

GEOGRAPHIC VULNERABILITY OF MOZAMBIQUE AND ITS EDUCATIONAL CHALLENGES IN THE FACE OF CLIMATE CHANGE

VULNERABILIDADE GEOGRÁFICA DE MOÇAMBIQUE E SEUS DESAFIOS EDUCACIONAIS FRENTE ÀS MUDANÇAS CLIMÁTICAS

LA VULNERABILIDAD GEOGRÁFICA DE MOZAMBIQUE Y SUS DESAFÍOS EDUCATIVOS FRENTE AL CAMBIO CLIMÁTICO



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ABSTRACT: The article aims to understand Mozambique's geographic vulnerability to climate change, considering the challenges related to rapid population growth and disorderly urbanization as factors that contribute to increasing its fragility, especially in relation to educational aspects. It is characterized as exploratory qualitative research and is based on critical-documentary analysis. The data indicates that, in the period from 1983 to 2023, Mozambique was impacted by more than 26 tropical cyclones, resulting in 6,249,273 people affected, 3,004 injured and 1,352 deaths. The study concludes that it is possible to reduce the consequences of these events through coordinated actions between different sectors and greater internal supervision. Among the alternatives, educational policies and reforms are recommended with the incorporation, into the school curriculum, of themes such as resilience, adaptation, resistance and surveillance, aiming to minimize the damage caused by climate change.

KEYWORDS: Geographic vulnerability. Climate changes. Educational challenges. Mozambique.

RESUMO: O artigo tem como objetivo compreender a vulnerabilidade geográfica de Moçambique diante das mudanças climáticas, considerando os desafios relacionados ao rápido crescimento populacional e à urbanização desordenada, fatores que contribuem para aumentar sua fragilidade, especialmente em relação aos aspectos educacionais. Caracteriza-se como uma pesquisa de natureza qualitativa exploratória e fundamenta-se na análise crítico-documental. Os dados indicam que, no período de 1983 a 2023, Moçambique foi impactado por mais de 26 ciclones tropicais, resultando em 6.249.273 pessoas afetadas, 3.004 feridos e 1.352 óbitos. O estudo conclui que é possível reduzir as consequências desses eventos por meio de ações coordenadas entre diferentes setores e uma maior fiscalização interna. Dentre as alternativas, recomendam-se políticas e reformas educacionais com a incorporação, no currículo escolar, de temas como resiliência, adaptação, resistência e vigilância, objetivando minimizar os danos causados pelas mudanças climáticas.

PALAVRAS-CHAVE: Vulnerabilidade geográfica. Mudanças climáticas. Desafios educacionais. Moçambique.

RESUMEN: El artículo tiene como objetivo comprender la vulnerabilidad geográfica de Mozambique frente al cambio climático, considerando los desafíos relacionados con el rápido crecimiento demográfico y la urbanización desordenada como factores que contribuyen a aumentar su fragilidad, especialmente en relación con los aspectos educativos. Se caracteriza por ser una investigación cualitativa exploratoria y se fundamenta en el análisis crítico-documental. Los datos indican que, en el período de 1983 a 2023, Mozambique se vio impactado por más de 26 ciclones tropicales, lo que resultó en 6.249.273 personas afectadas, 3.004 heridos y 1.352 fallecidos. El estudio concluye que es posible reducir las consecuencias de estos eventos mediante acciones coordinadas entre diferentes sectores y una mayor supervisión interna. Entre las alternativas, se recomiendan políticas y reformas educativas con la incorporación, en el currículo escolar, de temas como resiliencia, adaptación, resistencia y vigilancia, con el objetivo de minimizar los daños causados por el cambio climático.

PALABRAS CLAVE: Vulnerabilidad geográfica. Cambio climático. Desafíos educativos. Mozambique.

Introduction

Climate change represents one of the greatest global challenges facing humanity in the 21st century. Its harmful ramifications are clearly visible, especially in the social and economic spheres, resulting in an abrupt change in the way and quality of life of the populations directly impacted. Studies, such as those by Nicolodi and Petermann (2010), defend the need to develop integration actions between different sectors of society. Amid these transformations, education plays a vital and challenging role in preparing current and future generations to understand, face and mitigate the effects of climate change.

Faced with this problem, a plurality of global studies emerges that are dedicated to understanding this phenomenon from different perspectives and analytical approaches (Plutzer; Hannah, 2018; Cantell *et al.*, 2019; Lagos; Martínez-Abad; Ruiz, 2019; Ballinger; Jeanette, 2020). According to Gómez and Cartea (2019), these investigations direct their attention to organizational complexities, highlighting the pressing need to prioritize research that is dedicated to unveiling effective strategies for developing an educational curriculum that substantially expands the resilience and resistance capacity of educational policies, both internally and externally to the educational system (Mutote; Santos, 2022).

Mikulewicz (2019) highlights that, over the last two decades, the concept of resilience has risen in importance in discussions that permeate both the theory and practice of adaptation to climate change. However, there is growing skepticism in critical social science circles regarding the limited empirical evidence on the effectiveness of this approach at the local level (Taylor; Stouffer; Meehl, 2012).

The etymological principles of resistance and resilience, used in this study, represent interdisciplinary approaches, whose purpose is to provide a set of tools designed to strengthen the adaptive strategies of educational policies in the face of the climate crisis in Mozambique. Furthermore, they seek to program strategic actions aimed at responding to the impacts caused by climate change and triggering preparation to face future environmental disasters (Collen, 2019). In this sense, the ability to adapt is intrinsically part of resilience, as outlined by Folke (2006). According to Collen (2019), the word “adaptation” refers to the ability to make adjustments to ecological, social or economic systems in reaction to tangible or anticipated climate stimuli, including their consequences and effects.

With regard to resilience, authors such as Holling (1973) and Ribeiro (2007) conceptualize it as a measure of the tenacity of systems, as well as their ability to absorb transformations and disturbances, whilst still maintaining the relationship between populations

or variables unchanged at the state level. Furthermore, it is possible to interpret resilience as the ability to face risks, including those arising from climate change induced by humanity (Holling, 1973).

Based on the concepts of resistance and resilience, it is understood that the lack of adequate intervention and preparation instruments to mitigate catastrophic impacts in Mozambique, which may be caused by climate change, play a crucial role in the systematic failure of school administration in confronting of the climate crisis. In this case, taking into account the vulnerability of Mozambique's geographic location linked to rapid population growth, disorderly urbanization and the constant incidences of natural disasters suffered by the country, questions arise: what are the challenges to reducing the impacts of climate change in the educational and What possible strategies can be adopted to strengthen the country's resilience?

Therefore, the purpose of this study is to understand the vulnerability of Mozambique's geographic location to climate change, associated with problems related to rapid population growth and disorderly urbanization, as factors that contribute to greater fragility, both in relation to extreme events (tropical cyclones) as significant impacts on children's learning processes. Specifically, we sought to highlight the actions, policies and strategies carried out by the government of Mozambique together with its cooperation partners, and their alignment or not in building resilience from the point of view of preparing and training the populations that seek these places.

Methodology

It is characterized as qualitative research of an exploratory nature (Creswell; Clark, 2013). It takes as sources the data made available by the National Institute for Disaster Risk Management and Reduction (INGD) for cyclonic seasons between 1980 and 2022, obtained by researchers through visits and consultation of INGD's internal data relating to the research topic. Climate databases on the Impact of Climate Change on Sanitation in Mozambique (*WaterAid*) and on the total number of population existing in the national territory through the National Statistics Institute (INE) were also considered.

With the aim of obtaining information about the (in)capacity of resilience of educational policies at primary level in the face of the climate crisis in Mozambique, data collection took place between April and May 2023. In this process, visits were carried out at INGD facilities

in period from April 4th to May 2nd, 2023 and from INE between May 16th and 23rd, 2023. For data processing, the *software Excel* to produce Table 1 and Graphs 1 and 2. Each percentage presented in the graphs is the result of the difference between the population according to their gender and year. To create the map of Mozambique (Figure 1), the *ARCMAT software* was used.

In this process, the following were considered for the analyses: a) the geographical characteristics of Mozambique; b) the number of cyclones that occurred in Mozambique in the period from 1980 to 2022; c) the number of deaths caused by these cyclones; d) Mozambique's population growth between 2007 and 2023. To conduct analysis of the results, Figure 1, Table 1 and Graphs 1 and 2 were used.

Results

Geographical characteristics of Mozambique

Mozambique is a country located in the Southern African region, on the eastern coast of the African continent, south of the equator. It borders Tanzania (north); Malawi, Zambia (northwest); Zimbabwe, South Africa and Swaziland (west); and South Africa (south) is bathed by the Indian Ocean (east), called the Mozambique Channel, which borders Madagascar and the Comoros, encompassing Mayotte. Furthermore, Mozambique has three main forms of relief: plains, plateaus and mountains.

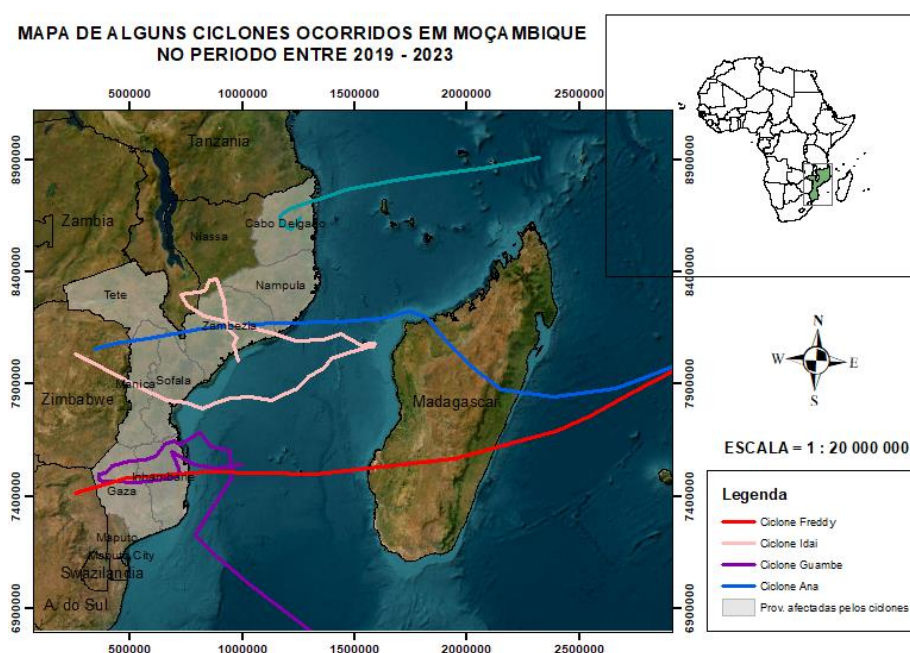
The plains extend along the entire coast, with a maximum altitude of 100 meters and, from the coast to the interior (in the river valleys), with altitudes that vary between 100 and 200 meters. The plateaus are located in the center and north of the country, covering the provinces of Tete, Manica, Niassa, Zambézia, Nampula and Cabo Delgado, with altitudes varying between 200 and 500 meters (medium plateaus) and between 500 and 1000 meters (*altiplanaltos*). The mountains are located in the center and north of the country, specifically in the provinces of Manica, Zambézia and Niassa.

Regarding climate, the country presents four variations: a) humid tropical characterized by the rainy season with average annual temperatures varying between 24°C and 26°C, which occurs in the central and northern regions of the country; b) dry tropical with average annual temperatures above 26°C, predominant in the south of the country; c) high-altitude tropical with average annual temperatures below 22°C, present in higher altitude areas, with rainfall throughout the year; and d) semi-arid tropical with average annual temperatures ranging

between 24°C and 26°C, predominant in the interior of the province of Gaza, specifically between Chicualacuala and Massingir.

With regard to river basins, Mozambique is crossed by several rivers (Lúrio, Rovuma, Zambéze, Búzi, Púngue, Save, Incomati, Limpopo and Maputo), in addition to having natural lakes (Niassa, Chirua, Chiúta and Amaramba) and lakes artificial (Cahora Bassa, Chicamba Real, Pequenos Libombos, Corumana and Massingir). In relation to flora, the country has: a) dense forest, made up of tall trees close together; b) open forest, composed of trees of similar height; in both forests, the presence of small animals predominates, such as monkeys, snakes, lizards, crows, hummingbirds, herons, owls, butterflies, beetles, ants, among others; c) savanna, with scattered trees of different sizes and a large presence of herbs; In this region, the fauna is made up of large animals, such as buffaloes, elephants, antelopes, zebras, giraffes, lions, leopards, panthers, cheetahs and hippos. The country has arable soils, suitable for plant cultivation and agricultural practice, and non-arable soils, unsuitable for agriculture.

Furthermore, the country has natural resources, goods originating from nature and used by human beings for various purposes. These resources can be classified as renewable and non-renewable. Renewable resources are those that do not run out, but are constantly renewed by natural processes. Non-renewable resources are goods that can be exhausted or diminished if they are used excessively by humans. Based on this characterization and with the aim of highlighting Mozambique's vulnerability index in relation to the probability of being affected by cyclones, Figure 1 was created.

Figure 1 – Some cyclones that hit Mozambique in the period between 2019 and 2023.

Source: Authors' elaboration.

Figure 1 represents the geographic map of Mozambique, highlighting the following aspects: the limits with neighboring countries and the provinces most affected by tropical cyclones, which have hit the country in the last four years (2019-2023). The green line represents cyclone Kenneth, which caused a major impact in the province of Cabo Delgado in 2019. In the same year, cyclone Idai, represented by the pink line, had a greater incidence in the provinces of Sofala, Manica, Zambézia and Nampula. The lilac line illustrates the movement made by cyclone Guambe in the province of Inhambane in 2021. The blue line describes the trajectory of cyclone Ana, which hit the province of Zambézia with greater intensity in 2022. The red line indicates the trajectory of cyclone Freddy, which mainly affected the provinces of Inhambane and Gaza in 2023.

Extreme events, such as tropical cyclones, began to be monitored in the national territory of Mozambique after the proclamation of independence on June 25, 1975. From 1983 onwards, with the creation of several institutions, such as the current National Institute of Management and Reduction of Disaster Risk (INGD), these events began to be recorded systematically. Table 1 presents the 26 tropical cyclones that hit Mozambique in the period from 1983 to 2022, with information on their names, years, wind strength, number of people affected, injured and killed in the country.

Table 1 – List of cyclones that hit Mozambique in the period from 1983 to 2022

Cyclone names	Years of occurrence	Maximum wind (km/h)	Number of affected	Number of injured	Number of deaths
Demoina	1983/84	100	35,000	-	109
Filao	1987/88	142	-	-	-
Nadia	1993/94	220	903	-	54
Bonita	1995/96	250	98,727	-	6
Lisette	1996/97	125	-	-	-
Eline	1999/00	215	26,101	-	57
Gloria	1999/00	42	-	-	-
Atang	2001/02	58	-	-	-
Delfina	2002/03	100	268,129	-	59
Japhet	2002/03	140	105,231	-	7
Flavio	2006/07	222	194,112	-	61
Jokwe	2007/08	150	166,127	41	17
Dando	2011/12	220	15,352	27	28
Funso	2011/12	200	-	-	-
Irina	2011/12	100	4,550	14	9
Dineo	2016/17	155	173,990	215	7
Desmond	2018/19	130	64,699	-	-
Idai	2018/19	280	1,514,662	1642	603
Kenneth	2018/19	230	550,959	101	7
Chalane	2020/21	111	289,987	94	45
Eloise	2020/21	165	73,254	13	11
Guambe	2020/21	155	469,831	25	11
Ana	2021/22	130	185,429	25	two
Gombe	2021/22	230	736,015	108	63
Dumako	2021/22	165	23,733	1	14
Jasmim	2021/22	-	-	-	-

Source: Author's elaboration,

According to Table 1, the number of tropical cyclones occurring in Mozambique, without including other extreme phenomena such as droughts, floods, floods and earthquakes of lesser magnitude, highlights the fragility and vulnerability of the country's geographic location.

These events, in turn, result in a setback in the implementation of public policies, such as schools, hospitals, bridges, housing and roads, in addition to the impact on institutions, placing the country in an increasingly underdeveloped state. Furthermore, there is an increase in human losses, the number of orphaned children and people with disabilities. Another consequence of these events is rapid population growth and disorderly urbanization.

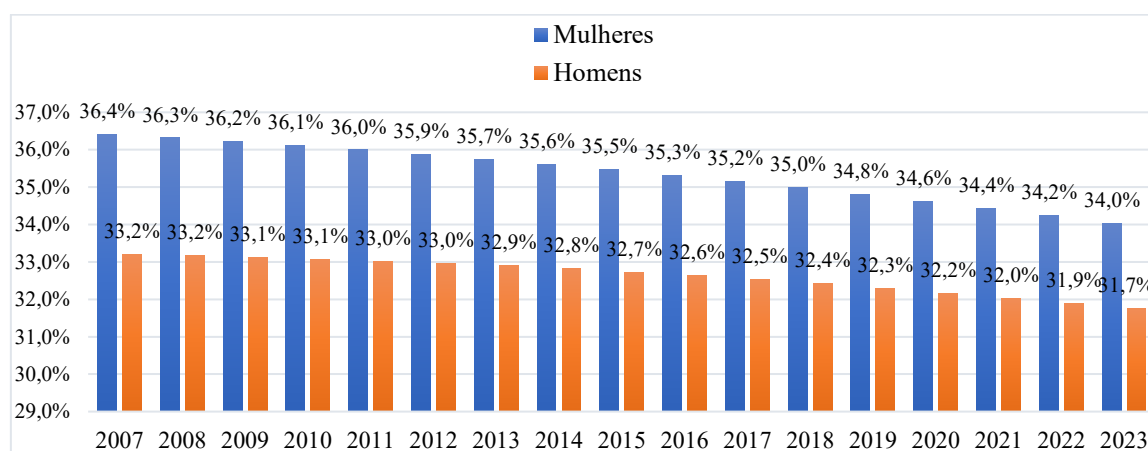
We note in Table 1 that, in the period from 1983 to 2023, a total of 26 tropical cyclones were recorded, affecting 6,249,273 people, leaving around 3,004 injured and resulting in 1,352 deaths. Furthermore, we can see that some periods (1999 to 2000, 2002 to 2003, 2011 to 2012, 2018 to 2022) were especially critical in terms of the number of cyclones occurring in a short space of time, with a frequency of 2, 3 or 4 cyclones in one or two years.

Table 1 also shows that the cyclone that caused the greatest human impact in Mozambique was Idai in 2018/19, with wind speeds of up to 280 km/h, affecting 1,514,662 people, leaving 1,642 injured and causing 603 deaths. On the other hand, Cyclone Jasmim in 2021/22 had a smaller impact, leaving no significant consequences.

Population growth in Mozambique between 2007-2023

The instrument used to count the total number of the population in Mozambique is the population census. Since the proclamation of independence in 1975 until the time of this study, the country has carried out four population censuses (1980, 1997, 2007 and 2017). In the first census (1980), the housing issue was not included. At that time, the objective of the Mozambique government was to count the number of people in Mozambican territory. Probably, the justification for this exclusion is related to the fact that during the colonial war, which began in 1964 and resulted in the proclamation of independence in 1975, many people were displaced from their areas of origin to safe places amid the context of war. Only from the second census (1997) onwards was the relevance of including the housing issue considered.

Graph 1 – Gender percentages in the rural population of Mozambique from 2007 to 2023.⁴

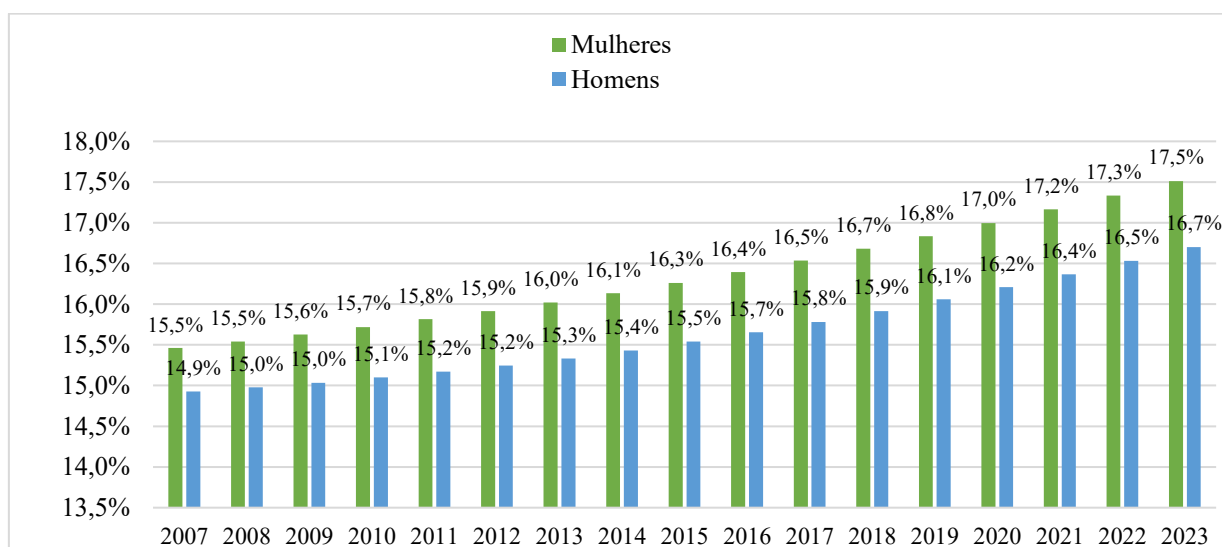


Source: Authors' elaboration.

⁴ Blue: Women; Orange: Men.

In Graph 1, it can be seen that the female population is larger than the male population in every year, with an average annual difference of 0.7% in relation to the total population of the urban area. In both projected groups, there is an increase in population, with the male population showing an average annual increase of 0.11% in the total population of the urban area. On the other hand, the female population shows an average annual increase of 0.13%, registering the largest increase.

Graph 2 – Gender percentages in the urban population of Mozambique from 2007 to 2023.⁵



Source: Author's elaboration.

In Graph 2, it can be seen that the total female population in all areas is greater in relation to the male population, with an average annual difference of 3.4%. The female population shows an average annual reduction of 0.02%, while the male population increases in the same proportion, from 2007 to 2023. When analyzing Graph 2, it can be seen that the percentage of the total population in the urban area has been growing gradually, result of an exodus from rural areas (according to Graph 1) in all years, presenting an average difference of 36.0%. It is observed that in rural areas, as time progresses, the population decreases in the same proportion (0.24%). On the other hand, the total increase in the population in the urban area from 2007 to 2023 is 3.8%, corresponding to the same percentage of population reduction in the rural area in the same period.

⁵ Green: Women; Blue: Men.

Discussion

Currently, the climate crisis has been considered one of the main threats to the way of life of all living beings on our planet (Alves, 2019), and not just exclusive to Mozambique. This evidence has been reinforced by studies released by the Intergovernmental Panel on Climate Change (IPCC), the United Nations High Commissioner for Refugees (UNHCR) and the World Meteorological Organization (WMO). These sources corroborate that the average temperature on the Earth's surface has shown a continuous increase, driving the occurrence of extreme environmental phenomena, including cyclones, and consequently, leading to the displacement of people around the world. These factors are generally associated with rapid population growth, disorderly urbanization, environmental sanitation problems, lack of clarity in territorial planning policies, poverty, among others.

Given this scenario, it is necessary to promote spaces for discussions about the effects of climate change (Verderio, 2021). In this sense, environmental education, when effectively inserted into school curricula, presents itself as a field of study that can lead people, from a young age, to understand the causes, impacts and plan the adoption of resilience mechanisms and practices to face challenges arising from natural disasters caused by climate change.

Based on the analysis of the sources, it is identified that, although Mozambique presents a rich diversity in terms of forests, fauna, soils and natural resources, it occupies third position among the African countries most vulnerable to disasters, such as droughts, floods, cyclones, epidemics and earthquakes of lesser magnitude (Wateraid, 2022). This finding is in line with the study by Macane and Mate (2022), who classified Mozambique as the fifth most vulnerable country in the world with regard to the vulnerability index to climate change. This vulnerability is mainly due to factors such as exposure to climate risk, weak socioeconomic, technological and financial development, poverty and lack of human resources with knowledge about extreme events.

As it is located along the Rift Valley, one of the regions with the greatest seismic activity and susceptible to hydrometeorological disasters, Mozambique becomes more susceptible to strong winds and cyclones. This region is home to around 60% of the country's population and concentrates most of the infrastructure, including roads, water supply systems, schools and hospitals, which are in poor maintenance conditions. This, in turn, considerably amplifies vulnerability to catastrophic events of natural origin (Macane; Mate, 2022).

Faced with imminent threats, over the last few years, the government of Mozambique has implemented several actions, programs, strategies and measures with the aim of minimizing

the negative consequences resulting from climate variations and aligning itself with global initiatives. These actions include: a) ratification of the United Nations Framework Convention on Climate Change (UNFCCC) (Mozambique, 2022), incorporating Mozambique's immediate and pressing adaptation needs; b) strengthening the country's early warning system; c) promoting public awareness and disseminating information about climate change; d) improving institutional coordination between entities involved in identifying the country's vulnerabilities and reducing risks associated with disasters; e) incorporation of climate change into district planning (Wateraid, 2022).

According to Afonso (2021), at a national level, the government of Mozambique has consolidated its policies, strategies and actions related to mitigation, adaptation and building resilience, which include: a) Environmental Law No. 20/97 (Mozambique, 1997); b) the Disaster Risk Management and Reduction Law No. 10/2020 (Mozambique, 2020); c) the Master Plan for the Prevention and Mitigation of Natural Disasters (2006-2016) (INGC, 2006), which introduced a new proactive approach with the aim of minimizing the vulnerability of local communities, the economy and infrastructure; d) the Master Plan for Disaster Risk Reduction (2017-2030) (INGC, 2017), designed to adapt to current conditions outlined by climate change at a global and national level; e) the Nationally Determined Contribution Plan in the context of the Paris Agreement (Mozambique, 2018), referring to climate change with 25 strategic actions, two of which focus on the water resources, water supply and sanitation sector; f) the National Determined Contribution (NDC) for the period 2020-2025, which was presented at the United Nations Climate Change Conference (COP26) in Glasgow. Furthermore, in 2012, the National Strategy for Adaptation and Mitigation of the Effects of Climate Change (2013-2025) (Mozambique, 2012) was developed, which particularly prioritizes the optimization of drainage and sanitation systems, both in environments rural and urban (Wateraid, 2022).

After being forced to establish institutional mechanisms in response to the negative consequences caused by cyclones Idai and Kenneth, the Government of Mozambique established the Post-Idai Reconstruction Office in 2019. However, some institutional obstacles were identified in mitigating the impacts of these cyclones, such as: insufficient inclusion of activities in management plans; limited implementation of local risk management committees at community level (in air and land); excessive bureaucracy; poor communication between different levels of government administration; financial difficulties; lack of staff training to face extreme situations; low investment in research in institutions; unsatisfactory quality of

technological devices used by meteorological services; as well as substantial challenges in territorial ordering at municipal level (Mutote; Santos, 2022).

Regarding the challenges faced, the country is faced with limited investments in modern technology and limitations in infrastructure related to health, sanitation and education. Furthermore, the Mozambican legal framework still does not adequately address climate change as a threat to these sectors. There is also a lack of strategic alignment between municipal, district, provincial and national bodies to address these three issues and climate change, which is aggravated by rapid population growth and disorderly urbanization.

In Mozambique, accelerated population growth is not accompanied by effective urban public policies (Matos, 2021). Due to the high rate of poverty, people are often forced to migrate from their areas of origin (peri-urban areas) to rural areas in search of subsistence and, mainly, to build their homes. In rural areas, people face problems associated with urban mobility and sanitation, as well as precarious housing conditions, with undivided land, lack of information about risks, lack of topographical studies and use of precarious materials in construction (Maloa; Júnior, 2018; Maloa, 2019). Furthermore, acts of corruption occur related to the sale of land, although it is prohibited by law to sell land that is owned by the Mozambican State.

In the case of urban areas, it is observed that, due to the high cost of living, people flock to peri-urban areas, which lack adequate urban infrastructure and face sanitation problems. These areas largely depend on informal work. In turn, municipalities, responsible for urban management, face financial difficulties both in building new infrastructure and maintaining existing ones (Baia, 2009).

It is understood that the process of moving populations from one region to another (migration), due to the consequences of natural disasters that have occurred in Mozambique over the years, has accentuated aspects of vulnerability. These include classrooms that are constantly affected or completely destroyed, which, after a natural disaster, served as emergency shelter for the homeless, especially women and children, interrupting the school cycle. This results in prolonged interruption in access to education, with no scheduled date for return. Furthermore, it has caused an increase in children dropping out of school, caused by deaths, injuries or the loss of those responsible for their education, causing a process of school dropout due to the lack of guidance or because they started to live far from school. Teachers, in turn, face difficulties teaching, either because their homes have been destroyed or because schools do not have the minimum conditions to serve children. All of these factors have conditioned a set of efforts undertaken by authorities at local/central level in Mozambique, in

an attempt to minimize the negative effects caused by natural disasters, caused mainly by climate change at a global level.

Another negative externality of travel caused by climate change, in the teaching and learning process, is centered on people's historical and cultural issues. As children live and coexist in environments that are completely foreign to what they know, they lose their emotional ties with their ancestors. This is particularly significant in Africa and Mozambique, where most cultures have a strong connection with their ancestors, and worship them through various rituals to ask for better luck or free them from afflictions and problems. The problem of not belonging to new places and the difficulty of concentrating on the learning process also arises. Children take some time to adapt to new school contexts, which can be accentuated by the lack of psychological assistance and pedagogical support.

Gómez and Cartea (2019) emphasize that the current climate crisis represents a threat to contemporary humanity. For the authors, this fact demands the implementation of emerging and assertive educational policies, capable of addressing climate change and its impacts within the scope of the curricula of basic and higher education institutions, as well as promoting educational practices in other social contexts.

It is understood that a careful review of basic education curricula in Mozambique, incorporating environmental education with a transversal approach, will allow to expand the spirit of resilience in the lives of students, educators and the entire school community. This effect results from the training of students with knowledge, converting them into agents of social transformation in their respective locations, through behaviors that reflect their ecological awareness and engagement.

For this purpose, it is imperative to highlight that the development of political and educational strategies at national level, aimed at dealing with the impacts generated by the global climate crisis and, specifically, in Mozambique, emerges as one of the sustainable measures that reinforce the capacity for adaptation, mitigation, awareness, supervision and broad social mobilization among students, educators and local communities.

Given the consequences caused by climate change, some initiatives are necessary to address this problem. One of them lies in the importance of transcending disciplinary boundaries and approaching the issue of Environmental Education as a multidimensional problem that needs to be worked on in an interdisciplinary way and from a holistic approach. An interdisciplinary approach is necessary, integrating scientific, social, economic and ethical knowledge to understand and deal with this phenomenon. Developing curricula that incorporate

this holistic view can be a challenge, but it is crucial to form citizens capable of analyzing, questioning and proposing solutions to the climate crisis.

Another aspect that can help minimize the current scenario of climate change caused by humanity concerns teacher training. In this sense, higher education courses must effectively address climate change in their classes so that future educators can work on the topic critically. Well-trained teachers are able to transmit knowledge more effectively, stimulating practical actions and encouraging critical reflection on environmental issues among their students.

Innovation and technology in education also play a crucial role in raising awareness and engaging students. Interactive platforms, digital resources and learning tools can be explored to make environmental issues more accessible and engaging for students, promoting experimentation and problem-solving. Overall, climate change education is not just about informing, but collective action to empower individuals to take action. Encouraging students' active participation in sustainability projects and involving them in practical collective actions is essential. This can range from implementing sustainable practices at school to engaging in community projects or even environmental awareness campaigns.

Final remarks

The study showed that, in the period from 1983 to 2023, Mozambique has already been hit by at least 26 tropical cyclones, which affected 6,249,273 people, left 3,004 injured and caused 1,352 deaths. It is also observed that the years between the end of the last century (1999) and the two decades of the 21st century (2000 to 2022) were the most critical in terms of the number of cyclones occurring in a short space of time, with a frequency of 2, 3 and 4 cyclones for one or two years.

It appears that rapid population growth is not being accompanied by the construction of new infrastructure and supervision of the occupation of environmentally delicate areas or areas susceptible to natural disasters. For this reason, the WaterAid report shows that, by the year 2020, around 771 million individuals still lacked access to drinking water, 1.6 billion faced a lack of basic sanitation and 2.3 billion required services basic hygiene, including 670 million people without access to any hand hygiene facilities.

The most economically disadvantaged communities, lacking access to essential health services, maternal and child care and injury treatment, combined with reduced educational levels, less prosperity and location in remote and rural areas with few or expensive

transportation options, are faced with challenges regarding access to public health care and education. Such communities are forced to migrate to regions far from urban centers and, consequently, face problems associated with urban mobility and sanitation.

Another factor that puts the lives of financially poor people in Mozambique at risk is intrinsically linked to corruption, through the sale of spaces that, according to land law, are owned by the State and should not be sold. In these cases, it is necessary to articulate public policies according to objectives and needs, given the high percentage of the total population in urban areas, which is higher than in rural areas. The displacement of populations from one region to another caused by climate change has had a negative impact on social, economic areas and especially education, as they are grouped into a set of elements that unfold from this new social demand. These climatic phenomena have also generated weaknesses in infrastructure, loss of the history and culture of a given region, influencing children's learning processes, as they find themselves in the constant process of migration, generating all the problems of large centers.

Facing educational challenges in the face of climate change requires a joint effort from governments, educational institutions, teachers, students and communities. Education not only informs, but empowers people to understand, question and act. Therefore, an integrated and comprehensive approach to education is crucial to prepare future generations to face and mitigate the challenges posed by climate change.

Within the Mozambican educational context, it is considered essential that reforms extend not only to educational policies, but also to the school curriculum, through the integration of topics related to local knowledge, information, surveillance, resilience, adaptation, mitigation, resistance and transformation Social. This approach aims to mitigate the harmful effects of climate change. It remains a challenge, for future studies, to analyze how school managers, teachers, those in charge of education and students in Mozambique have interpreted the impacts caused by natural disasters in the educational sphere.

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