

3.2.0

SERIES 3

Building Resilience



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SCENARIO DEVELOPMENT

Planning for an uncertain future is complex. It requires resilience planners to make assumptions about what is driving urban change, what changes will occur, and then, ultimately, what activities can be undertaken to control that change in beneficial, resilient ways. Powerful forces are rapidly altering the form and function of cities around the world. Three of the most important drivers of urban change are climate change, demographic shifts (both in terms of birthrates and rural to urban migration), and economic transformations. Understanding how these forces might interact in the future will help you identify possible points of intervention to reduce vulnerabilities and increase resilience.

Traditional long-range economic and urban planning efforts create future scenarios based on historical trend analysis. The uncertainty associated with the local scale, timing, and magnitude of climate change can require a different approach. Focusing on possible future outcomes, rather than the specific trends, can lead to more climate adaptive responses.

IN THIS SET YOU WILL:

- ✓ Learn how to use scenario planning as a tool for exploring future conditions and developing, evaluating and ranking resilience interventions.
- ✓ Understand why scenario planning is a more effective means of future planning than trend analysis.

OVERVIEW

To build resilience you must first explore what you need to be resilient to. This requires a vision of what your city or community might look like in the future. Scenario development allows you to explore a range of possible future conditions, to examine how vulnerability might change in each future, and to evaluate what actions would build resilience under most or all of those possible futures. There are a number of different ways to develop future scenarios. One of the simplest is projecting past historical trends into the future. This is often how future population and population growth is determined.

Cities are highly dynamic; the form and function of the urban environment is constantly shifting. Two of the most important forces at work in cities are economic development and demographic change. In many developing countries, urbanization has dramatically increased over the last 3 or 4 decades. One of the primary drivers of this change has been rural to urban migration. Migration can occur for a number of reasons, but is often closely associated with the growing economic opportunities in urban areas relative to traditional rural livelihoods. Migration is not a new phenomenon and has played an important role in growing and transforming cities throughout history. However, rapid migration can strain resources and infrastructure and pose challenges to urban planners.

Migration becomes a “problem” when a city is unable to accommodate new residents; for example when adequate housing and economic opportunities are lacking. As a result, the rate and scale of migration are often used as indicators of social and infrastructural weakness and vulnerability. Although similar, rate and scale can mean two different things for future planning. The rate of migration is the speed by which new residents are moving to the city, which may accelerate or fluctuate over a given time. The scale of migration is the overall volume of new residents, particularly relative to existing urban population. Both can strain city resources.

Not all urban change is driven by migration. Cities are the center of concentrated economic activity and prosperity. This makes them attractive for migration. It also means there will be ongoing investment in public sector improvements and private development. Some urban areas, such as the Central Business District, may see rapid turnover in buildings as older, outdated structures are replaced by modern high-rises and transportation networks. Outlying areas may be converted from farm or pasture to factories and business parks. These trends have implications for the exposure of infrastructure and for the flexibility and redundancy of critical systems. For example, a high concentration of business development and activity in the urban center may result in the development of stronger systems of transportation,

energy, and water distribution. However, it may simultaneously expose the entire city to a catastrophic failure if an extreme event overwhelms this one area. However the alternative, such as factories and business parks that are dispersed around the city, can require lengthy “single line” extension of services that are vulnerable to failure at lower levels of exposure.

When envisioning possible futures for your city or community you will want to develop high, medium, and low anticipated growth trends scenarios based on historical trends of economic growth and migration for the future. Ideally, you will understand what has driven these trends in the past (e.g. recovery from war, change in political structure, recurring severe drought and crop failure, etc.) and weigh how events in the next several decades might maintain or change these trends.

With climate change, climate becomes a third important driver for urban development and change. However, trend analysis is not the best way to construct future scenarios related to climate. This is the essence of the challenge that climate change presents—future climate is likely to look quite different from past climate. Certain broad level changes will occur. Global average temperature will increase, and this warming will be felt as specific impacts such as increased frequency and severity of tropical cyclones, rising sea

levels, changes in the timing and intensity of rainfall events, alterations of monsoonal cycles, and the reduced productivity of many agricultural crops, among many others. However, climate scientists can’t say exactly what the temperature changes and associated impacts will be in any given location or year. Consequently, resilience planners need to explore how possible climate changes in the future may disrupt urban systems, agents, and institutions under different development scenarios. It is useful for planning purposes to choose a time horizon, such as 2025 or even 2050 which is within the reasonable lifespan of most urban infrastructure and where the effects of climate change will be more fully evident so that interventions are adaptive to the full extent of the threat¹.

¹ Many climate change reports include potential changes as far out as 2100. However, this is not a time horizon that is practical for local resilience planning.

How to Construct Scenarios

In Activity 3.2.1 we suggest a two-step process for developing and using scenarios. First, imagine a series of possible futures for your city. Then second, use these possible futures to build a best-case/worst-case analysis of specific issues facing your community or city. You will work through the details of this in the activity.

This type of scenario analysis can be conducted very qualitatively or very quantitatively, depending on needs and desires of the planning team.

- When used to generate initial resilience options, you may want to conduct a series of qualitative scenario building exercises that look at a broad range of physical and social conditions. By fairly quickly exploring a broad range of futures, you may quickly come to find that the range of future challenges are captured in two or three scenarios. You can then focus in on those.
- As you develop resilience options, you will want to evaluate them against your selected future scenarios to make sure they will work in all futures, or at least do no harm in all futures.
- As you prioritize resilience interventions, you may want to do more detailed scenario analysis that addresses the relative effectiveness of one intervention over another across your full range of scenarios.
- Finally, as you begin to implement resilience interventions, you may want to conduct quantitative scenario analyses to inform intervention design, scale, environmental, social or technical considerations, etc.

3.2.1

SERIES 3

Building Resilience



CONSTRUCTING SCENARIOS

Activity 3.2.1

One of the biggest challenges in planning for climate change is uncertainty—past trends are no longer useful indicators of future conditions. In this activity, you will explore how to develop future scenarios that focus on future outcomes, rather than past trends. You can use these scenarios to guide the development, evaluation and ranking of resilience interventions. Systematic use of scenarios in evaluating potential future conditions and needs can help you achieve a more resilient future.

IN THIS ACTIVITY YOU WILL:

- ✓ Select a future planning question to focus on.
- ✓ Identify the two most important factors for that future planning question.
- ✓ Identify the best- and worst-case scenarios for each of those factors.
- ✓ Set up a matrix analysis to explore the four possible futures that would result from combining the best and worst cases for both factors.

ACTIVITY 3.2.1: CONSTRUCTING SCENARIOS

INSTRUCTIONS

We suggest a two-step process for developing and using scenarios. First, imagine a series of possible futures for your city. Then second, use these possible futures to build a best-case/worst-case analysis of specific issues facing your community or city.

In the first step, imagining different futures for your city, you can use demographic and economic trends to create several storylines for a period in the future (such as 2030 or 2050):

- high rates of migration with low economic growth
- low rates of migration and low economic growth
- rapid migration and fast growth
- slow migration and rapid growth.

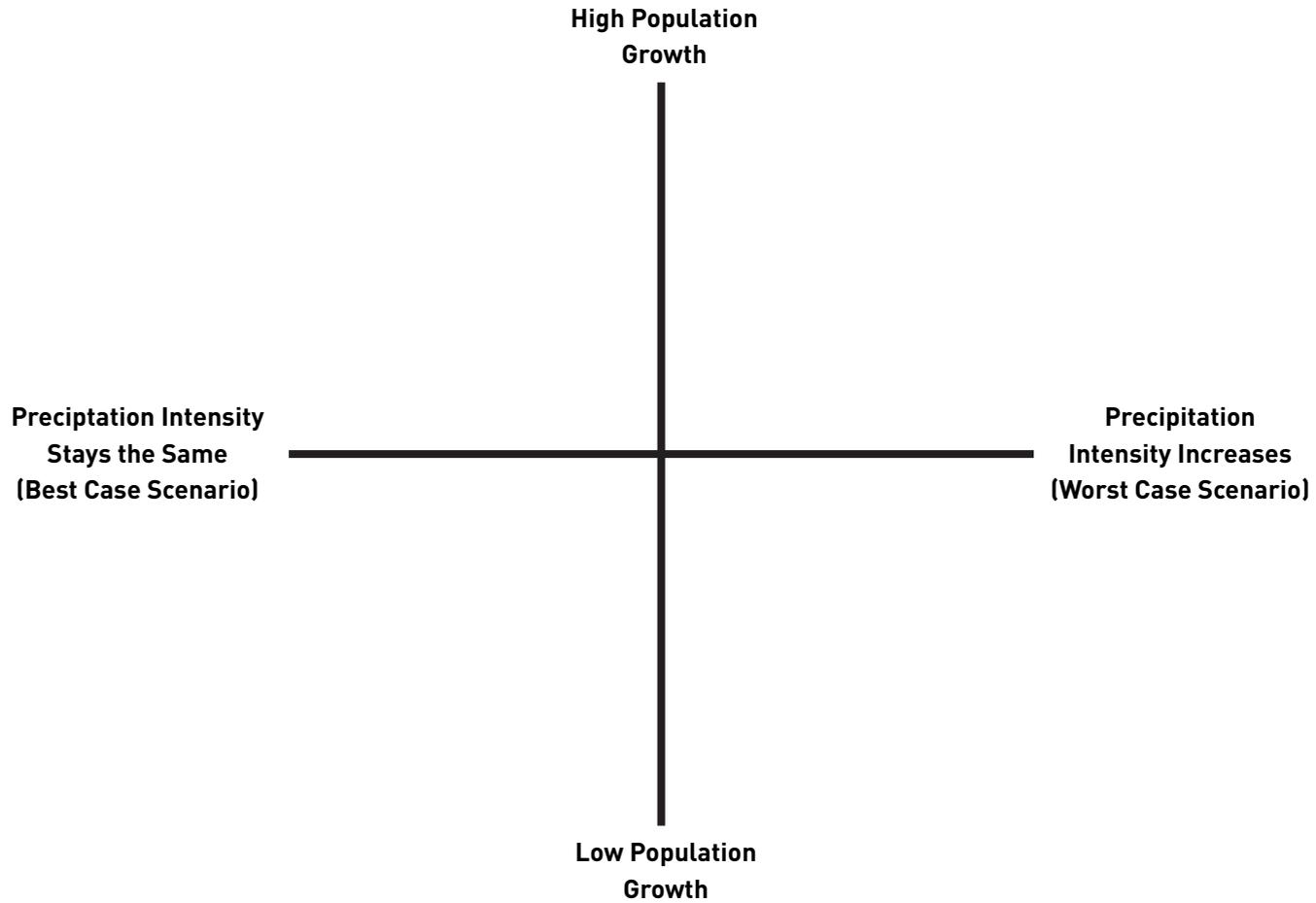
If you find it helpful, these can be tied to specific events that are being discussed for the future, such as development of a bridge, road or airport connecting your city to new markets, changes in national agricultural policy which might impact migration rates, etc.

These storylines will help you define high and low rates of growth and characterize what your city might look like

under each of those conditions. At a very basic level, you are just telling a story about what the city looks like and how it functions. Some cities in your region may have attributes that you hope your city will achieve in the future—an active business district with clean, safe public transit or abundant, high quality, affordable housing for the poor, for example. This can provide a starting point for exploring the conditions needed to achieve those goals. The goal of creating these broad story lines is to think about how changes in economic conditions or populations may promote or inhibit resilience aside from the role that climate change might play. A rapid rate of urban population growth, for example, that exceeds the city's ability to provide sufficient support for new residents will increase vulnerability to climate impacts.

The second step in Scenario Development is to identify two factors that are most important for your future planning. If you are concerned about city vulnerability to flooding caused by rainstorms, the two most important factors might be population growth rate and precipitation intensity. If you are concerned about how climate change will affect food security, your two factors might be temperature and drought. There also may be more than two factors that are important,

FIGURE 3.2.1
Setting up your future scenarios.



in which case you will want to pick two to start. Once you have completed your analysis of the first two factors, you can then build additional scenarios to address additional factors. Dealing with two factors at a time, even if there are many others, allows for an easier, more structured analysis. Because scenario planning is less about predicting a specific future and more about thinking about the range of potential futures and the main characteristics of each future, it is not necessary to attempt to construct a more complex set of scenarios at this point.

For each of the two factors you identified, you will create a best-case scenario and a worst-case scenario. In selecting your two most important factors, avoid factors that are highly predictable or highly unpredictable. If your factor is highly predictable, then there will be no difference between the best-case and worst-case scenarios. If it is highly unpredictable, it may be impossible to guess what the best-case and worst-case scenarios are. Work with factors that you can come up with reasonable bounds for. One way you might want to select factors is to choose one physical factor, and one social factor, e.g. drinking water vs. education/awareness around drinking water.

On a blank sheet of paper draw vertical and horizontal axes as shown in Figure 3.2.1.

Use the best-case and worst-case scenarios to label the ends of horizontal and vertical lines. It does not matter which factor goes on which line, nor does it matter on which end of the line the best-case and worse-case conditions are put. Once you have set up your axes, look at each quadrant. What are the positive and negative aspects of each quadrant for your future planning? List these in that quadrant. We show a very simple example on the following page in Figure 3.2.2.

Once you have listed positives and negatives for each scenario, think about current systems and whether they are set up to either address the negatives or take advantage of the positives.

- What challenges are posed in each scenario? Which can your city handle? Which can't you handle and why? What would happen? For example, high heat might not affect a particular sector until energy production or distribution is affected. Then energy constraints, coupled with high heat, might result in high vulnerabilities.

- Are the current systems redundant or modular? Are there backups in place in case of failure? If not, how could backups or safe failure points be included?
- Is there a scenario in which current systems will completely fail? What could you do if those conditions occurred?

Write down the information you generate about each of your future scenarios either next to the grid or on another sheet of paper.

Finally, explore whether, if you had to plan for just one of these scenarios, which you would choose, why you would choose that scenario, and what the risks of selecting that scenario over the other could be.

FIGURE 3.2.2
Populated Scenario Chart

