

The Local Disaster Index (LDI)

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. This approach is concerned with the national significance of recurrent small scale events that rarely enter international, or even national, disaster databases, but which pose a serious and cumulative development problem for local areas and, more than likely, also for the country as a whole. These events may be the result of socio-natural processes associated with environmental deterioration (Lavell, 2003a; Lavell, 2003b) and are persistent or chronic in nature. They include landslides, avalanches, flooding, forest fires, and droughts as well as small earthquakes, hurricanes and volcanic eruptions.

For the purposes of this study, we classified the various types of events registered in the DesInventar database⁵ into six phenomena: geodynamic (internal and external), hydrological, atmospheric, technological, and biological (Cardona *et al.*, 2004a, 2004b, 2005). To further simplify, external geodynamic phenomena are referred to as *landslides and debris flows*, whereas internal geodynamic phenomena are referred to as *seismo-tectonic*. Hydrological and atmospheric phenomena were grouped and are referred to as *floods and storms*. Finally, technological and biological phenomena are simply referred to as *other events*. In addition, the database was standardized to take into account three variables: i) the number of deaths, ii) the number of people affected by the events, and iii) direct losses (that is, the economic value of housing and crops lost or damaged) for the four types of event.

⁵ The database was put together by La Red de Estudios Sociales en Prevención de Desastres de América Latina (La RED).

The database also combines disaggregated data for the number of people affected by disasters with that for people left homeless. The reason for doing this is that in some countries both designation depict the same thing. Destroyed and affected housing are also aggregated; an “affected” house is equivalent to one-quarter of a destroyed house. The cost of rebuilding destroyed houses is taken to be the average cost of a social housing unit during the period of analysis. The value of one hectare of crops was calculated on the basis of the weighted average price of crop areas that are usually affected by disasters, taking into account expert opinion in the country at the time of analysis.

The LDI is equal to the sum of three local disaster subindicators that are calculated based on data from the DesInventar database for number of deaths, number of people affected and losses in each municipality.

$$LDI = LDI_{Deaths} + LDI_{Affected} + LDI_{Losses}$$

The Local Disaster Index 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 5 shows the total LDI in 2000, which was obtained by adding its three components: the LDI related to the number of deaths (K), the number of people affected (A), and total losses (L).

Figure 5. Total LDI

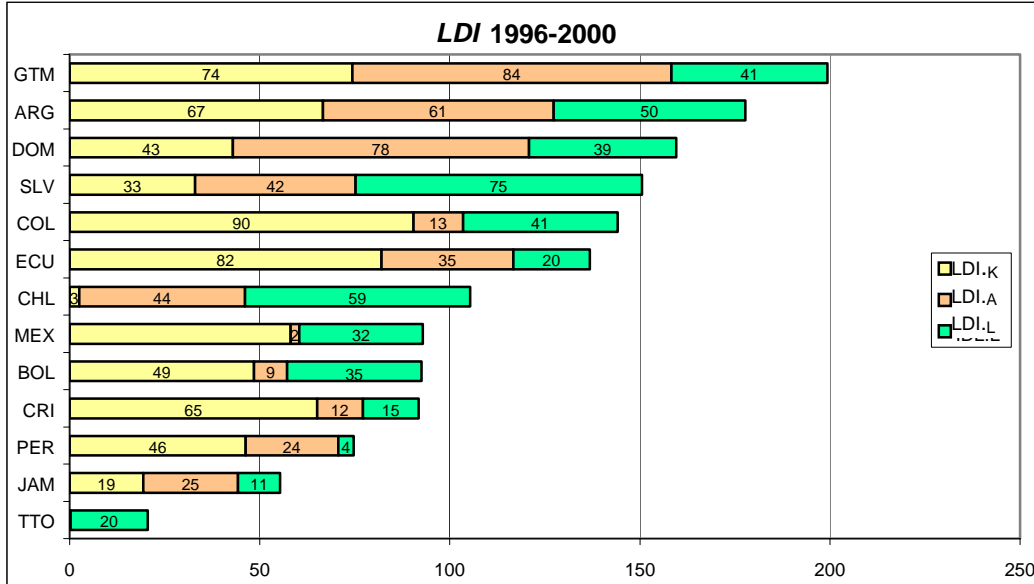
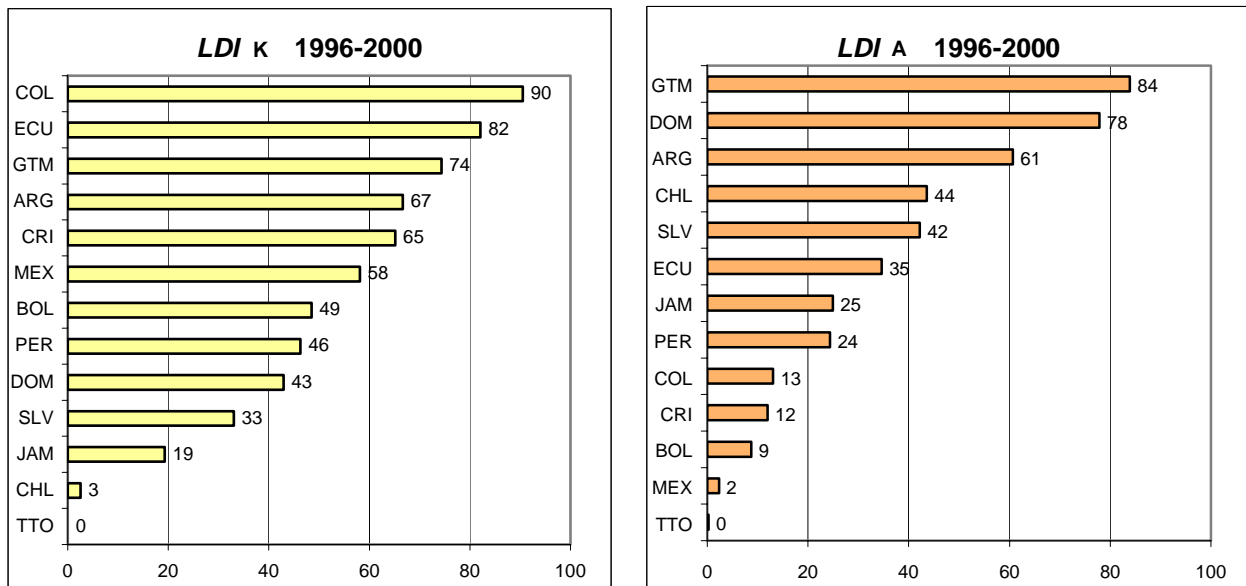


Figure 6. LDI_K and LDI_A



The left side of figure 6 shows the LDI for 1996 - 2000 based on number of deaths, LDI_K. The right side of the figure shows the indicator for the number of persons affected, LDI_A. The data for Colombia and Ecuador (ECU) show that, during this period, there was a greater incidence and persistence in the distribution of deaths among municipalities. However, data for Guatemala (GTM) and the Dominican Republic

(DOM) show a greater incidence and persistence in the distribution of the number of people affected. Disasters between 1996 and 2000 generated numerous landslides and floods in many municipalities in these four countries. Colombia was affected by an earthquake in coffee growing areas in 1999, and by extensive flooding in the north in 1995 and 2000. Guatemala suffered the consequences of hurricane

Mitch, while the Dominican Republic was buffeted by hurricane Georges in 1998.

Although the Local Disaster Index takes into account the total number of deaths, persons affected, and economic losses, it is important to emphasize that it is a measure of uniformity of dispersion of these figures. Therefore, in order to evaluate the LDI, the figures were normalized according to the total area of the municipalities to which they correspond, and were related to the number of municipalities where effects were registered.

Similarly, we calculated a LDI' that takes into account the concentration of losses (direct physical damage) at the municipal level and is aggregated for all events in all countries. This indicator shows the disparity of risk within a single country. The left side of figure 7 shows the LDI for 1996-2000. The right side of the figure shows LDI' for the same period.

LDI_L shows relative losses in El Salvador were more similar and more evenly distributed

among all municipalities than in other countries. This means that there is a lower variability of risk in the country. LDI' shows that in countries such as Bolivia, Ecuador and Peru (PER), losses during the period studied were concentrated in a few municipalities. An LDI' of 0.93, 0.92 and 0.91 signifies that 10 percent of the municipalities concentrate 82, 78 and 75 percent of losses, respectively (see methodology: Cardona *et al.*, 2004a, 2004b, and 2005).

The usefulness of these indices for economic analysts and sector officials in charge of establishing rural and urban policies lies in the fact that they allow them to measure the persistence and cumulative impact of local disasters. As such, they can prompt the consideration of risk in territorial planning at the local level, as well as the protection of hydrographic basins. They can also be used to justify resource transfers to the local level that are earmarked for risk management and the creation of social safety nets.

Figure 7. LDI_L and LDI'

