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Original article

Global Warming and Psychotraumatology of Natural Disasters: The Case of the Deadly Rains and Floods of April 2022 in South Africa



Réchauffement climatique et psychotraumatologie des catastrophes naturelles : le cas des pluies et inondations meurtrières d'avril 2022 en Afrique du Sud

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ABSTRACT

Climate change and global warming have led to an increased incidence of flooding across the world. Against the backdrop of the recent devastating floods in the KwaZulu-Natal province of South Africa, this paper explores psychotraumatology of natural disasters. In particular, we explore the impact of internal migration in South Africa, as well as apartheid spatial planning and inequality on the consequences of the flooding. We also focus on the psychotraumatology resulting from flooding, in general, and in particular on the victims of the flooding in the KwaZulu-Natal province of South Africa. We conclude that the psychopathological consequences of such natural disasters are ignored even though they seriously affect the people concerned. The development of specific trainings for psychologists in psychotraumatology and the care of victims should be a priority in the future.

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R É S U M É

Le changement climatique et le réchauffement climatique ont entraîné une augmentation de l'incidence des inondations dans le monde. Dans le contexte des récentes inondations dévastatrices dans la province du KwaZulu-Natal en Afrique du Sud, cet article explore la psychotraumatologie des catastrophes naturelles. Nous explorons l'impact des migrations internes des populations en Afrique du Sud, ainsi que l'aménagement du territoire issu de la période de l'apartheid et des inégalités qui en ont découlé, sur les conséquences des inondations. Nous nous concentrons également sur la psychotraumatologie résultant des inondations, en général, et en particulier sur les victimes des inondations dans la province du KwaZulu-Natal en Afrique du Sud. Nous concluons que les conséquences psychopathologiques de telles catastrophes naturelles sont ignorées ou sous-évaluées, même si elles affectent gravement les personnes concernées. Face aux prévisions de multiplication et d'intensification des événements climatiques extrêmes, le développement de la formation à la psychotraumatologie et à la prise en charge des victimes doit être une priorité à l'avenir pour les psychologues.

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1. Introduction

At the time of writing this commentary, record rainfall, flooding and mudslides led to the closure of the Yellowstone National Park in Montana, United States of America. This was, however just the latest incident of flooding that has been plaguing the world since the beginning of the year. Heavy rains during the month of April 2022 and the beginning of May have led to floods in all parts of the world and on every continent, with the exception of Antarctica [22]. The countries that have been affected during just these two months are shown in Table 1.

It would appear that there has been a sharp increase in floods in 2021–2022. The map in Fig. 1 shows the scale of flooding around the world and the countries affected by major floods during this period [22]. In some instances, floods have occurred repeatedly in the same country.

The map in Fig. 1 paints a grim picture of the extent of flooding in the world in 2021–2022. All countries in South and Central America have been affected, while most of Europe and Africa have

similarly been affected. In 2021 there were 432 disastrous events reported across the world and 52% (223) of these events were instances of flooding [15]. The human and socio-economic costs of these floods have been extreme. There have been 4, 143 deaths reported in 2021 as a result of flooding with the share of deaths by continent being: Americas (43.2%), Europe (2.9%), Asia (48.7%), Oceania (0.1%), and Africa (5.1%). Apart from the fatalities it has been estimated that the 29.2 million people across the world had been impacted with the largest numbers affected in Asia (65.5%) and Africa (29.4%). Economic losses due to flooding was reported to be about 74.4 billion US\$ [15].

While a direct causal link between climate change and flooding cannot easily be assumed due to limited evidence, the Intergovernmental Panel on Climate Change, referring to the impact of climate change on flooding, states “it has detectably influenced several components of the hydrological cycle such as precipitation and snowmelt. . .which may impact flood trends” [59] (p. 178). In this regard, while global warming may not impact floods directly, it aggravates those factors that do cause flooding [21].

Table 1
Flood Affected Countries Across the World During March–May 2022.

Continent				
Africa	Asia	America	Europe	Oceania
DR Congo	Afghanistan	Canada	Spain	Australia
Malawi	Indonesia	USA		
Rwanda	Malaysia	Brazil		
South Africa	Philippines	Colombia		
Tanzania	Thailand	Dominican Republic		
Uganda	Uzbekistan	Ecuador		
		Guadeloupe		
		Haiti		
		Peru		
		Venezuela		



Fig. 1. Countries Affected by Floods across the world 2021–2022.

Table 2
Impact of the Kwazulu-Natal Floods in Numbers (Source: [43]).

Impact	Number
Fatalities	435
People missing	54
Houses affected	17, 438
People left homeless	6, 278
People living in shelters after homes destroyed	7, 245
Damages to rail infrastructure	R995.4 million (South African Rand)
Water and sanitation infrastructure	R1 billion
Overall damages	R17 billion
SMME's affected	110 (R20 million)
Damages to the manufacturing sector	R431 million
Warehousing and logistics sector	R33.5 million
Construction sector	R18.1 million

In April 2022 the Kwazulu-Natal Province, which is located on the east coast of South Africa, experienced about 300 mm of rain in one day, which represents about 75% of South Africa's annual rainfall [42]. The extreme rainfall and consequent flooding are regarded as the deadliest on record in South Africa [2]. As at 21 April, the final confirmed fatalities associated with the flooding stood at 435, with a number of people still unaccounted for [17]. The flooding destroyed several thousand homes, roads, bridges and severely impacted critical infrastructure. Table 2 provides an overview of the scale and cost of the impact of the flooding [45].

2. Psychotraumatology of precipitation and flooding in general

The torrential rains and floods show the power of nature against the fragility of man. These extreme climatic events can cause different levels of human damages depending on the intensity, exposure, and vulnerability of the affected populations. The violence of these natural disasters can kill or injure. Most often these natural disasters damage, devastate, and destroy housing, infrastructures, places and labour structures. Their impact is human, material, social and environmental, and the aftermath is immediate. It can persist and become more serious over time, with for instance, loss of housing structures, pollution, illnesses, degraded professional situations, etc. It is common to hear victims say that they have “lost everything”, that “the labour of a lifetime is engulfed” or that “all the memories of their past have been destroyed”. Indeed, they are often destroyed or washed away. The examples of such losses are endless and repeat more and more on the planet.

In France, for instance, on October 2, 2020, in the hinterland of the Côte d'Azur, during the storm Alex, the Boréon, the Vesubie and the Tinée rivers rose for 7 to 8 meters above the usual levels, causing deaths and extensive material damages in the touristic village of Saint-Martin-Vesubie, including the collapse of the bridge which crossed the Boréon river, the destruction of numerous houses, the petrol station, the fire station, the gendarmerie, segments of the business artisanal park, and an important part of the cemetery. An 86-year-old woman testified that she would no longer be able to pray at her daughter's grave, which was swept away by the waves, as some other 170 tombs in the cemetery. “I can't stand not having my daughter anymore. I only have her photo left”. Her daughter had died four years earlier, as a result of the Islamic terrorist attack on July 14, 2016 in Nice [10]. The torrential floods caused a new trauma for this octogenarian. She participated in DNA samples in the hope of finding human remains for analysis: “We found a leg 300 km away from here, the water carried everything in its path, so we don't

have much hope”. “We lost our late beloved family members and friends. It's traumatic” said distraught families who can now only meet near a stone erected in tribute to all those missing in the cemetery of the town.

In many parts of the world, torrential rains and floods constitute major psychotraumatogenic events for the affected victims, regardless of their age. The psychopathological consequences can be immediate, post-immediate or long-term [3–5,60,61,63]. Loss of people, memories or belongings creates significant anxiety, existential distress, depression and deterioration of interpersonal ties. Some victims can even be traumatised by the repetition of these extreme climatic events, which add to other vulnerabilities. Does humidity play a role in the development of physical and mental pathologies? In Bangladesh, for instance, a World Bank survey showed that with global warming the monsoon has become longer, and the temperature of the winter months has risen faster than that of the summer months which are the monsoon months. The results show an increase in respiratory diseases, dengue fever and a decrease in cholera. On a psychological level, changes in weather can cause mood swings, but seasonality has a slightly different impact on anxiety and depression. The level of anxiety disorders increases with temperature and humidity. The increase in average humidity and average temperature increases the probability of anxiety by 0.3% and 0.8%, respectively. More people suffer from depression during winter. Increasing temperature reduces the probability of depression by 1.6%. In addition, women are at a higher risk of depression than men, while men are more sensitive to anxiety [72]. Some damages can be mitigated by systems of solidarity and compensation for destruction when such mechanisms exist.

3. The floods in South Africa: The impact of apartheid spatial planning and inequality

The institutionalized colonial apartheid system created an architecture of inequity embedded in societal, legislative, socio-economic and racially segregated services, which continue to manifest in South Africa today [39,47]. Following the democratically elected government in 1994, the Reconstruction and Development Programme intended to mitigate the deleterious social, economic and political effects of apartheid, through poverty alleviation and addressing socio-economic disparities in previously marginalized and disadvantaged groups. However, the spatiality of apartheid and post-apartheid cities remains an area of concern almost 30 years after the repeal of the Group Areas Act, which legislated racial land zoning practices [45]. Despite post-apartheid Human Settlements Policies that stressed the provision of “viable, socially and economically integrated communities, situated in areas convenient to access economic opportunities as well as health, education and social amenities...” [18] (p. 19), the extension of existing townships and formation of new townships in urban areas has largely mimicked previous spatial dynamics where poor people live further away from the cities that depend upon their labour [11]. Inequities in South Africa are reflected along racial lines, compounded by intergenerational poverty, barriers to accessing education, skills and productive land. Black South Africans in urban areas predominantly live in large informal settlements on the outskirts of cities and urban hostels, a disproportionate number of Black South Africans reside in rural areas with limited infrastructure and services [1]. The capacity for communities to cope with flooding events and recover from them is influenced by socio-spatial discrepancies and inequities across income, age, education, and access to services [6,48].

Almost 30 years after achieving democracy, the apartheid legacy of segregation continues to disproportionately affect access

to water, sanitation and hygiene services vital to public health and socio-economic development [1], particularly in previously disadvantaged and marginalized communities. Research suggests that adverse social and economic circumstances, such as poverty, income inequality, violence and poor housing are socially driven correlates of psychological adversity and influence the prevalence and severity of mental disorders [32,67]. Further, communities impoverished by apartheid demonstrate increased risk of depression [12]. In a sample of adolescents, Das Munchi and colleagues [16] found that anxiety, depression and post-traumatic stress disorders were associated with material disadvantages in adolescents who self-identified as being from historically disadvantaged communities. Mental health treatment constraints in the public health system [20] and inadequate basic services [6] aggravate the mental health inequities.

While the world is grappling with the impacts of climate change and global shifts in hydrological cycles, research suggests that Southern Africa is particularly vulnerable to climate change [58]. The negative impact of climate change is predicted to increase disease burden; water insecurity; heat and sun exposure; financial and food insecurity; and interpersonal violence; as well as natural disasters [6]. Socio-economic vulnerability in poor, marginalized and vulnerable groups of people in South Africa make it difficult for these groups to cope with disasters, water insecurity and economic losses that arise from climate shocks. Further, the social conditions that predispose vulnerable groups to climate change also place them at higher risk of psychological distress [6].

The intersection between historical, social, economic, political, policy and governance issues in the country and the interplay with natural elements and climate change makes poor and historically disadvantaged communities more vulnerable to negative psychological consequences [6]. By comparison, rich communities have greater resources at hand to mitigate and adapt to climate shocks. While Section 26 of the Constitution recognizes the right “to have access to adequate housing” and that the state “must take reasonable legislative and other measures, within its available resources to achieve the progressive realization of this right” [54] for many South Africans, this right remains unmet. In responding to the pressing disaster risk of rainfall flooding, socio-spatial considerations require careful consideration [23] along with meaningful investment in social protection systems to strengthen resilience to economic vulnerability and climate risk [69].

4. The floods in South Africa: Internal Migration

Given the past history and current levels of development, South Africa faces economic challenges that have direct impacts on the population. Indeed, it is still the most unequal country in the world in 2021, with a Gini index of 0,63 [70]. The economic development of South Africa is very heterogeneous with rich provinces such as Gauteng, the Western Cape and KwaZulu-Natal concentrating the economic and industrial forces of the country to the detriment of the other provinces, which remain mainly rural and underdeveloped [29].

Such an economic situation is accompanied by an uneven distribution of the people, mainly concentrated around these three big economic hubs [28], trying to find jobs in a country where more than 35% of the active population is unemployed, to access a better life. Regional migration and internal migrations are therefore an important issue in the country, with mass internal immigration around Johannesburg (Gauteng), Cape Town (Western Cape) and Durban (KwaZulu-Natal) [57]. In KwaZulu Natal 30% of household members are not permanent residents [38]. Such population movements, in general of young adults do not only create ethnic

problems with increase xenophobic attacks [26], economic problems, with a labour market that always needs to absorb more and more workers [28], but it also has a direct impact on the spatial distribution and organization of these individuals who migrate around these economic centres [27]. Consequently, housing is often problematic, and migrants do not have other choice than to resort to poor housing, often in slums, made from inadequate materials. In such a case, any climatic issue becomes a problem where people, especially in case of rain, are at health and security risks and tend to easily lose their housing and belongings. In total, more than a quarter (26%) of the South-African population still leaves in slums, which represents more than fifteen million people [71].

Given the level of poverty in the country, with almost 50% of the adults living below the poverty line [66], the concentration of population around the big economic centers, and the poor quality of housing, it is not surprising that the April 2022 floods had catastrophic repercussions. Regarding material damages, 13 500 households were affected by the floods, 3927 housing structures were destroyed, and another 8097 partly destroyed. The floods resulted in 435 confirmed deaths, reflecting the grim human toll of the disaster [55] and pushing the Government to trigger the state of disaster, to place affected people in shelters and to try to move them to new land [35]. With such settings, continuous regional and internal migrations due to inadequate development planning around big cities are likely to continue, putting more and more people living in informal settlements at risks of natural disasters [37].

5. The psychological and psychopathological impact of the deadly rains and floods on the victims of April 2022

In KwaZulu Natal, the vast majority of those exposed to flooding were residing in peri-urban areas or informal settlements located in environmentally vulnerable settings on the outskirts of major cities [13]. These areas are typically characterized by overcrowding, insufficient access to safe water and sanitation and inadequate drainage and solid waste collection, as well as difficulties in access to health care and emergency services [68]. Residents of these areas are among the most impoverished and rely on informal jobs to generate income [13,40]. They also have a lower capacity to prepare for and cope with flooding events.

Researchers, for example Zhong [73] and colleagues, have divided flooding events into three distinctive periods, each associated with specific physical and mental health outcomes. The immediate aftermath (where the flood waters are still present) is predominantly characterized by medical and other rescue activities while the medium-term period, which occurs in the weeks and months following flooding, is associated with immediate recovery and restoration efforts. This can include rebuilding emergency infrastructure (e.g. roads, electricity and telecommunication), creation of temporary shelters and the provision of food and water. The last phase entails long term restoration for example, rebuilding of homes and restoring underground infrastructure [73]. The health consequences associated with the immediate phase include drowning and injury whereas those associated the mid-and-long-term periods can entail communicable diseases, respiratory infections as well as epidemic diseases such as cholera and diarrhea [36,49]. Since flooding hampers access to and delivery of medical services, it can result in wider disease outbreaks [62]. Furthermore, some populations may be more at risk of post-disaster infectious diseases including children, the elderly as well as those with comorbid conditions [73]. In KwaZulu-Natal, news reports indicate that damaged roads have prevented health care workers and

patients from accessing health care facilities and underscored concerns about people on chronic medication who may not be able to access medical care [31].

Reacher et al. [53], in a historical cohort study following severe flooding in southern England, reported that the flooding event was associated with new episodes of illness including asthma, earache, and an increase in gastroenteritis diseases. Jiao and colleagues [25] found a significant increase in cardiovascular illness following several years after Hurricane Katrina in the United States while Rodriguez-Llanes and colleagues [56] reported a higher incidence of child malnutrition following flooding in India. Many South African families rely on school feeding schemes [19] and the damage to schools as well as infrastructure due to flooding would have significant implications for food security. In South Africa, there is also a high incidence of non-communicable diseases most notably HIV/AIDS and tuberculosis [35,36]. In addition, the country has a high incidence of COVID-19 infections. The presence of these conditions increase vulnerability to adverse physical health outcomes in the aftermath of flooding [73].

A growing body of literature [24,31,65,73] has confirmed that the mental health consequences of flooding are often more severe and prolonged compared to the physical health impacts. The most common psychological sequelae associated with exposure to flooding is post-traumatic stress disorder (PTSD) [73]. People living in South Africa are already disproportionately exposed to traumatic events that are likely to result in PTSD including sexual assault, domestic violence, hijacking and robbery [45,50]. Against this backdrop, those exposed to flooding events may be more vulnerable to adverse psychological outcomes. Those who received no warning of possible flooding and were unprepared were more likely to experience depression and PTSD [41]. Research suggests that the greater degree of exposure has been associated with a higher prevalence rate of PTSD, which suggests a dose-response relationship (i.e., the degree of exposure to flooding and proximity to flooding predicts psychological distress) [52]. More specific factors such as the personal experience of injury, damage to property and forced relocation as well as fear of death and injury to oneself and significant others increases the likelihood of adverse psychological reactions post-disaster [44].

Exposure to post-disaster stressors has an impact on mental health and includes stressors such as lack of housing, water, electricity and sanitation [41]. Food insecurity and adversity in housing reconstruction have also been associated with increased psychological distress. Individuals who have to relocate their homes are more than twice as likely to experience PTSD, anxiety and depression. Significant associations have been found between displacement as a consequence of flooding and adverse psychological sequelae including depression, anxiety and PTSD [72]. Displacement to temporary accommodation can be experienced as alienating and this can be aggravated in situations where family members are missing or families are split between shelters. Carroll and colleagues [14] argue that natural disasters such as flooding fragment bonds of community, continuity and familiarity. Normal everyday routines are severely compromised while attachment bonds to homes, personal possessions and social relationships are disrupted. This can lead to feelings of helplessness, heightened distress and anxiety.

6. Conclusion

The deadly rains and flooding across the world have led to severe material, economic, and psychological consequences. The psychopathological consequences of such natural disasters are insufficiently assessed and considered. Often, they are ignored even though they seriously affect the people concerned. The

development of specific training for psychologists in psycho-traumatology and the care of victims should be a priority in the future [63,64]. Such trainings would make it possible to set mass and individual psychological support systems up for persons affected by extraordinary traumatic events [51] (natural and technological disasters [7,8], armed conflicts [9], terrorist attacks [10] and accidents).

Disclosure of interest

The authors declare that they have no competing interest.

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