

Environmental Damage Assessment Methodology



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Why assessing environmental damages caused by disasters



- Natural capital is part of the assets of a country. Negative environmental changes affect the flow of environmental goods and services, and therefore they cause people welfare losses. 
- In addition, natural ecosystems play a key role in damage mitigation of extreme events. By including environmental damage in the assessments, it allows:
 - To establish relationships between damage magnitude and previous environmental degradation; this highlights the importance of environmental protection as strategy for disasters reduction 
 - To consider environmental restoration among the investment alternatives post-disaster

Table 1
GOODS AND SERVICES PROVIDED BY ECOSYSTEMS

Ecosystem	Goods	Services
Agroecosystems	Food crops Fibre crops Crop genetic resources	Maintain limited watershed functions (infiltration, partial soil protection) Provide habitat for birds, pollinators, soil organisms important to agriculture Build soil organic matter Sequester atmospheric carbon
Forest ecosystems	Timber Fuelwood Drinking and irrigation water Fodder Nontimber products (honey, fruit, spices, plant medicines, hunting, etc.) Genetic resources	Remove air pollutants, emit oxygen Cycle nutrients Maintain array of watershed functions (infiltration, purification, soil stabilization) Maintain biodiversity Sequester atmospheric carbon Moderate weather extremes and impacts Generate soil Provide for aesthetic enjoyment and recreation
Freshwater ecosystems	Drinking and irrigation water Fish Hydroelectricity Genetic resources	Buffer water flow (control timing and volume) Dilute and carry away wastes Cycle nutrients Maintain biodiversity Provide aquatic habitat Provide transportation corridor provide for aesthetic enjoyment and recreation
Grassland ecosystems	Livestock (meat, leather, etc.) Water for human consumption and irrigation Genetic resources	Maintain array of watershed functions (infiltration, purification, soil stabilization) Cycle nutrients Remove air pollutants, emit oxygen Maintain biodiversity Generate soil Sequester atmospheric carbon provide for aesthetic enjoyment and recreation
Coastal ecosystems	Fish and shellfish Fishmeal (animal feed) Seaweeds (for food and industrial use) Genetic resources	Moderate storm impacts (mangroves, barrier islands) Provide wildlife (marine and terrestrial) habitat Maintain biodiversity Dilute wastes Provide harbours and transportation routes Provide for aesthetic enjoyment and recreation

Source: World Resources Institute (2001)



General considerations

- The methodology approach considers the environment as an economic asset (natural capital) that provides goods (food, fibers, genetic resources, water, energy, etc.) and services (biodiversity conservation, water cycle regulation, capturing and storage of carbon, aesthetic beauty and opportunities for recreation, etc.)
- The environment also provides welfare through the benefits of non-use values (existence and option values)
- Proposed methodology for environmental damage assessment takes into account several existing constraints:
 - Limited availability of time for undertaking the assessment
 - Lack of information on the environment
 - Methodological problems derived from the absence of markets for most of environmental services

STEPS OF THE ASSESSMENT PROCESS



1 DESCRIPTION OF THE ENVIRONMENT BEFORE/
WITHOUT DISASTER (BASELINE)

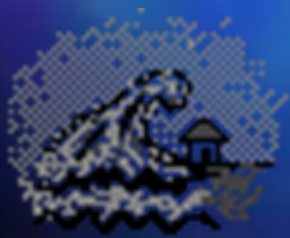
2 ENVIRONMENTAL IMPACTS IDENTIFICATION



3 QUALITATIVE ENVIRONMENTAL ASSESSMENT

4 EFFECTS CLASSIFICATION: DIRECTS DAMAGES
AND INDIRECTS LOSSES

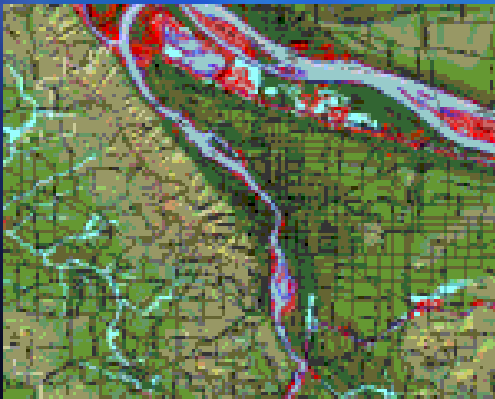
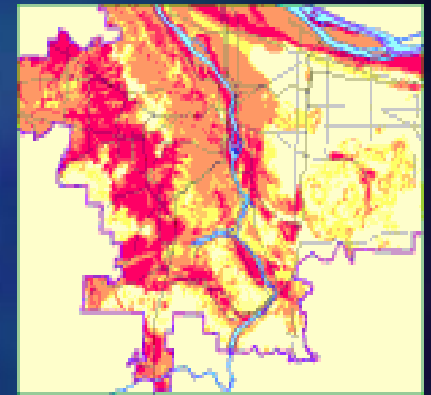
5 ECONOMIC VALUATION



6 OVERLAPPING WITH OTHER SECTORS

1. DESCRIPTION OF THE ENVIRONMENT BEFORE/WITHOUT DISASTER

- DETERMINATION OF THE BASELINE IN ORDER TO IDENTIFY THE EFFECTS RELATED TO THE DISASTER
- USUALLY, THE BASELINE IS THE SITUATION BEFORE THE DISASTER. However in long-lasting disasters (such as droughts) it must be taken into account the situation without disaster.
- When there is previous significant environmental degradation, it is difficult to establish the baseline



- It is important to focus the attention, both in the main damages observed and in those related with aspects of major interest (protected areas, relevant ecosystems, endemic species habitat, etc.)

1. (CONT.) Linkages of disaster effects with previous environmental degradation

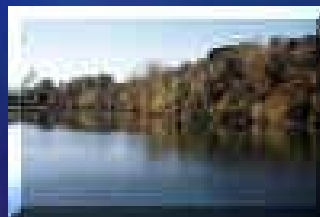
LOCAL SCALE



- DEFORESTATION-FLOODS
- MANGROVE FOREST LOSS
- SOLID WASTE MANAGEMENT
- URBANIZATION PROCESS
- INFRASTRUCTURE PROJECTS

REGIONAL SCALE

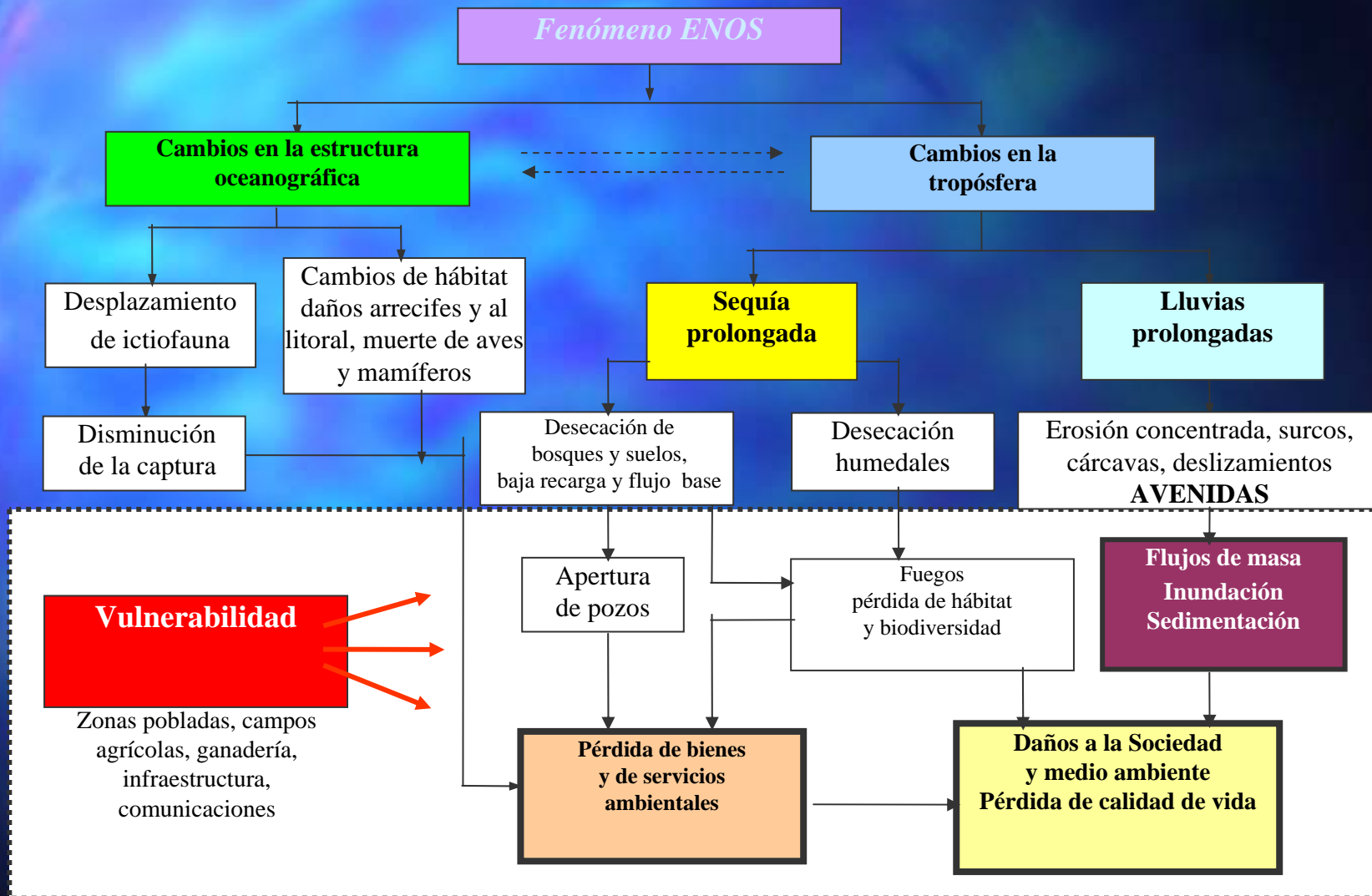
- WATERSHED MANAGEMENT
- FOREST FIRES



2. Environmental impacts identification

- Description of the identified environmental damages
- It is very useful to draw a graph showing causal chains





3. Qualitative environmental assessment

- Depending on the available information, a qualitative environmental impact assessment can be done by using a damage scale, regardless of a possible later economic valuation



EXAMPLE OF ENVIRONMENTAL IMPACTS CATEGORIES

Environmental Impact	Damage Scale	Damage Extent	Recovery Period	Recovery Costs
Insignificant	Almost inexistent	Very little extent	Immediate Very short	None
Negligible or minimum	Little	Local	Short	Low
Moderate	Notorious	Local Low extent	Short to Medium	Medium-high
Severe	Very notorious	Local or Wide extent	Medium to Long	High or very high Very high
Very severe	Deep and Destroyer	Local or Wide extent	Medium to long	Very High
Total	Total o quasi total	Local or Wide extent	Very long to irreversible	Invaluable

Source: Adapted from Alfonso Mata (1995).

4. EFFECTS CLASSIFICATION: DIRECTS DAMAGES AND INDIRECTS LOSSES



4.1 (CONT.) DIRECT DAMAGES

- **CHANGES IN QUANTITY OR QUALITY OF THE ENVIRONMENTAL ASSETS (ENVIRONMENTAL CHANGE)**

- QUALITY LOSS OF DRINKING WATER
- AIR POLLUTION
- CHANGE IN THE SEA TEMPERATURE
- ETC.

- **DAMAGE TO THE CONSTRUCTED CAPITAL LEADING TO PREVENT (OR AT HIGHER COSTS) THE USE OF ENVIRONMENTAL ASSETS**

- BREAKDOWN OF WATER NETWORKS
- DESTRUCTION OF ROADS TO TOURIST AREAS
- DESTRUCTION OF SHIPS AND FISH EQUIPMENTS
- ETC.

4.2 (Cont.) EFFECTS CLASSIFICATION: DIRECTS DAMAGES AND INDIRECTS LOSSES



4.3 (CONT.) INDIRECT LOSSES

- Temporary Changes in the environmental flow of goods and services until the recovery of the natural capital and or the constructed capital
 - Loss of fish catches until the sea recover its normal condition and/or until the recovery of ships, equipments and fish related infrastructure
 - Drop in tourist income due to changes in the conditions of natural assets and/or related infrastructure (hotels, roads, etc.)
 - Incremental costs due to the temporary use of bottled water, vaccination costs, etc.
 - Temporary loss of agricultural production caused by floods, etc.

5. Economic valuation of damages

- Monetary estimation of environmental damage is not easy (and sometimes impossible)
- In general, there are few environmental goods and services that can be measured in terms of market value. For this reason, it is frequent the use of indirect procedures.
- Depending on the available information it can be used different environmental valuation methodologies. Some of them (such as contingent valuation) demand information that should be gathered through surveys.
- Following the general approach of the ECLAC damage assessment, it is used (when possible) the restoration cost method.

5.1 (cont.) Direct damages valuation

A. Natural Capital (environmental changes)

- Market value of the environmental asset when it is possible (example, agriculture land value)
- When it is not possible, the required investments for recovering the previous situation if they are reasonable in terms of cost benefit analysis (e.g. beach cleaning, environmental restoration projects)
- When it is not possible (or appropriate), the net present value of the environmental goods and services lost (e.g. in the case of forests where there is estimations of the environmental values)

B. Constructed capital related to environmental use

- The information is usually taken from other sectors, taking into account the risk of overlapping (double accounting)

5.2 (cont.) Indirect losses valuation

- When recovery or restoration of environmental and/or constructed assets is not immediate, indirect damages should be considered.
- They are calculated as the net present value of the goods and services flow forgone during the period of recovery
- Not always it is possible its estimation
- In many cases they have been incorporated in the assessment of other sectors (drop of agricultural production, loss of tourist income, higher expenses in health, etc.)

6. Overlapping with other sectors

- This analysis should be done in order to avoid double counting**
- A great share of environmental damage has already been included in other sectors (both direct damages and indirect losses)**
- Sometimes, a damage is considered environmental depending on the institutional structure of the country affected.**

6. (cont.) Overlapping with other sectors

Environmental direct damages and indirect losses

I. No monetary valuation. Damage described or assessed qualitatively

II. Monetary valuation. Environmental damages and losses not included in other sectors

III. Monetary valuation. Environmental damages and losses included in other sectors. They can be isolated and estimated separately

IV. Monetary valuation. Environmental damages and losses included in other sectors. It is not possible (or it is very difficult) to isolate them.

II+III = Total environmental damages and losses valuation
II = To be added in global estimation