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Summary

The purpose of this work is to review ECLAC's experience in assessing the economic and social impact of disasters. Toward that end, the database established according to assessment reports is described and the patterns of sectoral damage and losses from different types of events are defined. The pattern of damage indicates that 49.5 per cent of same occurred in the social sector, while the production sector and infrastructure accounted for 34.1 per cent, and 16.4 per cent of damage respectively. This pattern varies according to the origin of the disaster. Damage resulting from climate disasters is concentrated in the production sector, 52.1 per cent, infrastructure, 27.5 per cent and the social sector, 20.4 per cent. For their part in geophysical disasters, on average, the social sector accounted for 74 per cent of the damage, while the infrastructure and production sectors recorded 6.5 per cent and 19.5 per cent, respectively. Unlike damage, losses are concentrated primarily in the production sector, 71.2 per cent, with lower percentages recorded in the social sectors, 12.8 per cent and infrastructure, 16 per cent. This responds to the sectoral distribution of the losses stemming from climate events in which 73.9 per cent corresponded with the production sector, 19.8 per cent with infrastructure and 6.3 per cent with the social sector. With respect to geophysical disasters, this distribution was 56.9 per cent, 13 per cent and 30.1 per cent, respectively.

Introduction

Beginning with the Managua earthquake in 1972, up to 2010, ECLAC coordinated 88 disaster impact assessment reports in 28 countries in the region. Most of these have focused on disasters of relative importance. According to the Emergency Events Database (EM-DAT) compiled by the Center for Research on the Epidemiology of Disasters (CRED) of the Catholic University of Louvain in Brussels, Belgium, at the global level, between 1972 and 2010, 10,051 disasters occurred,[1] of which 1,690 took place in Latin America and the Caribbean. Of these, 1,192 were climate disasters, 347 were geological and 114 were of biological origin.[2]

The cost of the 88 disasters, with estimates coordinated by ECLAC during the aforementioned period, was approximately US$ 213 billion,[3] resulting in 309,742 deaths and affecting approximately 30 million persons. As for the economic impact, damage was recorded at approximately US$ 150 billion, while losses reached almost US$ 63 billion.

The assessments performed by ECLAC on the effects and impact of disasters, corresponded for the most part (84) with climate or geological events. The total cost of climate disasters is quite similar to that of the geophysical, US$ 105 billion and US$ 100 billion, respectively, with average total costs of US$ 1.5 billion for the former and US$ 8.3 billion for the latter.

The purpose of this work is to review ECLAC's experience in order to define patterns of sectoral[4] and sub-sectoral damage and losses resulting from different types of events. Toward that end, consideration has been given to a classification that distinguishes, in so far as is possible, the natural

[1] It defines a disaster as an event that overwhelms local capacity and/or which may require external assistance. Recorded in that database are those that meet one of the following criteria: (i) ten or more persons are reported dead; (ii) one hundred or more persons are reported affected; (iii) declaration of a state of emergency; or (iv) a call for assistance is made.

[2] This classification is based on s Skidmore and Toya (2002).

[3] Level estimates, originally in current US$ millions were converted to real US$ millions at 2000 prices using the global price index of the Monetary Fund (http://www.imfstatistics.org/imf/). From this moment onward, every time dollars are mentioned, it must be understood that it refers to real dollars at 2000 prices.

[4] The sectoral classification used throughout this document corresponds with that of ECLAC (1991) and ECLAC (2003). They consider 3 sectors. (1) The Social Sector, which is subdivided into: (i) education; (ii) health; (iii) housing and human settlements. (2) The Production Sector, comprising: (i) agriculture and forestry; (ii) industry; (iii) trade and services. (3) The Infrastructure Sector, which includes: (i) water and drainage; (ii) transport and communications; (iii) energy.

event and the characteristics of the sub-region affected, in terms of its exposure to natural phenomena, as well as spatial and climate aspects and the population size of human settlements. The distinction of the phenomena responds to the characterisation of the major events that lead to disasters: (i) climate disasters that include: storms and hurricanes, the El Niño Southern Oscillation (ENSO) cycle and flooding brought about by extreme precipitation events; (ii) geophysical events, such as earthquakes, tsunamis and volcanic eruptions, and (iii) a category of mixed events, which includes those disasters resulting simultaneously from climate and geophysical events. The sub-regions selected are: Central America, Mexico, the Caribbean and South America.

At the sectoral level, the damage resulting from all the events was distributed as follows: social sector, 49.5 per cent, production sector, 34.1 per cent and infrastructure, 16.4 per cent. This pattern varies according to the origin of the disaster. Damage resulting from climate disasters is concentrated in the production sector, 52.1 per cent, infrastructure, 27.5 per cent and the social sector, 20.4 per cent. For their part in geophysical disasters, on average, the social sector accounted for 74 per cent of the damage, while the infrastructure and production sectors recorded 6.5 per cent and 19.5 per cent, respectively. Unlike damage, losses are concentrated primarily in the production sector, 71.2 per cent, with lower percentages recorded in the social sectors 12.8 per cent and infrastructure, 16 per cent. This responds to the sectoral distribution of the losses stemming from climate events in which 73.9 per cent corresponded with the production sector, 19.8 per cent with infrastructure and 6.3 per cent with the social sector. With respect to geophysical disasters, this distribution was 56.9 per cent, 13 per cent and 30.1 per cent, respectively. The comparison of the relative sectoral impact between the distributions of damage and losses highlights the marked reduction in the social sector and the increase in the production sector.

The rest of this work is organised as follows. The second section focuses on the impact of disasters by countries and sub-regions. The third section highlights the most fatal disasters, while the fourth section presents the results by the type of event that gave rise to the disaster. The fifth section defines the sectoral patterns of damage and the following section defines those corresponding with losses. Lastly, some evaluative considerations are presented.

I. Disasters by sub-regions and countries

ECLAC has performed assessments on the economic and social impact of disasters in 28 countries, see table 1. The country recording the most reports is Nicaragua with 10. It is underscored however that impact assessments have not been carried out in Brazil, Cuba, Chile and Paraguay. Note that 40.9 per cent of assessments took place in Central America, 27.3 per cent in the Caribbean, 22.7 per cent in South America and 9.1 per cent in Mexico.

Table 1
ECLAC: impact assessments by country and sub-region

Country/ region	Biological	Climate	Geophysical	Mixed	Total
Total disasters	**2**	**71**	**13**	**2**	**88**
Central America and Mexico	**1**	**32**	**9**	**2**	**44**
Belize		3			3
Costa Rica		4			4
El Salvador		5	3	1	9
Guatemala		4	1	1	6
Honduras		3			3
Mexico	1	5	2		8
Nicaragua		7	3		10
Panama		1			1
South America	**1**	**17**	**2**		**20**
Argentina		1			1
Bolivia (Plurinational State of)	1	5			6
Colombia		2	1		3
Ecuador		2	1		3
Guyana		2			2
Peru		2			2
Suriname		1			1
Venezuela (Bolivarian Republic of)		2			2

Table 1 (concluded)

Country/ region	Biological	Climate	Geophysical	Mixed	Total
Caribbean		**22**	**2**		**24**
Anguilla		1			1
Antigua And Barbuda			1		1
Bahamas		1			1
Cayman Islands		2			2
Dominica		2			2
Grenada		2			2
Haiti		3	1		4
Jamaica		3			3
Dominican Republic		5			5
Saint Lucia		1			1
Sint Maarten		1			1
Turks And Caicos Islands		1			1

Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

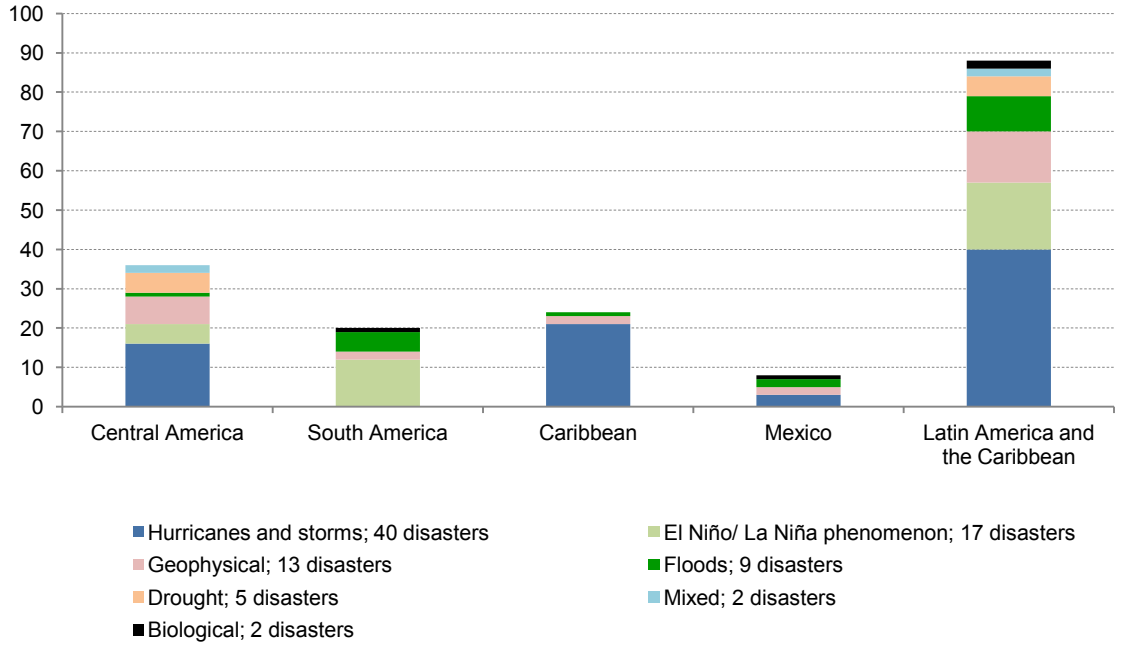
Table 2
ECLAC: number of deaths, population affected and total cost of disasters studied 1972-2010

Sub-region/ country	Deaths	Population affected	Damage [a]	Losses [a]	Total cost [a]
All Countries	**309 742**	**26 942 973**	**150 490**	**62 669**	**212 614**
Central America and Mexico	**58 871**	**11 084 899**	**97 954**	**28 125**	**126 080**
Belize	26	9 035	416	127	543
Costa Rica	43	176 039	222	180	402
El Salvador	3 559	1 395 562	6 762	2 875	9 637
Guatemala	24 782	3 837 589	20 740	1 593	22 334
Honduras	12 662	796 331	7 172	2 016	9 188
Mexico	8 270	2 731 667	28 271	12 547	40 818
Nicaragua	9 524	2 122 676	34 371	8 762	43 133
Panama	5	16 000		25	25
South America	**22 906**	**9 465 096**	**35 797**	**24 259**	**60 056**
Argentina	22	520 175	357	594	951
Bolivia (Plurinational State of)	22	3 362 124	5 650	4 009	9 659
Colombia	1 542	1 118 802	5 800	1 597	7 397
Ecuador	1 286	1 061 523	7 197	7 546	14 744
Guyana	34	570 774	369	45	414
Peru	0	2 580 000	13 970	9 645	23 615
Suriname	0	31 698	31	7,5	38
Venezuela (Bolivarian Republic of)	20 000	220 000	2 423	815	3 238
Caribbean	**227 965**	**6 392 978**	**16 739**	**10 285**	**26 478**
Anguilla	0	10 000	61	10	71
Antigua And Barbuda	0	4 200	0	0	0
Bahamas	2	28 500	198	132	330
Cayman Islands	2	37 672	2 502	514	3 015
Dominica	45	104 060	367	226	46
Grenada	28	171 553	685	85	770
Haiti	225 573	2 525 167	3 508	2 952	6 461
Jamaica	28	1 830 235	673	206	879
Dominican Republic	2 287	1 617 154	7 842	5 457	13 299
Saint Lucia	0	23 167	9	5	14
Sint Maarten	0	31 000	806	629	1 436
Turks And Caicos Islands	0	10 270	88	69	157

Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.
[a] Millions of real dollars in 2000.

The total cost of these 88 disasters was approximately US$ 213 billion. Said disasters resulted in 309,742 deaths and affected approximately 30 million persons,[5] see table 2. Of these costs, 40.1 per cent occurred in Central America, 28.25 per cent in South America, 12.46 per cent in the Caribbean and 19.2 per cent in Mexico, see table 2. With respect to deaths, 73.6 per cent occurred in the Caribbean, 2.7 per cent in Mexico, 16.3 per cent in Central America and 7.4 per cent in South America. For its part, the regional profile of persons affected differs from that of deaths. In this case, 42.1 per cent took place in South America, 9.1 per cent in Mexico, 20.5 per cent in the Caribbean and 28.2 per cent in Central America. As it will be observed in section 4, this pattern is associated with the type of events that occur in these regions.

Figure 1
Latin America and the Caribbean: climate and geophysical disasters assessed by ECLAC, according to origin and sub-region 1972 – 2010



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

[5] Population affected is understood as the persons requiring immediate assistance during a period of emergency, in terms of one or several basic needs such as food, water, housing, sanitation or medical aid.

II. Disasters according to their origin

As at 2010, ECLAC conducted assessments on the economic, social and environmental effects and impact of 71 climate disasters, 13 geophysical, 2 biological and 2 mixed, see figure 1. The total cost of climate disasters is quite similar to that of the geophysical, US$ 105 billion and US$ 100 billion respectively, with average total costs amounting to US$ 1.5 billion for the former and US$ 8.3 billion for the latter, see table 3. Note that the number of geophysical disasters was less than one fifth of that of climate disasters.

Climate disasters were responsible for 15 per cent of the total deaths, while 84.8 per cent of deaths occurred during geological events. Regarding the population affected, these percentages were recorded at 74.48 per cent and 22.75 per cent respectively. Note however, that the average population affected in the case of the former is approximately 326,000 persons, while the other group recorded 523,000 persons.

A. Climate disasters

The 71 assessments performed by ECLAC on the effects and impact of climate disasters focused on: 40 on storms and hurricanes, 14 on the El Niño Phenomenon, 3 on La Niña and 14 extreme episodes of precipitation and drought.

With respect to the first group, 21 of these assessments were conducted in Caribbean countries, highlighting those on hurricane Dean (2007), a category 5 hurricane which affected 4 countries,[6] namely: Haiti, Dominica, Saint Lucia and Belize. Another sizeable number of these assessments took place in Central America, highlighting those on hurricane Mitch (1998), also a category 5 hurricane, as

[6] The Saffir-Simpson scale defines and classifies the category of a hurricane based on its wind speed. Category 1 is the least intense (winds ranging from 119 to 153 km/h); category 5 is the most intense (winds exceeding 250 km/h). The category of a hurricane is not necessarily related to the damage it causes. Category 1 or 2 hurricanes can have a severe impact depending on the atmospheric phenomena interacting with them, the type of region affected and the travelling speed of the hurricane. Category 3, 4, or 5 hurricanes are considered severe.

well as those on hurricane Cesar (1996), a category 4 hurricane, where ECLAC performed assessments for five and three countries respectively.

The disasters resulting from storms and hurricanes led to 50.2 per cent of the deaths, 37.3 per cent of the population affected, 41.29 per cent of the damage and 38.4 per cent of the total losses. All of these percentages were calculated based on the respective totals of climate events.

In Central America, it is estimated that some 17,519 persons died as a result of storms and hurricanes. The most catastrophic event to strike this sub-region has been hurricane Mitch (1998), which was responsible for 23,149 deaths throughout Central America. In the Caribbean, storms and hurricanes led to 5,376 fatalities. The disasters recording the highest number of deaths in the Caribbean include: that resulting from hurricane Jeanne in 2004 in Haiti and those stemming from hurricanes David and Frederick in the Dominican Republic in 1979, with 2,665 and 2,000 victims respectively.

Then there is a second group of impact assessments associated with the ENSO[7] cycle, 14 corresponded with the warm phase, El Niño, and 3 with the cooling phase, La Niña, which produced extreme precipitation and drought. The El Niño assessments were conducted on the extreme episodes of 1982-83 and 1997-98, which had a significant impact on the economies of the countries of Central America and the Andean zone of South America, especially Peru and Bolivia. The La Niña impact assessments were conducted in 2007 and 2008 in Bolivia. The ENSO cycles have had a less lethal impact than floods, landslides and hurricanes, but it is estimated that the population affected has been larger, due essentially to the impact made by these phenomena in South America, which has a larger vulnerable population.[8]

With respect to total climate disasters, those resulting from the ENSO cycle were responsible for 4.1 per cent of deaths, 48.8 per cent of the population affected, 47.8 per cent of damage and 52 per cent of losses. Note the difference with the pattern of impact of hurricanes and storms. Those associated with the La Niña and El Niño phenomena produced significant consequences for the population affected, as well as damage and losses, but not in the number of fatalities.

B. Geological disasters

ECLAC has performed impact assessments on 13 geophysical events, essentially earthquakes. With respect to the totals of the four categories of intensity used, these disasters accounted for: 85.1 per cent of the deaths, 22.8 per cent of the population affected, 53.9 per cent of the damage and 30.6 per cent of the losses. As indicated in section 3, eight of these disasters were among the 15 most fatal events of the region. The impact caused by geophysical disasters in the four categories used is very much influenced by those eight disasters.[9] In addition, El Salvador is the country in which assessments on the effects and impact of these events have been most frequently conducted, 3 in total, specifically the earthquake occurring in 1986 and the two consecutive events in January and February, 2001.

C. Mixed disasters

Mixed impact assessments correspond with disasters produced by the combined occurrence of a climate event and a geophysical one. Both took place in Central American countries. In El Salvador (2005), tropical storm Stan was combined with the eruption of the Ilamatepec volcano (also known as Santa

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[7] Southern Oscillation (ENSO) is the result of a cyclical warming and cooling of the surface of the Central and Eastern Pacific ocean. This Pacific region is usually colder than what may be suggested by its equatorial location, due primarily to the influence of the northeast winds, a cold ocean current that flows toward the north throughout the coast of Chile and the rise in cold waters from the depths of the ocean, on the outskirts of the coast of Peru.

[8] In South America, it is estimated that the total population affected by the extreme events of the La Niña and El Niño phenomena is 7,323,548 persons, with death amounting to 1,471.

[9] The percentages represented by catastrophic events in the total of those categories in geophysical disasters were 99.9 per cent, 87.2 per cent, 99.6 per cent and 99 per cent, respectively

Ana) located very close to San Salvador and in Guatemala (2010), tropical storm Agatha occurred simultaneously with the eruption of the Pacaya Volcano. In terms of deaths, these two impact assessments represented 0.1 per cent. With respect to the population affected, damage and losses, the impact was 2.1 per cent, 0.6 per cent and 0.8 per cent, respectively.

D. Biological disasters

Impact assessments on biological disasters are recent. One was conducted in Bolivia in 2009, where the impact of dengue was evaluated and the other was performed as a result of AH1N1 in Mexico (2009). These disasters caused 0.05 per cent of the fatalities, 0.6 per cent of the population affected and 9.2 per cent of the losses recorded in the disasters studied by ECLAC. Losses are determined by those attributed to the second event mentioned and were associated with the isolation measures ordered in that country to control the epidemic.

III. Cost pattern of disasters

The economic and social impact of disasters is estimated at US$ 213 billion, with damage amounting to approximately US$ 150 billion and losses close to US$ 63 billion. The amounts corresponding with climate and geophysical disasters were presented in section 4. The distribution of the total costs varies between damage and losses and according to the type of disaster and the features of the geographic areas affected.

The highest damage estimates correspond with that of the earthquake that occurred in Managua, Nicaragua (1972), US$ 25.8 billion and that of the earthquake that took place in Mexico City (1985), recorded at US$ 25.2 billion. For their part, the highest estimates of losses correspond with the disasters brought about by the El Niño Phenomenon in Peru, recorded at almost US$ 7.5 billion and the Managua earthquake, at US$ 6.3 billion.

The damage and losses resulting from a disaster are based not only on what caused it, but also on the demographic and socioeconomic structure of the region affected. In order to determine the cost pattern of the disasters studied by ECLAC, consideration has been given to a classification that distinguishes, in so far as is possible, the natural event responsible and the characteristics of the sub-region affected, in terms of its exposure to natural phenomena, as well as spatial and climate aspects and the population size of human settlements.

The distinction of the phenomena responds to the characterisation of the major events that led to disasters mentioned in the previous point. The sub-regions selected include: Central America, Mexico, the Caribbean and South America. These sub-regions are vulnerable to weather, and have population sizes, territories, conditions of affectation and physical vulnerability of dissimilar characteristics. Although, a sizeable portion of Latin America and the Caribbean has among its principal threats, earthquakes, volcanic eruptions and landslides, Central American and Caribbean countries have conditions of greater physical vulnerability, due to the reduced size of their territories and economies, coupled with adverse socioeconomic conditions stemming from their weaker economies. Mexico, Central America and the Caribbean are located in the hurricane zone. The islands of the Caribbean, most of them small in size, are affected annually by storms and hurricanes originating in the Atlantic. Mexico and Central America, in addition to the storms from the Atlantic, are also vulnerable to recurring cyclones from the Pacific. In some Central American countries, not only do storms affect their coasts,

but they also cross their entire territory, as was the case with Hurricanes Joan and Cesar in Nicaragua, and Mitch, which affected all the countries.

According to the classification that combines the type of natural event responsible for the disaster and the features of the sub-region affected, the assessments conducted by ECLAC between 1972 and 2010 regarding the effects and impact of disasters, focus primarily on the sub-regions of Central America and the Caribbean, with the disasters studied in South America being reduced to 12 disasters caused by the El Niño and La Niña phenomena and 4 of the 9 floods resulting from the extreme precipitation that occurred in this sub-region: Caracas, Venezuela (1999), Cordoba, Argentina (2003), Suriname (2006) and Guyana (2005, 2006).

The disasters with the greatest average impact on property have been those brought about by geophysical events in Mexico and Central America, see table 3. Three of the major disasters in terms of damage occurred in these sub-regions: Nicaragua, Mexico and Guatemala, with damage recorded at US$ 2.6, US$ 2.5 and US$ 1.8 billion, respectively. In general, the average estimates for damage are higher for geophysical disasters.

As for climate disasters at the regional level, the highest average damage was estimated in South America at US$ 2.82 billion, resulting from the climate changes of the El Niño phenomenon, for the periods 1982-1983 and 1997-1998, which had a severe impact on Colombia, Peru and the Plurinational State of Bolivia. These are followed in importance by the damage estimated for the floods analysed in South America, Central America and the Caribbean, for which the average damage was estimated at US$ 838 million. In regards to storms and hurricanes, the most significant damage estimates are those of Central America and the Caribbean, with average damage recorded at US$ 818 and US$ 705 million, respectively.[10]

With respect to estimates of losses, as is the case with damage, these are generally higher for geophysical events than climate events. For the geophysical disasters of Mexico, average losses are estimated at US$ 1.8 billion, followed in importance by those of the Caribbean and South America, with average estimates of US$ 2.4 and US$ 2.34 billion. Among climate disasters, the highest estimates of average losses correspond with those incurred from the El Niño Phenomenon in South America,[11] recorded at US$ 1.89 billion, while the estimated losses for the storms and hurricanes studied in Mexico are recorded at US$ 698 million.[12]

For the total disasters studied by ECLAC between 1972 and 2010, damage estimates are 2.4 times greater than those of losses; however, these ratios demonstrate differences by type of event and geographic zone.[13] Ratios significantly higher than 2.3 are recorded among the average estimates for the geophysical disasters of Mexico, Central America and for those of the La Niña Phenomenon in South America, with ratios of 6.9, 5.9 and 3.9, respectively. Ratios lower than 1 are recorded for the disasters brought about by hurricanes and storms in Mexico, 0.8, and for the geophysical disasters of South America, 0.6.

[10] The highest damage from storms were those resulting from hurricanes David and Frederick in the Dominican Republic (1979), at US$ 6.6 billion; hurricane Fifi in Honduras (1974), at US$ 5 billion; hurricane Joan in Nicaragua (1988), at US$ 3.5 billion.

[11] In the sub-region, the highest losses were recorded in Peru during the period 1982-1983.

[12] The highest losses in Mexico resulted from hurricane Wilma, recorded at US$ 1.1 billion. For this disaster, losses exceeded damage.

[13] As expected, epidemics and droughts have damage and loss ratios equal to zero since their occurrence does not lead to damage in property. For the remaining episodes, damage estimates are expected to be similar or higher than those for losses.

Table 3
Damage and loss estimates according to type of event and sub-regions
(Millions of real dollars)

Type of disaster/region/country	Damage	Losses	Total cost [a]	Average damage	Average losses	Damage/ loss ratio
All disasters	**150 161**	**62 677**	**213 585**	**1 950**	**746**	**2.4**
Climate disasters	**69 066**	**37 361**	**106 427**	**1 084**	**541**	**1.8**
Hurricanes and storms-Central America	13 088	4 560	17 640	818	304	2.8
Hurricanes and storms-Caribbean	14 122	7 827	21 012	705	391	1.7
Hurricanes and storms-Mexico	1 659	2 094	3 754	553	698	0.8
La Niña phenomenon-South America	4 364	1 113	5 478	1 455	371	3.9
El Niño phenomenon-Central America	2 904	1 111	4 013	726	222	2.6
El Niño phenomenon-South America	25 384	17 087	42 471	2 820	1 899	1.5
Extreme precipitations (floods and landslides)	7 543	3 431	10 974	838	381	2.1
Drought (Central America)	0	135	135	0	27	0.0
Geophysical disasters	**80 948**	**19 132**	**100 078**	**6 745**	**1 739**	**4.2**
Geophysical-Central America	49 799	8 383	58 179	7 114	1 397	5.9
Geophysical-South America	2 873	4 670	7 543	1 436	2 335	0.6
Geophysical-Caribbean	2 979	2 454	5 433	2 979	2 453	1.2
Geophysical-Mexico	25 297	3 626	28 923	12 648	1 813	6.9
Mixed disasters-Central America	**894**	**486**	**1 368**	**441**	**243**	**1.8**
Biological disasters	**0**	**5 697**	**5 697**	**0**	**2 849**	**0.0**

Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.
[a] Disasters for which there are no estimates of damage and losses have been excluded from the total cost. These correspond with the disasters in Grenada 1975 and Antigua and Barbuda 1974. By including these disasters, the total cost reaches 213.348 billion real dollars.

A. Damage estimates by sector

From the sectoral perspective, damage was distributed as follows: social sector, 49.5 per cent, production sector, 34.1 per cent and the infrastructure sector, 16.4 per cent. This pattern varies according to the origin of the disaster. Damage resulting from climate disasters is concentrated in the production sector, 52.1 per cent, infrastructure, 27.5 per cent and the social sector, 20.4 per cent. With respect to geophysical disasters, on average, the social sector accounted for 74 per cent of the damage, while the infrastructure and production sectors recorded 6.5 per cent and 19.5 per cent, respectively.

In regards to the subsectors, those most affected by climate disasters were: agriculture and forestry, housing and transport and communications. Each of these accounted for more than 70 per cent of the damage of their respective sector. In the case of disasters of geophysical origin, the most affected

subsectors included trade and services, with almost 70 per cent of the damage in the production and transport sector, which represented 82 per cent of the damage to infrastructure.

1. Geophysical Disasters

Highlighted under these disasters is the effect of earthquakes on the social sector, and to a lesser extent, on infrastructure and the production sector, see table 4.

In the Caribbean, estimates of the impact on the assets of the social sector represented 79.4 per cent of total damage, followed by the infrastructure sector, 13.6 per cent and the production sector, 7 per cent, respectively. In Central America, these relative impacts were recorded at 73.2 per cent, 5.4 per cent and 21.4 per cent, respectively. In South America, those of the social sector represented 60.1 per cent and those of the production sector, 30 per cent. The assessments conducted for Mexico highlight the relative significance of the damage of the social sector, 76.4 per cent.

Table 4
Percentage distribution of damage estimates according to economic sectors by type of event and sub- regions
(Percentage)

Type of disaster/region/country	Production	Social	Infrastructure	Total
All disasters	**34.1**	**39.5**	**16.4**	**100**
All climate disasters	**52.1**	**20.4**	**27.5**	**100**
Hurricanes and storms-Central America	47.8	30.6	24.5	100
Hurricanes and storms-Caribbean	46.1	30.6	23.3	100
Hurricanes and storms-Mexico	29.4	19.9	50.7	100
El Niño phenomenon-Central America	86.2	5.1	8.6	100
La Niña phenomenon-South America	7.4	48	44.6	100
El Niño phenomenon-South America	68.0	8.7	23.3	100
Extreme precipitations	34.0	20.4	45.6	100
All geophysical disasters	**19.5**	**74**	**6.5**	**100**
Geophysical-Central America	21.4	73.2	5.4	100
Geophysical-South America	30.0	60.1	9.9	100
Geophysical-Caribbean [a]	7.0	79.4	13.6	100
Geophysical-Mexico	15.9	76.4	7.7	100
All mixed disasters	**4.9**	**21.8**	**73.3**	**100**
Mixed-Central America	**4.9**	**21.8**	**73.3**	**100**

Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.
[a] Corresponds with the sectoral distribution of damage, Haiti 2010.

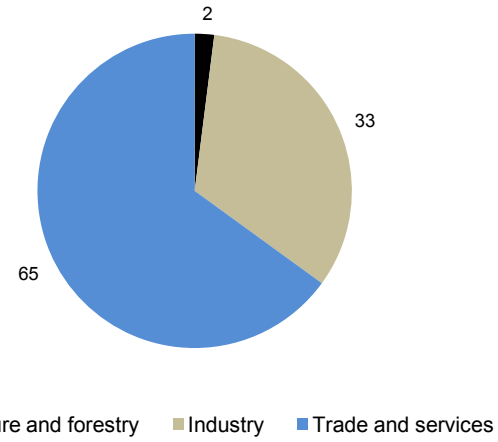
a) Production sector

With respect to geophysical disasters, the concentration of damage was primarily in the trade and services and industry subsectors, which represented 65 per cent and 33 per cent of the total damage respectively. As expected, the agriculture and forestry subsector recorded lower percentages in all sub-regions, see figures 2 and 3.

In South America, the industry subsector recorded the highest percentage of the damage of the production sector, 80 per cent, due to the effects of the earthquake that occurred in Ecuador in 1987. Following in importance are Mexico and the Caribbean with 57 per cent and 25 per cent, respectively.

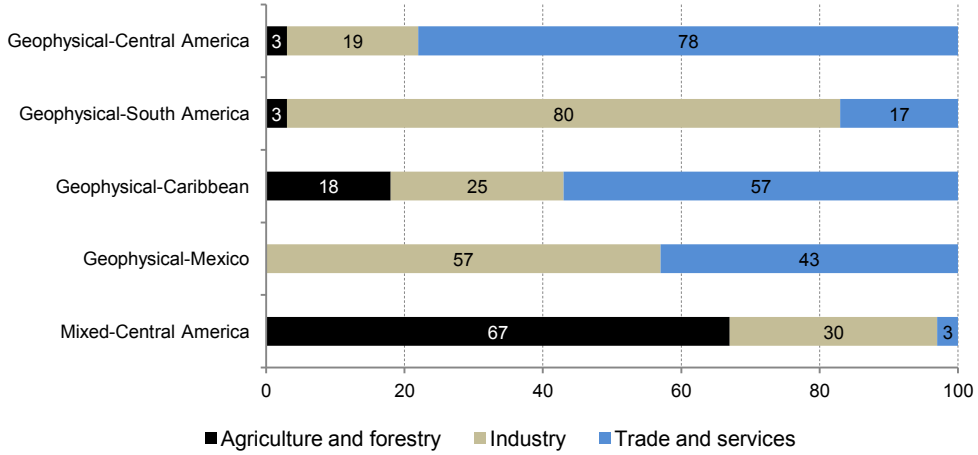
The estimated damage was concentrated in the trade and services subsector in Central America, 78 per cent and the Caribbean, 57 per cent, see figure 3.

Figure 2
Geophysical disasters, percentage distribution of damage estimates according to production subsectors
(Percentage of the total damage of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 3
Geophysical disasters by sub-region, percentage distribution of damage estimates according to production subsectors
(Percentage of the total damage of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

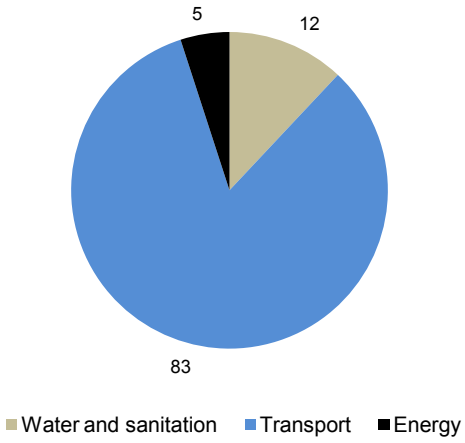
b) Infrastructure sector

In terms of damage caused by geophysical disasters in infrastructure, the most affected subsectors were transport and water and sanitation with 83 per cent and 12 per cent of the total, respectively, see figure 4. In Central America and South America, most of the infrastructure subsectors record total

damage percentages lower than 11 per cent, which, together with the agriculture and forestry subsector, represent the lowest percentages of total distribution of damage, see figure 5.

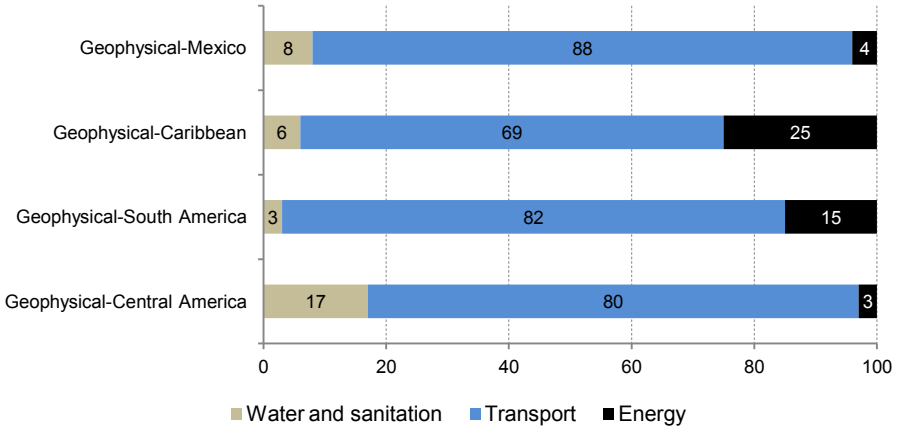
The impact assessments performed on geophysical disasters in the Caribbean assign higher percentages to the infrastructure subsectors. This result is very much influenced by the Haiti earthquake of 2010 and highlights the significance of the transport and energy subsectors with 69 per cent and 25.2 per cent, respectively.

Figure 4
Geophysical disasters, percentage distribution of damage estimates according to infrastructure subsectors
(Percentage of total damage)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 5
Geophysical disasters by sub-regions, percentage distribution of damage estimates according to infrastructure subsectors
(Percentage of the total damage of the sector)

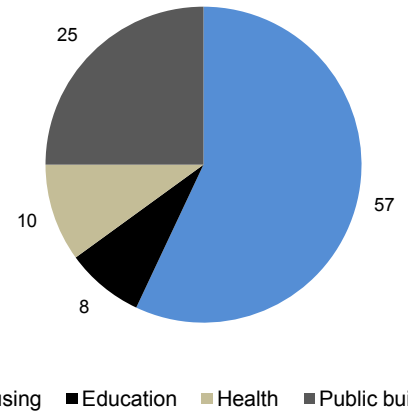


Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

c) Social sector

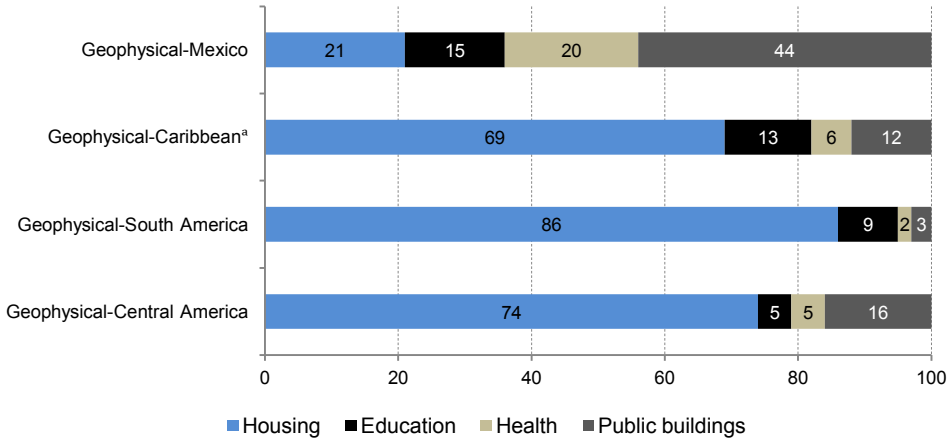
The housing subsector recorded 56.7 per cent of the damage in the social sector, followed by public buildings, 25 and health, 10.1 per cent. When we refer to the sub-regions, with the exception of Mexico, housing records more than 50 per cent of the total damage estimated for geophysical disasters. This subsector is by far the most important, since its damage accounts for more than 80 per cent of the total of the social sector, see figure 7.

Figure 6
Geophysical disasters, Percentage distribution of damage estimates according to social subsectors
(*Percentage of the total damage of the sector*)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 7
Geophysical disasters by sub-regions, percentage distribution of damage estimates according to social subsectors
(Percentage of the total damage of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.
[a] Corresponds mainly with the sectoral distribution of the damage resulting from the 2010 earthquake in Haiti.

2. Climate Disasters

The damage resulting from climate disasters is concentrated in the production sector, 52.1 per cent, infrastructure, 27.5 per cent and the social sector, 20.4 per cent.

The pattern of affectation of storms and hurricanes in Central America was as follows: production sector, 48 per cent, social sector 27.7 per cent and infrastructure, 24.5 per cent. In the case of the El Niño phenomenon in this region, these relative impacts were recorded at: 86 per cent, 5 per cent and 9 per cent, respectively.

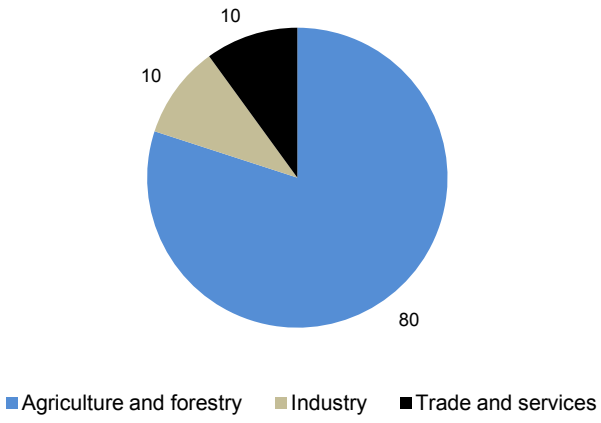
For the Caribbean, which was only affected by storms and hurricanes, the profile of affectation indicates that 46.1 per cent occurred in the production sector, 23.3 per cent in infrastructure and 30.6 per cent, in the social sector, see table 4.

In the case of South America, it has been indicated that it was affected by the El Niño and La Niña phenomena, with the former showing a pattern of affectation in which the production sector suffered 68 per cent of the damage. In the region, the La Niña phenomenon has had a significant impact on the assets of the social and infrastructure sectors, recording 48 per cent and 44.6 per cent respectively, of the damage attributed to this disaster. This phenomenon affects housing and infrastructure since it has generally led to floods and landslides, destroying houses, transport and communication networks and basic water and drainage services.

a) Production sector

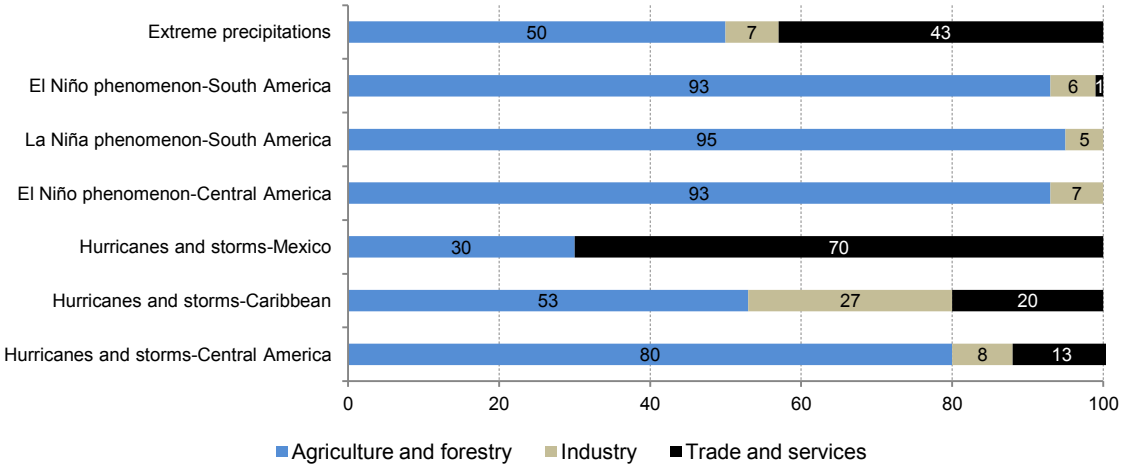
In this sector, the damage was concentrated in the agriculture and forestry subsector, 80 per cent, followed by industry, then trade and services, both recorded at 10 per cent, see figure 9. The dominance of the agriculture and forestry subsector was even greater in the case of the ENSO, in both its cooling and warm phases, accounting for more than 90 per cent of the total damage in the production sector. The estimates of the damage brought about by storms and hurricanes in Central America and the Caribbean also indicate significant percentages for this subsector.

Figure 8
Climate disasters, percentage distribution of damage estimates according to production subsectors
(Percentage of the total damage of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010

Figure 9
Climate disasters by sub-regions percentage distribution of damage estimates according to production subsectors
(Percentage of the total damage of the sector)

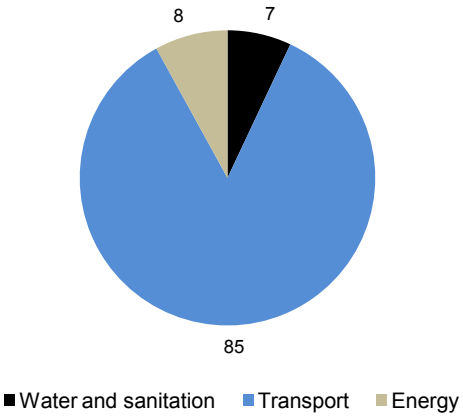


Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

b) Infrastructure sector

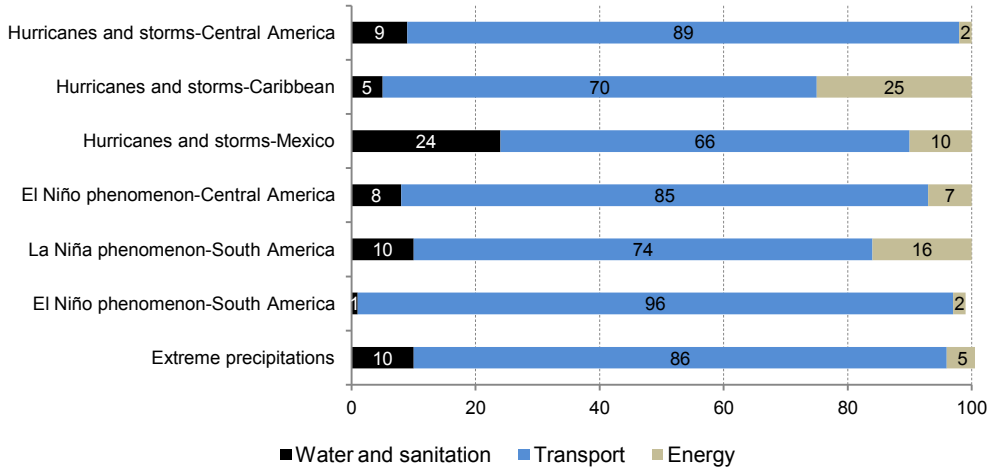
The damage in infrastructure corresponded primarily with transport and roadways. With respect to types of events that led to the disaster, the damage caused by storms and hurricanes usually affects the subsectors of transport, water and electricity. In Mexico, the disasters resulting from these phenomena demonstrate that the highest percentage of damage occurs in the transport subsector, which accounted for 65.9 per cent of the total damage to infrastructure. For the Caribbean, that percentage was 69.5 per cent and for Central America, it was 89.1 per cent. For its part, the ENSO, in its cooling phase, produces intense rainfall in South America, resulting in floods, with an extremely high impact on the transport subsector, accounting for almost all damage in infrastructure, see figure 11.

Figure 10
Climate disasters, percentage distribution of damage estimates according to infrastructure subsectors
(*Percentage of the total damage of the sector*)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 11
Climate disasters by sub-regions, percentage distribution of damage estimates according to infrastructure subsectors
(*Percentage of the total damage of the sector*)

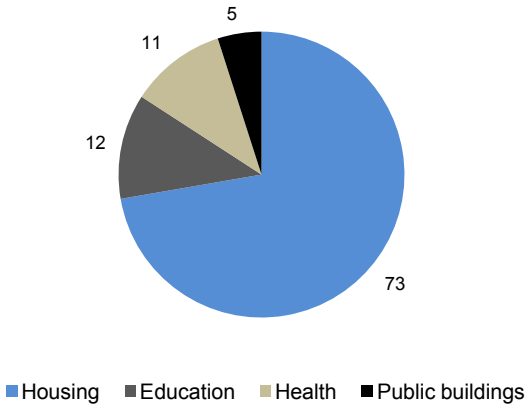


Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

c) Social sector

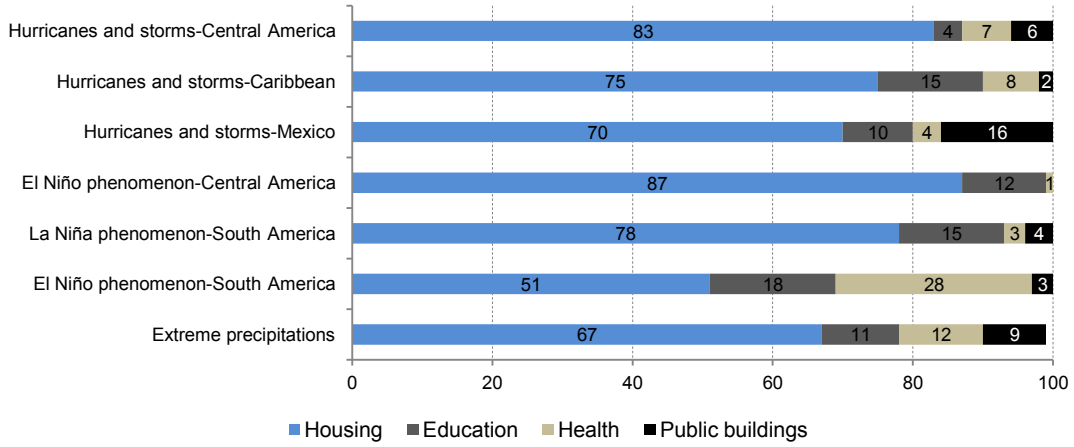
Housing recorded the highest percentage of the total damage in the social sector, 72.6 per cent, see figure 12. The highest damage percentages of this subsector have been recorded for the disasters generated by the floods occurring in South America due to the La Niña phenomenon and those stemming from storms and hurricanes in the Caribbean and Central America, see figure 13. In the education subsector, the highest damage percentages have been recorded for the disasters resulting from storms and hurricanes in the Caribbean Islands, the La Niña phenomenon in South America and the El Niño phenomenon in South America. The damage percentages of the health subsector are low in all types of disasters analysed, with the exception of the El Niño phenomenon in South America, which reached approximately 28.2 per cent.

Figure 12
Climate disasters percentage distribution of damage estimates according to social subsectors
(*Percentage of the total damage of the sector*)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 13
Climate disasters by sub-regions, percentage distribution of damage estimates according to social subsectors
(*Percentage of the total damage of the sector*)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

B. Estimates of losses according to sector

Unlike damage, losses are concentrated primarily in the production sector, 71.2 per cent, with lower percentages recorded in infrastructure, 16 per cent and the social sector, 12.8 per cent, see table 5. This responds to the sectoral distribution of the losses stemming from climate events in which 73.9 per cent corresponded with the production sector, 19.8 per cent with infrastructure and 6.3 per cent with the social sector. With respect to geophysical disasters, this distribution was 56.9 per cent, 13 per cent and 30.1 per cent, respectively.

In short, damage and losses differ in their sectoral and sub-sectoral concentrations. The distribution of damage covers a larger number of subsectors, while losses are concentrated primarily in the production subsectors: agriculture and forestry, industry, and to a lesser extent, trade and services.

Table 5
Percentage distribution of estimates of losses according to economic sectors by type of event and sub-regions
(Percentage of total losses)

Type of disaster/region/country	Production	Social	Infrastructure	Total
All disasters	**71.2**	**12.8**	**16.0**	**100**
Climate disasters	**74.0**	**6.3**	**19.8**	**100**
Hurricanes and storms-Central America[a]	64.8	13.3	21.9	100
Hurricanes and storms-Caribbean	83.2	7.6	9.2	100
Hurricanes and storms-Mexico	68.9	2.4	28.7	100
El Niño phenomenon-Central America	65.3	12.9	21.8	100
La Niña phenomenon-South America	75.0	7.3	17.6	100
El Niño phenomenon-South America	74.0	2.9	23.0	100
Extreme precipitations	70.7	11.5	17.8	100
Drought Central America	67.7	0.0	32.3	100
Geophysical disasters	**56.9**	**30.1**	**13.0**	**100**
Geophysical- Central America	39.9	51.4	8.7	100

Table 5 (concluded)

Type of disaster/region/country	Production	Social	Infrastructure	Total
Geophysical-South America	94.2	2.2	3.6	100
Geophysical-Caribbean	30.9	47.0	22.1	100
Geophysical-Mexico	60.4	0.1	39.5	100
All mixed disasters	**40.7**	**35.0**	**24.3**	**100**
Mixed disasters-Central America	40.7	35.0	24.3	100
Biological disasters	96.3	3.7	0.0	100
Epidemics	96.3	3.7	0.0	100

Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.
[a] Sub-sectoral estimates of losses are not available for the disaster resulting from Hurricane Fifi in Honduras.

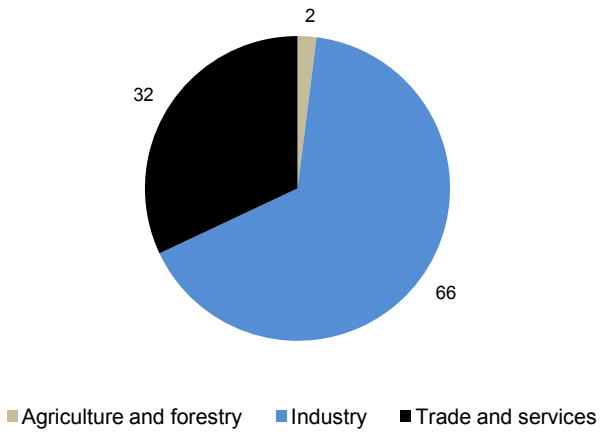
1. Geophysical Disasters

During the period 1972-2010, the losses estimated by ECLAC for geophysical disasters are approximately US$ 19.132 billion. The sectors suffering most of these losses are the production, 56.9 per cent and the social, 30 per cent. In geophysical disasters, the concentration of losses estimated for the production sector in the remaining sub-regions ranges between 31 and 90 per cent. It should also be underscored that in the geophysical events in the Caribbean, the concentration of losses in the social sector, 47 per cent, exceeded that of the production sector, 31 per cent. In Central America and the Caribbean, the losses of the production sector were concentrated in trade and services, 72 per cent and 61 per cent, respectively, see table 5.

a) Production sector

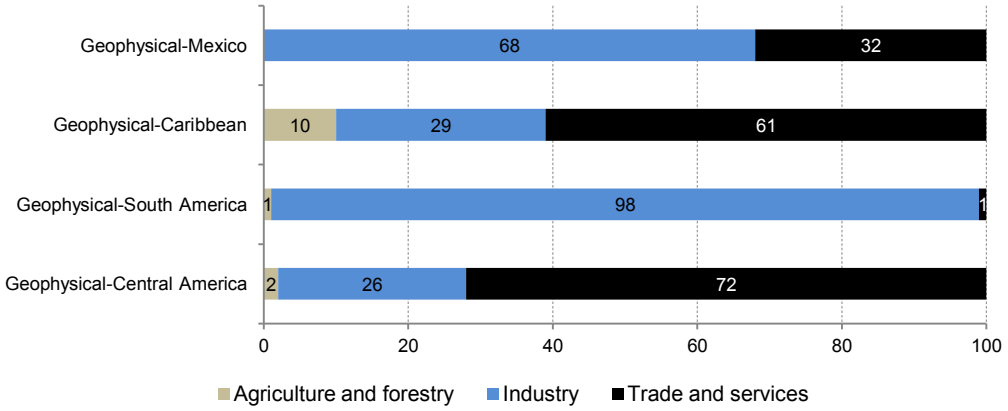
Industry and trade and services recorded 65.8 per cent and 32.2 per cent of the losses, respectively. The highest estimates of losses correspond with the geophysical events that occurred in South America, where they represented on average, 94.2 per cent of the total losses, affecting mainly the industrial subsector, which accounted for 97.7 per cent of the losses of the production sector. To a large extent, this result is associated with the earthquake that took place in Ecuador in 1987, where losses were estimated at US$ 4.25 billion, which represented 99 per cent of the total losses stemming from that event, see figures 14 and 15.

Figure 14
Geophysical disasters, percentage distribution of estimates of losses according to production subsectors
(Percentage of the total losses of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 15
Geophysical disasters by sub-regions, percentage distribution of estimates of losses according to production subsectors
(Percentage of the total losses of the sector)

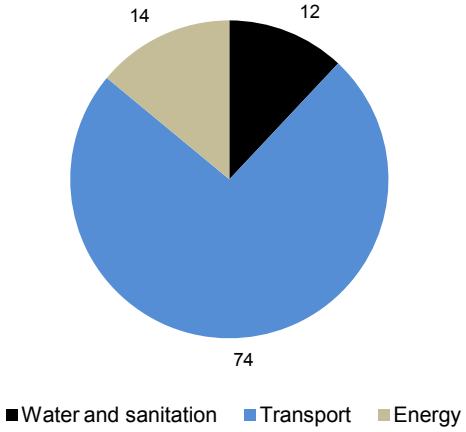


Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

b) Infrastructure

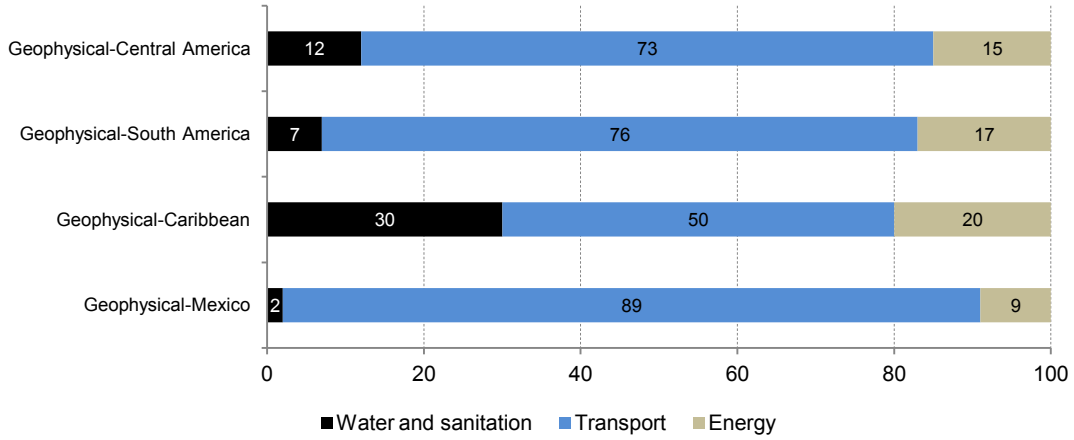
In infrastructure, the highest losses were recorded by transport and communication, 74.5 per cent, energy, 14 per cent and water and drainage, 11.5 per cent. In Mexico and South America, losses are attributable to transport and communication. For its part, the Caribbean demonstrated more equitable distribution of the losses of the region, see figure 17.

Figure 16
Geophysical disasters, percentage distribution of estimates of losses according to infrastructure subsectors
(Percentage of the total losses of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 17
Geophysical disasters by sub-regions, percentage distribution of estimates of losses according to infrastructure subsectors
(Percentage of the total losses of the sector)

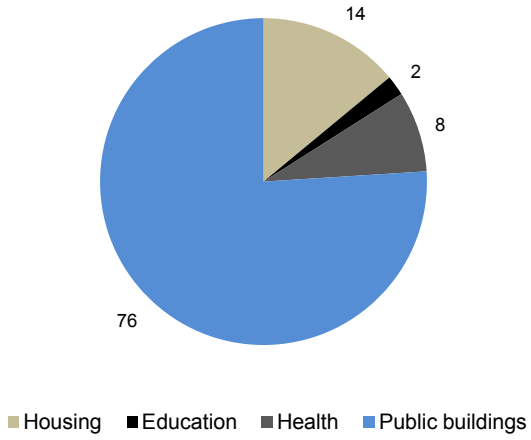


Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

c) Social

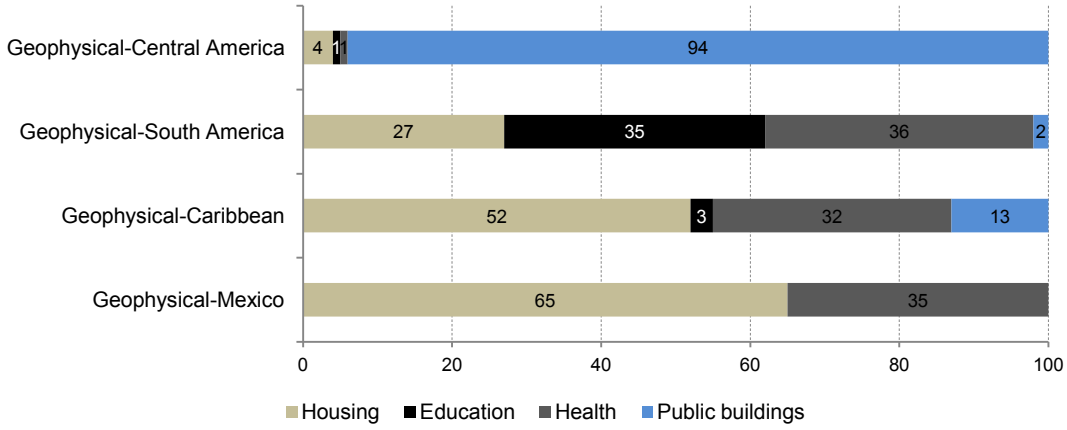
The estimates of losses of the social sector do not exceed 3 per cent in Latin America, see table 5. In the Caribbean however, they are higher due to the Haiti Earthquake of 2010, which resulted in losses that represent 47 per cent of the sectoral losses, highlighting the impact on the housing subsector, which accounts for 60 per cent of the total losses of the social sector, see figure 18.

Figure 18
Geophysical disasters, percentage distribution of estimates of losses according to social subsectors
(Percentage of the total losses of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 19
Geophysical disasters by sub-regions, percentage distribution of estimates of losses according to social subsectors
(Percentage of the total losses of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

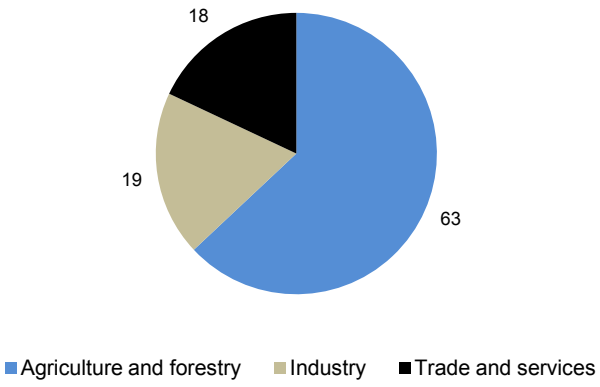
2. Climate disasters

In regards to the impact resulting from climate events, the highest concentrations of losses were estimated in the production sector, not only in South America, due to the La Niña Phenomenon, 75 per cent, but also in the Caribbean and Mexico, due to storms and hurricanes, which accounted for 64.8 per cent and 68.9 per cent, respectively, see table 5.

a) Production

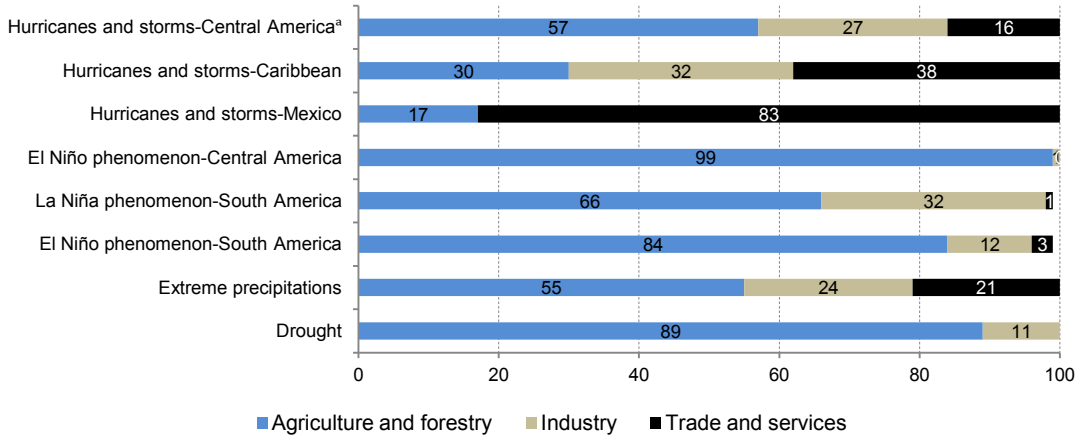
The production subsector recording the highest percentage of losses was agriculture and forestry, 63.2 per cent of the total losses, which were suffered due to the El Niño events in Central America and La Niña in South America, see figure 21.

Figure 20
Climate disasters, percentage distribution of estimates of losses according to production subsectors
(Percentage of the total losses of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 21
Climate disasters by sub-regions, percentage distribution of estimates of losses according to production subsectors
(Percentage of the total losses of the sector)

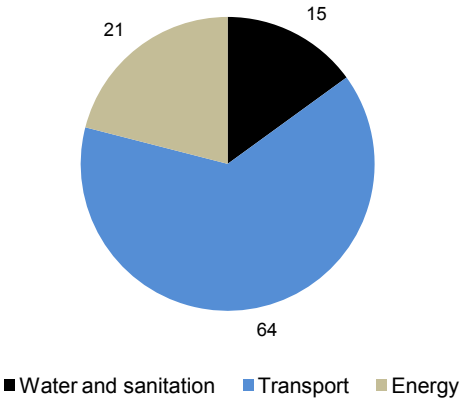


Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.
[a] Sub-sectoral estimates of losses are not available for the disaster resulting from Hurricane Fifi in Honduras.

b) Infrastructure

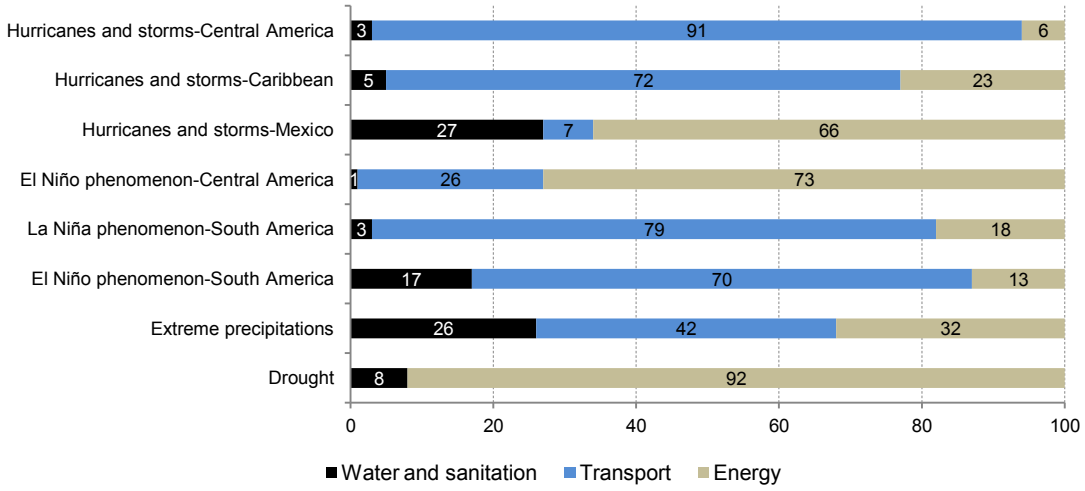
As for the infrastructure sector, the losses suffered account for 16 per cent of the total. Among them, the transport and communications subsector represented 64.2 per cent, energy, 21 per cent, water and drainage, 14.7 per cent, see figure 22. The shift in the impact toward the transport sector was the result of hurricanes and storms in Central America and the Caribbean, as well as the El Niño phenomenon in South America, which recorded more than 70 per cent of the losses in infrastructure. For its part, the energy subsector recorded the highest losses due to the droughts in Central America, the El Niño phenomenon in Central America and the La Niña phenomenon in South America, which accounted more than 50 per cent of the losses in infrastructure, see figure 23.

Figure 22
Climate disasters, percentage distribution of estimates of losses according to infrastructure subsectors
(Percentage of the total losses of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 23
Climate disasters by sub-regions, percentage distribution of estimates of losses according to infrastructure subsectors
(Percentage of the total losses of the sector)

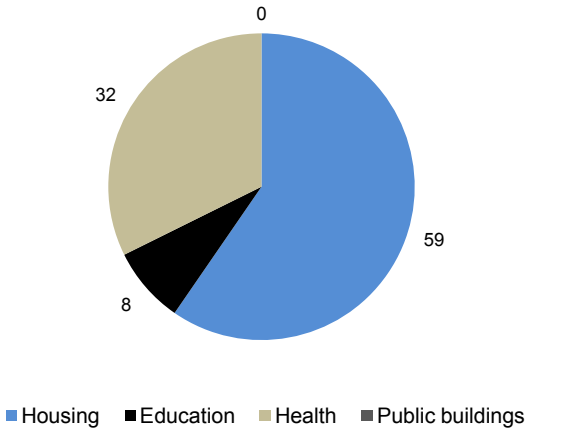


Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

c) Social

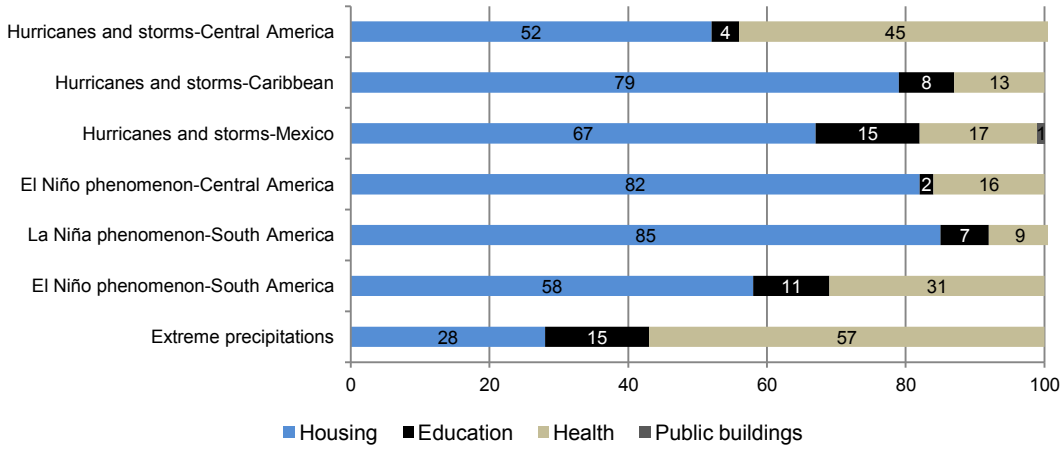
Lastly, the social sector accounted for 6.3 per cent of the losses. The highest losses correspond with the housing subsector, as a result of hurricanes and storms, representing more than 50 per cent of the total recorded for the social sector, reaching approximately 80 per cent in the Caribbean. This figure is similar to that recorded for the losses suffered by this subsector as a result of the ENSO, not only in South America, but in Central America as well. It should also be underscored that the health subsector accounted for 44 per cent of the losses of the sector due to storms and hurricanes in Central America and 31 per cent of those losses in the case of the El Niño phenomenon in South America, see figures 24 and 25.

Figure 24
Climate disasters, percentage distribution of estimates of losses according to social subsectors
(Percentage of the total losses of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

Figure 25
Climate disasters by sub-regions, percentage distribution of estimates of losses according to social subsectors
(Percentage of the total losses of the sector)



Source: Prepared in-house based on Disaster Impact Assessments conducted by ECLAC 1972 to 2010.

IV. Conclusions

The database resulting from the assessments conducted on the economic and social impact of disasters, allows sectoral impact profiles to be established for various events. As maintained throughout the document, these are also based on the economic structure of the zone affected. These patterns serve as an input in the sense that not only is the total cost of an event being measured, but also the way in which it has affected different sectors which, without a doubt, is important data for disaster risk management.

From the consolidation and review of that database, it can be said that sectorally, the damage resulting from all events was distributed as follows: social sector, 49.5 per cent, production sector, 34.1 per cent and infrastructure, 16.4 per cent.

This pattern varies according to the origin of the disaster. Damage resulting from climate disasters is concentrated in the production sector, 52.1 per cent, infrastructure, 27.5 per cent and the social sector, 20.4 per cent. With respect to the production sector, damage was concentrated in the agriculture and forestry subsector, 80 per cent, followed by trade and services with 10.3 per cent and industry with 9.3 per cent. In regards to infrastructure, damage was greater on the transport subsector, which accounted for 84 per cent of the total destruction of assets in this sector. Lastly, housing was the subsector that reported the highest percentage of damage, 72.6 per cent, of those occurring in the social sector.

With respect to geophysical disasters, on average, the social sector represented 74 per cent of the damage, while the impact on the infrastructure and production sectors was recorded at 6.5 per cent and 19.5 per cent, respectively. Among the total damage in the social sector, 56.7 per cent occurred in the area of housing, followed by public buildings with 24.8 per cent, health with 10.1 per cent and education with 8.3 per cent. In the case of infrastructure, the subsector most affected was transport with 82.5 per cent of the total. In the mean time, in the production sector, damage was concentrated in the trade and services and industry subsectors, which totalled 65 per cent and 33 per cent, respectively.

Unlike damage, losses are concentrated primarily in the production sector, 71.2 per cent, with lower percentages recorded in the social sectors 12.8 per cent and infrastructure, 16 per cent. This responds to the sectoral distribution of the losses stemming from climate events in which 73.9 per cent corresponded with the production sector, 19.8 per cent with infrastructure and 6.3 per cent with the social sector. The production subsector recording the highest percentage of losses was agriculture and forestry, 63.2 per cent of the total losses, which were suffered due to the El Niño events in Central America and La Niña in

South America. With respect to infrastructure, by order of importance, the transport and communications subsector recorded 64.2 per cent of the losses, energy, 21 per cent, water and drainage, 14.7 per cent, see figure 23. In the case of the social sector, the housing subsector has recorded the highest losses.

Regarding geophysical disasters, losses were distributed as follows: production sector, 56.9 per cent, infrastructure, 13 per cent and social sector, 30.1 per cent. The comparison of the relative sectoral impact between the distribution of damage and losses highlights the marked reduction in the social sector and the increase in the production sector. The production subsectors most affected were industry and trade and services, which recorded 66 per cent and 32 per cent of the losses, respectively. In infrastructure, the highest losses occurred in transport, 74.5 per cent. Lastly, within the social sector, the public buildings subsector was the most affected, recording 75.5 per cent of the losses.

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