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Assessing Progress in Reducing the Number of Disaster-affected People: Insights from Zimbabwe

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ABSTRACT

In 2015, 187 countries appended their signatures to the Sendai Framework for Disaster Risk Reduction. This framework has seven global targets which need to be monitored both at national and global levels. In order to promote the monitoring and reporting on progress in attaining the global targets, the United Nations Office for Disaster Risk Reduction provided some technical guidance notes and methodologies. Using the case study of Zimbabwe, this study used the technical guidance notes and methodologies to assess the country's progress in reducing the number of people affected by disasters. Quantitative data for this assessment came from public sources published by the Government of Zimbabwe spanning the period 1990 to 2019. This data was analysed using 3-year and 5-year moving averages. In addition, the study used qualitative interviews to explain the trends in the number of people affected by disasters. Results showed slight decreases in the number of people affected by both aggregated and disaggregated disasters. Drought disasters emerged as the only one that affected millions of people yearly. However, storms and epidemics were sporadic and characterised by big spikes. The study concluded that Zimbabwe is slowly attaining Target B. The study further offered three policy implications that are meant to significantly reduce the number of people affected by disasters. This includes the need to strengthen drought preparedness/mitigation, and disease surveillance and control systems.

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1. Introduction

Worldwide, disasters including drought, floods and tropical storms affect millions of people [1]. In particular, floods and tropical storms have dominated the hydrometeorological disasters in many places [2, 3]. These disasters affect people in many ways including destroying/damaging their homes, disrupting their livelihoods and causing injuries [4, 5]. In many cases, developing countries are among the worst affected due to their limited capacities for preparedness and mitigation [6]. For example, the 2010 floods in Pakistan, affected about 24 million people by damaging approximately 2 million hectares of crops [7]. In Bangladesh, hailstorms, floods and droughts are increasingly reducing the production of crops [8, 9]. In East and Southern Africa, Cyclone Idai and Kenneth damaged homes and disrupted the livelihoods of more than 3 million people in 2019 [10].

Zimbabwe has not been spared by such disasters. The country is prone to droughts, floods and hailstorms [11, 12]. Given this, Zimbabwe joined other countries in adopting a global framework for disaster risk reduction - the Sendai Framework for Disaster Risk Reduction (SFDRR) in 2015. The SFDRR has seven global targets which need to be monitored both at national and global levels. Target B of the SFDRR seeks to substantially reduce the number of disaster-affected people by 2030 [13]. The adoption of the SFDRR marked a shift from managing disasters to managing disaster risks [14]. It showed a high-level political commitment to reduce the number of people affected by disasters. In particular, Target B is expected to facilitate a systematic collection of disaggregated data at all levels with the key intent of monitoring national progress in reducing the number of people affected by such disasters. This would inform decision- and policy-making processes at the national level [15]. However, three questions arise regarding Target B: To what extent are countries living up to their commitment? What efforts are individual countries putting in order to substantially reduce the number of disaster-affected people? What challenges are, or may be hindering the achievement of Target B? These questions are pertinent because hydrometeorological disasters are projected to increase in frequency and intensity due to climate change [5]. While some places are likely to experience increased risks, others may face new risks they never anticipated. Consequently, the number of people affected by such disasters may increase. The present study contributes to the disaster risk reduction (DRR) scholarship and SFDRR in particular, by bringing in disaggregated data of people affected by disasters from a developing country, Zimbabwe.

In order to avoid different conceptualisations of disasters, the United Nations (UN) provided this definition: a serious disruption of the functioning of a community at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to human, material, economic and environmental losses and impacts' [16]. This definition enables countries to comprehensively define the people who are affected by disasters and to measure their progress in achieving Target B of the SFDRR. Zimbabwe is among the countries which adopted the UN definition of a disaster. A declaration of a state of disaster is made by way of a statutory instrument whenever there is widespread human suffering and or, huge economic losses which may require extraordinary measures to assist the affected people [17]. Thus, for an event to be declared a disaster, the government of Zimbabwe considers not only the number of fatalities but also the extent of economic damage and the number of people affected. In some cases, an appeal for international assistance is made to scale up the mobilisation of resources for response and recovery [18]. Therefore, this study used Zimbabwe as a case study to assess progress in achieving Target B of the SFDRR. It answers these two research questions: To what extent is Zimbabwe moving closer to attaining Target B of the SFDRR? Based on lessons learned from Zimbabwe, what can other countries do to reduce the number of disaster-affected people?

2. Determining the Number of Disaster-affected People

Although the world agreed to bring down the number of people affected by disasters by 2030 [13], there remain many challenges in achieving that target. In many developing countries, disaster databases are either non-existent or are at different levels of establishment [19]. As a result, the data is incomplete, leading to significant variations among the estimated people [20, 21]. In some cases, consistently measuring the number of people affected by disasters in a verifiable way is very difficult [22]. This is partly due to the different interpretations of the term 'affected'. People can be affected directly or indirectly by disasters [23]. On the one hand, the directly affected people are determined by counting those who suffer injury or illness; people who get evacuated, displaced, or relocated as a result of a disaster; or those who suffer direct damage or destruction to their livelihoods and dwellings [14]. On the other hand, the indirectly affected people are those who suffer the consequences of a disaster through disruption or changes in the economy, critical infrastructure, basic services, commerce, work or other social consequences [14]. While counting people whose homes are destroyed/damaged by disasters may be easy, indirectly impacted people are difficult to establish. For example, the number of people affected by the 2010 Haiti earthquake ranges between 1.5 million and 3 million partly owing to the different pathways in which people were affected [24, 25]. Such pathways include tsunamis, slope failure, coastal flooding, ground motion and an outbreak of cholera [26]. During disasters, people can also suffer short- or long-term consequences to their lives and livelihoods [27, 28]. For example, drought has been observed to substantially reduce the quality of livestock productivity in developing countries [29]. Likewise, flooding may result in acute stress, depression, and post-traumatic stress disorders among the people affected [6]. Counting people affected in such ways is very difficult.

Many countries use different methods to establish the number of people affected by disasters For example, Zimbabwe uses medical records to count people who fall ill as a result of epidemics [30]. Although this method may give correct demographic disaggregation of the people affected (which is key in monitoring Target B), it may miss other people affected in places where access to health is problematic [31]. In such places, many people who fall ill may not seek medical care because of a lack of money. In other places, the challenge is how to attribute an injury or illness to a disaster event. For instance, the cause of malaria illness is not usually attributed to excessive increases in temperatures and rainfall although studies have shown close links between these two weather elements and malaria [32, 33].

The other challenge in determining the disaster-affected people is related to time-frames of the attribution and the cut-offs during the data collation, especially about disasters of biological origin. Currently, there are no agreed time frames of when the collation process should start and end [34]. Rather, the practice is that individual countries determine their timeframes for each disaster. This depends on the epidemiology of each disaster and the feasibility of collating the data. Although it is understood that each country may have its disaster epidemiology, allowing countries to set their time-frames for each disaster may give room for under or over-reporting of the people affected. In large-scale disasters such as drought in sub-Saharan Africa, the impacts may accumulate over a long time. This may require more complex information management systems to establish the number of people who fall ill due to drought or those whose livelihoods were disrupted or destroyed by drought [35]. Other long-duration disasters such as COVID-19 may span several years making it difficult to determine the loss of livelihoods ascribed to this pandemic [36, 37]. The loss of livelihoods may also come as an indirect effect, which becomes even more difficult to determine [38].

In order to promote a consistent measurement of progress in attaining the global targets of the SFDRR, the UN General Assembly adopted indicators developed by the Open-Ended Intergovernmental Expert Working Group (OIEWG) [39]. Table **1** shows the indicators for Target B as well as the definition of the related key terms. However, there are very limited studies which have operationalised the OIEWG indicators for Target B to monitor individual countries' progress in attaining the target. The current study responds to this gap by using disaggregated data from Zimbabwe.

3. Materials and Methods

3.1. Study Area: Zimbabwe

Zimbabwe is a southern African country with an estimated population of 16 million people [40]. About two-thirds of this population (about 68per cent) live in rural areas where they are engaged in rain-fed farming [41]. The country is divided into five farming regions where rainfall gradually decreases from Region I to V [42]. Regions IV and V which constitute about two-thirds of the country are drought-prone where less than 400mm of annual rainfall is recorded. As a result, Zimbabwe is affected by agricultural droughts. In the last 30 years, the most severe agricultural drought episodes include 1991–1992, 1994–1995, 2002–2003, 2015–2016, and 2018–2019 seasons [11]. The 1991/1992 agricultural drought was so severe that Zimbabwe became a chief food importer in the Southern

African Development Community (SADC) region [12]. Likewise, the 2015/2016 and 2018/2019 agricultural droughts caused drastic crop failure to the extent that about 7.5 million and 5.1 million people were food-insecure respectively [43]. The droughts depleted the country's strategic grain reserves.

Table 1: Target B indicators and the definition of related terms.

No.	Indicator	Definition of Related Key Term
B-1	Number of *directly affected* people attributed to disasters, per 100,000 population.	*Directly affected* people are people who have suffered injury, illness or other health effects; who were evacuated, displaced, relocated; or have suffered direct damage to their livelihoods, economic, physical, social, cultural and environmental assets.
B-2	Number of *injured or ill* people attributed to disasters, per 100,000 population.	*Injured or ill people* refer to people who suffered from a new or exacerbated physical or psychological harm, trauma or an illness as a result of a disaster.
B-3	Number of people whose *damaged dwellings* were attributed to disasters.	*Damaged dwellings* are houses or housing units with minor damage, not structural or architectural, and which may continue to be habitable, although they may require repair and/or cleaning.
B-4	Number of people whose *destroyed dwellings* were attributed to disasters.	*Destroyed dwellings* include houses or housing units that have been levelled, buried, collapsed, washed away or damaged to the extent that they are no longer habitable, or must be rebuilt.
B-5	Number of people whose *livelihoods* were disrupted or destroyed, attributed to disasters.	Livelihoods are productive assets and activities required for securing a means of living, on a sustainable basis, with dignity.

Source: UNISDR 2017:19-21, 39-40.

Furthermore, Zimbabwe is affected by tropical cyclones that develop in South West Indian Ocean [44]. The most recent devastating tropical cyclone was Cyclone Idai of 2019 which killed 347 people, and injured about 200 while 344 people went missing [45]. Cyclone Idai also induced massive landslides that buried homesteads and townships in the Chimanimani and Chipinge districts [46]. In 2017, floods associated with Cyclone Dineo severely affected the eastern and southern districts of Zimbabwe where 192 lives were lost and 136 were injured [45]. At times, flooding induced outbreaks of malaria and cholera in isolated places [47, 48]. Malaria remains a public health threat in Zimbabwe where more than 50 per cent of the population is at risk of contracting the disease [49, 50]. The worst cholera epidemic was the one that killed over 4,000 people during the rainy season of 2008/2009 [51].

3.2. Study Design and Approach

This study adopted a mixed approach with a case study design [52]. This approach was the most appropriate for two reasons. First, the study dealt with the number of people affected by disasters between 1990 and 2019. This enabled conducting time series analyses of people affected by each disaster group in order to have a holistic picture of Zimbabwe's progress in attaining Target B. Second, qualitative interviews were needed to explain the reported numbers as well as to qualify the trends in disaster-affected people. The case study design enabled an in-depth understanding [52] of the impact of the disasters affecting the country.

3.3. Data Sources

Quantitative data came from secondary sources published by the Government of Zimbabwe. In specific, the websites of the Department of Civil Protection (DCP) [53] and the Zimbabwe National Statistical Agency (ZIMSTAT) [54] provided comprehensive reports of the number of people injured by disasters; the people whose dwellings were damaged or destroyed by disasters; the number of people with livelihoods disrupted or destroyed by disasters; and those who were either evacuated, displaced or relocated as a result of a disaster. The study used data for all pronounced disasters spanning the period 1990 to 2019 in order to establish trends across a range of disasters. These include droughts, tropical cyclones, convective storms, riverine floods, flash floods, cholera and malaria epidemics. In order to explain and qualify the quantitative data, the study interviewed six disaster experts drawn from the government (three), academia (two) and the Red Cross Society in Zimbabwe (one). Semistructured interviews that focused on how and to what extent the disasters affected the people were used. In addition, the interview questions were made simple and the recall time was made short in order to minimise the recall biases or errors among the informants. The study also asked about what was needed to reduce the number of people affected by the disasters.

The study attempted to improve the quality of the data by incorporating data from other global disaster datasets including the Global Disaster Identifier Number (GLIDE), DesInventar Sendai, NatCatService, Dartmouth Flood Observatory and the University of Richmond Disaster Database Project. However, none of these had records for Zimbabwe for the period under study. Therefore, the study ended up verifying and comparing the data with reports from UN agencies operating in the country [55-57], the World Bank Group [58, 59] and the EM-DAT/CRED database. The latter is a well-respected worldwide disaster database which is compiled from different sources - public and private [60]. A few differences emerged between government statistics and those from other sources during the verification and comparison. When that happened, the study went by government statistics.

3.4. Computation Methodology

The study adopted the indicators proposed by the OIEWG for the measurement of Target B [61]. These include the number of injured or ill people attributed to disasters (B_{-2}); the number of people whose dwellings were damaged by disasters (B_{-3}); the number of people whose dwellings were destroyed by disasters (B_{-4}) and; the number of people whose livelihoods were disrupted or destroyed by disasters (B_{-5}). The study further added another indicator involving the number of people who were either evacuated, displaced or relocated as a result of the disaster (B_{-6}). This group of people was added because it may sometimes be mutually exclusive to the other groups and it may face distinct disaster experiences which include changes in their residential places and social networks [14]. Based on the disaster profile of Zimbabwe between 1990 and 2019, the study first disaggregated the data into three disaster groups: drought, storms (tropical cyclones, convective storms and floods), and epidemics (malaria and cholera). Second, each of the indicators for the three disaggregated disaster groups were calculated as measured in situ during each post-disaster-needs assessment.

Except for indicator B_{-5} (number of people whose livelihoods were disrupted or destroyed by disasters), the calculation of the other four indicators (B_{-2}, B_{-3}, B_{-4} and B_{-6}) was straightforward. In order to determine the number of people whose livelihoods were disrupted/destroyed by disasters, the study concentrated on agricultural livelihoods only because farming is the key source of livelihood for about 70 per cent of the Zimbabwean population [11]. Hence, the study focused on the number of people whose perennial and seasonal crops, forestry and livestock were disrupted or destroyed by drought, storms and or, epidemics. The seasonal crops included maize, sorghum, pearl millet, finger millet, ground nuts, round nuts and sugar beans, while perennial crops included bananas, pineapple, and citrus fruit trees such as mangoes, oranges and macadamia nuts. As for the forestry sector, the study concentrated on the number of people whose plantations, stored timber, and other assets used for timber production were disrupted or destroyed. Likewise, in the livestock sector, the study calculated the number of people whose livestock inputs and assets, were either disrupted or destroyed. Equation 1 was used to compute the number of people whose livelihoods were disrupted or destroyed by the disasters (B_{-5}).

$$B_5 = \sum B_{5C}, B_{5F}, B_{5L} \qquad \text{Equation 1}$$

Where:

B_5 = Number of people whose livelihoods were disrupted or destroyed by disasters

B_{5C} = Number of people whose crops were disrupted or destroyed by disasters

B_{5F} =Number of people whose forestry activities were disrupted or destroyed by disasters

B_{5L} = Number of people whose livestock production was disrupted or destroyed by disasters

In order to calculate the total number of people directly affected by all disasters, the study used Equation 2 which involved a simple sum of the disaggregated indicators B_2 to B_6.

$$B_1 = \sum B_{2,} B_{3,} B_{4,} B_{5,} B_6 \quad \text{Equation 2}$$

Where:

B1 = Number of people directly affected by disasters.

B2 = Number of injured or ill people attributed to disasters.

B3 = Number of people whose dwellings were damaged by disasters

B4 = Number of people whose dwellings were destroyed by disasters

B5 = Number of people whose livelihoods were disrupted or destroyed by disasters

B6 = Number of people who were either evacuated, displaced or relocated as a result of a disaster

The study then conducted a time series analysis (TSA) on each disaster group to establish the variability in the number of people affected by the disasters between 1990 and 2019. A TSA involves studying a sequence of data points collected through discrete time intervals [62]. Because the dataset contained many gaps or zeros, the study used a moving average (MA) method to smoothen out the short-term fluctuations and highlight longer-term trends [63]. A 3-year MA was applied for drought- and total disaster-affected people; and a 5-year MA for the storms- and epidemic-affected people. The MA method ensured that variations in the mean were aligned with the variations in the data rather than being shifted in time [64]. Therefore, the zeros in the dataset could not distort trends in the number of people affected by the disasters. This enabled a holistic picture of the progress of the country in attaining Target B. Finally, the study thematically analysed the interview transcripts [65]. Two themes which emerged from this analysis included the extent of disaster-affected people in the country and the possible reasons for the loss or impact. Then, graphs, narratives and a table were used to present the results.

4. Results

This research found that Zimbabwe experienced various disasters that affected an average of three million people on an annual basis between 1990 and 2019. As shown in Table **2**, the disasters include drought, storms (cyclones, convective storms and floods) and epidemics, notably malaria and cholera. Table **2** also shows that drought was the only disaster that affected people yearly. In most of the years (80 per cent), the drought disasters affected millions of people. The worst drought disasters occurred in 1990, 1992, 2001, 2018 and 2019 when the number of people affected was close to half the population of the country. Key informants revealed that the country lacked robust drought mitigation and adaptation measures to reduce the number of people affected by drought.

Unlike drought, storms and epidemics only affected the country on a sporadic basis. For example, 19 of the 30 years were without storm disasters. However, key informants explained that some of the gaps in Table **2** might have been caused by poor data collation or politicization. For example, one academic informant said that the number of people affected by epidemics might have been suppressed in some years to portray a good picture of the health standards of the country. Similarly, a government informant alleged that some of the high numbers of people affected by malaria and storms might have been exaggerated to attract international humanitarian aid to the country.

A 3-year MA showed seven spikes and five troughs for the total disaster-affected people (Fig. **1**). Notable spikes were recorded in the 11^{th} and 28^{th} observations while the lowest troughs were observed in the 8^{th} and 21^{st} points. In general, Fig. (**1**) shows that the number of people affected by all the disasters has been fluctuating since 1990. However, there is a steady decline in the number of people affected by all disasters from 1990 to 2019. But this trend should be read with caution as it does not reflect a substantial reduction in the number of people affected by the disasters (as required by Target B of the SFDRR). Across the years, the trend is characterised by plus and minus three million people affected by disasters.

Table 2: Number of disaster-affected people in Zimbabwe from 1990 to 2019.

Year	Drought	Epidemics	Storms	Total
1990	5 000 000	-	-	5 000 000
1991	2 000 000	-	-	2 000 000
1992	6 000 000	5 649	-	6 005 649
1993	4 000 000	-	-	4 000 000
1994	3 000 000	-	-	3 000 000
1995	4 000 000	-	-	4 000 000
1996	1 800 000	500 000	-	2 300 000
1997	350 000	-	-	350 000
1998	550 000	377	-	550 377
1999	400 000	462	-	400 462
2000	3 900 000	2 812	2 700 000	6 602 812
2001	6 000 000	-	30 000	6 030 000
2002	3 500 000	452	-	3 500 452
2003	2 800 000	750	18 000	2 818 750
2004	3 600 000	-	-	3 600 000
2005	2 300 000	1183	-	2 301 183
2006	3 900 000	-	-	3 900 000
2007	2 100 000	10 000	17 000	2 127 003
2008	1 500 000	98 349	-	1 598 349
2009	800 000	1 346	-	801 346
2010	1 667 618	258	820	1 668 696
2011	1 300 000	1 140	-	1 301 140
2012	1 406 000	-	-	1 406 000
2013	4 300 000	-	9 700	4 309 700
2014	2 200 000	11	2 502	2 202 513
2015	564 599	-	475	565 074
2016	4 100 000	-	2 000	4 102 000
2017	350 000	-	113 023	463 023
2018	5 500 000	5 164	-	5 505 164
2019	6 900 000	-	270 186	7 170 186

(Source DCP and ZIMSTAT reports)

An analysis of the disaggregated disaster groups revealed a similar slight decrease across the droughts, storms and epidemics. The 3-year MA showed six peaks for drought-affected people, four of which recorded more than four million people affected (Fig. **2**). From the 3rd to the 8th observation, the number of people affected by drought decreased. This corresponds to the period 1992-1999. However, there was an exponential jump from the 8th to the 11th point where the second highest number of people affected by drought was recorded (in 2001). After that, the number of people affected was slightly fluctuating up to the 25th observation (in 2016). Then, another jump was recorded from the 25th to the 28th observation when the highest number of people affected by drought was recorded (in 2019). Notwithstanding these fluctuations, there appears to be a slight decreasing pattern in the number of people affected by drought disasters shown in Fig. (**2**). However, the 3-year MA showed 11 years in which more than three million people were affected by droughts. Given this, the country cannot celebrate the decreasing trend shown in Fig. (**2**). The key informants opined that lack of proper recording could not be ruled out due to challenges in attributing the affected people to disasters, especially those who fell ill due to drought. In addition, they hinted that there could have been some politics in collating drought-affected people during some of the years under study. Many informants pointed at the 2019 drought-affected people that the number might have been exaggerated to attract international humanitarian aid in forex, while for the other years with very few people affected, the figures might have been suppressed to avoid the embarrassment of the failure of the fast-track land reform programme that Zimbabwe embarked on in the year 2000.

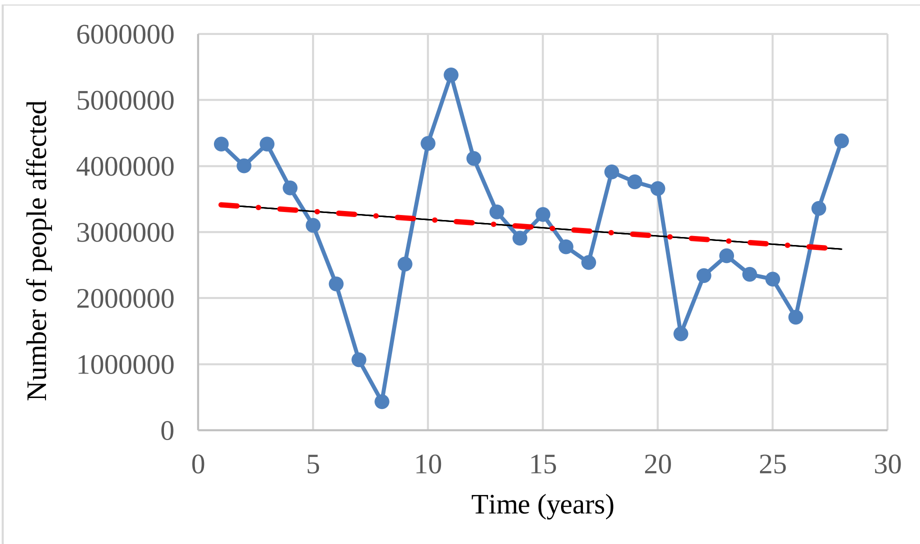

Figure 1: 3-Year moving average for the total disaster-affected people.

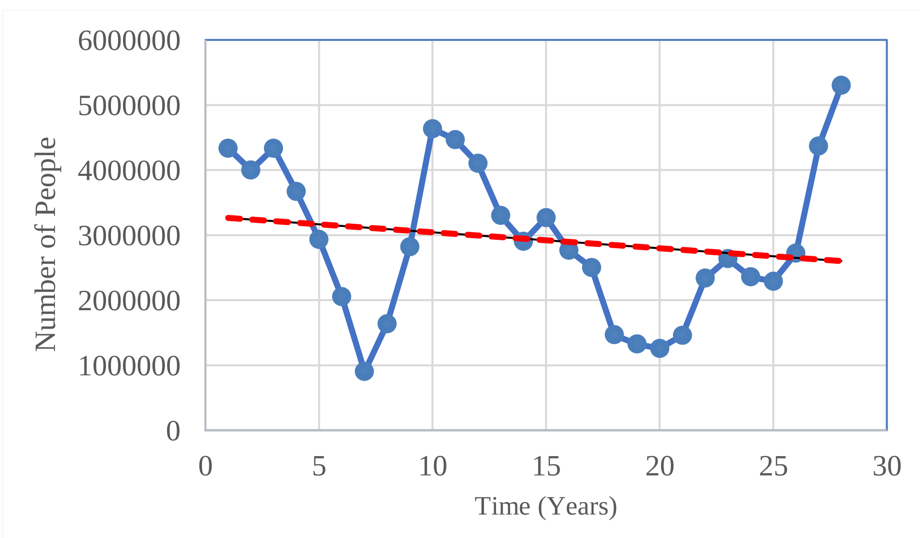

Figure 2: 3-Year moving average for drought-affected people.

The 5-year MA for the storms-affected people showed two periods of very low or no people affected: the 1st to the 6th observation and the 12th to the 25th observation (Fig. **3**). The two periods correspond to the years 1990-2000 and 2005-2018. The years 2000-2004 were characterised by a significant jump in the number of people affected by storms, to an average of about 540 000. This rise has been largely influenced by a single event: Cyclone Eline of 2000 which affected about 2.7 million people. Fig. (**3**) also shows another jump to about 560,000 people affected. This jump is attributed to the 2019 Tropical Cyclone Idai which affected about 270 000 people.

Although the recorded storm events were few, they affected thousands of people, making Zimbabwe prone to storm-related disasters. Notwithstanding this, Fig. (**3**) shows a steady decline in the average number of people affected by storms from 1990 to 2019. However, the decrease needs to be understood with caution because the interviewees raised doubts about the 19 years (1990-1999, 2002, 2004-2006, 2008-2009, 2011, 2012 and 2018) with zero people affected by storms. All the informants thought that probably, there were problems with collating data related to people whose dwellings were damaged or destroyed by storms, those with livelihoods disrupted or destroyed by storms and or, the people who were forced to evacuate or relocate as a result of the storms.

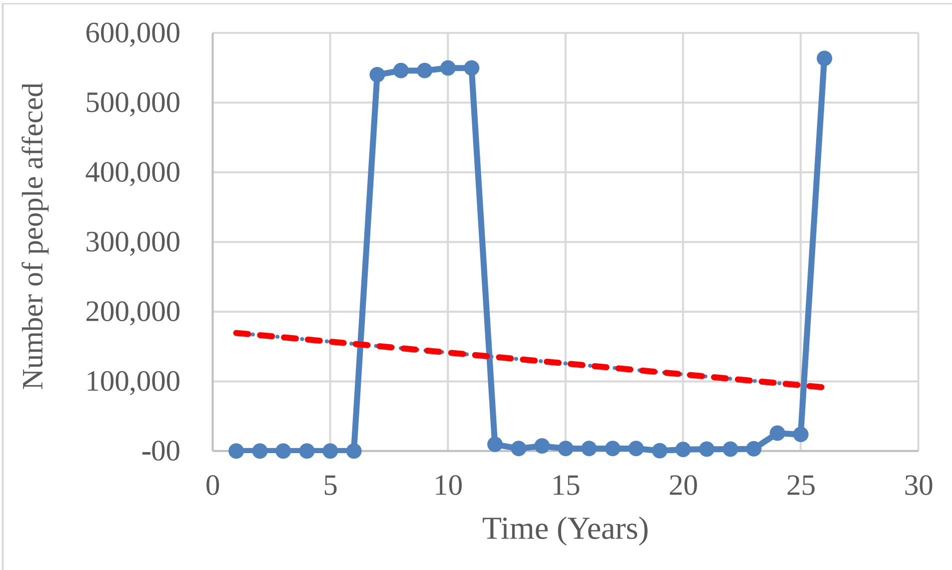

Figure 3: 5-Year moving average for storms-affected people.

The 5-year MA for people affected by epidemics showed two key periods in which about 1,000 people were affected (Fig. **4**). The first period runs from the 3rd to the 7th observation, while the second one extends from the 15th to the 19th point. The two observation periods correspond to the years 1996-2000 and 2007-2012. The 8th - 14th observation and the 20th - 26th observation periods were marked by very low numbers of people affected by epidemics. These periods correspond to the years 2001-2005 and 2013-2019. However, Fig. (**4**) shows a general decline in the number of people affected by epidemic disasters.

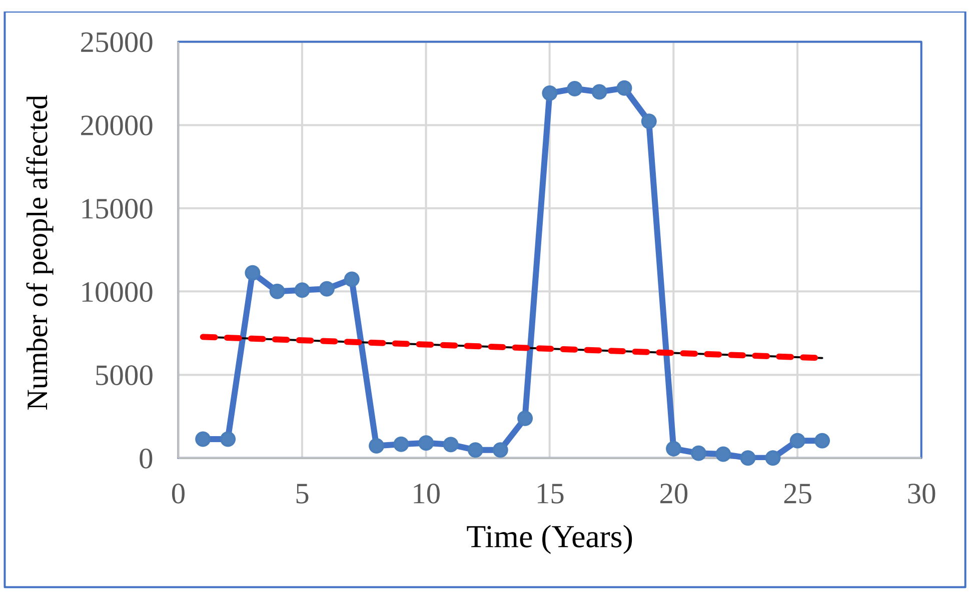

Figure 4: 5-Year moving average for epidemics-affected people.

Although the frequency of these epidemics has remained low, their impact in terms of people affected has at times been very high. Of great concern are the 1996 and 2008 spikes in malaria and cholera outbreaks which affected about half a million and 100 000 people respectively. These figures were above the country's thresholds of about ten cases in each category. Therefore, the seeming decline in epidemic-affected people should also be treated with caution for two main reasons. First, the number of people affected by the epidemic events exceeded the country's thresholds by far. Interviewees argued that this could be an awakening call for the government to strengthen its disease surveillance and response systems. Second, 15 out of 30 years had zero people affected (1990, 1991, 1993-1995, 1997, 2001, 2004, 2006, 2012, 2013, 2015-2017 and 2019). All the key informants opined that the epidemics could have affected some people during those years, but they were probably not recorded to portray a good picture of the health standards of the country.

5. Discussion

This study sought to assess Zimbabwe's progress in attaining Target B of the SFDRR: substantially reducing the number of people directly affected by disaster by 2030. The results showed a general decrease in the number of people affected by all disasters as well as by the disaggregated disaster groups. Over the years, drought has been affecting the highest number of people every year while storms and epidemics have been sporadic and characterized by big spikes. The emergence of drought as a major disaster in Zimbabwe is not surprising for two key reasons. First, about 67 per cent of Zimbabwean land falls in drought-prone agroecological regions IV and V [42]. Second, about 70per cent of the population directly survives on agriculture, while about 60 per cent of this population is engaged in rainfed farming systems [11]. This reaffirms findings from studies outside Zimbabwe that found droughts to have caused crop failure and food shortages for millions of people in many regions of Africa where people strongly rely on rain-fed agriculture [66, 67]. By affecting so many people in Zimbabwe, drought is threatening food security and the related livelihoods in the country [12]. In doing so, it is hampering not only the attainment of Target B, but also the achievement of the related sustainable development goals (SDGs), particularly SDG1 (no poverty), SDG2 (zero hunger), and SDG3 (good health and well-being) [68].

The spikes in people affected by epidemics particularly in 1996 and 2008 were catastrophic resulting in unprecedented suffering [51, 69]. The spikes were expected because of the deteriorating socio-economic conditions during those years. The health delivery system nearly collapsed in 2008 when the country recorded an inflation rate of 79.6 billion per cent [51]. On a similar note, the spikes in the number of people affected by storms are worrisome. They raise questions on whether the country has systematic measures in place to reduce the number of people affected by disasters. The spikes may be explained by three key factors: overestimation, politicisation of the disasters and lack of preparedness. On the one hand, overestimation probably stemmed from poor data collection and the politicisation of the disasters themselves [70]. The spikes might have been an exaggeration of figures meant to attract forex from humanitarian aid organisations. This problem has also been observed among the Turkana pastoralists in Kenya [71] and in many civil conflicts [72]. On the other hand, a lack of preparedness might have been a result of a lack of capacity in both the state and the communities affected. Zimbabwe has been criticised for its lack of preparedness and a thrust on reactionary approaches when dealing with disasters, particularly tropical cyclones and floods [45, 73]. The lack of preparedness has also been observed among the SADC countries such as Mozambique and Malawi, resulting in many people being affected by storms [74].

The study has contributed to the existing literature on the construct of disaster-affected people and the operationalisation of the OIEWG technical guidance notes and the methodologies adopted by the UN General Assembly [39]. Although defining the disaster-affected people has been a challenging task (as reflected by the various definitions of the term 'affected') [14], the methodology used in this study produced a robust case proxy that can be applied in many settings to measure the national trends in the attainment of Target B of the SFDRR as well as in enhancing informed DRR policy and actions. It involved using multiple indicators because no single indicator could comprehensively capture all the disaster-affected people. This is one of the lessons learned when monitoring progress in attaining Target B. The development of Target B metrics also pointed to another lesson: the need for countries to capture comprehensive disaster data. When the 187 countries adopted the SFDRR, they committed themselves to systematically collect data and monitor their progress in achieving this target [61].

Regular monitoring of disaster-affected people is vital in order for identifying trends and emerging dynamics in disaster risk profiles of countries. A decline in the number of disaster-affected people may indicate that countries are protecting their citizens from hazards. However, this study's data had some gaps which may not necessarily mean that people were not affected by disasters during the years in question. Rather, it might have been a problem of poor data collection resulting in under-reporting [20] or politicization [70]. Related to this are the low figures recorded in some years, particularly for drought. Such figures might have been suppressed to avoid the embarrassment of the failure of the fast-track land reform programme that Zimbabwe embarked on in 2000 [75]. Despite the aforementioned allegations, the case of Zimbabwean metrics can spur other countries into assessing their national trends in reducing the number of disaster-affected people. Most importantly, the utility and efficacy of Target B metrics will be seen when countries make DRR policies and decisions based on such metrics.

However, the current study has three key limitations for other countries to consider when monitoring their progress in reducing the number of people affected by disasters. First, the number of disaster-affected people in this study was largely limited to agricultural livelihoods, dwellings and internally displaced people. Yet a significant number of people all over the world are engaged in non-farming activities. Second, people who were indirectly affected by the disasters have not been considered in this study partly due to the unavailability of such data. However, in other countries, the number of people indirectly affected by disasters has been observed to be much higher than those directly affected [76]. This includes the people affected by Hurricane Sandy in North America [77]. Therefore, the indirectly affected people should be considered to inform DRR policies and measures at national and subnational levels.

Third, the use of multiple indicators to measure Target B probably introduced double counting and or, underreporting. For example, the summation of the people injured by tropical cyclones and those whose dwellings were destroyed or damaged by the same storms might have resulted in counting twice the number of people affected by the storms. This is because the people might have been injured whilst inside the damaged or destroyed dwelling. Likewise, excluding mortality figures of the cholera epidemic might have resulted in underreporting of the number of people affected by the epidemic (because mortalities and ill people are mutually exclusive). Underreporting might also have been introduced during the determination of people whose livelihoods were disrupted or destroyed by disasters. This is mainly because this study focused on agricultural livelihoods since the majority of the Zimbabwean population is engaged in farming [11]. There could have been some non-agricultural livelihoods which were not considered in this study. There are two key problems associated with double counting and underreporting of people affected by disasters. First, underreporting underestimates the impact of disasters at the local level. Yet such disasters may have long-term impacts on the populace [78, 79]. Second, both double counting and underreporting misinform DRR policy and practice. Therefore, countries need to separate datasets for the indicators and keep them constant when measuring the attainment of Target B of the SFDRR.

6. Conclusion and Policy Implications

This research found that Zimbabwe experienced various disasters that affected an average of three million people annually between 1990 and 2019. The disasters include drought, storms (cyclones, convective storms and floods) and epidemics, notably malaria and cholera. Drought emerged as the only disaster that affected millions of people yearly. In most of the years (80 per cent), it affected more than a million people every year. The worst drought disasters occurred in 1990, 1992, 2001, 2018 and 2019 when the number of people affected was close to half the population of the country. Unlike drought, storms and epidemics only affected the country on a sporadic basis. About 63 and 50 per cent of the study period were without recorded storm and epidemic disasters respectively.

This study provided a clear picture of Zimbabwe's slow progress in attaining Target B of the SFDRR. The number of people directly affected by drought has been high over the years while those affected by storms and epidemics have been fluctuating and marked by huge spikes. The study concluded that the country is slowly reducing the number of people affected by disasters. Overall, the study has contributed to the understanding of the OIEWG methodology for Target B. Regular monitoring of disaster-affected people is vital for identifying trends or emerging dynamics in disaster profiles of countries. A decline in the number of people affected by disasters may indicate that countries are protecting their citizens from hazards.

The findings of this study have wider DRR policy implications in Zimbabwe and beyond. First, the development of Target B metrics necessitates the need to create accurate national disaster databases. This may strengthen the systematic data collation of people affected by disasters. Understanding the trends in the number of disaster-affected people can inform local DRR policies and practices. For example, policies can be aligned to the global framework of the SFDRR as happened in Bangladesh [80]. They can also inform the adoption of context-specific preparedness measures as witnessed in Mexican rural communities [81]. Second, where drought is the major disaster affecting people, countries need to strengthen their drought preparedness and mitigation measures. As is the case of Zimbabwe, proactive drought mitigation measures should target the smallholder farmers who constitute the majority of people with very limited capacities to cope and adapt to drought [12]. For example, smallholder farmers may be encouraged to diversify their activities (on-farm and off-farm diversification) in order to reduce their dependency on rainfed farming. The merits of proactive implementation of policy measures can be drawn from other developing countries including Pakistan and India. When the resource-constrained smallholder farmers in Pakistan were encouraged to undergo community training on livestock feeding, livestock losses were reduced [29]. In India, a strengthened drought policy included strategies and measures that not only reduced the impacts of drought but also reduced drought vulnerability and risk in various economic sectors [82]. Third, in countries where epidemics are a health issue, there is a need for the health authorities to strengthen disease surveillance, response and control systems. This is critical in hotspots of common diseases [83], and most importantly in the face of increased disease outbreaks induced by climate change [84], as well as the ongoing COVID-19 pandemic [85]. Doing so will reduce the number of people affected by epidemics of various origins.

Conflict of Interest

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