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**IMPACT OF THE MANAGEMENT OF NATURAL DISASTERS IN THE
COUNTRIES OF THE SOUTHERN AFRICAN DEVELOPMENT
COMMUNITY (SADC): THE CASE OF MOZAMBIQUE (2010-2017).**

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Abstract

The intention is not only to publish information on the Impact of Natural Disaster Gestation in the Southern African Development Community (SADC): Case of Mozambique (2010-2017), but together with the readers, trigger a process of reflection and debate the theme.

In recent years, in all parts of the planet, in the face of adversities, especially of climatic origin, natural disasters are deadlier than some wars, so that states tend to capitalize on more resources than ever to overcome these hecatombs.

In this work the safety theory was explored, especially the contribution of the Copenhagen school, which presents a safety perspective that focuses on the environmental monitoring that is the focus of this research work and also conceptual reference aims to broaden the knowledge about the subject.

Natural disasters these days are a perennial threat to national and international security.

They cause more sacrifices of lives of people and goods than some conventional wars. Under the conditions of Mozambique, natural disasters cause damage to the economy and the social fabric, there is a need to focus on population education, structural and non-structural measures, bet on SADC and international cooperation.

The factors that cause natural disasters in Mozambique are: floods, cyclones and droughts which endangers the safety of citizens. The approach methodology is exploratory and descriptive,

Key words: safety, risk, disasters, floods, calamities and droughts.

Introduction

The present research work is entitled Impact of Natural Disaster Management in the Southern African Development Community (SADC): Case of Mozambique (2010-2017). The Southern Africa Development Community (SADC) is an intergovernmental organization established in 1992 and dedicated to socio-economic cooperation and integration, as well as cooperation on countries of Southern Africa. Its objectives include promoting peace and security; promote sustainable development through the collective interdependence of member states and achieve sustainable use of natural resources and protection of the environment. As one can deduce the protection of the environment is one of its agendas. In recent years, in the face of adversities, mainly of climatic origin, this community has been plagued by natural disasters that have destroyed infrastructure and lives. Thus, it is understood that in other quarters, natural disasters are more deadly than some wars, hence SAD states tend to capitalize on human and material resources to quell these hecatombs.

In the light of the above, it is the central objective of this work to understand the mechanisms of SADC in the prevention and mitigation of natural disasters and to describe the impact of natural disasters in Mozambique.

The choice of Mozambique is linked to the reforms introduced to deal with anthropic origin phenomena in the prevention and mitigation of natural disasters, which culminated in the reduction of victims.

In terms of time, the research analyzes the period from 2010 to 2017. The choice of this period is due to the fact that Mozambique has been plagued by droughts, floods and cyclones of high magnitude. The results show that it was possible to avoid the occurrence of larger damages due to the refinement of the performance and commitment in more coordinated molds.

As mentioned earlier, the territory of Mozambique is subject to natural and man-made disasters. The 2011 Human Development Report considers Mozambique "one of the most vulnerable countries in the world in relation to natural disasters and the effects of climate

change". Alongside this, the Report adds that Mozambique is a country vulnerable to natural hydro-meteorological disasters (drought, floods, tropical cyclones and earthquakes) due to its geographic location. In this context, it should be noted that some of the phenomena mentioned are cyclical and others occur occasionally.

According to the same report, floods have been more frequent in the central and southern regions of the country. Tropical cyclones have had a higher incidence in the northern region, while the drought has plagued the southern region, whose impacts have been more perilous in Gaza and Inhambane province. The occurrence of these hecatombs, in addition to causing fatalities and severe impacts on the degradation of the environment, destroy little infrastructure and hundreds of thousands of people regularly lose their homes and possessions, becoming easy "prey" of endemic diseases, requiring assistance medical and medical assistance and emergency food aid.

In view of the above, the question is: to what extent can regional integration in SADC improve the management of natural disasters in member countries? Indeed, regional policies are strongly aligned in terms of action in this component of natural disaster prevention and mitigation.

The first strategy conceived by the 15 SADC countries, namely: Angola, South Africa, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, Swaziland, Tanzania, Zambia and Zimbabwe. See map1.



Map1 - SADC countries

In the field of natural disaster mitigation policies is the sharing of information on weather forecasting in SADC, annually the climatology experts from the countries of the region meet in Gaborone, Botswana, SADC Headquarters, to analyze the climate forecast.

1. This technical team shares the information for all the countries of the region, for each government to elaborate its emergency contingency plan based on available data on climate change.
2. Disaster prevention and mitigation is based on pre-warning measures for communities, especially those at risk, through the dissemination of information via the media (radios, televisions and newspapers), with prominence for community radios; and
3. Sharing information among the countries of the region has been the key to natural disaster prevention and mitigation strategies.

2. Development

2.1 Security Theory

2.1.1 Genesis, assumptions and precursors.

Security Theory or Securitization Theory has as its main defenders Ole Waever and BarriBuzan. She (theory) fits in the School of Copenhagen, founded in 1996, by Bill McSweeney, considered like one of its drivers. The Copenhagen School is so called because it has developed important studies on peace and security in the world at the Center for Peace and Conflict Research (COPRI).

Buzan, Waever and Wilde published in 1998, "Security: A New Framework for Analyzes", with the intention of revitalizing International Security Studies. In the same period, McSweeney had the prowess of pushing the field of analysis, in a holistic perspective, beyond the military aspects, emphasizing the economic, social, political and environmental domains (Tanno, 2003, 53).

In the Mozambican context, security theory was extensively studied by Emílio Jovando Zeca, professor of Peace Studies and Conflicts and Negotiation Techniques at the Instituto Superior de Relações Internacionais (ISRI). For this author, quoting David Baldwin (1997),

when we talk about security, we have to ask three questions: Security for whom? Under what threat and against what values? [in this way] we can gauge that security is always about a subject that can be the individual, the state or the system. Security threats can be military rather than military. Finally, security involves core and central values for the survival and existence of the subject or safety referent (Zeca, 2013: 138)

Still in the path of this theory,

Carl John Asberg and Peter Wallensteen define security from a conceptual model based on threats, core values and capabilities. The central values are the set of aspects that must be protected and safeguarded and refer to the fundamental aspects that allow the existence and survival of the individual, society, states or international system. Threats refer to the challenges, hazards and vulnerabilities that are directed against the core values of a security referent and threats can be military or non-military. Finally, capabilities refer to the set of resources and actors to deal with the threat in order to provide security (Asberg and Wallensteen, 1998: 168-177 cited by Zeca, 2013: 139).

On the basis of the above, security refers, in a broad sense, to protection against the physical threat of the State. In a narrower sense, we would say that security has to do with protecting against threats to the citizens of that state. We see, therefore, that the concept of security is closely linked to the threats of essential values, especially when neglected may jeopardize the future of the State, particularly of the populations, communities, local authorities, families and the citizen. In the current context, threats refer to the challenges, dangers and vulnerabilities that are directed against human life, values, interests and needs of the State as a whole. As can be seen from the passage in Asberg and Wallensteen's analysis, security covers the existence and healthy and peaceful survival of the individual, society, state or international

system in the face of global threats. For example, natural hydro-meteorological disasters (droughts, floods, tropical cyclones and earthquakes) affect not only Mozambique and SADC, but also other countries.

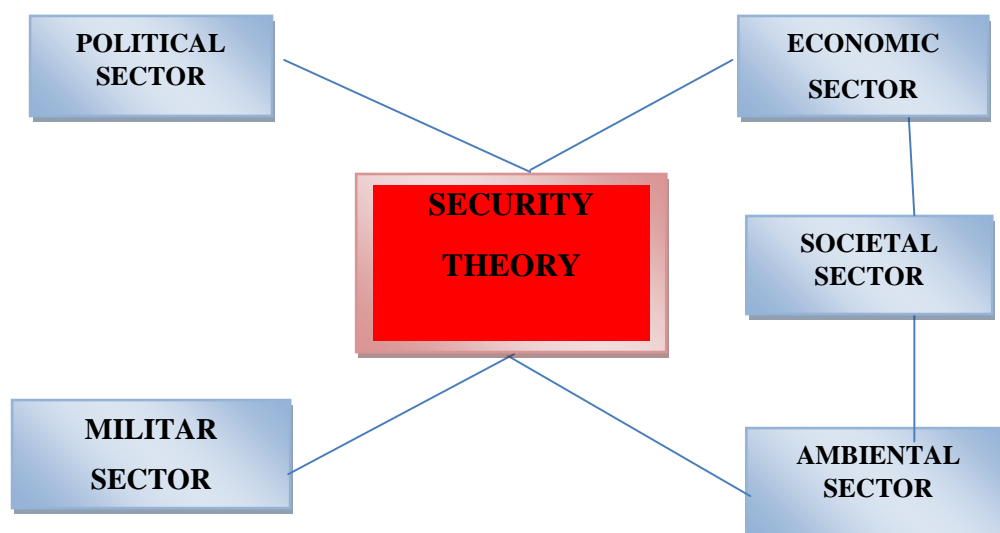
Hence the African expression, "when your neighbor's beard is burning, instead of putting your sauce in, you must help him in the extinction of the fire" (Mataruca, 2011: 31).

In this regard, Zeca points out that

The concept of security is traditionally based on realistic theory, state and military power are the most important aspects of national defense and security policy. Security was associated with the military's ability of the state to preserve its core values, against potential external aggressors. This view is flawed at the present time, particularly when considering security, taking into account other types of threats against socio-political, economic, environmental and other elements affecting social cohesion, political stability, economic and social justice (Zeca, 2013: 140).

In the light of the above, it is noted that security has come to be viewed in a more holistic perspective as "- all human collectivities (allegedly because it is inappropriate to assign military focus), to ensure security" - beyond the State (Zeca, 2013: 140). In the same direction, William (2008: 4) David (2001, 86: 103) and Fernandes (200: 208) quoted by Tanno (2003: 53), linking to the foundations of the Copenhagen School, clarify the following (interdependent) in security: (i) Political sector; (ii) Military sector; (iii) Economic sector; (iv) Societal sector and (v) Environmental sector, as shown in Figure 1.

Figure 1 - Sectors of security



Source: Own elaboration

The security sectors outlined above are opposed to the traditional security model, which focuses on military aspects. Thus, in view of Figure 1, the Political Sector corresponds to political threats, aimed at destroying or undermining the state's organizational stability (Buzan, 1991: 96). The Military Sector is concerned with the relationship between armed offensive and defensive capabilities and with each State perceiving the other. The economic sector has as securitization the aspects of economy of the State and international politics, with direct repercussions on the well-being and stability of the State and of the populations, especially those related to the international economic and financial system. The Societal Sector is conceptualized in the sustainability and the evolution of the standards of the language, culture and religion and still in the national identity and custom. The environmental sector is related to the quality of the environment and the possibility of renewal of natural resources, at three levels of security: individual, state and international system (Buzan, 1991: 96).

2.1.1.1 Importance of Security Theory

The Theory of Security has multiple importance in our work, in the domains listed. The Security Theory could guide SADC, particularly Mozambique, to better operationalize Disaster Risk Reduction (DRR) actions, develop policies, strategies and operational plans for prevention, mitigation, rehabilitation of the economic and social fabric. Environmental sector: Environmental security is useful, as floods spread endemic diseases and destroy ecosystems, affecting nature (the quality of soil and air). In this regard, the non-president of the United States of America, Barack Obama, has declared climate change is a national security issue, stating that "Climate Changes national security issue 2" (Borges, et al., 2016: 248).

2.2 Conceptual framework

The present theme makes use of the concepts that will appear, namely, security, threat, disasters, calamity, natural disasters, floods, droughts, management, prevention, mitigation and resilience.

In fact, it is not intended to specify all the breadth and implications of the concepts, but only to focus on those aspects that are of immediate and practical interest to this research (Mataruca 2004: 2).

2.2.1 Climate Change

A famous adage of Gramsci that dictates, "history teaches, but does not have students."

The issue of climate change has a dramatic impact on national security, from rising sea levels to severe droughts, from melting ice caps, to the most frequent and disastrous natural disasters (Marques, 2015).

For 52 nations located on small islands, environmental collapse is not a potential but an ongoing reality, as the oceans are on the verge of sweeping the map of these small paradises in which an immense amount of biodiversity lives, almost 1% of humanity (Achim Steiner, cited by Marques, 2015: 299).

In 1995, according to the IPCC's climate change assessment report, it was estimated that more than 50% of these phenomena are primarily due to human activities [...] in 2001, that probability rose to 66% [...] in 2007 was 90 % [...] of 2013, [...] science shows in 95% certainty that human activity is the dominant cause of global warming since the mid-twentieth century. Idem

Looking at the data, it can be said that since the 1950s the cause of warming is human activities.

The idea that we must choose between fighting climate change or growing the world economy is a false dilemma (Marques, 2016: 39).

Climate change is changes that occur in the general climate of planet earth. These changes are verified through scientific records in the average values or deviations from the mean, calculated over the years.

2.2.1.1 Generating factors

Climate change is produced at different time scales in one or several meteorological factors

such as maximum and minimum temperatures, rainfall, ocean temperatures, cloudiness, relative humidity, etc.

Climate change is caused by natural phenomena or human actions. In this last case, the climatic changes have been provoked from the Industrial Revolution (Century XVIII), at which moment it increased significantly the air pollution.

2.2.1.2 Consequences

Currently, climate change has been the subject of many discussions and scientific research. Climatologists have found that in recent decades, there has been a significant increase in global temperature, a phenomenon known as global warming. This phenomenon, generated by the increase of the air pollution, has caused the ice melting of the polar caps and the increase in the level of water of the oceans.

The desertification process has also increased in recent decades due to climate change. Law No. 15/2014 of June 20, in its preamble, recommends that, since Mozambique is a country vulnerable to calamities, such as floods, droughts, cyclones and other disasters from human action, it becomes necessary to establish principles and mechanisms effective and efficient management to reduce their impacts on the economy and communities. That said, it can be stated that the main threats and potential are identified.

2.2.2 Disaster Management

Disaster management comprises policies, plans and strategies for prevention and mitigation, aimed at preventing or reducing the impact of disasters on the lives of populations or communities.

2.2.3. Disaster

According to Castro (1998), a disaster is defined as the result of adverse events, natural or man-made, over a (vulnerable) ecosystem, causing human and / or environmental damages and consequent economic and social damages. Here it is noted that the term "adverse" means hostile, enemy, contrary, one who brings misfortune and unhappiness.

Disasters are often sudden and unexpected, of a gravity and magnitude capable of producing various damages and losses, resulting in deaths and injuries. Therefore, they require preventive and restorative actions, involving governmental and private sectors, aiming for a recovery that can be achieved through routine procedures.

However, it should be noted that natural disasters can also have positive and negative aspects. According to Sidle et al. (2004) and Silva et. al. (2003) commented that natural phenomena responsible for disasters may offer some advantages. For example, the river that floods is dangerous, but provides water, sediment and nutrients. Danger has been observed as an occasionally disadvantageous aspect, sometimes benefiting human activity by varying according to time scale.

The United Nations, in the words of Borges et. al. (2016: 239) define disaster as a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental loss that exceeds the capacity of the affected community or society to deal with the situation exclusively with its own resources.

While a natural disaster "is a natural multidimensional event that causes serious disturbances in the functioning of a society. This event can be divided into three elements: natural hazard, exposure and vulnerability. "Wissner et. al. (2005) and Birkmann 2006) cited by Borges et. al. (2016).

Thus, a natural hazard becomes a disaster due to these three elements. While a serious natural hazard usually results in a natural disaster in any situation, usually small natural hazards may not result in natural disasters if the exposure and vulnerability of society are low.

2.2.4 Risks

Another relevant concept in this study is risk. According to the Facilitator's Manual (s / year), risk is the likelihood of harmful consequences, or losses (deaths, destruction of property, livelihoods, interrupted economic activity or damaged environment resulting from

interactions between natural events or caused by man and conditions of vulnerability (Kobiyama, 2006).

2.2.5 Vulnerability

According to Castro (1998), a disaster is defined as the result of natural or man-made adverse events on a (vulnerable) ecosystem, causing human and / or environmental damage and consequent economic and social damage. Here it is noted that the term "adverse" means hostile, enemy, contrary, one who brings misfortune and unhappiness.

2.2.6 Calamity

According to the coupling in Law No. 113/91 on Civil Protection-Portugal: Event or a series of serious events of natural or technological origin, with a prolonged effect in time and space, usually foreseeable, liable to cause substantial material damage and, if necessary, victimization, which severely affects living conditions and the socio-economic fabric in areas of the national territory (Ribeiro, 2008, p.)

2.2.7 Floods

In recent years, Mozambique has been affected by floods that have caused enormous damage to the economy, this phenomenon of floods is defined by Hipólito&Vaz (2011: 4839), as

"An extreme hydrological phenomenon caused by intense precipitation of more or less prolonged duration in a hydrological basin or part of it, giving flow rates that exceed the flow capacity of the lower river bed".

With this definition the concept of flood is associated with flooding of areas that are not subject for most of the time. Sometimes the expression is also used to designate an increase in flow, regardless of whether or not the flow capacity of the lower river bed is exceeded. Flooding may also result from melting snow or returning from dams.

According to the same author, "the great floods are natural disasters that cause material,

social and even material damages, and there is no year in which this is not happening anywhere" (Hipólito&Vaz, *ibid* .: 4839).

Due to the impossibility of limiting their occurrence, the authors point to some full containment measures, suggesting that a variety of measures exist to mitigate the negative impacts of floods, usually grouped together in structural measures and non-structural measures, all of which depend very much on the economic vulnerabilities of a given country, in the concrete case in Mozambique these measures have not been easy to implement due to scarce resources.

Structural measures include the construction of "defense dams allows to protect certain priority areas, such as urban centers or villages, irrigation systems or economic infrastructures, preventing these areas from being flooded by rising river levels" (*ibid* .: 552). With regard to non-structuring measures, "flood warning and hydrographic basin planning may be highlighted. The warning allows to reduce the negative impacts of floods by warning populations and early mobilization of civil protection mechanisms "(*Ibid*).

The warning system in this optics, when combined with the forecast.

"The effectiveness of warning systems increases when linked to real-time flood forecasting, even when this forecast is affected with uncertainty. In addition, flood forecasting allows better exploitation of the reservoir to cushion end-of-stream flood flows. The physical ordering of river basins, in particular the control of the occupation of floodplains, maintenance of vegetation cover and the conservation of drainage lines have positive effects on flood mitigation "(*Ibid*).

He also recalls that damming floods by river dam may not have the desired effects,

"The mitigation of floods by large dams sometimes produces perverse effects, emphasizing that in countries with poor and poorly educated rural population. Although this dam has a limited effect on large flooding, they can absorb almost all small floods. In addition to the negative impacts on the environment, this eliminates most people's headache routine, so they are less prepared when a large flood occurs, as discussed in UN / ECE (2000) and EU (2003).

In this, "the protection of floods of urban areas or perimeter of irrigation by means of defense dikes is very habitual, it is a solution to avoid floods in well-defined areas"(Ibid).

In the case of some basins such as Limpopo and Zambeze, especially the Limpopo River, there is time for measurement, for example:

"Between the Pafuri region where the Limpopo River enters Mozambique from neighboring countries and the floodplain of Lower Limpopo, there is a period of about 48 hours during a flood, which makes it possible to provide timely information on the system protection. The disorderly occupation of floodplains causes current floods to cause far greater losses than those caused in the past by similar floods."(Ibid).

According to Hipólito&Vaz (2013: 562), "all types of measures are currently being implemented in an integrated way in flood risk management, aiming at reducing the probability and impact of floods, as described in Lavothe et al. . al. (2005) and EC (2004). "This approach has shown more effects and programs that incorporates the following elements:

- ♣ Preventing losses in future floods by avoiding the development of housing and industries in malleable areas, adopting future flood risk development, and promoting appropriate land, agricultural and forest management practices.

Protection by adopting structural and non-structural measures to reduce the likelihood of floods and their impact on specific areas;

- ♣ Preparation, informing the population of the risks of the floods and what they should do when a flood occurs, and providing the civil defense agencies with the means necessary for interventions that are foreseeably necessary;

- ♣ Emergency response, small contingency response plans for flood occurrence; and

- ♣ Recovery, promoting the return to normal conditions as quickly as possible, mitigating the social and economic impacts on the affected population and rehabilitating damaged infrastructures.

The floods that cause misfortunes in Mozambique have already been considered a blessing in antiquity, according to Biswas (1972) quoted by (Hipólito&Vaz, 2011: 556) in the great civilizations of antiquity (India, Mesopotamia, Egypt, China), floods were regarded as blessings to the gods, and societies were adapted to them. In Egypt at the time of the Pharaohs, floods were awaited for flooding and fertilization of the fields, and crops were made accordingly, and extensive dyke systems and other hydraulic works were developed for maximum water use. Nowadays, with the enormous population growth and its almost total sedentarization, floods are seen in a negative perspective, since its main impacts harm society, although there are positive impacts in term of conservation of the environment. In the path of the same author, due to the mastery of negative effects, the social effort is directed towards minimizing floods and their impacts. Among the main impacts of floods may be:

- ♣ Possibilities of human losses (full of 2000 - about 700 deaths);
- ♣ Evacuation and displacement of thousands of people;

- ♣ Serious damages in public and private infrastructures;

- ♣ Interruption of communication during the extended period; and

- ♣ Delay in the recovery of flooded agricultural areas, with great loss of production in case of annual crops, and these losses can be prolonged for the following years in the case of orchards or crops such as sugar cane.

2.2.8 Drought

Cunha (1982), quoted by Hipólito&Vaz (2011: 489), presents a fairly general definition of drought, considers that drought is the "occurrence of a serious deficit of water availability over a long period and covering a large area."

Droughts along with floods are another factor that increases the scarcity of resources, they resemble floods, cyclones, and earthquakes in their negative impacts, but they present quite different characteristics, according to Hipólito&Vaz (2011: 573), "in the world, droughts,

tropical cyclones and earthquakes are the disasters that account for the vast majority of the damage caused to humanity by natural forces.”

In comparative terms, floods occur on the plains, riverbanks or water lines, having a well-defined and regionally small geographical extent, droughts on the contrary, are characterized by covering large regions either in a country or even in a region like Southern Africa. The floods have a minor duration, hours, days, exceptionally weeks. On the other hand, droughts have an extended time span, weeks, usually months, sometimes up to over a year. The floods have a well defined beginning and can be marked the moment of its beginning. When they are moderate, the margins and areas usually are not. Droughts begin without any specific atmospheric or hydrological phenomena announcing them, and only become noticeable due to the scarcity of available water resources. "In the same way, when a flooded river returns to its normal bed, it is considered to be the hydrologically ended flood, while the end of the drought is difficult to determine and is only known a posteriori" (Hipólito&Vaz , 2011: 573).

The drought is distinguished from other disasters because its development takes place more unpredictably, its progression is slower, its occurrence drags on for a longer period, it can reach large areas of much larger proportions and recovery is slower.

Continuing with Hipólito&Vaz (2011: 489), on the floods,

There is now a reasonable predictability of floods in terms of the flows that will occur in several sections of a river, flood heights and areas to be flooded, forecasting in advance for a few hours to days, which appropriate measures to mitigate its negative impacts. Unfortunately, there is no corresponding predictive capacity for droughts, although advances in climatological modeling begin to provide useful indications in this regard.

The experiences of the past decades indicate that societies are generally ill-equipped to deal with the droughts. Due to the intrinsic characteristics of droughts, they are usually detected late and only limited mitigation of their negative impacts is achieved. Peixoto (1983), cited by Hipólito&Vaz (2011: 575),

"Says that droughts are manifestations of climatic fluctuations associated

with large-scale anomalies in planetary atmospheric circulation, leading to the absence or sharp decrease of precipitation over a long period of time over a region."

Droughts are not local phenomena and are often associated with pre-existing, persistent anti-cyclonic conditions.

We can conclude that drought is a phenomenon of difficult prediction, as Hipólito&Vaz (2011),

This is a result not only of the very nature of the phenomenon, but also of the different perceptions that scientists from different areas, politicians and decision makers, peasants and city dwellers, users of water and environmentalists, have this same phenomenon.

2.2.8.1 Drought forecast

With the development of science, there are available drought forecasting methods, of which they stand out (Hipólito&Vaz, 2011: 692):

- ♣ Method based on the analysis of time series to make inferences from historical records, trying to detect possible cyclicities.

- ♣ Method based on correlations between hydro-meteorological variables directly related to drought (such as precipitation) and other phenomena such as the occurrence of sunspots;

- ♣ Methods based on global models of atmospheric circulation and teleconnections. The use of global models has been increasing the ability to predict extremes.

2.2.8.2 Consequence of Drought

Droughts make it difficult to provide water for urban supply, damage to agriculture, industry

and the production of hydroelectric power, and restriction of river and fishing and inland waterways.

Indirect effects, favoring conditions that lead to the occurrence and spread of forest fires, phytosanitary problems, degradation of water quality, soil erosion and in the long term, desertification in arid and semi-arid climate regions.

The effect of a drought can have an impact outside the country or region,

"The severe drought that affected the Chinese territory in the winter of 2010-2011 has been associated with the underlying causes of the upsurge of social unrest and violence that have turned Tahir Square into Egypt into a real battlefield." (BORGES, et al., 2016: 236).

It is noted that there was the globalization of the risk, China lowered wheat production as a consequence of the drought, and imports from Egypt dropped from this cereal by table produced social upheavals.

2.2.8.3 Drought mitigation measures

For this purpose, measures are adopted to minimize or eliminate the impact of drought, so they depend on the development conditions and resource mobilization capacities of each region or country, some measures may be highlighted. Thus, according to Hipólito&Vaz (2011: 594),

"The drought mitigation measures that can be adopted depend greatly on the conditions of each region: level of development, main economic activities, sectors most affected by drought, possibility of mobilizing untapped water resources, social and cultural aspects."

In this regard, Cunha (1985), cited by Hipólito&Vaz (2011: 594), grouped the mitigation measures into three main categories according to their specific objective:

♣ Increasing water supply, reducing water demand, minimizing the economic impacts of drought.

♣ Measures to increase water supply are not easy to implement in poor countries, as has been evident in droughts in Africa in recent decades.

♣ Measures to reduce water demand can be much more effective, while taking into account that not all reduction in demand is reflected in a decrease in consumption, for example by focusing efforts on minimizing losses.

Measures in this category may include:

♣ Mobilization of the population for voluntary reductions in water consumption

♣ Reuse of water, both in residences with industries

♣ Imposition of restrictions and banishment of certain types of consumption, such as irrigation, etc.

♣ Replacement of irrigated crops with others with less need for water.

2.2.8.4 Flood management and drought management

According to Hipólito&Vaz (Ibid: 692), the main objectives in relation to flood management are to prevent loss of human lives and to minimize the negative social and economic impacts of floods, such as loss of assets, damage to public infrastructures and deprivation of social and economic life.

In order to meet these objectives, it is necessary to know the vulnerable zones and the flood risks associated with various return periods, which can be achieved through appropriate modeling of the propagation of the hydrograph of the flood corresponding to each return period in the river and its flood plain.

In the most vulnerable areas, there is a flood warning system in connection with civil protection. Communities, institutions, businesses and affected persons should be involved in

the planning of protection measures and their implementation, including regular public awareness and education campaigns.

The proper functioning of the flood warning system implies prioritization of the pluviometric and hydrometric stations that are part of these systems. In the case of shared basins, it is necessary to ensure good coordination with countries of amount in terms of obtaining hydrological information in real time.

As regards droughts, the main objectives of water management are to prevent hunger and lack of potable water in rural areas in less developed countries and to minimize the impacts of drought on water supply to urban areas, agriculture and cattle.

2.2.9 Earthquakes, earthquake and / or seismic shocks

The Castro just cited defines:

Earthquakes or earthquakes of tectonic origin are earth vibrations that cause vertical and horizontal oscillations in the surface of the earth, usually caused by ruptures and movement of the rocks inside the earth's crust.

♣ The intensity of an earthquake depends on the interaction of the following factors: Magnitude of the earthquake; Distance between the epicenter and the area considered; Depth of the epicenter; Geological characteristics of the area to be considered; and Quality of buildings.

♣ In general, the earthquake intensity is directly proportional to the magnitude of the seismic shock and to the amplitude and frequency of the shock waves, released in the focus of the fracture.

♣ The greater the distancing from the epicenter to the area considered, the lower the intensity of the earthquake.

♣ The seismic shocks originated in very deep epicenter are of reduced intensity, although its shock waves propagate the great distances (Ibid).

2.2.9.1 Main adverse effects of earthquakes

In the event of an earthquake, both buildings and infrastructures are exposed to damage or collapse, due to the movement of the terrain, especially those located near the epicenter, where the intensity of the earthquake is greater.

Sedimentary soils, poorly formed soils, and landfills are more vulnerable to earthquakes, as shock waves behave as if they enter through the bottom of a bottle, finding it difficult to proceed through the narrowing of the bottleneck.

The buildings most vulnerable to earthquakes are those constructed with: (1) Very thick and compact walls; (2) Matters with low coefficients of elasticity and low plastic capacity to absorb deformations; (3) shallow structures; (4) Very heavy roofs; (5) Archaeological projects with panels, balconies, rocking projections and oversized spans. Idem.

2.2.10 Natural Disaster Cycle

The Natural Disaster Management Cycle is an action plan that illustrates the process by which government, nongovernmental organizations and civil society plan how to reduce the impacts of disasters, methods of responding immediately to disaster and steps of recovery after the disaster has occurred.

Conceito de Risco



Risco é a combinação da interação entre Ameaça, Exposição e Vulnerabilidade, o qual pode ser representado pelos três lados do triângulo.

Se um destes lados aumentar, a área do triângulo também aumenta, e deste modo o Risco aumenta.

Se um dos lados diminuir, o Risco reduz.

Se pudéssemos eliminar um dos lados, então o Risco desaparece.

$$\text{Risco} = \text{Ameaça} \times \text{Exposição} \times \text{Vulnerabilidade}$$

Summaries of calamitous events affecting Mozambique, Figure1.

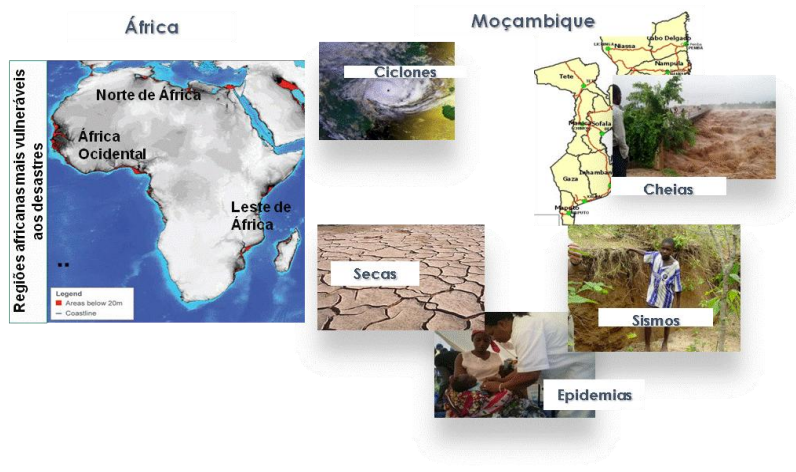


Figure 2 - Adaptation of the author

In order to better understand the causes and consequences of the impact of climate change on disaster risk in Mozambique, the INGC (National Institute for Natural Disaster Management) carried out a number of studies subdivided into different stages:

2008 - 2009: Comprehensive diagnosis of the Impact of Climate Change on the Risk of Disasters in Mozambique;
2009 - 2012: Identification of possible solutions combining measures of Disaster Risk Reduction and Adaptation to Climate Change;
2013 onwards: Implementation of the proposed solutions and appropriation of the results and methodologies used in the previous stages.

The results of the above studies have made it possible to scale up the process of vulnerability reduction and resilience building at national level with actions designed to be implemented at various levels in the short, medium and long term;
The studies constitute a scientific base of reference from which the Government of Mozambique can make decisions on reducing vulnerability to the risk associated with climate change;

Studies have shown that there is a need for a strong investment in human capital, particularly power holders for decision-making, in order to equip them with adequate insight, knowledge and tools on disaster risk reduction and its benefits to socioeconomic development.

1. Prior Notice to a Different Scale: To provide Mozambique with the capacity to analyze, plan and respond to a growing risk of disasters resulting from climate change, at micro and macro levels;
2. Coastal Protection: Identify the most vulnerable areas along the coast at the micro level, and (planned) investments at risk; recommending adaptation measures;
3. Prepare Cities: Help prepare cities, municipal officials and citizens to build resilience to climate change risks and implement opportunities;
4. Implement Adaptation, involving the private sector: Initiate the implementation of climate change adaptation, in a structured and sustainable manner, in partnership with the private sector;
5. Water, Do more with less: Increase Mozambique's capacity to manage water resources under increasing demand, variability and risk of disasters resulting from climate change;
6. Food security: Determine how significant productivity increases can be achieved in Mozambique under conditions of climate change, soil degradation and increasing water variability;
7. Extreme Analysis - Ocean Side: To increase understanding of extreme scenarios for Mozambique, including climate change in the oceans and potential impacts on fisheries;
8. Strategy: Provide an implementable national strategy to reduce the risk of increased disasters due to climate change.

2.2.11 Vulnerability factors identified in Mozambique are:

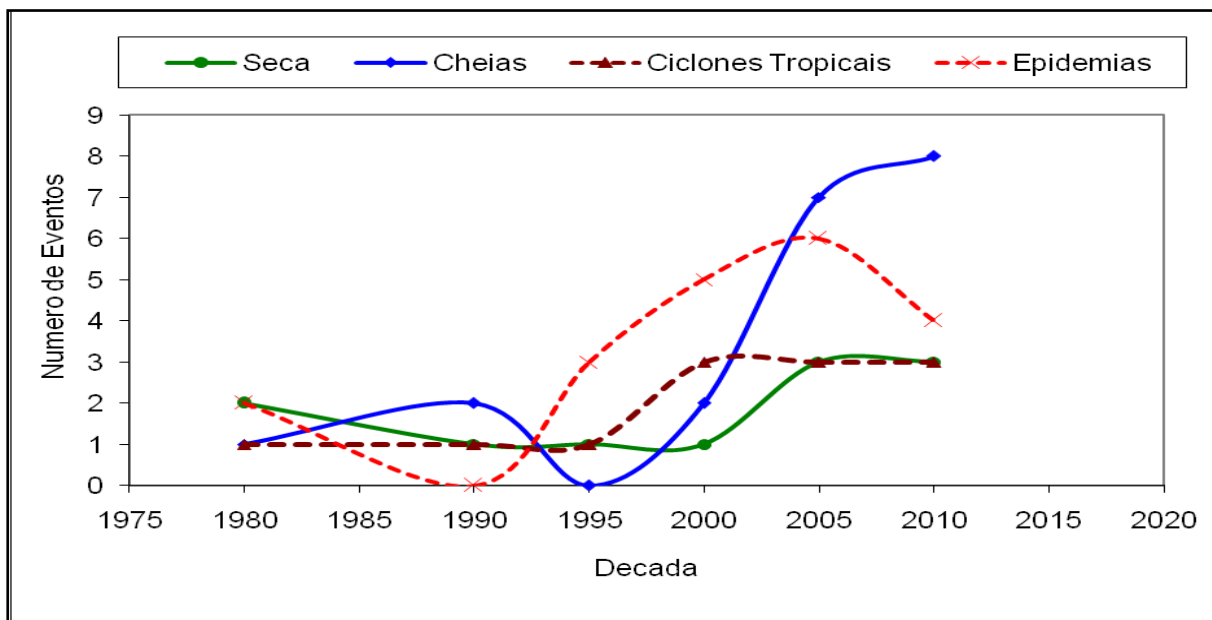
- ♣ Precarious housing, especially in rural and peri-urban areas and along river basins and near coastal areas;
- ♣ Socio-economic infrastructures (roads, bridges, schools, health units, etc.), mostly of little resilience;
- ♣ Lack of resources for investments in water management infrastructures; About 70% of the population dependent on agriculture and fisheries are activities dependent on climatic variability.

- ♣ Existence of informal neighborhoods in the main urban areas;
- ♣ No or poor functioning of rainwater, wastewater and / or whitewater runoff systems;
- ♣ Environmental sanitation problems; and
- ♣ Little popular or community knowledge about disaster risk management.

From the point of view of the history of natural disasters from 1980 to 2012, we can verify that

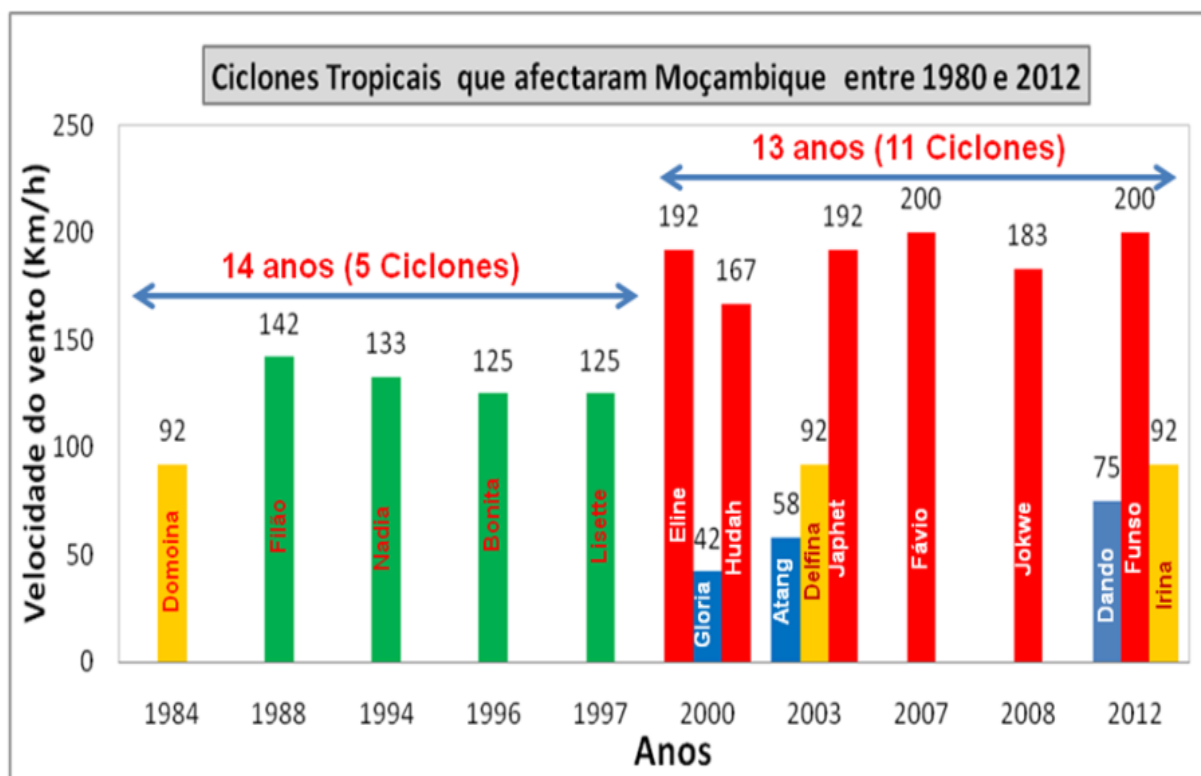
the floods respond by greater impact of their harmful effects. In average terms, Mozambique recorded a flood event every 1 to 2 years while droughts occurred every 2 to 3 years. See graph1

2.2.12 Historical evolution of natural disasters in Mozambique



Graph 1 - Source: INGC- - Historical evolution of natural disasters in Mozambique,

With regard to the tropical cyclones affecting Mozambique from 1980 to 2012, it can be highlighted that in 1984 Mozambique was hit by Cyclone Domina with a speed of 92 km / h, 2007 Flavia and Funso in 2012 reached 200 km / h, see figure 3 - on the trend of tropical cyclones.



Graph 3. Source: INGC

2.2.13 Vulnerability Factors

- ♣ According to the Local Facilitator Manual, vulnerability factors are a set of conditions that provoke vulnerability and are subdivided into physical, social, economic and environmental conditions that increase the susceptibility of a community or region to the impact of calamitous events.
- ♣ Precarious housing, especially in rural and peri-urban areas and along river basins and near coastal areas;
- ♣ Socio-economic infrastructures (roads, bridges, schools, health units, etc.), mostly of little

resilience;

- ♣ Lack of resources for investments in water management infrastructures;
- ♣ About 70% of the population dependent on agriculture and fisheries, which are activities dependent on climatic variability.
- ♣ Existence of informal neighborhoods in the main urban areas;
- ♣ No or poor functioning of rainwater, wastewater and / or whitewater runoff systems;
- ♣ Environmental sanitation problems; and
- ♣ Little popular / community knowledge about Disaster Risk Management. Existence of informal neighborhoods in major urban areas;

2.2.14 Disaster Management Cycle

The Natural Disaster Management Cycle in Mozambique comprises: Prevention, Mitigation, readiness, response and recovery, this is before, during and after a disaster.

Before the disaster occurs, it prepares itself, in this sense it is the phase in which the personnel training takes place, the additional means and the maintenance of the existent ones are acquired.

Also in this period the operational plan is drawn up, as forecasts for the probable events in the river basins expected to be affected by the floods, in case of needs additional means may be requested in neighboring SADC countries on the basis of existing relations without costs . During the occurrence of the disaster the civil protection unit is employed. It is at this stage that the response capacities are visualized in the sense of restoring normality as early as possible. In practice it is at this stage that the country has shown some limitations in the means used, and in the post-disaster phase, it provides humanitarian assistance to the populations consisting of tents, sanitation, rebuilding houses.

In the floods of 2006 the UNAPROC (National Civil Protection Unit) did search and rescue to 90,000 people, as early as 2013 only 1,000 people were saved, while many people had left the time in Chókuê in 2013 in terms of numbers around 60,000 people anticipated leaving alone in risk areas. This is indicative of the results of the work of raising awareness and

education of the populations that has been carried out at various levels. Informing the population of the risks of floods and what to do when a flood occurs.

2.2.15 Preventive measures in future floods

A set of measures is underway to prevent damage in future floods, which is to discourage the construction of homes and industries in malleable areas. At the level of protection, structural and non-structural measures are being adopted to reduce the likelihood of floods and their impact on specific areas; The construction of the Mapai dam is under way to divert a branch to arid zones, the construction of the Pandagua dam, these measures are included in the structural measures. Those responsible for this area consider that the construction of these dams completely eliminates the effect of Floods in the Limpopo and Zambezi Basins, as they have created a watershed.

Another aspect considered important is the system of previous notice that to operate it would avoid the high number of victims.

The system is affected by the following factors, namely:

- The flood warning system is installed in all river basins and managed by communities despite weak training.
- Low level of schooling of the population to cope with periodic readings and subsequent issuance of the warning has not been effective; and
- Has suffered vandalism by the popular, which consists of withdrawal of components of this system, especially the meter to manufacture home-made drinks.

○

2.2.16 Information Management in an Emergency Situation

Information management is an organized process of collecting data and other information from various sources, from its process and storage and from its dissemination to diverse

In the balance of management of floods, droughts and sales of 2015/2016, stands out food assistance to populations who lost their crops, opening water holes for the animals, distribution of seeds and animals.

There are still 64 deaths that have had as causes, entrapment by the waters, atmospheric discharges, house collapses, collapsed walls, drownings and electrocution. INGC report (2016)

In 2015/2016, floods affected the northern part of the country, while the southern and central zones were hit by a severe drought.

The impact on agriculture, total area cultivated was **4,799,935** ha, lost as the area of **878,739** ha, and were affected **468,000** producers throughout the country. See table 1.

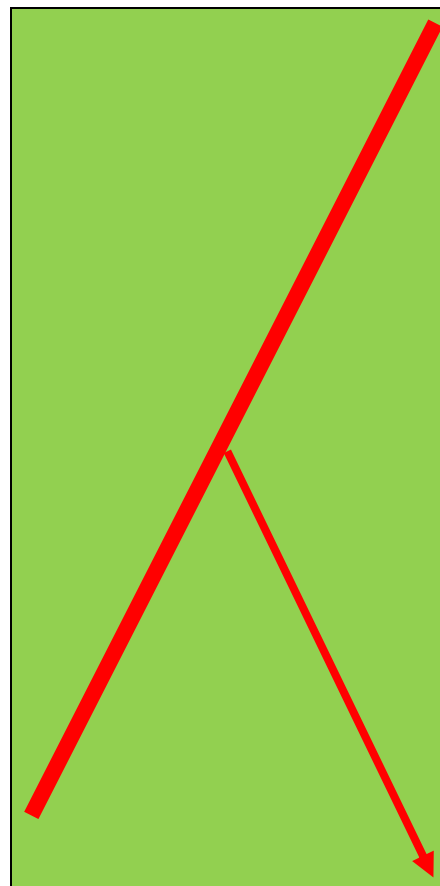
Impact of flood and drought on Agriculture.

Impacto na Agricultura				
Provincia	Fenómeno	Área Cultivada (ha)	Área Perdida (ha)	Produtores afectados
Niassa	Inundações	218,252	245	255
Cabo Delgado		387,293	2,675	2,871
Zambézia	Seca	1,189,315	8,024	6,094
Tete		872,329	125,882	106,928
Manica		973,599	236,038	115,572
Sofala		545,105	236,886	117,129
Inhambane		97,677	33,463	27,653
Gaza		426,541	174,082	49,285
Maputo Província		88,524	60,402	33,055
Maputo Cidade		1,300	1,041	9,163
Total			4,799,935	878,739

Table 1 - Source: INGC-2016

The impact on livestock, out of **1,798,000** cattle, **5,708** died and about 533,692 lives. Report (INGC - 2016).

3. SWOT Analysis

	<h3 style="text-align: center;">Strengths</h3> <ul style="list-style-type: none"> • Joint Planning • Improvement in the quality of information • Voluntary community participation in humanitarian assistance • Existence of Disaster Legislation • Approval of the Master Plan for the prevention and mitigation of disasters (preventive and proactive and non-reactive posture) 	<h3 style="text-align: center;">Weaknesses</h3> <ul style="list-style-type: none"> • Lack of capacity to provide humanitarian assistance to victims, (strong dependence on donations). • Failure to comply with measures in the Infrastructure • Vandalizing the means of prior information • Vulnerability enhancement
	<h3 style="text-align: center;">OPPORTUNITIES</h3> <ul style="list-style-type: none"> • High global awareness of natural disasters in particular in SADC • Existence of means of search and rescue 	<h3 style="text-align: center;">SUGGESTIONS</h3> <p style="text-align: center;">Increase research</p> <ul style="list-style-type: none"> • Focus on cooperation • Betting on experience and knowledge
<h3 style="text-align: center;">THREATS</h3> <ul style="list-style-type: none"> • Climate changes (95% are technological) • International Financial Crisis • Dams adjustment 	<h3 style="text-align: center;">SUGGESTIONS</h3> <ul style="list-style-type: none"> • Betting on mitigation • International partnerships • Construction of retention dams 	<h3 style="text-align: center;">SUGGESTIONS</h3> <ul style="list-style-type: none"> • Putting people in education • Re-equipping the sector • Leverage SADC capabilities

Source: Elaboration of the author

4. CONCLUSIONS AND RECOMMENDATIONS

As natural disasters have multiplied, the main conclusions are followed.

- ♣ The management of natural disasters in Mozambique occurs within the framework established by SADC and other legislation in force in the country;

- ♣ The factors that cause natural disasters in Mozambique are floods, cyclones, droughts and earthquakes, which endangers the safety of citizens and goods.

- ♣ The Theory of Security has multiple importance in our work, in the domains listed. Mozambique to better operationalize the actions of Disaster Risk Reduction (DRR), the development of policies, strategies gradually tending to involve more the military component in the civil defense, is in our understanding the reach of this theory regarding safety societal.

- ♣ Under the conditions of Mozambique, natural disasters cause damage to the economy and the social fabric, there is a need to focus on population education, structural and non-structural measures, bet on SADC and international cooperation.

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