



Towards a Comprehensive Understanding of Lightning Risk Management in Colombia: An Insight into the Current Context of Disaster Risk Management

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Abstract—The contents of this paper comprise both a glance at the Colombian current context in disaster risk management and quotations from the most outstanding reports and guidelines recently introduced in the scenario of global risk management, as well as its key role in achieving sustainable development. Then, a discussion is made concerning some aspects that are hindering the processes for improving lightning risk management and creating lightning safety education policies in the country.

Keywords—Lightning Risk; Disaster Risk Management; Extensive Risk; Reports; Guidelines

I. INTRODUCTION

Disasters caused by natural hazards are currently a major threat that affects both developed and developing countries. Contemporary aspects such as rapid population growth, denser urban areas, economic crises and global warming have intensified the effects and the potential negative consequences due to natural disasters. For this reason, the concept of risk management is becoming more prominent when local governments design and implement strategies pursuing sustainable development. At the same time, the international community is making great efforts to provide an adequate platform which may guide the course of disaster risk management towards an integrated vision, seeking to promote the organization of a strong and long-term cooperation between the authorities and the population at all levels to face disaster risks better.

In order to contribute to the path proposed in [1] for the development and implementation of public policies for lightning safety education in Colombia, this paper aims to provide a general vision of the current context of disaster risk management where some of the key elements recently established worldwide in the topic may be presented, so that

they may be taken into account to improve lightning risk management within the framework of national development policies in the country.

II. COLOMBIAN CONTEXT IN RISK MANAGEMENT

A new tendency in disaster risk management has been observed in Colombia during last years, and this has been evidenced by the performance of comprehensive studies and the formulation of renewed policies on the topic of disaster risk management. One of the main studies was named *Analysis of Disaster Risk in Colombia: A Contribution to the Creation of Public Policies* [2], first published in Spanish in March 2012, which is a detailed analysis of the Colombian disaster risk management situation within the frame of the development policies of the country. This report, solicited by the Colombian National Planning Department (DNP in Spanish), corroborated that even though Colombia has progressed towards an integral vision in managing risk and disasters, losses in human lives and property are still increasing, following the global trend.

This document also asserts that the first factor to have this growing tendency of risk conditions in Colombia is the lack of a successful articulation between the achieved conceptual advances in the knowledge about risk management, its relation with development, and the plans and decisions performed by national and local governments within their public management course. Additionally, there exist frequent non-accurate interpretations of existing laws and standards by these authorities, resulting in not having adequate harmony and order when actions to prevent and cope with risks effectively are required. Due to this situation, the report suggests six strategies to help to overcome the detected obstacles in relation to governance in disaster risk management in the country. These six strategies are enumerated in table 1.

TABLE I. SIX SUGGESTED STRATEGIES TO IMPROVE GOVERNANCE IN DISASTER RISK MANAGEMENT IN COLOMBIA^a

Strategies
1. Incorporate risk management as a State policy and overcome existing imbalances in the System through the adjustment and harmonization of a regulatory and institutional framework
2. Increase the effectiveness and efficiency of risk management investment through strategic planning, coordination among territorial levels, and monitoring and control
3. Strengthen local capacity in territorial management in order to reduce the causes and accumulation of disaster risks
4. Reduce flood and landslide risk through planning, investment, monitoring and control, and articulation of the different agents responsible for watershed management
5. Reduce risk generation and disaster impact through policies and sectoral action plans
6. Delimitate public and private responsibilities in risk management and deepen the State's fiscal vulnerability policies in facing disasters

a. Adapted from [2]

One month later, the enactment of the Law 1523 of 2012 resulted in the adoption of the National Policy on Disaster Risk Management and the establishment of the National System of Disaster Risk Management (SNGRD in Spanish) [3], which were fruit of a process of years working around the strengthening of the national capacity to mitigate risks from natural disasters. Afterwards, the Colombian government approved the National Plan for Disaster Risk Management, "A strategy of development" [4], effective until 2025, as instrument of the Law 1523 to define the goals of the risk management process within the framework of the National Development Plan. These goals are presented in table 2.

Not a long time after, remarkable new reports and guidelines on the topic of disaster risk management have been given around the world; the principal ones are the theme of the next section.

III. CURRENT GLOBAL RISK MANAGEMENT CONTEXT

A. World Development Report 2014

Under the slogan *Risk and Opportunity: Managing Risk for Development*, the World Bank Group released its flagship annual World Development Report of 2014 [5], which focuses on explaining why risk management should be considered as an essential and powerful tool for development and how can people shift from passive fear of being shocked by crises to a proactive, systematic and integrated vision in the topic. To do this, the relevance of the process of risk management is highlighted by mentioning and describing three main reasons: (1) risk management saves lives, (2) risk management averts damages and prevents development setbacks, and (3) risk

management unleashes opportunity. Moreover, this process is explicated in the report taking into account the interaction among its four components (knowledge, insurance, protection, and coping) and the five key insights listed in table 3.

As conclusive result, the WDR 2014 offers the following five principles which may guide public action to improve the risk management of households by applying them in designing and implementing public policies: (1) keep a long-run perspective, (2) promote flexibility, (3) provide the right incentives, (4) protect the vulnerable, and (5) do not generate uncertainty or unnecessary risks.

The WDR 2014 recognizes the advances of Colombia to have an integrated and systemic approach to disaster risk management, reflected in the creation of the SNGRD. The document also declares that Colombia has become a leader in its region thanks to the efforts done to decrease the losses from disasters, by indicating that these have been focused on decentralization and stronger prevention, which have been materialized principally by developing appropriate resettlement strategies that include improvement of land use plans, better community awareness of risks, support and monitoring before and after moving, and recovery actions when people are resettled.

B. Global Assessment Report 2015

For its part, the United Nations Office for Disaster Risk Reduction (UNISDR) presented in 2015 its biannual Global Assessment Report on Disaster Risk Reduction (GAR15), which is entitled *Making Development Sustainable: The Future of Disaster Risk Management* [6].

TABLE II. GOALS OF THE COLOMBIAN NATIONAL PLAN FOR DISASTER RISK MANAGEMENT^a

General Goal
To guide the actions of the State and civil society concerning the knowledge of risk, risk reduction and disaster management in compliance with the National Policy Risk Management, that contribute to the safety, welfare, quality of life of people and sustainable development in the country.
Strategic Goals
1. To improve the knowledge of disaster risk in the national territory
2. To reduce the construction of new risk conditions in territorial, sectorial and environmental development.
3. To reduce the existing disaster risk conditions
4. To guarantee an opportune, effective and appropriate disaster management
5. To strengthen governance, education and social communication in risk management with differential approach, gender approach and cultural diversity

a. Adapted from [3]

TABLE III. FIVE KEY INSIGHTS ON THE PROCESS OF RISK MANAGEMENT FROM THE WORLD DEVELOPMENT REPORT 2014^a

Five key insights	
1.	Taking on risks is necessary to pursue opportunities for development. The risk of inaction may well be the worst option of all
2.	To confront risk successfully, it is essential to shift from unplanned and ad hoc responses when crises occur to proactive, systematic, and integrated risk management
3.	Identifying risks is not enough: the trade-offs and obstacles to risk management must also be identified, prioritized, and addressed through private and public action
4.	For risks beyond the means of individuals to handle alone, risk management requires shared action and responsibility at different levels of society, from the household to the international community
5.	Governments have a critical role in managing systemic risks, providing an enabling environment for shared action and responsibility, and channeling direct support to vulnerable people

a. Adapted from [5]

Since the first edition in 2009, GAR is well known for its emphasis on reviewing globally the impact of disasters and proposing strategic orientation in integral risk management to governments. The document pays special attention to extensive risks, their characteristics and consequences, and how to reduce them. Additionally, last GAR affirms that sustainable development cannot be achieved unless disaster risk is reduced. For that reason, the future of disaster risk reduction is discussed in GAR15 with the goal of motivating towards its reflection, debate and practice, taking into account four areas of discussion: (1) risk governance, (2) risk knowledge, (3) cost-benefit analysis, (4) and accountability, in order to contribute as essential instrument to the achievement of the goals of the New Sustainable Development Agenda, adopted by the United Nations General Assembly last year [7].

As well as the World Development Report 2014, the GAR15 also highlights the Colombian progress on risk management throughout the past years. The document cites Colombia as example of shifting from managing disasters and emergencies to managing risks, by presenting the history of the SNGRD birth along with the fact that with the enacting of the Law 1523 of 2012 Colombia has become pioneer in providing governance principles and arrangements for disaster risk management.

C. Sendai Framework

The second lustrum of this decade has begun facing great challenges in disaster risk reduction worldwide. After the third United Nations World Conference on Disaster Risk Reduction, held in March 2015, it was adopted a major agreement named *Sendai Framework for Disaster Risk Reduction 2015-2030*,

which replaces former Hyogo Framework, event that becomes of special importance to those who seek to be involved in the process of risk management, for it represents the transition into a renewed global guidance for disaster risk reduction.

Having the purpose of guiding the multi-hazard management of disaster risk in development at all levels, as well as within and across all sectors, the expected outcome of the Sendai Framework is the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries [8]. In order to achieve this, the Sendai Framework has seven targets and four priorities for action which are, due to their prominence, fully listed in table 4.

TABLE IV. GLOBAL TARGETS AND PRIORITIES FOR ACTION OF THE SENDAI FRAMEWORK^a

Global Targets	
1.	Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality rate in the decade 2020-2030 compared to the period 2005-2015
2.	Substantially reduce the number of affected people globally by 2030, aiming to lower average global figure per 100,000 in the decade 2020 -2030 compared to the period 2005-2015
3.	Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030
4.	Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030
5.	Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020
6.	Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this Framework by 2030
7.	Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030
Priorities for Action	
Priority 1. Understanding disaster risk	
Priority 2. Strengthening disaster risk governance to manage disaster risk	
Priority 3. Investing in disaster risk reduction for resilience	
Priority 4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction	

a. Adapted from [8]

IV. DISCUSSION

It is evident that nowadays countries are going through a key moment where both disaster risk reduction and risk management in general now have global new guidelines and a refreshed scope. However, misunderstandings respect to the characteristics of risks, as well as a lack of strengthened governance to manage disaster risk, are still the first barriers that are present when people pursue to get better results in making preventive and coping actions against natural disasters, and Colombia is not the exception. Within Colombian and Latin American literature and media there exist commonly diverse interpretations of the concept *storm* (*tormenta* in Spanish), which sometimes may confuse or inform erroneously the general public because there is not enough clarity about what does this word really refers to. Frequently, events and statistics associated with rainstorms, tropical storms, windstorms, gales, hailstorms and electric storms are all referenced just using the same word *tormenta*.

For instance, in the case of the data presented in [9] and [10] the percentage of deaths from lightning are specifically displayed under the name of thunderstorm or electric storm as cause, but in other important statistics as the results of surveys about the perception of major hazards to which Colombian households are exposed and the high-priority threats as reported by communities in ten countries in Latin America, shown in [9] and [11] respectively, the word *tormenta* is used without giving more details. Therefore, in order to disseminate adequate information related to natural disasters, including lightning hazard, it is necessary to make the distinction properly and explain the consequences of each one, referencing their features separately, due to all of them have particular characteristics and may produce different shocks.

On the other hand, taking into account the random nature of the lightning hazard, it is also necessary to consider the lightning risk as an extensive risk, not as an intensive risk. That means that, although it is listed among natural disasters, a lightning produces neither a great number of injuries at the same place nor at the same time. The events involving electrical storms in Colombia registered in [12-14] are proof of that, where it is evident their high-frequency and low-severity losses (no high quantity of people affected per event), which according to [6] are the typical characteristics of extensive risks. Not dealing with this fact appropriately has made more difficult the process to integrate lightning risk officially into the programs of the SNGRD, resulting in not having yet a program exclusively dedicated to manage this important natural disaster in the country.

V. CONCLUSIONS

The most prominent reports and guidelines recently produced in disaster risk management have been addressed. It is noticeable that the world is going through a new phase in disaster risk management oriented to sustainable development, and this is an ideal scenario to take the decision of getting actively involved in the topic.

The Colombian current context in disaster risk management has all the potential and resources to design and implement public policies on lightning safety education successfully, but this labor must take into consideration the particular characteristics and effects of lightning phenomenon and how to articulate this process with the development plan of the country.

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