Community-Based Disaster Risk Reduction and Adaptation Planning: Tools for Prioritizing Potential Solutions

Fawad Khan, ISET-Pakistan; Maria Fernanda Enriquez and Karen MacClune, ISET-International

December 2015

International Federation of Red Cross and Red Crescent Societies

Global Disaster Preparedness Center

ISET

ISET-Pakistan

December 2015

Published by: Institute for Social and Environmental Transition-International, Boulder, CO USA

For a downloadable PDF of this report, please visit: www.i-s-e-t.org/resources/training/Community-based-disaster-risk-reduction-and-adaptation-planning.html

Design by: Michelle F. Fox

Cover Image: Fawad Khan

Citation: Khan, F., Enriquez, M. F., MacClune, K. (2015). Community-Based Disaster Risk Reduction and Adaptation Planning: Tools for Prioritizing Potential Solutions. Boulder, CO: ISET-International.

TABLE OF CONTENTS

INTRODUCTION

The International Federation of Red Cross and Red Crescent Societies (IFRC) and a variety of other organizations make extensive use of participatory tools to identify vulnerabilities and capacities and to identify gaps where action could reduce vulnerability. For the IFRC, this tool is called Vulnerability Capacity Assessment (VCA). However, once solutions have been identified, there are no standardized approaches to guide their review and prioritization.

In particular, there are few prioritization tools that take economic efficiency into consideration. Most traditional economic analysis, such as cost benefit analysis, is too complex to be used for community-based activities and interventions, especially when climate change considerations have to be incorporated. This guide bridges this gap by providing tools and methods for answering the following questions: Which solutions identified in the VCA and in subsequent action planning are more economically feasible than others? Which solutions should have priority over others, considering specific factors such as who they benefit, how benefits are affected by gender, and so forth?

This guide provides step-by-step instructions for the implementation of an approach for prioritizing solutions where the Participatory Cost-Benefit Analysis (PCBA) is a central tool that allows communities to compare the costs and benefits of several identified disaster risk reduction measures. The PCBA can be implemented quickly, does not require extensive data, and includes the views of all the stakeholders affected by the decision. By engaging in the PCBA process, participants develop a better understanding of the economic efficiency and tradeoffs among various options. This improves the communities' ability to advocate on their own behalf, and gives outside participants a much clearer understanding of community priorities and the trade-offs involved in the decision at hand.

Additionally, this document introduces and provides guidance for the implementation of multi-criteria analysis, pair-wise ranking, and scenario analysis, tools that we recommend using along with the PCBA. Multi-criteria analysis (MCA) and pair-wise ranking are tools for prioritizing one option from among many when there are a number of different criteria influencing the decision. Scenario analysis is a tool to explore future scenarios for a community based on the assumption that structural changes, such as the trajectory of economic development, demographic shifts, climate change, and physical infrastructure development will bring about new vulnerabilities. Scenario analysis makes it possible to analyze whether current solutions would still work in the future under different conditions and, consequently, whether it still makes sense to consider those potential solutions.

The Vulnerability and Capacity Assessment (VCA)

The Vulnerability and Capacity Assessment (VCA) is a methodology used by the IFRC with communities and other stakeholders to obtain information regarding the communities' vulnerabilities to threats, hazards and risks and the capacities they have to respond. It allows communities to identify specific ways they can mitigate or adapt to the risks to which they are exposed[1]. The

1 Often the greatest risks to communities are posed by pressing issues that community members experience in their daily lives such as disease, poor water quality, domestic violence, etc. These issues should also be surfaced in the VCA and subsequent discussions. Actions to mitigate or adapt to natural hazard risks can incorporate elements that also address other risks, which will increase community interest and buy-in.


Photo by: ISET-Pakistan

VCA is inherently participatory, a policy tool that the IFRC emphasizes is implemented "not for the people, but with the people."[2]

The VCA is implemented in four stages:

- First, identify that there is a need to conduct a VCA in the program or activity context. If the VCA is determined to be the best way to proceed, the objectives of the VCA will be set and ways to manage the process defined.
- Second, the VCA requires extensive planning, including identifying the communities to work with, communicating with them about the goals of the process, and obtaining their consent. If a community is not interested in the process, there is no point in continuing. Planning also includes selecting and training staff and volunteers to conduct the VCA, purchasing resources for the meetings, and researching the best methodologies for engaging the communities.
- Third, conduct the VCA. This is a participatory process in which the process itself is as important as the outcome. A core result of the VCA process is that the community members involved will better understand local hazards, the risks they pose, existing coping and adaptation strategies, and the potential for additional action.
- Fourth, the VCA convener works with the community to analyze and understand the VCA results. In the process, potential solutions to the vulnerabilities faced by the community will be identified[3]. The focus, then, turns to determining which of the potential solutions identified by the communities in the VCA can be realistically implemented, and which alternatives should have priority over others.

Conventionally, the VCA does not provide a standard approach to guide the ranking of potential actions. The Participatory Cost-Benefit Analysis and associated tools outlined here offer such an approach.

2 "What is a VCA" is available at http://preparecenter.org/resources/what-vca

3 "How to do the VCA" is available at http://preparecenter.org/resources/

ASSESSING AND PRIORITIZING POTENTIAL ACTIONS

Coming out of the VCA, communities have a range of potential actions they are interested in pursuing. This guide presents, in a series of steps using a series of tools, a way to evaluate, refine and prioritize that collection of actions. If you work through these steps systematically and collaboratively, at the end you will have a small number of possible actions, each of which has broad community buy-in and has been identified as being a cost-effective means to address current and future vulnerabilities and build resilience. The process steps are shown in the flow-chart below. By referring back to this chart as you work through the document, you will be able to quickly and easily see where you are.

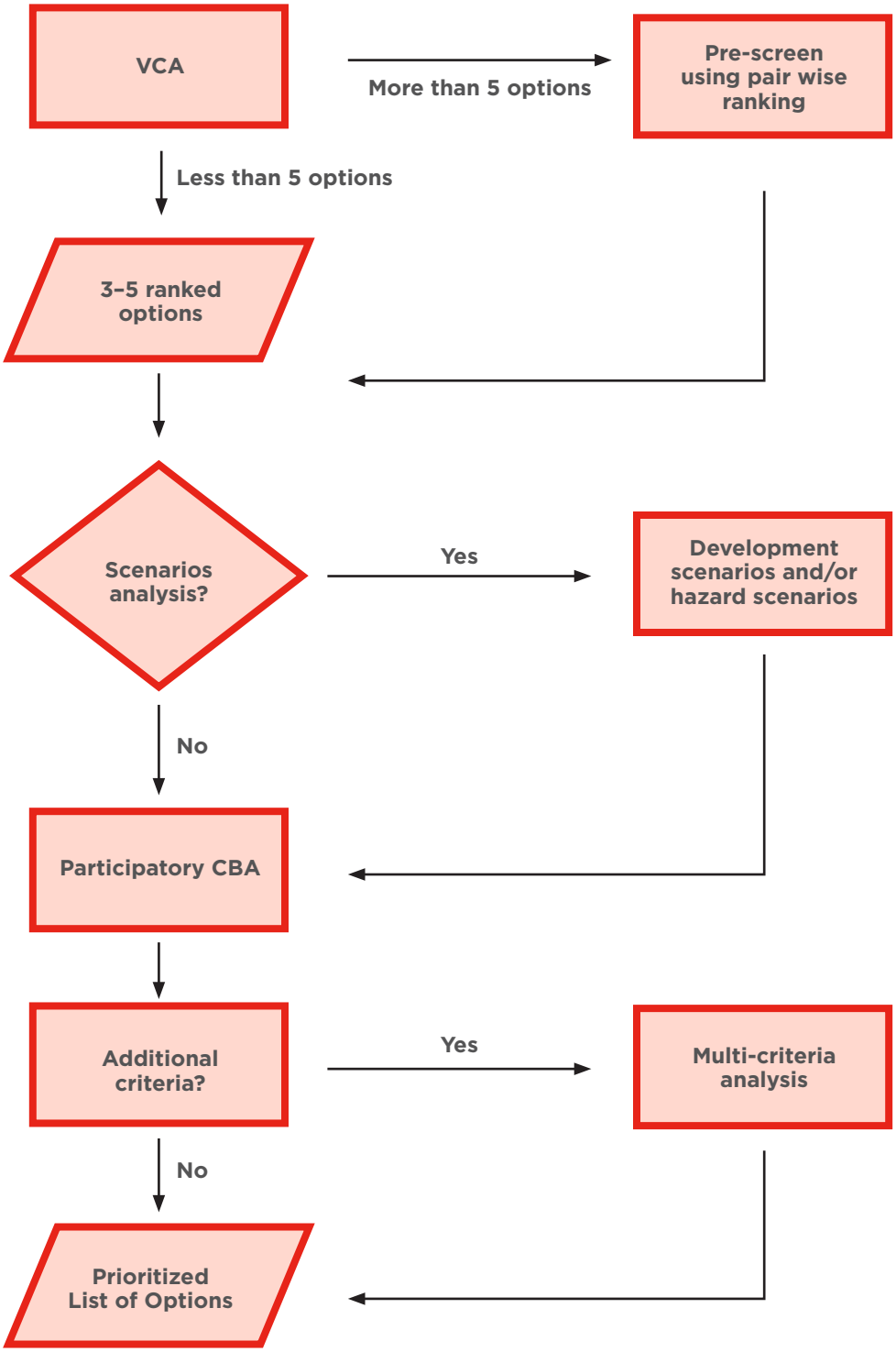
TABLE 1

SUMMARY PROCESS FOR PRIORITIZING ACTIONS

Process	Output	Purpose
Pair-wise ranking of identified options	Reduce the number of options to 3-5, if more are available	Saves time in prioritizing process
Development and/ or Hazard Scenarios Evaluation	Assess the effectiveness of options under different conditions	Modify options for effectiveness or remove them as undesirable under future conditions
Participatory Cost Benefit Analysis	Evaluate economic returns on investment	Get the most adaptation/risk reduction benefit from your money
Multi-criteria Analysis	Use additional targeting criteria such as benefits accruing based on gender, exposure or poverty	Make sure that the benefits go to those who need them the most

FIGURE 1

PROCESS FLOW CHART FOR PRIORITIZING ACTIONS



The first step in the prioritization process is to pre-screen all the potential actions identified in the VCA process. Though all proposed actions could all be reviewed and prioritized using PCBA and multi-criteria analysis, it is generally more realistic for everyone involved to pre-screen potential actions and reduce the number down to a prioritized list of three to five actions.

Pair-wise Ranking, Development Scenarios Evaluation, and Hazard Scenarios Evaluation are three tools that can be used to conduct this pre-screening. The selection of one of these tools over the other two will be dependent on the issues your community are exploring, community interest, and your sense of which tool might be most effective given the proposed actions. You should read through the descriptions of the following tools and select one that you think will be feasible given your group, group capacity, and available time for assessing your proposed actions. There is no right or wrong choice of tool. The goal is simply to systematically explore your proposed actions and to select from among them the actions that are most likely to achieve your goals and/or have the most community buy-in.

The Development and/or Hazard Scenarios evaluations can also be used following pair-wise ranking to verify that options selected for prioritization based on their perceived value today will still be effective in the future.

Pair-Wise Ranking

Pair-wise ranking helps communities prioritize resilience actions according to the communities' needs and circumstances. Pair-wise ranking is a commonly used method to rank problems and solutions in such fields as agriculture, forestry, education, finances, health, and so on (Narayanasamy, 2009).

Pairwise ranking is best done with groups organized on the basis of specific categories, such as gender, ethnicity, etc. The advantage of organizing groups in the communities based on these categories is that the most vulnerable populations can better express their views. In mixed-groups, community members with more power and authority tend to dominate the discussion and decisions.

How to rank the potential actions[4]

On a large piece of paper, chalkboard, or similar, list all the potential actions down the left-hand side. Number them off, starting with one. Across the top above the first action, list all the numbers, leaving space between them. Then, draw lines between the row and columns to form a large table (see the Table 2 example below).

4 Procedure taken from Narayanasamy 2009, p. 222.

TABLE 2

EXAMPLE OF A PAIR-WISE RANKING TABLE

Potential Action	1	2	3	4	Score	Rank
1 Promotion of Minimum Tillage operation		1	1	1	3	I
2 Planting into degraded and eroded land			3	4	0	IV
3 Construction of check-dams				4	1	III
4 Protection of water sources					2	II

As a group, rank the actions as described below:

- One by one, compare the first action (row 1) with the other actions listed in the columns. For each comparison, have participants discuss which they prefer and why. This preference can be subjective—e.g., the community is more comfortable with the idea of built solutions than changes in farming practices—or objective—e.g., the labor needed to build check-dams is unavailable. What is important is that there be a broad discussion about each pair of actions that surfaces possible advantages and disadvantages of each option, and that the group come to a consensus about which action in each pair to prioritize. When you come to a group decision, enter the group's preference in the respective cell—e.g., if they prefer action 1 to action 3, enter a 1 in the cell. If you cannot reach a decision, skip that pair and go to the next.
- Move on to the second action in row 2. Compare it with the third and subsequent actions (you already compared the second action against the first action in row 1). As above, discuss each pair and enter the group's preference in the respective cell.
- Complete these steps for each row in the table until all the actions are compared.
- Go back to any unranked pairs. Revisiting them, can you now prioritize one over another? Can you remove both of them from consideration (i.e., the other options on the list are better than both of these)? If you can neither prioritize one nor remove both, then keep both and fill in their own number in the blank squares in each row. However, plan to conduct a scenario analysis to verify they are both sensible actions given likely development and hazards in the future.
- Score each action. For action 1, count how many cells in the table contain a "1." List that number in the "Score" column in the action 1 row. Repeat this for each action. For example, in the table below, action 4 has a score of 2 because it shows up once in row 2 and once in row 3.
- Rank the actions based on the number of times the action was selected.

In the example above, the promotion of minimum tillage operation repeats three times and has been ranked as the preferred option by the community. Protection of water sources repeats two times and has been ranked as the second option for the community. Construction of check-dams repeats one time and is the third preferred option by the community. Planting into degraded and eroded land has a zero and it is ranked as the last option for the community. In this example, if the goal was to reduce the number of potential actions being evaluated in a Participatory CBA activity, planting into degraded and eroded land could be removed from further consideration.

TABLE 3

EXAMPLE OF A PAIR-WISE RANKING TABLE (USING STONES OR SEEDS)

Resilience Action	Score (seeds or stones)	Score	Rank
Promotion of Minimum Tillage operation	ooo	3	I
Planting into degraded and eroded land		0	IV
Construction of check-dams	o	1	III
Protection of water sources	oo	2	II

Source: example adapted from Russell 1988-2001

Pair-wise ranking using stones or seeds

An alternate method to implement pair-wise ranking is using stones or seeds. Resilience actions are compared against each other in pairs, but for each comparison a seed or stone is placed close to the most important resilience action. At the end, participants have to count the number of seeds or stones for each resilience action and then rank the actions according to that score (Russell 1988-2001).

Combining results from multiple groups

Once you have conducted the ranking activities with each of your groups in the community, you will want to combine the results from each group to come up with a final score for each proposed action. If the groups all consistently rank one or several actions at the bottom, this will be easy. However, if one group ranks an action highly and another group ranks it at the bottom, you will need to go back to each group, show them the results from each of the other groups, and discuss with them the reasons the other groups ranked options the way they did. Usually, this sharing will raise issues the initial group was unaware of and allow them to revise their ranking. If this second round of discussion does not clearly produce a set of actions preferred by all groups, you may want to use one of the other tools below to explore and pre-screen actions in another way.

Development and Hazard Scenarios Analyses

Another way to pre-screen or evaluate the value of possible actions to reduce vulnerability and build resilience is to think about what the future might look like and identify which actions will work across a range of possible futures versus actions that will only work for very specific future conditions. This is called scenario analysis. In this manual, we present two types of possible scenario analyses—Development Scenarios Analysis, and Hazard Scenarios Analysis.

Development Scenarios Analysis looks at how, and how quickly, the modern world is changing. Development and globalization are rapidly changing economies and the natural and built environments in which they function. Increasing populations are intensifying pressure on available resources. Migration of people to cities and often to other countries is changing livelihoods and social fabric. Both development and climate change are affecting the nature and intensity of climate hazards. Actions with a lifespan of more than a few years should take into consideration what future conditions will be like. Will livelihoods dramatically change, placing new demands on land usage? Will built infrastructure solutions still function as planned or will surrounding development impact their effectiveness? Will solutions designed with the current rainfall intensities or sea level still deliver the same benefits if rainfall is more intense or sea levels higher? These are the sorts of questions you can address using Development Scenarios Analysis.

Hazard Scenarios Analysis is similar to Development Scenario Analysis, but focuses on one specific risk event of concern and explores the performance of proposed actions in response to that risk event. So, for example, if you are concerned about addressing the impacts of flooding, Hazard Scenario Analysis can be used to explore how a given action will behave for mild, moderate, and extreme flooding. In some cases, actions may perform well at one severity level but deliver no benefits or can even be detrimental at other severities.

Development scenarios analysis

There are a number of different ways to come up with Development Scenarios for the future. One of the simplest is projecting past historical trends into the future. This is often how future population and population growth is determined. One of the development scenarios any community will want to consider is how their population and development may change over the next one or two decades, or by the time their children are adults. When envisioning possible futures for a community, think about the range of possible conditions—both high and low population growth, based on historical trends of economic growth and migration. Ideally, you will understand what has driven past trends (e.g., recovery from war, change in political structure, recurring severe drought and crop failure, migration in or out of the community, etc.) and weight how events in the next several decades might maintain or change these trends.

For climate-related vulnerability, you will also want to consider climate change. However, trend analysis is not the best way to construct future scenarios related to climate. Instead, you will want to consider the broad changes that are expected to occur. Global average temperature will increase, and will result in 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. Heat waves will become more common and of longer duration, floods will become more intense, droughts will become longer, and weather will become more variable. To develop scenarios of future climate risk, the community should explore the types of weather events that are currently problematic (or disastrous) and think about how an increase in frequency or severity of those events might impact the community.

Development Scenarios

Below is a three-step process for creating development scenarios and using them to pre-screen potential actions.

1. Imagine a series of possible futures for the community.

2. Use these possible futures to build a best-case/worst-case analysis of specific issues facing the community.

3. Evaluate potential actions against selected future scenarios to make sure they will work in all futures, or at least do no harm in all futures.

Step One

In the first step, imagining different futures for the community, consider futures such as:

- Rapid increase in population and low economic growth;
- Slow increase in population and low economic growth;
- Rapid increase in population and rapid economic growth;
- Slow increase in population and rapid economic 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 or road connecting the community to new markets, changes in national agricultural policy that might impact migration rates, etc.

These storylines will help to define high and low rates of growth and characterize what the community might look like under each of those conditions. At a very basic level, you are just telling a story about what the community looks like and how it functions. Some nearby communities may have attributes that you hope your community will achieve in the future—an active market, affordable high quality housing, irrigation for crops, protection from floods, etc. The development of initial future storylines can provide a starting point for exploring the conditions needed to achieve those goals. The point of creating these broad story lines is to think about how changes in economic conditions or population may increase or reduce vulnerability. A rapid rate of population growth, for example, that exceeds the community's ability to provide sufficient support for new residents will increase vulnerability to climate impacts.

Step Two

The second step in Scenario Development is to identify two factors that are the most important for future planning. If you are concerned about community vulnerability to flooding caused by rainstorms, and part of the reason people are vulnerable is because an increasing population is forcing people to live on lands prone to flooding, one of your factors might be population growth rate. The second might be precipitation intensity, which will probably increase due to climate change. If you wish to reduce the vulnerability of a peri-urban community primarily employed as day laborers, your two factors might be temperature and socio-economic trends affecting labor markets. If you choose to think about climate risks becoming more severe in the future, don't worry too much about how much more severe (e.g., how much deeper a flood, how much longer things will be inundated, how hot the heat wave will be, etc.). For now, focus on whether the proposed action works for current conditions, and if it would still work if, for example, flood waters were deeper or heat waves were hotter.

You may find there are more than two factors that are important. In this case, pick two to start. Once you complete 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 of those futures, it is not necessary to attempt to construct a more complex set of scenarios at this point.

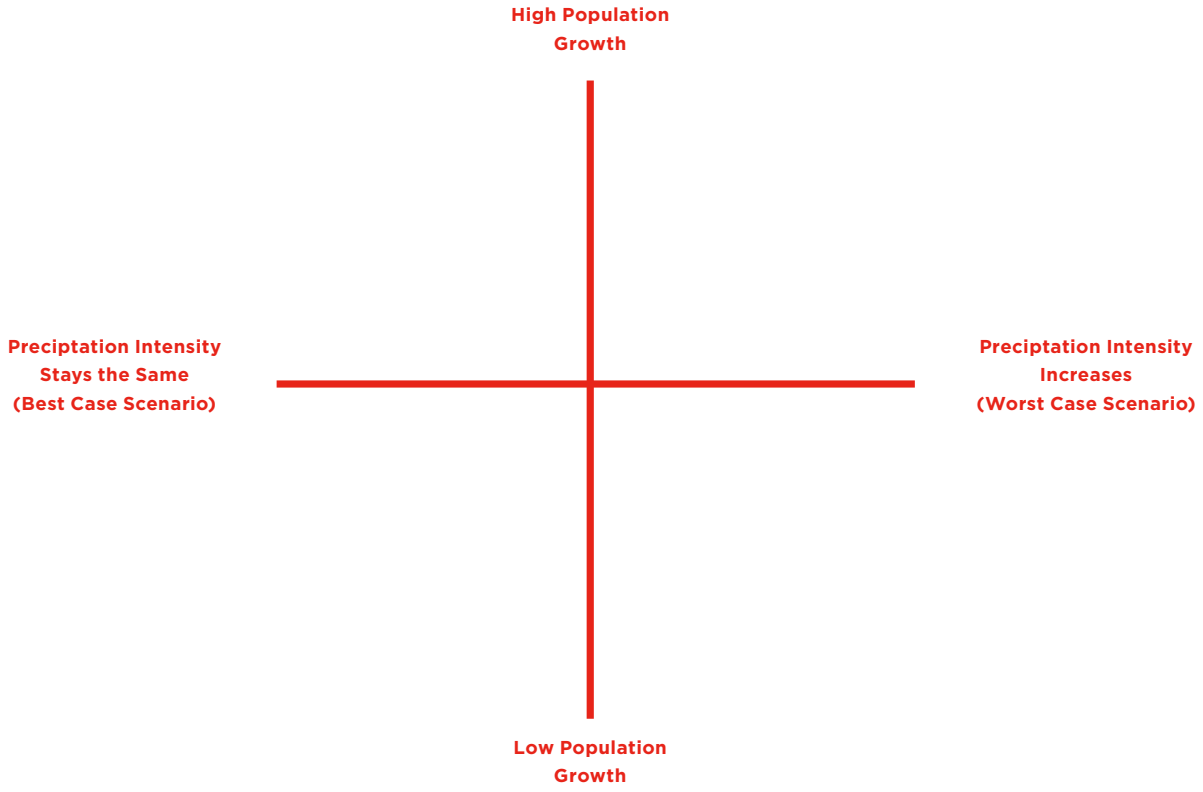
For both factors you identify, create a best-case scenario and a worst-case scenario. In selecting the two most important factors, avoid factors that are highly predictable or highly unpredictable. If your factor is highly predictable, then there will be no difference between the best-case and worst-case 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, for example, drinking water versus education/awareness around drinking water.

Step Three

On a blank sheet of paper, draw vertical and horizontal axes as shown in Figure 2.

FIGURE 2

SETTING UP FUTURE SCENARIOS



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 corner. What are the positive and negative aspects of each corner for your future planning? List these in that corner. We show a very simple example in Figure 3.

Once you have listed positives and negatives for each scenario, review the proposed actions one by one. For each action, consider how it would behave in each of the four corners of your scenario grid.

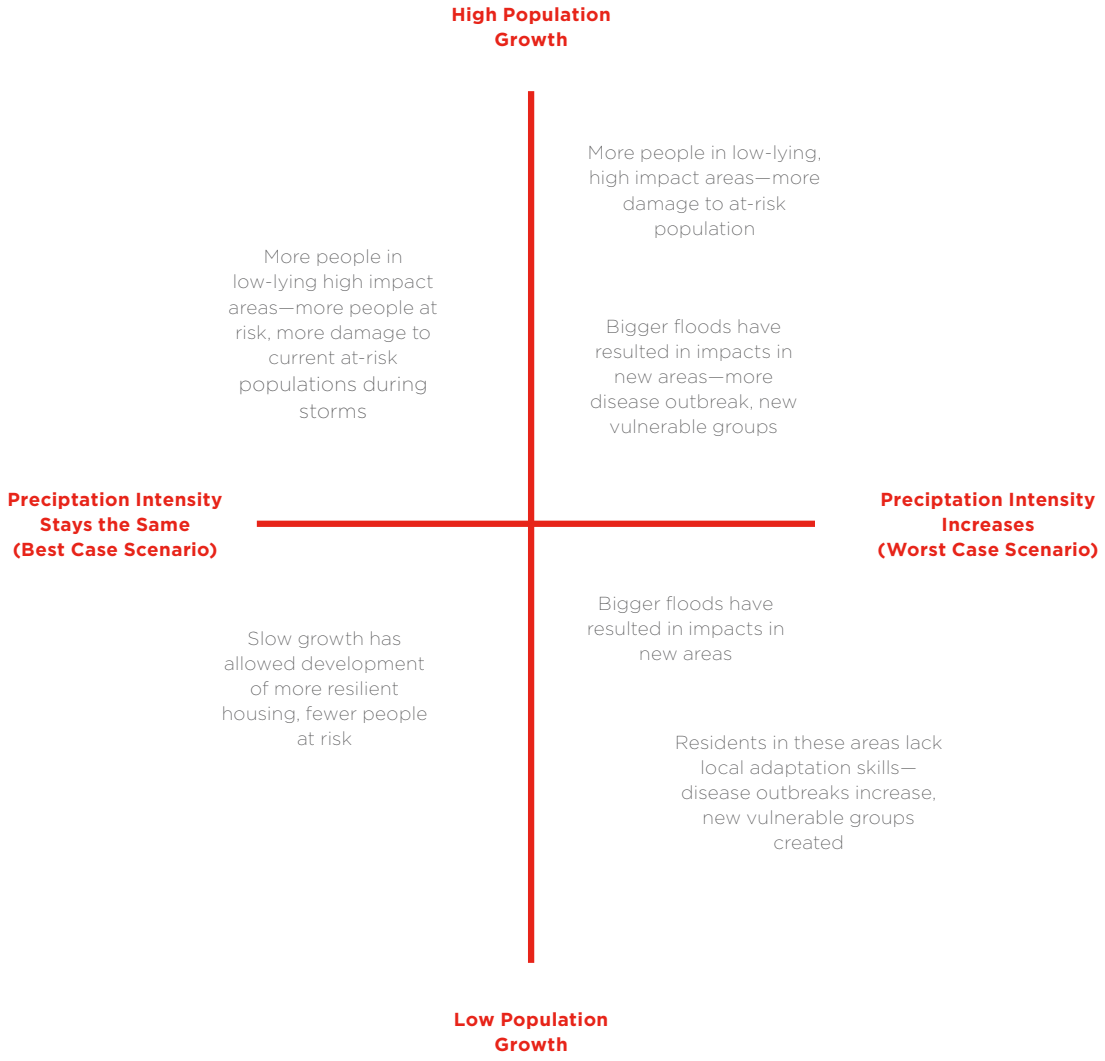
- What challenges are posed in each scenario? Does your proposed action decrease vulnerability and increase resilience under those conditions? For example, concrete homes with metal roofs might be more resilient in the face of flooding, but if increasing heat is a problem, they might become unlivable. Conventional mud and stick construction or innovative straw bale construction built on a concrete plinth might be better options.
- Is there a scenario in which the proposed action 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.

Discuss as a group if some of the proposed actions fail under some of the future scenarios and if they should be retained or removed from the list of options. There

FIGURE 3

POPULATED SCENARIO CHART



might be other benefits they deliver, particularly in the near term, that make them worth doing even if they eventually fail.

Finally, if you had to plan for just one of the four scenarios, explore which you would choose, why you would choose that scenario, and what the risks of selecting that scenario over the others could be. Which of your proposed actions would be the best actions to take if you only selected that one scenario? If you implemented those actions and one of the other scenarios occurred instead, what would happen?

Conclude this exercise by first deciding whether to remove from consideration any of the proposed actions and second, by noting whether you found ways to strengthen proposed actions so that they would better address possible future conditions. You do not need to focus on reprioritizing possible actions at this step unless you are considering more than five actions and need to reduce the number prior to conducting a participatory cost benefit assessment. If you still have more than five potential actions, go back to the pair-wise ranking activity to further pre-select actions before beginning the Participatory Cost Benefit Analysis.

Hazard scenario analysis

Hazard Scenario Analysis is similar to Development Scenario Analysis, but focuses on one specific risk event of concern and explores the performance of proposed actions in response to that risk event.

Actions to reduce vulnerability and increase resilience are often selected based on events that occur at a certain severity, either small, regularly recurring events or once-in-a-lifetime events. However, some of the proposed actions may provide benefits regardless of the severity of the event, making them more appealing to the community. Alternately, there may be small modifications you could make that would enhance a proposed action to work at multiple scales of severity, raising its value and making it easier to prioritize that action over other proposed actions.

How to Construct Hazard Scenarios

1. Identify the type of hazard event you most want to address with the proposed actions (e.g., flooding, drought, wind storm, etc.).

2. For this type of event, consider three severities:

    - The type of event occurring every two to five years (almost everyone in the community has experienced an event like this),
    - The type of event occurring every 20 years (parents and grandparents talk of this, but the younger generation may have not yet experienced it for themselves),
    - The type of event occurring once in a lifetime (only the community elders have lived through or heard first-hand accounts of this type of event).

3. Evaluate each of the proposed actions against each of the three event severities.

4. Review the results and discuss the implications.

5. Based on the results and discussion, select four or five actions for further analysis.

Step One

In the first step, focus on the actual physical event you are trying to address. Don't worry right now about the impacts that event has (for example, the flood causes waterborne disease, children can't get to school, crops are lost, etc.). We'll list those in step two. For now, focus on the basic event that is the primary problem. Write this down at the top of a large piece of paper or a blackboard.

Step Two

Below the risk event you wrote down, draw three columns. Discuss as a group what the risk event looks like as a regular, recurring event that almost everyone in the community has lived through at least once.

- When did it last occur?
- What happened when it last occurred?
- Have there been several of these events over the last decade? If this risk event occurs at a problematic level several times a year, or only once a decade, that's fine.

Write down in the far left column when this problematic event last occurred and what happened that was a problem.

- Was everyone in the community impacted? If not, write down who was impacted and who wasn't.
- What were the impacts people suffered?
- Were people able to recover on their own?
- Did people have to use resources to recover in ways that have left them more vulnerable?

Feel free to add additional information or questions for discussion. The goal is for all participants to have a common understanding of what happens during a hazard event of this severity.

Now, repeat these steps for the same event, but at a severity that occurs about once every 20 years, and then again for the most severe event anyone in the community can remember living through or hearing their parents or grandparents talk about. For this last category, you will probably have to imagine what would happen today if such an event occurred, since the impacts are likely to be quite different from what happened in the past unless the community has recently experienced a once-in-a-lifetime type event.

TABLE 3

EXAMPLE OF A HAZARD EVENT SCENARIO TABLE

River Flooding		
Small, regular event	About every 20 years	Once-in-a-lifetime
We get small floods every 2 to 3 years during the monsoon	Floods of 1997, 2009, 2010	Flood of 1983
Little floods just affect people along the riverbank Homes are flooded, often damaging mud and stick construction The people impacted are primarily the landless who live in informal settlements between the embankment and the river–they don't have land tenure Because we lack early warning, households that are flooded may lose food or other assets Crop land usually benefits from these floods Recovery is handled on the household level. Recurring flooding can push most vulnerable households to send one or more members off to do migrant work and send back remittances	Bigger floods affect more people; sometimes bank stabilization and protection structures are damaged and/or irrigation canals are flooded, causing damage in unexpected places The number of people impacted is greater; the impacted are not just the most vulnerable The types of damages are generally manageable structure damage and limited loss of assets Impacts to the most vulnerable along the river can be more significant, including complete loss of shelter Government may provide relief and recovery support, but it is usually insufficient; many impacted households will have men migrate for work, particularly if cropland is covered with sand and unusable	Floods broke the embankments, caused extensive flooding including the district capital Households, businesses, schools and the hospital were all flooded Floodwaters didn't recede for 3 days–many people were stuck on roofs There were numerous deaths and significant financial damage including loss of large livestock, loss of fields to sedimentation, loss of homes, business closure Government and INGO relief was mobilized Crops were heavily damaged, impacting food supply for over a year Damages today might be less because of the embankments that have been built along the river, or they might be worse if the embankments failed in places because now there are lot more people living in the region.
Proposed action: Flood awareness raising, building safe-houses A safe-house[5] would not make a big difference for the small floods. Awareness raising might help—people lost food in the last flood because it was stored in big pots that were too heavy to move. Are there other options? People are moving into the floodplain because they don't understand the risks—Do we need an awareness campaign? Could a safe-house be used as a local clinic?	For the people along the river, a safe-house could be useful if they had advance warning that the flood was coming Could they bring their goats? Awareness should extend beyond floodplain–e.g., people living along irrigation canals, on "safe" side of embankments	Safe houses could make a really big difference if coupled with early warning. Lives were lost because people didn't have anywhere safe to retreat to A lot of lives were lost on the east side of town away from the river. Now there is an embankment. So does a safe-house over there make sense? Could we design the new school to double as a safe-house? Safe-house would need to have a water supply so people could be there for 3+ days Lots of people have forgotten a big flood could happen, or have just moved here from elsewhere and don't know the risks. Large-scale awareness raising is needed

5 In the example, from the Karnali Basin in Nepal, safe-houses are two-story, open-air community structures built to provide temporary (12-48 hour) refuge during a flood event for people living in the floodplain.

Step Three

Now, consider the first of your ranked actions. Would it change the impacts of the regularly occurring, problematic event? If it is helpful against these smaller, regularly occurring events, who would most benefit? Would those who most benefit be the same as those currently most impacted?

Consider how the first action would change the impacts of a 20-year event. Would it provide benefits? What would the benefits be? Who would most benefit? If it doesn't provide benefits, would it make things worse?

Finally, consider how the first action would work in an once-in-a-lifetime event. Would it help, or would the scale of the event totally overwhelm the proposed action? If it helped, would it help everyone equally? Would it help the community but intensify impacts on neighboring communities? Would your action worsen the impacts of the event for the community?

Now discuss as a group how this first action works at the three different scales of event. Where is it most useful? For regular small events? For huge once-in-a-lifetime events? Who does it most benefit? Does it benefit your community but increase impacts on neighboring communities?

Record the results of the discussion for the first action in a table like that shown below. Then, repeat these steps for each of your prioritized actions.

Step Four

When you have reviewed all the potential actions for each of the three event severities, you will then want to review the results.

Questions you might want to explore could include:

- Are all the proposed actions useful primarily for events at one level of severity?
- Do the proposed actions all benefit basically the same people, or do some benefit one group and some another group?
- Are there some actions that help at all three event severities?
- Are there some actions that make things worse at some event severities but better at other severities?
- Is the investment of time and/or materials needed for the action lost during very severe events? If such an event occurred in the next 10 or 20 years, is it still worth implementing the action?
- Does reviewing the proposed actions in this way change your thinking about whether they are a good idea? Are there any actions you would now eliminate, having thought about them in more detail?
- Are there actions you would modify to improve their value? Would these changes make them clearer priorities for further consideration?

Step Five

The goal of this exercise is to review potential actions in a slightly different way, and based on that review, select a subset of those actions for further analysis.

If you find, after working through this activity, that one or more of the prioritized actions no longer looks like such a good idea, are there ways that it could be changed to make it more effective? Many risk prevention activities, particularly those that rely on physical structures, work very well for smaller and medium sized events and then fail catastrophically for extreme events. The Hazard Scenario Analysis can highlight those types of risks. It doesn't always mean you don't want to proceed with the proposed risk prevention activity—it may simply highlight that you need to be aware of the potential failure points and develop additional actions to address those gaps. Nonetheless, at this stage of your work, you may not want to focus on those activities as your top priority.

Based on your analysis in this activity, can you prioritize four or five potential actions? If so, you are ready to move to the cost benefit analysis. If you still have more than five potential actions, go back to the pair-wise ranking activity to further pre-select actions before you begin your Participatory Cost Benefit Analysis.

THE PARTICIPATORY COST-BENEFIT ANALYSIS (PCBA)

For a quick overview of the PCBA and the main steps to implement it in the field you can check the Annex "Summary Guide for Field Work." We recommend that you read the following section first before using the Summary Guide.

The Participatory Cost-Benefit Analysis (PCBA) is a tool that helps prioritize among potential actions by comparing the benefits and costs of the various proposed actions. The PCBA is a qualitative analysis that captures information that is often unavailable from traditional data sources. It ensures that financial, social, and environmental benefits and costs of an activity are identified.

The traditional cost-benefit analysis is a quantitative analysis in which costs related to a certain investment are quantified and compared to total benefit derived from that investment. This is a time consuming and data intensive process and it requires computational skills. Climate Risk Reduction analysis in the face of climate change adds additional complexity to this process. Although costs are calculated in the same manner as any other investment, benefits are measured in terms of damages avoided if that intervention is implemented. To do this, one needs to know the historic and projected future frequency of climate hazard events, the potential intensity of future events, and estimate potential future damages associated with those event intensities. This requires additional expertise, data, and analysis time. In contrast, the Participatory CBA can be implemented quickly and easily, requiring little or no quantitative data and instead relying on the knowledge and opinions of the stakeholders that will be impacted by the decision.

The PCBA is highly recommended for all situations, even if there is a quantitative CBA planned at a later stage. It is quick, it is inexpensive, and it usually generates new information about the project, the project impacts, and who will or will not benefit. For example, in the PCBA the stakeholders involved not only identify the benefits and costs of proposed options, but also learn about and negotiate the implications of the different options and how those implications should be valued. PCBA can be used to initiate discussions with diverse groups of stakeholders and can be facilitated through dialogues at the community, city, state, and national levels. In the work with community groups, because it is qualitative, the PCBA specifically enables such groups to clearly see the financial and non-financial benefits and costs of an activity before deciding to embark upon it. This leads to making more informed choices and enhances ownership of the intervention, which is likely to increase its sustainability through community management.

The PCBA is best used in tandem with multi-criteria analysis and scenario analysis to ensure the inclusion of the adaptation needs of the most poor, women and vulnerable people. A social-group-specific analysis is required to understand costs and benefits as men, women or marginalized groups might have different attributes associated with different cost benefit analysis criteria. This document offers detailed explanation for implementation of these tools.

Where the PCBA has been implemented

The PCBA has been implemented in South Asia and South East Asia. In Nepal, the PCBA was implemented in nearly 26 districts and numerous villages. The PCBA tool is part of the National Framework for Local Adaptation Plans for Action (LAPA Framework), developed in Nepal to integrate climate change resilience into local-to-national development planning processes and outcomes. The LAPA framework was designed in 2010 to support the operationalization of the policy objectives outlined in the Nepal National Climate Change Policy and Climate Resilience Planning (NAPA). However, it can be used more broadly by vulnerable communities and service providers to identify those who are most vulnerable to the effects of climate change, to prioritize potential solutions, to develop local adaptation plans for action and integrate such plans into local to national planning processes, to implement these plans, and to monitor the progress of these plans in delivering climate resilient outcomes.

The PCBA has also been used in activities related to the Asian Cities Climate Change Resilience Network (ACCCRN) project. ACCCRN is an initiative across 10 cities in Vietnam, Indonesia, India, and Thailand that catalyzes attention, funding, and action to strengthen climate change resilience for cities.

In the case of the Lai Floods in Rawalpindi, Pakistan, the idea of a participatory CBA came from the demand of the affected women to understand how the researchers were analyzing the economics of various risk reduction measures proposed by the various formal agencies in the government and among the donors. The women then proposed their own solutions and with help of the research teams ranked cost and benefits of the various suggestions. No ratios were derived at that time but the discussions on tradeoff of various options were found to be very productive in understanding the economic and distributional aspects of effectiveness of the proposed solutions. The method was then developed further for future application.

How to implement the PCBA

Implementing the PCBA can be broken down into six steps, assuming that the assessment of vulnerabilities has already been carried out, potential actions have been identified, and potential actions have been reduced to a core set of three to five alternatives. If not, it is necessary to review and conduct a VCA (Vulnerability and Capacity Assessment, as outlined by the International Federation of Red Cross and Red Crescent Societies) or similar vulnerability and capacity assessment using other tools. Based on this assessment, actions to reduce vulnerability and build resilience then need to be identified and an initial set selected for PCBA evaluation.

Step One: Advance preparation

Before conducting the PCBA, it is important to select a strong facilitator with experience in participatory processes, fluency in the local language and good understanding of the culture and local norms of the area you are working in. Ideally you will also have some training in this PCBA process.

If you and your facilitator have no prior experience with or training on this PCBA process:

It is possible to use this PCBA process based solely on this manual, but it will take some work. If no prior training is available the facilitator should spend a couple of days on mock exercises with colleagues or any other group available. Three to five iterations may be needed to really understand the steps, how to implement them, and how to flow from one to another.

Developing CBA ratios (Step 4) is particularly challenging. Without training it may take two to three attempts before the ratios can be derived successfully.

We would suggest first practicing 'in house', until you successfully understand the process and only then go for implementation with communities.

The facilitator should carefully review this handbook in advance. If you and your facilitator have no prior experience with this PCBA process, you should build in extra time to practice with a supportive group prior to going into the community.

Before the actual CBA exercise, it is useful to prepare output charts in advance. These include formats for:

1. Qualitative description of the costs and benefits of each proposed interventions.
2. Quantitative values for the costs and benefits of each proposed interventions.
3. Final matrix for benefit/cost (B/C) ratio calculation.

Preparing formats saves time, ensures the process is followed properly, and helps in keeping the process focused on generating the necessary information with the community.

Step Two: Organizing the work in the community

Ideally, the PCBA is conducted in groups of 10-15 people, though smaller or larger numbers can be accommodated. However, sometimes this is not possible and the facilitator will have to adjust to the context where he or she is working.

Where there are distinct groups of populations, it is sometimes useful to have more than one group in the same community. Gender, ethnic grouping or level of exposure may be used to make these groups, for example, people with houses in the flood plain vs. those who live on higher grounds. Having such diversity ensures that all voices are heard and the different distributional aspects are covered.

It is also important to have a few key informants in the group, such as a local government representative, sub-engineer, or extension worker, who has knowledge of the proposed options and can help determine costs of interventions and their operations and maintenance implications.

Before starting the work, it is important to explain to the community the purpose of the exercise that they will carry out, the time involved in the activity and why it is important for them to be part of the process. Since the number of people participating in the exercise is limited, the community should be asked to nominate their representative (See box below). However, community members should be given the option to join as observers to keep the process transparent.

What if you have too many participants for one group?

If there are a large number of stakeholders to accommodate, they can be broken into two or more groups, the PCBA conducted with each group, and then the results from each group shared and discussed with the other groups. Alternately, if there are one or more relatively homogeneous groups within the larger group, each homogeneous group can nominate a few individuals within their group to represent the groups' interests while the rest observe the process silently for their own knowledge.

Step Three: Identifying costs and benefits

In Step 3, Identifying costs and benefits, you will identify the economic, social, and environmental costs and benefits of several of the proposed resilience actions. In order to compare interventions with different life spans, you need to set a time horizon for the analysis; this can be done in consultation with the community. The lifetime of the longest intervention would determine the scope of the analysis in terms of time period. For primarily crop-based interventions, a period of a single year or cropping season is enough, but if you are considering infrastructure, the period may go up to 30 years. Short-term interventions costs and benefits can be repeated for an appropriate number of cycles to match the longest-term intervention. For example, five years of annual costs and benefits of crops can be added to match an intervention that has a five-year lifespan.

Start by explaining to the community what economic, social, and environmental costs and benefits are:

- Economic cost is the direct cost incurred during establishment (upfront) and maintenance (recurring) of the intervention.
- Social and environmental cost is the cost of impacts or trade-offs incurred by opting for the proposed intervention, including the opportunity cost forgone (for example, the cost of relocation of people or inability to use the land for certain productive purposes), or any other adverse impacts, intended or unintended.
- Economic benefits are the costs averted/prevented after adopting the proposed intervention (for example, value of the losses prevented by the intervention).
- Social and environmental benefits are associated with building resilience, such as improving forest health and developing forest products that locals can sell to diversify their household income.

Some of the social and environmental benefits may not be associated with reducing vulnerability or resilience building. These benefits are referred to as "co-benefits," such as a storm shelter that can also be used to house a school or dispensary. Such benefits accumulate over the lifetime of the project. For example, the shelter saved 10 years of rent for the dispensary.

Next, with the community, brainstorm to identify the costs and benefits of each option proposed. At this initial stage, the costs and benefits should simply be described; they do not have a quantitative value placed on them yet. Benefits might include assets saved or damages avoided. When describing costs and benefits, consider both the tangible elements (infrastructure, for example) and intangible elements (such as impact on livelihoods). For example, participants may have lost sewing machines during annual flooding. To ensure that losses are accurately represented, you would include both the cost of replacing the sewing machine and the income lost during the time that a working sewing machine was unavailable.

In your costs and benefits brainstorming:

- If you haven't already, select three to five resilience actions to work with. If more than three to five options are evaluated at one time, the time and complexity of the review rapidly increases.
- Identify costs and benefits for each action in each category, i.e., economic, social and environmental. These can be written on separate slips of paper and taped to a big sheet of paper, a bulletin board or table, or written directly on a large sheet of paper. If possible, use one color for costs and a different color pen or paper slips for benefits.
- Once everyone has contributed, review the chart as a large group to determine if there are any obvious costs or benefits that have been overlooked.

Categorization of the costs and benefits in terms of economic, social, and environmental cost and benefits is useful for ensuring that all these aspects are discussed and no cost and benefits are overlooked. Also, the use of one-time and recurrent costs and benefits for each category help document all possible implications of the options proposed. The three categories may include the following types of costs and benefits:

- Economic—sources of income generation, cost of labor, maintenance, rent
- Social—education, improvement of health, conflict among community

- Environmental—improved environment, cleaner drinking water, removal of solid waste, aesthetic improvement of an area.

You can add or remove categories that you consider important if it makes the case simpler for people to understand or if the intervention has a certain focus that is better captured through different categories. Also, it is important to know that all costs and benefits are to be added. Therefore, it is more important to have all costs and benefits listed than to put them in the right category. For example, reduction in incidence of disease can be either put in health or economic benefit as long as the benefit in terms of cost of treatment and loss of wages is correctly identified. Also, make sure that costs or benefits are not double counted because they fall in more than one category. List each cost or benefit in one category only.

Organize the information on the chart into economic, social, and environmental costs and benefits. Have one person record all the responses in a pair of large tables drawn on a blank sheet of paper, one table for costs and one table for benefits. For each potential action, make sure to identify costs and benefits in each category. If you have considered a category and there is nothing to record there, write that in the appropriate space on the table.

Table 4, below, is an example of a costs and benefits table categorized in capitals.

Step Four: Valuing the costs and benefits and obtaining the Benefit/Cost Ratios

The costs and benefits can be valued in a number of ways, ranging from purely quantitative to purely qualitative or a mix of the two. For example, improvement in the communities' health is a qualitative benefit, while

TABLE 4

COSTS AND BENEFITS CATEGORIZED BY CAPITALS

Activity	Cost			Benefit		
1.Water Supply Scheme	Economic	Social	Environmental	Economic	Social	Environmental
	1. Construction 2. Electric Motor 3. Electricity 4. Pipes 5. Maintenance	Nil	Nil	1. Pure Drinking Water 2. Better Health 3. Livestock 4. Kitchen Gardening	Education	Trees
2.Tube Well	**Cost**			**Benefit**		
	Economic	Social	Environmental	Economic	Social	Environmental
	1. Installation 2. Machinery 3. Tank 4. Diesel & Lubrication 5. Maintenance 6. Distribution Pipes	Nil	Water Table	1. Production Increase 2. Vegetables	Life Style Uplift	Trees Vegetation
3.Wheat Cutter Machine	**Cost**			**Benefit**		
	Economic	Social	Environmental	Economic	Social	Environmental
	1. Tractor 2. Cutter 3. Labor 4. Diesel 5. Maintenance	Nil	Nil	1. Saving the Harvest Labor	Nil	Nil

reduction in medical expenses can be quantified. Pollution of the river is a qualitative cost, while the cost of materials for construction can be quantified.

The most easily scored situation is when costs and benefits are all quantitative. In this case, assign them all scores based on the quantified costs and benefits and move to step five. However, it is more likely you will have a mix of quantifiable and non-quantifiable values. A mix is more challenging to resolve, but often the most revealing.

When you have a mix of quantifiable and non-quantifiable values:

- First, assign scores to all quantifiable costs and benefits.
- Next, you can use pairwise ranking to identify where your non-quantifiable values lie compared to the quantifiable values, as is shown in Tables 6 and 7 for education and trees. For non-quantifiable values that lie between two quantifiable ones, ask the group where between the two values it should fall—exactly in the middle of the two, near the higher one, near the lower one—and then assign a monetary value to that item.
- Finally, for non-quantifiable values that fall below a quantifiable value, see if they can be scored with the same process. If they are too small, lump several non-quantifiable items together (costs cannot be lumped with benefits) and then assign a value. Otherwise, very small values can be discarded.

Using these quantification approaches, quantify, score or rank all of the costs and benefits for each of your actions.

When a non-quantifiable value falls above the quantified values, a detailed discussion with the community is required. It is important to ascertain whether the value is relatively higher in magnitude or several time higher, i.e., 10, 100, or 1000 times higher. After this discussion a value can be assigned to each item.

There may be rare cases where all costs and benefits are non-quantifiable. In such cases all the costs and benefits for an intervention should be ranked against each other and then assigned a score between 1 and 10. These scores can be added for all costs and benefits for a ratio.

Once you have quantified all the costs and benefits for all of the resilience actions, construct a scoring table such as the example shown in Table 5 and fill in the individual economic, social and environmental costs and benefits you have calculated for each potential action. Then, for each action, sum the total costs and write those numbers in the Total columns under Costs. Do the same for Benefits. Finally, for each action, divide the total benefits by total costs for each action. This result is the benefit cost ratio for each action. The B/C ratio can be interpreted as the economic return on each unit of money spent. For example, a ratio of 1.5 means that for each dollar spent a benefit of 1.5 dollars will be gained. If the ratio is less than 1, i.e., 0.8, it means that for each dollar spent only 80 cents of return is coming and one should reconsider that option as it costs more than the benefits it brings. In the Table 7 example, that would mean the tube well is the most cost-effective option with a ratio of 13.77.

Value of Life

Life saving is a major objective in many disaster risk reduction activities and it needs special attention in PCBA analysis. In the case of loss or saving of life it is methodologically contentious and unethical to put a monetary value on life.

For interventions for the purpose of life saving, compare the costs per life saved. This is calculated as the net cost of the intervention (total cost-total benefit) divided by expected number of lives saved, which illustrates the economic efficiency of proposed interventions.

For interventions not aimed at life-saving where life-saving is a co-benefit, the benefit can be ignored for PCBA comparison among interventions with the knowledge that there are additional benefits.

TABLE 5

BENEFIT/COST SCORING

Activity	Cost						Benefit					
1.Water Supply Scheme	**Economic**	**Sum**	**Social**	**Sum**	**Enviro**	**Sum**	**Economic**	**Sum**	**Social**	**Sum**	**Enviro**	**Sum**
	1. Construction	600,000	Nil		Nil	Nil	1. Animal Domestication	2,400,000	Education	270,000*	Trees	240,000*
	2. Electric Motor & Pipes	220,000					2. Time Saving	5,400,000				
	3. Electricity	1,000,000					3. Kitchen Gardening	1,400,000				
	4. Maintenance	200,000					4. Health	2,800,000				
Total Cost		**2,020,000**		**Nil**		**Nil**		**12,000,000**		**270,000**		**240,000**
2.Tube Well	**Cost**						**Benefit**					
	Economic	**Sum**	**Social**	**Sum**	**Enviro**	**Sum**	**Economic**	**Sum**	**Social**	**Sum**	**Enviro**	**Sum**
	1. Installation	250,000	Nil		Nil		1. Production Increase	11,400,000	Lifestyle Uplift		Trees & Vegetation	1,000,000
	2. Machinery	200,000					2. Vegetables	6,200,000				
	3. Tank	150,000										
	4. Diesel & Lubrication	300,000										
	5. Maintenance	200,000										
	6. Distribution Pipes	250,000										
Total Cost		**1,350,000**		**Nil**		**Nil**		**17,600,000**		**Nil**		**1,000,000**
3.Wheat Cutter Machine	**Cost**						**Benefit**					
	Economic	**Sum**	**Social**	**Sum**	**Enviro**	**Sum**	**Economic**	**Sum**	**Social**	**Sum**	**Enviro**	**Sum**
	1. Tractor	600,000	Nil	Nil	Nil	Nil	1. Saving the Harvest Labor	900,000	Nil	Nil	Nil	Nil
	2. Cutter	100,000										
	3. Labor	125,000										
	4. Diesel	45,000										
	5. Maintenance	30,000										
Total Cost		**900,000**		**Nil**		**Nil**		**900,000**		**Nil**		**Nil**

Currency PKR (Pakistan Rupee)

* Non-quantifiable benefit estimated from ranking in table 6.

TABLE 6

PAIRWISE RANKING OF QUANTIFIABLE AND NON-QUANTIFIABLE BENEFITS

Item	Health	Livestock	Kitchen Garden	Education*	Trees*	Total Score
Health	x	1	1	1	1	4
Livestock	0	x	1	0	1	2
Kitchen Garden	0	0	x	0	1	1
Education*	0	1	1	x	1	3
Trees*	0	1	1	0	x	2

*Education and trees are non-quantifiable benefits. Scores for these were calculated using pairwise ranking, and values were then discussed and assigned according to how they were ranked against known values.

TABLE 7

BENEFIT/COST RATIO

Sr. No	Activity	Cost	Benefit	B/C Ratio
1	Water Supply Scheme	2,020,000	14,400,000	7.12
2	Tube Well	1,350,000	18,600,000	13.77
3	Wheat cutter machine	900,000	900,000	1

Currency PKR (Pakistan Rupee)

Step Five: Distributional Factors

"Distributional factors" are information about who benefits or is harmed by an action. A quantitative CBA sums up explicit, quantifiable costs and benefits, but generally fails to incorporate distributional concerns. The PCBA, by virtue of how it is implemented, will identify many distributional concerns. Nonetheless, attention will be needed to assure that all distributional concerns are identified and addressed. There is rarely a fully representative group engaged in the PCBA process, and even if there is, local social dynamics may not allow equal participation due to reasons beyond the skills of the facilitator.

The local facilitator is usually in the best position to make judgments about how representational the group is and whether it is useful to divide groups by socially relevant dimensions to assure the broadest participation. In many contexts, conducting the exercise separately with all-male and all-female groups is important because of their different responsibilities in supporting livelihoods and different perspectives of what is most or least important. Similarly, social norms may inhibit the opportunity of a certain class to express their opinions freely; conducting PCBA activities in separate social groups may be required to achieve full participation. Finally, exposure to risk based on geography may disaggregate people's preferences—certain locations in a community may be at greater or lesser risk than others, affecting the valuation of various alternatives by those living in those areas. Careful 'stratification' of groups can resolve such issues.

Some of the questions you need to consider when such groupings are made include:

- Are there people or groups that do not benefit from this action? Are they intentionally left out? Is there some way the project could be modified to benefit them?
- Are there people or groups that may be negatively affected by this action? How will

they be impacted? Has this already been considered in the costs of the action?
- Are there people or groups that will benefit more from this action than from other actions? If so, who will benefit more? Are these the people you think most need the extra benefit?
- Are there people or groups that will benefit less? Are those who will benefit less often the people who benefit less? Is it okay that they are going to benefit less?

If your PCBA is conducted as a series of PCBAs with distinct interest groups, the results from different groups should be shared for better understanding of each other's perspectives. Such sharing may challenge the beliefs and value systems of different groups and should be dealt with utmost respect and tact to avoid unnecessary conflict and disharmony among the population and the external partners.

This may be a challenging discussion. Often, distributional concerns are strongly influenced by politics, social expectations and cultural dynamics. Your VCA may provide supporting evidence for issues that are raised here, and may therefore provide a way to open the discussion.

Step Six: Presenting and discussing findings with the community

In this activity, you have completed an initial participatory cost-benefit analysis. The steps you have worked through are exactly those that you want to walk your full stakeholder group through. The only reason this assessment is initial rather than final is that, presumably, there are other stakeholders who should be included in the discussion about the actions you assessed.

Discuss the process of completing this assessment:

- Did it change your perception of any of the proposed resilience actions you assessed?
- Did any of the results surprise you? Were there costs or benefits identified that you had not considered?
- Were there any new issues raised in the discussion of distributional concerns?
- Would this activity be different, or achieve different results, with a different group of participants?
- Who should be invited to review the activities you assessed today?

When you conduct a full participatory cost-benefit analysis, including representatives of all those impacted by the proposed actions, you will need to present your results to the larger stakeholder group, including the decision-makers who will ultimately determine which actions are implemented. At this presentation, you should review your findings by showing results of each of the steps previously developed and how and why different options were scored the way they were. This should include:

- What were the qualitative costs and benefits?
- How were the costs and benefits scored?
- What were the reasons for assigning those scores?
- What cost-benefit analysis did this result in?
- Was the cost-benefit analysis further modified based on distributional concerns? If so, what were those concerns, and how were they used to modify the final scores?
- What does the final scoring indicate? What actions should be pursued?

Be sure to include the discussion on final options. In addition, report on whether this exercise gave you clear answers to what the most appropriate resilience plan would be, what questions remain, and what further analysis may be needed to come up with the answers.

ADDITIONAL TOOLS TO SUPPORT THE PRIORITIZATION OF SOLUTIONS

Multi-criteria Analysis

It is easy to select from among several alternatives if all you care about is cost. It becomes somewhat harder to select an alternative when what you care about is subjective and/or multi-faceted, such as improving the lives of a vulnerable population. It can become quite difficult to select when you care about, for example, cost AND improving the lives of a vulnerable population AND technical feasibility AND distribution of benefits. This diversity in type and quality of information about a decision calls for methods and techniques that can assist in information processing.

Multi-Criteria Analysis Matrices (MCAM) are a simple yet systematic tool for prioritizing or choosing one option from among several options when there are a number of different criteria influencing the selection. MCAM provide a framework for assigning numerical values to both quantitative and qualitative options with respect to how they address a list of specified criteria. Scores assigned to options via MCAM can be useful when justifying selection of a particular option to a reviewer outside the selection process.

As part of the VCA process and subsequent action planning, the community or stakeholder group generates multiple possible actions. For each action, there are a number of criteria those actions can be measured and considered against: cost, feasibility, benefits to various sub-groups in the community, gender equity, etc. Using MCAM, for each action, assign a numerical value to each of the criteria. Numerical values are summed for all criteria, resulting in an overall numerical weight for each action. You can use this score to compare actions, to justify selection of one action over another, etc. Multi-criteria analysis matrices provide a simple structure for doing just this.

In application, the potential actions and the criteria they are being evaluated against are collected in a table (called a decision matrix or decision table; see Table 8 below). The table columns represent the potential actions; table rows represent evaluation criteria (e.g., cost, impact on local households, timeframe to implement, who will benefit, etc.). Values found at the intersection of each row and column in the table represent a "criterion outcome"—a measured or predicted performance of a potential action for a given criterion. Structured in this way, the decision matrix compiles and presents the data for comparison of alternatives.

Though the basic approach to decision matrices is quite straightforward, depending on the actions being evaluated and/or the criteria used for evaluation, there can be challenges in application. For example, if different criteria are contradictory or not really comparable, it may not be sensible to assign them numerical values. In this case, a yes/no scoring or a present/absent scoring may be needed.

Alternate scoring may also be desirable when one criterion is deemed more important than the others. In table 8, we illustrate scoring all criteria from one to five, with one being the least desirable and five being the most desirable. However, in broader application, it could be that who benefits (or doesn't) is the most important element of a successful project, and should therefore be given more weight such that the difference between broad benefits and benefits only reaching one sub-group

is reflected more strongly in the scoring. There are a number of ways this could be done, such as by specifying a minimum value for the criterion e.g., four or five, or by double-weighting the criterion ((1 to 5)*2), Both of these approaches have the advantage of preserving the one to five scoring scale, making it simpler to see what is being compared.

Determining when a criterion should be given extra weight and how that extra weight should be applied is something that will depend on the issues surrounding the criterion. In general, the criterion weight should reflect how important it is to meeting the stated goal, how it impacts failure, political and/or social values, etc. The participant group should discuss what criteria will be used to assess each potential action and the weight assigned to each criteria. The sharing and learning in this discussion is ultimately as important as coming up with a final scoring for all proposed actions.

Overall, the strength of the MCAM methodology is that it supports the inclusion of subjective criteria in the evaluation and scoring of alternatives such as gender equality and benefitting vulnerable populations.

Procedure

Table 8, below, illustrates various options to address flooding in Surat, India. Following the table, the steps used to fill it out are discussed.

Step One

Fill in the column headings using the list of potential actions that have been identified. If you have more than about five options, pick five to start with and plan to go through the MCAM process several times until all options have been evaluated.

Step Two

Each row represents a criterion that you will use to evaluate the potential actions. The cost-benefit ratio or relative ranking assigned during the PCBA work should be one of the criteria listed. The group should

TABLE 8

EXAMPLE MCAM TABLE AND SCORING

	Flood awareness raising, building safe-houses	Raising height of dikes by 0.3 meters	Relocating vulnerable community*	City develops and enforces new limits on floodplain development
Inclusion of Vulnerable Groups in Process	4	2	1	2
Technical Feasibility	5	5	5	5
Financial Feasibility CBA ratios	4	1	3	5
City management and capacity (1 = no capacity; 5 = full capacity)	4	5	2	4
Generates New Knowledge (5 = yes; 0 = no)	5	0	5	5
Total Score	**22**	**13**	**16**	**21**

* This is dependent upon the group's involvement in relocation decision-making.

Index: 1-5, 1 = least desirable, 5 = most desirable

develop other criteria to evaluate potential actions against. This is a good time to identify distributional concerns, particularly if they were not evaluated as part of the PCBA work. Criteria could include impacts on natural resources like community forests or river banks, whether benefits accrue equally to both genders, all ages, and all sub-groups within the community, whether there are co-benefits of the action such as skills development or learning opportunities that have not been explicitly valued elsewhere, etc. Information from the vulnerability assessment (VCA) is critical and should be referred to as evaluation criteria are developed.

Step Three

Discuss as a group whether all the criteria should be equally weighted or if some criteria are more important than others. If some are more important, discuss and decide on how to weight or score those criteria to reflect their importance.

Step Four

As a group, work together to fill in the boxes across each row indicating, on a subjective scale from 1 to 5 (or your modified weighting, as needed), how the action in that column satisfies the criteria noted for that row. Use larger numbers to indicate that an option better meets the criteria and smaller numbers to indicate that it does not meet the criteria well. For example, in the table for Surat, raising dike heights is a zero in the "Generates New Knowledge" column because the dikes would be raised by adding fill—nothing new would be learned.

Step Five

When you get to the bottom of the matrix, add up the scores in each column and record the value in the Total row. These values indicate the numerical ranking of each proposal with respect to the criteria.

Step Six

Discuss as a group:

- What factors are not included in the rankings;
- Which criterion scores are based on qualitative data and which on quantitative data, and how does this impact the total score for each proposed activity;
- How would different weighting of the criterion scores (e.g., weighting vulnerable groups twice as much as other criteria, so doubling that score) impact the total score; and,
- Does everyone agree with the ranking? If not, what needs to be discussed?

In this example, the low total score assigned to "raising dike heights" might be used to remove it from the list of projects under active consideration, while the similar scores assigned to the other three activities might be used to justify including all three in an "Adaptation Activities to Address Flooding" proposal package.

In application, some criteria scores will be easy to quantify. They will be based on simple judgments, ratings by experts, or on cost. Others may require serious thought and discussion to come up with meaningful scoring. Still others may require additional study and/or discussion with external players. In cases requiring more thought and multiple stakeholders, it may take some time to develop the criterion scores. However, as with the PCBA, it is during the process that learning occurs. The process is often as or more valuable than the resulting scores.

Strengths and Weaknesses

Strengths of the Multi-Criteria Analysis approach to decision-making include:

- Providing a single number for each alternative by which alternatives can be compared.
- Making alternative selection relatively transparent by providing a numerical score that can be pointed to in justifying selection.
- Providing a non-monetary basis for judging relative value of different activities.

Weaknesses of this methodology include:

- There may be compelling reasons why the highest scoring proposal should not be selected (e.g., if it is politically unfeasible, funding is unavailable, etc.). If you find you have given the highest score to an action you do not think warrants it, consider revising or adding to your list of criteria or changing how you weight your criteria scores.
- Criteria weights and scores can be subjective. Differences between results and perceived outcomes, or different ranking due to differing criteria weighting, should be discussed by the group. This should be seen as an opportunity to discuss priorities and values.

YOUR FINAL PRIORITIZED ACTIONS LIST

Congratulations! You have now worked your way from an initial list of possible actions generated during your VCA or similar process to a clear, prioritized list of activities and projects you want to begin implementing. This, by itself, is a major accomplishment and will provide clarity for the community on how it wants to move forward.

However, perhaps more important than the prioritization itself, all of the stakeholders that have been involved in the PCBA process should now be able to clearly articulate why the actions have been prioritized the way they have, the criteria that went into that prioritization, and how and why the prioritize actions will benefit the community. If you included either a development or hazard scenario analysis as part of your assessment, you will also be able to clearly discuss, in addition to how these actions are valuable now, the range of possible futures or events for which these actions will provide benefit.

This type of information and clarity around benefits will not only be of value to community members, it will be highly valuable in approaching government, aid organizations, or other donors for funding for your projects. At the same time, the engagement approach used to prioritize actions will clearly illustrate the community understanding of and commitment to taking certain actions over others, potentially streamlining approval processes and other logistical requirements that must be met before implementation can begin. Though not explicit elements of this methodology, these co-benefits are often reason enough to undertake a participatory CBA assessment even when a traditional CBA assessment is already being conducted.

Moving forward, you should be sure to discuss both the results of your PCBA work, and also the process by which you conducted it. Both are valuable, both have generated knowledge and buy-in, and both will earn you attention and respect as you begin your project implementation.

SUMMARY GUIDE FOR PCBA WORK

This section is intended as a pocket guide for facilitators working in the field. It provides a quick summary of the crucial steps of the PCBA that need to be implemented in the field.

PRE STEPS

- Review this manual and practice the PCBA - Do at least one successful mock PCBA process, from start to finish, before going to your community. Three to five iterations may be needed if you have not been formally trained in this methodology.
- Make formats
    - Costs and Benefits in words (Table A)
    - Costs and Benefits in numbers (Table B)
    - Summary benefit cost ratio calculator. (Table C)
- Meet with the community and explain the PCBA process and outcome
- Identify groups of 10-15 participants that represent the community. If needed, make more than one group to represent different actors, e.g., men and women or along other social or geographical lines.

TABLE A

LISTING OF COST AND BENEFITS FOR OPTION X

	Costs			**Benefits**		
	Economic	Social	Environmental	Economic	Social	Environmental
One time						
Recurring						

PCBA PROCESS

1. List all ranked options

2. List costs and benefits for each option

- For each option, separately list the costs and benefits on the Table A format in words. Do not try to quantify at this stage:
    - Break them into economic, social and environmental costs or other categories that would help the community identify more costs and benefits
    - Within each category identify both one-time and recurring costs and benefits
    - Check that you have not listed any costs or benefits more than once (e.g. in both social and economic). Remove any duplicates.

3. Calculate the value of the costs and benefits

- Determine the timeline for the analysis—it should be the expected lifetime of the longest lasting intervention but no more than thirty years.
- Make a second table like Table B below and insert all the quantifiable costs and benefits.
- Remember benefits are the losses reduced due to the intervention i.e., difference in losses in current conditions without the intervention minus those with the intervention.
- Co-benefits are benefits that are not related to risk reduction but are still produced through the intervention.
- Also note the non-quantifiable costs and benefits on the list (they will mostly be in the social and environmental category)
- Repeat separately for each intervention
- There are three types of scenarios where the quantification can happen:
    - You can assign a quantifiable value to score costs and benefits.
    - You can use pairwise ranking to identify where your non-quantifiable values lie compared to the quantifiable values. For non-quantifiable values that lie between two quantifiable ones, ask the group where between the two values it should fall, exactly in the middle of the two, near the higher one, near the lower one—and then assign a monetary value to that item.
    - For non-quantifiable values that fall below a quantifiable value, see if they can be scored with the same process. If they are too small, lump several non-quantifiable items together (costs cannot be lumped with benefits) and then assign a value. Otherwise, very small values can be discarded.

There may be rare cases where all costs and benefits are non-quantifiable. In such cases all the costs and benefits for an intervention should be ranked against each other and then assigned a score between 1 and 10. These scores can be added for all costs and benefits for a ratio.

TABLE B

QUANTIFYING COSTS AND BENEFITS FOR INTERVENTION X

(Period of analysis - xx years)

	Costs			Benefits		
	Economic	Social	Environmental	Economic	Social	Environmental
One time	e.g., construction					
Recurring	e.g., maintenance					

4. Calculate Benefit-Cost Ratios

- Transfer all the values from different interventions to the same chart for comparison. See the Table C.
- Calculate total Costs and Benefits for each option.
- Divide the benefits by the costs for each option and write the ratio in the B/C ratio column.

5. Compare and discuss options with community.

- The B/C ratio can be interpreted as the economic return on each unit of money spent. For example, a ratio of 1.5 means that for each dollar spent a benefit of 1.5 dollars will be gained. If the ratio is less than 1, i.e. 0.8, it means that for each dollar spent only 80 cents of return is coming and one should reconsider that option as it costs more than the benefits it brings.

TABLE C

COMPARISON OF COSTS AND BENEFITS

	Costs			**Total**	**Benefits**			**Total**	**B/C Ratio**
	Econ.	Social	Environ.		Economic	Social	Environ.		
Option 1									
Option 2									
Option 3									

GUÍA RESUMEN PARA APCB

Esta sección contiene un resumen de los pasos cruciales para la implementación en campo del Análisis Participativo Costo-Beneficio (APCB). Recomendamos la lectura de la sección completa en el documento principal antes de usar este resumen.

PASOS PREVIOS

- Revise el manual y practique el APCB por lo menos una vez de principio a fin antes de visitar una comunidad. Deberá realizar el proceso completo entre tres a cinco veces si no ha recibido entrenamiento previo formal en esta metodología.
- Tenga los formatos preparados
    - Costos y beneficios en palabras (Tabla A)
    - Costos y beneficios en números (Tabla A)
    - Resumen para calcular el índice costo-beneficio (Tabla C)
- Reúnase con la comunidad y explique el proceso del APCB y sus resultados.
- Identifique grupos de 10-15 participantes que sean representativos de los varios grupos dentro de la comunidad. Si es necesario se puede trabajar con más de un grupo para asegurar que los diferentes actores estén representados. Por ejemplo, mujeres y hombres, u otros grupos sociales o geográficos.

Tabla A: Costos y beneficios por cada actividad

	Costos			**Beneficios**		
	Econ.	Social	Ambiental	Econ.	Social	Ambiental
Una vez						
Recurrente						

PROCESO APCB

1. Liste todas las acciones de resiliencia

- Describa todos los costos y beneficios por cada acción de resiliencia
- Para cada acción de resiliencia, describa en por palabras separadamente los costos y beneficios: (No trate de cuantificar aún).
    - Separe los costos y beneficios en capitales económico, social y ambiental u otras categorías que ayuden a la comunidad a identificar costos y beneficios adicionales.
    - Dentro de cada categoría identifique costos y beneficios que se repiten una vez y aquellos que se repiten varias veces.
    - Revise que no haya anotado algún costo o beneficio más de una vez. Borre cualquier costo o beneficio que esté duplicado.

2. Calcule los valores de los costos y beneficios

- Determine el período de tiempo que cubre el análisis—puede ser el tiempo de duración de la acción de resiliencia más larga, pero no mayor a treinta años.
- Elabore una tabla similar a la anterior e incluya todos los costos y beneficios que se pueden cuantificar (Tabla B).
- Recuerde que los beneficios son las pérdidas que se reducirán con la implementación de la acción de resiliencia.
- Co-beneficios son los beneficios que no están vinculados con reducción de riesgos pero se producirán con la implementación de la acción de resiliencia.
- Anote también los costos y beneficios que no se pueden cuantificar (estos costos y beneficios se encuentran más frecuentemente en las categorías social y ambiental)
- Repita estos pasos separadamente para cada intervención
- Hay tres tipos de escenarios donde la cuantificación puede suceder:
    - Asigne un valor cuantificable a los costos y beneficios.
    - Usted puede usar la herramienta llamada "pair-wise ranking" para identificar donde se localizan sus valores no cuantificalbes en comparacion con los valores cuantificables. Para los valores no cuantificables que se encuentran entre dos valores cuantificables, pregunte al grupo si el valor no cuantificable está en la mitad de los dos valores cuantificables, está más cerca del valor más alto, o más cerca del valor más bajo. Asigne un valor.
    - Para los valores no cuantificables que se encuentran bajo un valor cuantificable, analice si se puede asignar valor usando el mismo proceso. Si son muy pequeños entonces se los

Tabla B: Cuantificando los costos y beneficios para cada intervención X
(Periodo del análisis - xx anos)

	Costos			Beneficios		
	Econ.	Social	Ambiental	Econ.	Social	Ambiental
Una vez	e.g. construcción					
Recurrente	e.g. mantenimiento					

puede agrupar (recuerde que los costos no se pueden agrupar con los beneficios). Asigne un valor. Los valores muy pequeños pueden ser descartados.

Hay casos poco frecuentes donde todos los costos y beneficios no son cuantificables. En estos casos todos los costos y beneficios de una acción de resiliencia deben ser comparados entre ellos y asignar un puntaje del 1 al 10. Estos puntajes se deben sumar para todos los costos y beneficios para poder obtener el índice costo-beneficio.

3. Calculando los indices costo-beneficio

- Copie todos los valores de las diferentes acciones de resiliencia en un mismo cuadro para poder comparar. Ver Tabla C abajo.
- Sume los costos y beneficios de cada acción.
- Divida los beneficios para los costos y obtenga el índice Beneficio/Costo.

4. Compare y discuta las acciones con la comunidad

- El índice SB/C puede ser interpretado como el retorno económico por cada unidad de dinero que se gasta. Por ejemplo, un índice 1.5 significa que por cada dólar gastado se ganará un beneficio de 1.5 dólares. Si el índice es menor a 1, por ejemplo 0.8 esto significa que por cada dólar gastado se recupera solo 0.8 centavos y uno debe reconsiderar esa acción de resiliencia porque son más los costos que los beneficios que genera.

Tabla C: Comparación de costos y beneficios

	Costos			Total	Beneficios			Total	Indice B/C
	Econ.	Social	Ambiental		Econ.	Social	Ambiental		
Opción 1									
Opción 2									
Opción 3									

References

Narayanasamy, N. (2009). ***Participatory Rural Appraisal: Principles, Methods and Application***. Thousand Oaks, CA: Sage Publications Inc.

Russell, T. (1988-2001). Pair wise ranking made easy. ***PLA Notes CD-ROM***. Retrieved from http://pubs.iied.org/pdfs/G01675.pdf

Additional Resources

Enriquez, M., Hawley, K., Bejarano, I., Abarca, R., Ianni, F. (2015). ***Análisis Participativo Costo-Beneficio: Guía para uso en Campo***. Retrieved from http://i-s-e-t.org/resources/training/pcba-guide-spanish.html

Khan, F. & Hawley, K. (2013). ***Introduction to Cost-Benefit Analysis***. Retrieved from http://training.i-s-e-t.org/wp-content/uploads/modulesContent/pdfs/ISET_CRFTM_Set3-5_All_v1.pdf

Khan, F. & Hawley, K. (2013). ***Participatory Cost-Benefit Analysis***. Retrieved from http://training.i-s-e-t.org/wp-content/uploads/modulesContent/pdfs/ISET_CRFTM_Set3-6-0_v1.pdf

GoN (2011). ***National Framework on Local Adaptation Plans for Action***. Government of Nepal, Ministry of Environment, Singhdurbar.

This product was funded by, and in partnership with:

International Federation of Red Cross and Red Crescent Societies

Global Disaster Preparedness Center

ISET

ISET-Pakistan

Through the Vulnerability Capacity Assessment (VCA), communities are able to identify potential disaster risk-reduction initiatives. However, communities generally have diverse projects they are interested in pursuing and they must prioritize which ones are feasible to implement. This guide provides step-by-step instructions for the implementation of an approach for prioritizing solutions where the Participatory Cost-Benefit Analysis (PCBA) is a central tool. The PCBA is an approach that enables communities to compare the costs and benefits of several identified initiatives. By engaging in the PCBA process, participants develop a better understanding of the economic efficiency of and tradeoffs among various options. This improves the communities' ability to advocate on their own behalf, and gives outside participants a much clearer understanding of community priorities and the trade-offs involved with the decision at hand. Additionally, this document offers guidance for the implementation of multi-criteria analysis, pair-wise ranking, and scenario analysis—tools that can be used along with the PCBA to prioritize one option from among many. Once communities learn how to use the tools presented in this guide and use them to prioritize their initiatives, they will have a better understanding of what the benefits of the chosen activities are and will be better positioned to achieve their goals. This knowledge brings legitimacy to their project proposals and improves their capacity to secure funding and assistance from donors and government agencies.