrease by 10%. Hence gross domestic product will experience a slight drop due to the adverse impacts on the agricultural sector. Moreover, the inherent uncertainty associated with how climate change will be manifested should be understood as a wildcard as Indonesia pushes to increase production of primary commodities such as palm oil. It is impossible to say how changing regional climates will affect long-term viability of palm oil and other commodities, but it most certainly will have a disruptive impact, given that agricultural production is subject to complex interactions of biological, physical, and chemical systems. Since these systems react to changing climates in different ways, the ensemble of geographic variables that create suitable conditions will likely change.
The IPCC says the world on the whole has warmed about one degree Celsius (0.9°C) since 1901. While this might not seem like very much, it is important to understand that the impacts of even small changes to the global system can be very significant. As planners and decision-makers, we can sometimes be lured into a false sense of security because the numbers don’t seem very big. Moreover, we might be tempted to conclude that the problem isn’t really that urgent. But again, small changes make a big difference in terms of precipitation events and distribution, both spatially and temporally of rainfall.

According to the IPCC, Southeast Asia, which includes Laos, Vietnam, Thailand, Malaysia, Indonesia, Burma, and the Philippines, PNG, and Brunei, have observed a 0.4-1°C increase in temperature. Temperatures are predicted to increase on average by 1.5-2°C by 2046-2065 with most warming in the northwestern areas of the region (Thailand, Burma, Laos, Cambodia, and Vietnam). The highest daily maximum temperature will increase by 3-4 degrees C.

To help us think about the impacts of small changes in temperature, the facilitator will step through what each degree of change actually means. Current international discussions (which will hopefully culminate in a new global agreement to cut GHG emissions at the 2015 meeting of the Conference of Parties to the UN Framework Convention on Climate Change)
in Paris) revolves around keeping future warming to 2 degrees Celsius. This means that there is a general consensus that, because of GHGs that are already in the atmosphere, the world is on track to experience an unavoidable increase in temperatures of 2 degrees. This is an important point to stress to the participants because it underscores the importance of preparing for inevitable changes. The points below should give the participants an idea of what sorts of changes to expect. As you step through each of these points, encourage the participants to discuss what these impacts would mean locally.

1-2 Degrees

--Major impacts on ecosystems and species
--Increase of heat waves, droughts, flows, and spread of infectious diseases

2-3 Degrees

--Major loss of coral reef ecosystems and other species
--Large impacts on agriculture, water resources and health
--Significant increase in droughts and extreme rainfalls
--Up to 74 cm sea level rise in the next 100 years
--Terrestrial carbon sink becomes a source, accelerating global warming

3-4 Degrees

--Major species extinctions
--1-3 billion people suffer from water scarcity
--Food yields fall everywhere, global production plummets
--Fifth of world population affected by flooding
--Significant increase in human deaths due to malnutrition, disease, heat wave, flood, and drought
Discussing potential impacts. More heat waves.

Changes in extremes based on multi-model simulations from nine global coupled climate models, adapted from Tebaldi et al. (2006).


Discussing potential impacts. Rising sea levels.

Local sea level change (m) due to ocean density and circulation change relative to the global average (i.e., positive values indicate greater local sea level change than global) during the 21st century, calculated as the difference between averages for 2080 to 2099 and 1980 to 1999, as an ensemble mean over 16 AOGCMs (atmospheric-ocean global climate models) forced with the SRES A1B scenario. Stippling denotes regions where the magnitude of the multi-model ensemble mean divided by the multi-model standard deviation exceeds 1.0.

This is Indonesia’s current national Climate Change Adaptation Plan. Some of the information for this presentation was derived from this plan, whereas other information was taken from the Fifth Assessment Report (AR5) of the IPCC. The Indonesia National Action Plan for Climate Change Adaptation is included in the resources pack the participants will receive. English and Bahasa Indonesia versions are included in the resource pack for participants.
Observed changes in Indonesia for seasonal rainfall. The upper map shows the December, January February Period. The lower map shows June, July, and August. Redder means less rainfall on average, whereas blue means more rainfall on average. Analysis by Indonesian government agencies indicates that the increase in DJF rainfall occurred on almost all of Java and the Eastern part of Indonesia. In JJA, a significant decreasing trend has been seen in almost all of Indonesia, with a few exceptions.

Ask the participants if there have been changes in rainfall patterns in their cities/regions.
Projected changes in rainfall for Indonesia for 2010-2020 periods relative to 1980-2000
Estimated rate of increase in sea level on the basis of models with ice melting. Based on AR4 data. Indonesia’s NAPA report suggests that by 2100 you could see as much as 1.75 meters of sea level rise. By 2050 it is expected to reach on average 35-40cm higher relative to 2000.

This is sea level rise for the future in Indonesia. Sea level rise is another important economic and social consideration, as some estimates indicate that as much as 25% of national GDP is derived from activities located on or near the nation's 81,000-km coastline. Salt water intrusion, more intense storm activity, other impacts will displace or disturb many activities located near the coast. As the national government struggles to cope with these problems it will draw financial and other resources away from other problems and initiatives.
This is the trend in sea surface temperatures in 30 years from 1982-2011. This is sea level rise that has already occurred. The trend is expected to increase into the future.

Increased sea surface temperatures can impact fish migration patterns and can lead to coral bleaching. They can also lead to increased storm activity.
This slide describes the national institutional and legal context for climate adaptation planning in the Philippines.

Republic Act 9729 (the Climate Change Act) created the Climate Change Commission, which has the responsibilities listed on this slide.

The National Climate Change Action Plan (NCCAP) prioritizes seven cross-sectoral areas, including those listed on this slide.
According to the IPCC’s AR4 and other sources, the Philippines has already experienced the following:

--increasing hot days and warm nights
--decreasing cold days and cool nights
--increasing maximum and minimum temperatures
--1971-2000 increase in mean annual, maximum, and minimum temperatures by .14 degrees Celsius
--An increase in mean rainfall since the 1980s and an increase in the number of rainy days since the 1990s (Between 1998-2011 rainfall in Tacloban City increased by 257%).
--Increased occurrence of landslides between 1990-2004

The document shown here can be downloaded at http://dilg.gov.ph/PDF_File/reports_resources/DILG-Resources-2012130-2ef223f591.pdf
This slide describes projected changes for the Philippines under the A1B scenario from the AR4.

MAM = March April May, usually the dry season in the Philippines
JJA = June July August, usually the wet season in the Philippines.
Project Noah: Program for weather forecasting. PAGASA. They do the projections. Hydromet. Sea level rise.

PIVS: Information on Liquifaction

National Mapping and Resource Information and Resource Information Authority. Maps. 1:50,000 resolution. Landslide maps

University of the Philippines National Institute for Geological Science: provides technical expertise, training for using Project NOAH tools. Also provides advice to agricultural sector.

Climate Change Commission: Provides policy guidance

National Disaster Risk Reduction Council: Information on existing risks, hazards, they coordinate everyone else, all the outputs of NOAH
Economic disaster losses are higher in developed countries…

...but fatalities are higher in developing countries. From 1970-2008, over 95% of natural-disaster-related deaths occurred in developing countries.

**Ask** the participants why fatalities from disasters are higher in developing countries than developed countries. Use a flip chart or white board to record the answers.

**ACTIVITY: “Explaining the problem”**

Given a 15 minute time period to persuade a policy- or decision-maker about the urgency of climate change:

1. What information would you consider most persuasive?
2. Which climate trends do you consider most important?
3. What impacts would you most emphasize?
4. How would you persuade him/her of the ‘truth’ or validity of your arguments?
5. What words would you use to describe the problem?

**ACTIVITY 2.1: “Explaining the problem” 30 minutes**

This activity will be conducted individually or in groups. This is a role play activity, and each group will have different roles. One participant in each group will play the part of the “convincer”. The other participant will be the “adversary” and will play the role of a superior, subordinate, concerned citizen, businessman, politician, etc., and will raise questions and doubts about climate change. It will be the task of the convincer to construct a succinct and coherent explanation of the importance of the problem. Each group will develop a concise statement that describes the potential impacts of climate change in the local setting, along with the importance for taking action.

After the groups have acted out the scenario, reconvene the larger group. Use the white board or flip chart to develop a list of points that seemed to be most compelling, those that were least compelling or useful, and points that participants are not clear on. Make the point that framing the issue is extremely important for gaining support and buy in for the resilience building process. Moreover, an important part of the CCAR plan will be a section that explains the basics of climate change in the context of the participants’ cities as well as a description as to why climate change is a pressing issue deserving of attention and resources.
This activity should yield a basic outline of the key points of climate change presented in a compelling way and in language that can be easily understood by non-experts. This outline can then be easily incorporated into the CCAR plan.

EXAMPLE FROM MAUMERE & BANDUNG TRAININGS

For this activity the facilitator divided the participants into groups of 4-8. One of the participants was assigned the role of bupati/walikota (mayor/regional chief executive). The other participants were assigned roles of various heads of departments (planning, Water, etc). The heads of departments were asked to describe why the chief executive should consider climate change to be a real and important threat for local communities. The activity was then debriefed in plenary by the facilitator.
This section explains what types of information goes into the first part of a general CCAR policy document, and provides some examples from CCAR planning processes that have been implemented elsewhere.
The purpose of this slide is to get the participants back to thinking about their own CCAR-DRR plan, and the actual contents of it. By this point we are only addressing the first two chapters or sections of the CCAR-DRR plan and what goes in them. These two sections are the

1) Introduction

2) Overview of Climate Change.
This is part of step one, developing the introductory materials.

This is a slightly more sophisticated analysis from the Makassar vulnerability assessment that shows land cover change over a 2-decade period in the watershed of the Jeneberang River. This analysis uses satellite imagery, which is normally available from the city planning department. This type of analysis is useful for understanding ongoing trends, and how they impact the environment.

This map, and all of the excerpts of the Kupang and Makassar City vulnerability assessments, were produced by and provided courtesy of Yayasan Kota Kita, an Indonesian NGO that specializes in urban governance and capacity building. Find out more about YKK at www.kotakita.org.
From Kupang City’s vulnerability Assessment. This map shows areas of the city where urbanization and land conversion is currently taking place. How might this sort of information be used in a climate change adaptation plan?

The point is that it is important to understand current and future trends in urbanization and other processes that will affect the city’s exposure to climate change in the future.

This map, and all of the excerpts of the Kupang and Makassar City vulnerability assessments, were produced by and provided courtesy of Yayasan Kota Kita, an Indonesian NGO that specializes in urban governance and capacity building. Find out more about YKK at www.kotakita.org.
Makassar’s vulnerability assessment also includes ongoing and planned development projects, including a ring road, monorail, water treatment. These types of facilities are necessary, but could potentially be vulnerable to climate-enhanced disasters. In many cases, future development doesn’t take into consideration current disasters, or future impacts of climate change.

This is a major weakness of planning processes in many parts of the world, including the us, however, disaster managers have lots of skills and expertise that are useful in the planning process.

This map, and all of the excerpts of the Kupang and Makassar City vulnerability assessments, were produced by and provided courtesy of Yayasan Kota Kita, an Indonesian NGO that specializes in urban governance and capacity building. Find out more about YKK at www.kotakita.org.
Another early step in CCAR processes is to determine the vulnerable groups in your city for special attention. These images are from Kupang City’s vulnerability assessment. In this case, the steering committee held a public meeting to solicit input for the planning process. They identified these three groups of people as being the most vulnerable to climate change impacts. The idea here is that you want to identify already existing challenges, and well as measures that are being taken to address those challenges. Later on in the vulnerability assessment this will serve a number of purposes including

--help to ensure that current investments in improving development indicators are “climate proof” to as great a degree as possible

--Identify synergies between climate change adaptation, DRR, and other development projects. This will help make CCAR-DRR more efficient, and will also facilitate “mainstreaming”.

This graphic was produced by and provided courtesy of Yayasan Kota Kita, an Indonesian NGO that specializes in urban governance and capacity building. Find out more about YKK at www.kotakita.org.
Activity 2.2: Identify Primary Climate Change Impacts in Your City. REFER TO WORKSHEET 2.2: Identifying Primary Climate Impacts in Your City

The purpose of this activity is to decide which impacts of climate change are of greatest concern / importance, and to lay the groundwork for identifying the priority impacts and vulnerabilities that might result from those impacts. Facilitator should ensure that there are several different threats being analyzed

Examples of threats might include

--Drought
--Changing seasons
--Sea Level Rise (SLR)
--Increased flooding
--More frequent and severe tropical storms

To create the groups for this activity the facilitator will ask the participants to write down on a scratch paper the one impact (e.g. rising sea levels, increased flooding, etc.) they feel to be the most severe and challenging for their
particular city. There should be no consultation; each participant should make an individual choice. The facilitator will then tally the results on the board, dividing the participants into groups of 4 based on the challenges selected, and grouping like with like. After the groups are created the facilitator will distribute the worksheet ("Issue Brief Worksheet") for the activity.

One of the most important aspects of this activity that should be communicated to the participants is that this is the first step in creating a "threat profile" which is an essential part of the end product, which is the Climate Change Adaptation and Resilience (CCAR) Plan. These Threat Profiles would cover each of the climate change related challenges and would be “living documents”, meaning that they would evolve over time through iterative processes of building resilience as more information becomes available at future junctures. The Threat Profile covers, among other things, a specific threat and potential impacts on the participant’s city. Thus in this activity the participants are identifying the specific impact that their Threat Profile will focus on. As the participants progress through today’s module they will add detail on exposure, sensitivity, coping capacity, and vulnerability to their issue brief, which will become part of the CCAR.

**Note for facilitator during debrief:** Emphasize that defining threats is an iterative process, and participants may redefine threats as the course, and also the planning process, proceed. In other words, as new information, understanding, and experience emerges, the threat profile should be revisited.

**Note From Quezon City and Maumere Trainings:** The Quezon City pilot training was attended by city officials and other stakeholders from three different local government units (LGUs), who were divided into participant groups. Each group was equipped with an LCD projector. The groups then worked for approximately 45 minutes to complete as much of the worksheet as possible on a shared computer. The LCD projector allowed all the participants in each group to see what was going into the worksheet.

However, in the Maumere training the participants simply discussed the first few questions on the worksheet. The facilitation team decided to distribute the worksheet as a “reference” that could potentially be completed after the training.

Either of these approaches (or even a different approach) is appropriate in different circumstances. Prior to implementation the facilitation team should review this activity (and all of the activities) to determine what procedure will be used.
### Key Takeaway Points from Module 2

- Different types of threats: slow/sudden onset; direct/indirect impacts
- Projection models give us some indication of future climate and impacts, but cannot tell us exactly what to expect, where to focus, or what systems will be affected
- We will face new weather challenges in the future, and so the past is no longer an adequate guide for future climate
- Urban areas are particularly susceptible to enhanced climate impacts

In this slide the facilitator will briefly go back over the main points of today’s module.
Looking Ahead: How do we plan for and adapt to climate change?

• Climate change impacts are inevitable: We must start becoming more resilient now!

• It takes time, effort, and resources to identify risks, develop policies, and implement adaptive measures

• We need to shift our time horizon from 5 – 10 years to 25 – 100 years

• We need to be flexible in preparing for uncertainties regarding future climate impacts and disasters

• Our cities will need flexible policies & programs to build greater resilience to potential impacts

Ask the question first. After some discussion, present the slides. This slide is to build a bridge to module three and to reiterate the major conceptual points that emerged out of today’s module and put them in the context of planning for climate change.
This slide says “Thank you. Any Questions?” in Indonesian.