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Co-evolution between structural mitigation measures and urbanization in France and Colombia: A comparative analysis of disaster risk management policies based on disaster databases

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A B S T R A C T

This article examines the major differences between the EM-DAT and DesInventar international disaster databases, which are frequently used as the basis for designing risk reduction programs. We found that disaster prevention policies, whether they are based on EM-DAT or DesInventar disaster type, encourage an increase in urbanization especially when they are only based on structural mitigation measures. Therefore, as they cannot remove all risk of future disasters, mitigation of small to medium-scale events may lead to greater events. Our findings are based on a comparative analysis of two case studies. On the one hand, we study the impact of small events in Medellín, Colombia, while on the other hand we study the Upper Rhone basin mitigation measures, in France.

Introduction

The recent profusion of PhD theses (Combe, 2007; Defossez, 2009; López-Peláez, 2008; Rebotier, 2008; Vinet, 2007) and research programs about risk management in Latin America and France highlights major differences in how disasters have been defined. This is illustrated by the two major databases referred to in these research works – EM-DAT (Emergency database), which is compiled by the CRED[2]; and DesInventar[3] – which define disasters according to very different criteria.

EM-DAT is an international database that was set up by the CRED as a tool for identifying events that are considered major on national and international scales. For the purposes of the EM-DAT database, a disaster is defined as an event that causes at least ten deaths and/or affects 100 people and/or leads to a call for international assistance (Cred, 2007). The first two criteria define a disaster in terms of the intensity of its impact. The third criterion highlights the inability of the societies concerned to manage the event themselves. Thus, a disaster is defined as an event that causes a high level of damage and overwhelms national management capabilities.

In contrast, DesInventar is a tool for drawing up national databases in Latin America, which highlights the effects of local disasters (La Red & Osso, 2002). As it was designed to complement the EM-DAT inventory, DesInventar includes events of lower intensity (D'Ercole, Hardy, Metzger, & Robert, 2010) and adopts an approach that is more suited to the specific rural and urban development patterns of Latin America. The validity of this type of approach has gained in acceptance in recent years, as it is shown by the inclusion of the notion of "extensive risk" in the United Nation's glossary of risk prevention terminology. Extensive risk is defined as "repeated or persistent hazard conditions of low or moderate intensity, often of a highly localized nature, which can lead to debilitating cumulative disaster impacts" (Unisdr, 2009). Extensive risks usually threaten populations living in rural areas or urban margins.

The major differences in the way these two databases define disasters, raises the question of whether or not they are compatible. The criteria used by DesInventar give credence to the expression "small disaster", which is commonly used by disaster managers and

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[2] The Center for Research on the Epidemology of Disasters (CRED) is based in Louvain-La-Neuve (Belgium). The CRED hosts and manages the EM-DAT (Emergency database), which is one of the world's leading international databases on disasters.

[3] DesInventar is a disaster analysis method developed by LA RED (Network of Social Studies for Disasters Prevention in Latin America). It is based on the construction of a database of low, medium and high-intensity disasters, and their effects on a local scale. It has been implemented in several Latin American countries (www.desinventar.org).

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researchers in Latin America (Lavell & Franco, 1996; López-Peláez, 2008; Marulanda & Cardona, 2006). However, the term is problematic when compared with the CRED's definition of disasters as high-intensity but relatively rare events, which cannot easily be qualified as "small." In Europe, most research and risk management efforts are focused on "CRED-type" disasters (Combe, 2007; Defossez, 2009; Vinet, 2007).

We examine the differences between the two databases, and explore their apparently contradictory characters. Our hypothesis was that structural mitigation measures, whether they respond to low intensity events on a national or international scale, or to what DesInventar defines as "small disasters" on a local scale, may lead to CRED-type disasters. As Bull-Kamanga et al. (2003) pointed out: "Small events may graduate in time to larger events, as population and vulnerability increase in the areas close to the sources of the hazards, and as hazards grow in size and potential intensity".

Hence, despite appearances, the definitions of disasters used by DesInventar and the CRED are not incompatible. Whether they are designed to reduce small disasters risk or CRED-type disaster risk, protection measures enable urban development in flood areas based on an acceptable level of risk. This is consistent with previous studies such as Parker (1995) or Saurí-Pujol et al. (2001) who investigated relationships between dikes and damage increase. Parker (1995) named this process the "escalator effect".

In Medellín, the occurrence of 'small disasters' illustrates the need for DesInventer

Numerous researchers in Colombia have drawn attention to the differences between DesInventar and EM-DAT. Quantifying these differences for the period 1970–1999 shows that EM-DAT lists 83 disasters in Colombia, whereas DesInventar lists 10,286 disasters (La Red & Osso, 2002). In Medellín, only 1.3% of the events included in the local DesInventar database for the period 1956–2006 meet the CRED's definition of a disaster (López-Peláez, 2008). Fewer than ten people were killed in 94% of cases, and no deaths were registered in 96.4% of cases. Fig. 1 compares annual mortality for "small disasters" (i.e., where the number of deaths was less than the CRED's threshold of ten deaths) with annual mortality for CRED-type disasters. During this period of time, only eight events met the CRED's definition of a disaster, including the Villatina catastrophe of September 1987, when a landslide buried an entire neighborhood, killing 500 people. In comparison, over the same period of time, there were 141 small disasters, which led to 305 deaths.

Why does DesInventar use such low criteria compared with those of the CRED? During analyses carried out for the European Union's DIPECHO program, attention was drawn to the shortcomings of the CRED database for evaluating impacts in Central America and the Caribbean (D'Ercole & Pigeon, 1999). Recent work has confirmed these shortcomings by underlining the fact that repeated small

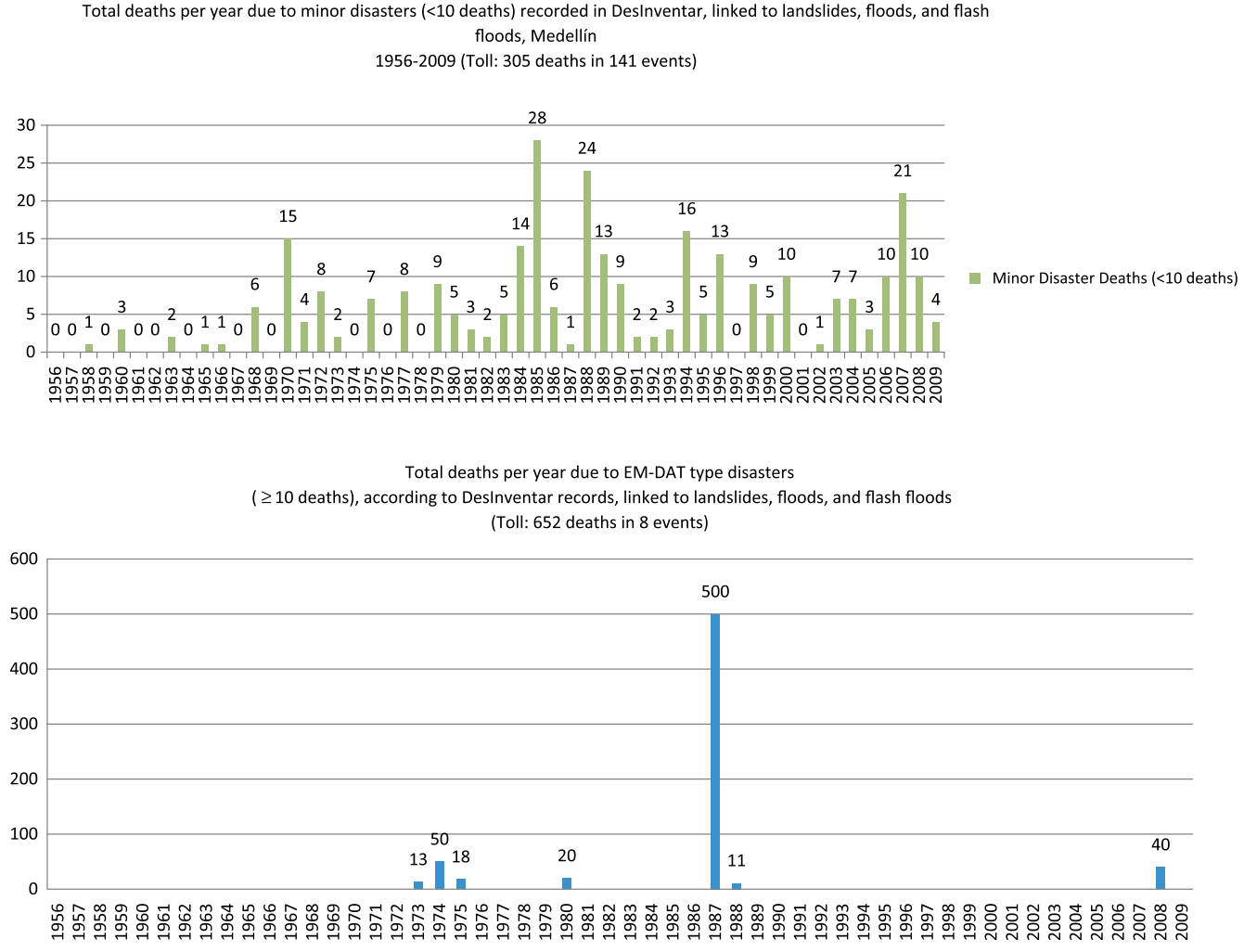

Fig. 1. Comparison between annual mortality figures for EM-DAT and DesInventar disasters (Source: DesInventar records for the Aburrá Valley Metropolitan Area).

Table 1
Comparison of the losses caused by the main disasters that have struck Colombia, and the cumulative losses produced by small disasters listed in the DesInventar database López-Peláez (2008) adapted from Marulanda and Cardona (2006).

Loss indicators	Pacific coast tsunami (1979)	Popayan earthquake (1983)	Nevado del Ruiz volcano eruption (1985)	Tierradentro-Paez earthquake/avalanche	Eje Cafetero earthquake (1999)	Villatina landslide (1987)	Minor events (1971–2002)	Total
Deaths	271	283	24,442	271	1,862	640	9,475	37,244
Disasters	14,620	35,000	232,546	12,461	160,336	2,436	1,745,531	2,202,930
Houses destroyed	1,800	2,470	5,402	1,600	35,949	100	93,160	140,481
Hectares of farming lands destroyed	S/D	S/D	11,000	40,000	S/D	S/D	2,174,713	2,225,713
Estimated losses (In millions of USD)	17 USD	300 USD	246 USD	2 USD	1,591 USD	S/D	1,653 USD	3,809 USD

Sources: Pacific Coast Tsunami (Marulanda & Cardona, 2006; Meyer, 2005); Nevado del Ruiz, Eje Cafetero and minor events (Marulanda & Cardona, 2006); Popayan Earthquake (EM-DAT: The OFDA/CRED International Disaster Database - www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium; Sarria, 2005); Tierradentro-Paez (EM-DAT; Wilches-Chaux, 2005), Villatina (EM-DAT; García-Acosta, 2005) (N/A: not available data).

disasters can have substantial effects on a country's economic development, and that these effects are in addition to the consequences of major catastrophes (Marulanda, Cardona, & Barbat, 2010). This point is illustrated by the relative sizes of the financial costs associated with CRED and DesInventar disasters in Colombia (Table 1). López-Peláez (2008, 2010) estimated that cumulative economic losses due to the destruction of housing buildings by small disasters in Medellín between 2004 and 2007 were equivalent to 26.8% of the city's housing budget for the same period of time. This fact highlights the long-term economic and human cost of frequent disasters, even if they are of low intensity on a worldwide scale.

Hence, the differences between the two databases reflect differences in settlement patterns, as each database was designed to capture as accurately as possible the dominant types of events in a specific context. EM-DAT was designed to catalog high-intensity but relatively infrequent disasters; whereas DesInventar was created to facilitate the production of local statistics, and to map the spatial distribution of disasters and variations in disaster occurrence in areas such as Medellín.

The frequency map of disasters for Medellín's different neighborhoods shows that the most affected areas are the poorest neighborhoods, located at the northeastern and central-eastern zones of the city. Although the affluent southeastern area of the city has similar topographical and hydrological characteristics to the other areas, it has been less affected by disasters. As it is shown in Fig. 2, there is a strong link between the spatial distribution of disasters and the HDI that confirms the concept of risk as a social construct (García-Acosta, 2005). Theses discrepancies between hazards assessments and disasters distribution point out the relevance of understanding disasters – whether they are CRED or DesInventar-type –, as a coevolving process with urbanization.

The map of areas frequently affected by DesInventar-type disasters coincides with the map of informal settlements that have spread in potentially unstable areas, such as on the banks of urban streams. In these areas, urbanization increases risk, for example, as a result of wastewater flows, the overloading of reclaimed land, box-culvert or excavations constructed for access routes. Informal settlements clearly favor "small disasters" that are triggered by reactivating landslides or changes in run-off especially during the rainy seasons.

Although such events may be seen as real disasters at home scale as they may represent the loss of their livelihood for people affected, they are relatively minor on the scale of the Medellín conurbation. Nevertheless, these events draw greater attention from the corresponding authorities due to both the frequency and the long-term effects of such apparently minor disasters. In addition, the repeated occurrence of low intensity events leads to them being regarded as routine, which makes it more difficult to foresee a future catastrophe (Hardy, 2002).

This fact raises the question of whether managing "small disasters" can bring about larger disasters. Urban dynamics of Medellin show well the relationship between urbanization and changes in the frequency of disasters. Despite differences in time span, damage types and settlements, important similarities are provided by an analysis of the urbanization of the Upper Rhone basin in France.

The Upper Rhone basin: how damage linked to flood protection measures can increase risk of future 'cred-type' disasters

Combe (2007) and Dupont and Pigeon (2008) have shown that the frequency of CRED-type disasters in France's Upper Rhone basin is currently very low. They investigate disaster prevention related to floods concerning the Rhône and the Arve, one of the Rhône river tributaries. These research works pay particular attention to the current low frequency of the events corresponding to the definitions given by the CRED for disasters. These studies also incite to use a historical perspective in order to understand a paradoxical fact: even though population has increased, the mortality rate has been relatively low. This situation can be generally observed in long-industrialized countries. The results of these studies show that a historical perspective must be used in order to see that relative mortality rates have never been lower. The lack of a DesInventar-type database for the Upper Rhone basin suggests that disaster prevention is less of a priority for the population of this area, than it is for Medellín. This observation is also reflected in the very revealing title Combe chose for her PhD thesis – "La ville endormie ? Le risk d'inondation à Lyon" (The Sleeping City? The risk of flooding in Lyon).

Nevertheless, the 20th century has seen an undeniable intensification of urbanization, and many upper catchment flood plains that were regularly (annually) flooded during the 19th century are now urbanized (Mougin, 1914). The results of the Franco-Swiss INTERREG[4] program for the Upper Rhone show a decrease in the numbers of flood events for Lyon and the Arve Valley. There have been no disasters in Lyon since those of 1840 and 1856. In addition, floods between Geneva and Chamonix caused by the River Arve breaking its banks have become increasingly rare; the last major flood occurred in 1968 (Dupont & Pigeon, 2008). According to Mougin (1914), at least 44 major floods occurred along the River Arve during the 19th century, whereas only 15 serious floods were recorded during the 20th century.

However, historical records of floods must be interpreted with caution, as river flow conditions and population densities have

[4] European Territorial Cooperation Program France-Switzerland 2007–2013 (http://www.interreg-francesuisse.org/).

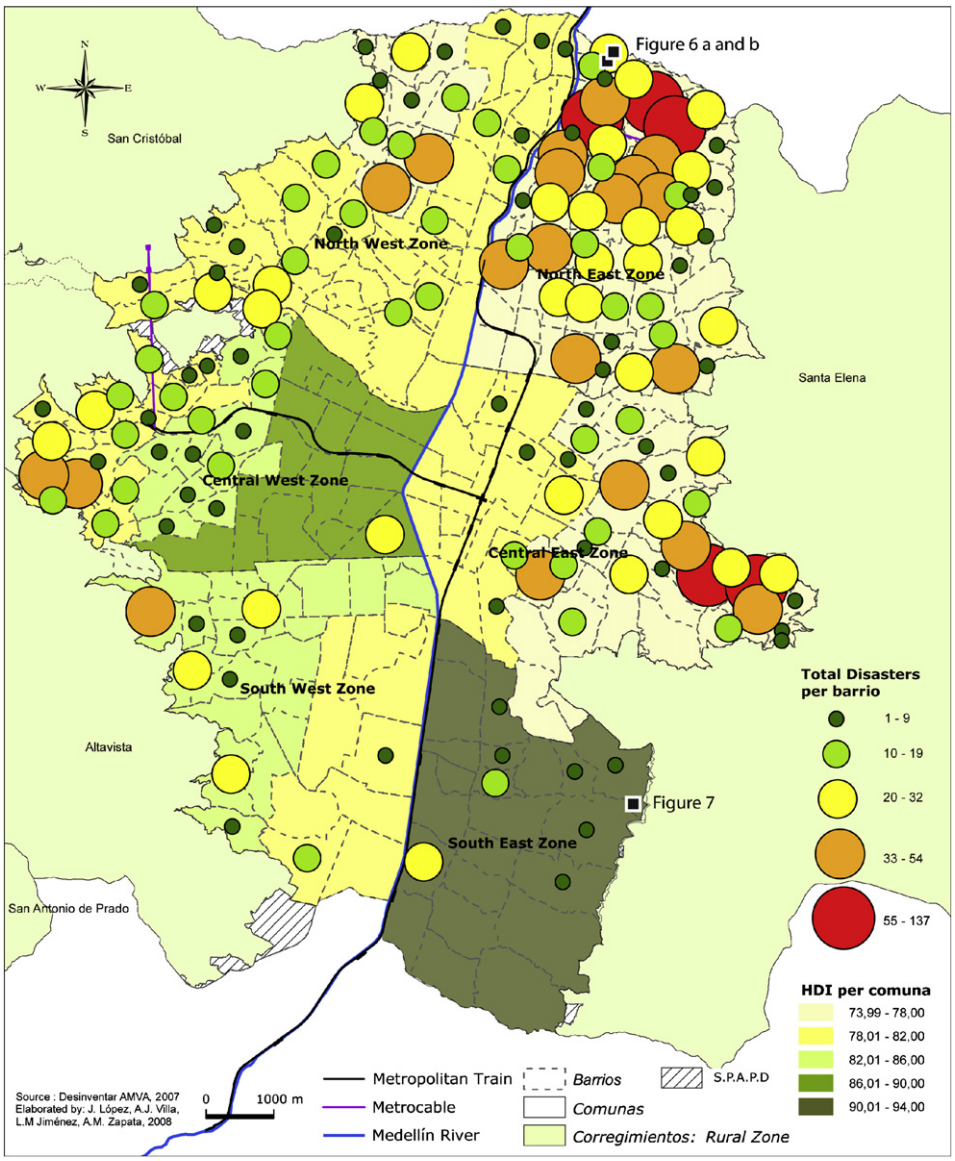

Fig. 2. Distribution of landslide, flood and flash flood events for the period 1956–2006, and relationship with the Human Development Index (HDI) (Source: López-Peláez, 2008).

changed considerably over the last two centuries. These changes accelerated in the second half of the 20th century, leading to an increase in the incision of river channels. The beginning of the 19th century marked both the end of the Little Ice Age and a peak in the population density of the upstream part of the Arve basin. Hence, these flood frequencies shall not be allowed to mask the fact that data for the beginning of the 19th century and the early 21st century are not directly comparable.

Despite these methodological difficulties, this underlying trend highlights two points: Firstly, structural flood protection measures, such as dikes, have helped reduce the number of recorded flood events. Also, there is a big mismatch between peak flow rates and flood frequencies. At the Bout-du-Monde, near the confluence of the Rhone and the Arve in Geneva, a hydrological station recorded a mean flow rate of 499 m^3/sec for the period of time between 1904 and 2000. During this same period of time, flow rates in excess of 600 m^3/sec were recorded on 18 occasions, eight of which occurred after 1968 (Office fédéral de_l'environnement, 2010). The lack of a direct relationship between peak flow rates and flood events shows there is no simple causal link between variations in flow rate and damage, and highlights the role that can be played by flood protection works, such as dikes.

Secondly, the decrease in the frequency of flooding justifies the criteria used by the CRED to define a disaster. Viewed from the perspective of some of the heavily urbanized municipalities in the Upper Rhone basin, such as Cluses, the concept of small disasters may appear to be much less relevant than in Medellín. However, research studies have drawn attention to the tendency of flood prevention works to bring about future disasters. As Vinet (2007) and Defossez (2009) have pointed out, this tendency is also seen in the Mediterranean regions of France.

This fact raises the question of whether or not the concept of small disaster is relevant to areas such as the Upper Rhone basin. This statement is very debatable, as a large number of flood protection works have been built to control and correct river flows. Historical and field analyses of these projects show that many of them were designed as protection measures for neighboring settlements and to protect earlier defenses. Thus, there are several generations of works, the history of which is recorded in the archives (Fig. 3).

Fig. 3. The River Arve at Le Tour (Chamonix), August 2001.

For example, at Le Tour (Chamonix) the banks of the Arve bear the marks of at least three generations of dikes (Fig. 3). The history of these structures can be traced through the archives of the Mountain Terrains Restoration Department in Annecy, and the minutes of Chamonix municipal council meetings. Every time, the official objective was to prevent the continued incision of the bed of the Arve uprooting and destroying an earlier generation of dikes. As these works were considered to improve the safety of the Balme-Charamillon cable car (the main gateway to the Chamonix-Le Tour ski area), they induced an increase in the capacity of the cable car and a subsequent increase in urbanization.

Thus, it can be inferred that there are less serious and more frequent river-related damage events that are not recorded in the CRED database due to its international focus. Because less severe river-related damage events attract little media attention, they can only be cataloged through a combination of field investigations and archive searches. In such cases, information about river-related damage events can be provided by the expenditure needed to maintain or reinforce protection works, which is recorded in the capital investment sections of local authority budgets. However, these budgets also show that protection works can be a huge financial burden that may temporarily block urbanization (Pigeon, 2002). From this point of view, they can be considered "small disasters."

It is possible then to recognize similarities in the evolution and management of these two very different settlements. In both areas, there has been strong interaction between disaster prevention and urbanization. The measures to protect areas from relatively small (on a worldwide scale) but frequent disasters can often unintentionally encourage further urbanization. Such measures can contribute to generate future CRED-type disasters.

Co-evolution between disaster prevention and phases of urbanization in Medillín and the Upper Rhône basin

An analysis of urban development on the flood plains of the Upper Rhone and its tributaries reveals a partial co-evolution with local flood prevention works. Because transforming the flow regime by constraining a river within dikes favors increased incision of the river bed (Bravard & Petit, 2000; Peiry, 1988), these protection works regularly need reinforcing. Consequently, documents such as council meeting minutes frequently refer to the need to reinforce dikes and/or sills. These new investments are required to protect recent urban developments, but they are also useful for justifying new phases of development.

Such a progression can be seen at Scionzier (Haute-Savoie), in the Cluses urban area (Fig. 4), where the Co-evolution between several groups of parameters is bringing about a "CRED-type" disaster. According to old maps, the confluence of the Arve River and the Foron de Scionzier River remained free from urban development until at least 1854, but this area is now completely covered by industrial parks and housing estates (photograph from 2000). This increased urbanization is reflected in a number of criteria, including the increase in building density on the Arve flood plain, the growth of permanent and temporary populations (industrial areas), the rise in real estate values, and the increase in expenditure on protection works (Fig. 4). Damage to these works can be classified as "small disasters" because the resulting expenditure needed to repair or strengthen protection works now exceeds the capacity of Scionzier's municipal budget. As a result, finance has to be sought from an inter-municipal body, in this case, the Public–Private Association for the Development of the Arve and its surroundings, which manages the Arve-Lake Geneva River Contract. However, these protection works have not prevented damage related to the River Arve flooding (Fig. 4), so the urban expansion encouraged by these works has increased the need for more protection works, as is shown by the construction of two sills and two dikes at Pressy in 1984 and in 2002.

Protection works reduce the frequency of minor flood events, without completely removing the risk of damage related to river channel incision. In addition, extreme confidence in structural mitigation measures can lessen the social perception of risk by provoking a false sense of security that can reduce the will to undertake non-structural mitigation measures. As well as managing small disasters, these works encourage further urbanization. A consequence of this process is that any future exceptional flood is likely to cause a CRED-type disaster. The exponential trend shown in Fig. 4 illustrates this point. A flood event that exceeds the capacity of the dikes will cause damage that is several orders of magnitude greater than the damage associated with the last major flood, in 1968. This could have happened during the February

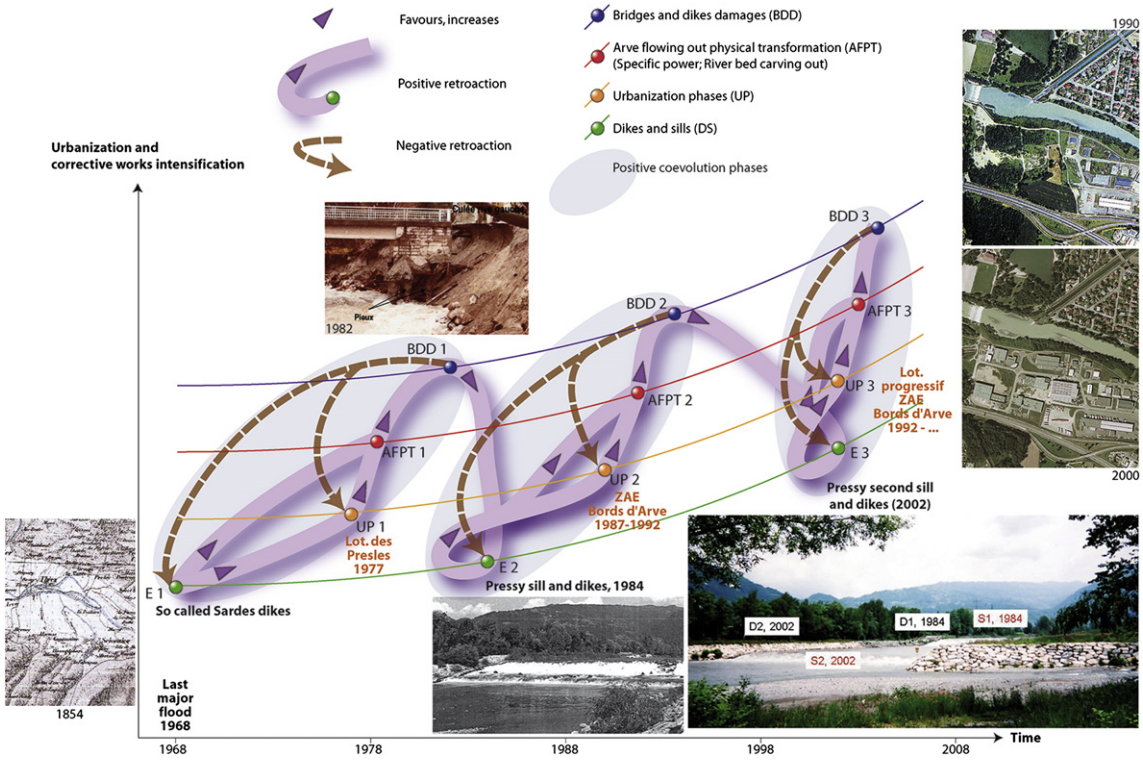

Fig. 4. Co-evolution between correction works, phases of urbanization, physical changes to the flow of the Arve and damage to bridges and dikes.

1990's 100-year flood. However, institutions managing flood risks did not experience any dike disruption as can be confirmed in local archives.[5]

As it was shown, it can be considered that minor flood events (local scale "small disasters" according to the DesInventar definition) generate the possibility for CRED-type disasters to occur. Urbanization promotes the building of protection works by causing a structural increase in real estate values. In turn, these protection works propitiate a reduction in the frequency of overflow events, thereby encouraging further urbanization and the building of more costly protection works.

This tendency for doing protection works to promote further urbanization can also be seen in Medellín. According to López-Peláez (2008), since the beginning of the 20th century, local urban development plans have included the construction of protection works along the Medellín River, which runs through the metropolitan area from North to South, as well as along its tributary streams (quebradas). These works were intended to recover land to which the city can expand, and they were also designed to definitively control the flow of the river and prevent frequent flooding. The major prevention works are mainly concentrated along the lower bed of the river, in order to provide a central access route for the whole conurbation. The use of culverts, covered channels and protection walls has enabled the utmost use of streams canyons and flood plains for urban development, often without proper studies or regular monitoring and maintenance.

Although it was unplanned, this process has been driven by the same desire to maximize land use, in response to the acceleration of formal and informal urbanization, which began in the late 1960s. The effects of the changes in flow dynamics produced by these practices are gradually being observed. The evolution of flood and flash flood events recorded by DesInventar over the last three decades supports this interpretation (Fig. 5).

A marked increase in the frequency of flood events in the early 1980s climaxed in 1988, one of the most rainy years recorded in last four decades, when floods forced the City council to declare a state of emergency. This crisis, which occurred the year after the Villatina landslide catastrophe, marked a turning point in local policies, and led the authorities to stress much more importance on the study, rectification, management and protection of the river network. The reduced frequency of flood events during the 1990s can be partly attributed to this new approach of risk. At the same time, the reinforcement and expansion of protection works encouraged further urbanization and accelerated the occupation of the banks. For example, protection works are often used as foundations for informal settlements (Fig. 6). Although the DesInventar database suggests that these works have reduced the frequency of small disasters, the combined effects of modifying flow dynamics, increasing sewage, waste and debris inputs from buildings and increasing the areas exposed have also brought about more intense events.

Nevertheless, it is important to indicate the limits of these databases. Until 2002, DesInventar was based entirely on information from Saldarriaga (2003), but since then, variations in the criteria used for selecting information have added a degree of heterogeneity to the database. Since 2004, the council department responsible for responding to emergencies (SIMPAD) has also compiled information about recent events. The SIMPAD database shows a much higher frequency of disasters for the last six years (2004–2009); during such time, the council issued 455 evacuation notices, forcing people to evacuate their homes due to the risk of flooding. Furthermore, taking into account that SIMPAD does not include flash floods in the "flood" category (unlike DesInventar),

[5] Plan de Prévention des Risques (PPR) commune d'Annemasse, rapport de présentation, archives municipales d'Annemasse et Service de Restauration des Terrains en Montagne, 2001.

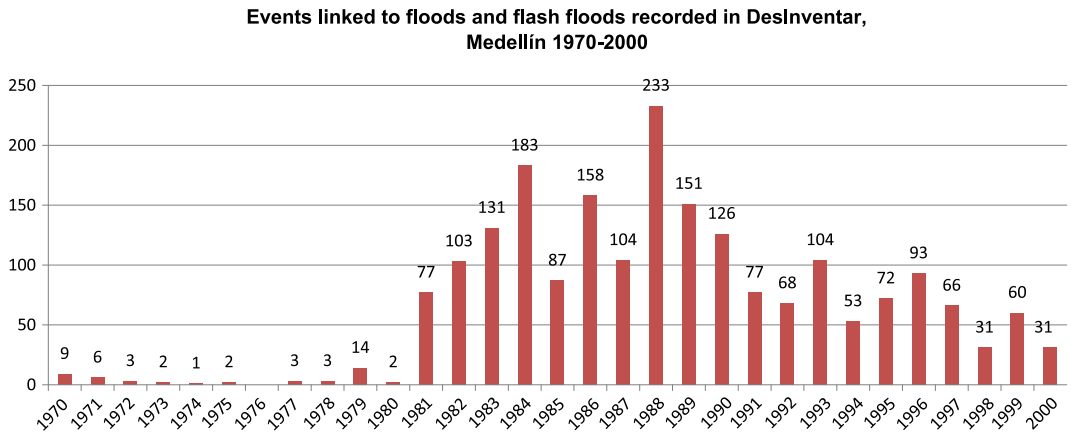

Fig. 5. Flood and flash flood events in Medellín (1970–2000) recorded in the Desinventar database.

the increase in flood frequency recorded by the SIMPAD is smaller than it would have been if flash floods were included (Fig. 5).

The abrupt change in the frequency of floods highlights the importance of both the method used to compile and compare data, and the possible links with climate variability. The increased risk of a "CRED-type" disaster cannot only be attributed to an increased exposure to risk as a result of protection works, or a consequent intensification of urbanization. Nevertheless, the existence of this trend has been confirmed by fieldwork.

The disaster risk situation in Medellín is not only linked to the flood protection works that have been built. These protection works have also led to an increase in population densities in unstable areas, some of which have been designated as "high-risk zones," where public investment is not authorized and relocating the existing populations is a priority. This is particularly the case for areas where providing public services and infrastructure was considered too expensive "for the communities and for the municipal authorities" according to geotechnical criteria (López-Peláez, 2008). However, due to the fact that authorities do not have the means to relocate the entire population at risk (estimated at 30,000 households) in safer areas, they have decided to build flood prevention works and to facilitate access to basic services (roads, retaining walls, public services, etc.). Often, these structural risk-mitigation works have become anchor points for local people, thereby promoting the densification of the population and causing "CRED-type" disasters. Recent and higher-intensity events, which were triggered by failures of the improvised fresh water and wastewater systems in former slums that seemed to be structurally improved widely show the trend identified in this study. Such is the case of the El Socorro sector in 2008, where 28 people were killed in a landslide.

This co-evolution of urbanization and risk management does not only affect informal settlements. For example, real estate industry

Fig. 6. Occupation of river banks around river works (Left: Quebrada El Burro; Right: Quebrada La Seca. Photos: J. López, 2006).

Fig. 7. Landslide at Alto Verde, south-east Medellín, November 16, 2008 (Photo: W. Agudelo, 2008).

pressure on the high-income area of El Poblado at the Southeast hills of the city, has also led to new risks. Despite massive investment in civil engineering works, landslides have accelerated in some areas, thereby showing the limitations of protection measures that have been implemented. In 2008, a landslide destroyed six houses in one of the most expensive areas of the city, killing 12 people (Fig. 7). This event once again raised the question of control measures and land use restrictions, as well as citizen co-responsibility programs and other non-structural risk-management measures.

Awareness of the link between protection measures, urbanization and disaster risk should draw local authorities attention toward risk management policies from a more comprehensive approach. This has been done by several Latin America cities, including Quito (Estacio, 2009; Robert, 2007), La Paz (Hardy, 2008), and Lima (D'Ercole et al., 2010), most notably by reinforcing disaster risk management policies or through Municipal Risk Management Plans[6] in the case of France.

Conclusion

The differences between the EM-DAT and DesInventar databases are partly a reflection of the differences in the settlement patterns of the Upper Rhone Valley and Medellín. EM-DAT's data are based on consolidated urbanization, or even metropolitan criteria; some of its information is taken from the annual reports of the main insurance companies.

DesInventar's database is better adapted to informal forms of urbanization at a city level. It registers events that occur more frequently but that have much lower intensity on a global scale, and that are also overlooked by CRED's criteria.

However, for poor populations, events that are invisible from an international point of view can still be extremely serious on a local scale. Similarly, in France's Upper Rhone basin, the accumulated effects of relatively minor events can have serious consequences in terms of the investment needed to maintain and strengthen protection works, which may eventually exceed the means of the municipalities concerned. The inability of individual councils to cover these investments has motivated the creation of inter-municipal organizations, such as the Public–Private Association for the Development of the Arve and its surroundings, which steers the Arve-Lake Geneva River Contract. These events can be considered "small disasters" on a municipal scale.

Disasters cannot be viewed merely in terms of the low frequency events with a relatively high-intensity on a worldwide scale that are listed by the CRED, as the damage caused by DesInventar-type small disasters can cause major difficulties if such events occur repeatedly. As defined by DesInventar, if an event exceeds the financial capacity of the people affected, whether they live in a poor household in Medellín or in a municipality in France it can be considered a disaster. Moreover, the management of "small disasters" brings about bigger disasters, mainly by reducing the frequency of the damage to protected properties, and by promoting urbanization. The intensity-frequency ratio of damaging events varies on a spatial scale as well as on a time scale. Also, there are logical and chronological links between events of different intensities, as depicted by Farmer's curve (Pigeon, 2010).

Although protection works can never give total protection against hazards, they can give the impression that risk has been neutralized, reducing social perception of risk. This should be taken into account by local authorities in order to reinforce non-structural measures. This is the main objective of the political framework drawn up at Hyogo (ISDR, 2007), which has been translated into stronger emergency preparedness and response programs, and increased research into vulnerability criteria and resilience measures.

This undercurrent is found in both Latin America and Europe. It clearly reveals the ability of urban societies to learn from the undesired effects of risk management policies, in order to reduce damage events. These similarities suggest that a more theoretical approach to the question (e.g., by referring to self-organization theories) will provide a better understanding of why, despite differences in approaches and definitions, both databases are not incompatible in any aspect.

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