

Handbook

for Estimating the Socio-economic and Environmental Effects
of **Disasters**

Economic Commission for Latin America and the Caribbean
ECLAC

ORIGINAL: SPANISH

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Economic Commission for Latin America and the Caribbean (ECLAC) 2003.

Handbook for Estimating the Socio-economic
and Environmental Effects of Disasters
LC/MEX/G.5
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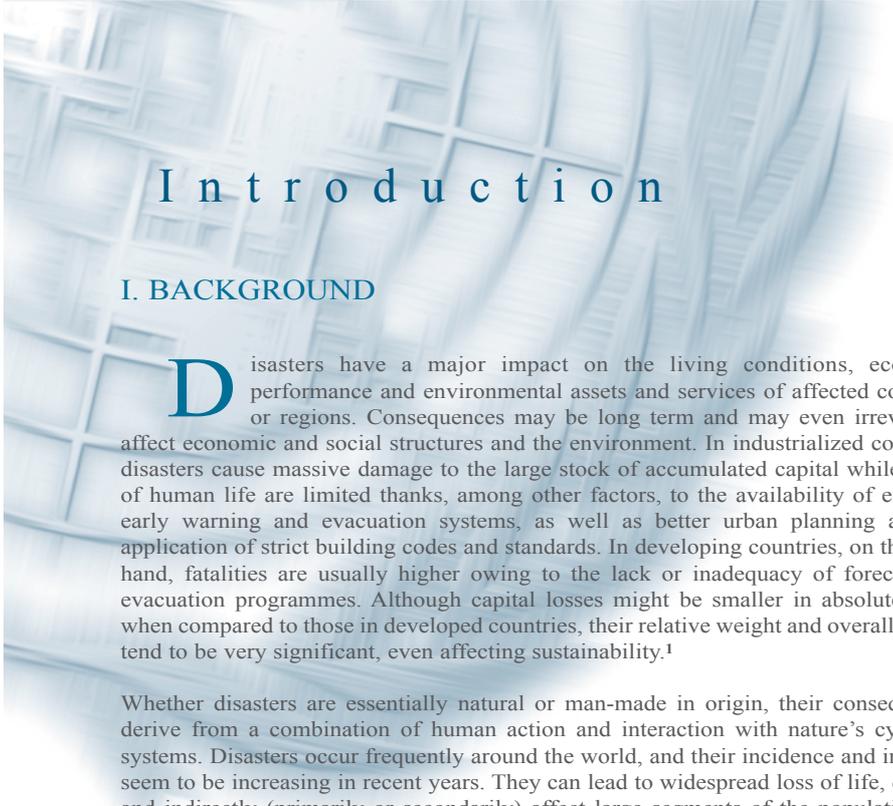
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I n t r o d u c t i o n

I. BACKGROUND

Disasters have a major impact on the living conditions, economic performance and environmental assets and services of affected countries or regions. Consequences may be long term and may even irreversibly affect economic and social structures and the environment. In industrialized countries, disasters cause massive damage to the large stock of accumulated capital while losses of human life are limited thanks, among other factors, to the availability of effective early warning and evacuation systems, as well as better urban planning and the application of strict building codes and standards. In developing countries, on the other hand, fatalities are usually higher owing to the lack or inadequacy of forecast and evacuation programmes. Although capital losses might be smaller in absolute terms when compared to those in developed countries, their relative weight and overall impact tend to be very significant, even affecting sustainability.¹

Whether disasters are essentially natural or man-made in origin, their consequences derive from a combination of human action and interaction with nature's cycles or systems. Disasters occur frequently around the world, and their incidence and intensity seem to be increasing in recent years. They can lead to widespread loss of life, directly and indirectly (primarily or secondarily) affect large segments of the population and cause significant environmental damage and large-scale economic and social harm.

In fact, recent ECLAC estimates show that in the last three decades more than 150 million people have been affected by disasters in Latin America and the Caribbean, including more than 12 million direct victims and 108,000 deaths. Moreover, total damage –and this was not an exhaustive estimate for the whole region– amounted to more than 50,000 million 1998 dollars, concentrated in the smallest and relatively less developed countries, especially in Central America, the Caribbean and the Andean sub-regions.² (See Figure 1 below).

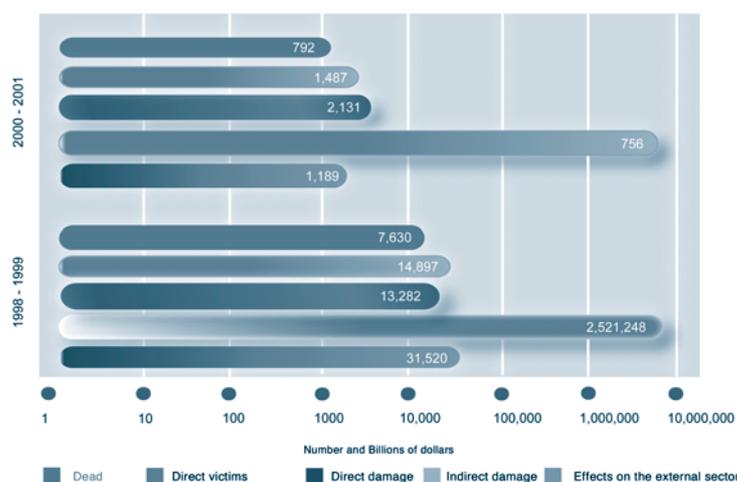
Globally, statistics show that disasters cause more socially significant and irreversible damage in developing countries, where the poorest and most vulnerable population groups feel the most severe impact. In the developed world, on the other hand, an increasing and significant degree of protection against disasters has been achieved over the years thanks to the availability of resources and technology for the introduction of effective prevention, mitigation and planning measures, together with vulnerability reduction schemes. Even in these countries however, damages have risen significantly as a result of the greater concentration and value of societal activities.

¹ Jovel, Roberto, "Natural Disasters and Their Economic and Social Impact", *ECLAC Review*, No. 38, Santiago, Chile, August 1989.

² See ECLAC and IDB, *Un tema de desarrollo: La reducción de la vulnerabilidad frente a los desastres*, Mexico City and Washington, 2000.

Some progress has been achieved in the field of planning, prevention and mitigation in Latin America and the Caribbean, but large segments of the population still live in highly precarious and vulnerable conditions. Most of the countries in the region are in areas that are prone to hydro-meteorological and geological phenomena that have produced well-known instances of widespread loss of human life and significant damage to physical and social infrastructure, while undermining economic performance and the environment.

Figure 1
LATIN AMERICA AND THE CARIBBEAN; EFFECTS OF DISASTERS (1998-2001)



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Undesirable disaster effects may include damage to economic and social infrastructure, environmental modifications, fiscal and foreign sector imbalances, price increases, modifications to demographic structures and changes in development priorities as the task of replacing lost or damaged assets results in the deferment of projects intended to overcome long-standing needs. The most devastating impact is undoubtedly the deterioration in the social well-being of the population, especially among the poorest and most vulnerable population groups. Furthermore, the ramifications of disasters increasingly extend beyond the affected community or country through unexpected population migration, disease transmission, trade reductions or widespread environmental modifications.

To reduce the long-term effects of disasters, affected countries must take actions along parallel tracks. First, as an integral part of their economic and social development strategy, they should assign financial resources for the prevention and mitigation of the foreseeable impact of a disaster. Such a commitment should be understood as a high-yield investment –in economic, social and political terms– for achieving long-term growth. Second, once a disaster has occurred, they must ensure that reconstruction investments contemplate vulnerability-reduction features to favor an adequate level of sustainable growth.

When a disaster occurs, national-emergency bodies are generally in charge of assessing humanitarian needs during the emergency stage, with support from the United Nations System and other public and private international organizations. It is now standard practice for the affected community or country to take the most essential steps to meet humanitarian requirements arising from the emergency. In addition, friendly countries and international organizations either directly or through non-governmental organizations. Promptly provide additional assistance as needed, both public and private agents take part in this effort, along with many local, regional and international non-governmental or social assistance organizations.

Reconstruction of damaged or destroyed assets, however, normally requires resources well beyond those available during the emergency or humanitarian assistance stage or otherwise within reach of the affected country. As a result, reconstruction is often undertaken without vulnerability reduction. To put it bluntly, vulnerability is reconstructed instead of being reduced.

To avoid this, immediately after the emergency stage, an assessment must be made of the direct and indirect effects of the event and their consequences on the social well-being and economic performance of the affected country or area. This assessment need not entail the utmost quantitative precision, but it must be comprehensive in that it covers the complete range of effects and their cross-implications for economic and social sectors, physical infrastructure and environmental assets. With such estimates in hand, it is possible to determine the extent of reconstruction requirements, which is an, urgent task since those affected cannot wait long under the conditions prevailing after a disaster occurs. Such an exercise is indispensable for identifying and undertaking reconstruction programme and projects, many of which will require the international community's financial and technical cooperation.

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To ensure vulnerability reduction, reconstruction programme and projects must be designed within a mitigation and prevention strategy that is part of the development process. Therefore, a set of diagnostic tools is needed to measure the type and amount of damage and losses caused by each type of disaster. Such working tools are not very abundant in the economic literature, especially since they must be able to gauge social, economic and environmental effects.

Based on special disaster-assessment endeavors in the region since the early 1970s, the Economic Commission for Latin America and the Caribbean (ECLAC) developed an assessment methodology that further broadened and developed the concepts outlined by UNDRO a decade earlier.³

³ ECLAC, *Handbook for the Estimation of the Socio-economic Effects of Natural Disasters*, Santiago, Chile, 1991; UNDRO, *Disaster Prevention and Mitigation: Compendium of Current Knowledge*, Volume 7, "Economic Aspects," United Nations, New York, 1979.

The methodology published by ECLAC at that time made it possible to estimate the effects of natural disasters; it was also applicable to man-made ones, as in the case of certain armed conflicts in Central America. In the original ECLAC Handbook, disaster effects are measured at the sectoral and global levels, thus allowing for an assessment of the reconstruction capacity of the affected country or region and the scope of the necessary international cooperation. The ECLAC methodology pays due consideration to the prevailing insufficiency of reliable quantitative information for the region, the availability of which is even more limited after a disaster. The ECLAC Handbook did not include methods for estimating damage and losses in certain social and economic sectors, to the environment or to specific population groups.

ECLAC now presents a revised and extended version of the Handbook that incorporates the practical experience acquired through the assessment of numerous disasters in the past decade, as well as the development of new and complementary concepts. This new version has also greatly benefited from the cooperation and contributions of distinguished experts and consultants from Latin America, the Caribbean and other parts of the world, and it is the result of the conceptual analyses of many disasters that have occurred in the region over the past three decades.⁴

viii This revised Handbook incorporates new and significant developments while refining and improving the methodology for damage assessment contained in several sections included in the first version published in 1991. In that respect, special reference should be made to the inclusion of cross-sectoral subject areas such as the environment, employment and income, and the differential effects on women, whose action is essential both during reconstruction and in mitigating the future impact of disasters. Furthermore, we put forward new tools for this type of analysis, which are now available thanks to the databases that can be accessed over the Internet, the use of remote sensors and the systematization of geo-referenced information. The Handbook points to some analytical difficulties associated with lags in the compilation of sufficiently detailed or itemized information –for example by sex, by income group or by geographic or political areas within a country– or the lack of baselines defining "normal" or pre-disaster situations such as environmental situation diagnoses and human development and social fabric indicators.

⁴ See the comprehensive listing of documents describing assessments undertaken by ECLAC since the early 1970s, included in the last section of the present Handbook.

II. CONTENTS

This new version of the ECLAC Handbook describes the methods required to assess the social, economic and environmental effects of disasters, breaking them down into direct damages and indirect losses and into overall and macroeconomic effects. The Handbook is not aimed at identifying the origins of disasters or defining the actions to be undertaken during the emergency or humanitarian assistance stage, since these tasks fall within the jurisdiction of other institutions and bodies. Although this second version of the Handbook contains significant improvements, it is not a finished product. Rather, we view it as a work in progress to be enriched continuously by the experience and contributions of its users as they apply it to the unique challenges of each new disaster.

The Handbook focuses on the conceptual and methodological aspects of measuring or estimating the damage caused by disasters to capital stocks and losses in the production flows of goods and services, as well as any temporary effects on the main macroeconomic variables. This new edition also contemplates both damage to and effects on living conditions, economic performance and the environment.

The Handbook describes a tool that enables one to identify and quantify disaster damages by means of a uniform and consistent methodology that has been tested and proven over three decades. It also provides the means to identify the most affected social, economic and environmental sectors and geographic regions, and therefore those that require priority attention in reconstruction. The degree of detail of damage and loss assessment that can be achieved by applying the Handbook will, however, depend on the availability of quantitative information in the country or region affected. The methodology presented here allows for the quantification of the damage caused by any kind of disaster, whether man-made or natural, whether slowly evolving or sudden. The application of the methodology also enables one to estimate whether there is sufficient domestic capacity for dealing with reconstruction tasks, or if international cooperation is required.

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Although this Handbook provides methods for evaluating different types of situations, it is not intended to be all encompassing. However, the concepts and examples provided will afford the analyst the basic tools needed to examine cases not explicitly covered in this text.

The Handbook is divided into five sections. The first describes the general conceptual and methodological framework. The second section outlines the methods for estimating damage and losses to social sectors, with separate chapters on housing and human settlements, education and culture, and health. The third section concentrates on services and physical infrastructure, including chapters on transport and communications; energy; and water and sanitation.

The fourth section covers damages and losses to productive sectors, with separate chapters on agriculture and fisheries, industry, trade and tourism. The fifth section deals with overall, cross-sectoral and macroeconomic effects, with separate chapters on environmental damages, the differential effect of the disaster on women, the impact on employment and income, a damage overview that provides a procedure for calculating total direct and indirect losses, and the effects of the disaster on the main macroeconomic aggregates.

The damage overview is specially relevant since expressing total damage in comparison to the size of the economy or other general variables allows one to determine the magnitude of the disaster and its overall impact. The analysis of the effects of the disaster on the possible performance of the main macroeconomic variables or indicators should be undertaken for a time-frame ranging from one to two years after the event, although this may be extended for up to five years depending on the magnitude of the damage.

x In addition to the conceptual framework described in each chapter, practical examples of actual cases analyzed by the ECLAC Secretariat are included as appendices for each sector. To the fullest possible extent, these examples have been chosen in order to reflect a wide range of possibilities: different natural phenomena (climatic or geological in origin, sudden or slow evolving events), as well as the composition and relative weight of losses. We have cited geographically diverse countries, and special conditions of vulnerability such as those found in Small Island Developing States (SIDS). In addition, we have included recurrent or seasonal events and phenomena with varying occurrence cycles.

The Handbook is presented in such a form that specialists involved in evaluating specific sectors can quickly refer to relevant conceptual material and chapters that are focused on their specific field of interest. An electronic version of the Handbook is also available on CD-ROM or at the ECLAC website; it also includes examples of recent case assessments using the revised methodology. We hope that this second version of the Handbook will not only be more complete but also more "user-friendly" than the original.

We further hope that readers and users of the Handbook will contribute their experiences in order to enrich and improve future editions. It will be used as a tool to train technical personnel in the countries at risk and also as a means to increase a greater culture of prevention within the region.

III. THE BEST TIME TO UNDERTAKE THE ASSESSMENT

It is impossible to decide a priori the most opportune time to undertake an assessment, as it will depend on the type of phenomenon causing the disaster, its magnitude and its geographic scope. In general, experience shows that the assessment should not begin until the humanitarian assistance stage is completed or well underway, so as not to interfere with search and rescue activities and to ensure the availability of sufficient quantitative information on direct, indirect and macroeconomic damage and losses. Given that in each case the assessment team will require the assistance of numerous national and regional counterparts from the affected areas, assessment work must be scheduled to begin when such personnel are no longer involved in humanitarian assistance efforts or, as is often the case, they or their families are no longer considered part of the affected population.

On the other hand, the assessment should not be unnecessarily delayed as there is an urgent need to elicit support from the international community, whose attention may quickly be diverted by disasters in other parts of the world.

The timing or sequence of dealing with the subjects in each assessment cannot be defined beforehand because it will depend on the type and magnitude of the event. However, in general terms, the analysis should usually begin with an evaluation of the population affected by the disaster with an eye toward defining the different degrees of impact; one should also keep in mind the differential impact on men and women and their differing roles during the emergency, rehabilitation and reconstruction stages. As a second step, one can identify and analyze damage to the social sectors (housing and human settlements, education and culture, and health), highlighting the situation of the most vulnerable groups. Third, the economic sectors (agriculture and fishing, trade and industry, and services) and infrastructure may be approached. The analysis of the effects of the disaster on environmental assets and services can be undertaken concurrently.

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The breakdown and depth with which the analysis is performed –as can be seen from the recent documents prepared by the ECLAC Secretariat– depend on the type of phenomenon involved and the availability of information for estimating damages and losses. In some cases it is possible to estimate damage and losses in minute detail, down to the level of vulnerable groups, municipalities or local communities.

IV. ACKNOWLEDGEMENTS

The Government of Italy, which made possible the 1991 publication of the first version of the Handbook, provided financial support for the preparation of this second edition. Further support was provided by the Government of the Netherlands through its technical program with ECLAC.

In addition, the Pan-American Health Organization (PAHO/WHO) provided technical cooperation for the preparation of the chapters on health and water and sanitation, as did the Technical Secretariat of the Central American Environment and Development Commission, in its fields of expertise.

The World Bank and the Inter-American Development Bank (IDB) were closely involved during the development of the revised version of the manual, participating at meetings to review progress and making valuable comments in various instances. The World Bank also provided input and financial support for the revision of this Handbook. Additional funding for this effort was provided under the umbrella of the ProVention Consortium, with the support of the Government of the Kingdom of Norway's Royal Ministry of Foreign Affairs and the United Kingdom's Department for International Development through its Conflict and Humanitarian Affairs Department.

xii ECLAC is deeply grateful for these contributions and also acknowledges the great importance to this exercise of interaction with many officials, academics and others who, in the course of assessment missions in the region, contributed ideas that enriched this manual.

V. AUTHORS

ECLAC entrusted the preparation of this version of this Handbook to Ricardo Zapata Martí, the Mexico City subregional headquarters official who acts as focal point for the subject of disasters at the Commission. Roberto Jovel, who directed the preparation of the first version of the Handbook, was hired as an external consultant to guide and supervise this version, as well as to write some sections. The following people, including members of the permanent staff, participants and in an interdivisional cooperation effort, and external consultants, were responsible for writing specific chapters:

Affected population: José Miguel Guzmán, with the support of the Latin American Demographics Center (CELADE), Alejandra Silva, Serge Poulard and Roberto Jovel.

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Health: Marcel Clodion, consultant from the Pan-American Health Organization (PAHO/WHO) and Claudio Osorio (PAHO/WHO).

Housing and human settlements: Daniela Simioni, ECLAC Division of the Environment and Human Settlements (DEHS); with support from Mauricio Faciolince, Ricardo Bascuñan and Silvio Griguolo (consultants).

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Water and sanitation: Claudio Osorio (PAHO/WHO).

Transport and communications: Ian Thompson, head of the Transport Unit of the ECLAC Division of Natural Resources and Infrastructure, with a contribution by David Smith (consultant).

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Tourism: Françoise Carner (consultant), José Javier Gómez (DEHS) and Erik Blommestein, ECLAC subregional headquarters for the Caribbean.

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Macroeconomic effects: Ricardo Zapata and René Hernández, from the ECLAC subregional headquarters in Mexico City.

The following ECLAC officials read the original manuscript and provided valuable suggestions that enabled the improvement of the final version of the Handbook:

Nieves Rico, Women and Development Unit at ECLAC headquarters;
Pilar Vidal, Women and Development Unit at ECLAC/Mexico; Esteban Pérez, ECLAC subregional office for the Caribbean.