3.2 The Economic and Social Effects of Small Disasters Revision of the Local Disaster Index and the Case of Study of Colombia

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Abstract

Analysis of small disasters illustrates how these frequent events, usually as result of the climate variability, increase difficulties for the local development and entail a serious problem for the development of a country as a whole. These disasters, contrary to the extreme and extraordinary events, are not visible at the national level very often and their effects are not relevant from macro-economic point of view. Small disasters usually affect the livelihoods of poor people in rural areas and small municipalities, perpetuating their level of poverty and human insecurity as factors of social vulnerability. On the other hand, in urban centers, small and moderate disasters have allowed having a light of the city zones that historically have presented the greatest vulnerability levels. The main objective of this paper is to present the revision made to the methodology of the *Local Disaster Index* (LDI), developed in the framework of the Program of Indicators for Disaster Risk Management in the Americas. The LDI in the new version illustrates that the accumulative impact may be highly significant at the local level and, consequently, to the national level from social point of view. In addition, the paper presents the results of the evaluation of the proneness of Colombia to small scale and chronic disasters and the type of impact they have to the local development and to the country from an aggregated point of view. Such analyses have detected the spatial variability and dispersion of vulnerability and risk in the country as a result of events that rarely enter the international or even national disaster databases, but which pose an accumulative development problem for local areas and, given their overall probable impacts, for the country as a whole.

Introduction

The effects of natural hazard events of small or moderate size are not considered by many people as `disasters´, although they have the same origins and causes of those of large and extensive effects. The impact of these types of events can not be underestimated because, in general terms, they are a window to typify the disaster risk problem of a city, region or country. This is not a debate on risk regarding of extreme events with a long return period, but insular, real and daily risk that multiple communities are exposed to in rural areas and in small and large cities. The most of these disasters are the result of socio-natural processes associated with environmental deterioration and are associated with persistent small hazard events, such as landslides, avalanches, flooding, storms, and also lower scale earthquakes and volcanic eruptions.

Risk regarding to small disasters usually is not considered relevant; nevertheless, small disasters are a social and an environmental problem that have big implications. These events, in their majority, are related to persistent hazard events such as landslides, avalanches, floods, forest fires, droughts and so on, that are the result of socio-natural processes associated with climatic variability and environment deterioration that affect, in a chronic way, the most fragile socio-economical low income population. In general, small and frequent disasters prevent the sustainability of local human development and they reveal in which areas of urban centers the vulnerability is growing and where new hazards, or the exacerbation of the already existing hazards, is occurring as a result of inadequate environmental, social and economical processes.

Hypothesis and Method

At present, climate change impacts worry several scientists and some politicians. Particularly the effects related to risk and human insecurity increasing. However, it is important to mention that risk growing is not only due to climate variability hazard events exacerbated as result of climate change. There are also other risk factors that have to be seen with the same thoroughness as the `vulnerability´ conditions and the need of `adaptive capacity´ to the action of the natural hazard events. These are risk factors that have not been perceived well enough due to the lack of systematized information. For this reason, this paper presents data that illustrate the increasing of what can be called `small disasters´ or `invisible disasters´. They are a result of climate variability and the vulnerability increasing from an economic, social and environmental perspective. These figures point up, from a new perspective, that climate change implies a serious problem of disaster risk, not only related with the potential of future extreme events, but small and frequent disasters that destroy the livelihoods of the poorest and deepen their incapacity of adaptation, perpetuating their vulnerability and poverty.

In Colombia, during the period between 1971 to 2002, `EM-DAT´ disaster database, constructed by Center of Epidemiology of Disasters of Catholic University of Lovaina, registered 97 events that fulfilled at least one of the following criteria: a) 10 or more death people; b) at least 100 affected people; c) emergency state has been declared; and, d) international assistance has been required. Summarizing, it is about events that in some way have called attention of authorities or news reports. That is, it deals with visible disasters. However, beyond these notable disasters, there are also hundreds, even thousands, of events that have occurred in the same period that have not been registered into statistics of international organizations related to this subject. Now then, according to DesInventar database, developed by the *Social Network for Disaster Prevention in Latin America* (La RED in Spanish), more than 19,000 events during the same period happened in Columbia. This number of events contrasts considerably with 97 events registered by EM-DAT disaster database. This paper presents a summary of the results of the analyses made by Marulanda and Cardona (2006) on the impact of the small and local disasters in Colombia during 32 years using the DesInventar database. The analyses involved the reformulation of the Local Disaster Index approach and the results of the evaluation of the proneness of Colombia to small scale disasters and the type of impact they have to the local development and to the country from aggregated point of view.

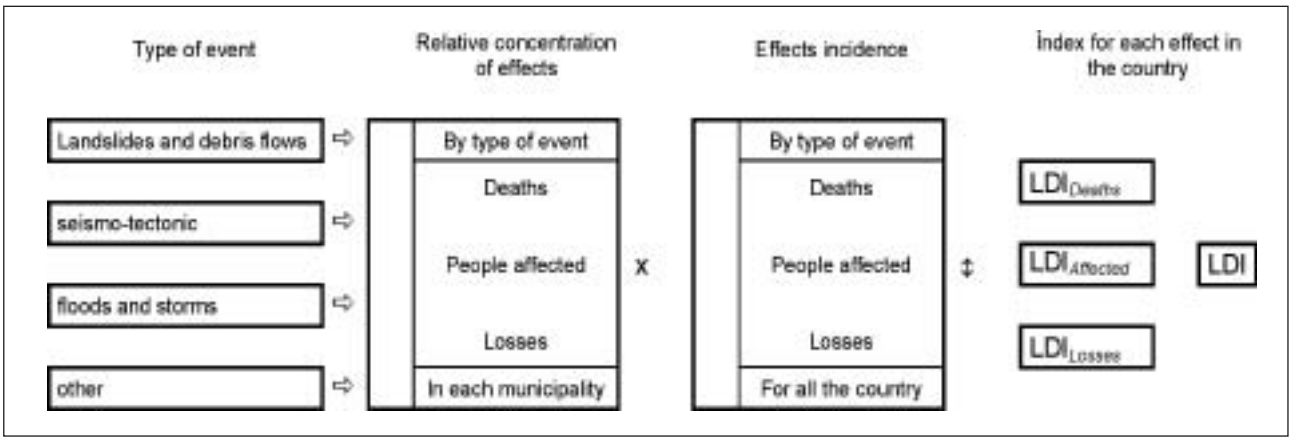
New Formulation of the Local Disaster Index

Small and moderate disaster analysis and the consequently definition of large events, establish diverse methodological problems. On one hand, the problem of threshold from which a disaster is considered large and, on the other hand, given the effects of an event (for example an earthquake) on different territorial units, which of these effects should be included or excluded of an analysis of small and moderate disasters, given the singular impact registered in each unit (i.e. a municipality).

Without pretending to have an answer to these two problems, analysis should be inclined to exclude from databases the information of effects related to the large disasters. Taking into account the preparation of databases and the difficulties to identify all potential wrong data by a detailed analysis and, particularly, the shortcomings as a result of several doubted figures of affected people and affected hectares of crops, outlier identification process defining arbitrary thresholds was applied. Although the direct selection of large disasters is an acceptable procedure, the definition of a large disaster is a problem if a systematic approach is attempted in any country. The process of identification of outliers, any way, detected the extreme main effects of the large hazard events, but their small or moderate effects remained considering that the selection should be based on the size of the effects and not because the effects were made by a `recognized´ hazard event.

The LDI was proposed and developed by the Institute of Environmental Studies *(Instituto de Estudios Ambientales* (IDEA)in Spanish) of the National University of Colombia in Manizales, in the framework of the program `Indicators on Disaster Risk Management in the Americas´ for the *Inter-American Development Bank* (IDB)[14] . This index represents the propensity of a country to experience small-scale disasters and their cumulative impact on local development. The index attempts to represent the spatial variability and dispersion of risk in a country resulting from small and recurrent events. The LDI captures, simultaneously, the incidence and uniformity of the distribution of local effects. That is, it accounts for the relative weight and persistence of the effects attributable to phenomena that give rise to municipal scale disasters. The higher the relative value of the index, the more uniform the magnitude and distribution of the effects of various hazards among municipalities. A low LDI value means low spatial distribution of the effects among the municipalities where events have occurred. Figure 1 illustrates schematically how LDI is obtained for a country based on the information of events in each municipality.

Figure 1: LDI Estimation



Source: Program of Indicators on Disaster Risk and Risk Management for Americas, National University of Colombia, Manizales, Institute of Environmental Studies, Inter-American Development Bank

The LDI was evaluated by IDB-IDEA program of indicators taking into account the effects of the extreme hazard events. It means the evaluation included the effects of all disasters, both small and frequent as extreme and sporadic. For this reason, the original LDI would be better denominated as `Local Effects Index´ (LEI). In order to have a real *Local Disaster Index*, the values should be based on the effects of small scale disasters, most of them considered actually as local. Therefore, once the outliers have been obtained and excluded of the database, the results of the computed index would be considered as a real LDI. The results are very different indeed. The LDI in the new version illustrates that the accumulative impact may be highly significant at the local level and, consequently, to the national level from a social point of view. It attempts to represent the spatial variability and dispersion of risk within a country, expressed in the occurrence of smaller and more recurrent events.

Table 1 shows the new version of LDI calculated without outliers. On the whole, the trend of the new LDI shows clearly that in Colombia the effects of the small disasters are growing. It means greater regularity and incidence of effects on the territory due to local disasters, with serious implications for local level. Figure 2 shows the graphics of LDI values in the different periods.

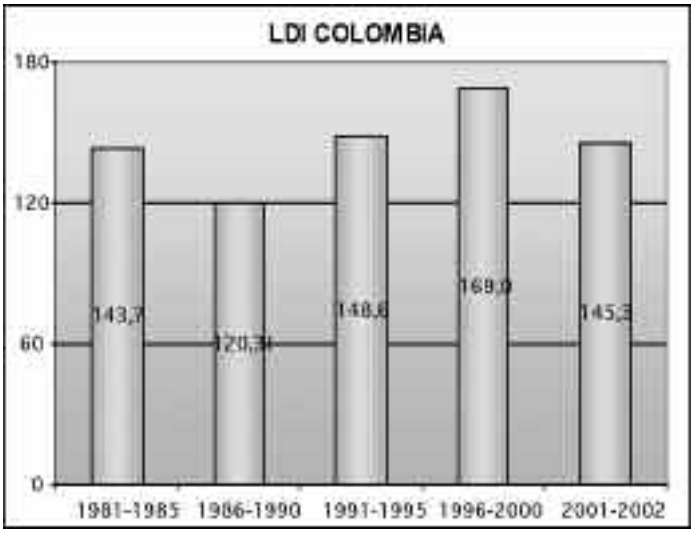
14 Technical fundamentals and details on the Local Disaster Index can be found in the Main Technical Report of the Program of Indicators on Disaster Risk and Risk Management for Americas, National University of Colombia, Manizales, Institute of Environmental Studies, Inter-American Development Bank (Cardona et al, 2005) http://idea.unalmzl.edu.co Cardona (2006) and Marulanda and Cardona (2006).

Table 1 New LDI for death people (K), affected people (A) and losses (L) without outliers

	1981–1985	1986–1990	1991–1995	1996–2000	2001–2002
LDIK	70,63	83,21	75,22	76,20	82,15
LDIA	67,69	8,62	62,12	78,00	62,15
LDIL	5,44	28,54	11,26	14,81	1,07
LDI	**143,75**	**120,38**	**148,61**	**169,01**	**145,37**
LDI'	0,95	0,93	0,90	0,90	0,89

Source: based on DesInventar (2007) without outliers

Figure 2: Local Disaster Index of Colombia from 1980 to 2002



Source: based on DesInventar (2007) without outliers

In general, as total LDI shows, small scale disasters have caused a growing in the incidence and uniformity of effects among all municipalities of the country in the period evaluated. Form the perspective of vulnerability assessment and policy implications, the increasing of LDI reflects vulnerability growing, environmental deterioration and hazard event recurrence as result of the climate variability and change. The figures of LDI at subnational level allow identifying hot spots of vulnerability in the country or in urban areas of megacities. In addition, LDI targets vulnerable populations differently than large scale disaster targeting due to the fact that LDI identifies the frequent destruction of livelihoods as a result of `invisible´ disasters.

Revealing the Impact of Small Disasters

DesInventar[15] constitutes simultaneously a database system for elaborating historical inventory of disasters and a methodology for its analysis. It is constituted, on one hand, by software that allows gathering, systematizing, organizing and consulting information incorporated to the system from a space point of view and a temporal point of view, and, on the other hand, by information capture and analysis methodology that makes special emphasis in the following aspects:

15 For a detailed information about conception, methodology and use of DesInventar see: www.desinventar.org, especially methodological and user manual that appear there. Also, the work made by LA RED-OSSO for UNDP-ISDR "Comparative analysis of disaster database EmDat-DesInventar" January 2003 in www.desenredando.org can be consulted.

a) DesInventar has interest in disasters as a set of adverse impacts over lives, goods, infrastructure and social relations caused by inter-relation of socio-environment and anthropogenic phenomena in given vulnerability conditions. It includes those disasters with very few effects (i.e. destruction of a house or five affected people because of a crop loss caused by a frost) to those with large effects.

b) Disasters materialize in communities and their environments. Resolution observation levels of disasters affect vision and understanding. This is why they should associate to various spaces scales. This allows to see disasters as an expression of daily risk construction, and to discompose those disasters in multiple and differentiable effects, as they are singularities for each affected community.

c) Information that gives an account of exposition, vulnerabilities and risks conditions at all scales must be constructed as variables and indicators that are as much as possible, homogeneous, both in terms of effects and in trigger effects. Then, there must be a common language looking for a compromise between rigorous definitions on comparability of data set at continental scale.

According to the aforementioned, the second objective of this paper has been to present the results of the evaluation of the proneness of Colombia to small scale and chronic disasters and the type of impact disasters have on the local development and to the country from aggregated point of view. The Appendix 1 presents the results obtained from the evaluation of the effects and economic costs of the small disasters in Colombia using the DesInventar database. Such analysis has detected the spatial variability and dispersion of risk in the country as a result of events that rarely enter in the international, or even national, disaster databases, but which clearly pose serious and accumulative development problems for local areas and, given their overall probable impacts, for the country as a whole. Most of these disasters are the result of socio-natural processes associated with environmental deterioration and are associated with persistent small events.

This type of context must be identified given that recurrent small scale disasters notably increase the difficulties of local development. Such events usually affect the livelihoods of poor populations, thus, perpetuating their levels of poverty and human insecurity. This aspect is also relevant to evaluate the fiscal exposure of government and its contingency liabilities of the government related to compensate housing and recovering of the livelihoods of poorest people.

Conclusions

Experience of application of DesInventar for other Latin American and Caribbean countries in the last years has given extremely positive results when allowing to build a general, wide view of the type of events that most frequently appear in these countries. However, it is important to emphasize that the study made for Colombia represents, until present, the most complete effort of application of this tool and the deepest analysis that has been made because it has not only allowed making a description of frequent type of disasters that affect the country, but also to establish the origin of their causes in some cases. On the other hand, it has allowed identifying the effects, the high priority attention zones, and fundamentally, the impact that small disasters have caused on the economy of specific sectors and at the national level.

Interesting results and implications for development have been detected, considering the dispersion, as well as the persistence, of the effects at local level. The Local Effects Index (old LDI by IDEA for the IDB) or the new Local Disaster Index proposed herein as an alternative with a subtle variation, reveal and measure the susceptibility of the country to small scale and recurrent disasters. They illustrate that the accumulative impact may be highly significant at the local level and, consequently, to the national level from social points of view; small and frequent disasters prevent the sustainability of local human development.

The results obtained from the analysis of the impact of small scale disasters emphasizes and demystifies that extreme disasters are not necessarily what determine the history of disasters in the countries. Until now, in the case of Colombia, this recent history has been dominated by big disasters, such as those caused by Popayan earthquake in 1983, Nevado del Ruiz eruption in 1985, Tierradentro (Paez) earthquake in 1994 and Quindio earthquake in 1999. Nevertheless, accepting the relevance of their effects on the population and the economy of the country as a whole, it is also necessary to recognize that each year an important number of small and moderate disasters, not very spectacular in terms of damage and losses in individual way, certainly do affect the population and the diverse economic sectors as a result of their frequency and impact accumulation over time.

The outcomes of these analyses have been useful for economic analysts and sectoral decision makers related to the promotion of urban policy development, because they can detect not only the potential impact of extreme events, but also the persistence and accumulation of effects of the small and local disasters. As such, they can prompt the consideration of vulnerability and risk in territorial planning at the local level, as well as the environmental protection of specific ecosystems and hydrographic basins. They can also be used to justify resource transfers to the local level that are earmarked for risk management and social development.

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Appendix 1 The Impact of Small Disasters: The Case Study

Effects of Small Disasters

After making a gross computation of damage and losses caused by small and moderate events that have occurred in the Colombian territory during the last 32 years, it can be seen that, indeed, they have not been marginal. Table 1 shows that close to nine and a half thousand people died, almost two million people were affected, 93 thousand destroyed homes and 217 thousand affected houses, as well as close to 2 million crop hectares destroyed, have been the result of the accumulation of this type of disasters from 1970 in the country.

Table 1: Gross Figures of Effects as a Result of Small and Moderate Disasters

Period	Death	Affected	Destroyed houses	Affected houses	Damage crop hectares
1971–1980	**2,964**	**204,393**	**18,588**	**16,604**	**327,497**
1981–1990	**3,812**	**608,180**	**19,754**	**16,044**	**738,743**
1991–2000	**2,394**	**871,374**	**50,465**	**163,051**	**964,450**
2001–2002	**305**	**61,584**	**4,353**	**21,376**	**144,023**
1971–2002	**9,475**	**1,745,531**	**93,160**	**217,075**	**2,174,713**

Source: DesInventar (2007) database

In a shorter term analysis, it can be seen that a larger number of effects tend to accumulate during the decade from 1991 to 2000, the period during which the greatest number of small disasters occurred. With the exception of the number of dead people, this is the period when the largest damage and loss quantity occurred by local disaster. It even reaches to be much greater than the average registered by local event during the 32 years studied, as is illustrated by the Table 2.

Table 2: Average of Effects by Local Event as a Result of Small Disasters

Period	Death	Affected	Destroyed houses	Affected houses	Damage crop hectares
1971-1980	**0.57**	**39.11**	**3.56**	**3.18**	**62.67**
1981-1990	**0.71**	**112.52**	**3.65**	**2.97**	**136.68**
1991-2000	**0.34**	**123.37**	**7.14**	**23.09**	**136.55**
2001-2002	**0.20**	**40.84**	**2.89**	**14.18**	**95.51**
1971-2002	**0.49**	**90.90**	**4.85**	**11.30**	**113.25**

Source: DesInventar (2007) database

The decade between 1981 and 1990 registers losses and damage in deaths, affected people and destroyed crop hectares categories over the total average; the period between 1971 and 1980 just reaches to be greater than the total average in the number of deseased people by event. Finally, the comparison of annual averages in the previous decades and the period 2001-2002 shows that the latter presents very high values, considering it is a period of only two years against periods of ten years.

Accepting that, from 1970s, the quality and the opportunity of data are similar, the trend towards an increase in the amount of damage and losses by small disasters throughout the years can be only explained by two factors: first, the increment of the intensity and recurrence of the hazard events; second, the increasing of vulnerability and volume of exposed elements. The increment of hazard events

is detected particularly in some hydrographic basins, likely a result of environmental degradation and climate change, particularly a result of the climate variability. On the other hand, taking into account the growing population and urbanization in the last 40 years, it is possible to accept an increase in the volume of exposed elements and their vulnerability. In any case, it is possible to say that the risk increase and accumulation in the country are consequences of the rising of the natural and socio-natural hazard events, due to the kind of development model followed by the country during the last years. In comparative terms, the accumulation of damage and losses induced by small disasters during the all considered period of time is notable. Establishing a comparison between two of the greatest disasters that the country suffered during last 32 years – the Nevado del Ruiz volcanic eruption in 1985 and the Quindio earthquake in 1999 – the figures cannot be undervalued, as is presented in Table 3.

Table 3: Comparison Between the Effects Due to Small and Extreme Disasters

Type of damages and losses	Nevado del Ruiz eruption (1985)	Quindio Earthquake (1999)	Small disasters (1971-2002)
Deaths	**24,442**	**1,862**	**9,475**
Affected people	**232,546**	**160,336**	**1 745,531**
Destroyed houses	**5,402**	**35,949**	**93,160**
Affected houses	**NA**	**43,422**	**217,075**
Damage crop hectares	**11,000**	**NA**	**2 174,713**

Source: DesInventar (2007) database

Even number of deceased people in the volcanic disaster of 1985 represents an extraordinary event that exceeded predictions of any type of specialist during that time; accumulation of deaths caused by small disasters over time tend to be also an elevated figure. It represents 38.8% of deaths occurred in Armero and Chinchina by the volcanic eruption. People affected outnumber those affected by large disasters by 7.5 and they are almost 11 times greater than the figure of the Quindio earthquake of 1999, which severely affected the whole coffee-growing region. Finally, taking into account the number of destroyed houses, small disasters represent more than 2.5 times the number of destroyed houses in the Quindio earthquake and more than 17 times the destroyed houses in Armero and Chinchina. Houses affected by small disasters outnumber by five the houses affected by the the Quindio earthquake.

Economic Cost of Small Disasters

In terms of economic cost, the registered losses by small and moderate local events are very significant. Considering two categories of economic losses (damaged houses and crop hectares), total amount accumulated for 32 years of study exceeds 1,650 million dollars, according to Table 4. Of this total, 35.1% corresponds to the number of destroyed and affected houses and the other part (64.9%) corresponds to the amount of damage in crop hectares. Calculation of losses caused by small disasters was developed using methodology proposed by Risk Indicators Project, IDB-IDEA. In the case of houses, it was considered total of destroyed houses plus affected houses, where four affected houses correspond to a destroyed house. Estimation of loss is made assuming reposition of a social interest house (average number of square meters by value of square meter constructed of this type of construction in each period) and without the cost of land. For the case of the loss estimation of crops, it was obtained based on the average cost of the typical hectares of crops in the flooded zones by total number of affected hectares. This approximation is useful for estimating the magnitude of losses and to make general comparisons. For example, although in the case of affected crops overestimations can exist, by valuation errors or by difficulty estimating the real surface affected, it is possible to detect that losses in the agricultural sector are very important although they are rarely visible.

Table 4: Estimated Cost of Losses and Damage Caused by Small Disasters, Thousand Dollars

PERIOD	LOSSES IN HOUSES	LOSSES IN CROPS	TOTAL
1971–1980	**68,217.00**	**98,249.10**	**166,466.10**
1981–1990	**78,424.50**	**295,497.20**	**373,921.70**
1991–2000	**385,892.33**	**578,669.70**	**964,562.03**
2001–2002	**47,127.42**	**100,816.45**	**147,943.87**
1971–2002	**579,661.25**	**1 073,232.45**	**1 652,893.70**

Source: based on the methodology of the IDB-IDEA Program of Indicators

Now then, these are hypothetical values and they neither correspond to real reposition expenditures nor any coverage of losses made by the government. That is, in most cases, neither any formal reconstruction program has been made, nor any government credits or subsides were paid. Although these estimations are not accurate, the figures give an order of magnitude of a problem that is worrying and overlooked. In these cases, most of affected people are low-income communities with scarce resources that do not receive any recovery aid from the government when this type of event occurred. In addition, they are recurrently affected by these small disasters at the local level, losing their livelihoods. This chronic situation, certainly, is not relevant from the macroeconomic point of view, but it perpetuates the poverty and underdevelopment of the country.

From Tables 1 and 4 it is clearly observed that the losses have been increased over time in different ways with the respective number of occurred events. Thus, between the 1970's and 1980's the number of events had an increment only of 3.42%, but the losses occurred had an unexpected increment of 224.6%. Whereas the increment of events from the 1980s to 1990s was of 130.68% –in fact notable– the losses had an extraordinary increment of 257.96%. The importance of these figures, expressed in monetary terms, can be seen also if the average cost of each registered event is considered. In this form, the average cost of an event for the period of 1971 to 1980 was 31,853 dollars; for the period between 1981 and 1990, it was 69,181 dollars; and for 1991 and 2000, it was 136,566 dollars.

A comparative analysis of losses caused by small events and some of the recognized extreme disasters with massive destruction that have occurred in Colombia is useful to calculate the impact that small and moderate events have had over time. According to the figures of Table 5, material losses in current million dollars caused by small disasters in 32 years represent 6.7 times the losses caused by the Nevado del Ruiz volcanic disasters in 1985. Even the aggregated losses during the decade 1981–1990, due to small disasters, are 1.5 times the losses caused by the same disaster in Armero and Chinchina. On the other hand, the total of losses produced by small local events only considering figures of destroyed houses and crop hectares surpassed the material losses caused by the Quindio earthquake in 1999. That means that approximately every 30 years, the losses caused by small disasters to housing and agriculture are similar to the losses produced by a large event, such as the Quindio disaster.

Table 5: Losses of Extreme Hazard Events, Current Million Dollars and (%GDP)

Events	Estimated losses	Costs of rehabilitation
Eruption of Ruiz Volcano (1985) Armero	**246.05 (0.70)**	**359.95 (1.02)**
Coffee Region Earthquake (1999) Quindio	**1 590.81 (1.88)**	**856.72 (1.01)**
Small and moderate events (1971–2002)	**1 652.89**	**NA**

Source: Extreme events, ERN report on small disasters for National Department of Planning, (2005)

Nowadays it is very common to evaluate the economic impact of disasters, taking into account aggregated macroeconomic variables, such as the *Gross Domestic Product* (GDP). This has been the ap-

proach of the International Financial Institutions as the banks and agencies of the *Economic Commission for Latin America and the Caribbean* (ECLAC). Although it is recognized that the economic losses do not correspond to the real impact of disasters, the economic losses expressed as a percentage of national and sectoral GDPs are certainly useful herein to illustrate the relevance of small disasters and their impact on the national economy. In the agriculture sector, for example, small disasters registered elevated amounts of losses. Table 6 shows that accumulated losses for the period 1971-1980 were equivalent to 1.52% of agricultural GDP for 1980. Furthermore, the impact of small disasters was more significant in the 1980s because the total amount of losses in the sector represented 4.52% of agricultural GDP for 1990; it was also greater (5.6%) for 1990's. Losses in the sector have been equivalent to 12.65% of sectoral GDP, constant prices, for the period of 32 years.

Table 6: Accumulated Losses of Small Disasters in Million Dollars and %GDP of Agricultural Sector

Period	Losses in crops current (constant)	GDP agricultural sector current (constant)	Losses in sectoral GDP (%)
1971–1980	**98,25 (172.64)**	**6,466 (11,352)**	**1,52**
1981–1990	**295,50 (689.50)**	**6,539 (15,257)**	**4,52**
1991–2000	**578,67 (758.38)**	**10,330 (13,358)**	**5.60**
2001–2002	**100,82 (138.80)**	**10,103 (13,909)**	**1.00**
1971–2002	**1 073,24 (1 759.32)**	**(13.909)**	**(12.65)**

For estimation, it was taken GDP of the last year of each period using data of the World Bank (2003).

Table 7 shows losses due to destruction of housing by small disasters in terms of GDP of the construction sector. The amount of losses is considerably smaller than registered in the agricultural sector, but the impact respecting to the sectoral GDP is quite larger. During the 1970s, losses were equivalent to 4.25% of the construction GDP. In the 1980s, it was 3.95%; and in the 1990s, losses raised to 12.62%. In accumulative terms, damage produced to housing over the 32 years represented 19.92% of the sectoral GDP at constant prices.

Table 7: Accumulated Losses of Small Disasters in Million Dollars and %GDP of Housing Sector

Period	Losses in houses current (constant)	GDP construction sector*current (constant)	Losses in sectoral GDP (%)
1971–1980	**68.22 (119.87)**	**1,607.20 (2,824.11)**	**4.25**
1981–1990	**78,42 (182.98)**	**1,993.10 (4,650.58)**	**3.95**
1991–2000	**385.89 (505.73)**	**3,058.10 (4,007.80)**	**12.62**
2001–2002	**47.13 (64.88)**	**3,184.95 (4,354.89)**	**1.48**
1971–2002	**579.66 (873.47)**	**(4.354.89)**	**(19.92)**

For estimation, it was taken GDP of the last year of each period using data of the World Bank (2003).

Finally, at aggregated level, the impact of small disasters results significant. According to Table 8, the total of relative losses to housing and agricultural sector caused by small disasters in the period of 32 years represents 2.25% of national GDP for 2002 at constant prices. This number is significant, taking into account that losses caused by the Quindio earthquake represented 1.88% of national GDP of 1999.

Table 8: Accumulated Losses of Small Disasters in Million Dollars and %GDP of Colombia

Period	Losses [crops+houses] current (constant)	National GDP current (constant)	Participation of losses in national GDP %
1971–1980	**166.47 (264.81)**	**33,400 (53,180)**	**0,50**
1981–1990	**373.92 (688.05)**	**40,274 (74,108)**	**0,93**
1991–2000	**964.56 (1 129.24)**	**83,220 (96,652)**	**1,16**
2001–2002	**147.95 (175.94)**	**84,002 (99,893)**	**0,18**
1971–2002	**1 652.89 (2 249.03)**	**(99,893)**	**(2.25)**

For estimation, it was taken GDP of the last year of each period using data of the World Bank (2003).

Using previous figures obtained for small disasters, it is difficult to talk about no disasters with null impacts. Furthermore, when the cost of damage in other kind of infrastructure (i.e. lifelines, facilities, roads, bridges, etc.) and on productive sectors (industry, commerce, electricity and others) have not been included in the estimated losses.

These figures are not only significant in quantitative terms, but they can be considered evidence that confirms the hypothesis that recurrent and accumulated effects of damage and losses by small disasters can be equivalent and in many cases larger than caused by extreme disasters, whose correlation or simultaneousness of effects are very visible. Even though these small disasters continue being `invisible´, they are not considered concerning events. Results given in this document illustrate the relevance of these kinds of disasters because they indeed represent a worrying risk situation that now exists in all countries of Latin America.