Disasters and Development

Study Guide and Course Text for C280-DD02
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Dear Director

I did the preliminary self-test on pages 7–8 for Disasters and Development (C280-DD02) following the instructions in the study guide. I’ve checked the box below that shows the number of correct answers I had.

☐ 25 to 32 I already know most of the course material.
☐ 17 to 24 I know much of the course material and look forward to learning more.
☐ 9 to 16 I know some of the course material and hope to learn much more.
☐ 0 to 8 I don’t know much of the course material yet but will learn it soon.

I’m glad to provide this information to help you improve future Disaster Management course materials.

Sincerely yours,

(Your name here)

Please mail in the preaddressed envelope provided.
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INTRODUCTION

Purpose and scope

This course, *Disasters and Development*, is designed to introduce another aspect of disaster management to professionals who work in government agencies, non-governmental organizations (NGOs) and United Nations agencies. This course is designed to increase your awareness of the nature and management of disasters, leading to better performance in disaster preparedness and response.

The content has been written by experts in the field of disaster management and in general follows accepted principles, procedures, and terminology. However, terminology in this field is not standardized and authors from different institutions may use the same terms in slightly different ways. Therefore, there is a glossary of terms at the end of this text. Definitions found in the glossary are those of the suggested by the United Nations. Definitions in the text are those of the authors.

Overview of this course

This course introduces a new paradigm for understanding the disaster/development interface. Specifically, we assert that disasters and development are closely linked in that disasters can both destroy development initiatives and create development opportunities and that development schemes can both increase and decrease vulnerability. The course also introduces the concept of sustainable development, and its relationship to development and vulnerability reduction.

**Part One** introduces these concepts and discusses how disaster effects can vary from one type of hazard to another as well as from one type of economic condition to another.

**Part Two** develops the new paradigm in depth and provides case examples to amplify the concepts and relationships.

**Part Three** explores the variety of interrelationships among disaster mitigation, environmental management and sustainable development.

**Part Four** describes different methods and tools for analyzing potential investment decisions and will increase your capacity to analyze the mitigation benefits of development alternatives in both the pre- and post-disaster contexts.

**Part Five** suggests roles for affected communities, governments, NGOs and UN agencies in promoting development based on the links between disasters and development.
Getting Started

Before you start the course, we suggest you take the preliminary self-test on the next pages to find out how much you may already know about disasters and development. If you find you do well on parts of this self-test, you can move quickly over those parts of the course in the study guide and leave yourself more time for other parts. If you don't do well at first, don't worry. It will become clearer as you study. After reviewing the answers for preliminary self-test, study each of the five parts of this course as a separate lesson, taking and reviewing the self-assessment test at the end of each.

When you have completed all the self-assessment tests to your satisfaction, you may request the final examination package as explained in the letter which accompanied this course. The package, which will be mailed to the proctor you nominate, includes instructions on taking the examination. When you request your final examination, please take a moment to complete the course evaluation at the end of this booklet.

After your proctor returns your completed examination to the University of Wisconsin-Extension, it will normally take 1-2 months for grading, transcript recording of your CEUs and preparation of your Certificate of Completion. On successful completion of the examination the certificate will be mailed to you with enrollment information for additional self-study courses.
PRELIMINARY SELF-TEST

Before you start the course, we suggest you take this preliminary self-test to find out how much you already know about disasters and development. If you find you do well on parts of this self-test, you can move more quickly over that subject when you come to it in the study guide and leave yourself more time for other sections. If you don’t do very well at first, don’t worry. It should become clear in time!

Matching
The following are four commonly defined categories of economies, which represent generalized stages of development. Match the type of economy with the description which best describes it.

Type of Economy:
A. Highly Stressed Economies
B. Rural/Agricultural Economies
C. Newly Industrialized Economies
D. Small Island Economies

1. Single crop or single commodity economies.
2. Characteristic of many less developed countries—structurally adjusting, resilient, decentralized.
3. These are highly vulnerable and can slip into catastrophic economic decline quickly. The situation is often caused or exacerbated by civil war or related forms of internal conflict or disruption.
4. Highly urbanized, with high density urban populations.

True/False
Indicate T or F

5. While the economies of poorer countries suffer greater impact from disasters in absolute economic terms, the economies in wealthier industrialized countries suffer more in relative terms.
6. Generally, geological disasters affect a smaller geographical area than do meteorological disasters.
7. Losses of capital stock which result from earthquakes, affecting both social and physical infrastructure, tend to be much greater than those resulting from floods.
8. Theoretically, while development programs can increase vulnerability, there is little evidence to support this view.
9. Relief assistance often stimulates the local economy by pumping additional goods and materials into the local markets.
10. Following disasters, programs which provide financial support and incentives to the non-formal sector will usually have a negative impact on the economic recovery of the affected area or country.
11. Proponents of sustainable development stress the critical importance of sustaining present levels, strategies and rates of economic growth and development.
12. Disaster assessments usually over-estimate the damage done to the non-formal sector.
13. Calculations of losses due to disasters are performed in an atmosphere of “risk” and “uncertainty.”
14. Recent disasters have cast doubt on the belief that the poor of a society are the segment most vulnerable to disasters.
15. One positive outcome of development has been that more and more rural poor people are migrating to urban areas which in turn has significantly decreased their vulnerability.
16. The sustainable development movement has generated economic models which are sophisticated and accurate in their ability to quantify the environmental costs associated with economic development projects.
17. Environmental management includes the principle that certain resources which remain “unused” will actually provide more benefit to society than if they were used.
18. While effluent production may pose little threat to humans, it is increasingly dangerous to the environment we live in.
Multiple Choice

Circle the best answer:

19. Newly industrialized economies hit by natural disasters:
A. have difficulty recovering from losses sustained in the agricultural sector
B. have relatively few alternative sources of employment for displaced agricultural workers
C. rarely suffer damage to their infrastructure
D. often have substantial financial reserves with which to buy food on global commercial market

20. Generally, create much greater production losses and other indirect losses than do:
A. floods and droughts; earthquakes
B. earthquakes and droughts; floods
C. earthquakes; floods
D. floods; cyclones

21. Mitigation activities:
A. are effective as part of a medium- to long-term development approach which incorporates hazard reduction measures
B. can include the construction of dams and windbreaks, as well as land-use policies and building codes.
C. generally should be planned separately from development activities
D. A and B
E. B and C
F. All of the above

22. In assessing the value of vulnerability reduction and sustainable development practices, which of the following variables are the easiest to measure and quantify?
A. economic costs of preparedness and mitigation
B. economic benefits of mitigation
B. economic costs of potential losses
D. environmental costs associated with the loss and destruction of natural resources
E. A and B
F. B and C

23. When assessing the value of vulnerability reduction measures, quantification of benefits and losses must include:
A. direct non-monetary effects
B. indirect non-monetary effects
C. direct monetary effects
D. A and C only
E. All of the above

24. Sustainable development emphasizes which of the following:
A. sustaining present levels, rates and strategies of economic growth and development
B. the needs and well-being of future generations
C. incorporating natural resource allocation and conservation into development planning
D. merging environmental concerns with economic decision making
E. A, B, and D
F. A, B and C
G. All of the above

25. Disaster recovery programs should:
A. involve the affected communities in program decision making
B. focus on getting things "back to normal"
C. incorporate opportunities for mitigation and development
D. A and B
E. A and C
F. All of the above

26. Realistic pricing which recognizes the value of non-timber forest products, along with conservation practices, is an example of ________ pricing.
A. proper resource
B. future option
C. environmental alternative
D. opportunity cost

27. Disasters kill about ______ people each decade:
A. 1/2 million
B. 1 million
C. 3 million
28. The loss of production and clean-up costs resulting from a disaster are referred to as:
   A. direct non-monetary effects
   B. indirect monetary effects
   C. indirect non-monetary effects
   D. indirect mitigation effects
   E. indirect non-tangible effects

29. By the year 2001, there will be ? cities with populations numbering over one million people:
   A. 50
   B. 100
   C. 200
   D. 400

30. Which of the following best represents the concept of “Environmental Opportunity?”
   A. identification and use of environmental resources to maximize development potential
   B. exploiting or conserving a resource based on which strategy will maximize sustainable progress
   C. conserving resources in a way that maximizes economic growth
   D. creating jobs and economic opportunity through environmental and natural resource protection.

31. Biodiversity refers to:
   A. strategies which diversify our use of resources in an environmentally friendly way
   B. policies which merge environmental, agricultural and economic considerations
   C. the degree of variety found in nature, including genetic material, ecosystems and human cultures
   D. the amount of biological variation measured in the atmosphere.

32. In economics, the “_____” cost of a resource is the cost of the next best alternative:
   A. alternate
   B. economic option
   C. marginal
   D. risk-involved
   E. opportunity
PART 1

THE RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

Learning Objectives

This part of the course will increase your understanding of:

- the conceptual relationship between disasters and development
- terms frequently used to discuss these concepts
- how vulnerability to hazards can vary based on local and economic conditions
- how disaster effects can vary from one hazard type to another

Introduction

This course suggests a new conceptualization of the relationship between disasters and development. This new conceptualization has been growing in the development community over the last few years and is a major philosophical underpinning of the United Nations Disaster Management Training Programme (DMTP). Rarely a week goes by when a major disaster is not reported in the media—a disaster that results in death and destruction—a disaster that frequently wipes out years of development programming and sets the slow course of improvement in third world countries further behind, wasting precious resources.

The Impact of Disasters on Life, Property, GNP

Human and material losses resulting from disasters have been increasing at an alarming rate. Damages inflicted by disasters kill one million people each decade, leave millions more homeless and damage infrastructure, homes and buildings. Over the last thirty years, economic losses resulting from disasters have tripled. In the 1960s, disasters cost the world an estimated $40 billion; in the 1970s, the cost was $70 billion; by the 1980s, it had risen to $120 billion. The combined material damage occurring from natural disasters in 1990 and 1991 has been estimated at $100 billion. Prior to 1987, only one disaster exceeded $1 billion in insured losses. Since this date, however, over 13 disasters have exceeded this mark.

While industrialized countries incur greater economic losses in absolute terms due to disasters, it is the developing countries, where two-thirds of the world's population live, that suffer the most debilitating consequences. Ninety percent of the natural disasters and ninety-five percent of the total disaster-related deaths worldwide occur in the developing countries. In addition, per capita losses in the gross national product (GNP) of developing countries are estimated to be twenty times greater than in industrial countries.
For a long time the cause and effect relationship between disasters and social and economic development was ignored. Ministries of Planning and Finance and other development planners did not concern themselves with disasters. At best, development planners hoped that disasters would not occur and, if they did, were most effectively handled by relief from donor countries and relief organizations. Development programs were not evaluated in the context of disasters. Neither the effect of the disaster on the development program nor from the possibility that development programs increased either the likelihood of a disaster or the potential damaging effects of a disaster.

Increasingly, there is an awareness that disasters often result from unresolved development problems such as environmental degradation, uncontrolled urban growth, exacerbated by population growth and political and institutional gaps. Disasters were seen in the context of emergency response—not as a part of long term development programming. When a disaster did occur, the response was directed to emergency needs and cleaning up. Communities under disaster distress were seen as unlikely places to institute development. The post-disaster environment was seen as too turbulent to promote institutional changes aimed at promoting long term development.

The growing body of knowledge on the relationships between disaster and development indicates four basic themes (see Figure 1).

**FIGURE 1 DISASTER-DEVELOPMENT RELATIONSHIPS**

Aspects of a community’s development and vulnerability to disasters are charted here. The graphic shows the various “orientations” with which you may analyze the “field” of development and disaster vulnerability.

The field is divided into positive and negative aspects of the disaster/development relationship by the vertical axis. The right half reflects the positive or optimistic side of the relationship and the left side of the diagram deals with the negative aspects of the relationship. The short statement given in each quadrant sums up the basic concept derived from the overlap of the two realms.
The four themes presented in Figure 1 may be expanded as follows:

1. Disasters set back development programming destroying years of development initiatives.
   - Infrastructure improvement e.g. transport and utility systems are destroyed by a flood.

2. Rebuilding after a disaster provides significant opportunities to initiate development programs.
   - A self-help housing program to rebuild housing destroyed by an earthquake teaches new skills, strengthens community pride and leadership and retains development dollars that otherwise would be exported to large construction companies.

3. Development programs can increase an area's susceptibility to disasters.
   - A major increase in livestock development leads to overgrazing, which contributes to desertification and increases vulnerability to famine.

4. Development programs can be designed to decrease the susceptibility to disasters and their negative consequences.
   - Housing projects constructed under building codes designed to withstand high winds result in less destruction during the next tropical storm.

Decision-makers who ignore these relationships between disasters and development do a disservice to the people who place their trust in them. Increasingly, around the world, forward thinking Ministries of Planning and Finance with the support of United Nations and Non-Governmental Organization (NGO) officials are assessing development projects in the context of disaster mitigation and are designing disaster recovery programs with long term development needs in mind.

Development requires institutional and structural transformations of societies to speed up economic growth, reduce levels of inequality and eradicate absolute poverty in a way that is sustainable. Over time, the effects of disasters can seriously degrade a country's long-term potential for sustained development and cause governments to substantially modify their economic development priorities and programs.

At the same time, disasters often provide opportunities for development. They can improve the atmosphere in favor of change and create a rationale to establish development programs such as job training, housing construction and land reform. However, poor management of the relief and rehabilitation responses may have severe negative implications for development for years to come, and may even increase vulnerability to future hazards.
Given that poverty increases a population’s vulnerability to disasters, many will conclude that economic growth and development alone present the solution for reducing vulnerability. Although in aggregate terms economic development will usually reduce a society’s vulnerability to natural disasters, many associated trends, such as environmental degradation and uncontrolled urban growth, will actually contribute to an increase in certain types of vulnerability. In recognizing these relationships, advocates for the environment and many proponents of development are increasingly speaking in terms of “sustainable development,” which is discussed in Part 3.

The following discussion highlights the importance of considering the likely potential, risks and consequences of disasters as part of development program planning. It emphasizes the opportunities for preventing and mitigating damage and disruption that arise when disaster considerations are integrated into project planning for development. The need to consider emergency responses in the context of development and the integration of development considerations into emergency response planning is underlined. The discussion will increase your understanding of the development/disaster linkages, introduce the concept of sustainable development as a long-term development and disaster reduction strategy, broaden your view of intervention possibilities, provide examples of how development planners assess the costs and benefits of these types of programs, and identify negative and positive examples of putting these ideas into practice.

**Definition of Terms**

This discussion concerns the relationship of several concepts: disaster, development, sustainable development, structural adjustment, mitigation and reconstruction. Several of these concepts may already be familiar to you. However, you may wish to review definitions of the less commonly used terms, particularly those associated with disaster management.

**Disaster:** The occurrence of a sudden or major misfortune which disrupts the basic fabric and normal functioning of a society, or community. An event or series of events which gives rise to casualties and/or damage or loss of property, infrastructure, essential services or means of livelihood on a scale which is beyond the normal capacity of the affected community’s ability to cope with out aid.

**Preparedness:** Administrative, individual and community action to minimize loss of life and damage, and facilitate effective rescue, relief and rehabilitation, including:

- Forecasting and disseminating warnings of imminent potentially damaging phenomena.
- Developing and testing plans for responding to both warning and impact of such phenomena.
- Assuring the rapid availability of appropriate material resources, transport, equipment, and funds when and where needed.
Mitigation: Measures which lessen the impact of a disaster phenomenon by improving a community’s ability to absorb the impact with minimum damage or disruptive effect. The measures include both preparedness (see above) and protection of physical infrastructure and economic assets. Mitigation is generally considered to comprise two separate types of activities:

- Structural mitigation: dams, windbreaks, terracing, hazard resistant buildings
- Non-structural mitigation: Education programs and policies, e.g. land-use, zoning, crop diversification, building codes, forecasting and warning

Development: Development, by many, has been associated mainly with economic growth, economic development, increasing levels of disposable income and increased access to consumer goods.

Sustainable development: Sustainable development recognizes the need to consider economic growth and development within a sustainable strategy that meets the needs of the present without compromising the ability of future generations to meet their own needs. Concepts which are closely related to sustainable development include sustainable human development, sustainable agricultural development, and natural resources and environmental management.

Structural adjustment: Usually a discretionary or automatic response to an unsustainable balance of payments deficit usually involving a reallocation of resources between sectors and categories of expenditure (including savings). Although a pre-condition for most development financing, structural adjust-

Q. Development is defined differently by different people. It is often defined as an improved or higher quality of life. Sometimes it is defined as increased disposable income. How do you define development?

A.
ment may result in economic contraction in the short term by suppressing demand and imports. It usually adversely affects employment and output. Adjustment may lower investment levels and saving ratios.

How Disaster Effects Can Vary From One Type of Hazard to Another

Hazards vary considerably in the scale of their impact, the geographical scope and the duration of effects. Consider briefly the range of hazards prevalent in your area: these may include riverine or coastal flooding, landslides, tropical storms, earthquakes, drought, urban fires, civil conflict, or technological and industrial hazards. Each of these has a very different

FIGURE 2 ECONOMIC LOSSES CAUSED BY RECENT NATURAL DISASTERS OF GEOLOGICAL ORIGIN IN LATIN AMERICA AND THE CARIBBEAN

(in millions of 1987 US dollars)

<table>
<thead>
<tr>
<th>LOSSES &amp; EFFECTS</th>
<th>EARTHQUAKES</th>
<th>HURRICANES</th>
<th>FLOODS/ DROUGHTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mexico City</td>
<td>Ecuador</td>
<td>David &amp; Frederick</td>
</tr>
<tr>
<td>TOTAL LOSSES</td>
<td>4337</td>
<td>1001</td>
<td>1057</td>
</tr>
<tr>
<td>DIRECT LOSSES</td>
<td>3793</td>
<td>186</td>
<td>842</td>
</tr>
<tr>
<td>Capital stock</td>
<td>3777</td>
<td>184</td>
<td>506</td>
</tr>
<tr>
<td>Inventories</td>
<td>16</td>
<td>2</td>
<td>230</td>
</tr>
<tr>
<td>Production</td>
<td>0</td>
<td>0</td>
<td>106</td>
</tr>
<tr>
<td>INDIRECT LOSSES</td>
<td>544</td>
<td>815</td>
<td>215</td>
</tr>
<tr>
<td>Production</td>
<td>154</td>
<td>704</td>
<td>185</td>
</tr>
<tr>
<td>Services</td>
<td>390</td>
<td>111</td>
<td>30</td>
</tr>
<tr>
<td>SECONDARY EFFECTS</td>
<td>4050</td>
<td>794</td>
<td>606</td>
</tr>
<tr>
<td>Public sector finances</td>
<td>1899</td>
<td>397</td>
<td>303</td>
</tr>
<tr>
<td>Increased expenditures</td>
<td>2025</td>
<td>55</td>
<td>264</td>
</tr>
<tr>
<td>Decrease in revenues</td>
<td>(126)</td>
<td>342</td>
<td>39</td>
</tr>
<tr>
<td>EXTERNAL SECTOR</td>
<td>8579</td>
<td>781</td>
<td>464</td>
</tr>
<tr>
<td>Reduction of exports</td>
<td>1650</td>
<td>635</td>
<td>167</td>
</tr>
<tr>
<td>Increase in imports</td>
<td>9075</td>
<td>155</td>
<td>296</td>
</tr>
<tr>
<td>Disaster-related income</td>
<td>(2146)</td>
<td>(9)</td>
<td>0</td>
</tr>
</tbody>
</table>

potential for disruption, depending on the intensity of the disaster impact, and its geographic relation to populations, economic assets, and the type of economic activity in progress (Figure 2.)

Adapted from J. Roberto Jovel, "Los Efectos Economicos y Sociales de los Desastres Naturales en America Latina y el Caribe," ECLAC 1989

a All figures adjusted for inflation through 1987 to enhance comparability.
b Secondary effects estimated for 1986 to 1987, and projected thereafter through 1990.
c Includes damages caused by ensuing floods and mudflows which represent a very high percentage of the total.
d Damages refer to the Dominican Republic only, even though other countries were affected as well.
e Damages refer to Bolivia, Ecuador and Peru, although other countries were affected as well.
f Figures in parentheses refer to income gained.
Several conclusions can be drawn by analyzing information about the type and extent of social and economic losses caused by some of the recent major disasters. The Economic Commission for Latin America and the Caribbean (ECLAC) has focussed on evaluations of the effects of several disasters in their region. Several important lessons can be drawn that relate not only to Latin America and the Caribbean, but to other regions as well.

By analyzing the phenomena that caused the natural disaster, ECLAC has concluded that:

- Natural disasters of meteorological origins, such as floods, tropical storms, and droughts, generally affect a larger geographical area than geological disasters. This conclusion is substantiated by comparing the effects of the El Niño current in 1982-1983 with recent earthquakes. The El Niño current affected the entire Pacific Coast of South America (from Colombia to Chile) in those years. In comparison, recent earthquakes have affected urban centers and other smaller geographical areas.

- Due to population density, the number of victims resulting from geological natural disasters, such as earthquakes, is greater than those resulting from meteorological phenomena. For example, the Guatemala earthquake of 1976 caused 22,000 deaths, while Hurricane Joan of 1988 caused only a few deaths in Nicaragua.

- Losses of capital stock which result from earthquakes, affecting both the social and physical infrastructure, tend to be much greater than those resulting from floods. The estimated losses of capital stock from the 1985 earthquake in Mexico, for example, was placed at $3.8 billion (the highest figure considered reliable). By comparison, El Niño caused losses of capital stock one third this amount in Bolivia, Ecuador and Peru in 1982-1983.

- Unlike losses of capital stock, production and other indirect losses are generally much greater in the case of floods and droughts. For example, El Niño caused indirect losses of $2.7 billion, whereas the Mexican earthquake caused indirect losses of only one fifth of that amount.

- When a geological phenomenon causes floods or mud slides, production losses and other indirect losses are much greater than in cases of other geological disasters. The 1987 earthquake in Ecuador is a clear example of this conclusion where indirect losses were 82 percent of total losses.

The following effects are common to all types of natural disasters:

- Where there is a considerable number of victims, the already limited qualified human resources in affected countries may be diminished. Such was the case in Guatemala after the 1986 earthquake which directly affected 19 per cent of the total population.

- Often there is a significant decrease in the availability of housing and in the infrastructure related to health and education. This may exacerbate shortages which existed prior to the disaster. The San Salvador earthquake of 1986 left some 50,000 people without housing, or with seriously damaged housing, and 75 percent of the health related infrastructure was totally destroyed.
There is often a temporary decrease, lasting up to several months, in income among low wage earners with a concomitant increase in the already high rates of under-employment and unemployment.

- Usually, there are temporary breakdowns of services providing water, sanitation, electricity, communication and transportation.
- Finally, temporary shortages of food and raw materials for agricultural and industrial production are common effects of natural disasters.

ECLAC has estimated that in the 15 years between 1962 and 1976, Central American countries were affected by different types of natural disasters which caused 39,600 deaths as well as losses in capital stock, production and material goods amounting to some $8.5 billion (in 1987 dollars). The losses incurred were as follows:

<table>
<thead>
<tr>
<th>Type of disaster</th>
<th>Deaths</th>
<th>Millions of dollars (in 1987 dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floods and wind storms</td>
<td>6054</td>
<td>1896</td>
</tr>
<tr>
<td>Drought, hail and cold storms</td>
<td>0</td>
<td>163</td>
</tr>
<tr>
<td>Eruptions and earthquakes</td>
<td>33,500</td>
<td>6453</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>39,554</strong></td>
<td><strong>8512</strong></td>
</tr>
</tbody>
</table>

If the above figures are combined with those from specific disasters already mentioned as well as those of other disasters for which there is only partial information available, it can be concluded that Latin America and the Caribbean have sustained annual losses of over 6,000 lives and over $1.5 billion (in 1987 dollars) due to natural disasters.

Two examples that illustrate these differential effects of disasters are of Hurricane David and Frederick in the Dominican Republic and the Phenomenon of El Niño of 1982-83 in South America. Case studies of those disasters are at the end of Part 1.

**Q.** What types of disasters are most likely to affect your country?

**A.**

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How Vulnerability Varies Between and Within Countries

Development is, in part, a process of investment and capitalization of economies over multi-year periods. There are, of course, widely differing types of economies, each subject to different processes and patterns of investment, institutional change and structural re-organization. Each type will exhibit a different sensitivity both in the short and long term to the impacts from various kinds of major disasters and hazard agents.

While industrialized countries suffer greater economic damages in absolute terms, poor countries are impacted more severely in relative terms. Deaths from natural disasters are also more frequent in poor countries. This reality can be illustrated by comparing Japan’s experience with disasters to that of a developing country: Nicaragua. The economic impact of the 1995 Kobe earthquake on Japan was relatively small, as it only represented a small portion Japan’s total GNP. In contrast, the economic impact of the 1972 Managua earthquake on Nicaragua was severe, as the damage represented over 200% of Nicaragua’s annual GNP. After twenty years, Nicaragua has yet to fully recover.

For analytical purposes, consider four commonly defined country economies as examples. It should be emphasized that these economies represent generalized stages of development and overlap is inevitable. The main purpose here is to focus on broad differential effects. The four types of economies are as follows:

- **Newly industrializing economies**—highly urbanized, with high density urban populations.
- **Rural/agricultural economies**—characteristic of many less developed countries—structurally adjusting, resilient, decentralized.
- **Small island economies**—single crop or single commodity economies.
- **Highly stressed economies**—these are highly vulnerable and can slip into catastrophic economic decline quickly. The situation is often caused or exacerbated by civil war or related forms of internal conflict or disruption.

Using these four categories, we can begin to develop an overview of how the various types of economies differ in their overall vulnerability to each type of shock.

**Newly industrializing economies**

The economies of newly industrializing areas are fairly indifferent to agricultural damage. They can usually withstand losses in this sector. There are, for example, often sufficient financial reserves to purchase food on global commercial markets. There may also be more short-term alternative sources of employment for agricultural workers. On the other hand, these economies may be vulnerable to damage to infrastructure, e.g. power systems, transport, communications, and public utilities, by earthquake and tropical storms.
Rural / Agricultural economies

These economies, which often characterize less developed countries, are relatively immune to disasters of short and sudden impact. However, they are susceptible to disasters which have extensive rural impact, particularly drought, severe pest damage and civil conflict.

Small island economies

Island economies are often highly dependent on a few crop types or commodities. They are often particularly susceptible to tropical storms (with crop destruction and damage to ports), drought, and volcanic eruptions. Two hurricanes in Dominica in the late 1970s caused direct, indirect, and secondary losses of around US$1700 million. In Jamaica in 1988, the Gross Domestic Product (GDP) fell an estimated two percent after Hurricane Gilbert as compared with a projected growth for that year of five percent.

Highly stressed economies

Generally, economies under exceptional stress and civil conflict are also particularly vulnerable to drought or widespread floods. But almost any disaster-related shock will have a destabilizing impact on these economies.

Disasters also can destabilize other processes which complement or underpin development activity, most notably structural adjustment activity. The requirements for immediate recovery and reconstruction after an extensive sudden disaster can reverse and disrupt this adjustment process, while further compounding its negative impacts. For example, depending on the particular conditions of the disaster, public expenditure requirements may increase substantially, while at the same time employment and output fall and investment and savings decline. The outcome will be a further decline in the prospects for future development.

Q. Which sectors of your country’s economy are most likely to be affected by disasters?

A.
CASE STUDIES

Hurricanes David and Frederick

In 1979, Hurricane David hit the Dominican Republic. Several days later, Hurricane Frederick also hit the island. The combination of high speed winds and the subsequent floods caused widespread destruction of housing, agricultural infrastructure, production, electric utilities, supplies of potable water, and of the physical infrastructure in general as well as of the environment.

An estimated 2100 people died in the storms. This number could have been far higher had it not been for an early warning system and an evacuation plan. More than 600,000 people (10% of the country's population) were left homeless. It was not possible to obtain reliable figures on injured persons or on those left unemployed. The direct losses of these disasters were estimated at $842 million.

Indirect economic losses were estimated at a $464 million deficit in the balance of payments. This was due to an increase in imports of post-disaster necessities and decreased exportation of bananas and other crops. The fiscal deficit increased by $303 million because of increased expenses related to aid, rehabilitation and reconstruction and to a decreased income from exports (see Figure 2 on page 11).

The gross domestic product grew at a more rapid rate during the years that followed the disaster. This was due, at least in part, to a prior economic recession caused by increased oil prices. Limited information is available about the effects of inflation and about fluctuations in monetary reserves after these disasters. *

The Phenomenon of El Niño of 1982 and 1983

Changes in the atmospheric currents over the South Pacific in 1982 and 1983 affected Bolivia, Chile, Ecuador and Peru in different ways and intensities. There were floods along much of coastal Ecuador and Northern Peru, as well as in the Amazonian region of Bolivia. A serious drought affected the highlands of Bolivia and Peru. The temperature and the salinity of the ocean water were adversely affected.

The death toll and number of injured people was not high; 298,000 people were left homeless because of the floods. A total of 3.7 million people were directly affected by a partial or total loss of their means of production, the disappearance of health and educational services, the scarcity of food and the deterioration of nutritional levels, an increase in the morbidity and the scarcity of agricultural and food products.

The highland drought pushed the most impoverished groups to near starvation and resulted in new migrations towards other regions and countries. The situation that existed in this region before the disaster has only recently been reestablished.

Small scale fishermen as well as the commercial fishing enterprises were considerably affected by a reduction in fish caused by changes in the composition of the ocean water. Certain species of fish emigrated or died. The fishing industry has only recently recovered from this disaster.

The direct losses in Bolivia, Ecuador and Peru were estimated at $1.3 billion. They included losses of capital stock and inventory losses in agriculture, transportation, oil production, fishing and in the social infrastructure. The indirect losses amounted to $2.6 billion, due to the decreased production in agriculture, industry and fishing as well as to increased costs and decreased income in transportation.

The total losses thus amounted to $3.9 billion. Therefore, the cost of this disaster was the second highest in the recent history of the region (Figure 2). These losses represent about 10% of the combined GNP of these countries, some 50% of the public sector income at that time. Bolivia, with the most fragile economy, was by far the most adversely affected.

The secondary effects on economic development were substantial. The negative effect on the balance of payments reached an estimated $621 million in the biennium of 1982-1983 due to a decrease in fishing, agricultural and livestock exports and to the importation of food as well as farm products and livestock. The ratio between the public sector and the GNP increased notably. This was due to decreased revenues from value-added taxes and export taxes, as well as to unforeseen expenses related to relief, rehabilitation and reconstruction.

The growth rate of the gross national product and per capita product decreased in these three countries by up to 10%. The consumer price index increased by as much as 50% in some cases, due mainly to increases in food prices caused by reduced production and speculation.*

PART 1 SUMMARY

- The relationship between disasters and development can be summed up with the following four concepts:
  - development can increase vulnerability
  - development can reduce vulnerability
  - disasters can set back development
  - disasters can provide development opportunities
- Disaster effects vary with the hazard type causing the disaster.
- Vulnerability varies between different societies and economies. Four basic types of economies analyzed are:
  - newly industrializing economies
  - rural/agricultural economies
  - small island economies
  - highly stressed economies
Self-Assessment Test - Part 1

Question

Answer the following questions:

1. Describe the four themes on the relationship between disasters and development, and provide examples of each. Compare your answer to the descriptions provided on page 13.

   B. often are lacking the financial reserves needed to buy food on the global market.
   C. have few alternative sources of employment for displaced agricultural workers.
   D. are especially resistant to infrastructural damage.
   E. A and B
   F. B and D

4. Structural adjustments, in the short-term may:

   A. contract the economy by suppressing demand and imports.
   B. increase employment and output.
   C. increase investment levels and savings ratios.
   D. result in immediate price decreases.
   E. B and D
   F. A and C

5. Approximately what percentage of all the disasters in the world occur in developing countries?

   A. 6 %
   B. 10 %
   C. 35 %
   D. 55 %
   E. 90%

Multiple choice

Circle the best answer(s):

2. Based on the information provided on economic losses caused by natural disasters, we can conclude which of the following:

   A. Due to population density, deaths resulting from geological disasters are generally greater in number than those incurred from meteorological disasters.
   B. Geographical disasters result in a fewer losses of capital stock than do meteorological disasters.
   C. Meteorological disasters generally result in greater production and other indirect losses than do geological disasters.
   D. Geographical disasters generally affect a smaller geographical area than do those of meteorological origin.
   E. A, B and C
   F. A, C and D

3. Newly industrialized economies hit by natural disasters:

   A. are generally resilient to losses sustained in the agricultural sector.

   True/False

Indicate T or F

6. Development planners usually have overlooked opportunities for instituting development activities in areas stricken by disasters.

7. Generally, earthquakes will result in greater production losses and indirect losses than will droughts and floods.

8. Rural/agricultural economies often are greatly altered by disasters of short and sudden impact.

9. Unless countries adopt and implement more mitigation measures, the world will soon witness its first disaster where insured losses will have surpassed $1 billion.

PART 2

UNDERSTANDING AND EXPLOITING DISASTER/DEVELOPMENT LINKAGES

Learning Objectives

This part of the course will increase your understanding of:

- how disasters can impact development programs
- how development programs and trends can increase vulnerability
- how development programs can be designed to decrease vulnerability
- how disaster recovery programs can be designed to promote development at the same time that they decrease vulnerability

Introduction

Disasters can significantly impede the effectiveness of development resource allocation. The damage is done in many ways and the impacts can be as complex as the economy itself. However, a broad picture of the mechanisms of disruption can be gained by reviewing four categories of impact.

- loss of resources
- interruption of programs and switching of crucial resources to other, shorter-term needs
- the negative impacts on investment climates
- disruption of the non-formal sector

Loss of Resources

Development resources are lost when a disaster wipes out the products of previous investment. The primary loss of development resources occurs from damage to capital stock and inventory. This is initially the most visible effect of sudden impact disasters. Tropical storms can destroy factories, fishing ports, power systems and telecommunications. Earthquakes damage and destroy buildings, transport, and public utilities. Disasters have a particularly destructive economic impact in areas where there are very few alternatives for assets which are destroyed or in areas where those assets are particularly critical. For example, Peru's fishing and related industries suffered greatly as a result of the 1972-73 and 1982-83 El Niño phenomenon when several of the fish varieties virtually disappeared from the Pacific coastal areas. The negative consequences to the export sector and the direct negative impact on fishermen from this loss were high.
There is a further loss of development resources from reduction in the production of goods and provision of services. This results from direct disruption by the disaster and its immediate local effects and, subsequently, from the increased cost of goods and services which then result. Income losses resulting from lost production have a particularly depressing impact on consumer ability to purchase goods and services. Lost productivity may also result in loss of export markets, for example, a coconut plantation in India lost to cyclone damage will take five years to regenerate during which time other coconut producing countries can increase market share.

**Shifting Resources**

Development activity can also be negatively impacted by interrupting ongoing programs to allow a shift in resources from long-term programs to highly visible short-term recovery and emergency response programs.

The secondary effects of a major disaster also disrupt the development process. These secondary effects of direct economic impact include inflation, balance of payment problems, increase in fiscal expenditures and decreases in monetary reserves. An increase in the country’s debt means that as the debt service burden increases, countries have fewer resources available to invest in productive enterprises. The outcome is usually the lowering of economic growth, delays to development programs, cancellation of programs and disincentives to new investment.

**Impact on Investment Climate**

Repeated disasters, in particular, have a negative impact on the incentive for further investment. A climate of stability and certainty is needed to encourage investors. At the individual level, repeated losses from hazardous events can discourage creative investment. Under conditions of uncertainty, both foreign and domestic investors will generally be very cautious about supporting entrepreneurial activity.

**Impact on the Non-formal Sector**

Disasters have special negative impacts on the non-formal sector. The costs of disasters are often underestimated because disruption in this part of the economy is not usually taken into account. In many societies the non-formal economy, while not usually included in national economic statistics, can involve a substantial portion of the total population. The non-formal sector is especially vulnerable to housing damage because houses often serve as sites of business activity. Once local business is disrupted, there will be indirect costs from lost employment and income. Small business in this sector may be especially sensitive to price increases. In addition, relief efforts can themselves inhibit recovery in this sector. For example, import of relief items can create disincentives to small producers, particularly in the agricultural and personal and household goods sector.
Q. Based on your experiences identify some of the ways that these programs have been interrupted by disasters.

A.

Q. Identify at least two large scale development projects that you are familiar with that have been affected by disasters:

A.

If you are unable to identify development projects, select two from the list below and answer the questions:

1. Irrigation, rural infrastructure and agricultural services for yield increases
2. Forest resource management projects
3. Restructuring of National Agricultural Credit Bank
4. Integrated Rural Development Projects (IRDP)—extension services, on-farm adaptive research and technology testing, irrigation and rural water supply, farming and fishing inputs, road rehabilitation and maintenance, training for agricultural co-ops, technical assistance and training
5. Improvements in farm-access roads, training, and diversification of agricultural production
6. Education planning, training capacity for specific sectors, vocational training support
7. Strengthening of national electric power program—finance restructuring and institution development
8. Restructuring of enterprises with export orientation
9. Technical and marketing support for small and medium size industry
10. Malaria control projects
11. Strengthen urban food distribution systems and supplementary feeding programs
12. Credit and technical assistance for small enterprises
13. Institution building assistance to national railway authorities and ministries of transport
14. Transport sector adjustment and investment credit
CASE STUDY

BANGLADESH 1991 CYCLONE

On April 30, 1991, Cyclone Marian roared through the southeastern coast of Bangladesh, with accompanying wind speeds of up to 210 kilometers/hour. The high winds, exceptional rainfall and a six meter storm surge killed thousands, destroyed property and infrastructure and disrupted many sectors of the economy. Official estimates placed the number of deaths and injuries resulting from the cyclone at 138,866 and 138,849, respectively.

According to government estimates, 780,000 homes, 9,300 schools and 655 health centers were either damaged or completely destroyed. Power, water and communication lines were cut to the affected areas. Train, road and air service to Chittagong, an especially hard-hit port city, were also disrupted. More than 190 kilometers of coastal embankments were destroyed and another 940 kilometers were damaged. Numerous tubwells in the stricken area were damaged or contaminated. In many areas, surface water was sanitized, including ponds used for bathing and cleaning. In the Chittagong port, almost all industries suffered heavy damage. The port itself was left in shambles, with numerous beaching and sinking of vessels, damage to container facilities, and the loss of channel buoys and markers. Full recover of the port was expected to take as long as a year.

The damage in the agricultural sector was severe. An FAO/WFP survey reported the loss of 247,000 tons of cereal crops and 35,000 tons of vegetables, tubers and other crops. The damage to coastal embankments, combined with the high salinity in some areas and the shortage of tools, seeds and fertilizers contributed to bleak prospects for the June-October rice crop production. The loss of 224,000 head of cattle, often the only source of draught power, further hindered the cultivation of crops. In addition, 218,000 goats and 2.4 million head of poultry perished in the storm.

In the fishing sector, the cyclone caused excessive damage to 31,000 hectares of shrimp farms as well as to fish processing plants, vessels, and stocks. In the forestry sector, estimated production losses totaled 15 million cubic feet of softwood and 3.3 million cubic feet of hardwood. The considerable losses of fuel wood and timber, coupled with the excessive damage to coastal mangrove plantations, increased the possibility of serious coastal erosion in the future. The loss of income generating assets in all sectors (e.g. tools, boats, nets) and of agricultural employment were expected to present serious obstacles to the affected population's ability to return to their prior means of livelihood. A U.N. task force estimated the cost of reconstruction and rehabilitation to be $1.78 billion U.S. dollars. This amount represents about one-tenth of the country's annual Gross National Product.
CASE STUDY

The 1985 Earthquake in Mexico City

An earthquake of extraordinary magnitude, 8.1 on the Richter scale, caused extensive damage in a densely populated sector in the center of Mexico City in September 1985.

The earthquake and its aftershocks caused the deaths of more than 10,000 persons; another 30,000 suffered injuries or psychological effects and about 150,000 were left homeless.

Approximately 33,600 dwellings were destroyed and 65,000 more suffered considerable damage. The health sector facilities were especially hard hit, with many hospitals and clinics destroyed. Nearly one fifth of the schools in the city were destroyed or seriously damaged. Also seriously damaged or destroyed were the water, electrical, and telecommunications systems in the central city.

The direct losses were estimated at $3.8 billion. These losses included the urban infrastructure, public service facilities and their equipment, housing, health and educational facilities, communications, small industry and businesses. The indirect losses were estimated at $544 million and included the decrease of income and the increase in the costs to small industry and business, communications, tourism and the personal services sector. The total losses caused by the earthquake amounted to $4.4 billion making this natural disaster the most damaging in recent years in the region.

More serious than the absolute losses is the effect which the rehabilitation and reconstruction had on the macro economics of Mexico. The effects are especially significant considering that the total losses represented only 2.7% of the Gross Domestic Product of Mexico. However, the disaster occurred at a time when the government was applying a policy of austerity in public expenditures, the banks had limited assets to meet the increased demand for credit and when more external restrictions were foreseen.

It was estimated that in the five years following the earthquake the negative effect in the balance of payments will have reached $8.6 billion in spite of considerable income from insurance and foreign donations. It is also estimated that the fiscal deficit increased approximately $1.9 billion due to the expenses of rehabilitation and reconstruction.

The demands of the reconstruction required the Mexican authorities to revise their economic policy in order to accommodate greater needs for public funding, credits and imports. The priorities for public expenditures were reoriented to reconstruction projects leaving many of the pre-disaster problems of the city unattended.
Development Programs Can Increase Vulnerability

Underdevelopment predisposes a population to the adverse consequences of natural and other hazards. At the same time, however, the development process, itself, may increase vulnerability to disasters. This section reviews the variety of forces which shape this relationship between vulnerability and the character of development activity.

There is a clearly established linkage between poverty, marginalization, over-population and vulnerability. To a large extent, vulnerability derives from poverty. Poor people are more likely to live in vulnerable areas, for example, on slopes vulnerable to landslides; in flood-prone areas; on marginal agricultural land. Poorer countries, generally, are more likely to have a dangerous building stock, often as a result of inadequate resources to enforce appropriate building codes in addition to a lack of public awareness and education. (See Case Study "The 1992 Cairo Earthquake," pg. 34)

Lack of access to education and information often has wider implications for vulnerability—people may be simply unaware of the options open to them for vulnerability reduction. Poor people have far fewer assets to invest in resources which may reduce their vulnerability and may be unwilling to make any significant investment without clear and obvious benefits. Poor people are less likely to be in a position to organize collectively to reduce risks, partially because poorer groups usually have a higher proportion of women, young children, elderly people, the sick and disabled. Furthermore, after a disaster, the effects of malnutrition and chronic illness put people at additional risk.

If poverty increases a population's vulnerability to disasters, some might conclude that economic development is a sufficient condition for reducing vulnerability. In macro terms, development will usually contribute to a reduction in vulnerability to natural disasters. However, many of the activities and trends associated with development contribute to an increase in other types of vulnerability. For example:

- **Consumption, overuse and destruction of natural resources**
  Development has allowed humans to control and transform natural resources into products that increasingly provide more personal security, health and comfort. But as the pace and the demand for continued development increases, so will natural resources be depleted at an unsustainable rate. The limited and non-renewable nature of these resources, and the negative consequences of their rapid depletion through overuse increase vulnerability in three ways. First, societies face the possible scarcity of resources which sustain life, such as food. Second, increased competition for declining resources results in food shortages, sometimes compounded by conflict over control and access. Poorer and less powerful segments of society become especially vulnerable. Third, the loss of some resources to economic development poses environmental consequences for everyone. For example, the depletion of forest has been linked to loss of ozone, possible global warming, and rising sea levels, with the resultant loss of productive land, reduction in food availability, and increasing health dangers.
Furthermore, deforestation, together with the destruction of the vegetative cover on natural pastures, has increased the threat of floods and the deterioration or desertification of previously fertile land.

- Population growth
Increased wealth, development and technologies have led to improvements in health, increased fertility and increased life expectancy. While short term vulnerability may be reduced, the cumulative impact of these gains has led to significant population increase. Demands are increased on a depleting resource base, wastes are returned to the environment, and there is an overuse of land, water, and energy. Expanding human populations also increase the potential for political conflict and violence, already noted as sources of human vulnerability.

- Use of marginal lands
Technological progress and growth have encouraged societies to use lands that previously were considered unsafe or unproductive. These lands are inevitably more prone to hazards. Marine and coastal zone development, for example, leads to population concentrations, exposed to possible storm-surge, high winds, flash flood, and landslide risks. Tourist development can increase potential vulnerability when low lying beach areas are targets for infrastructure and capital investments. Urban development often leads to influx of relatively low-income groups, with large-scale settlement on marginal land, or in high-density, poor quality housing. Buildings may be sited on earthquake faults, in flash-flood zones, or on slopes prone to landslides.

- Urbanization
At the beginning of the 20th century, fewer than ten cities counted populations greater than one million. As we enter the 21st century, over 400 cities claim this distinction. In 1960, only three cities had populations greater than 10 million, and all of these cities were in the industrialized world. Today, there are 25 cities with more than 10 million inhabitants, and 18 of these are in the developing world. Uncontrolled growth in these megacities leave them more vulnerable to disasters and a whole new set of hazards that accompany the processes that make city life attractive. Available resources can be inadequate to sustain a larger population, and harmful wastes may be produced in quantities that cannot be absorbed in the given space, increasing the potential for hunger and disease. Urbanization also brings new hazards from industry and technology.

- Pollutants
Investment in poorly controlled hazardous industries may lead to concentrations of populations around the industry, increasing exposure to hazards from both chronic and catastrophic release of toxic pollutants. The Bhopal gas leak in India and the Mexico City fuel storage explosion are two such examples with disastrous results. Some industrial processes may also result in dangerous levels of pollutants being released into the air, water and soils. There may be immediate impact on the health of humans, animals, and plants. The possible permanent contamination of basic resources may preclude their future use.
- **Hazardous products**
  Chemicals and chemical processes are often keys to industries development. Chemical fires, explosions, or leakage represent new hazards. Similarly, gas storage tanks, nuclear reactors, and other technologies of modern industries also pose other new hazards.

- **Misguided development projects:**
  Water resource management, including dams and irrigation projects may increase community vulnerability to hazardous areas. Road construction and poorly managed forestry programs will often lead to deforestation and increased risk of landslides. Agricultural projects promoting cash crops may reduce production of staple foods. Livestock development projects can lead to severe loss of vegetation cover and near-desertification.

Each of these examples illustrates the importance of including risk and environmental impact assessments as part of development program planning and evaluation. Further research, training and education in these areas are critical for mitigation.

**Q.** Identify a development program from your personal experience that has increased the vulnerability of the population and describe how and why vulnerability was increased.

**A.**

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CASE STUDY

THE 1992 "CAIRO EARTHQUAKE"*

On October 12, 1992, an earthquake measuring 5.6 on the Richter scale shook Cairo, Egypt and the city's surrounding areas. The earthquake, which would have registered as a moderate or even small event, had it occurred in Japan or along the western coast of the United States, devastated hundreds of buildings and rural homes. It resulted in over 500 deaths and 4,000 injuries. Most of the damage, deaths and injuries occurred in the densely populated (and older) inner-city slum districts of Cairo. Hundreds of old, poorly constructed and already dilapidated buildings had collapsed in this area.

Most of the buildings that collapsed were in violation of city building codes and safety regulations. For example, the 14-story building which collapsed killing 61 people in the rich Northern suburb of Heliopolis, had originally been constructed as a six or eight story building. The remaining stories were added later illegally - a practice not uncommon in this city. In addition to homes and businesses, many school buildings were damaged. One national survey noted that 1,087 seriously damaged schools would be closed, while another 5,780 schools required extensive or partial repairs and restoration.

The earthquake's effects were not limited to Cairo. In three of the seriously affected rural villages in the western Nile valley, over 2,600 houses were reported completely destroyed. The destroyed houses included traditional ones made of mud brick and timber, as well as more modern constructions which had not been designed to withstand even minimal earthquake tremors.

CASE STUDY

Agricultural Development as an Agent of Disaster in Northern Sudan

Although they are conceived with the intention of helping boost a nation’s economy, agricultural development schemes can make small farmers more vulnerable to drought and famine. Such was the case in northern Sudan prior to the 1984/85 famine, in which the ability of 4.5 million people to gain access to the resources they needed was severely disrupted and in some cases completely taken away.

Before the introduction of large scale mechanized farming, northern Sudan’s small farmers practiced cultivation and herding techniques that helped preserve the fertility and regenerative power of the land. Though they were subsistence farmers, the social order involved an intricate web of interdependence and reciprocal support, in which people helped each other through hard times by sharing their resources.

Starting in the mid 1970s, however, the rapid expansion of the mechanized agricultural sector disrupted the social order of the rural farmers and made conservation farming techniques impossible. People were displaced from the land they had used for cultivation and grazing. Social networks were torn apart as the new market-based economy gained influence. Traditional political leaders lost a great deal of their power, and the extended families became fragmented, thus disrupting the tradition of redistributing wealth.

At the end of the 1970s, roughly 1.6 million hectares (4 million acres) were being used for mechanized farming, with the landholding of each farm averaging 400 hectares (1000 acres). By 1982, this number had risen to 2.5 million hectares (6 million acres). By contrast, the land used for traditional cultivation remained constant throughout that time at 3.6 million hectares (9 million acres).

While the amount of traditional farmland remained constant, the population did not. More and more people relied on the land for their livelihood. The mechanized farms’ concentration on cash crops raised for export left the poor increasingly dependent on the market for their food needs and more vulnerable to fluctuations in prices and job availability. In addition, the mechanized farms often cut through traditional rangelands, migratory routes, and sources of water.

The result was an emergence of a new class of poor people. This class was the product of a fragile market economy. In order to produce enough food, rural farmers had to intensify their farming techniques. They were no longer able to rotate crops, maintain weeding regimes, and leave pasture lands fallow necessary for regeneration. These changes hastened soil degradation, deforestation, and water source depletion.

Drought is not an infrequent occurrence in northern Sudan, yet not every drought becomes a famine. For a famine to occur, the population must be vulnerable and unable to employ the preventive measures necessary to minimize the effects of drought. When the rains failed in the early 1980s, these new poor were already vulnerable to price increases, crop failure, loss of livestock, and lack of employment opportunities.

The mechanized farms responded to the drought by cutting back their planting, thus leading to a sharp decline in the amount of work available. By the end of 1983, an estimated 1 million people in northern Sudan had already been affected by the drought (Office of US Foreign Disaster Assistance of the Agency for International Development statistic).

The social and economic consequences of agricultural development have proved disastrous for the rural poor farmers, undermining their ability to insure themselves against drought and environmental degradation, and at the same time preventing them from attaining economic viability.

Development Programs Can Decrease Vulnerability

The term mitigation is increasingly applied to measures which reduce economic losses, as well as those which reduce death and injury. To restate the distinction between the two types of mitigation, structural mitigation includes measures to reduce the economic and social impact of hazard agents and involve construction programs, especially dams, windbreaks, terracing and hazard resistant buildings. Non-structural mitigation is most commonly used to refer to policies and practices, including land-use policies, zoning, crop diversification, building codes, and procedures for forecasting and warning. In a broader context, non-structural mitigation can also include education, awareness, environmental understanding, community organization, and empowerment strategies.

Mitigation is most effective as part of a medium- to long-term development program which incorporates hazard-reduction measures into regular investment projects. Under these conditions risks can be assessed analytically and explicitly in the context of national planning and investment program reviews. The cost effectiveness of specific emergency preparedness measures and hazard reduction activities can be assessed. There are opportunities to build links between government and international organizations involved in relief and recovery and provide opportunities for investment institutions to help governments gain access to new developments in hazard-reduction technologies. In regular investment project design and sector loans, attention can be given to early warning systems and other elements of emergency preparedness through financial or technical assistance.

These uses of development programs to decrease vulnerability is increasingly being incorporated into every level of program and project preparation and review within UNDP country programming and other financial and technical assistance projects. Structured review procedures will require that the disaster implications of new projects be explicitly taken into consideration.

There is a wide range of options for incorporating mitigation measures into regular development programs. Each of the following examples will suggest ways of protecting populations and critical economic assets against hazards and of reducing the overall impact of a disaster.

- First, strengthening of urban utility systems and industrial support infrastructure is a common aim of development projects. This is achieved through a variety of external inputs, including loans, technical assistance, and institution development support. So called "lifeline systems"—water, electric power, transport links and communications can be made more effective as well as more selectively resistant to particular hazards.

Investments in transport and communications also improve a country’s ability to respond to, and recover from, a major emergency. For example, improvements in road capacity will usually make evacuation easier. Better communications will often lead to improved early warning and more effective preparedness and response measures. Investments in airports and bridges can help speed up the delivery of relief resources.

- Second, there are usually many opportunities to incorporate hazard-resistant building techniques in housing and other construction programs. These opportunities are usually specific to the type of
programs. These opportunities are usually specific to the type of housing used in the region and the nature of local hazards. Such measures can substantially reduce earthquake and tropical storm deaths and injuries. In addition, these programs can protect high value economic resources, reducing the total costs of damage and improving the chances of more rapid recovery.

On a wider scale, the application of building codes, associated training programs, and more extensive use of zoning regulations in urban development decreases the population at risk, and the likelihood of damage to industrial facilities. Improved drainage systems and flood protection measures can further protect people and facilities in hazardous areas.

- Third, investments in improving administration and strengthening the resource-base of public institutions will have a general positive impact on the effectiveness of preparedness arrangements, emergency responses and the quality of longer-term recovery planning. Training programs in general, and especially those with a management or technical focus, can be expected to improve the implementation of mitigation and response measures.

- Lastly, agricultural and forestry programs provide a range of opportunities for mitigation. Reforestation programs reduce risks of erosion, landslides and flash flooding. Changes in cropping patterns can also ameliorate erosion problems and losses due to floods and drought. Introduction of pest-resistant crops reduces the economic and other impacts of infestations. Programs for soil conservation, water harvesting and improved on-farm storage mitigate the effects of drought.

Each of the examples above represents an opportunity for mitigation. Each also requires investment of scarce resources.

Q. Identify the goals of a specific mitigation project currently in progress, perhaps as part of a regular development project. How was funding obtained for the mitigation component? How might success be measured? Describe your answer below.

A. __________________________________________________________
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CASE STUDY

Forestry Project in Nepal Combines Development and Mitigation Strategies

The deforestation of Nepal has occurred at an alarming rate, with 50,000 hectares of forest cover (or 2% of total forest land) lost each year. This loss of soil protection has resulted in serious erosion in the mountainous region. There, population density has increased to more than 500 people per square kilometer of cultivated land. An estimated 80% of Nepal’s energy use comes from fuelwood, and forests contribute more than 33% of fodder needs. In addition, increasing numbers of livestock have led to overgrazing, which significantly contributes to environmental degradation.

During the 1980s, the government of Nepal began implementation of a community forestry program to counteract these trends. This ongoing project is intended to stimulate increased production of such forest products as fuelwood, fodder and timber, to simultaneously improve rural welfare and forest conditions. The strategy involves the decentralization of the existing Forestry Department’s control, and a transformation of its Community Forestry and Afforestation Division from a custodial to a collaborative role, with communities assuming responsibility for planning and implementing their own forestry projects.

With deforestation, the dangers of environmental degradation, flooding and drought are increased. The Ministry of Forest and Soil Conservation, together with funding from the United Nations Development Programme, is pursuing a project to increase community involvement in conservation and disaster mitigation practices. Activities being promoted include fodder tree planting, land use management, training, inclusion of people at the local and district levels in the planning process, and coordination of forestry activities of all community projects.

By giving rural farmers the commercial rights to forest products and providing them with information concerning forest conservation, it is hoped that they will have more of an economic interest in protecting forest land and increasing its productivity. Special emphasis is placed on training and extension activities for women, who perform most of the work related to forest products in Nepal.

Working at the grass roots level, Nepal’s community forestry program is an innovative attempt to improve the productivity of the land and reduce potential disasters by linking increased production with protection of forest resources.

* Adapted from UNDP Project document # NEP/85/017/B/01/12—Project of the government of Nepal
Disasters as Opportunities for Development Initiatives

Disasters can be a vehicle for major development programs. The political impact of damage and disruption can be a real catalyst for change. Disaster inspired development initiatives are influenced in a number of ways, but two aspects are especially important. First, disasters can highlight particular areas of vulnerability, for example where serious loss of life has occurred, or where the economic damage is disproportionate to the strength of the impact. The outcome of this is usually to highlight the general level of underdevelopment. Second, for a few weeks or months, the political environment may favor a much higher rate of economic and social change than before, in areas such as land reform, new job training, housing improvements, and restructuring of the economic base (note however that this may involve a transfer of resources from other areas and sectors).

The value of direct international assistance given after disasters may partially compensate for economic losses, although the amounts are usually rather small in relation to the total loss. Early injections of aid rarely constitute more than ten percent of the overall losses, and are usually considerably less than that. In the following months and years, there may be additional longer term development aid, which would otherwise not have been made available.

There may also be longer-term benefits from a drastic restructuring of the economy as a result of a disaster. For example, small island economies which were previously dependent on a single crop may expand their economic base, often with international assistance.

The extent to which development opportunities can be followed up after a disaster will usually be constrained or otherwise influenced by donor investment policy for emergency loans. It is illustrative to review the current World Bank criteria for emergency lending for post-disaster investment. According to the Bank:

- the operation must be directed as restoring assets or productivity in a long-term development perspective—not relief
- the prospective economic returns should be high
- the effects of the emergency should be significant
- the event triggering the emergency should have a low probability of happening again soon
- the need for an urgent response should be evident
- emergency lending is limited to cases where effective action can be felt in two to three years
- there should be some prospect for future reduction in the hazard

Development opportunities are often missed or compromised because of an excessive focus on relief assistance. Relief assistance may introduce substantial flows of resources into small communities: resources which could be purchased locally. The method of injection of these resources—often involving free distribution through inappropriately chosen local structures—may discourage independence and entrepreneurship. The scale and variety of external relief sources in some disasters make this a difficult problem to contain and highlights the need for governments and international agencies to continually emphasize the development framework of the disaster response.
Q. How do disasters affect the willingness of societies to introduce mitigation measures?

A.

Designing recovery programs to reduce vulnerability

It is vital to ensure that rehabilitation and reconstruction do not leave the society as vulnerable, or even more vulnerable than before. This may happen for a variety of reasons, but two causes which need particular emphasis are lack of awareness of detailed risk factors among decision-makers and planners at both national and community levels and the related tendency for development options to be foreclosed when decisions are made quickly with incomplete information. There is a great need to support and guide governments in developing strategic recovery programs which mesh with national development goals and which lead to substantial reductions in vulnerability.

There are many ways of shaping and influencing the process of reconstruction. Structural mitigation will be enhanced by improvement in and wider application of building codes and by restructuring land-use patterns. These administrative measures can be reinforced and complemented by changes in pricing policies and subsidy structures to encourage specific mitigation measures by the public.

Interventions are especially effective where they focus on areas of particularly high risk, for example, low-income housing design and construction in earthquake-prone areas. The non-formal sector offers special opportunities for intervention, such as support for craftsmen including training and loan funds for small construction businesses and other micro-enterprises.

The importance of basing measures to reduce physical vulnerability on detailed scientific evidence cannot be over-emphasized. A number of studies have shown how casualties and deaths in earthquakes and wind-storms are often associated with very specific risk factors, particularly the types of material used in construction and specific design features which affect the vulnerability of the structures and their occupants.
Other opportunities exist for reducing the vulnerability of infrastructure. These include specific technical improvements in the critical parts of "life-line" systems e.g. preventing flood—or debris—damage to switchgear or communications equipment.

Other areas for enhanced protection can include government offices, banking facilities, food warehouses, road transport facilities and schools. Upgrading of transport infrastructure will usually facilitate evacuation and pre-positioning of emergency supplies, relief deliveries, and the subsequent restoration of markets and services in the affected area.

Similar general benefits will also result from improvements to government telecommunications. The ability to share information quickly can improve both the management of emergency response, and the coordination of longer term recovery.

There are many ways to facilitate reconstruction that also enhance mitigation. One way is to gather detailed technical information on the specific factors influencing vulnerability as quickly as possible. The technical assistance component must be incorporated before planning decisions are finalized.

Support for the private sector, including the non-formal sector is a key element of successful reconstruction management. This requires, particularly, reinforcing the role of the financial sector. Finance for reconstruction will come from government sources, local and international reconstruction loans, grant assistance from international sources, and capital generated from within the community. There will usually be opportunities for helping to strengthen existing banking structures, housing associations, and co-operative credit societies by providing technical advice and information system development.

Similar support for financial management during the recovery period will usually be needed within the government system. This may include advice on financial planning procedures, reporting, monitoring systems, auditing, and evaluation.

The reconstruction period is an opportunity for general assistance to government with administrative procedures, including enhanced management training programs. Areas of special importance include:

- coordination of lending programs, grants and subsidies;
- support at the higher levels for policy framework development;
- support for improvement of centrally driven accountability systems;
- reviews and enhancements of financial approval procedures;
- assistance with donor liaison and reimbursement claims.

Support for the private sector, including the non-formal sector is a key element of successful reconstruction management.
After a major typhoon passed through several Western Pacific islands in the mid 1980s, a damage survey was conducted to assess 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 uplift force of the wind passing over the houses. Roofing sheets were peeled from the roof structure because of inadequate nail sizing and quantity of nails used to secure the roofing sheets to the structure below. In some cases where the roofs were adequately nailed down, the entire roofing system was blown away. This was due to a lack of adequate connection between the rafters and the walls.

Replacement cost estimates were made. Typical costs (replacement costs) ranged from $3,000 to $10,000. This replacement cost covered the replacement of the roof and associated structural damage, and the replacement of the owners' possessions which were lost due to water damage from the heavy rains which accompanied the typhoon.

In the subsequent building program, elements were incorporated into the replacement program to strengthen the houses against typhoon force winds. These elements were as follows:

- longer roofing nails of the proper type
- closer spacing of the roofing nails
- bent metal straps used for connecting the rafters to the wall to resist the uplift force of the wind
- shorter overhanges to lessen uplift
- plywood soffit closures to lessen the uplift of the roof

The total average cost per dwelling for these improvements was $50. With an anticipated savings of thousands of dollars in replacement costs in a future typhoon, the mitigation elements were seen as a probable savings even though they added slightly to the initial cost of the rebuilding program.

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

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

1. Development measures (in this case reconstruction) can effectively 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 are often 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. *

* This case study is a composite of real events that often occur.
Q. Identify two types of recovery programs that would have long term positive implications for development.

A. 

PART 2 SUMMARY

- Disasters can hold up development by:
  - loss of resources
  - shifting of resources to emergency response
  - depressing the investment climate
  - affecting the non-formal sector

- Development can increase vulnerability through:
  - dense urban settlement
  - development of hazardous sites
  - environmental degradation
  - technological failures or accidents
  - imbalance of pre-existing natural or social systems

- Development programs can reduce vulnerability through:
  - strengthening of urban utility systems
  - hazard resistant building techniques
  - institution building and capacitation of local authorities
  - agricultural and forestry programs

- Disasters can provide development opportunities by:
  - creating a social and political atmosphere of acceptance to change
  - highlighting the general level of underdevelopment that caused the disaster
  - focussing international attention and aid on the disaster area

- Recovery programs should be designed to reduce vulnerability through:
  - targeting areas of high risk
  - support of the private and non-formal sectors
  - enhanced management training programs
Self-Assessment Test - Part 2

Question
Answer the following question:

1. What is the difference between structural and non-structural mitigation? Provide examples of each. Compare your answers to the descriptions provided on page ?

Multiple Choice
Circle the correct answer(s)
2. The non-formal sector in developing countries:
   A. is relatively unaffected by price increases.
   B. is usually included in national economic statistics.
   D. usually only includes a minor proportion of the population.
   E. is often adversely affected by free distribution of relief aid.
   F. B, D and E
   G. None of the above

True/False
Indicate T or F
3. ______ The impact of disasters on the nonformal sector is usually underestimated.
4. ______ Although major disasters may lead to an increase in the country’s debt, this is offset by a generally enticing/favorable investment climate.
5. ______ Structural mitigation refers to the policies which are designed to reduce a disasters impact on the community.
6. ______ Disasters can serve as the impetus to restructure and diversify an economy which previously was dependent on one single crop or economic source.
PART 3

DISASTERS, THE ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

Learning Objectives

This part of the course will increase your understanding of:

- the concept of sustainable development
- policies related to achieving sustainable development
- the goals of environmental management.
- the interrelationships among disaster mitigation, environmental management, and sustainable development.

Introduction

Part 2 examined how disasters often result from unresolved development problems such as environmental degradation, or uncontrolled urbanization, exacerbated by population growth and political and institutional gaps. The discussion emphasized that unless new approaches to development are implemented, many of the "hazard-intensifying" trends associated with traditional development will become norms with increasingly devastating and disastrous effect. Sustainable development has been proposed as one new development approach. This part of the course introduces the concept of "sustainable development," identifies some of its primary corollaries, and suggests policies that promote it. The relationship between environmental management and disaster management is also described.

Q. What is sustainable development? What are some examples of policies which will support sustainable development? Compare your answers with the discussion which follows.

A.
CASE STUDY

Working against drought and disease in Tunisia

Water has long been a scarce commodity in Tunisia, particularly in the south; recent droughts have dried up many small reservoirs and lowered the groundwater levels, causing many wells to be abandoned. Many wells still in use contain dangerous salt levels and agents of such diseases as viral hepatitis, typhoid, and other strains of diarrhea. The local Ministry of Health has determined that latrines and septic tanks situated above or at the same level as the water table contributed to the contamination. In 1984, following a dramatic increase in incidences of waterborne diseases, Tunisia focused its efforts on improving water quality. Since that time, dramatic improvements have taken place. While only 20% of the rural population has adequate sanitary facilities, the percentage having a safe supply of water has risen from 15% to 50%. With the help of donors, many village wells were rehabilitated. Village water committees were set up nationwide, to support caretakers for the pumps and assure that the pumps remained repaired.

The greatest improvement has been in people’s health. The incidence of viral hepatitis was cut to 0.1% from a previous level of 50%; the incidence of diarrhea has been reduced by 80%. A focus on health education is responsible for much of this improvement. Children, even in remote villages, can recite the steps to clean water and improved sanitation (“Add three drops of chlorine to one liter of water;” “Wash your hands before every meal.”). Until recently, people were using polluted sources of water because they did not understand the hazards.

Q. How did the Tunisia water and sanitation project reduce vulnerability to disasters? How did it prevent environmental degradation? How was it sustainable?

A.
**Human-oriented policies**

**Sustainable human development**—Evidence from the performance of rapidly growing economies indicates that investment in human development is one of the most effective strategies. Sustainable human development generates growth and also equitably distributes the fruits of that growth. Human development includes providing more and better education, health care, and social services. When the responsibility for planning and executing development programs is moved from centralized agencies (which often lack the information and resources to manage local activities) to community-based operations, then local talent becomes involved and the disadvantaged will benefit. Policies which support human development, include community-based maternal/childcare, health/nutrition, and family planning programs. Urban self-help programs have improved urban conditions, while small credit programs have reduced poverty by providing seedlings, credit and land to peasants for micro-enterprises.

**Environmental policies**

**International agreements**—for reducing the use of fossil fuels as energy sources—are essential. For stabilizing global climate, the *Earth Summit Convention on Climate Change* and the *Principles for Management of All Types of Forests* provide guidelines for reducing and stopping deforestation and for technological cooperation to produce resource-efficient, low-polluting technologies for developing countries.

Soil erosion and degradation can only be stopped if farmers and agribusinesses invest in soil conservation. However, some subsidies in developing countries discourage sustainable agricultural practices. For example, subsidies for certain agricultural chemicals encourage the use of monoculture, which depletes the soil. In developed countries—such as Japan and the United States as well as in Europe—subsidies for fertilizers and pesticides result in high usage of these chemicals on farms. The subsequent runoff of chemicals into streams and rivers is high, making agriculture one of the largest polluting activities.

**Protecting biodiversity**—One key goal of sustainable development—using biological resources while protecting the biodiversity of species—requires international, regional, national and local efforts to preserve natural habitats and ecosystems. International and national policies in forestry, fisheries and wildlife management must also provide economic incentives and laws to protect biodiversity. Biodiversity may be defined as an umbrella term for the degree of natural variety including diversity of genetic material, species, ecosystems and human cultures.

**Training, education and research**—Efforts must be increased to develop and support institutions—both government and private—which investigate and train in natural resource management and environmental policy-making. Building community-based environmental organizations is also a key element to this strategy.
Sustainable Systems Through Technology

Incentives must be established to reduce pollution and wastes. Economic incentives may be introduced that increase the demand for energy- and resource-efficient technologies, to ease the stresses on forests and to stop water and air pollution. Public opinion can also exert pressure for the support of more environmentally sound technologies. In the United States, laws requiring disclosure of toxic waste releases helped pressure industries to reduce emissions. In eastern Europe, lack of such public disclosure in some cases allowed pollution levels to grow to dangerous levels without opposition. The “polluter pays” principle, using environmental charges and taxes, may help reflect actual environmental costs in market prices.

The search continues for answers to a key question: Which policies will promote the use of cleaner, more efficient technologies? If all countries demand such technologies, such demand may stimulate research and reveal new opportunities for adopting innovative policies.

Environmental management

Environmental management addresses environmental issues together with the process of sustainable development. Appropriate management is achieved when resources are used efficiently or conserved because of their important ecological role in sustaining ecosystems. Inappropriate management occurs when resources are overused or underutilized, or when resources forming the basis for local and global ecosystems are not conserved. Inherent within an environmental management perspective is the concept of “environmental opportunity.” These opportunities can include both the exploitation and conservation of a resource, whichever will maximize sustainable progress. In some cases, the maximum benefit from a resource might be obtained by leaving it alone. Developing solar energy and biomass fuel are examples of environmental opportunities.

An important facet of environmental management is the formation of national environmental policies and legislation which relate to and support national socioeconomic goals. National goals, however, are often based on pressures to increase production and may lead to destructive use of resources. Adoption of the concept of sustainable development can be encouraged through persuasion from consumers, legal regulation, and economic incentives. Environmental management relies heavily on institutional and community participation. The presence and assistance of national environmental institutions allow local environmental management programs to succeed. Planning and management should be decentralized to the community level where people have a better knowledge of the local environment and interests.

Environmental management overlaps with disaster management in the area of development—both employ mitigation to prevent environmental degradation. Environmental management also seeks to use efficiently any resources, recognizing that lost resources, such as traditional cultures, species of plants and animals, and arable land, cannot be restored. Mitigation measures usually provide an excellent return on development investment. One example is energy efficient stoves: use of such stoves not only decreases deforestation, it also reduces the labor and expense of producing fuel.
CASE STUDY

Flood disaster prevention in Taiz, Yemen

Taiz, as the second largest city in the Yemen Arab Republic, is victim to many of the problems resulting from rapid urban growth. The population of 150,000 has more than doubled in the past five years. About 28% of the homes are flooded every year—32% are flooded every ten years. In 1982, after three days of rain, an unusually severe flood occurred causing widespread damage.

The effects of the floods on the urban environment are moderate but may happen five to ten times per year. Sediment accumulates at major traffic intersections, disrupting traffic; streets erode and underground utilities are exposed to pedestrian traffic. The floods more often affect the homes and businesses of the poor. The annual direct loss from floods is about US$27 million. This estimate does not consider the production loss caused by damage to infrastructure.

The following factors have rendered the Taiz area vulnerable to flooding as well as to other disasters. First, environmental degradation has progressed rapidly, due mainly to the unplanned expansion of human settlements. Secondly, infrastructure and services are poorly maintained and inadequate to cope with an increasing demand. Third, the managerial and financial capabilities of regulatory and policy agencies in Yemen are weak; thus programs are often poorly planned and implemented.

In 1988, the International Development Association (IDA) conducted a study that prioritized flood control over other improvements, to safeguard development efforts. A project was designed in coordination with the Ministry of Municipalities and Housing (MMH) of Yemen to improve Yemen's physical infrastructure while strengthening the local institutions. The project was designed to provide:

- flood control structures to protect the most vulnerable parts of the city, such as open channels, culverts, and sediment and boulder traps.
- the restoration of street pavement, terracing of both unstable slopes and surface drainage footpaths in narrow streets, to control erosion.
- the purchase of equipment to maintain roads and flood control works.
- technical assistance for strengthening the MMH and its branch offices.
- technical assistance for the management of construction projects.
- the introduction of a new municipal resource mobilization policy to make maximum use of existing resources.
- the preparation of a future urban development project and staff training.

Q. What requirements of sustainable development does this project fulfill?
A.
PART 3 SUMMARY

- Sustainable development emphasizes:
  - the needs and well-being of future generations
  - meeting the needs of the world’s poor
  - allocating and conserving resources
  - merging environmental and economic concerns
  - changing the quality of growth
  - re-orientating technology

- Improved policies which can promote sustainable development include:
  - economic policies (e.g. proper resource pricing)
  - agricultural policies (e.g. sustainable rural and agricultural development)
  - human oriented policies (e.g. sustainable human development)
  - environmental policies (e.g. agreements protecting energy sources & biodiversity)

- Environmental management:
  - uses resources efficiently and conserves resources critical to sustaining ecosystems.
  - maximizes sustainable progress through pursuit of environmental opportunities
  - supports the formation of environmental policies, legislation and popular movements
  - overlaps with disaster management in using mitigation to prevent environmental degradation

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Answer from page 51 Bulgaria
All living organisms may die, and the chemicals now polluting the Black Sea also risk polluting the atmosphere. The situation could deteriorate to the point where whole towns would have to be evacuated disrupting lives and livelihoods. The tourism industry would suffer as tourists choose healthier destinations.

Answer from page 51 Bulgaria
Bulgaria’s 20-year plan includes measures to curb and eliminate the discharge of pollutants. The plan aims to stop the concentration of industrialization in the center of Bulgarian coastal zone, and develop the less densely populated south — thus also controlling urbanization. Countries from the region must cooperate in the clean-up because pollution of the sea and atmosphere is a regional problem requiring regional solutions.

Answer (from page 53) Yemen
It fulfills some aspects of each major area: (economic: resource mobilization; human-oriented policies: training; environmental policies: urban development plan; and technological inputs)
Self-Assessment Test - Part 3

Questions
Answer the following questions:

1. Why are disaster mitigation and environmental management essential components of sustainable development?

2. Name three components of environmental management.

3. Give an example from your country where undervalued resources have been wasted or not conserved. Do development programs in your country always have a training component? For rural as well as urban professionals? Does your country have an environmental protection plan? How does it address global environmental changes? What economic incentives are offered by your government to prevent environmental degradation? Are they effective? What others could be offered? What percentage of your country's budget goes to environmental protection and human development?

Define or Describe
Compare your answers with those provided in the text.

4. Proper Resource Pricing:

5. Environmental Opportunity

6. Environmental Management

7. Sustainable agricultural development

8. Sustainable human development

9. Biodiversity

True/False
Indicate T or F

11. Proponents of sustainable development stress the critical importance of sustaining present levels, strategies and rates of economic growth and development.

12. The sustainable development movement has generated economic models which are sophisticated and accurate in their ability to quantify all environmental costs associated with economic development projects.
PART 4

ASSESSING THE TRADE-OFFS IN INVESTING IN VULNERABILITY REDUCTION

Learning Objectives

This part of the course will increase your understanding of:

- factors influencing decisionmakers’ analysis of mitigation options
- different types of costs, benefits and effects
- models and tools useful in evaluating mitigation options

Introduction

This part discusses how governments decide whether and how much they should spend on vulnerability reduction. Relatively small, single investments in disaster preparedness or mitigation can greatly reduce the recurrent losses of capital items and production caused by disasters. However, in any development program there will be competition for resources and priorities need to 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 mitigation is rarely 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 is inevitably reflected in the political arena.

In many countries, disasters occur rather infrequently, and it is perhaps understandable that some politicians and government officials usually discount the possibility of having to justify a lack of expenditure on 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 the Losses Occur?

The economic analysis of projects is conducted in an atmosphere of risk and uncertainty. Situations of risk are usually defined as those in which the potential outcomes can be described using well-known probability distributions. The example of flood risks is often 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. These situations are therefore much more difficult to analyze than risks. They include many economic, political, and meteorological events, where 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 mitigation and vulnerability reduction are important components of an effective development portfolio and are most effective when incorporated into on-going development. Therefore, governments are increasingly willing to build planning systems to achieve this.

Q. What’s the difference between risk and uncertainty?

A. 

Where 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 disaster 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.

Because the analysis of development projects is carried out in the context of uncertainty, methods for dealing with this can sometimes be quite complex. Nevertheless, a number of relatively simple and trustworthy approaches have been developed for use in practical development planning. A more detailed discussion of cost/benefit analysis is included in Annex 1.

Pay Now, or Pay Later?

Two definitions need to be made at this point: 

Opportunity cost: the opportunity cost of a resource is the cost of its next best alternative. A person engaged in mopping up a flood would usually be employed in some other job. The opportunity cost of mopping up is the foregone value of the work he or she would otherwise 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 money available for productive investment sometime in the future.

An overriding choice facing a government is whether to spend now on preparedness or 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:

"What are the opportunity costs of investing in preparedness and/or mitigation?"

"Is the present value of the future loss higher or lower than the cost of investing in preparedness and/or mitigation?"

One basic principle affecting the choice is that spending on preparedness and mitigation should be less than the present value of the expected losses which 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 given monetary values fairly simply, others are much harder to value. There are various categories of impact and consequent loss. One way to list these is as follows:

- Direct monetary effects: damage and destruction of infrastructure and buildings.
- Indirect monetary effects: loss of production and clean-up costs (some economists may judge the latter to be direct costs).
- Direct non-monetary effects: deaths, injuries, loss of cultural items.
- Indirect non-monetary effects: disruption of schools, health, stress.
- Loss of non-renewable natural resources: environmentalists are developing increasingly general definitions of these (encompassing such considerations as genetic diversity and ecological balance).
- They certainly 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* are also problematical. 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 is even more controversial, but again may be feasible. Finding appropriate values for *indirect non-monetary effects* is much more difficult. Some costs are simply not quantifiable in any reasonable way, particularly 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/mitigation the primary benefits can be defined as the savings of the losses which would have occurred. There are thus the same problems in assigning values as those noted earlier. But there are also secondary benefits which are as hard or harder 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 mitigation measures are generally the easiest to quantify. Accurate estimates are usually possible, especially for planned capital investment using well-defined methods, systems, and resources, over relatively short periods of time.

Q. Which are easier to predict accurately: costs, benefits or losses?
A.  

Judging the Effectiveness of Mitigation Packages

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

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

An advantage of screening projects using a framework of analytical methods is that it 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 which accomplish a range of objectives and promote quantifiable as well as non-quantifiable benefits.
CASE STUDY

Western Pacific Typhoon, Part 2

In the immediate aftermath of the Typhoon which destroyed houses and businesses in the Pacific (see page ?) an instant "building boom" ensued which quickly outstripped the local resources of the islanders.

Government funding (supplemented by international aid) was made available for immediate reconstruction of damaged structures based on the extent of the damage sustained calculated at pre-typhoon prices for building materials and labor. There was a general feeling among the population to take advantage of the grants and low cost loans while the funding lasted and a fear that these programs might disappear as quickly as they appeared.

Workers skilled in the building trades quickly raised their rates, foremen and crew leaders of larger companies left their jobs to start their own businesses. The cost of building materials doubled in five weeks and all skilled workers were under contract to repair the larger businesses and expensive vacation homes of the wealthy.

Local companies quickly advertised to attract workers from other nearby islands that were not affected, ultimately attracting many opportunistic individuals from other countries as well.

Many homeowners were left out of work due to the destruction of their employers' places of business or of their own means of livelihood. They were not hired on as construction workers due to lack of training and tools. The grants and loans provided them now proved to be too small to restore their loss due to the escalation of material prices, and the increased cost of hiring skilled workers (if any could be found that would be willing to work on a small home rather than a business).

One local development agency understood the plight of the small homeowners and initiated a self-help building program incorporating skills training, and disaster mitigation techniques that could easily be integrated into the repair of small single family dwellings. Neighborhood associations were formed to help coordinate group meetings and to arrange cooperative rebuilding efforts. Material suppliers were educated on mitigation techniques to support the home builders.

With the skills training they acquired, and the savings in the cost of labor for the rebuilding of their houses, many families were able to completely repair their own homes in ways that left the homes stronger than they had been before the typhoon struck. Not only were the houses repaired and strengthened, but the owners gained a new self-sufficiency and an understanding of how to reduce their own vulnerability.
Q. What are the advantages of using formal, quantitative methods to review mitigation/prevention options?

A.

There is always competition for development resources and trade-offs have to be made.

Existing problems are given more priority than future problems.

Future losses due to disasters may or may not occur, calculations of these losses must be performed in an atmosphere risk and uncertainty.

Spending on preparedness and mitigation should be less than the present value of the expected losses which 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:
- direct and indirect monetary effects
- direct and indirect non-monetary effects.
Self-Assessment Test - Part 4

Question
*Answer the following question:*

1. Define the following terms in the context of disasters: "risk," "uncertainty," "present value," and "opportunity costs." Compare your answers to those found in the text.

Multiple Choice
*Circle the best answer(s):*

2. In assessing the value of vulnerability reduction and sustainable development practices, which of the following variables are the easiest to measure and quantify?

   A. Economic costs of preparedness and mitigation measures
   B. Economic benefits of mitigation programs
   C. Economic costs of potential losses
   D. Environmental costs associated with the loss and destruction of natural resources
   E. A and B
   F. B and C

3. Deaths, injuries and the loss of cultural items are examples of _____ following a disaster?

   A. direct opportunity cost
   B. indirect opportunity costs
   C. indirect non-monetary effect
   D. opportunity value
   E. direct non-monetary effects

True or False
*Indicate T or F*

4. _____ Situations of "risk" cannot be assessed with a high degree of confidence.

5. _____ Calculations of potential disaster losses are done in an atmosphere of risk and certainty.

6. _____ Investing in activities to mitigate sudden-onset disasters, such as earthquakes, is usually less-problematic than investing in activities to mitigate slow-onset environmental disasters, such as droughts.

7. _____ When economic analysis of projects are conducted in an atmosphere of "uncertainty," potential outcomes cannot be described in objectively known probability distributions.
PART 5

FORGING THE LINKS BETWEEN DISASTERS AND DEVELOPMENT

Learning Objectives

This part of the course will increase your understanding of:

- current and potential roles for international donors, national governments, United Nations agencies and NGOs in helping countries make the disaster/development connection and promote sustainable development practices
- cooperation required for disaster prevention through sustainable development planning
- why the affected communities need to be involved in designing and implementing programs

Introduction

While the local community and national government may have the most direct role in making links between disasters and development, there are roles for international donors, the United Nations and NGOs at all levels.

Role of International Donors

International donors must provide the lead by providing the funds and incentives which promote sustainable development and disaster management both at the national and community level. For example, international donors funding development programs should require that all project proposals include a study on the projected impact on the environment and the measures that will be adopted to ensure its environmental soundness.

As an example, in Costa Rica, after evaluating the environmental impact of a rural infrastructure project, USAID determined that "300-square kilometers [of] wetland within the project area was ecologically important and would have been lost if the proposed project was to go forward to upgrade roads and expand rural infrastructure." USAID, as a condition of its funding, required that the Costa Rican government set aside and manage the Cano Negro area as a wildlife reserve.

Donors must provide funds which strengthen the institutional and scientific capabilities in natural resource management within the assisted country. Strong and active institutions—both public and private—staffed with skilled personnel are the foundation for the self-reliance and the source of both technical expertise and policy leadership for sound environmental policies and practices.
National Government Role

National governments can best reduce the impact of disasters by incorporating disaster preparedness strategies and sustainable development principles into their national development planning process. In addition, governments should take collective action as part of a general environmental management effort. Policies for the public and private sectors must be geared to protect productive natural systems, as well as basic services and infrastructures. Commitments by governments to reducing vulnerability should be made and resources allocated. Funds may have to be diverted from national budgets, along with some redirection of foreign assistance.

The UN and the NGO Role

UNDP, DHA, other UN agencies and NGOs have a major role to play within a country to promote a wider awareness of the links between disasters and development and the options for reshaping national strategies for disaster preparedness, mitigation, and recovery. Generally, this role can be considered to have three parts. First, the organizations should design initiatives to increase the overall knowledge and level of commitment of national counterparts to preparedness, mitigation and sustainable development related recovery programming. Second, UN agency officials and NGOs can provide access to nontraditional sources of capital and technical assistance. Third, both UN agency officials and NGOs must review their country programs and other national projects to assess mitigation and sustainable development opportunities and ensure that such development schemes do not increase vulnerability.

Increasing knowledge and awareness

Building vulnerability reduction, mitigation, and sustainable development into development programs requires action to increase awareness among politicians, administrators, community leaders, and above all among the ordinary people affected by disasters. Similarly, reducing the disaster potential generated by poorly conceived development programs may need additional awareness raising among national development planners. One important goal is to encourage the widest possible perspective on a national mitigation strategy. Governments should be encouraged to develop an overall country-wide disaster plan with supporting policies. The constituency for this needs to extend beyond government. Collaborating constituencies for mitigation must be built among NGOs, the banking, finance and insurance sectors, private industry, and supporting bodies ranging from economic policy groups to safety councils. Each constituency will need a unique strategy.

One key to this process is a detailed focus on risk factors and how they vary for different types and intensities of hazard conditions, different types of economic activities, and different populations. Carefully tailored programs can assist politicians and administrators to understand the nature and extent of the various risks faced by communities, to appreciate how people within those communities view these risks, and to assess the economic effects of natural disasters on industry, commerce, and agriculture. An additional early role is to encourage a detailed inventory of critical facilities and reconstruction resources, to ensure that planning is based on the best possible information.
A second requirement is to demonstrate ways to reduce these risks through better decision-making and planning. The aim is to encourage disaster mitigation and sustainable development planning at different levels of public administration, based on risk assessment and analysis of vulnerability. This will only be possible if there is clear awareness among national and regional planners of the benefits of including disaster mitigation measures in national development plans, land-use planning proposals, and in project appraisal in hazard-prone areas.

Training will be a core part of the strategy for encouraging widespread involvement and commitment, with special emphasis on support for training institutions for national planners. There will be real long-term benefits from integrating mitigation into the general training curriculum.

**Promoting the use of non-traditional resources**

UN agency officials and NGOs can play a vital role in helping governments utilize the expertise from scientific institutions and the private sector in the government planning process. They can also encourage exchanges of staff and information with other countries where similar problems have been encountered.

Access to university-level programs will be important. The research base for disaster related and sustainable development of information and training will need to be strengthened. Areas to focus on include developing tools for analyzing and predicting damage to capital items, death and injury to people, and disruption of productive activity; and developing models for forecasting the economic outcome of these effects for a particular economic system. Similarly, they should focus on developing tools to analyze sustainable development practices which will reduce future vulnerability.

UN agency officials and NGOs can also provide legitimacy and access to donors to provide financing and seed capital for mitigation and sustainable development projects. NGOs and donors must increase their commitment to funding preparedness, mitigation and development related recovery programs. Many NGOs, in particular, have the flexibility within their funding mandates to shift resources to promote recovery related development interventions.

Advocacy and pressure groups for disaster mitigation may already be present or emerge gradually. Their role can be enhanced, especially by NGOs, by improving access to information, and supporting training in risk assessment, vulnerability analysis and organizational effectiveness.

UN agency officials and NGOs can also provide legitimacy and access to donors to provide financing and seed capital for mitigation and sustainable development projects. NGOs and donors must increase their commitment to funding preparedness, mitigation and development related recovery programs. Many NGOs, in particular, have the flexibility within their funding mandates to shift resources to promote recovery related development interventions.

Advocacy and pressure groups for disaster mitigation may already be present or emerge gradually. Their role can be enhanced, especially by NGOs, by improving access to information, and supporting training in risk assessment, vulnerability analysis and organizational effectiveness.
Q. What are some ways that UN agency officials and NGOs can help a country’s leaders promote development in the context of disaster preparedness, mitigation and recovery?

A.

Setting a good example

It is critically important that UN agencies and NGOs put these concepts into practice themselves as a model to government counterparts. This is best done by aggressively seeking out mitigation and sustainable development opportunities, funding their implementation and critically reviewing all development schemes to ensure that they do not increase vulnerability. To achieve this, disaster focal points, whose job it is to monitor and promote mitigation-related strategies, should be identified and supported. Naturally, the focus of action will depend largely on the political structures within the country, but one area to emphasize will be the role and contribution of line-ministries. It is in these sectors of government that the planning skills and resources for integrating development, and sustainable development and mitigation are most likely to be found.

The perspective of such a program will need to be long-term, and will have to take account of the tendency of governments to ignore disaster related projects in the absence of any major disasters. The aim should be to build and sustain a spectrum of multi-sector support programs for mitigation and sustainable development, promoted by line-ministries, and to reinforce these with training, continued awareness-building, and pressures from other constituencies. In some countries, NGOs enjoy a favored position with political and government leaders and are uniquely positioned to bring legitimacy to mitigation projects.

A primary argument for change will be cost. Attention of politicians and planners must be focussed on a comparison of the costs to the government of achieving higher levels of mitigation and sustainable development and the costs if they do not. At the same time, there will be continuing opportunities to promote and support a range of individual projects, including demonstration projects. Demonstration projects identify measures that can be done at low cost, often involving adjustments to existing projects. An additional early strategy is to build up information on the current situation, using risk and vulnerability studies and audits of institutions with disaster functions.

Cooperation required for disaster mitigation

Long-term efforts to mitigate disasters through sustainable development planning should be a high priority for donor, government, and non-governmental humanitarian assistance and development agencies.
Such measures require cooperation among three groups: agencies in charge of disaster preparedness and response; agencies in charge of development; and scientific and engineering research organizations. These groups should plan for the following types of programs to be implemented on regional, national and international levels:

**Technical Assistance**—Country-overview documents should be prepared that cover all aspects of vulnerability to disasters. All agencies, technical documents and key professionals should be identified in the country-overview documents.

**Training**—Technicians should be trained to prepare and update country-overview documents. Professionals should be trained on an interdisciplinary basis, to assess vulnerability and patterns of environmental degradation as part of environmental planning. This includes: river basin planning and management of watershed areas; use of natural resources to meet the needs of the poor for food, fuel, safe building sites and building materials; assessment of landslide areas and of desertification processes. Emphasis should be placed on food production, forest management and planned expansion of settlements.

**Technology Transfer**—Techniques for managing information about hazards—including mapping, emergency preparedness and response information—must be made available to staff in charge of national planning. Information on human-made disaster prevention, air pollution controls, trade in hazardous products, cleaner and safer industrial processes should also be provided.

### Building Links Between Disasters and Development—
The Community’s Role

**The role of the community**

Underlying all these development initiatives is the need for community involvement in mitigation. Ultimately, the victims of disasters and the beneficiaries of development programs are individuals in local communities in affected countries. Failing to involve individuals and communities in designing and implementing programs will cause the programs to be inadequately conceptualized and less than fully implemented. The best results in linking preparedness, vulnerability reduction and development are obtained by involving members of the communities-at-risk from the start.

The uneven results of long term grassroots empowerment schemes linked with the mandates of international development funding institutions result in a preference for comparatively large projects, in which interest groups that lack political and economic power are seldom fully represented. Governments, too, find it easier to operate from a centralized position, rather than to have programs with grassroots consultation, especially at the initial stages. As a result, most disaster related development programs have a top down approach, with community involvement serving primarily as an aid to implementation instead of providing input to program planning. However, research as well as practical experience indicates that individuals are most committed to implementing programs that they have helped to conceive.
Unfortunately, local governments, communities and individuals rarely have the luxury of uncommitted resources that can be deployed to achieve disaster related development goals. In poorer communities, which are often particularly affected by disasters, the problems of day-to-day existence tend to outweigh prospects of more remote risks. Consequently, outside assistance in the form of programmatic ideas, capital and technical assistance is usually necessary to promote such initiatives.

Well designed public education programs can build the necessary attitudes to create a belief that preparedness is important. Over time, attitudes can be shaped without extraordinary costs to individuals. For example, individual farmers can be taught not to breach embankments in a flood prone area once they realize that their land will flood even if the existing flood waters are drained into a neighbors fields. However, structural mitigation initiatives will normally require multiple goals to appeal to individuals. For example, people will build hazard-resistant structures because they want better houses or because there is a wage subsidy involved rather than because it will give good protection from a disaster that may or may not occur.

Q. Provide an example of a successful attempt to involve potential disaster victims in designing and implementing a prevention or mitigation program.

A. 

The best hope for a community’s recovery from or preparation for a disaster is to have a history of strong organization and well developed community leadership with experience in mobilizing community members to coordinate and implement programs. Therefore, it is important that vulnerable communities receive the benefit of community development programs before a disaster strikes.
Nevertheless, even in areas without a strong local history of organization, the recovery period from a major disaster provides unique opportunities to build vibrant community organizations. It is well documented that disaster victims demonstrate natural organizing efforts in response to an emergency situation. During this period, new leaders emerge and act in ways to inspire community trust. These new leaders can and often do serve to promote long term empowerment for their fellow citizens. Response and recovery programs that build on this emerging leadership can be useful not only for building mitigation into recovery but for promoting long term community involvement in development programming.

Community involvement can be fostered in a variety of ways in those communities where vulnerability is the greatest. A disaster may impact more heavily on some sectors of a community than others. For development purposes, experienced workers feel that mitigation activities should involve entire communities, not just the direct victims of a previous disaster. Community involvement, whenever possible, should be fostered by indigenous groups and organizations. Organizations with pre-existing links to the community are most likely to be trusted and are usually close enough to the community to remain involved to monitor implementation. Outside assistance, then, can take the form of training, research and information sharing, and financing of demonstration projects.

Disasters aside, in most cases vulnerability derives from poverty. Families settle on unstable hillsides because the land is cheap. People crowd their living spaces because they can't afford other options. Countries allow hazardous industrial development projects because they fear no development if they impose restrictions. The overriding goal of development must be the removal of the social and economic factors which predispose whole communities, indeed whole countries, to destitution and which place them at risk from their environment. Disasters multiply and expose the effects of poverty. Development programming must take account of disasters. This focus and this module is aptly summarized by Mary Anderson:

Even the most efficiently managed disaster recovery operation, if it is focused on getting things 'back to normal,' leaves a society no less vulnerable to natural hazards. Preparedness/mitigation, on the other hand, produces benefits, in addition to those that are equivalent to the savings of disaster damage, that are completely unrealizable through the recovery option. These are the promotion of a stable environment which provides incentives for investment and entrepreneurial activity, the potential development of a sense of efficacy on the part of the broader population, and the development of improved management and planning skills. Only if these are promoted and strengthened can we expect that sustainable long-term development can ever be achieved. Thus, disaster prevention, incorporated into development planning, is one important area for investment to achieve sustainable development.

CASE STUDY

Study of recovery after disaster: local participation in redevelopment planning

The post-disaster recovery period offers an opportunity for local organizational capacity building. Inserting development objectives into recovery activities has been shown to reduce costs and increase the effectiveness of recovery aid policies. External aid can be used to support organizations involved in self-directed sustainable development initiatives allowing local people to define the goals and control resources.

Studies of long-term recovery efforts have shown that communities often respond in different ways to the same input, depending on the strength of local organizations and social units. For example, richer communities are often able to exert influence and be rebuilt faster than poorer communities. When people and organizations are linked in an equal manner, development policies are more likely to fit the need of the citizens. When local institutions cannot act collectively to solve local problems, local development is often not targeted properly to the needs of the citizens. When problems occur in the delivery of aid, it is often a result of weak local institutions.

Communities can take steps before and after a disaster to increase the likelihood of sustainable development and mitigation by evaluating the existing and potential roles of local government agencies and community-based NGOs for future recovery efforts, as depicted in the following example:

Montserrat, West Indies: Before Hurricane Hugo struck in 1989, Streatham village located on the small island state of Montserrat in the eastern Caribbean was historically vulnerable to disaster and always required outside assistance to recover. The village lacked a highly coordinated network of social and governmental organizations which might enable it to take control of its own affairs. Among its strengths, however, were ties to larger networks of institutions outside of the village where problems could be expressed, and also ties to external aid through long-term projects funded by Canada. Local organizations in Streatham village had the potential to enhance the work of external organizations through their knowledge of local circumstances.

After Hugo caused extensive damage, two outside organizations, a Canadian NGO and a regional NGO, collaborated with a local community action group to assist in the recovery. The Canadian NGO sought to build improved housing by providing funds to the intermediary NGO to carry out the construction activities in Streatham. The intermediary group worked with the community action group to initiate the project. The Canadian NGO also supplied the program with building materials and transport.

The new program produced significant accomplishments. The community action group staff conducted a series of training workshops on rebuilding and structural strengthening techniques. Twenty homes were rebuilt and many others repaired. Local groups traveled to Canada to conduct seminars for Canadian supporters to demonstrate how foreign aid was used. The long-term accomplishments included:

- improvement in local visibility and sense of importance
- substantial increase in voluntary participation of local citizens in recovery activities
- strengthening of community action groups capacity to undertake other development projects
- increase in Canadian donors understanding of local needs and trust in local capacities resulting in granting of additional aid
- establishment and maintenance of a local agricultural and marketing cooperative.

The excellent results of the recovery program can be partially attributed to the goals of the Canadian NGO at the onset: to empower the local and regional groups and not do the work itself. This resulted in the strengthening of local institutional capacities. In turn, the foreign donors developed a better understanding of the institutional capacity building needs for effective recovery and development and were able to address these needs through their development programs.

PART 5 SUMMARY

- UN agencies and NGOs can play a part in reshaping national strategies in disaster preparedness, mitigation, and recovery. This is accomplished through:
  - increasing knowledge and awareness
  - demonstration of risk reduction measures through better decision making and planning
  - technical expertise and information exchange
  - legitimizing and financing of mitigation projects

- UN agencies and NGOs should strive to set positive examples and serve as models for local government counterparts.

- Community involvement is critical to the design and implementation of mitigation programs.

- Since disasters arise from situations of poverty, development programs should be aimed at reducing poverty.
Self-Assessment Test - Part 5

Question

Answer the following question:

1. Describe some of the roles of donors, national governments, UN agencies and NGOs in promoting mitigation and sustainable development.

Multiple Choice

Circle the best answer(s):

2. To best mitigate against the effects of disasters, development programs should primarily focus on:
   A. promoting urban development.
   B. reducing the factors which contribute to poverty.
   C. enhancing research ability of donor-country universities.
   D. developing the industrial base within a country.
   E. A and D
   F. None of the Above

True / False

Please indicate with a T or F

3. ____ Training programs are often a useful way to encourage widespread support and commitment for disaster mitigation and preparedness activities.

4. ____ The design and implementation of mitigation programs should be left solely to government planners and outside experts.

5. ____ One of the primary benefits of incorporating prevention and mitigation activities into development planning is that it promotes investment for achieving sustainable development.
ANNEX 1

Cost-benefit analysis for vulnerability reduction in the context of uncertainty

The degree of risk and uncertainty differs in different elements of a large project, and may also vary over time. An important task for the planner is to identify areas of sensitivity and to describe them clearly, so that any decision is made with an understanding of how reliable the basic information is. Sensitivity analysis consists of testing the effects of variations in selected costs and benefit variables on the project’s rate of return or net present value.

Cost-benefit analysis for development projects in the context of uncertainty is the subject of a number of guidelines produced by development institutions. (See for example, World Bank Central Project’s Note 2.02, “Risk and Sensitivity Analysis in the Economic Analysis of Projects.”)

According to different forecasts or estimates of future events, the projected net present value of a project can vary over a wide range. Under some conditions a probability value can be assigned to a given outcome. A value known as the expected value of the net present value of the project takes into account the entire range of possible present values of net benefits from the project. It is calculated by weighing all possibilities with their corresponding relative frequencies or probabilities, and summing to give an average figure.

For example, if the net present value can take values of +$20 million with a probability of 0.7 and −$80 million with a probability of 0.3, then the expected NPV of the project is

\[(0.7 \times 20) + (-0.3 \times 80), \text{ or } -$10 \text{ million.}\] (Projects with a negative NPV will normally be rejected.

Sensitivity analysis involves testing how changes in selected cost and benefit variables affect a project’s net present value. It helps to identify what, in most cases, will be a small number of variables—changes which cause the greatest variation in the net present value. These are the factors which usually need the most detailed investigation and where management effort to prevent negative impacts will probably be most influential. A basic requirement is to identify those values of the variables at which the net present value of the project becomes zero (so-called “switching values”). The technique is theoretically fairly straightforward, but complicated in practice by correlation among variables, and the need to take variation in clusters of variables into account.

Individual variables can be assigned probability distributions for their values. With appropriate statistical advice, samples from these probability distributions, fed into the sensitivity analysis process, can sometimes be used to generate a sample of net present values which approximates the true probability distribution of the net present values. It is then possible to give some estimate of the percentage of outcomes in which the net present value will be unacceptable.
### Annex 2

#### Acronyms

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<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>DHA</td>
<td>Department of Humanitarian Affairs</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
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<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
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<td>UNDRO</td>
<td>United Nations Disaster Relief Organization (now DHA–Geneva)</td>
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<tr>
<td>ECLAC</td>
<td>Economic Commission for Latin America and the Caribbean</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organization</td>
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<td>WFP</td>
<td>World Food Programme</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>WHO</td>
<td>World Health Organization</td>
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ANNEX 3

ADDITIONAL READING


GLOSSARY

This glossary lists the disaster management terms as used in the UNDP/LINDRO Disaster Management Manual. Different usages which UNDP and other users of this manual might encounter in other documents are mentioned in the definitions as necessary.

Assessment
(Post-disaster) (sometimes Damage and Needs Assessment)

The process of determining the impact of a disaster or events on a society, the needs for immediate, emergency measures to save and sustain the lives of survivors, and the possibilities for expediting recovery and development.

Assessment is an interdisciplinary process undertaken in phases and involving on-the-spot surveys and the collation, evaluation and interpretation of information from various sources concerning both direct and indirect losses, short- and long-term effects. It involves determining not only what has happened and what assistance might be needed, but also defining objectives and how relevant assistance can actually be provided to the victims. It requires attention to both short-term needs and long-term implications.

Damage assessment

The preparation of specific, quantified estimates of physical damage resulting from a disaster, and recommendations concerning the repair, reconstruction or replacement of structures, equipment, and the restoration of economic (including agricultural) activities.

Disaster

The occurrence of a sudden or major misfortune which disrupts the basic fabric and normal functioning of a society (or community). An event or series of events which gives rise to casualties and/or damage or loss of property, infrastructure, essential services or means of livelihood on a scale which is beyond the normal capacity of the affected communities to cope with unaided.

Disaster is sometimes also used to describe a catastrophic situation in which the normal patterns of life (or eco-systems) have been disrupted and extraordinary, emergency interventions are required to save and preserve human lives and/or the environment. Disasters are frequently categorized according to their perceived causes and speed of impact. [See: Sudden natural disasters; Slow-onset disasters; Technological disasters; Human-made disasters]

Disaster management

A collective term encompassing all aspects of planning for and responding to disasters, including both pre- and post-disaster activities. It refers to the management of both the risks and the consequences of disasters.

Disaster mitigation

A collective term used to encompass all activities undertaken in anticipation of the occurrence of a potentially disasterous event, including preparedness and long-term risk reduction measures.

The process of planning and implementing measures to reduce the risks associated with known natural and man-made hazards and to deal with disasters which do occur. Strategies and specific measures are designed on the basis of risk assessments and political decisions concerning the levels of risk which are considered to be acceptable and the resources to be allocated (by the national and sub-national authorities and external donors).

Mitigation has been used by some institutions/authors in a narrower sense, excluding preparedness. It has occasionally been defined to include post-disaster response, then being equivalent to disaster management, as defined in this glossary.

Disaster preparedness

Measures that ensure the readiness and ability of a society to (a) forecast and take precautionary measures in advance of an imminent threat (in cases where advance warnings are possible), and (b) respond to and cope with the effects of a disaster by
organizing and delivering timely and effective rescue, relief and other appropriate post-disaster assistance.

Preparedness involves the development and regular testing of warning systems (linked to forecasting systems) and plans for evacuation or other measures to be taken during a disaster alert period to minimize potential loss of life and physical damage; the education and training of officials and the population at risk; the establishment of policies, standards, organizational arrangements and operational plans to be applied following a disaster impact; the securing of resources (possibly including the stockpiling of supplies and the earmarking of funds); and the training of intervention teams. It must be supported by enabling legislation.

**Expected losses/effects**
The expected number of lives lost, persons injured, damage to property and disruption of essential services and economic activity due to the impact of a particular natural or man-made hazard. It includes physical, social/functional and economic effects.

**Famine early warning**
The process of monitoring the situation in areas known to be particularly vulnerable to the effects of droughts, crop failures, or changes in economic conditions, to enable remedial measures to be initiated before hardship becomes acute.

**Hazard**
(or hazardous phenomenon or event)

A rare or extreme event in the natural or man-made environment that adversely affects human life, property or activity to the extent of causing disaster.

A hazard is a natural or man-made phenomenon which may cause physical damage, economic losses, or threaten human life and well-being if it occurs in an area of human settlement, agricultural, or industrial activity.

Note, however, that in engineering, the term is used in a more specific, mathematical sense to mean the probability of the occurrence, within a specified period of time and a given area, of a particular, potentially damaging phenomenon of a given severity/intensity.

**Hazard assessment**
(sometimes hazard analysis/evaluation)
The process of estimating, for defined areas, the probabilities of the occurrence of potentially-damaging phenomenon of given magnitudes within a specified period of time.

Hazard assessment involves analysis of formal and informal historical records, and skilled interpretation of existing topographical, geological, geomorphological, hydrological, and land-use maps.

**Hazard mapping**
The process of establishing geographically where and to what extent particular phenomena are likely to pose a threat to people, property, infrastructure, and economic activities.

Hazard mapping represents the result of hazard assessment on a map, showing the frequency/probability of occurrences of various magnitudes or durations.

**Human-made disasters**
Disasters or emergency situations of which the principal, direct causes are identifiable human actions, deliberate or otherwise. Apart from “technological disasters,” this mainly involves situations in which civilian populations suffer casualties, losses of property, basic services, and means of livelihood as a result of war, civil strife, or other conflict.

In many cases, people are forced to leave their homes, giving rise to congregations of refugees or externally or internally displaced persons.

**Human-made hazard**
A condition which may have disastrous consequences for a society. It derives from technological processes, human interactions with the environment, or relationships within and between communities.

**Natural hazard**
Natural phenomena which occur in proximity and pose a threat to people, structures or economic assets and may cause disaster. They are caused by biological, geological, seismic, hydrological, or meteorological conditions or processes in the natural environment.
Reconstruction
The permanent reconstruction or replacement of severely damaged physical structures, the full restoration of all services and local infrastructure, and the revitalization of the economy (including agriculture).

Reconstruction must be fully integrated into ongoing long-term development plans taking into account of future disaster risks and possibilities to reduce those risks by the incorporation of appropriate mitigation measures. Damaged structures and services may not necessarily be restored in their previous form or locations. It may include the replacement of any temporary arrangements established as a part of emergency response or rehabilitation.

Risk
For engineering purposes, risk is defined as the expected losses (lives lost, persons injured, damage to property, and disruption of economic activity) caused by a particular phenomenon. Risk is a function of the probability of particular occurrences and the losses each would cause. Other analysts use the term to mean the probability of a disaster occurring and resulting in a particular level of loss.

A societal element is said to be “at risk”, or “vulnerable”, when it is exposed to known disaster hazards and is likely to be adversely affected by the impact of those hazards if and when they occur. The communities, structures, services, or activities concerned are described as “elements at risk.”

Risk assessment
(sometimes risk analysis)
The process of determining the nature and scale of the losses (due to disasters) which can be anticipated in particular areas during a specified time period.

Risk assessment involves an analysis and combination of both theoretical and empirical data concerning: the probabilities of known disaster hazards of particular force or intensities occurring in each area (“hazard mapping”); and the losses (both physical and functional) expected to result to each element at risk in each area from the impact of each potential disaster hazard (“vulnerability analysis” and “expected loss estimation”).

Risk mapping
The presentation of the results of risk assessment on a map, showing the levels of expected losses which can be anticipated in specific areas, during a particular time period, as a result of particular disaster hazards.

Risk reduction (long-term)
Long-term measures to reduce the scale and/or the duration eventual adverse effects of unavoidable or unpreventable disaster hazards on a society which is at risk, by reducing the vulnerability of its people, structures, services and economic activities to the impact of known disaster hazards.

Typical risk reduction measures include improved building standards, flood plain zoning and land-use planning, crop diversification, and planting wind-breaks. The measures are frequently sub-divided into “structural” and “non-structural”, “active” and “passive” measures.

N.B. A number of sources have used “disaster mitigation” in this context, while others have used “disaster prevention”.

Slow-onset disasters
(Sometimes Creeping Disasters or Slow-onset Emergencies)

Situations in which the ability of people to acquire food and other necessities of life slowly declines to a point where survival is ultimately jeopardized. Such situations are typically brought on or precipitated by drought, crop failure, pest diseases, or other forms of “ecological” disaster, or neglect.

If detected early enough, remedial action can be taken to prevent excessive human distress or suffering occurring. However, if neglected, the result can be widespread destitution and suffering, and a need for emergency humanitarianism assistance as in the aftermath of sudden disasters.

Sudden natural disasters
Sudden calamities caused by natural phenomena such as earthquakes, floods, tropical storms, or volcanic eruptions. They strike with little or no warning and have an immediate adverse impact on human populations, activities, and economic systems.
Course Evaluation

Self-Study Course on Disasters and Development

1. What is your present position?

2. How many years have you spent in disaster-related work?

3. How many years of formal education do you have?
   _____ 0 to 6 years   _____ 7 to 12 years   _____ 12 to 16 years   _____ more than 16 years

4. How was the level of content in this course?
   _____ too difficult   _____ about right   _____ too easy

5. Was the course material relevant to your work?
   _____ yes   _____ no

6. How useful to you were the various components of the course?

<table>
<thead>
<tr>
<th>Very Useful</th>
<th>OK</th>
<th>Not Useful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Guides:</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Study Text:</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Self-Assessment Tests:</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

7. How valuable to you was the total course?

<table>
<thead>
<tr>
<th>Very Valuable</th>
<th>Of Some Value</th>
<th>Not Valuable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

8. Additional comments:

Please return this to:
Disaster Management Center
Department of Engineering Professional Development
University of Wisconsin-Madison
432 North Lake Street
Madison, WI 53706 U.S.A.

Thank you for taking a moment to complete this course evaluation.