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DISASTERS, POVERTY AND DEVELOPMENT: A COMPREHENSIVE VIEW FROM INDIVIDUAL LEVEL TO SOCIETY

Abstract: Disasters cause major impacts on the economic performance of developing countries and on the livelihoods of millions of poor people around the world. With economic development and growing investment, along with the growing risk of extreme weather events, disaster costs are projected to increase rapidly over the decades. An appropriate evaluation of the costs of a natural disaster is necessary to guide the plan for financial resilience. Dealing with the consequences requires a multidimensional approach. This chapter will offer a thorough analysis of disaster impacts and their connection to development. This discussion will be held both at macro level (the government) and micro level (individuals and households). Finally, a section on climate change and its connection to disaster risk have been included, as an important topic in international public discussions.

Key words: disasters, climate change, resilience, developing countries, poverty, risk management.

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1. INTRODUCTION

Disasters have a major impact on the living conditions, economic performance and environmental assets and services of affected countries or regions. These have been principally conditioned by the increases in population and assets exposed to adverse natural events, a trend likely to worsen with growing urbanizcsation, environmental degradation and expected increase in the number and intensity of hydro-meteorological events resulting from climate change (Ghesquiere and Mahul, 2010). It is recognized that disasters can have widespread impacts, causing not only harm and damage to lives, buildings and infrastructure, but also impairing economic activity, with potential cascading and global effects. Consequences may be long term and may even irreversibly affect economic and social structures and the environment.

With countries facing more frequent and severe disasters and increasingly constrained public finances, the development of disaster risk management strategies has become indispensable for enhancing the resilience of societies against disasters and reducing their long-term social and economic costs. In order to implement a efficient disaster risk management strategy, is essential to understand disaster impacts in all their dimensions. Often the literature addresses macroeconomic impacts of disasters and the possible ways to cope with the aftermath of a disaster. Communities and individual perspectives are less addressed in international literature. However, it is of crucial importance to understand behavior and reactions of individuals and the communities where they live, in order to address public policies in the right way. Failure to comprehend such behavior would result in unforeseen consequences once a disaster has taken place.

This chapter will give a comprehensive overview of disaster impacts, focusing mostly on the relationship between disasters and economic development. It will address both macro level and micro level behavior. Climate change is also considered when discussing disaster impacts and disaster management strategies. The first part of the paper will focus on the concept of macroeconomic risk of natural disaster. The second of the chapter will deal with community and individual behavior in case of disaster and consequences they face in relation to overall macroeconomic impacts. This part will focus mostly on the theory of risk behavior and the way it applies in case of disaster events. Later, a short overview of financial resilience means used to cope with such risk is presented. Finally, a case study about climate change action in Albania will be introduced, focusing on the response to climate change based on three levels, international, national and community.

2. DISASTER AND POVERTY

Disasters impact the macroeconomic indicators in any country they occur and no apparent relation have been observed between economic development and exposure to natural hazards (Stromberg, 2007). However, disaster impact is much more serious in developing countries and emerging economies (Gurenko and Lester, 2004). This is due to many factors, including the infrastructure conditions, lower building standards, absent or poor incentives for mitigation, and underdevelopment of private markets which do not provide catastrophe insurance for homeowners and small businesses, and greater constraints on government resources available to cope with disasters. Although capital losses might be smaller in absolute terms when compared to those in developed countries, their relative weight and overall impact tend to be very significant, even affecting sustainability (Ghesquiere and Mahul, 2010.).

Of the 40 worst catastrophes in terms of the number of victims in 1970- 2001, 39 occurred in developing countries (Gurenko and Lester, 2004). A 2013 study states that disaster losses in developing nations amount to $862 billion, which is considered under-estimate (Kellett and Caravani, 2013). The United Nations Development Programme (UNDP) calculates that while only 11% of those people exposed to droughts, earthquakes, floods and windstorms live in low-development countries, they account for 53% of the people who lose their lives (UNDP, 2004). These devastating events affect millions of

people around the world, causing deaths and injuries and destroying homes and livelihoods. In addition, inequality is even greater than available losses data suggest because of under-reporting by low income countries (CRED and UNISDR, 2018). While high income countries reported losses from 53% of disasters between 1998 and 2017, low income countries only reported them from 13% of disasters. No losses data are therefore available for nearly 87% of disasters in low income countries.

Developing countries face further constrains when trying to develop disaster risk management strategies which would alter disaster impacts. This is because of the mentality present in these countries. This includes the mentality of governments which often develop short run strategies corresponding to the election cycle, the mentality of the private sector which develop its activity focused on short term profit, without taking into account any damages imposed to the environment and infrastructure, and the mentality of the population which do not consider insurance as a risk protection technique (Lester, 2000; Gurenko and Lester, 2004; ECLAC, 2003).

3. DISASTER AND CLIMATE CHANGE

When discussing about disasters and their impacts is crucial to address also how climate change is contributing to disaster impacts all over the world. Climate change affects disaster risk in two ways: short-term climate variability and its extremes influence the range and frequency of shocks that society absorbs or adjusts to, whereas longer-term variability can lead to changes in the productive base of society, particularly in natural resource dependent economies (Parry and Carter, 1985). Climate change s an international challenge and, as such, requires cooperation on an international scale. The Intergovernmental Panel on Climate Change (IPCC) has calculated that global average surface temperatures have increased by 0.13°C per decade since 1950 and that the global average surface temperatures might increase from 1.8°C to 4°C by the end of the 21st century due to the emissions of GHG expected to occur in the future (IPCC, 2007). Potential consequences of this heating vary from manageable to catastrophic. Several impacts will be felt on agricultural production (Howden et al, 2007), on natural ecosystems (Hulme, 2005), on biodiversity (Bates et al, 2008), on the quantity of water pollutants (Haines, 2006), on the reduction of forests and living species and increase the probability of diseases, and on the sea level rise (IPCC, 2007). Moreover, tourist destinations may change, due to the fact that climate change will alter the lengths and quality of the tourism season. This way, the demand and seasonality of tourism will change, therefore affecting the general economic growth of a country depending on tourism (Fankhauser and Tol, 2005).

The variability of climate during this last century has been deteriorated by human activity, as anthropogenic factors have put lots of pressure to the natural resources. This pressure is mostly attributed to developed nations, while developing economies and poor countries have now to bear the costs of a damaged environment (IBRD, 2010). Scientists have warned that without any reaction to climate change, the consequences will be disastrous. The future generations will suffer the irreparable consequences caused by environmental pollution.

Obviously climate change is contributing to raising disaster risk. However, public policies for disaster risk management often do not comprise climate action. The reason for these two distinctive agendas include (Schipper and Pelling, 2006):

• climate change policy deals exclusively with climate-related hazards and their impacts;

• the time frames for reactive adaptations to climate change and disasters are distinct— disaster impacts are relatively immediate and concentrated, whereas the consequences of climate change may evolve, along with social change, over a longer time scale; and

• disaster risk reduction has to date focused on the local and national scales, while climate change policy has so far prioritized mitigation, which has been predominately global in scope.

Contemporary thinking on climate change management defines two distinct kinds of activities: mitigation activities and adaptation activities. Many authors insist that for the next 10-15 years it will be essential to put a major emphasis on mitigation, because the more mitigation is done, the less adaptation will be necessary. However, the effects of climate change will be felt with increasing force in years to come, even under the most optimistic scenario for mitigation efforts (Goodwin, 2008).

4. DEVELOPMENT AND DISASTER CONSEQUENCES IN NUMBERS

More than $7 trillion is accounted for the economic damage caused worldwide as a result of natural disasters from 1900 to 2015. About 60% of the damage comes from floods and storms. The study was introduced by the Karlsruhe Institute of Technology in April 2016. Meanwhile, in terms of human loss, according to the study, 8 million people have died throughout this time frame from disasters such as earthquakes, volcanoes, droughts, fires, etc.

Extreme weather events have become more frequent, world population has doubled, and disaster reporting has become more complete. However, in comparison with the population of the globe in general, which is on the rise, deaths from such catastrophes, with the exception of Africa, are declining (Figure 1). This is partially attributed to the geographical distribution of disasters. While upper income and lower income countries have the same chance of being hit by a disaster event, in high income countries the means to cope with a disaster have improved over time, making a highly exposed area less vulnerable to disaster impacts (Stromberg, 2007).

In absolute monetary terms, over the last 20-year, the USA recorded the biggest losses (US$ 945 billion), reflecting high asset values as well as frequent events. China, by comparison, suffered a significantly higher number of disasters than the USA (577 against 482), but lower total losses (US$ 492 billion) (CRED and UNISDR, 2018). Comparing continents, Asia, as the continent with the highest population and land mass, has the most disasters, fatalities, and people affected. In relation to the population, the death rate is highest in Africa (Stromberg, 2007).

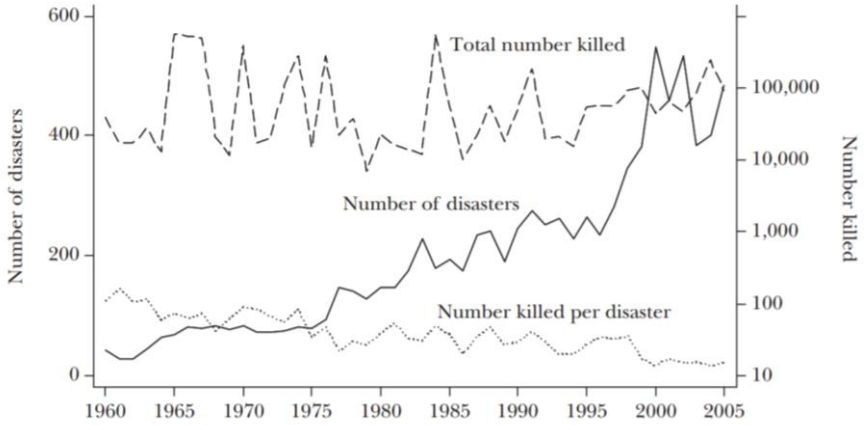

Figure 1: People affected by disasters, Source: Stromberg, 2007

Floods are the main cause for economic and human losses, according to the findings from the 35,000 natural disaster database in over 115 years. Since 1960, storms and hurricanes have replaced the floods as the most devastating force that struck buildings and infrastructure. It can not yet be determined whether this is due to climate change (The Karlsruhe Technological Entity 2016). The frequency of other natural disasters, especially earthquakes that make up 26 percent of the losses and volcanoes that caused a percent, remain quite constant over time. Earthquakes are estimated to cause nearly 30% of the deaths, or, say, about 2.3 million human lives lost during the 115-year period. Of these, 60% of the number of victims remained under collapsed collapsed buildings, and 28% of the tsunami caused.

Between the 1950s and 1990s, the cost of natural disasters increased 15 times. Disasters in the 1990s caused an economic loss estimated at an average of $ 66 billion a year (in 2002 prices). In 1998-2017 disaster-hit countries also reported direct economic losses valued at US$ 2,908 billion, of which climate-related disasters caused US$ 2,245 billion or 77% of the total. This is up from 68% (US$ 895 billion) of losses (US$ 1,313 billion) reported between 1978 and 1997. Overall, reported losses from extreme weather events rose by 151% between these two 20-year periods. In 2017, according to the Natural Catastrophe loss data: NatCatService | Munich Re, total losses from world natural disasters accounted for $ 330 billion, compared to $ 184 billion in 2016. The year's losses resulted from 710 events, compared to 780 events in 2016.

All published data demonstrate that while absolute economic losses might be concentrated in high income countries, the human cost of disasters falls overwhelmingly on low and lower-middle income countries. This burden is expected to rise, especially under the conditions of a changing climate change, which, as shown before, is increasing the frequency and severity of extreme weather events.

5. MACROECONOMIC RISK OF NATURAL DISASTERS

Hochrainer (2006) defines the risk of any natural disaster as a function of probability (risk), and loss (exposure, vulnerability). This definition does not represent a mathematical formula, instead it serves primarily to express the integration of these different dimensions in the evaluation of risk.. Figure 1 represents a way to determine the risk of a natural disaster, according to this relationship.

Economic impacts of a disaster are usually grouped into three categories: direct, indirect, and macroeconomic effects (often called also secondary effects) (Menchler, 2005). Direct economic damages are mostly the immediate damages or destruction of assets or “stocks”, due to the event per se. A smaller portion of these losses results from the loss of already produced goods. The effects can be divided up into those to the private and public economic sectors. Another category of direct damages is the extra outlays of the public sector in matters of emergency spending in order to help the population during and immediately after a disaster event.

The direct stock damages have indirect impacts on the “flow” of goods and services, i.e. indirect economic losses occur as a consequence of physical destruction affecting households and firms. Most important indirect economic impacts include: diminished production/service due to interruption of economic activity; increased prices due to interruption of economic activity leading to reduction of household income; increased costs as a consequence of destroying roads, e.g. due to detours for distributing goods or going to work; loss or reduction of wages due to business interruption. It should be kept in mind that the social and environmental consequences also have economic repercussions. The reverse is also true for loss of business and livelihoods can affect human health and well-being.

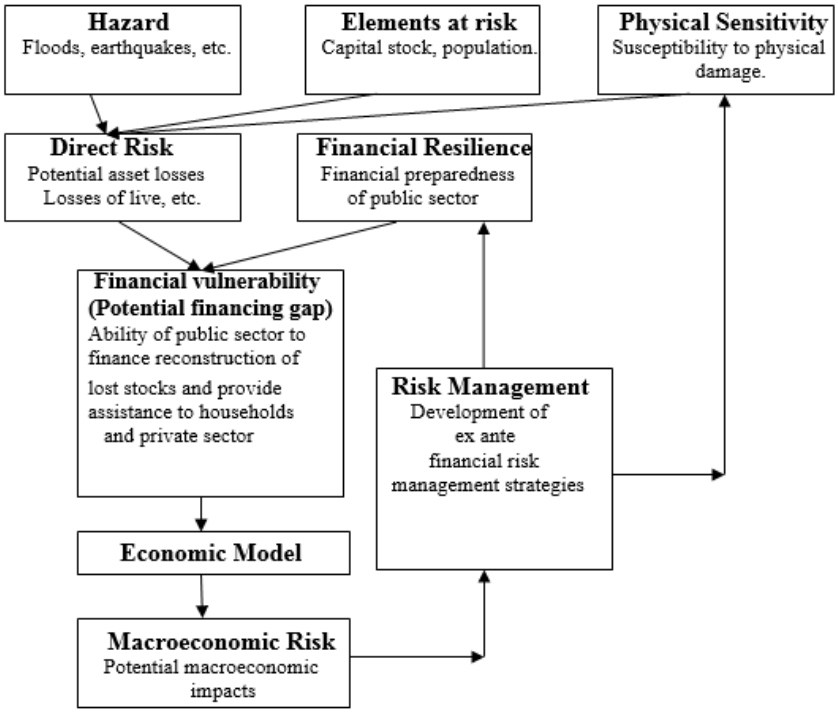

Figure 2: Macroeconomic risk management approach, Source: Hochrainer 2006

The public sector has in most of the cases the responsibility to bear the cost of damages caused by a disaster. Therefore macroeconomic impacts also arise in case of disasters. The disaster will affect different sectors in varying degrees and thus will be reflected in the macroeconomic performance of the country's economy. Table 1 illustrates some potential impacts of a disaster event.

Table 1: Potential impacts of a disaster event to macroeconomic indicators, Source: Hochrainer, 2006

Macroeconomic Indicator	Expected change
GDP	Immediately drop in GDP growth in the year of the event Rise in GDP growth in the year after the event Slowdown in second and/or third year
Agricultural sector	Significant fall in production
Manufacture Sector	Decrease in activity due to disruption of transportation, reduced production capacities
Service Sector	Decrease in activity due to disruption of transportation and payment system
Exports of goods	Reduction in the rate of growth in the year of the event In the year after return to the previous levels In subsequent years continuation of the year after
Imports of Goods	Considerable increase in the rate of growth in the event year A return to pre-disaster level a year after In subsequent years a further drop, possibly caused by reducing incomes
Gross Formation of Fixed Capital	Sharp increase in the year following the disaster
Inflation rate	Short increase caused by the disruption of production and distribution and increasing transportation costs
Public financing	Worsening of deficit due to a shortfall in tax revenues and increase of public expenditures
Trade balance	Deficit due to decrease in exports and an increase in imports, associated with the decline in production capacities and strong public and private investments for reconstruction

Major natural disasters have a very negative impact in the short run. For example, the share of gross domestic product, the decline in tax revenues, the growth of the fiscal deficit due to aid and reconstruction spending, the growth of trade deficit due to the reduction of exports and the increase in imports.

Unfortunately, there are no preliminary models for the consequences of different disasters, but the overall consequences are determined by a complex set of factors, including the country's economic situation before the event, the amount of damages caused, the extent of the disaster, the time at which it occurs, the nature of the phenomenon, the reaction of the institutions, the reconstruction phase, the level of debt before the event, and so on.

The fact that GDP is negatively affected by disasters is generally accepted throughout the literature. Because of the loss of capital and also of the various factors of a country's previous economic situation, different chain effects may affect GDP performance, measured either at the level of growth or at its own level. There are some possible scenarios regarding the performance of GDP after the action of the event (Fig. 3). First, GDP can return to its predicted level, which means that the disaster has had no effect on macroeconomic factors. Second, GDP may rise above its forecasted level, which means that the event had positive effects on the country's macroeconomic performance. Thirdly, GDP may rise but again be below its forecasted level, which means that the disaster has had long-term negative effects on macro factors.

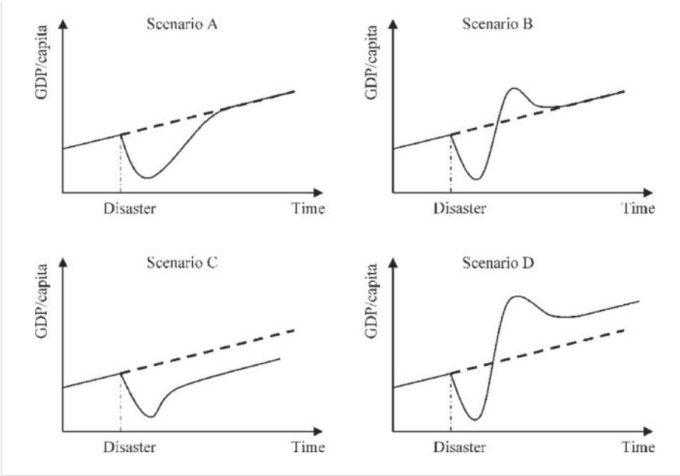

Figure 3: Scenarios of GDP after a disaster event, Source: Chhibber and Laajaj, 2008

The agricultural sector's level of growth is negatively affected by the catastrophe year, especially due to hydro-meteorological risks, but after one or two years it returns to its previous level. Although growth rates are slightly higher in the post-disaster period, there could be no data showing the long-term effect in this sector. Also, the growth rate of production is negatively affected by natural disasters in the year of the event. Even then, the growth rate in the year after the tragedy is higher, but there is still no clear growth performance for the medium to long term. However, it is noticed in the coming years that the growth rate is still negatively affected by natural disaster. In the service sector, growth rates are negatively affected by the disaster year, but its effects are reduced at least two years later. Growth rates of the export sector are negatively affected in the year of the event. Although it appears that in the years immediately following the catastrophe the average growth rates are higher, which is difficult to explain, no clear trends in this sector can be observed in the long run, although there is a negative trend in this period rather than positive. The import growth rate is positively affected by events of this kind in the year that occur. In the medium term, the growth rate is in the pre-event period, and for the long run no general conclusions can be drawn. However, an interpretation of these outcomes may be that, during the first and second year after the disaster, imports are higher due to external aid, later as these aid decreases import growth rates decrease. Government spending in the event year decreases. However one to two years later, the average

growth rate of government spending increases due to reconstruction of the area and public and private sector funding efforts. Overall, in the long run, government spending stagnates below pre-crisis levels, which may be explained by government's fiscal problems due to losing funding.

The assessment of the macroeconomic risk of a country from a natural disaster will help form the main strategies for risk management. Assessing the macroeconomic impacts involves taking a different perspective and estimating the aggregate impacts on economic variables like gross domestic product (GDP), consumption and inflation due to the effects of disasters, as well as due to the reallocation of government resources to relief and reconstruction efforts (ECLAC 2003). The relationship between the effects of a natural disaster is shown in Figure 4.

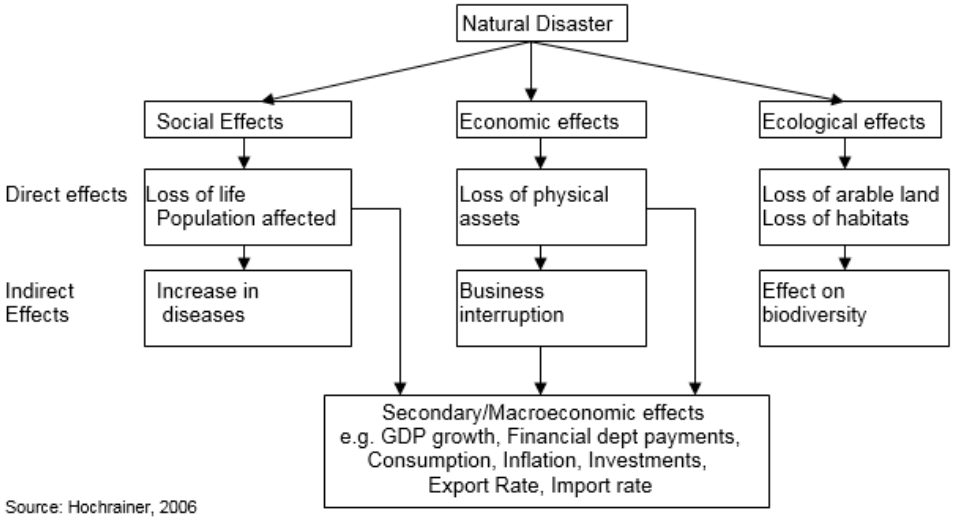

Figure 4: Relationship between the effects of the ND and macroeconomic indicators

6. RISK PERCEPTION AT INDIVIDUAL LEVEL[2]

Disaster risk is expressed as the likelihood of loss of life, injury or destruction and damage from a disaster in a given period of time (UNISDR, 2015). Any population exposed to natural dangers - such as earthquakes, hurricanes, fires or floods; or technological ones, such as explosions, chemical spills, train crashes and so on - wish and should be optimally informed about the risk characteristics, preventive measures and appropriate behaviors during emergencies. Authorities should devise appropriate planning, prepare coping strategies, and effectively communicate information to residents, people in the workplace, and communities as a whole. Better response to natural disasters requires active involvement of residents, which should have been informed and taught about the dangers they are facing (Miceli et al, 2008). In other cases, public discussion, stakeholder participation and perhaps joint resolution of conflicts are needed (Renn, 2008). All these situations include social processes that are commonly included in the term "risk communication" (Rohrmann, 2000). Risk communication is perceived as a necessary link between perception of risk and its management. Communication programs should be based on a sound understanding of individuals' sociopsychology (Morgan et al, 2001).

In general terms, perception of risk can be considered as an interpretation or understanding that the individual gives to particular threats that could potentially cause loss of life or property (UNISDR, 2009).

[2] For a full discussion on disaster risk perception and a case study of Albania see Pojani and Hudhra (2018)

Risk perception includes the process of collecting, selecting and interpreting signals about uncertain impacts of events, activities or technologies (Morgan et al, 2001). These signals can be referred directly to observations (for example, evidence of a car accident) or information from others (for example, reading about nuclear power in the newspaper). Floods have the largest number of studies conducted in relation to the attitude, perception, information and preparation of individuals to the risk of natural disasters, such as (Heitz et al, 2009; Plapp & Werner, 2006; Plattner et al, 2006; Terpstra, 2009). Few studies have addressed the risk perception in case of earthquakes and other types of natural disasters, such as (Alam, 2016; Liv et al, 2015).

Risk perceptions may vary depending on the type of risk, the risk context, the individual's personality, and the social context (Renn, 2008). Moreover, the perception of risk is affected by the so called situation and cognictive factors (Heitz et al, 2009). These perceptions guide people's judgments about the acceptability of risks and have a crucial influence on behavior before, during and after a natural or human disaster either (Renn, 2008). Summarizing the above, Messner and Meyer (2005) conclude that knowledge, experience, values, attitudes and feelings influence the thinking and judgment of people about the seriousness and acceptability of risks.

The factors contributing to the attitude and perception of the risks of natural disasters have been grouped by some authors into 4 categories: risk factors, information factors, personal factors, and context factors (Wachinger & Renn, 2010). Risk factors are related to individuals experience, and are influenced by the way the likelihood and frequency of an event is perceived, based on individual's own encounters with past events. Findings about the impact of risk factors are somewhat contradictory. Some survey data show that in some cases people doubt that danger will be repeated. Instead they argue that "lightning never hits twice in the same place" and do not seriously take into consideration past experience. This was the case in Heitz et al (2009) study, in which they found out that the perceived likelihood that a disaster event will happen again has not a relevant statistical relationship with past experience with disaster events. According to the authors this happens because of people psychology, which refuses to believe that bad episodes will be repeated. This was also the case of Kates (1971) findings of his case study research of risk perception in the East Coast in the US. He revealed how people are not willing to draw logical conclusions from their personal experience and they underestimate the risk of repetition of natural disasters. In other cases, studies have found that experience alters perception. A study conducted by Baan & Klijn, (2004) in the Netherlands for example show that after 1993 flooding events the perception of population toward disaster events changed totally once their catastrophic consequences were experienced.

Informational factors include the issue of risk communication and its impact. Information flow from experts, public authorities and media contribute to the perception people have on the efficiency of disaster risk management strategies and consequently to the perception of the level of safety from an eventual disaster event. In this regard, Harries (2008) argues that the more individuals have trust in society and the state as an institution, the less they take action against floods. On the other hand, Siegrist and Cvetkovich (2000) studying risk attitude in various, mostly natural, disaster events, were able to prove the hypothesis that the more individuals had knowledge and information about the potential and the risks of a natural disaster, the less they believed in the information provided by state authorities. The factor influencing risk perception in this case was the self-confidence of individuals.

Personal factors have been largely addressed by literature. They include factors such as: age, gender, educational level, profession, stakeholder membership, personal knowledge, personal disaster experience, trust in authorities, trust in experts, confidence in different risk reduction measures, involvement in post-disaster recovery action, world views, degree of control, religiousness, etc. Interesting findings have been produced by international literature in relation to these factors. It is common understanding for example that women, perceive a higher level of risk. Miceli, Sotgiu, & Settanni (2008) have confirmed this in their research, while studying the impact of age and gender on disaster risk perception. They state that women are less tolerant of the risk of natural disasters than men, while older ages are more tolerant. Armas (2007)

shows that grown-ups and individuals with higher levels of education are less tolerant of natural risk, while finding that income was not statistically significant in his study. Income, on the other hand, has been found to affect disaster risk tolerance in Baan & Klijn (2004) study. They find that the increase in family income reduces the tolerance of individuals to natural risk. Religion and belief is also addressed in the literature. Some people for example attribute responsibility for disaster events to a higher power or authority, such as God, destiny or national government (DRT, 2016). In other cases, disaster risk was found to become part of the identity of an individual or community. In such cases they would accept to coexist with danger, even by developing an emotional connection with it, thus neglecting the serious consequences of this disaster (Alam, 2016). This was the case of people in living in Yungay, Peru, who do not want to move from their homeland despite the high earthquake risk (Armas, 2007).

Finally, context factors, such as economic factors, vulnerability indices, home ownership, family status, country and area of living, closeness to the waterfront, size of community, age of the youngest child, also affect the way risk is perceived by the population (Heitz et a 2009).

7. BUILDING RESILIENCE IN CASE OF DISASTERS

The ability of the public sector to respond to the event is determined by several factors. This ability is often referred to as economic resilience(Cardona et al, 2008). The economic resilience is conditioned by all the possible internal and external resources available to the government to respond to the event. Access to these resources has limitations and costs that must be taken into account depending on the macroeconomic and financial conditions of the country. The availability of the following options in case of a disaster event determines the economic resilience level:

- The insurance and reinsurance payments;
- The reserve funds for disasters that the country has available during the evaluation year;
- The funds that may be received as an aid and donations, public or private, national or international;
- The possible value of new taxes that the country could collect in case of disasters;
- The margin for budgetary reallocations of the country, which usually corresponds to the margin of discretion expenses available to the government;
- The feasible value of external credit that the country could obtain from multilateral organisms and in the external capital market;
- And, the internal credit the country may obtain from commercial and, at times, the Central Bank, signifying immediate liquidity.

Financial strategies for disaster risk management are intended to ensure that individuals, businesses and governments have the resources necessary to manage the adverse financial and economic consequences of disasters, thereby enabling the critical funding of disaster response, recovery and reconstruction. The analysis of financial exposure of a country to disasters is an important part of disaster risk management strategy. However, it is only one component of a comprehensive disaster risk management strategy. This analysis is a subset of the overall macro-economic analysis (Ghesquiere F. and Mahul, O. 2010). Financial protection will help governments mobilize resources in the immediate aftermath of a disaster, while buffering the long-term fiscal impact of disasters. The comprehensive risk management strategy covers many other dimensions, including programs to better identify risks, reduce the impact of adverse events and strengthen emergency services (Figure 5).

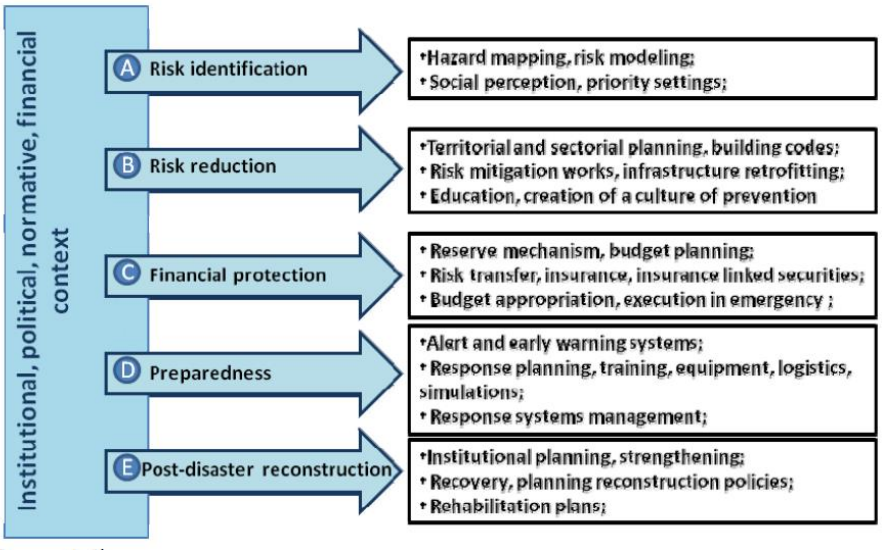

Figure 5: Comprehensive disaster risk management strategy, Source: Ghesquiere and Mahul (2010)

Risk financing instruments against disaster risks can be categorized into risk transfer and risk spreading instruments. While the dominant risk financing instrument is a risk transfer by insurance and reinsurance, other non-market risk transfer instruments, e.g. collective loss sharing, are also available (Mechler, 2005). Table 2 illustrates the main risk management approaches and instruments.

Table 2: Risk management approaches and instruments

Approaches	Examples of Instruments
Non-market risk transfer	Government assistance (taxes) for private and public sector relief and reconstruction funding Kinship arrangements Some mutual insurance arrangements Donor Assistance
Market risk transfer	Insurance and reinsurance, Micro insurance, Financial market instruments: Catastrophe bonds, Weather derivatives
Inter-temporal risk spreading	Contingent credit (financial market instrument), Reserve fund, Microcredit and savings

Source: Hochrainer, 2006

Risk-financing and risk-reduction strategies can be targeted to different layers of risk in terms of their severity (Figure 6). Particularly for structured investments, risk-reduction measures may be largely appropriate for low-loss events that occur frequently (low-layer risk), while risk sharing and transfer addresses risks, often at higher levels, that cannot be cost effectively reduce. In highly vulnerable countries, very low-probability, high consequence (high-level) risks are typically absorbed by governments and donor organizations (Linnerooth-Bayer and Hochrainer-Stigler, 2015).

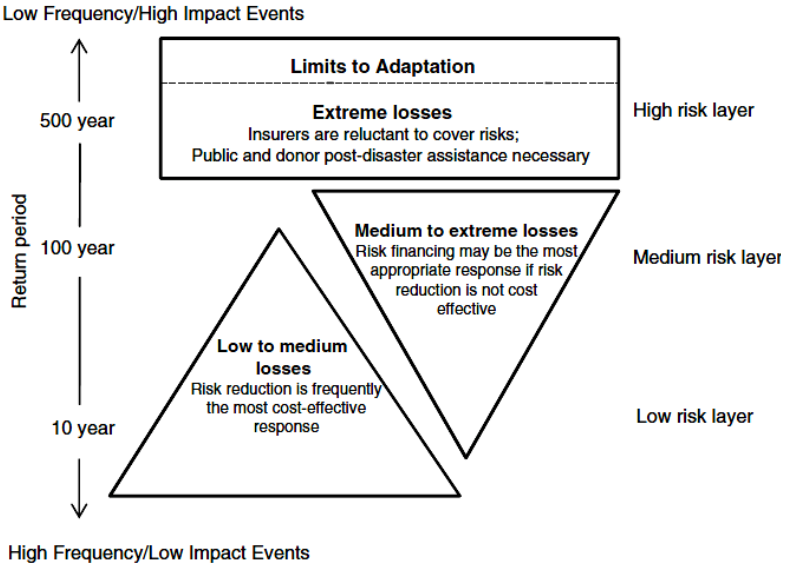

Figure 6: Disaster Risk Layers, Source: Linnerooth-Bayer and Hochrainer-Stigler (2015)

The public sector has in most of the cases the responsibility to bear the cost of damages caused by a disaster, acting as insurers of last resort (Cardona, et al 2008). In particular, the government plays a key role in loss financing after a disaster in developing and emerging-economy countries, and even in high-income countries. According to Hochrainer (2006), post disaster government assistance can be seen as one of the most important arrangements of non-market risk transfer. Governments have principally four possibilities to ease their financial burden in the context of natural disaster losses:

- First, they can continue as before and recover from the effects of a disaster event as best they can, using available resources;
- Second, they can eliminate the risk, e.g. by locating infrastructure out of hazard prone areas;
- Third, they can reduce the risk (mitigation), e.g. by retrofitting existing facilities and the last and fourth option is to transfer risk to other levels (Burby et al, 1991).

Governments generally have access to various sources of financing following a disaster. These sources can be categorized as ex-post and ex-ante financing instruments. Ex-post instruments are sources that do not require advance planning. This includes budget reallocation, domestic credit, external credit, tax increase, and donor assistance. Often the public sector relies on such ex post financial means, where international assistance has been especially important. Even though funding from donors and international development banks can be an important part of government catastrophe risk management strategy, over-reliance on this approach has often been the cause of the lack of economic incentives for countries to engage in proactive disaster risk management (Gurenko and Lester 2004). In addition, ex post international assistance in some occasions can result inadequate, since often is offered in-kind, which has several disadvantages (Keipi and Tyson 2002).

Households, businesses and governments can transfer their catastrophic risk by insurance and/or reinsurance. According to Linnerooth-Bayer and Mechler (2008) insurance and other risk-transfer instruments are justified by the concept of risk aversion. In addition to reducing direct and indirect losses, insurance provides economic security. For businesses, insurance removes risks from balance sheets, meaning that higher-profit and higher-risk activities can be pursued. For governments, insurance assures timely assistance and recovery, which can attract more investment to the country (Mechler, 2003). However, according to Hochrainer (2006), there are several problems of supply and demand side of the

insurance market. The low insurance density in the developing world is not surprising. On the demand side, for low income households, commercial insurance is not affordable and has high opportunity costs. Many low income countries are highly exposed to natural disaster risk and therefore even fair premiums would be quite high. As a consequence, residents of such countries cannot pay the price for such risk transfers and therefore require support from the non-risk communities or internationally. On the supply side, insurers are reluctant to promote coverage because of the intrinsic problems of insurability of catastrophe risk, the lack of formal titles to property of firms and individuals in developing countries, without which no formal proof of holdings can be established and therefore no premium calculations can be done, high transaction costs, unstable business environments and insufficient risk assessment and mitigation amongst others. Hence, in developing countries, instead of insurance, households usually rely on family and public support. Furthermore, they use traditional coping mechanisms to protect themselves from the economic impacts of natural disasters: diversification of crops and livelihoods, different sources of income, remittances from family members who are living abroad or spatial diversity of family members (Hochrainer, 2006; Linnerooth-Bayer and Hochrainer-Stigler, 2015).

Other ex-ante disaster risk management practices are considered a crucial part of disaster financial planning. Ex-ante risk financing instruments require pro-active advance planning and include reserves or calamity funds, budget contingencies, contingent debt facility and risk transfer mechanisms. In this respect, risk transfer instruments are of major importance and much emphasized in academic literature, financial strategies and international institution's recommendation, as a mean of risk management that should be considered and implemented in developing countries (Gurenko and Lester 2004; Keipi and Tyson 2002). In addition to traditional insurance and reinsurance, there is emerging interest in other alternative risk transfer instruments, e.g. catastrophe bonds and weather derivatives. Weather derivatives are index based, e.g., physical indicators such as rainfall measured at a specific location are used to define trigger events. Weather derivatives and index based insurance are seen now as promising risk transfer instruments for the developing and emerging economy countries, especially in the agriculture sector (World Bank, 2005). Catastrophe bonds emerged as instruments primarily for re-insurers; however, there are also governmental efforts in some countries (e.g. Mexico) to transfer their risk with this instrument (Hochrainer, 2006).

Finally, inter-temporal risk spreading is another approach for risk management. At the household level risk spreading over time can be achieved in the form of savings. On the country level, governments can establish catastrophe reserve funds, usually financed by taxes, which are depleted only in the case of a disaster event. Contingent credit arrangements allow borrowing money after an event, whereas the post-event annuity payments are smaller in comparison to a regular credit. Borrowing is also a kind of inter-temporal risk spreading of losses, because payments will be made in the future. As one can see, a contingent credit is a mixture of saving and borrowing (Hochrainer, 2006).

A comprehensive approach to disaster risk management should emphasize both ex ante measures (prior to a hazard) and ex post activities. Keipi and Tyson (2002) give a list of the instruments that can be used by governments as ex ante and ex post sources (Figure 7).

	***Ex* ante Sources**[a)]		***Ex post* Sources**
Instruments without risk transfer	Nonreimbursable resources ? Calamity funds ? Reserve funds or diversion of national budgetary resources ? Development and social funds Reimbursable resources ? Contingent credits ? Development and social funds	*Instruments with risk transfer* ? Insurance and reinsurance with damage coverage based on real losses ? Insurance and reinsurance with parametric activation of payments ? Catastrophe bonds with damage coverage based on real losses ? Catastrophe bonds with parametric activation of payments	Nonreimbursable resources ? Emergency donations ? Taxes Reimbursable resources ? Emergency credits (for example the IDB's Emergency Reconstruction Mechanism) ? Reconstruction loans ? Reformulation of existing loans

Figure 7: Classification of Disaster financing mechanisms, Source: Keipi and Tyson (2002)

Ghesquiere and Mahul (2010) provides an assessment of the time necessary to mobilize funds through these instruments (Figure 8). In the event of a disaster, immediately available and lowest-cost financing options would typically be used first. For example, financing through an existing calamity fund and/or insurance, reinsurance or catastrophe bonds would have priority. Similarly, part of budgeted resources from existing government programs would be transferred to meet immediate emergency needs. In some cases, development funds (municipal, social, urban, rural) may also be used. At the same time, the government would seek as much international aid and donations as possible and resort to contingency credits. If the government has access to emergency credits such as the IDB's Emergency Reconstruction Mechanism, it would request them and would also begin negotiations to direct resources from existing loans to finance disaster recovery (Keipi and Tyson, 2002).

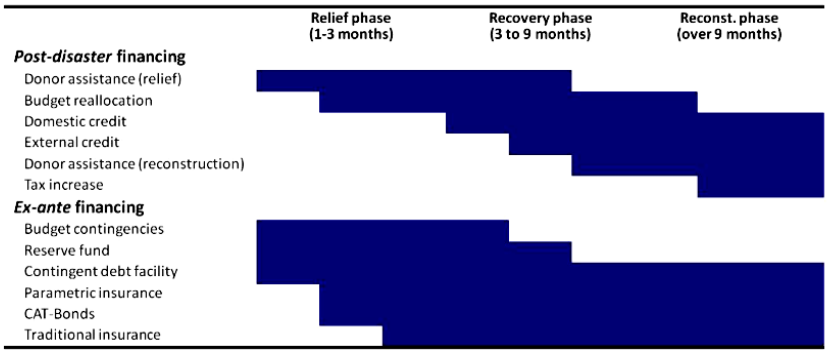

Figure 8: Sources of post-disaster financing, Source: Ghesquiere and Mahul (2010)

Finally, as the frequency of disaster events is expected to increase with the increasing risk of climate change, exposure of businesses, infrastructure, assets and economies to disaster risk will be even more serious. The inexorable increase in disaster loss over the past 50 years underscores the fact that ad hoc action may no longer be adequate. The rising frequency and costs caused by natural hazards call for more action to reduce disaster risk. A more proactive approach is urgent, starting with a better understanding of the sources of risk, the systematic consideration of risks in development planning, and the development of financial protection mechanisms. Understanding how to involve the private sector in responding to these risks – or encouraging them to take advantage of the new business opportunities that may arise from changing climate conditions – is crucial to catalyze greater investment in activities that increase countries, businesses, and communities' resilience.

SUMMARY

This chapter offered a discussion about disaster risk and development. First a general overview of impacts of disasters on both developed and developing countries has been presented. This part emphasized that while disaster events can occur in any country, their impact on economic development is much serious in developing countries. Several reasons for this were discussed. A theoretical review regarding the macroeconomic risk of natural disasters and some approaches and instruments for financing the risk of these disasters was presented in the next part. Then a different type of analysis was presented, that focused on individual and household. Risk perception and factors affecting it are summarized in this part. Later, a discussion on resilience and ways to achieve resilience at both government, community and household level is presented. These options were classified on the basis of their approach, time frame and nature. Finally, a section on climate change was included, as an important topic in international public discussions. It is very important for both government, business sector and households to consider disaster risk management strategies, and to consider threats and opportunities that may arise from changing climate conditions.

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REVIEW QUESTIONS

1. Which are the foreseen impacts on the GDP of the country following a disaster event? What are they influenced by?
2. Describe a disaster event you or someone you know have experienced. Please identify the foreseen monetary impacts on the family after the disaster event.
3. Distinguish between direct and indirect impacts of a disaster event.
4. Why are developing countries more affected by disaster events?
5. How does an experienced disaster event influence risk attitude of individuals?
6. How can governments/local communities and individuals financially cope with disaster impacts?.