Disasters and Development: Part 3: Assessing Trade-offs in Investing in Vulnerability Reduction

Rob S. Stephenson; Charles DuFrane*

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Abstract

This lesson describes how a government decides whether and how much it should spend on vulnerability reduction. There are techniques and methods by which decision-makers compare development alternatives. The differences between the risk that a potentially catastrophic event will occur and uncertainty are described, with uncertainty providing greater difficulty in economic analyses. There is a range of methods for identifying the complex mix of competing costs and benefits associated with any restructuring of investment priorities to accomplish disaster mitigation. The possibilities are described in terms of the opportunity costs and present value. Impact and consequent losses include: (1) direct monetary effects; (2) indirect monetary effects; (3) direct, non-monetary effects; (4) indirect, non-monetary effects; and (5) loss of non-renewable natural resources. The difficulties in assigning values to these effects are described, as well as the means of judging the cost-effectiveness of such interventions. An advantage of screening projects using a framework of analytical methods is that it can assist in focusing on a variety of possible outcomes and make the factors influencing these outcomes quite explicit.

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Objectives

This part of the study module is designed to enhance your understanding of:

1. Factors that influence the analyses of measures to mitigate damage used by decision-makers.
2. Different types of costs, effects, and benefits of interventions designed to mitigate damage.
3. Models and tools that are useful in evaluating options for mitigating damage.

Introduction

This section describes how governments decide whether and how much they should spend on vulnerability reduction. Relatively small, single investments in disaster preparedness or damage mitigation can reduce the recurrent losses of capital items and production caused by potentially catastrophic events. However, in any development program there will be competition for resources and priorities must be set.

Of particular interest here are the techniques and methods by which decision-makers compare development alternatives. There are a range of models which represent the ways in which comparisons are made in development decision-making.

In relation to hazards and vulnerability reduction, political economists often argue that "silent", long-term investment in preparedness or damage mitigation rarely is viewed with much favor by politicians. Short-term considerations tend to dominate, and mitigation often has little mass-appeal in electoral terms. For many populations, the main concern is with day-to-day survival and this inevitably is reflected in the political arena.

In many countries, disasters occur rather infrequently, and perhaps, it is understandable that some politicians and government officials usually discount the possibility of having to justify a lack of expenditure on damage mitigation. In addition, if a disaster does occur, there is always the perceived benefit of "putting on a show" of large-scale relief, however ineffective it may be.

Will Losses Occur?

The economic analysis of projects is conducted in an atmosphere of risk and uncertainty. Situations of risk usually are defined as those in which the potential outcomes can be described using well-known probability distributions. The example of flood risks often is used to illustrate this. If it is known that a river will flood to a specific level once every 30 years on average, a situation of risk (not uncertainty) exists.

Where uncertainty is present, potential outcomes cannot be described in objectively known probability distributions. Therefore, these situations are much more difficult to analyze than are risks. They include many economic, political, and meteorological events, for which a wide set of random influences shape events. To use extreme examples, few statisticians would feel comfortable in reliably predicting a stock-exchange collapse, patterns of civil disorder, or a tornado track.

Most governments accept the principle that damage mitigation and vulnerability reduction are important components of an effective development portfolio and are most effective when incorporated into on-going development. Therefore, governments increasingly are willing to build planning systems to achieve this. When a more structured analytical and decision-making framework can be useful in policy-making, there is a range of methods for identifying and clarifying the complex mix of competing costs and benefits associated with any restructuring of investment priorities to accomplish damage mitigation. These methods allow options to be compared against a standard.

For most governments and international development agencies, the predominant focus for comparison will be the return on investment that an option will give.

Since the analysis of development projects is carried out in the context of uncertainty, methods for dealing with this sometimes can be quite complex. Nevertheless, a number of relatively simple and trustworthy approaches have been developed for use in practical development planning.

Pay Now, or Pay Later?

Two definitions must be made at this point: (1) opportunity costs; and (2) present value.

Opportunity cost—the opportunity cost of a resource is the cost of its next best alternative. A person engaged in mopping up a flood usually would be employed in some other job. The opportunity cost of mopping up is the foregone value of the work he or she otherwise would have done. Or seen another way, the funds expected to pay for clean-up should not be spent on something else.

Present value—All things being equal, money available for productive investment now is worth more than would be the money available for productive investment sometime in the future.

An overriding choice facing a government is whether to spend now on preparedness and/or damage mitigation or, possibly, spend later on disaster recovery. Usually governments choose a mix of preparedness/mitigation and recovery programs. The key questions in this choice are: (1) "What are the opportunity costs of investing in preparedness and/or damage mitigation?"; and (2) "Is the present value of the future loss higher or lower than the cost of investing in preparedness and/or damage mitigation?" One basic principle affecting the choice is that spending on preparedness and damage mitigation should be less than the present value of the expected losses that would be averted by the preparedness/mitigation measure.

Assigning Values to Costs and Benefits

Estimating the cost of losses is difficult. While some losses can be assigned monetary values fairly simply, others are much more difficult to value. There are various categories of impact and consequent loss. One way to list these is as follows:

1. *Direct monetary effects*—damage and destruction of infrastructure and buildings;
2. *Indirect monetary effects*—loss of production and clean-up costs (some economists may judge the latter to be direct costs);
3. *Direct non-monetary effects*—deaths, injuries, loss of cultural items;
4. *Indirect non-monetary effects*—disruption of schools, health, stress; and

5. *Loss of non-renewable natural resources*—environmentalists are developing increasingly general definitions of these (encompassing such considerations as genetic diversity and ecological balance). They include productive agricultural land and some forestry resources.

Some direct and indirect monetary effects can be assigned values in a relatively straightforward way. However, where resources and activity in the non-formal sector need to be assigned values, quantification is more difficult, especially with measures of income. Direct non-monetary effects also are problematic. Measuring the costs of death and injury draws upon methods used in health economics and the insurance industry; and there are established methods and critiques. However, there is much controversy. Assigning value to damaged or lost cultural items also is controversial, but again may be feasible. Finding appropriate values for indirect non-monetary effects is much more difficult. Some costs simply are not quantifiable in any reasonable way, particularly the psychological effects. Finally, adding the costs associated with loss of non-renewable natural resources is extremely difficult, primarily because of difficulties of pricing the lost-production.

There are similar problems in quantifying benefits. When analyzing investment in preparedness/damage mitigation, the primary benefits can be defined as the savings of the losses that would have occurred. Thus, there are the same problems in assigning values as those noted earlier. But, there also are secondary benefits that at least are as difficult to quantify. These include improvements in the climate for development resulting from stability and greater certainty and maintenance of an entrepreneurial spirit within communities.

The costs of preparedness or damage mitigation measures generally are the easiest to quantify. Accurate estimates usually are possible, especially for planned capital investment using well-defined methods, systems, and resources, over relatively short periods of time.

Judging Effectiveness of Mitigation Packages

Decisions on investment in preparedness or damage mitigation options must be viewed in the context of how effective the overall preparedness or mitigation "package" is likely to be. Cost-effectiveness generally is held to vary with the type of event. Relatively predictable, sudden-onset events, e.g., tropical storms, generally are worth substantial investment in such programs as wind resistant housing and flood control measures. Some aspects of mitigation for unpredictable, sudden-onset events, such as earthquakes, also are good candidates for investment. Much is known about technical measures for protection, and investment usually is worthwhile to protect development projects that would be destroyed by earthquakes, such as dams.

Slow-onset, environmental events, such as excess silting and flood-risk enhancement (a problem in Bangladesh, for example) are more problematic in investment terms. The costs of protection potentially are very high, and high levels of investment are needed not only for infrastructure, but also in data collection, coordinated planning and decision-making, and public education. The costs of each of these must be included in any investment decision.

An advantage of screening projects using a framework of analytical methods is that the framework can help to focus on a variety of possible outcomes and make the factors influencing these quite explicit. This kind of approach offers a wide choice of options to policy makers, and provides the opportunity to choose options that accomplish a range of objectives and promote quantifiable as well as non-quantifiable benefits.

CASE STUDY 3a

Typhoon in the Western Pacific

After a major typhoon passed through several Western Pacific islands in the mid-1980s, a damage assessment was conducted to identify the building types hardest hit and the type of damage sustained by these structures. Most of the building failures recorded were among small, single-family dwellings. Of these, most of the damage incurred consisted of roof failures. Roofs were lost due to the uplifting forces of the wind passing over the houses. Roofing sheets were peeled from the roof structure because of the use of inadequate nail sizing and the quantity of nails used to secure the roofing sheets to the structure below. In some places, where the roofs were nailed down adequately, the entire roofing system was blown away. This was due to a lack of adequate connections between the rafters and the walls.

Replacement costs were estimated. Typical costs (replacement costs) per dwelling ranged from US$3,000 to $10,000. These costs covered the replacement of the roof and associated structural damage, and the replacement of the owner's possessions that were lost due to water damage from the heavy rains that were contained in the typhoon.

In a subsequent building program, elements were incorporated into the replacement program to strengthen the houses against typhoon-force winds. These elements included the use of: (1) longer roofing nails of the proper type; (2) closer spacing of the roofing nails; (3) bent metal straps used for connecting the rafters to the wall to resist the uplifting force of the wind; (4) shorter overhangs to lessen uplift; and (5) plywood soffit closures to lessen the uplift of the roof. The average of the total costs per dwelling for these improvements was $50. With an anticipated savings of thousands of dollars in replacement costs from a future typhoon, the mitigating elements were seen as a probable savings even though they added slightly to the initial costs of the rebuilding program.

In addition to the obvious monetary savings, several other non-monetary effects also could be avoided. No displacement from the rebuilt house would be required for the family, no emergency shelter would be required. There would be no loss of personal effects, no lost time away from employment due to the damage, and no reliance on the aid of outsiders.

This example makes two interesting points regarding damage mitigation measures and reconstruction:

1. Development measures (in this case, reconstruction) can incorporate mitigation measures; and
2. Mitigation measures are not always expensive. Even though there is a tendency for the cost of a building

to rise as the level of safety increases, there often are simple and inexpensive ways available to strengthen many types of structures. These can be incorporated into new development programs as well as reconstruction projects to reduce vulnerability without significantly increasing cost.

Summary

There always is competition for development resources, and trade-offs must be made. Most often existing problems are given more priority than are future problems. Future losses due to disasters may or may not occur, and calculations of these losses must be performed in an atmosphere of risk and uncertainty. Spending on preparedness and damage mitigation should be less than the present value of the expected losses that could be averted by such expenditure. To do this, values must be assigned to both the costs and benefits of any proposed program. Quantification of benefits and losses should include: (1) direct and indirect monetary effects; and (2) direct and indirect non-monetary effects.

Self-Assessment Quiz:

Identify two types of recovery programs that would have long term positive implications for development.

*Answer:*_____

Answer

1. Provide a standard to compare program options;
2. Facilitate identifying both anticipated and unanticipated outcomes;
3. Identify alternative ways to accomplish the same objective.

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