S E R I E

ECLAC SUBREGIONAL OFFICE IN

MEXICO

estudios y perspectivas

117

Economic impact of disasters: Evidence from DALA assessments by ECLAC in Latin America and the Caribbean

Ricardo Zapata

Benjamín Madrigal

NACIONES UNIDAS

CEPAL

ECLAC Subregional Office in Mexico

Mexico City, November 2009

This document has been prepared by Ricardo Zapata Martí, Regional Advisor and Regional Focal Point for Disaster Evaluation of the Disaster Evaluation Unit, ECLAC, with the collaboration of Benjamín Madrigal.

The views expressed in this document, which has been reproduced without formal editing, are those of the authors and do not necessarily reflect the views of the Organization.

United Nations Publication
ISSN printed version 1680-8800 ISSN online version 1684-0364
ISBN: 978-92-1-121731-5
LC/L.3172-P
LC/MEX/L.941
Sales No.: E.09.II.G.146

Printed in United Nations, Mexico City, Mexico

Table of contents

Tables

Graphs

Abstract

Over the last 35 years the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) has assessed major disasters in the Latin American region. Based on those exercises, which that have been conducted in a systematic manner using an evolving but comparable methodology over the years[1], there is now historical evidence of the economic consequences these events have on the region's economies. This evidence-based approach sheds light on the link between economic performance, development dynamics and how disasters, as "external" shocks, generate lingering effects of different relative importance.

The effect of disasters are most severe or visible in smaller, less developed, vulnerable, non diversified economies which are highly dependent on natural resources or on environmental services, interpreted in a broad sense to include services such as supporting tourism.

It could be argued that this evidence is neither statistically fully representative (assessments are conducted as demand driven exercises at the request of ECLAC's member governments), nor comprehensive, as only major events have been assessed and there is a yearly cumulative recurrence of minor events that have not been fully assessed. It could also be argued that improvements in the quality of both baseline data and data on disaster impacts as well as methodological improvements may lead cause disaster impact to appear to grow more over time than they actually did. In addition to the case by case quantifications that constitute the historical record of

1 ECLAC, Handbook for the evaluation of the socioeconomic and environmental impact of disasters (www.cepal.org/mexico, under "desastres"). In that webpage can be found a number of the numerous assessments conducted with the ECLAC methodology over the years.

disasters that will be the basis for this document, ECLAC has also undertake, some selected case studies on specific countries that quantify the economic impact of disasters over time in those countries[2].

Nevertheless, and in spite of the caveats indicated, there is a growing body of evidence at the world level that the economic impact of disasters is growing, as shown by statistics from international bodies (such as the International Strategy for Disaster Risk Reduction -- ISDR), academia (the Louvain University based Center for the Epidemiological Research of Disasters (CRED) sponsored by the United States Office for Foreign Disaster Assistance, OFDA database) and the private sector (the large world reinsurers such as Munich Re and Swiss Re).

[2] ECLAC-Inter American Development Bank (IADB) Project on Disaster risk information management (www.cepal.org/mexico, where the project documents, regional and national reports on Chile, Colombia, Jamaica, Mexico, and Nicaragua can be found.

I. Disasters, impact on development indices as observed in Latin America and the Caribbean

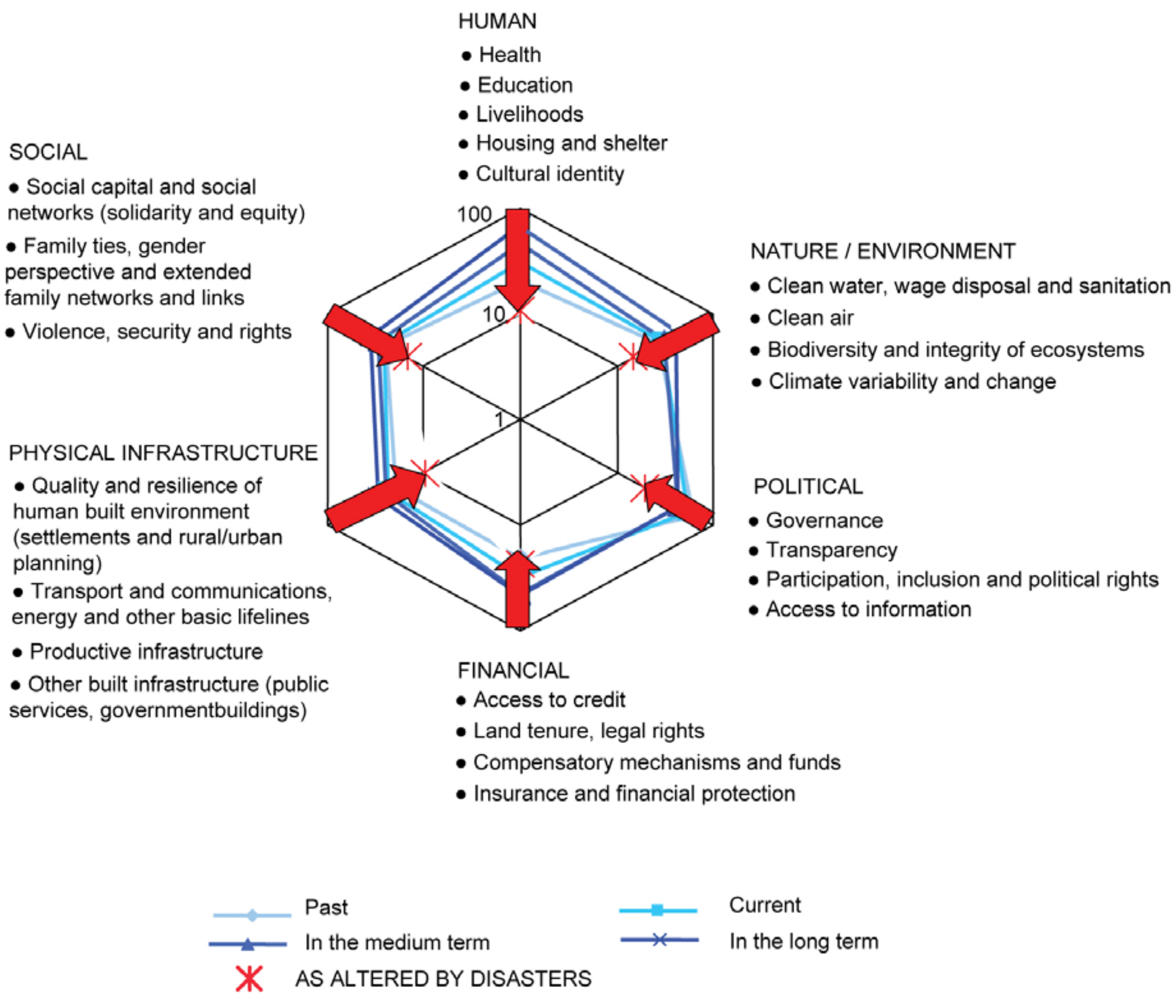
The link between this growing body of evidence and the visible impacts on development, as documented by the methodology developed over time, provides a basis to promote disaster risk reducing policies and investments in risk reduction. In addition, quantifying the impact – in terms of damage and losses—of climatic events, be it sudden onslaught disasters, or slow evolving ones such a droughts, or cyclical phenomena such as El Nino Southern Oscillation (ENSO), observation over a period of time gives an indication of trends in climate variability and change.

It is in this sense that disaster assessment is seen as a precursor for the quantification of climate change. It must also be noted that in many instances the increased damages and losses have complex causality in which climate change may be one of several stress factors. Some of the important factors may include environmental degradation, patterns of land use, urbanization, demographic evolution, production patterns and social factors such as quality of human capital, social capital, infrastructure resilience, and inappropriate use of natural resources.

1. Summary of impact of disasters in economic terms

Based on 35 years of analysis and assessments of disasters from the perspective of the development process (see graph), we find that disasters have two major negative consequences in developing countries: a setback in development indicators and an additional gap to be filled in terms of social, economic and physical investment. Disasters generate destruction of assets and losses (reduced flows and capacities) in connection to the fulfillment of basic human services (health, education, housing and shelter), as well reducing human living standards, affecting cultural identity factors eroding, social capital such as community integrity and social networks. Disasters may also have differentiated gender impact. In addition to the economic impact in terms of productive capacity and production losses, disasters also worsen natural and environmental conditions. These effects have to financial implications in terms of access to credit, capacity of individuals and society at large to recapitalize, the demands on government for compensatory post disaster mechanisms and fund particularly when —as tends to be the norm— post disaster impacts show under insurance and lack of post disaster financial protection. Ultimately these negative impacts have political effects in terms of governance and transparency. In many instances the post-disaster decisions are made at the top with insufficient participation, inclusion and respect to the views, perspectives and sometimes even the rights of the affected population.

GRAPH 1
DISASTERS' IMPACT ON DEVELOPMENT, AS A HOLISTIC, SYSTEMIC INTEGRATED PROCESS



Source: Author.

Some of the literature dealing with the impact of disasters[3] suggests that the overall impact of disasters is positive, as they force technical improvement and resilience in the recovery process. Other[4], as well as the numerous assessments made by ECLAC[5], show that the lack of financial resources to complete the reconstruction process, and the opportunity costs of investment used to rebuild —whether additional or diverted from other uses— leads to a net loss over time. Furthermore, if countries infrastructures fail to completely recover, there will be additional vulnerability generated, that will lead to increased damage and loss in the next disasters. This is particularly evident in the case of recurrent or seasonal disasters, such as cyclones, and major climatic events which are affected by climate change[6].

2. Absolute and relative economic impact of disasters in Latin America and the Caribbean (LAC)

In this section we discuss three basic questions. First, are disasters increasing over time; second, are the impacts sensitive to economic size and level of development; third, is there evidence that risk reduction effects lead to lessened impact.

(a) Is there an increase over time?

There is statistical information from numerous sources indicating that disasters are increasing in number, cost and impact over time (see graph 2). Some skeptics argue that this may be misleading as there is more information available at present than there was in the past and that the increase may be related to other factors, such as natural demographic growth leading to higher exposure and costlier investment and infrastructure associated with the development and economic growth process. Nevertheless, the fact remains that the economic cost, the amount of insured losses and the number of disasters, all show a marked increasing trend.

Evidence from historical records, country disasters assessments using the ECLAC methodology; show an increase in the impact of disasters over time. Even with a decreasing number of fatalities as in the case of Latin America and the Caribbean, the economic impact in terms of damage and losses has consistently. These trends are consistent with worldwide evidence from the OFDA-CRED database[7].

Furthermore, the statistical evidence also points to an accelerating increase in hydro meteorological events, which would seem to support the notion that climate variability and climate change play a role in the number of events. Meteorological events tend to have a larger proportion of losses rather than damage, i.e. geological and volcanic events tend to destroy more physical infrastructure and assets proportionally while causing fewer losses, relative to hydro meteorological events, particularly in productive sectors that are more heavily dependent on natural resources and on seasonal cycles, such as agriculture, raising livestock and fishing, and seasonally linked activities such as tourism.

---

3 Albala-Betrand, J.M. (1993). *Political Economy of Large Natural Disasters with Special Reference to Developing Countries.* Oxford, Clarendon Press.

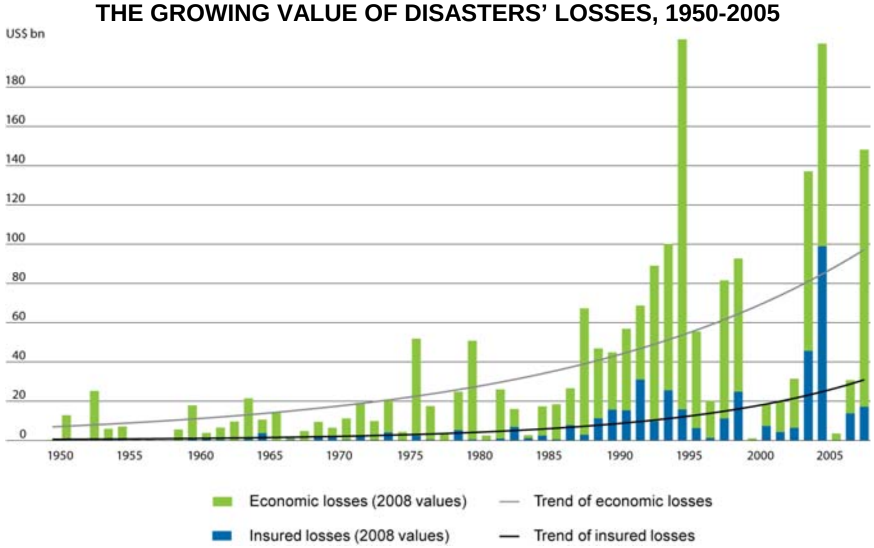
4 Arrow, K. J. (1992). "Insurance, Risk and Resource Allocation." *Foundations of Insurance Economics: Readings in Economic and Finance.* G. Dionne and S. E. Harrington. Boston, Kluwer Academic Publishers, Centre for Research on the Epidemiology of Disasters (CRED) (1999). EM-DAT: *International Disaster Database*. Université Catholique de Louvain, Brussels, Belgium, Charveriat, C. (2000). "Natural Disasters in Latin America and the Caribbean: An Overview of Risk." *Working Paper 434*, Washington DC, Inter American Development Bank), and several studies by Charlotte Benson and the work of Steven Bender (Bender, S. (1991). *Primer on Natural Hazard Management in Integrated Regional Development Planning*. Washington, DC, Department of Regional Development and Environment, Executive Secretariat for Economic and Social Affairs, Organization of American States, Benson, C. (1997). *The Economic Impact of Natural Disasters in the Philippines, The Economic Impact of Natural Disasters in Viet Nam, and The Economic Impact of Natural Disasters in Fiji.* London, UK, Overseas Development Institute.

5 See www.cepal.org/mexico.

6 See IPCC, 2007: *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K and Reisinger, A. (Eds.)]. IPCC, Geneva, Switzerland.

7 See http://www.emdat.be/Database/Trends/trends.html, Centre for Research on the Epidemiology of Disasters (CRED), Université Catholique de Louvain, Ecole de Santé Publique, EM-DAT by CRED.

GRAPH 2
THE GROWING VALUE OF DISASTERS' LOSSES, 1950-2005

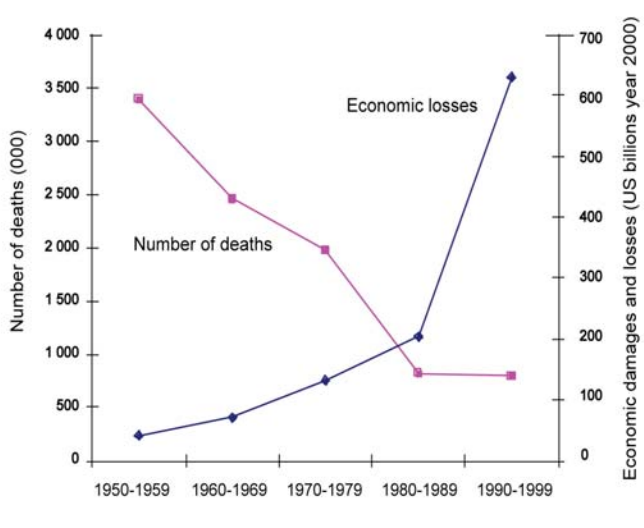


Source: Munich Re.

Particularly in the case of variations in the yearly seasons that affect planting, growing and harvesting cycles and in drought events, the impacts are mostly concentrated in losses[8].

Production and yield decreases are directly related to these phenomena. In the case of extreme meteorological events, such as cyclones and tropical storms, which cause damage to economic, physical and environmental assets, losses tend to endure over time.

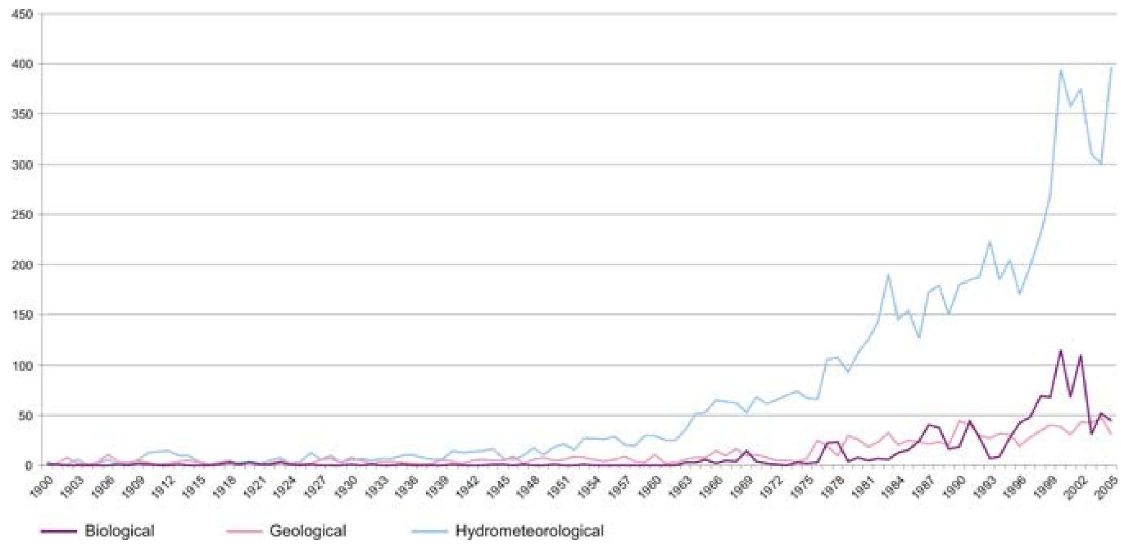
GRAPH 3
HUMAN VS. ECONOMIC IMPACT, 1950-1999



Source: ECLAC and CRED.

[8] Losses are changes in flows derived from damage and Damage is the destruction total or partial of assets, goods, capital, heritage (valued on "as is" or "was" basis).

GRAPH 4
NUMBER OF NATURAL DISASTERS REGISTERED IN EM-DAT, 1900-2005



Source: EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.

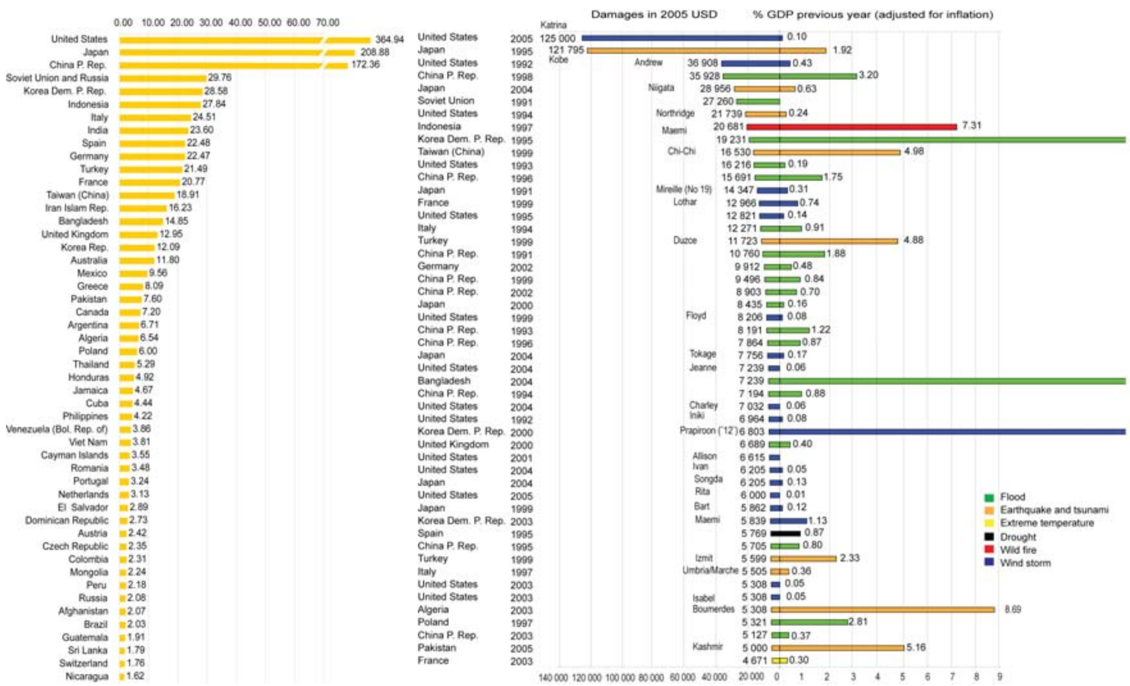
(b) Economy size and development level matter

The total and relative impact of a disaster is closely linked not only to severity of the natural phenomena but also to the resilience of the affected area, the level of development (i.e. total cost of existing infrastructure),the value added of affected economic activities and the diversification and sophistication of the economy.

In absolute terms, monetary damage and losses tend to be larger in more developed countries (see tables from the OFDA-CRED database).

GRAPH 5
RELATIVE AND ABSOLUTE VALUE OF DISASTERS, 1991-2005

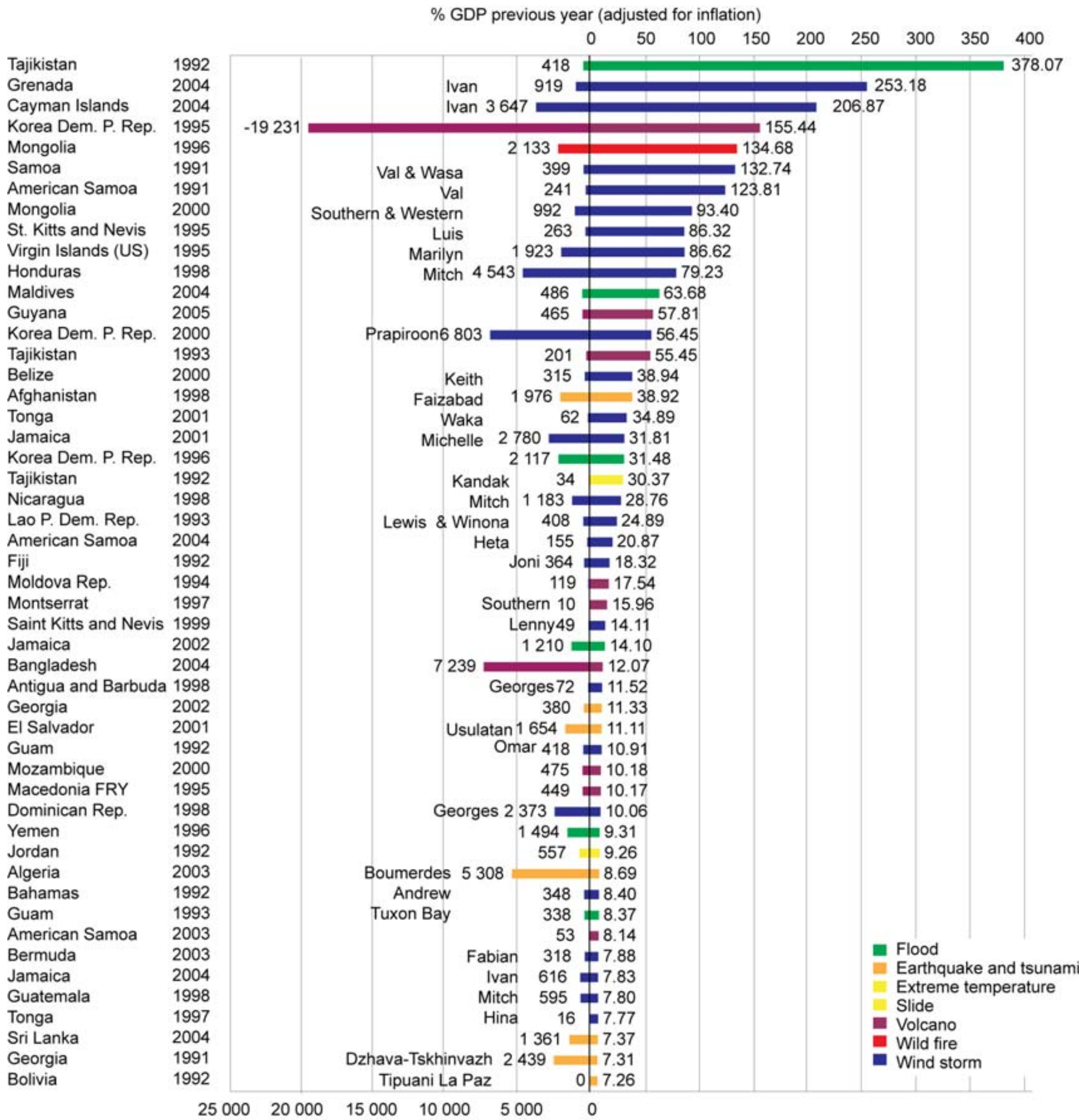
Accumulated absolute impact (1991-2005) (USD 2005 prices)	**Absolute impact and impact relative to Gross Domestic Product (GDP), by event**



Source: EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.

The relative impacts, as measured by damage and losses as a fraction of the annual Gross Domestic Product (GDP), is larger in smaller, less developed, and less diversified economies (see table from the OFDA-CRED database).

GRAPH 6
WORLD DISASTER BY RELATIVE IMPACT ON AFFECTED COUNTRY, 1991-2005



Source: EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be – Université Catholique de Louvain – Brussels – Belgium.

The following table summarizes the cumulative value of disasters in the region from 1972-2007, based on data from assessments conducted by ECLAC, or with the use of the ECLAC developed disaster damage and loss assessment methodology (DALA). See annex I.

TABLE 1
SUMMARY OF ECLAC VALUED DISASTERS IN LATIN AMERICA AND THE CARIBBEAN, 1973-2007

Date	Affected population		Total damages (constant USD millions 2007)				Total impact of disaster on previous year GDP	Total impact of disaster on previous year GKF
	Fatalities	Direct affected people	Total	Damages (Total or partial destruction of assets or capital)	Losses (Perturbation in flows)	Effects on the external sector (Changes in imports and exports) [a]		
Total	104 862	30 241 024	242 268	148 492	92 105	74 796		
Average per year (1973-2007)	3 084	889 442	7 126	4 367	2 709	2 200	2.08%	4.44%

Source: ECLAC, based on disasters assessed since 1972.
[a] Does not reflect financial flows affected, as would be increased debt, grants received, humanitarian donations and or insurance claims paid by reinsurers, unless so specified in the specific assessment.

The impact by sub regions differs given their level of exposure to hazards and the inherent vulnerabilities associated with size, level of development, social and economic disparities, and quality of infrastructure.

In the case of the Caribbean, in the period 1975-2007, disasters have caused more than 7,650 fatalities, affecting directly almost 5 million people. The total sum of the impact, in terms of damage and losses has reached 35,656 millions of dollars (2007 prices), which represents over 16,6% of the average regional GDP and exceeds by two times the yearly average gross capital formation. On average, the Caribbean experiences a yearly loss that exceeds 1,114 million US dollars. Currently, these negative impacts, bare even more severe: average fatalities have risen to more than 800 per year during the last seven years, from 239 for the whole 1975-2007 period and disasters affect over half a million Caribbean inhabitants, annually, up from an average of 160,000 in the 32 year period. The economic impact has also increased, mostly in terms of damages (total or partial destruction of assets) which rose to 1,798 billion dollars in 2000-2007. The yearly negative impact on the external account, due to import increases and losses of export revenue (mostly associated with tourism) fluctuates around 300 million US dollars. (See table 2).

TABLE 2
SUMMARY OF ECLAC VALUED DISASTERS IN THE CARIBBEAN, 1975-2007 AND 2000-2007

Date		Affected population		Total damages (constant USD millions 2007)			
		Fatalities	Direct affected people	Total	Damages (Total or partial destruction of assets or capital)	Losses (Perturbation in flows)	Effects on the external sector (Changes in imports and exports)
Total		7 650	4 996 271	35 656	24 095	9 890	7 283
Yearly average	1975-2007	239	156 133	1 114	753	309	228
Yearly average	2000-2007	801	533 144	1 798	1 188	371	343

Source: ECLAC, based on disasters assessed since 1972.

In Central America fatalities in the 1973-2007 period reached over 50,000 —an average of 1,564 per year— although the number has decreased to an annual average of 288 in the 2000-2007 period. The total affected population over the period exceeds 9 million and on average over the 2000-2007 period more than half a million are touched by major disasters every year. The total impact over time exceeds 115,768 million US dollars (2007 prices), which is more than 3,618 million per year, mostly due to damages. The incidences of drought and climatic impact on agriculture suggest average yearly losses of 1,344 millions. The total amount of damage and losses represents more than 10% of the region's yearly average GDP, and almost 30% of the region's yearly gross capital formation. The average external impact exceeds 1,132 million US dollars per year for the 32 year period.

TABLE 3
SUMMARY OF ECLAC VALUED DISASTERS IN CENTRAL AMERICA, 1975-2007 AND 2000-2007

Date		Affected population		Total damages (constant USD millions 2007)			
		Fatalities	Direct Affected People	Total	Damages (Total or partial destruction of assets or capital)	Losses (Perturbation in flows)	Effects on the external sector (Change in imports and exports)
Total		50 032	9 084 640	115 768	72 745	43 023	36 237
Yearly average	1975-2007	1 564	283 895	3 618	2 273	1 344	1 132
Yearly average	2000-2007	288	502 313	1 022	598	423	216

Source: ECLAC, based on disasters assessed since 1972.

In the Andean Community —given the limited number of events assessed (namely El Niño on two occasions)— no clear trend may be established. However, given the magnitude of those two events, it is worth comparing the differential impact in each instance.

TABLE 4
SUMMARY OF ECLAC VALUED DISASTERS IN THE ANDEAN COMMUNITY, 1982-2007

Date	Place	Affected population		Total damages (constant USD millions 2007)			
		Fatalities	Direct Affected People	Total	Damages (Total or partial destruction of assets or capital)	Losses (Perturbation in flows)	Effects on external sector
1982-1983	El Niño in Bolivia, Ecuador and Peru		3 840 000	42 589	27 728	14 861	18 462
1997-1998	El Niño, Andean Community	600	125 000	11 286	4 084	7 203	3 528
1999, January 25	Colombia	1 185	559 401	2 127	1 874	253	138
1999, December	Venezuela	20 000	200 000	4 309	2 632	1 678	431
2006-2007	Bolivia		618 740	529	169	360	0
Total		41 785	5 543 141	65 150	39 119	26 031	22 990

Source: ECLAC, based on disasters assessed since 1972.

The size of each national economy and the extent to which its territory is exposed is clearly shown by the relative impact of damage and losses to GDP. Though disasters have hardly weighted more than 1.5% of regional GDP, they have been most severe for Bolivia and Ecuador. Another noteworthy observation is the size of the damage relative to national investment. In total, damages are equal to about 10% of the region's gross capital formation. This must be seen in the context of the increased recurrence and strength of these climatic events (the Niño/Niña) alongside the increased degradation of the region's environment (destruction of natural habitats, deforestation, soil degradation and loss, etc.), and insufficiently developed and maintained infrastructure.

TABLE 5
RELATIVE IMPACT OF DISASTERS IN THE ANDEAN COMMUNITY, 1982-2007

Date	Place	Previous year GDP (in current USD millions)	Total impact of disaster on previous year GDP	Previous year GKF (in current USD millions)	Total impact of disaster on previous year GKF
1982-1983	El Niño in Bolivia, Ecuador and Peru				
	Bolivia	3 752.0	22.295%	56.80	918%
	Ecuador	299 537.8	0.214%	335.16	159%
	Peru	25 036.0	7.996%	857.10	141%
1997-1998	El Niño, Andean Community				
	Bolivia	7 397.0	7.125%	962.57	22%
	Colombia	97 147.1	0.581%	16817.19	0%
	Ecuador	21 267.9	13.551%	3057.27	28%
	Peru	55 876.1	6.264%	9096.51	18%
	Venezuela	70 795.0	0.102%	17609.79	0%
1999, January 25	Colombia Coffee region earthquake	98 512.9	1.609%	17331.88	8.0549%
1999, December	Venezuela landslides and floods	95 841.0	3.350%	25833.34	7.5910%
2006-2007	Bolivia, El Niño	844 137.2	0.060%	1536.00	10.6238%
Total		1 290 974.1	1.514%	92 244.5	9.826%

Source: ECLAC, based on disasters assessed since 1972.

TABLE 6
RELATIVE IMPACT OF ECLAC VALUED DISASTERS IN MEXICO, 1985-2007

Date	Total impact of disaster on previous year GDP	Total impact of disaster on previous year GKF
Total - 22 years (1985-2007)	0.66%	0.41%
Yearly average (1985-1999)	1.80%	0.35%
Yearly average (2000-2007)	0.20%	0.46%

Source: ECLAC, based on disasters assessed since 1972.

Mexico is the country where there is more consistent information given the yearly compilation done by national authorities. The summary of cumulative impact shows a smaller overall impact given the size and diversification of the economy. Over time the impact (damage and losses quantified) on the country's GDP has not exceed 2%, but the damage has grown in importance in terms of the cost of destruction relative to national investment (as expressed by the gross capital formation registered in the national accounts).

The cumulative effect has a national dimension, even though events are geographically localized and events seldom affect the whole of the territory. The national impact depends on specifics of the events and whether they are seasonal. Climatic events may be divided into thermal (freezes and snowstorms during the winter season in the north-northwestern part of the country), pluviometric (seasonal or multiannual droughts on the north-northeaster states), storms (during the months of May to December) associated with the tropical depressions, cold fronts and cyclones that hit the country on both the Pacific (namely affecting the Baja California peninsula) and Atlantic/Caribbean (affecting mostly the Yucatan peninsula), and floods associated with cyclones, cold fronts and tropical depressions affecting the low-lying flood plains of the states bordering the Gulf of Mexico where sometimes the flood is an indirect consequence of rain falling in the uplands, upstream of rivers washing into the Gulf. Non-climatic events are mostly seismic or volcanic in nature and are mostly linked to the tectonic plates' movements. These affect the central states and plateaus in the center of the country.

The impacts show acceleration over recent years, mostly in terms of the current value of damages and losses and the affected population, although the number of fatalities has decreased dramatically. Also evident is the increasing ratio of climatic over non-climatic events, which points to the urgency of looking at risk reduction more in terms of adaptation to climatic variability and change rather than just mitigation of the impacts of static or non-changing hazards. Table 7 summarizes the economic impacts over time.

(c) Increased value added vs. decreased risk reduction (transfer/management)

The increased cost of losses caused by disasters, as indicated, is related to —among other factors— the increased value added of investments and economic activities. This holds true for both developed and developing countries. Furthermore, there resources paid in claims (the noted increased in insured losses), which has been an increase in the bears witness to the fact that investments that generate more value added do not sufficiently include in the investment formula, and in the economic viability and profitability analysis, the resources required to decrease risk. Risk management is not appropriately quantified in investments and transfers of investment risk associated with the impact of natural events, as measured by insurance and other risk transfer mechanisms. In event after event there is a wide acknowledgement that both assets and economic losses were underinsured. Be it because some risks were not appropriately perceived or valued or that restitution of damage and losses in many cases were seen as part of the public goods that the state must provide its citizens (sovereign moral hazard), the fact remains that the increased value of assets and economic activities is, in many instances, inversely related to the amount of resources devoted to reduce, transfer, or manage risk. Thus, a public good (the social safety net to protect lives and property after a disaster deemed a governmental responsibility as stated in the UN disaster conferences) becomes a public calamity and further defers social and economic investments required for the development process.

In the case of financial management, government funds for calamities, if they exist at all, lack the resources needed to attend to disasters of the magnitude that they have to confront, and also lack stable sources of funding. In many instances, the funds deal primarily with emergency response or the reconstruction of public sector assets. Only a few countries allot funds for prevention and mitigation measures. Among the few that do, Mexico and Colombia should be seen as examples for other countries in the region[9].

TABLE 7
SUMMARY OF ECLAC VALUED DISASTERS IN MEXICO, 1985-2007

Date	Affected population		Total damages (current USD millions per year)			Foreign sector effects (variations on imports and exports)	Total damages (constant USD millions 2007)			
	Fatalities	Direct affected people	Total	Damages (total or partial destruction of assets or capital)	Losses (perturbation in flows)		Total	Damages (total or partial destruction of assets or capital)	Losses (perturbation in flows)	Effects on external sector
Total 22 years (1985-2007)	10 263	9 269 994	16 724	10 574	5 883	1 923	52 120	41 125	10 664	15 003
Total (1985-1999)	9 739	150 000	6 472	5 297	1 175	1 683	41 017	35 402	5 615	14 840
Yearly average 22 years (1985-2007)	467	421 363	760	481	267	87	2 369	1 869	485	682
Yearly average (1985-1999)	696	10 714	462	378	84	120	2 930	2 529	401	1 060
Yearly average (2000-2007)	75	1 302 856	1 465	754	673	34	1 586	818	721	23

Source: ECLAC, based on disasters assessed since 1972.

3. Dynamic impact of disasters

Disasters have not only a static impact in terms of immediate destruction of assets, a momentary drop in economic activity and disruption of social networks, but also tend to have an impact that lasts over time. The dynamic impact of assessed disasters over time has been contrasted in a counterfactual analysis. Thus, based on available statistics and the evaluations made, a comparison was made of the actual rate of growth of the affected countries GDP with the rate these economies might have had if the disaster had not caused the assessed damage and losses.

To approximate the gap in GDP performance attributable to disasters —in a preliminary approximation— we contrast the actual performance of the variable (taken from ECLAC's statistical and economic surveys of the countries)[10] with the estimated performance derived from the assessments made of concrete disasters over time. This generates the gaps presented here. A more sophisticated

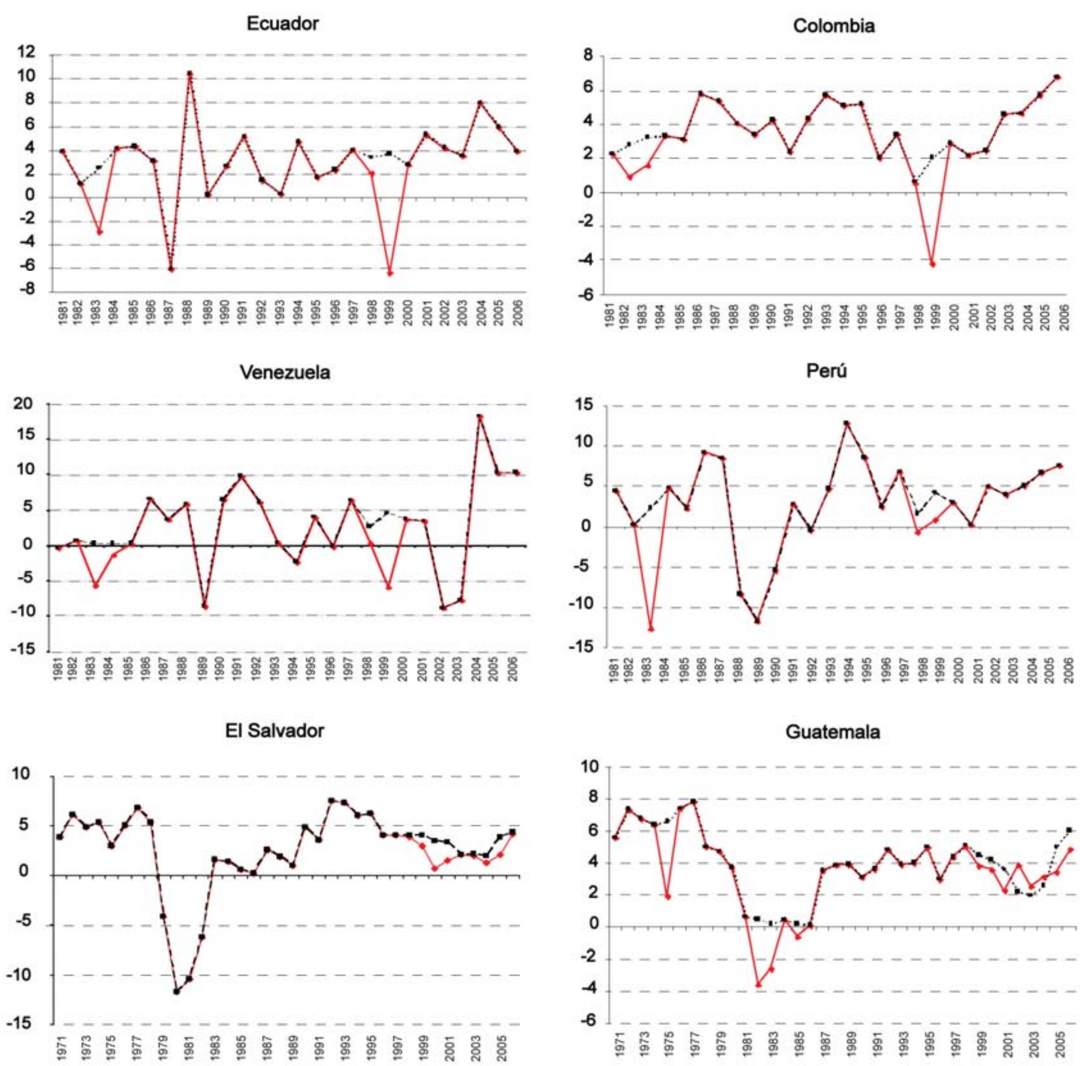
[9] IDB/ECLAC, *Information on disaster risk management. Case studies of five countries. Main technical report* (LC/MEX/L.805), Copyright © United Nations and IDB, December 2007. All rights reserved. Printed in Mexico City. This publication is part of the study carried out under the framework of the Information Program and Indicators for Disaster Management project, financed by the Inter-American Development Bank (IDB) and executed by the Economic Commission for Latin America and the Caribbean (ECLAC), Sub regional Headquarters in Mexico. The task was coordinated by Ricardo Zapata, ECLAC Focal Point on Disaster Evaluation, and in charge of development was Roberto Meli, ECLAC consultant. Also involved in producing the report were: Daniel Bitrán and Sandra Santacruz. The supervision was carried out by Caroline Clark and Kari Keipi of the IDB.

[10] The ECLAC *Statistics Yearbook* and the *Economic Survey of Latin America and the Caribbean* are yearly publications that are accessible online in the following sites: http://www.eclac.org/estadisticas/default.asp?idioma=IN, and http://www.eclac.org/de/default.asp?idioma=IN

methodology, using partial or general equilibrium models, has not been applied, since the number of observations (disasters assessed) is limited and not necessarily systematic, as assessments have been made historically on a demand-basis from affected countries. One of the few exceptions where a systematic gathering of damage and losses from disasters has been attempted is the case of Mexico. On the basis of other analyses made, small disasters in the region have been estimated to have an annual impact of over 200 million dollars[11].

The first observation is that the volatility of the rate of growth has further expanded or altered what would have otherwise been a smoother growth path. The following tables illustrate this for several countries.

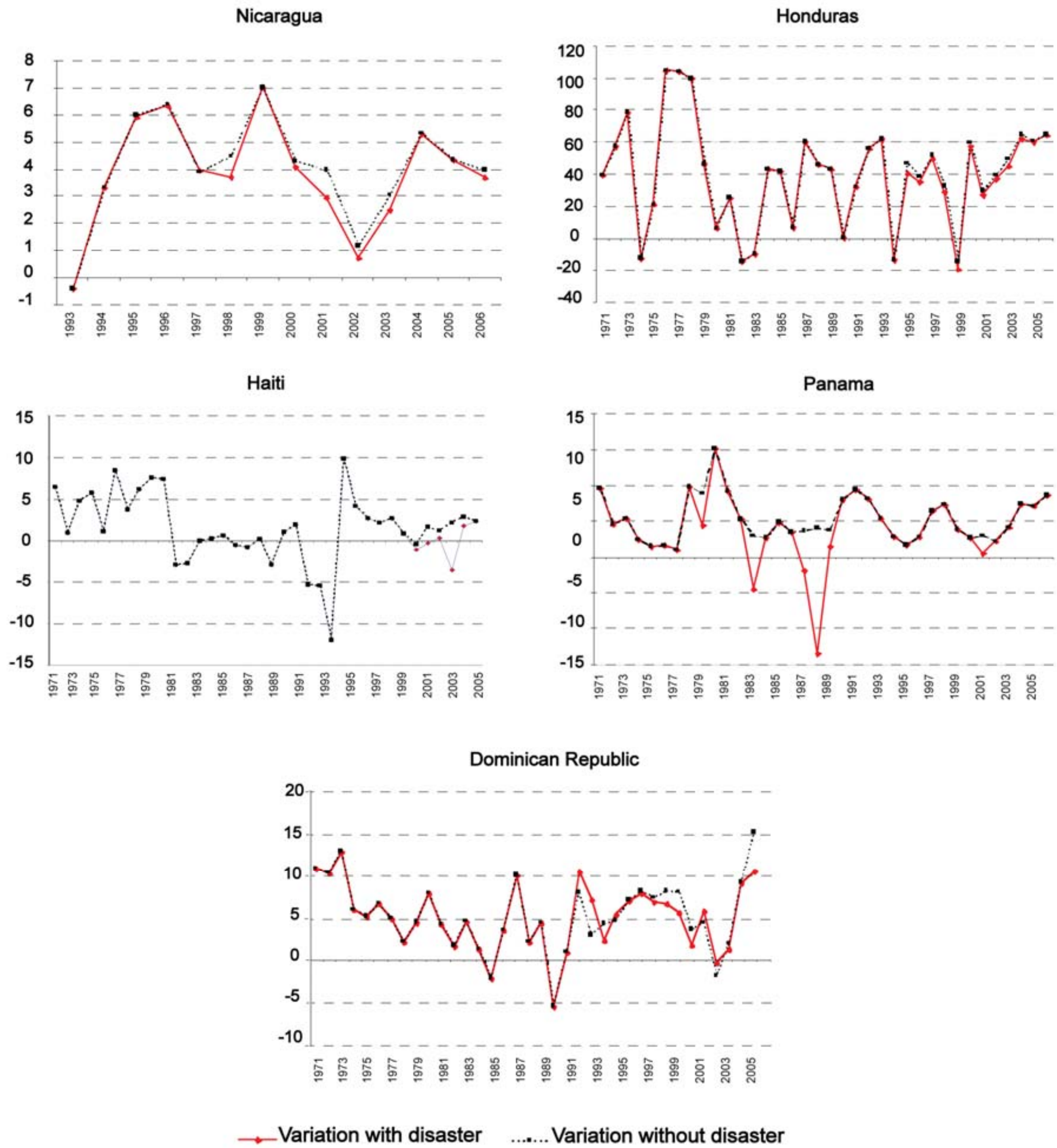
GRAPH 7
GDP VARIATION IN SELECTED COUNTRIES IN THE REGION, 1971-2005



(Continued)

[11] (Jovel, R., 2000) calculated that in current value the figure could be of up to 170 million from observations going over a 15 year period.

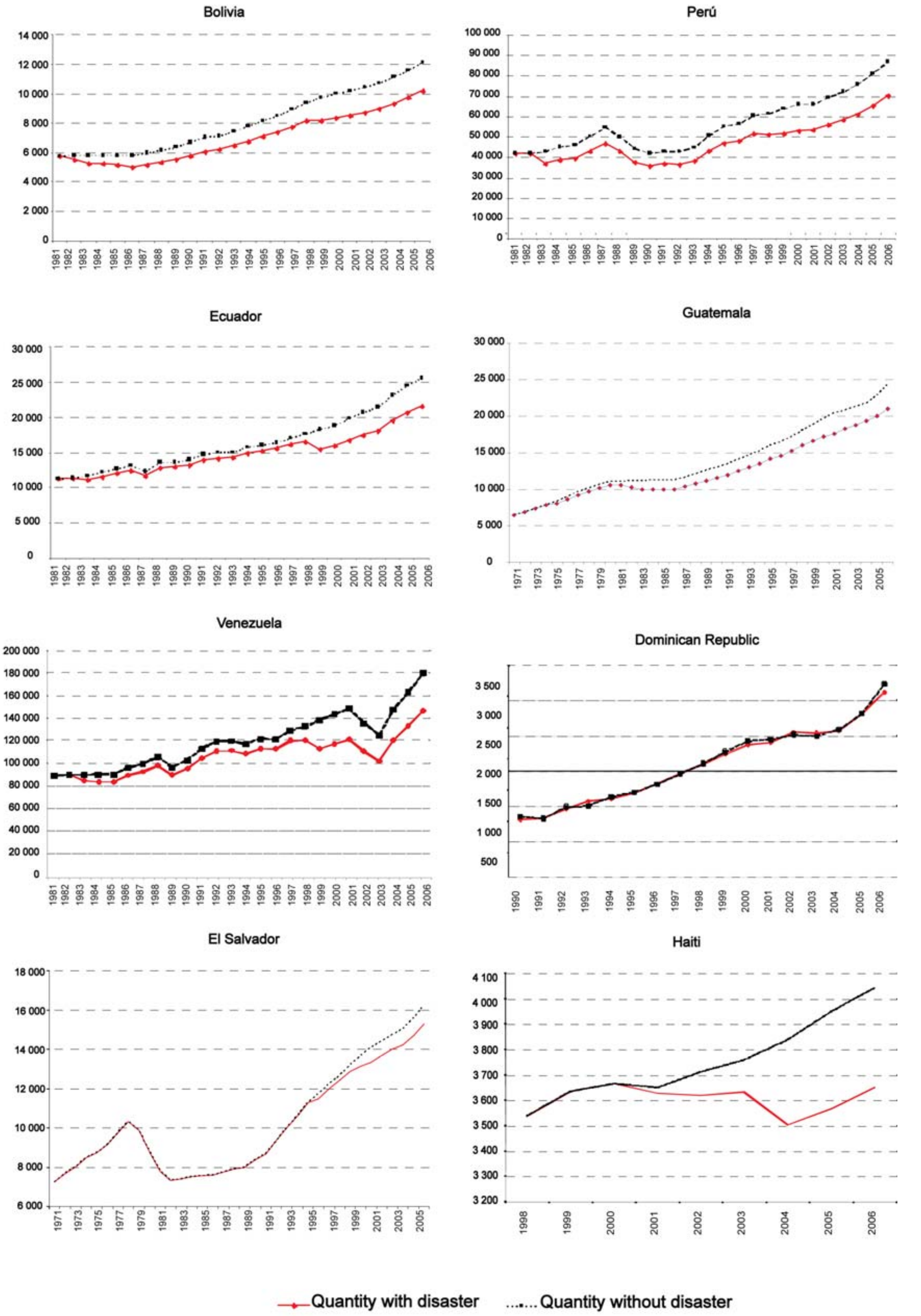
GRAPH 7 (conclusion)



Source: Estimated by the author.

The second observation is that, given the dynamic volatility and drop in GDP caused by the disaster, a growth gap emerges over time, which is further aggravated when the economy suffers a recurrent cycle of disaster events.

GRAPH 8
GDP GAP GENERATED BY DISASTERS IMPACT IN SELECTED COUNTRIES IN THE REGION, 1981-2006



Source: ECLAC, based on disasters assessed since 1972.

An interesting exercise outside of Latin America was carried out in Gujarat. The past performance of the Gujarat economy following major disasters (on the basis of historical information) is described in the following tables. The first table shows the state's GDP (GSDP) and the historically recorded damage of major events over the years. The second table describes the estimated damage and the amount spent on relief, as well as, the funds received from the central government through the calamity relief fund from the Finance Commission.

The state of Gujarat has a multihazard disaster history as stated in the following table:

TABLE 8
GUJARAT: MULTIHAZARDS DISASTER HISTORY, 1819-1999

Cyclone	1850	1881	1893	1897	1903	1917	1920	1933	1947	1948	1961
	1964	1975	1976	1978	1981	1982	1983	1990			
Drought	1985	1986	1987								
Floods	1980	1989	1999	1990					-	-	-
Earthquake	1819	1845	1847	1848	1864	1903	1938	1956			-

Source: *Gujarat Earthquake Recovery Program, Assessment Report*, March 14, 2001.

An analysis conducted by the Dr. S.S. Mehta, CEPT University (Centre for Environmental Planning and Technology in Gujarat, India)[12], compared the actual performance of the State's GDP to the expected performance given the state's dynamism trend if disasters (as indicated in its documented history) had not occurred (see tables below).

TABLE 9
GSDP AT CURRENT PRICES FOR THE YEAR 1993-1994 TO 2002-2003
(RS. IN CR) [13]

Year	Observed value	Expected value	Losses
1993-1994	49 194	57 002	-7 808
1994-1995	63 516	63 287	229
1995-1996	71 886	70 266	1 620
1996-1997	85 837	78 014	7 823
1997-1998	91 188	86 616	4 572
1998-1999	105 304	96 167	9 137
1999-2000	110 167	106 771	3 396
2000-2001	111 599	118 545	-6 946
2001-2002	127 191	131 616	-4 425
2002-2003	138 285	146 130	-7 845

Source: Gujarat Earthquake Recovery Program.

[12] See: ADPC, *A regional experience of assessing the socioeconomic impact of natural disasters*, a study for the Gujarat State Disaster Management Agency (GSDMA) prepared by Asian Disaster Preparedness Center (ADPC, Center for Environmental Planning and Technology (CEPT), the Indian Institute of Technology (IIT) in Mumbai, and the UN-ECLAC.

[13] Amount of monetary value in India is normally expressed in lakhs and crores. The following table indicates the conversion of these units to metric ones:

	Crore	(1,00,00,000)	⇨	100	Lakhs
1	Lakh	(1,00,000)	⇨	0.01	Crores
1	Million	(1,000,000)	⇨	0.1	Crores
1	Crore	(1,00,00,000)	⇨	10	Million
1	Billion	(1,000,000,000)	⇨	100	Crores
1	Crore	(1,00,00,000)	⇨	0.01	Billion

Thus, for example, to convert a Rupee (Rs.) amount (given in Crores, cr), into its corresponding Dollar amount in Millions, divide the rupee Amount by "Spot Rate", the Current Dollar Rupee rate multiplied by 10. Then Rs 4 Cr = Rs 4,00,00,000/- = 4,00,00,000 / 40 = USD 1 million (assuming the Dollar Rupee Spot rate to be Rs. 40/$). Similarly, Rs 16 Cr = USD 4 million).

TABLE 10
PER CAPITA INCOME AT (93-94 CURRENT PRICE) FOR THE YEAR 1993-1994 TO 2002-2003
(RS. IN '000)

Year	Observed value	Expected value	Losses
1993-1994	11 323	13 169	-1 846
1994-1995	14 336	14 328	9
1995-1996	15 911	15 588	323
1996-1997	18 690	16 959	1 731
1997-1998	19 573	18 450	1 123
1998-1999	22 279	20 074	2 205
1999-2000	22 482	21 839	643
2000-2001	22 273	23 760	-1 487
2001-2002	24 810	25 850	-1 041
2002-2003	26 649	28 124	-1 475

Source: *Gujarat Earthquake Recovery Program, Assessment Report*, March 14, 2001.

TABLE 11
GSDP AT CONSTANT PRICES FOR THE YEAR 1993-1994 TO 2002-2003
(RS. IN CR)

Year	Observed value	Expected value	Losses
1993-1994	49 194	51 970	-2 776
1994-1995	58 058	64 796	-6 738
1995-1996	61 246	61 121	125
1996-1997	69 966	64 571	5 395
1997-1998	71 442	68 215	3 227
1998-1999	76 571	72 065	4 506
1999-2000	78 298	76 131	2 167
2000-2001	76 453	80 428	-3 975
2001-2002	83 740	84 967	-1 227
2002-2003	85 536	89 762	-4 226

Source: *Gujarat Earthquake Recovery Program, Assessment Report*, March 14, 2001.

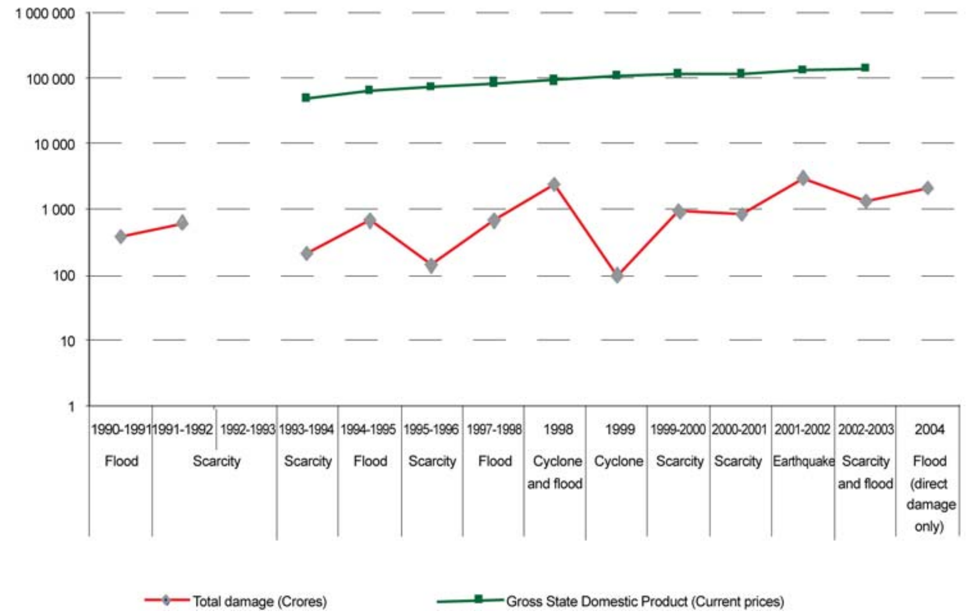
TABLE 12
PER CAPITA INCOME AT (93-94 CONSTANT PRICE) FOR THE YEAR 1993-1994 TO 2002-2003
(RS. IN '000)

Year	Observed value	Expected value	Loss
1993-1994	11 323	12 653	-1 331
1994-1995	13 104	13 079	26
1995-1996	13 556	13 555	1
1996-1997	15 234	14 032	1 202
1997-1998	15 335	14 521	814
1998-1999	16 200	15 108	1 092
1999-2000	15 978	15 572	406
2000-2001	15 259	16 121	-862
2001-2002	16 334	16 684	-350
2002-2003	16 484	17 271	-788

Source: *Gujarat Earthquake Recovery Program, Assessment Report*, March 14, 2001.
Note: When the expected value is more than the observed value, it indicates that there are losses in income of the economy/sector as the case may be.

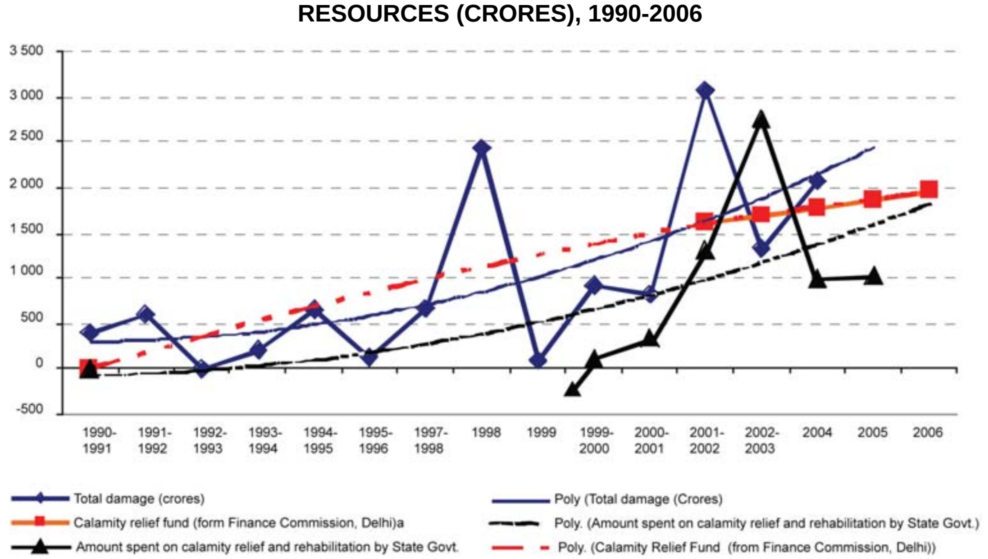
This can be graphically expressed by plotting the GDP performance and the disaster assessed damage, as well as by showing the flow of resources that were mobilized by the disaster calamity fund over time, and finally, by plotting the gap in the GDP performance over time.

GRAPH 9
GUJARAT: GROSS STATE DOMESTIC PRODUCT AND DISASTER DAMAGE, 1990-2004



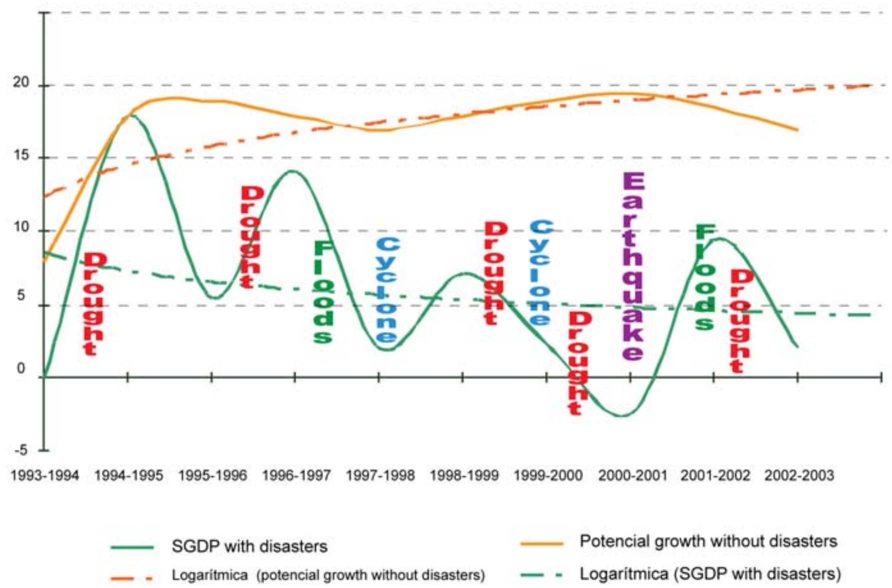
Source: ECLAC, based on Gujarat Earthquake Recovery Program, Assessment Report, March 14, 2001.

GRAPH 10
GUJARAT: TOTAL DAMAGE FROM DISASTERS AND CALAMITY FUND BUDGETED RESOURCES (CRORES), 1990-2006



Source: ECLAC, based on Gujarat Earthquake Recovery Program, Assessment Report, March 14, 2001.

GRAPH 11
IMPACT OF DISASTERS ON GDP: STATE OF GUJARAT INDIA, 1993-2003

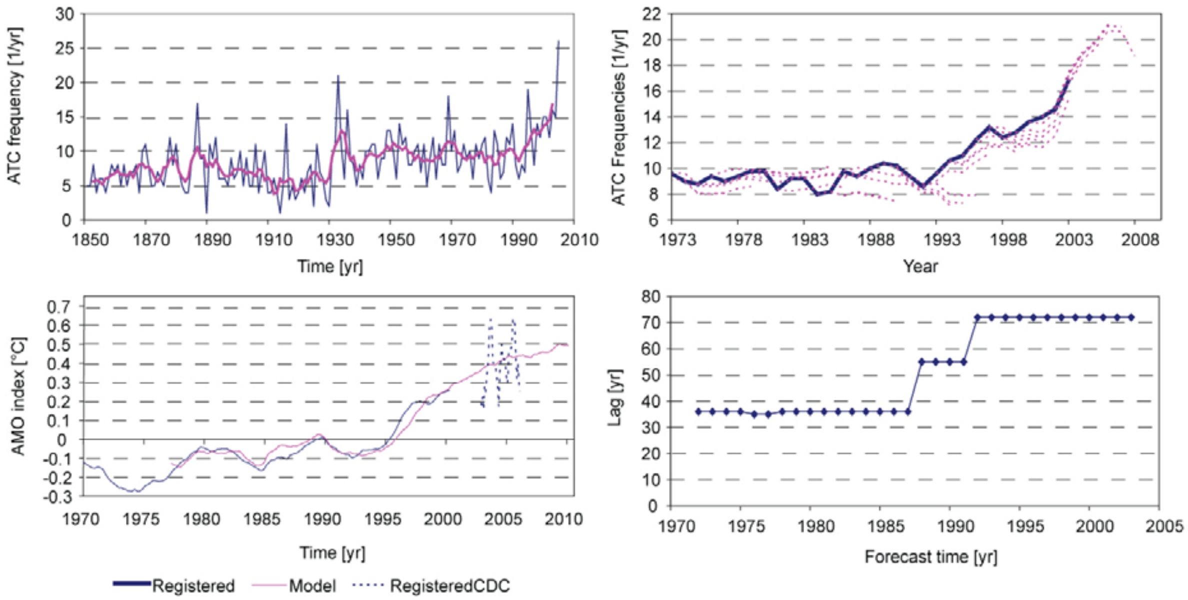


Source: ECLAC, based on Gujarat Earthquake Recovery Program, Assessment Report, March 14, 2001.

II. Evidence of environmental damage and losses associated with disasters

It is worth remembering that there is statistical evidence that there is a higher probability of major hurricane occurrence now than a few decades ago (see graph). When an extreme event occurs there will tend to be damages to the natural capital in terms of destruction of habitat, soil degradation, water pollution, etc., leading to the loss a damage of environmental and ecological services. These impacts affect ecosystem dynamics reducing the system's capacity to withstand natural phenomena. Examples include reduced water retention capacity, diminished resistance to storm and sea surges, reduced capacity to absorb CO_2, reduced soil fertility, altered chemical balance of bodies of water, etc. These effects may also lead to negative impacts on existing capital and infrastructure which affect the provision of environmental assets and other services, such as the disruption in the sources of water for irrigation or human consumption, caused by damage to water treatment plants. Thus, the losses are seen as modification in the flows of environmental goods and services where their use value is temporarily affected.

GRAPH 12
PROBABILITY OF EXTREME EVENTS, 1850-2005



Source: Sánchez-Sesma, 2006.

In order to quantify the impact of disasters on environmental capital, and the losses associated with environmental capital damage (partial or total, temporary or permanent), a methodology was devised based on the valuation of environmental services used in Costa Rica and in the Dominican Republic after hurricane Georges, and in Central America after hurricane Mitch. The values indicated in the table were applied as proxies for the actual monetary values of environmental services, in order to assign a monetary value to the environmental services lost.

TABLE 13
MINIMUM, AVERAGE AND MAXIMUM COMPENSATION COST FOR ENVIRONMENTAL SERVICES PROVIDED BY PRIMARY AND SECONDARY FOREST COVER

Environmental service	Primary forest			Secondary-type forest		
	Minimum	Average	Maximum	Minimum	Average	Maximum
Carbon sinking	19.0	38	57.0	14.63	29.26	43.89
Water protection	2.5	5	7.50	1.25	2.50	3.75
Biodiversity preservation	5.0	10	15.00	3.75	7.50	11.25
Ecosystem protection	2.5	5	7.50	1.25	2.50	3.75
Total	29.0	58	87.00	20.88	41.76	62.64

Source: Carranza, et al. 1996.

The value of carbon sinking in Costa Rica was made based on the assumption that an average hectare sequestered 7.7 metrics tons of carbon, equivalent to 28.2 tons of CO_2 per year, which implies that the reported forestry plantations in 1997 (142,600 ha) captured 6,3 million metric tons. An estimate was made of the storage capacity in the area based on the previous 20 years resulting in an estimated potential value of storage. The dollar figure reached at the time was of between 98 and 196 million US dollars, varying in accordance with the prices paid for CO_2 bonds[14].

Looking at the data produced by an assessment of the environmental impacts of major disasters, which was initiated after Hurricane Mitch, in 1998, we see that the actual weight of damage and losses caused to the environment, although significant, is not pervasive. This can be explained by a combination of two main factors. Firstly, pre-disaster environmental degradation was already at an advanced stage in many of the developing countries analyzed, so the marginal effect of the assessed event was not major, although the vulnerability to hazards will have been enhanced by pre-disaster environmental management. Secondly, the actual economic valuation of the environmental assets and the value of the environmental services provided to the economy are not sufficiently reflected in the national accounting system.

Physical impacts result in variation in the environmental services provided by natural capital that ultimately impacts the welfare of the population. On principle, these welfare effects ought to be valued through the present value of services affected. Alternatively, as an approximation to the loss of welfare, in several assessments the environmental services have been valued as the expenditures necessary to restore or rehabilitate the natural capital if rehabilitation is ecologically sound and such an investment is not over and above the value of lost or diminished services. Important considerations in this valuation are the time factor, since environmental rehabilitation may be a medium to long term process, and the feasibility or soundness of interventions on the ecosystems. It must also be noted that losses associated with environmental damage will spill over to other human activities and will therefore be accounted for in the diverse affected sectors, so there is a risk of double counting. For example, damage to beaches will cause losses in the tourism sector, water pollution may affect fishing activities, etc.

Another valuation of environmental damage was made in terms of the destruction of soil associated with mass landslides that obliterated agricultural land and forest cover, leading to losses in vegetation and crops. The actual natural capital lost –the soil that disappeared due to excessive rains, as in the case of Guatemala after Hurricane Stan—was valued in terms of permanent erosion. The procedure to calculate the cost of land lost to water erosion was based on Mota (1999), who considered both the slope of the affected land (25% y 40%) and the kind of vegetation cover. Rainfall data were taken from the national meteorological institute of Guatemala (INSIVUMEH) which indicated that in a six day period the amount of precipitation caused a soil loss that varied in each one of the relevant five meteorological substations. This led to a soil loss at a rate of 12.45 tons per hectare, which, given that Hurricane Stan affected over 719,800 ha. (7.198 Km2), meant an estimated total loss of 9,027,483 tons. The average unit value per damaged hectare was 34.2 quetzales (roughly 4.5 dollars per hectare) which suggest a total estimated loss of 308,7 million quetzales or 40.6 million dollars. This means that the environmental loss amounted to 4.1% of the total assessed impact of 7,473 million quetzales or 983 million dollars.

Nevertheless, as the figure shows, the average environmental impact is almost 2.5% of the total assessed impact, with wide variations. The accumulated total direct impact on the environment which we have been able to measure (i.e. direct losses to natural assets mostly valued on terms of lost environmental services) totals more than 323 US millions (constant 2007 value), giving a yearly impact for the period analyzed of almost 36 million dollars per year.

This is certainly a strong argument for adoption of a proactive approach to disaster risk reduction and adaptation to climate change. Even though clear cut attribution of major disasters to climate change, as expressed in greenhouse house emissions, may still be a matter of discussion in many circles, assessments made indicate that human intervention certainly a major contributing factor.

[14] Ramírez, Octavio A., Manuel Gómez, *Estimación y valoración económica del almacenamiento de Carbono,* CATIE, 1996.

TABLE 14
IMPACTS ASSESSED OVER TIME OF DIFFERENT DISASTERS IN THE REGION

Environmental damage associated with disasters	Value (USD$)	Percentage of total damage and losses
Hurricane Keith Belize 2000	24.53	8.80
Hurricane Stan Veracruz Mexico 2005	17.97	7.51
Hurricane Ivan Jamaica 2004	42.00	6.90
Torrential rains, tropical storm Stan, and Llamatepec volcanic eruption, El Salvador 2005	21.80	6.13
Hurricane Stan Mexico 2005	90.09	4.59
Hurricane Kena Jalisco Mexico 2002	5.38	4.50
Hurricane Dean Belize 2007	3.90	4.30
Tropical storm Stan Guatemala 2005	40.53	4.10
Hurricane Emily Quintana Roo Mexico 2005	2.64	2.52
Hurricane Mitch El Salvador 1998	7.00	2.09
Hurricane Emily Yucatan Mexico 2005	2.00	1.80
Hurricane Isidore Yucatan Mexico 2002	8.00	1.30
Hurricane Jeanne Haiti 2004	3.00	1.30
Hurricane John BC Mexico 2006	1.10	1.20
Hurricane Juliette BC Mexico 2001	0.55	0.90
Hurricane Mitch Nicaragua 1998	8.60	0.88
Tropical storm Noel Dominican Republic2007	3.50	0.80
Hurricane Isidore Campeche Mexico 2002	1.80	0.80
Floods Tabasco Mexico 2007	15.70	0.55
Hurricane Mitch Guatemala 1998	5.10	0.46
Hurricane Ivan, Cayman Islands 2004	13.00	0.40
Torrential rains Nayarit Mexico 2003	0.04	0.30
Hurricane Wilma Mexico 2005	4.75	0.27
Hurricane Jeanne Dominican Republic 2004	0.32	0.10
Floods Guyana 2005	0.08	0.02
Accumulated total (1998-2007)	323.38	2.50
Annual average	35.93	

Source: ECLAC, based on disasters assessed since 1972.

III. Disasters and MDGs

It is not feasible to assess the exact impact that disasters have had on the United Nations measure of the millennium development goals[15]. The additional gap created by disasters is not easily measured, as there are no valuations of the advancement on these MDGs in the previous decades. Furthermore, some of the goals are more qualitative than quantitative.

Nevertheless, given the quantification of impact on social sectors, such as health and education and given the impact on economic variables, it is evident that disasters pose an additional hurdle in attaining the MDGs. Also, the investments required for reconstruction and recovery lead to the deference, postponement, or change in development strategies in affected countries.

Finally, this leads to the conviction that risk reduction, environmental management in terms of risk management, and adaptation to climatic and environmental conditions, should be an integral part of national development strategies. In terms of internationally used instruments, risk reduction and climate change should be promoted by the UN led development assistance frameworks that are regularly negotiated with developing countries (known as the UNDAFs). Similarly, in the case of the World Bank, these two crucial elements –risk reduction and adaptation to climate change and environmental degradation in terms of environmental restoration and preservation should also be made part of the Country Assistance Strategies (CAS) and the Poverty Reduction Programmes (PRPs).

There are, at present, insufficient synergies at the national, regional, and global level on these issues. The commitment of investment resources is not only limited and insufficient but scattered and often linked to political expediency or major “unexpected” forces.

15 United Nations, *The Millennium Development Goals Report, 2008,* New York, 2008.

Bibliography

ADPC (Asian Disaster Preparedness Center), A regional experience of assessing the socioeconomic impact of natural disasters, a study for the Gujarat State Disaster Management Agency (GSDMA) prepared by ADPC, Center for Environmental Planning and Technology (CEPT), the Indian Institute of Technology (IIT) in Mumbai, and the UN-ECLAC.

Albala-Betrand, J. M. (1993), Political Economy of Large Natural Disasters with Special Reference to Developing Countries, Oxford, Clarendon Press.

Arrow, K. J. (1992), "Insurance, Risk and Resource Allocation." Foundations of Insurance Economics: Readings in Economic and Finance, G. Dionne and S. E. Harrington, Boston, Kluwer Academic Publishers.

Betancourt Yáñez, Pedro, y otros (1999), *Pérdidas de suelo y potencial Hidrológico en parcelas con coberturas vegetativas de especies forrajeras*, TERRA Latinoamericana, Julio-septiembre, Vol. 18, No. 003, Universidad Autónoma de Chapingo, Mexico.

Bitrán, Daniel (2000), Características del impacto socioeconómico de los principales desastres ocurridos en México, en el período 1980-99, CENAPRED, Mexico, September.

CAF (Corporación Andina de Fomento) (2000), "Las lecciones del niño, Vol. 4", Fenómeno del niño, Ecuador 1997-1998, Caracas.

(2000), "Las lecciones del niño, Vol. 4", Fenómeno del niño, Venezuela 1997-1998, Caracas.

(2000), "Las lecciones del niño, Vol. 4", Fenómeno del niño, Perú 1997-1998, Caracas.

(2000), "Las lecciones del niño, Vol. 4", Fenómeno del niño, Bolivia 1997-1998, Caracas.

___(1999), "Las lecciones del niño, Vol. 3", Fenómeno del niño, Colombia 1997-1998, Caracas.

Carranza, C. F. (1996), Valoración de los servicios ambientales de los bosques de Costa Rica, San José, Costa Rica, Centro Científico Tropical/ODA/MINAE.

___CENAPRED (Centro Nacional de Prevención de Desastres) (2006), Impacto socioeconómico de los principales desastres ocurridos, Vol. 8, Huracán Paul, Sinaloa, México, octubre, 2006, Mexico.
___ (2006), Impacto socioeconómico de los principales desastres ocurridos, Vol. 8, Huracán John, Baja California Sur, México, septiembre, 2006, Mexico.
___ (2006), Impacto socioeconómico de los principales desastres ocurridos, Vol. 8, Huracán Lane, Sinaloa, México, septiembre, 2006, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Wilma, Quintana Roo, Mexico, October.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Stan, Hidalgo, octubre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Stan, Puebla, octubre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Emily, Tamaulipas, septiembre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Emily, República Mexicana, septiembre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Emily, Quintana Roo, septiembre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Emily, Yucatán, septiembre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Emily, Nuevo León, septiembre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Stan, República Mexicana, octubre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Stan, Oaxaca, octubre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Stan, Veracruz, octubre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Stan, Chiapas, octubre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Wilma, República Mexicana, octubre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 7, Huracán Wilma, Yucatán, octubre, 2005, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 6, Grieta, Jalisco, México, julio 13 de 2004, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 6, Lluvias torrenciales, Durango, 20-23 de agosto de 2004, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 6, Lluvias torrenciales, Buenaventura, Chihuahua, 16-17 de agosto de 2004, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 6, Lluvias atípicas, Cozumel, Quintana Roo, 11 al 13 de junio de 2004, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 6, Lluvias torrenciales, Estado de México (Tenango del Valle) mayo 2, 2004, Mexico.
___ (2005), Impacto socioeconómico de los principales desastres ocurridos, Vol. 6, Lluvias torrenciales atípicas Coahuila, abril 4, 2004, Mexico.
___ (2004), Impacto socioeconómico de los principales desastres ocurridos, Vol. 5, Huracanes Ignacio y Marty, agosto 26 y septiembre 22, Baja California Sur, 2003, Mexico, December.
___ (2004), Impacto socioeconómico de los principales desastres ocurridos, Vol. 5, Fuerte precipitación en Veracruz, 5-6 de junio, 2003, Mexico, December.
___ (2004), Impacto socioeconómico de los principales desastres ocurridos, Vol. 5, Lluvias torrenciales, Chiapas, noviembre, 2003, Mexico, December.
___ (2004), Impacto socioeconómico de los principales desastres ocurridos, Vol. 5, Lluvias torrenciales, Veracruz, noviembre, 2003, Mexico, December.

___ (2004), Impacto socioeconómico de los principales desastres ocurridos, Vol. 5, Lluvias torrenciales, Zacatecas, 19-24 de septiembre, 2003, Mexico, December
___ (2004), Impacto socioeconómico de los principales desastres ocurridos, Vol. 5, Lluvias torrenciales, Nayarit, 4-17 de septiembre, 2003, Mexico, December.
___ (2004), Impacto socioeconómico de los principales desastres ocurridos, Vol. 5, Lluvias torrenciales, Jalisco, 4-17 de septiembre, 2003, Mexico, December.
___ (2004), Impacto socioeconómico de los principales desastres ocurridos, Vol. 5, Lluvias torrenciales, Guanajuato, 4-17 de septiembre, 2003, Mexico, December.
___ (2003), Impacto socioeconómico de los principales desastres ocurridos, Vol. 4, Huracán Kena, Jalisco y Nayarit, México, 21-26 de octubre 2002, Mexico, November.
___ (2003), Impacto socioeconómico de los principales desastres ocurridos, Vol. 4, Huracán Isidore, Campeche, México, agosto, 2002, Mexico, November.
___ (2003), Impacto socioeconómico de los principales desastres ocurridos, Vol. 4, Huracán Isidore, Yucatán, México, agosto, 2002, Mexico, November.
___ (2003), Impacto socioeconómico de los principales desastres ocurridos, Vol. 4, Rompimiento de la presa "Capulín", Zacatecas, agosto 22-23, 2002, Mexico, November.
___ (2003), Impacto socioeconómico de los principales desastres ocurridos, Vol. 4, Rompimiento de la presa Dolores, San Luis Potosí, agosto, 2002, Mexico, November.
___ (2003), Impacto socioeconómico de los principales desastres ocurridos, Vol. 3, Huracán Juliette, Baja California, México, 2001, Mexico, November.
___ (2003), Impacto socioeconómico de los principales desastres ocurridos, Vol. 3, Huracán Juliette, Sonora, México, 2001, Mexico, November.
___ (2002), Impacto socioeconómico de los principales desastres ocurridos, Vol. 2, Lluvias torrenciales, Monterrey, México octubre, 2000, Mexico, November.
___ (2001), Impacto socioeconómico de los principales desastres ocurridos, Vol. 2, Lluvias torrenciales, Estado de Sonora, México octubre 22-26, 2000, Mexico, November.
CRED (Centre for Research on the Epidemiology of Disasters) (1999), EM-DAT: *International Disaster Database*. Université Catholique de Louvain, Brussels, Belgium, Charveriat, C.
CEPAL (Comisión Económica para América Latina y el Caribe) (2007), Fenómeno de la Niña en Bolivia acumulado 2006-2007 (LC/MEX/L.863).
___ (2007), Inundaciones en Tabasco, octubre-noviembre 2007 (LC/MEX/L.854).
___ (2007), Tormenta Noel, República Dominicana, octubre 2007 (LC/MEX/L.853).
___ (2007), Huracán Félix y lluvias torrenciales en Nicaragua, septiembre-octubre 2007 (LC/MEX/L.860).
___ (2007), Huracán Dean, Santa Lucia (LC/CAR/L.140), August.
___ (2007), Huracán Dean, Belize (LC/CAR/L.153), August.
___ (2006), Inundaciones en Guyana (LC/CAR/L.188), February.
___ (2005), Lluvias torrenciales, Tormenta Stan y erupción del volcán Ilamatepec, Salvador, octubre, 2005 (LC/MEX/R.892), November.
___ (2005), Tormenta Stan, Guatemala, octubre, 2005 (LC/MEX/R.895), November.
___ (2005), Huracán Emily, Yucatán, México, julio 15-18 2005 (LC/MEX/L.693).
___ (2005), Huracán Emily, Tamaulipas, México, julio 15-18 2005 (LC/MEX/L.695).
___ (2005), Huracán Emily, Quintana Roo, México, julio 15-18 2005 (LC/MEX/L.696).
___ (2005), Huracán Emily, Nuevo León, México, julio 15-18 2005 (LC/MEX/L.694).
___ (2005), Tormenta Stan, Guatemala, octubre, Informe Preliminar.
___ (2005), Le cyclone Jeanne en Haïti, 16-18 septiembre del 2004 (LC/MEX/L.648/Rev.1), March.
___ (2005), Inundaciones de Guyana, enero 2005 (LC/CAR/L.31/Rev.1).
___ (2004), Huracanes Frances y Jeanne en Bahamas, 2004 (LC/MEX/L.642/Rev.2), December.
___ (2004), Huracán Iván en Islas Caimán, 11-13 de septiembre 2004 (LC/MEX/L.645/Rev.1), December.
___ (2004), Huracán Jeanne en República Dominicana, septiembre 15-17, 2004 (LC/MEX/L.638), November.
___ (2004), Hurricane Iván, Jamaica, 10-12 de septiembre del 2004 (LC/MEX/L.636), October.
___ (2004), Huracán Mitch en EL Salvador, octubre 23- noviembre 4, 1998 (LC/MEX/L.371), July.
___ (2004), Huracán Mitch en Guatemala, octubre 23- noviembre 24 1998 (LC/MEX/L.370), July.
___ (2004), Inundaciones en las cuencas Yaque del Norte y Yuna, República Dominicana noviembre 14-15, 2003 (LC/MEX/L.607), March.

___ (2003), Sismo en Colima, México, 21 de enero del 2003 (LC/MEX/L.557), July.
___ (2003), Desbordamiento del Río Salado en Santa Fe, Argentina 2003 (LC/BUE/L.185), June.
___ (2002), Sequía en Centroamérica, 2001 (LC/MEX/L.510/Rev.1), February.
___ (2000), Huracán Keith, Belice, septiembre 2000 (LC/CAR/G.627), November.
___ (2000), Inundaciones y deslizamientos en Venezuela en diciembre 1999 (LC/MEX/L.421), February.
___ (1999), Huracán Mitch en Costa Rica, octubre 23- noviembre 4 1998 (LC/MEX/L.373), April.
___ (1999), Terremoto, Colombia, enero 1999 (LC/L.1201), April.
___ (1999), Huracán Mitch en Nicaragua, octubre 23- noviembre 4, 1998 (LC/MEX/L. 372), March.
___ (1999), Huracán Mitch en Honduras, octubre 23- noviembre 24, 1998 (LC/MEX/L.367), January.
___ (1985), Terremoto, México, septiembre 19-20, 1985 (LC/G.1367), October.
___ (1983), Los desastres naturales en Bolivia, Ecuador y Perú, 1982-1983 (E/CEPAL/G.1274), December.
___ (1983), Fenómenos meteorológicos, Nicaragua diciembre 22-23, 1982 (E/CEPAL/MEX/1983/l.1), January.
___ (1982), Desastres naturales de 1982, El Salvador (E/CEPAL/MEX/1982/L.30), November.
___ (1982), Inundaciones de mayo 1982, Nicaragua (E/CEPAL/MEX/1982/R.2/REV.1), July..
___ (1979), Huracán David y Frederick, República Dominicana, octubre, 1979 (E/CEPAL/G.1098/Rev.1), August.
___ (1976), Terremoto, Guatemala, 4 de febrero, 1976 (E/CN.12/AC.63/2/Rev.1), February.
___ (1975), Tormenta tropical, Grenada, 9 Noviembre 1975 (E/CEPAL/CDCC/9), December.
___ (1975), Terremoto, Barbuda, 8 de octubre, 1975 (E/CEPAL/1001), April.
___ (1974), Huracán Fife, Honduras, septiembre 18-20, 1974 (E/CEPAL/AC.67/2/Rev.1), October.
___ (1973), Terremoto, Managua, Nicaragua diciembre 22-23, 1972 (E/CN.12/AC.63/2/Rev.1), January.
ECLAC (Economic Commission for Latin America and the Caribbean), Handbook for the evaluation of the socioeconomic and environmental impact of disasters (www.cepal.org/mexico, under “desastres”).
IDB (Inter-American Development Bank) (1991), "Natural Disasters in Latin America and the Caribbean: An Overview of Risk." *Working Paper 434*, Washington DC, Inter American Development Bank), and several studies by Charlotte Benson and the work of Steven Bender.
IDB/ECLAC, Information on disaster risk management. Case studies of five countries. Main technical report (LC/MEX/L.805), Copyright © United Nations and IDB,. Mexico City. December 2007
IPCC (Intergovernmental Panel on Climate Change) (2007), *Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth* Assessment *Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K and Reisinger, A. (Eds.)]. IPCC, Geneva, Switzerland.
Jovel, R. (2000), *El impacto socio-económico de El Niño en Costa Rica, durante 1997-1998. Congreso sobre la Reducción de Impactos* de *Variabilidad Climática: El Caso de El Niño de 1997-1998, en Costa Rica. San José, 3 y 4 de febrero de 2000*. Central American Integration System (SICA), San Salvador, El Salvador.
Mata, Alfonso (2002), Metodología para la identificación, clasificación y cuantificación de los impactos ambientales de los desastres naturales.
OAS (Organization of American States) (1997), Primer on Natural Hazard Management in Integrated Regional Development Planning. Washington, DC, Department of Regional Development and Environment, Executive Secretariat for Economic and Social Affairs, Organization of American States, Benson.
ODI (Overseas Development Institute), *The Economic Impact of* Natural *Disasters in the Philippines, The Economic Impact of Natural Disasters in Viet Nam, and The Economic Impact of Natural Disasters in Fiji.* London, UK, Overseas Development Institute.
Sánchez-Sesma, Jorge (2006), Atlantitc Tropical Cyclone Frequency, 2006-2010, Instituto Mexicano de Tecnología del Agua, Morelos, Mexico.
United Nations (2008), *The Millennium Development Goals Report, 2008*, New York, (http://mdgs.un.org/unsd/mdg/Resources/Static/Products/Progress2008/MDG_Report_2008,.pdf).

Annexes

Annex I

TABLE A-I.1
SUMMARY OF EVENTS ASSESSED BY ECLAC IN LATIN AMERICA AND THE CARIBBEAN, 1972-2007

The events assessed by ECLAC over time are presented in the following tables, in terms of human impact (lives lost and population affected) and in terms of economic impact, both at current yearly value and in constant US dollars (at 2007 prices).

Date	Place	Type of event	Affected population	
			Fatalities	Direct affected people
1972, December 22-23	Managua, Nicaragua	Earthquake (8.5 Richter)	6 000	300 000
1974, September 18-20	Honduras	Hurricane Fifí (95 knots, approximately 165 km./h)	7 000	115 000
1975, November 5	Grenada	Tropical storm	…	…
1975, October 8	Antigua and Barbuda	Earthquake (7.7 degrees Richter)	…	4 200
1976, February 4	Guatemala	Earthquake (7.5 degrees Richter, with aftershocks of 6)	23 000	2 550 000
1979, August 29	Dominica	Hurricane David (sustained winds of 150 knots)	42	60 060
1979, August 3-September 7	Dominican Republic	Hurricanes David and Federico (sustained winds of150 knots (260 km./h) and 115 (200 km./h), with rainfall of 700 mm. and river flow reaching 6 mil m^3)	2 000	1 200 000
1982, 20-31 May	Nicaragua	Floods	80	70 000
1982	El Salvador	Earthquakes (June19, 5.6 degrees Richter), droughts (July to September) and floods due to tropical depression (September 16-20)	600	20 000
1982	Guatemala	Several meteorological alterations: rains, storms and drought, between July and September	610	10 000
1982	Nicaragua	Floods and droughts (beginning in July)		
1982-1983	Bolivia, Ecuador and Peru	Meteorological phenomena: El Niño		3 840 000
	Bolivia	Bolivia: droughts and floods		1 600 000
	Ecuador	Ecuador: floods and storm surge		950 000
	Peru	Peru: Meteorological phenomena, ocean temperature alterations and droughts		1 290 000
1985, September 19	Mexico	Earthquake : 7.8-8.1 degrees Richter	8 000	150 000
1985, November 13	Colombia	Nevado del Ruiz volcano eruption and avalanches (Armero and Chinchiná)	22 000	200 000
1986, October 10	El Salvador	Earthquake (5.4 Richter)	1 200	520 000
1987, March 5	Ecuador	Earthquakes (6.1 and 6.8 degrees Richter) and aftershocks causing avalanches and landslides (Pichincha, Imbabura and Carchi provinces)	1 000	82 500
1988, October 13-26	Nicaragua	Hurricane Joan (125 knots or 217 km./h)	148	550 000
1988	Mexico	Hurricane Gilbert 1988	225	
1990	Mexico	Hurricane Diana 1990	139	
1990	Mexico	Floods in Chihuahua 1990	200	
1992				
1992, April 9	Nicaragua	Cerro Negro volcano eruption (sand and ash fall for 65 hours)	2	12 000

(Continued)

TABLE A-I.1 (continuation)

1992, September 1	Nicaragua	Tsunami (seaquake 7.0 degrees Richter with waves of up to 8 to 15 metros in the Pacific coast)	116	40 500
1995				
1995, September 5	Anguilla	Hurricane Luis (140 knots or 250 km./h)	...	...
1995, September 4-15	Saint-Martin, Netherlands Antilles	Hurricanes Luis (76 knots or 250 km./h) and Marilyn (100 knots or 170 km./h and rainfall up to 85 mm) with combined rainfall from both hurricanes of 316 mm.	...	...
1996				
1996, July 27-28	Costa Rica	Hurricane César (70 knots o 120 km./h)	39	40 260
1996, July 27-29	Nicaragua	Hurricane César (70 knots o 120 km./h)	9	29 500
1996	Mexico	Freezing temperatures 1996	224	
1997				
1997-1998	Costa Rica	El Niño (Floods and droughts)	...	119 279
1997-1998	An dean Community	El Niño	600	125 000
		Bolivia (droughts e floods)	...	...
		Colombia (droughts)	...	...
		Ecuador (floods and sea temperature alterations)	286	29 023
		Peru (floods and sea temperature alterations)	...	...
		Venezuela (droughts)	...	...
1997	Mexico	Hurricane Paulina 1997	228	
1998				
1998, September 22-23	Dominican Republic	Hurricane Georges (98 knots or 170 km./h)	235	296 637
1998, October 23-November 4	Central America	Hurricane Mitch (sustained winds of 144 knots or 285 km/h and rainfall over 600 mm.)	9 214	1 191 908
		Costa Rica	4	16 500
		El Salvador	240	84 316
		Guatemala	268	105 000
		Honduras	5 657	617 831
		Nicaragua	3 045	368 261
1998	México	Torrential rains in Tijuana 1998	92	
1999				
1999, January 25	Colombia	Earthquake in the Coffee Region (5.8 degrees Richter with epicenter near the town of Córdoba, Department of Quindío, affecting nearby departments of Risaralda, Cundinamarca and Valle del Cauca)	1 185	559 401
1999, December	Venezuela	Landslides	20 000	200 000
1999	Mexico	Disasters recorded by CENAPRED (excluding chemical, sanitary and other socio-organizational events)	402	
1999	Mexico	Floods in Veracruz 1999	124	
1999	Mexico	Floods in Puebla 1999	263	
2000				
2000, September 30 - 1 October	Belize	Hurricane Keith (Grade 5 Saffir-Simpson	3	57 403
2000 October 22-26	Mexico	Hurricane Keith (Grade 5 Saffir-Simpson (Sonora, Nuevo Leon, Tamaulipas, Quintana Roo and Chiapas)		
2000	Mexico	Hurricane Norman (Nayarit, Colima and Michoacán)		
2000	Mexico	Disasters recorded by CENAPRED (excluding chemical, sanitary and other socio-organizational events)	9	171 564

(Continued)

TABLE A-I.1 (continuation)

2001				
2001, January and February	El Salvador	13 January (earthquake, 7.6 Richter), 13 February (independent event from previous month, with a strength of 6.6 Richter)	1 241	2 351 886
2001, Second Quarter	Central America	Droughts affecting mostly Nicaragua, Honduras, Guatemala and El Salvador	35	600 000
2001 - Recorded Disasters	Mexico	Disasters recorded by CENAPRED (excluding chemical, sanitary and other socio-organizational events)	163	157 755
2001 - Damages for climate effect in Mexico	Mexico	Hydro meteorological phenomena and freeze	163	154 755
2001	Mexico	Hurricane Juliette in September, in Baja California and Sonora, reaching cat 4 Saffir Simpson	9	6 000
2001	Mexico	Quintana Roo and Oaxaca, Hurricane Iris in October, cat 4 Saffir Simpson	23	4 600
2001 - Geological phenomena in Mexico	Mexico	Earthquakes en Coyuca de Benita, Guerrero, 6.1 Richter, due to fault in the North American plaque	0	3 000
2001, October	Belize	Hurricane Iris, cat 4 Saffir Simpson (affecting Quintana Roo, Oaxaca and other communities in Mexico)	23	21 568
2001, November	Cuba	Hurricane Michelle, affecting the Central and Eastern part of the island, reaching cat 5 Saffir-Simpson	5	140 415
2001, November	Jamaica	Landslides, floods and avalanches due to the passage of Hurricanes Michelle and Iris	2	150 000
2002				
2002 - Recorded Disasters	Mexico	Disasters recorded by CENAPRED (excluding chemical, sanitary and other socio-organizational events)	52	5 850 381
2002	Mexico	Hydro meteorological phenomena and freezes	52	5 849 781
2002	Mexico	Hurricane Kenna (Jalisco, Nayarit and Nuevo León)	2	4 025 952
2002	Mexico	Hurricane Isidore (Yucatán and Campeche)	4	1 689 532
2002	Mexico	Torrential rains (Durango and Chiapas)	0	20 800
2002	Mexico	Water dams damages (San Luis Potosí and Zacatecas)	12	52 250
2002	Mexico	Floods (Sinaloa)	0	0
2002	Mexico	Droughts (Zacatecas)	0	0
2002	Mexico	Freeze and cold spell	71	2 000
2002	Mexico	Earthquake in Guerrero (aprox. 5.1 Richter)	0	600
2003				
2003 - April	Argentina	Floods caused by overflow of the Río Salado in the Province of Santa Fe	22	520 175
2003 - May	Dominican Republic	Damages caused by floods in the Yaque del Norte and Yuna rivers	10	63 520
2003 - Recorded Disasters	Mexico	Disasters recorded by CENAPRED (excluding chemical, sanitary and other socio-organizational events)	61	849 977
9.65596	Mexico	Hydro meteorological phenomena and freezes	35	322 977
2003- September	Mexico	Torrential rains (Guanajuato, Jalisco, Michoacán, Nayarit and Zacatecas), and landslides in Veracruz	22	233 128
2003- August September	Mexico	Hurricanes Marty and Ignacio in Southern Baja California	8	19 130
2003- September	Mexico	Tropical storm Larry n Chiapas and Veracruz	5	70 719
2003- January	Mexico	Earthquake in Colima, 21 January, 7.8 Richter (affecting Colima, Jalisco and Michoacán)	26	527 000
2004				
2004 - May	Haiti	Landslides in Font-Verretes and Mapou (affecting the city of Jimaní in the Dominican Republic)	2 665	16 900

(Continued)

TABLE A-I.1 (continuation)

2004 - September	Dominican Republic	Hurricane Jeanne , 15 to 18 September	23	32 554
	Haiti	Tropical Storm Jeanne over the city of Gonaives, and the departments of the North-West and the Artibonite, 18 September	2 754	297 926
2004	Bahamas	Hurricanes Frances and Jeanne (Sep. 3-20)	2	28 500
2004	Grenada	Hurricane Ivan, 6-8 September	28	81 553
2004	Cayman Islands	Hurricane Ivan, 11-13 September	2	35 189
2004	Jamaica	Hurricane Ivan, 10-12 September	17	369 685
2004	Cuba	Hurricane Ivan, 12-15 September	0	2 200 000
2004 - November	Dominican Republic	Floods in the watersheds of the Yaque del Norte and Yuna rivers, Dominican Republic, November 14-15 2003	10	63 520
2004 - Recorded Disasters	Mexico	Registered by CENAPRED (excluding chemical, sanitary and social events)	114	132 648
2004	Mexico	Hydro meteorological phenomena and freezes	104	132 293
2004	Mexico	Floods Edo. de Mexico (Tenango del Valle)	22	233 128
2004	Mexico	Floods. Coahuila	38	6 692
2004	Mexico	Floods Cozumel	1	20 000
2004	Mexico	Floods Durango	0	4 455
2004	Mexico	Floods Chihuahua	2	500
2004	Mexico	Land subduction Jalisco	1	130
2005				
2005 - January	Guyana	Floods in coastal region between Georgetown and Albion	34	274 774
2005	Guatemala	Tropical storm Stan, October, 2005	669	492 166
2005	El Salvador	Torrential rains, Tropical storm Stan and eruption of the Ilamatepec volcano, October 2005	69	72 141
2005 - July/September	Mexico	Hurricanes Emily, Stan and Wilma	98	742 119
2005-July	Mexico	Hurricane Emily in Mexico, July2005 (includes impact on the national petroleum enterprise PEMEX)	0	103 696
2005-July	Mexico	Hurricane Emily, Yucatán, Mexico, July15-18 2005	0	35 887
2005-July	Mexico	Hurricane Emily, Nuevo León, Mexico, July15-18 2005	0	40 385
2005-July	Mexico	Hurricane Emily, Tamaulipas, Mexico, July15-18 2005	0	17 000
2005-July	Mexico	Hurricane Emily, Quintana Roo, Mexico, July15-18 2005	0	10 424
		Emily affecting oil enterprise Pemex		
2005-September	Mexico	Hurricane Stan in Mexico	98	388 059
		Hurricane Stan, Hidalgo	4	27 180
		Hurricane Stan, Puebla	3	50 725
		Hurricane Stan, Oaxaca	5	37 405
		Hurricane Stan, Veracruz	0	18 924
		Hurricane Stan, Chiapas	86	253 825
2005-October	Mexico	Hurricane Wilma in Mexico	0	250 364
		Hurricane Wilma in Quintana Roo		219 214
		Hurricane Wilma in Yucatán		31 150
2006				
2006-February	Guyana	Floods in Pomeroon and Mahaica regions		
2006-May	Suriname	Floods in Central Suriname	0	31 698
2006-July	Mexico	Torrential rains in Cd. Juárez, Chihuahua	0	…
2006-September	Mexico	Torrential rains in Tamaulipas	0	…
2006-September	Mexico	Hurricane Lane, Colima	0	…
2006-September	Mexico	Hurricane Lane, Sinaloa	0	…
2006-September	Mexico	Hurricane John, Baja California Sur	5	5 305
2006-September	Mexico	Hurricane Paul, Sinaloa	0	…
2006-2007 accumulated	Bolivia	Excessive rains, floods and landslides caused by la Niña	…	618 740
2007				
2007-August	Saint Lucia	Hurricane Dean	…	23 167

(Continued)

TABLE A-I.1 (conclusion)

2007-August	Belize	Hurricane Dean	…	11 379
2007-August	Dominica	Hurricane Dean	…	11 608
September - October 2007	Nicaragua	Hurricane Felix in the RAAN region and tropical depression and excessive rainfall in the North western part of the country	113	354 215
2007- October	Dominican Republic	Tropical storm Noel	42	34 172
October - November 2007	Mexico	Floods in Tabasco and Chiapas due to cold front No. 4	0	1 200 000

Source: ECLAC led assessments.

TABLE A-I.2
SUMMARY OF DISASTERS IMPACT ASSESSED BY ECLAC, AT CURRENT PRICES OF THE YEAR OF OCCURRENCE, 1972-2007

Date	Place	Total damages (current USD millions per year)			Foreign sector effects (variations on imports and exports)
		Total	Damages (total or partial destruction of assets or capital)	Losses (perturbation in flows)	
1972, December 22-23	Managua, Nicaragua	772	620	152	309
1974, September 18-20	Honduras	208	154	54	42
1975, November 5	Grenada	10	4	6	3
1975, October 8	Antigua and Barbuda	20	14	6	10
1976, February 4	Guatemala	748	204	544	224
1979, August 29	Dominica	52	40	12	21
1979, August 3-September 7	Dominican Republic	829	577	252	140
1982, 20-31 May	Nicaragua	357	275	82	71
1982	El Salvador	129	98	30	39
1982	Guatemala	81	59	22	24
1982	Nicaragua	350	100	250	105
1982-1983	Bolivia, Ecuador and Peru	3 479	2 265	1 214	1 508
	Bolivia	836.5	522	315	251
	Ecuador	641	534	107	256
	Peru	2 002	1 210	792	1 001
1985, September 19	Mexico	4 104	3 589	515	1 641
1985, November 13	Colombia	307	212	95	61
1986, October 10	El Salvador	904	685	219	181
1987, March 5	Ecuador	1 001	186	815	834
1988, October 13-26	Nicaragua	840	745	95	309
1988	Mexico	76	76		
1990	Mexico	91	91		
1990	Mexico	3	3		
1992					
1992, April 9	Nicaragua	19	10	8	3
1992, September 1	Nicaragua	25	17	7	4
1995					
1995, September 5	Anguilla	55	46	10	22
1995, September 4-15	Saint-Martin, Netherlands Antilles	1 041	571	469	409
1996					
1996, July 27-28	Costa Rica	151	83	68	69
1996, July 27-29	Nicaragua	51	34	16	16
1996	Mexico	5	5		
1997					
1997-1998	Costa Rica	91	50	42	44
1997-1998	Andean Community	7 545	2 730	4 815	2 358
		527	213	314	138
		564	56	508	159
		2 882	846	2 036	659
		3 500	1 612	1 888	1 382
		72	3	69	21
1997	Mexico	448		448	
1998					
1998, September 22-23	Dominican Republic	2 193	1 337	856	856
1998, October 23-	Central America	6 008	3 078	2 930	1 589

(Continued)

TABLE A-I.2 (continuation)

November 4		91	54	37	18
		388	169	219	73
		748	288	460	23
		3 794	2 005	1 789	1 257
		988	562	425	218
1998	Mexico	603	603		
1998	Mexico	66		66	
1999					
1999, January 25	Colombia	1 585	1 396	189	103
1999, December	Venezuela	3 211	1 961	1 250	321
1999	Mexico	1 078	932	146	
1999	Mexico	293	216	77	
1999	Mexico	245	235	10	
2000					
2000, September 30 - 1 October	Belize	280	212	68	56
2000 October 22-26	Mexico	38	38	0	
2000	Mexico	13	13	0	
2000	Mexico	229	161	68	
2001					
2001, January and February	El Salvador	4 431	2 759	1 672	857
2001, Second Quarter	Central America	189	0	189	65
2001 - Recorded Disasters	Mexico	290	47	243	0
2001 - Damages for climate effect in Mexico	Mexico	264			
2001	Mexico	191	30	161	0
2001	Mexico				
2001 - Geological phenomena in Mexico	Mexico	3			
2001, October	Belize	210	161	49	107
2001, November	Cuba	1 866	1 386	480	376
2001, November	Jamaica	325	195	130	81
2002					
2002 - Recorded Disasters	Mexico	1 182	871	311	n.a.
	Mexico	1 182	871	311	n.a.
2002	Mexico	134	104	30	
2002	Mexico	919	688	232	
2002	Mexico	2	2	0	
2002	Mexico	20	17	4	
2002	Mexico	1		1	
2002	Mexico	23		23	
2002	Mexico	4	3	1	
2002	Mexico	0	0	0	
2003					
2003 - April	Argentina	1 027	364	663	393
2003 - May	Dominican Republic	43	33	10	9
2003 - Recorded Disasters	Mexico	544	355	189	
	Mexico	405	226	179	n.a.
2003- September	Mexico	256	106	150	
2003- August September	Mexico	79	73	6	
2003- September	Mexico	57	40	17	
2003- January	Mexico	134	124	10	
2004					
2004 - May	Haiti	…	…	…	…
2004 - September	Dominican Republic	296	149	147	124
	Haiti	296	199	97	47

(Continued)

TABLE A-I.2 (conclusion)

2004	Bahamas	551	330	221	302
2004	Grenada	889	791	98	594
2004	Cayman Islands	3 432	2 842	590	n.a.
2004	Jamaica	595	374	221	117
2004	Cuba	1 500	…	…	…
2004 - November	Dominican Republic	43	33	10	152
2004 - Recorded Disasters	Mexico	29	25	4	
2004	Mexico	29	25	4	n.a.
2004	Mexico	0	0	0	
2004	Mexico	14	12	2	
2004	Mexico	1	1	0	
2004	Mexico	11	10	1	
2004	Mexico	3	2	1	
2004	Mexico	0			
2005					
2005 - January	Guyana	465	418	47	93
2005	Guatemala	984	565	419	246
2005	El Salvador	356	160	196	100
2005 - July/September	Mexico	4 642	2 098	2 543	160
2005-July	Mexico	845	326	518	160
2005-July	Mexico	97	85	12	
2005-July	Mexico	69	58	11	
2005-July	Mexico	146	142	4	
2005-July	Mexico	106	41	65	
		427	0	427	
2005-September	Mexico	2 009	1 315	695	0
		82	74	7	
		87	77	11	
		167	133	34	
		241	194	48	
		1 432	837	595	
2005-October	Mexico	1 788	457	1 331	0
		1 739	429	1 310	
		49	28	21	
2006					
2006-February	Guyana	32	23	8	
2006-May	Suriname	47	38	9	
2006-July	Mexico	49	31	18	
2006-September	Mexico	12	7	5	
2006-September	Mexico	15	12	3	
2006-September	Mexico	174	136	39	
2006-September	Mexico	89	79	10	
2006-September	Mexico	11	5	6	
2006-2007 cumulated	Bolivia	509	163	346	
2007					
2007-August	Saint Lucia	18	12	7	
2007-August	Belize	90	47	42	
2007-August	Dominica	60	47	14	
September -October 2007	Nicaragua	297	215	82	165
2007- October	Dominican Republic	439.0 5	254.74	184.31	143.73
October - November 2007	Mexico	2 835.9 2	1 477.95	1 357.98	

Source: ECLAC led assessments.

TABLE A-I.3
SUMMARY OF DISASTERS IMPACT ASSESSED BY ECLAC AT 2007 CONSTANT PRICES, 1972-2007

Date	Place	Total damages (constant USD millions 2007)			
		Total	Damages (total or partial destruction of assets or capital)	Losses (perturbation in flows)	Effects on the external sector (import and export variations)
1972, December 22-23	Managua, Nicaragua	41 480	33 313	8 167	16 592
1974, September 18-20	Honduras	8 600	6 370	2 230	1 720
1975, November 5	Grenada	350	138	213	105
1975, October 8	Antigua and Barbuda	723	495	228	361
1976, February 4	Guatemala	24 032	6 557	17 474	7 210
1979, August 29	Dominica	1 196	921	276	479
1979, August 3-September 7	Dominican Republic	18 912	13 163	5 749	3 194
1982, 20-31 May	Nicaragua	5 071	3 907	1 163	1 014
1982	El Salvador	1 828	1 395	432	548
1982	Guatemala	1 149	841	309	345
1982	Nicaragua	4 978	1 422	3 556	1 493
1982-1983	Bolivia, Ecuador and Peru	42 589	27 728	14 861	18 462
	Bolivia	10 240	6 384	3 856	3 072
	Ecuador	7 842	6 536	1 306	3 137
	Peru	24 506	14 808	9 698	12 253
1985, September 19	Mexico	37 099	32 443	4 656	14 840
1985, November 13	Colombia	2 777	1 915	862	555
1986, October 10	El Salvador	7 293	5 526	1 767	1 459
1987, March 5	Ecuador	7 055	1 312	5 742	5 877
1988, October 13-26	Nicaragua	5 101	4 527	574	1 876
1988	Mexico	462	462		
1990	Mexico	376	376		
1990	Mexico	10	10		
1992					
1992, April 9	Nicaragua	56	31	25	8
1992, September 1	Nicaragua	74	52	22	13
1995					
1995, September 5	Anguilla	95	79	17	37
1995, September 4-15	Saint-Martin, Netherlands Antilles	1 795	986	810	706
1996					
1996, July 27-28	Costa Rica	240	131	108	110
1996, July 27-29	Nicaragua	80	54	26	25
1996	Mexico	8	8		
1997					
1997-1998	Costa Rica	136	74	62	65
1997-1998	Andean Community	11 286	4 084	7 203	3 528
		788	319	470	206
		844	84	760	237
		4 311	1 266	3 046	986
		5 236	2 411	2 824	2 067
		108	4	103	31
1997	Mexico	670	0	670	
1998					
1998, September 22-23	Dominican Republic	3 102	1 891	1 211	1 211

(Continued)

TABLE A-I.3 (continuation)

1998, October 23-November 4	Central America	8 498	4 353	4 145	2 247
		129	76	53	26
		549	240	309	103
		1 058	407	651	32
		5 365	2 835	2 530	1 778
		1 397	795	602	309
1998	Mexico	852	852	0	0
1998	Mexico	93	0	93	0
1999					
1999, January 25	Colombia	2 127	1 874	253	138
1999, December	Venezuela	4 309	2 632	1 678	431
1999	Mexico	1 446	1 250	196	
1999	Mexico	394	290	104	
1999	Mexico	329	316	13	
2000					
2000, September 30 - 1 October	Belize	360	272	88	72
2000 October 22-26	Mexico	49	49	1	
2000	Mexico	17	17	0	
2000	Mexico	295	207	88	
2001					
2001, January and February	El Salvador	5 476	3 410	2 066	1 059
2001, Second Quarter	Central America	234	0	234	80
2001 - Recorded Disasters	Mexico	358	58	300	0
2001 - Damages for climate effect in Mexico	Mexico	327	0	0	
2001	Mexico	236	37	199	
2001	Mexico	0	0	0	
2001 - Geological phenomena in Mexico	Mexico	4	0	0	
2001, October	Belize	260	199	61	132
2001, November	Cuba	2 306	1 713	593	465
2001, November	Jamaica	402	241	161	100
2002					
2002 - Recorded Disasters	Mexico	1 414	1 042	372	n.a.
	Mexico	1 413	1 042	372	
2002	Mexico	160	124	36	
2002	Mexico	1 099	822	277	
2002	Mexico	2	2	0	
2002	Mexico	24	20	4	
2002	Mexico	1	0	1	
2002	Mexico	27	0	27	
2002	Mexico	5	4	1	
2002	Mexico	0	0	0	
2003					
2003 - April	Argentina	1 185	420	765	453
2003 - May	Dominican Republic	49	38	11	11
2003 - Recorded Disasters	Mexico	627	409	218	
	Mexico	468	261	206	
2003- September	Mexico	295	123	173	
2003- August September	Mexico	91	84	7	
2003- September	Mexico	65	46	20	
2003- January	Mexico	154	143	11	

(Continued)

TABLE A-I.3 (conclusion)

2004					
2004 - May	Haiti	nag.	n.a.	nag.	
2004 - September	Dominican Republic	330	166	164	139
	Haiti	330	222	108	52
2004	Bahamas	614	368	246	336
2004	Grenada	990	881	109	662
2004	Cayman Islands	3 823	3 166	657	n.a.
2004	Jamaica	663	417	246	130
2004	Cuba	1 671	..	…	…
2004 - November	Dominican Republic	47	36	11	169
2004 - Recorded Disasters	Mexico	32	28	4	
2004	Mexico	32	28	4	
2004	Mexico	0	0	0	
2004	Mexico	15	13	2	
2004	Mexico	1	1	0	
2004	Mexico	12	11	1	
2004	Mexico	3	2	1	
2004	Mexico	0	0	0	
2005					
2005 - January	Guyana	500	450	50	100
2005	Guatemala	1 058	607	451	265
2005	El Salvador	383	172	211	107
2005 – July/September	Mexico	4 990	2 256	2 734	172
2005-July	Mexico	908	351	557	172
2005-July	Mexico	104	91	13	0
2005-July	Mexico	74	63	12	0
2005-July	Mexico	157	153	4	0
2005-July	Mexico	114	44	70	0
		459	0	459	0
2005-September	Mexico	2 160	1 413	747	0
		88	80	8	0
		94	83	11	0
		180	143	37	0
		259	208	51	0
		1 539	900	639	0
2005-October	Mexico	1 922	491	1 430	0
		1 869	461	1 408	0
		53	30	22	0
2006					
2006-February	Guyana	33	24	9	0
2006-May	Suriname	49	40	10	0
2006-July	Mexico	51	32	18	0
2006-September	Mexico	13	8	5	0
2006-September	Mexico	15	12	3	0
2006-September	Mexico	181	141	40	0
2006-September	Mexico	93	82	11	0
2006-September	Mexico	12	6	6	0
2006-2007 cumulated	Bolivia	529	169	360	0
2007					
2007-August	Saint Lucia	18	12	7	0
2007-August	Belize	90	47	42	0
2007-August	Dominica	60	47	14	0
September -October 2007	Nicaragua	297	215	82	165
2007- October	Dominican Republic	439	255	184	144
October - November 2007	Mexico	2 836	1 478	1 358	0

Source: ECLAC database.

Annex II

TABLE A-II.1
STATUS OF ADVANCEMENT IN THE MILLENNIUM DEVELOPMENT GOALS (2008 REPORT)

Goals and targets	Africa		Asia				Oceania	Latin America & Caribbean	Commonwealth of Independent States	
	Northern	Sub-Saharan	Eastern	South-Eastern	Southern	Western			Europe	Asia
GOAL 1: Eradicate extreme poverty and hunger										
Reduce extreme poverty by half	Low poverty	Very high poverty	High poverty	High poverty	Very high poverty	Low poverty	- - -	Moderate poverty	Low poverty	High poverty
Productive and decent employment	Very large deficit in decent work	Very large deficit in decent work	Large deficit in decent work	Very large deficit in decent work	Very large deficit in decent work	Very large deficit in decent work	Very large deficit in decent work	Moderate deficit in decent work	Small deficit in decent work	Moderate deficit in decent work
Reduce hunger by half	Low hunger	Very high hunger	Moderate hunger	High hunger	High hunger	Moderate hunger	Moderate hunger	Moderate hunger	Low hunger	Moderate hunger
GOAL 2: Archive universal primary education										
Universal primary schooling	High enrolment	Low enrolment	High enrolment	High enrolment	Moderate enrolment	Moderate enrolment	- - -	High enrolment	High enrolment	High enrolment
GOAL 3: Promote gender equality and empower women										
Equal girls' enrolment in primary school	Close to party	Close to party	Party	Party	Party	Close to party	Almost close to party	Party	Party	Party
Women's share of paid employment	Low share	Low share	High share	Medium share	Low share	Low share	Medium share	High share	High share	High share
Women's equal representation in national parliaments	Very low representation	Low representation	Moderate representation	Low representation	Low representation	Very low representation	Very low representation	Moderate representation	Low representation	Low representation
GOAL 4: Reduce child mortality under five-year-olds										
Reduce mortality of under-five-year-olds by two thirds	Low mortality	Very high mortality	Low mortality	Low mortality	High mortality	Low mortality	Moderate mortality	Low mortality	Low mortality	Moderate mortality
Measles immunization	High coverage	Moderate coverage	High coverage	Moderate coverage	Moderate coverage	Moderate coverage	Low coverage	High coverage	High coverage	High coverage
GOAL 5: Improve maternal health										
Reduce maternal mortality by three quarters *	Moderate mortality	Very high mortality	Low mortality	High mortality	High mortality	Moderate mortality	High mortality	Moderate mortality	Low mortality	Low mortality
Access to reproductive health	Moderate access	Low access	High access	Moderate access	Moderate access	Moderate access	Low access	High access	High access	Moderate access
GOAL 6: Combat HIV/AIDS, malaria and other diseases										
Halt and reverse spread of HIV/AIDS	Low prevalence	High prevalence	Low prevalence	Low prevalence	Low prevalence	Low prevalence	Moderate prevalence	Moderate prevalence	Moderate prevalence	Low prevalence
Halt and reverse spread of tuberculosis	Low mortality	High mortality	Moderate mortality	High mortality	Moderate mortality	Low mortality	High mortality	Low mortality	Moderate mortality	Moderate mortality
GOAL 7: Ensure environmental sustainability										
Reverse kills in forests	Low forest cover	Medium forest cover	Medium forest cover	High forest cover	Medium forest cover	Low forest cover	High forest cover	High forest cover	High forest cover	Low forest cover
Halve proportion without improved drinking water	High coverage	Low coverage	Moderate coverage	Moderate coverage	Moderate coverage	High coverage	Low coverage	High coverage	High coverage	Moderate coverage
Halve proportion without sanitation	Moderate coverage	Very low coverage	Low coverage	Low coverage	Very low coverage	Moderate coverage	Low coverage	Moderate coverage	Moderate coverage	High coverage
Improve the lives of slum-dwellers	Moderate proportion of slum-dwellers	Very high proportion of slum-dwellers	High proportion of slum-dwellers	High proportion of slum-dwellers	High proportion of slum-dwellers	Moderate proportion of slum-dwellers	Moderate proportion of slum-dwellers	Moderate proportion of slum-dwellers	- - -	- - -
GOAL 8: Develop a global partnership for development										
Internet users	Moderate usage	Very low usage	High usage	Moderate usage	Low usage	Moderate usage	Low usage	High usage	High usage	Low usage

Source: http://mdgs.un.org/unsd/mdg/Resources/Static/Products/Progress2009/MDG_Report_2009_Progress_Chart_Es.pdf.

For the regional groupings and country data, see mdgs.un.org. Country experiences in each region may differ significantly from the regional average. Due to new data and revised methodologies, this Progress Chart is not comparable with previous versions. Compiled by Statistics Division, Department of Economic and Social Affairs, United Nations.

The progress chart operates on two levels. The words in each box indicate the present degree of compliance with the target. The colours show progress towards the target according to the legend below.

Already met the target or very close to meeting the target.
Progress insufficient to reach the target if prevailing trends persist.
Missing or insufficient data.
Progress sufficient to reach the target if prevailing trends persist
No progress or deterioration.

* The available data for maternal mortality do not allow a trend analysis. Progress in the chart has been assessed by the responsible agencies on the basis of proxy indicators.

NACIONES UNIDAS

SEDE SUBREGIONAL DE LA CEPAL EN MÉXICO

Serie
CEPAL estudios y perspectivas

Números publicados

Un listado completo así como los archivos pdf están disponibles en

www.cepal.org/publicaciones

www.cepal.org/mexico

117. Economic impact of disasters: Evidence from DALA assessments by ECLAC in Latin America and the Caribbean (LC/L.3172-P (LC/MEX/L.941)) N° de venta E.09.II.G.146, 2009.
116. La industria microfinanciera en el Istmo Centroamericano y México: la evolución del mercado microcrediticio, el alcance y el desempeño de sus instituciones microfinancieras, Rodolfo Minzer (LC/L.3167–P (LC/MEX/L.936)) N° de venta S.09.II.G.140, 2009.
115. Regulación económica de aerolíneas en el Istmo Centroamericano, Víctor Hugo Valdés Cervantes (LC/L.3152–P (LC/MEX/L.933)) N° de venta S.09.II.G.125, 2009.
114. Medición del impacto de los acuerdos de libre comercio en América Latina: el caso de México, José Romero (LC/L.3132–P (LC/MEX/L.932)) N° de venta S.09.II.G.107, 2009.
113. La fundación de la CEPAL en México: desde los orígenes hasta 1960, Hugo Enrique Sáez A. (LC/L.3115–P (LC/MEX/L.927)) N° de venta S.09.II.G.93, 2009.
112. El Acuerdo de Asociación Económica entre Centroamérica y la Unión Europea: viabilidad, avances y perspectivas, Héctor Mata y Martha Cordero (LC/L.3110–P (LC/MEX/L.926)) N° de venta S.09.II.G.90, 2009.
111. Centroamérica: efecto de la integración con Estados Unidos sobre el mercado regional del maíz, Diana Ramírez Soto y José Alberto Cuéllar Álvarez (LC/L.3074-P (LC/MEX/L.910)) N° de venta S.09.II.G.64, 2009.
110. Instrumentos para la evaluación del impacto de acuerdos comerciales internacionales: aplicaciones para países pequeños en América Latina, Alberto Trejos (LC/L.3073–P (LC/MEX/L.909)) N° de venta: S.09.II.G.63, 2009.
109. Istmo Centroamericano y República Dominicana: desafíos de la crisis global al crecimiento agropecuario, Braulio Serna (LC/L.3029–P (LC/MEX/L.903)) N° de venta: S.09.II.G.35, 2009.
108. Metodologías para la evaluación del impacto socioeconómico de los desastres, Daniel Bitrán (LC/L.3022–P (LC/MEX/L.899)) N° de venta: S.09.II.G.31, 2009.
107. Módulo para Analizar el Crecimiento del Comercio Internacional (MAGIC Plus), Manual para el usuario, René A. Hernández e Indira Romero (LC/L.3020–P (LC/MEX/L.898)) N° de venta: S.09.II.G.30, 2009.
106. La educación superior y el desarrollo económico en América Latina, Juan Carlos Moreno-Brid y Pablo Ruiz-Nápoles (LC/L.3001–P (LC/MEX/L.893)) N° de venta: S.09.II.G.06, 2009.

- El lector interesado en adquirir números anteriores de esta serie puede solicitarlos dirigiendo su correspondencia a la Biblioteca de la Sede Subregional de la CEPAL en México, Presidente Masaryk Nº 29 – 4º piso, 11570 México, D. F., Fax (52) 55-31-11-51, biblioteca.mexico@cepal.org.

Nombre:..

Actividad: ....

Dirección: ....

Código postal, ciudad, país:..

Tel.:............................Fax: ....E.mail:..