

# 2.0.0

## SERIES 2

Understanding  
Vulnerability & Risk



# INTRODUCTION TO VULNERABILITY & RISK ASSESSMENTS

## Contents of Set

- 2.0.0: Guide
- 2.0.1: Activity
- 2.0.2: Case Study

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Series 2 of the Training Materials systematically walks you through some of the steps involved in conceptualizing, compiling, analyzing and utilizing an initial citywide vulnerability and climate risk study. This series is designed for a city and/or working group with little previous experience conducting climate vulnerability and risk assessments. Even if your city has conducted vulnerability and risk assessments previously, this series contains tips that might help you re-evaluate the data you've collected in a more systematic manner and identify remaining gaps.

Series 2 assumes that your city has either completed Series 1: Getting Started, or has completed some of the exercises covered in Series 1 under previous programs and that you therefore have certain types of information readily available, including: a Policy Review; Agent Mapping; and consensus on your city's guiding climate resilience principles. If your city has never done any of these exercises, we highly recommend that you complete the exercises in Series 1. Information

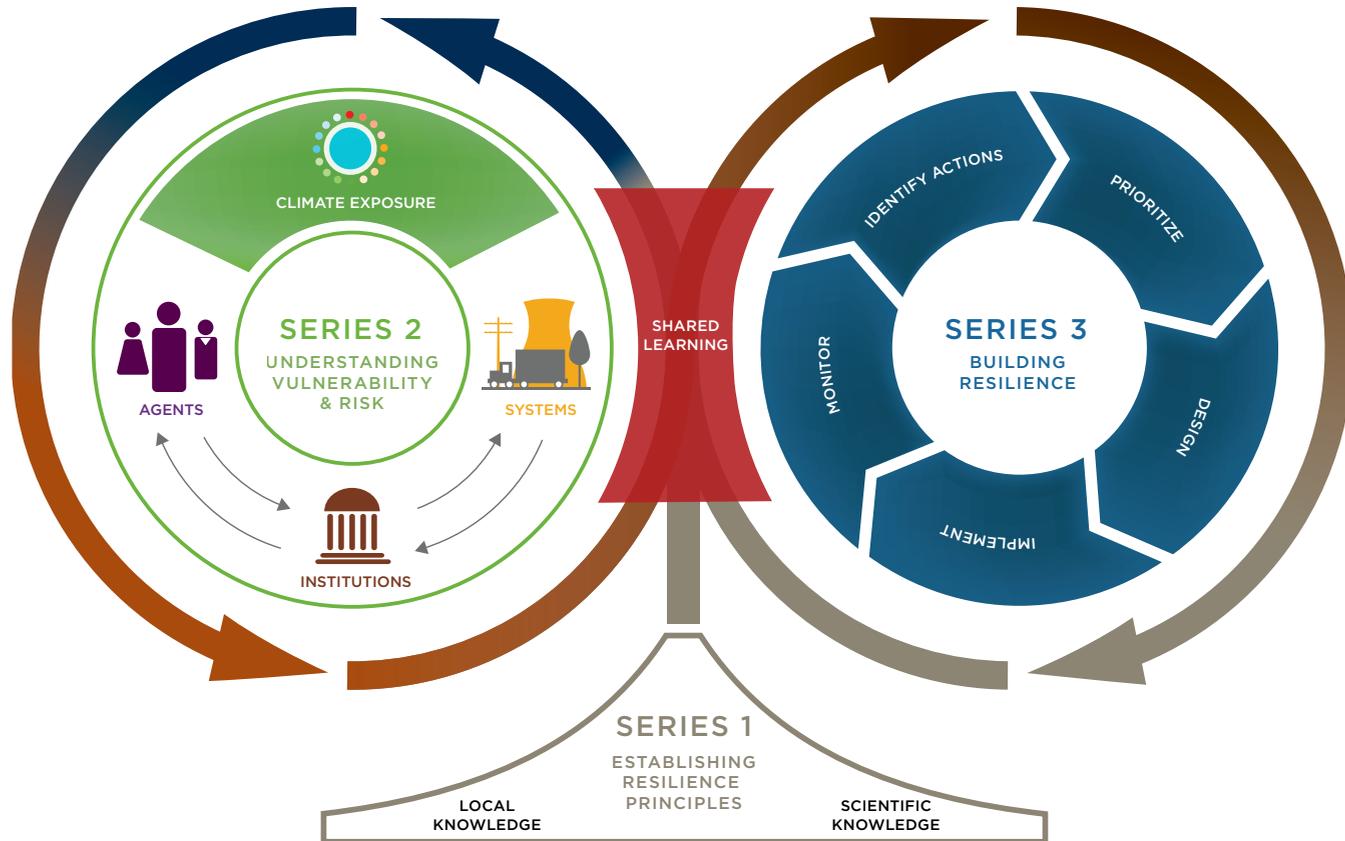
collected during Series 1 will help you through all stages of your resilience planning process and help you identify who (particularly government departments, universities, community-based groups, NGOs, etc.) should be involved.

## IN THIS SET YOU WILL:

- ✓ Review the steps covered in Series 1. If some or all of these steps have already been completed, you will be particularly well prepared for the Series 2 training, but the training can be undertaken prior to completing all of these steps if needed.

**FIGURE 2.0.1**  
**The Climate Resilience Framework**

Urban Climate Resilience Planning graphic. Series 2 of the Training Materials walks you through the left-hand loop of the diagram, the Vulnerability and Risk Assessments.



## WHY UNDERTAKE A VULNERABILITY ASSESSMENT

Climate change vulnerability assessments are key inputs to climate change resilience planning. They help you:

- Assess the vulnerability of your city's human, natural, and physical infrastructure to existing climatic hazards, to climate variability, and to future climatic changes;
- Help you identify why those people, natural systems, or physical infrastructure are vulnerable;
- Identify existing capacity to adapt to current and future climate stresses; and,
- Identify the actions or entry points for reducing those vulnerabilities.

This engagement is represented by the left-hand loop of the resilience planning diagram, shown in Figure 2.0.1.

### AS PART OF YOUR VULNERABILITY ASSESSMENT, YOU WILL:

- Document and describe your city's current climate hazards and what impact those hazards have on your city;
- Use your understanding of current climate hazards and impacts to identify potential impacts of future climate change;

- Identify the groups, areas of your city, and city services and functions that are most vulnerable to current climate hazards;
- Explore why these groups, areas and services are vulnerable;
- Explore how this vulnerability may change in the future because of climate change;
- Assess both the need and the capacity to adapt; and
- Broadly identify appropriate strategies and interventions to enhance the resilience of these vulnerable groups, areas and services, in ways that will also enhance city-wide resilience.

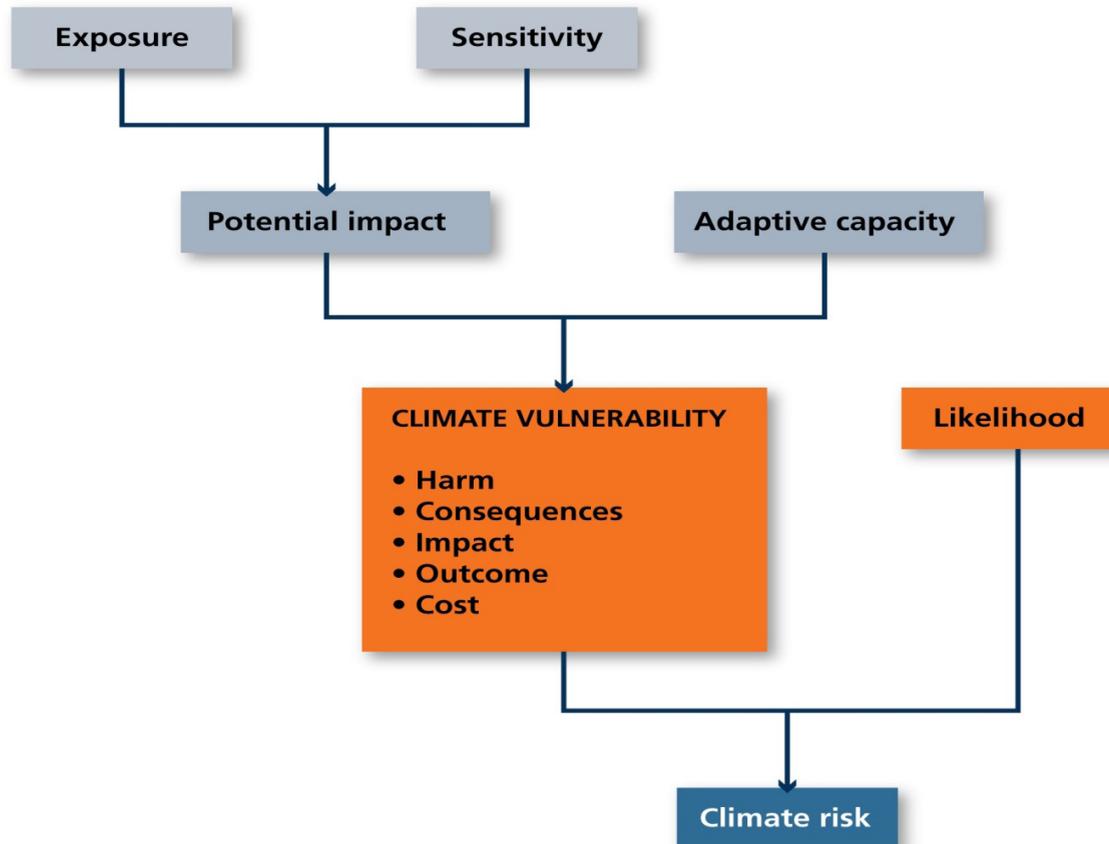
## Why Undertake a Risk Assessment

Risk is the likelihood that particular consequences might happen based on the vulnerability of a system and as a result of the likelihood of particular hazards. For example, a community may be vulnerable to flooding, but if improvements in drainage make it highly unlikely that a flood will occur, then the community's flood risk is very low.

Risk assessments include a review of the direct impacts of climate change on the most vulnerable groups, areas, and city services and functions, an exploration of how direct

**FIGURE 2.0.2**  
**Climate Risk Assessment**

A climate risk assessment can be the next step after a vulnerability assessment in which you try to describe, to the best of your existing knowledge, how likely it is that climate change will cause certain outcomes or impacts for your city. Source (UKCIP 2007).



impact to one element might cause indirect impacts for other elements, and an exploration of how direct impacts of climate change somewhere else in the world can indirectly affect your city (for example, through food security, raw materials availability, markets, etc.). Assessments of current risk are based on current vulnerability to particular hazard events combined with the historical likelihood of those particular hazard events and an examination of the resulting impacts. Forward-looking climate risk assessments take the range of potential changes in rainfall, temperature, or storms to develop future hazard likelihoods. These future hazard likelihoods are combined either with current vulnerability levels (most simple analysis) or with the scenarios of future vulnerability (more complex analysis) to develop scenarios of future risk.

Both vulnerability and climate risk can and will change.

Climate risk can change as a result of changes in likelihood of a climate hazard and/or changes in vulnerability.

Vulnerability can be reduced if proactive measures to reduce sensitivity and exposure or increase adaptive capacity are taken because risk is recognized. Vulnerability can increase if system fragility increases, if constraining rules, policies or laws are enacted that limit people's access to support or resources, or if people lose previous adaptive capacities. Vulnerability can also change after a disaster or similar high impact event occurs and your city and citizens respond, or fail to respond, to the consequences.

Vulnerability and risk assessments are crucial elements of the resilience planning process and are closely tied to shared learning dialogues (SLDs). As discussed in Set 1.3, SLDs are the iterative platforms that enable joint dialogue, reflection, and understanding of climate challenges, vulnerabilities, risks and potential resilience strategies within the cities. The process and outputs of these activities enable discussion, reflection, and collaborative planning on approaches and activities that can enhance a city's resilience to climate change impacts. Vulnerability and risk assessments are a key part of this process, providing critical bottom-up community information, top-down expert analysis of local climate hazards and climate change projections, and synthesis of the two. This information is then fed back to the SLDs for discussion and decision regarding further action.

## Training Materials: Series 2 Contents

There are many ways to conduct vulnerability and risk assessments, depending on information available, timelines, and the goals of the resilience process. The steps and methods introduced in this series are designed to help you select a methodology that works for your city—a methodology that you are comfortable with, you have the data to complete, and that will provide the information you want from the assessment. This series will also begin guiding you toward

thinking about how information from your vulnerability and risk assessments will help you identify and prioritize your resilience options, as well as adhere to your guiding resilience principles that you developed in Series 1. Series 2 is composed of 8 sets, which are listed and briefly described below. These represent the left-hand loop in the resilience planning diagram (Figure 2.0.1).

### **SET 2.1: DEFINING VULNERABILITY & RISK**

There are many definitions of vulnerability and risk in use in both the climate adaptation literature and in practice. There is no one single definition that is more ‘correct’ than the others. However, it’s important to make sure that everyone involved in the resilience planning process is using the same definition. Doing so will result in less confusion among participants and stakeholders, help guide your vulnerability assessment approach, methodology, and framework, and simplify communicating results when you’re done.

### **SET 2.2: CLARIFYING YOUR VULNERABILITY FRAMEWORK**

The vulnerability framework provides a starting point for determining the units of analysis—specific populations, sectors/systems or geographic areas, and timescales for historic and future analysis—that should initially be studied. At the same time, it can help identify important links between the initial units of analysis and other units of analysis that will

need to be investigated. Once a vulnerability framework has been selected, it will become easier to decide which methods for conducting a vulnerability assessment for your city are appropriate at each step.

### **SET 2.3: TREND ANALYSIS: PAST, PRESENT AND FUTURE**

Cities are constantly evolving, and as those changes take place the nature of vulnerability shifts over time. In this set, you will examine historic development trends from the last 20 to 50 years to understand how certain forces—such as economic development, urban planning, and rural-to-urban migration—have affected the way your city is structured, operates, and is vulnerable today. In addition to a changing climate, those social and economic forces of change will continue to impact your city and help shape its future vulnerability.

### **SET 2.4: CLIMATE CHANGE, EXPOSURE & RISK**

One component of vulnerability to climate hazards is exposure, literally putting people, infrastructure and assets in areas where hazards occur. Climate change is affecting the intensity, frequency, and in some cases location or nature of climate hazards. This set introduces climate change and its potential future impacts, examines current climate exposure, and explores potential future climate exposure and hazards.

### **SET 2.5: POVERTY & VULNERABILITY**

Vulnerability is often equated with poverty—“vulnerable” populations are identified by per capita or household income. Yet, this is often an oversimplification and may overlook many highly vulnerable groups and households because they have slightly more, or even significantly more, income than the poverty cutoff. In this set, you will explore the concept of vulnerability and the factors that contribute to creating and maintaining vulnerability.

### **SET 2.6: SYSTEM FRAGILITY**

In Set 2.3 you explored your city’s development trends, the types of historical climate hazards that have occurred in your city, and you mapped current hazard exposure for one hazard. In this set, you will build on this by completing a simple, qualitative baseline vulnerability assessment for one city system. You will examine that system’s strengths and fragilities, will consider how it has functioned in past disasters or crises, and will propose ways that system resilience could be improved, taking into account the characteristics of resilient systems presented in Set 1.1.

### **SET 2.7: VULNERABILITY AND GOVERNANCE**

Vulnerability is often perpetuated through institutional constraints, either cultural norms and expectations, or governance. Yet, efforts to build climate resilience must be mainstreamed into everyday governance if they are to lead to effective and sustainable interventions in the form of policy, budgeting, programs and projects. In this set, you will explore how to steer your resilience effort such that it can maximally leverage areas that align with positive governance, while brainstorming ways that you can use your process to begin influencing areas of negative governance.

### **SET 2.8: PUTTING IT ALL TOGETHER**

Over the course of this series we have presented a number of ideas, some of which may be new, and had you complete a variety of activities. All of the information and activities were designed to introduce techniques and ways of thinking that, with the addition of quantitative data regarding population, socio-economic factors, and climate, can be used directly to frame and populate your vulnerability assessment. In this final set of Series 2 we explore “top-down” and “bottom-up” information generation, and describe how you can combine this type of information generation with the approaches used in the other activities to produce a vulnerability assessment.

## 2.0.1

### SERIES 2

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# Checklist of Required Foundation Material for Series 2

### Activity 2.0.1

As you work through Series 2: Understanding Vulnerability & Risk, it will become increasingly clear why these steps are necessary before proceeding further. If some or all of these steps have already been completed, you will be particularly well prepared for the Series 2 training, but the training can be undertaken prior to completing all of these steps if needed.

### IN THIS ACTIVITY YOU WILL:

- ✓ Complete a checklist of information and actions that it is best to complete prior to undertaking your Vulnerability Assessment.

## ACTIVITY 2.0.1 : CHECKLIST OF REQUIRED FOUNDATION MATERIAL

### INSTRUCTIONS

In the questionnaire below, though most of the questions could be answered as yes/no questions, please take the time to note down additional details if they are available. For example, “several calls have been made to the national climatology office, but so far we have been unable to locate anyone to discuss available climate projections for our region.” Though simple, the act of combining information from all members of the group and noting it down may provide significant clarity about gaps and next steps.

### RESILIENCE STAKEHOLDERS

Have you identified and engaged a range of stakeholders—from government departments, community groups, NGOs, etc.—that are key to the resilience process (Set 1.2)?

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Have you formed a city working group and/or steering committee that will oversee and direct the city vulnerability and risk assessments, and be able to later identify and implement resilience activities and strategies (Sets 1.2 and 1.6)?

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## RESILIENCE PRINCIPLES AND PROCESS

Have you reviewed the urban climate resilience framework and decided how it will guide your city's resilience process (Set 1.1)?

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Have key stakeholders and the city working group developed and agreed upon a set of resilience principles and goals (Set 1.4)?

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Have the key stakeholders and city working group begun developing a common set of terminology (Set 1.6 and Lexicons)?

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Have the key stakeholders and city working group decided upon an initial and flexible timeline for various stages of the resilience process (Set 1.6)?

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Have you reviewed policies, laws, and plans at various government administrative levels that might impact your city's resilience process (Set 1.5)?

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## 2.0.2

### SERIES 2

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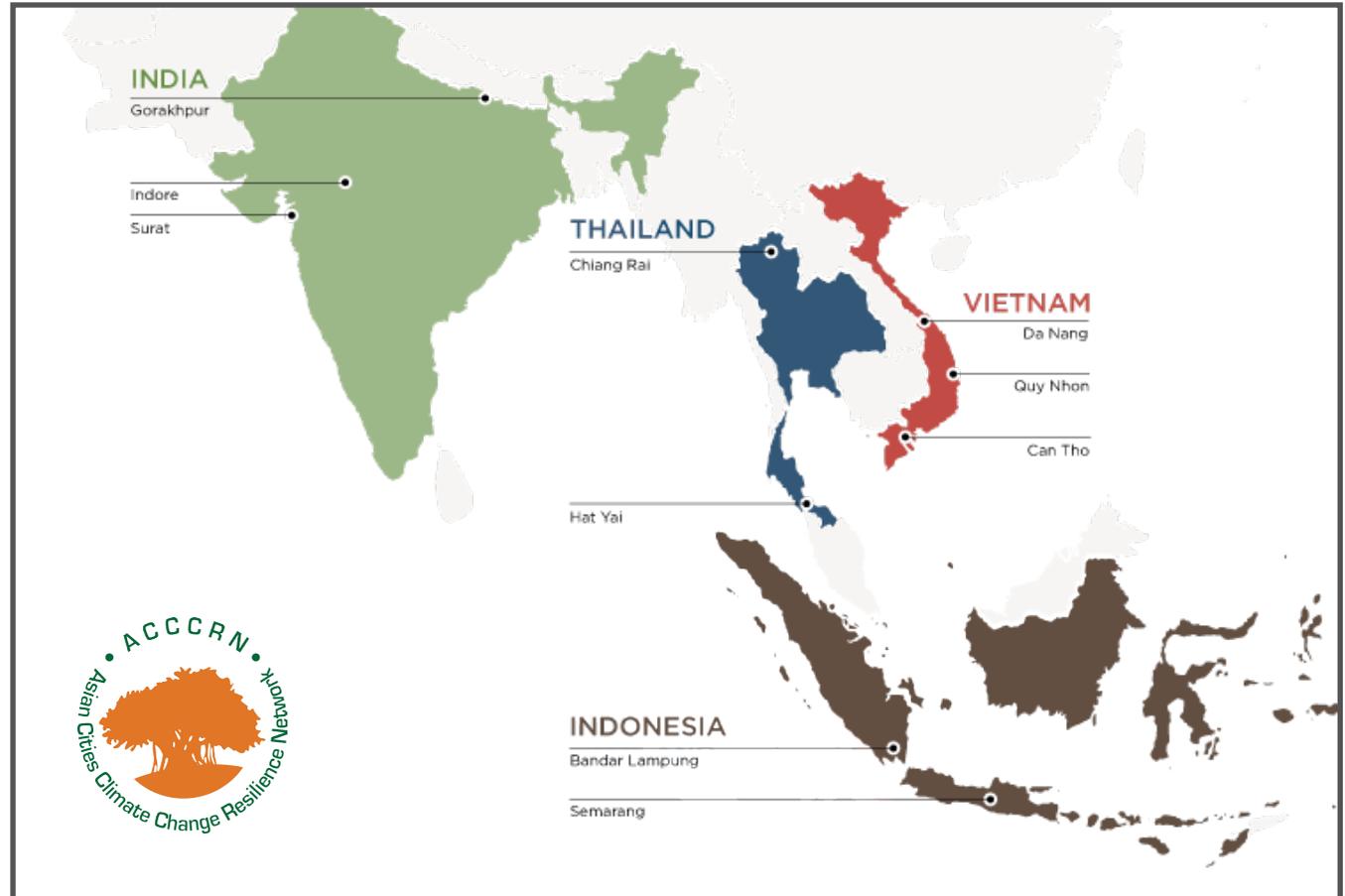


### Case Study 2.0.2

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## Vulnerability and Risk Assessments in the ACCCRN Cities



In the Asian Cities Climate Change Resilience Network (ACCCRN) project, though there were common elements in all ten ACCCRN cities, each city implemented vulnerability assessments in a slightly different way. Nonetheless, there were enough similarities to identify key factors that contributed to successful completion of the vulnerability assessments and application of the assessment findings to ongoing resilience planning.

The most critical element of the ACCCRN vulnerability assessments were that the findings, and the process of undertaking the assessment itself, were linked to adaptation planning aimed at reducing vulnerability and enhancing resilience. In the ACCCRN cities, the vulnerability assessments were reviewed as soon as they were completed with the goal of identifying next steps, gaps, and policy and planning implications. Without this translation into action, a vulnerability assessment alone will do nothing to reduce city vulnerability.

Beyond that, the primary goals in vulnerability assessment implementation in all of the ACCCRN cities were:

- To select methods for the vulnerability assessment with which the team was comfortable and that were feasible given the human, financial, and time resources available;

- To create a process that was flexible and iterative in order to enable the cities to pursue priority issues that emerged; and
- To help city officials, stakeholders, and residents get a preliminary understanding of climate change implications in their cities, identify additional areas for more intensive analysis, and provide some basis for considering how interventions could target vulnerable groups and areas in order to enhance resilience both of vulnerable groups and the overall city.

All ten cities completed vulnerability assessments and all but one city, where the assessment was poorly structured and consequently generated no new knowledge, generated new information that was subsequently used in developing their city resilience strategies.

Shared learning dialogues, described in Set 1.3 were central to building urban climate resilience in the ACCCRN cities. On one hand, designing and undertaking the vulnerability assessment required interaction between climate scientists, local experts knowledgeable in the function of urban systems, decision-making actors, and marginalized agents whose vulnerability might not be recognized by others. The iterative interaction among these groups and their different knowledge sets was crucial to building a common

understanding of potential urban vulnerabilities to climate change. On the other hand, design of resilience-building actions also required iterative engagement between technical experts, system users, and marginalized groups who need access to those systems to build their capacities. The SLDs allowed stakeholders to expand on issues that arose in both the design phase and assessment process, facilitating the iterative process of planning for resilience.

None of the ACCCRN cities other than Bandar Lampung and Semarang, in Indonesia, attempted to conduct risk assessments, and in Indonesia the risk assessments ultimately were only partially used in developing the city resilience strategies. The story behind why the risk assessments were only partially used is quite useful in thinking about how to set up the process in other cities.

In Indonesia, the risk assessments were conducted by CCROM, a research center at the Bogor Agriculture University. CCROM developed a series of indices, applied at the district level, to assess vulnerability, adaptive capacity, and climate exposure. These indices were assessed both for current and projected future vulnerability and climate risk. Though this analysis was very quantitative and well thought out, in application its value to the Indonesian cities was mixed. Some of the issues the city partners flagged were:

- The cities didn't like the indicators that were selected for analysis. In part, this was because they felt some of the indicators were misleading, such as the number of educational facilities in an area, rather than the average level of education. Because the indicators were not made transparent in the document, the city team spent considerable effort to discover what was actually being measured, leading them to further lose confidence in the analysis;
- Analyses were based on national datasets, some of which the cities did not consider reliable;
- Areas currently unexposed to flooding were identified as vulnerable to future flooding, but the city team was not convinced this was realistic;
- CCCROM only minimally consulted with partners, which exacerbated confusion;
- The report writing style was academic which made it difficult for many of the city partners to understand and increased the challenges in giving feedback to CCROM; and
- Overall the results were not practical because they aggregated hazards and referred to a hazard index rather than specific hazards.

These concerns about the analysis spurred the working group to review and discuss the CCROM assessment in great detail, and as a result working group members learned a lot about what should not be done in future vulnerability assessments. Semarang and Bandar Lampung ultimately supplemented the CCROM report with other secondary sources with which they felt more comfortable, and explored development trajectories under different climate scenarios via scenario development.

This experience is described here to illustrate that thoughtful selection of working partners (in particular partners who are willing and able to work closely with city stakeholders to understand their concerns and interests), careful attention to communication, and clearly laying out expectations and definitions is necessary to assure successful results. Climate change can feel daunting to those for whom it is new, particularly when faced with technical experts who seem to fully understand all the issues. However, those technical experts are unlikely to fully understand issues of importance to individual communities, city departments, and city leaders. **It is critical that city stakeholders stay engaged and actively working with technical experts if study results are to be useful to your city.**