Essai

The State of Environmental Migration 2020

A review of 2019

C. Zickgraf, T. Castillo Betancourt, E. Hut (eds.)

Presses Universitaires de Liège

The State of Environmental Migration

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Courriel : presses@uliege.be
Place de La République française, 41
Bât. O1 (7e étage)
4000 Liège, Belgium
Site : www.presses.uliege.be

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Maquette de couverture : Julien Noiset
Mise en page : Alain Chevallier

Relecture des épreuves :
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D/2021/12.839/7
978-2-87562-270-9
Imprimé en Belgique

Pour citer cet ouvrage :
The State of Environmental Migration 2020: A review of 2019
Liège, Presses Universitaires de Liège, 2021

Mots-clés : The State of Environmental Migration 2020: A review of 2019

Illustration de couverture: Serdyukov, I. Flood (*acqua alta*) in Venice, Italy. November 12, 2019. Shutterstock.

Edited by The Hugo Observatory of the University of Liège, the State of Environmental Migration 2020 has received funding from Belspo under contract number BR/175/A4/MIGRADAPT.

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de Regoyos Jacobo, *Belgistan. Le laboratoire nationaliste,* 2014.

Pirotte Gautier et Godin Julie, *Coopération au développement. Enquête sur les Initiatives Populaires de Solidarité Internationale,* 2013.

Goossens Pierre J., *L'or à travers les âges. Une histoire pas toujours dorée,* 2013.

Kuty Olgierd, Schoenaers Frédéric, Dubois Christophe, Dethier Baptiste, *La médiation scolaire. Un regard des acteurs sur leurs pratiques,* 2012.

Table of contents

South America

Contributors

Introduction

Caroline Zickgraf, Tatiana Castillo Betancourt and Elodie Hut

In the wake of a pandemic-ridden 2020, the year 2019 may seem a distant memory, but the people who lost their homes, jobs, and their loved ones because of environmental disasters (slow or sudden) are unlikely to have so quickly forgotten. Even when disasters are sudden and relatively temporary in duration, recovery and return can take years – if it occurs at all.[1] Each year disasters expose, magnify, and exacerbate various pre-existing inequalities within and between populations. Understanding what happened in terms of environment and human mobility in 2019, therefore, also helps us understand the vulnerabilities of 2020, not just to recurrent environmental shocks or ongoing changes but also to other forms of disaster like conflict or a health crisis. We, the editors, feel it is important to note that migrants and displaced people are some of the most vulnerable populations to the spread of the COVID-19 virus and to its adverse economic, social, and psychological effects, even though 2020 falls outside the scope of the present edition.

For the past ten years, the State of Environmental Migration (SEM) series presents snapshots of each year's key disaster displacement events, but also how environmental change more broadly relates to a spectrum of human mobility patterns, including immobility (by force or by choice). Our efforts to present case-based analyses of different countries, environmental contexts, and mobility experiences and outcomes, are by no means comprehensive. Rather than an exhaustive overview, the content of the annual SEM is led more by its authors than its editors. We select and feature papers from Master's students in Sciences Po's Paris School of International Affairs (PSIA) who are enrolled in the course 'Environment and Migration'. The students are free to research and write on any aspect of the environment-human mobility nexus, in any part of the world, using any (scientific) methodology, so long as it is anchored in some way to the previous year.

In this tenth volume of the series, authors present case studies from five different continents. This year's selected authors focus primarily on

[1] After nearly 25 million people were (newly) internally displaced by (sudden) environmental disasters in 2019, some 5.1 million were still living in displacement at the end of the year (IDMC 2020).

sudden-onset displacement contexts and the interconnectedness of global environmental change, human mobility and socio-political systems, with issues related to governance, urbanization, conflict, or citizen participation (or lack thereof), each bringing a unique and valuable perspective. Messac, for instance, looks at how drought and conflict-related internal displacement in Somalia's Bay Region impacted population settlement in urban centres. In his analysis of a flood linked to the combined effects of heavy rains and of a dyke failure in Budrio (Italy), Colonna stresses the importance of displaced populations' perceptions of the role and responsibilities of local authorities in terms of risk management. Similarly, in their respective analyses of the 2019 *acqua alta* in Venice, of the 2018-2019 Australian megafires and of Cyclones Idai and Fani in Mozambique and India, García Moreno, Pierna and Sanz provide evidence of the heterogeneity of both community and governments' responses to disasters and displacement risk. Additionally, this volume of the SEM features innovative methodological approaches and understudied disaster categories. For instance, Sánchez Juárez employs methods of critical discourse analysis to demonstrate how the media coverage of the 2018 Kerala floods in India further 'invisibilized' marginalised local communities at risk of displacement. Moreover, Sobrevilla's study of a dam failure in Brumadinho (Brazil) offers insights into the environmental consequences of industrial disasters and their impacts on population mobility.

By recognizing that environmental migration is neither solely a 'human mobility' matter nor a 'climate' one, the papers contained in this volume therefore respond to calls from academics and practitioners to approach this phenomenon in a nuanced and integrated manner. They also stress the importance of two-pronged policy approaches that aim to reduce displacement risk while enabling migration as an adaptation strategy, mobilizing multiple policy levels and domains in the process.

Africa

Drought in Somalia

A recurrent pattern affecting the resilience of Somalis and leading to growing urbanisation

Romane Messac

In 2019, Somalia faced a new episode of drought which led to the displacement of 148,000 people (UNHCR, 2019; IDMC, 2020). Since 2011, droughts have been regularly affecting the country, putting increased pressure on local communities across the country, mostly composed of farmers and herders and, as such, heavily dependent on climatic conditions to secure their livelihoods. Thus, these communities are particularly vulnerable to and, affected by, the impact of recurrent droughts which undermine their ability to recover. Moreover, in recent years, the terrorist group Al-Shabab has taken advantage of weak governance within the country and of the three decades of armed conflict, by imposing taxes on local communities (Levy & Yusuf, 2019; Eklöw & Krampe, 2019). As a result, many internally displaced people (IDPs) in search of shelter and protection are moving to already overstretched cities. There, IDPs face difficulties in accessing basic services and infrastructure, are exposed to malnutrition, and live in constant fear of being evicted. As climate change is expected to exacerbate the severity and the frequency of droughts in the coming years, this paper examines the implications of the displacements induced by the 2019 drought episode on urbanisation in Baidoa (southwestern Bay region), which was one of the main destinations for IDPs in 2019, and reflects on potential durable solutions for people displaced internally in the context of drought and insecurity.

Droughts in Somalia – a recurrent pattern

The Somali population is particularly vulnerable to drought episodes, which have become one of the main drivers of displacements in the country (UNHCR, 2019; World Bank, 2019; ReDSS, 2020). According to Shiferaw *et al.* (2014), vulnerability to drought can be defined as "*the socioeconomic and biophysical characteristics of the region that makes it susceptible to the adverse effects of drought*" (p. 68). With climate

change, drought has become a recurrent event and has severely affected the resilience of Somalian rural communities.[1]

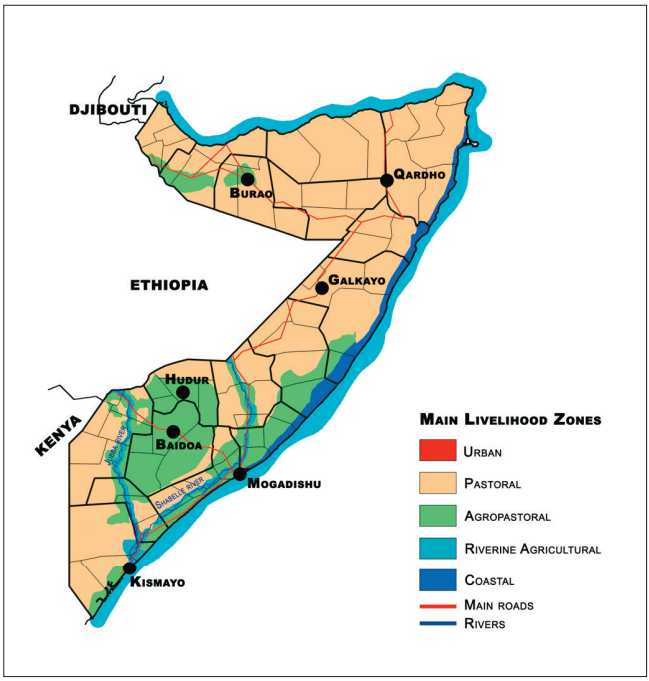
Exposure to droughts

Located in the easternmost part of the Horn of Africa, Somalia has an arid and semi-arid climate along with one of the highest average annual temperatures in the world, which oscillates between 30 and 40°C throughout the year (Ogallo *et al.*, 2017). The country records low and erratic rainfalls with an average annual rainfall of 250-300 mm, except in the southwestern part of the country which receives 700 mm annually (Ogallo *et al.*, 2017). In Somalia, a year is composed of two rainy seasons – *Gu* from April to June, which accounts for 60% of the total annual rainfall, and *Deyr* from August to November – and two dry seasons – *Hagga* from July to August, and *Jilaal* from December to March.

Because of its high seasonal and inter-annual variability, the climate system is a major driving factor of droughts in Somalia. Many climate variables interact with each other and influence the occurrence of droughts: the Indian Ocean sea surface temperature, the seasonal migration of the Inter-Tropical Convergence Zone (ITCZ), the ENSO (El Nino-Southern Oscillation) phenomenon, and several regional wind circulations such as the Tropical Easterly Jet, the Low-Level Westerly Jet, monsoons and the Turkana Jet (Haile *et al.*, 2019; Haile *et al.*, 2020; Lyon, 2014). These geographic and climatic characteristics make Somalia naturally more vulnerable to drought events. Additionally, several studies have demonstrated the combined effect of climate variabilities and anthropogenic effects on the occurrence of droughts (Haile *et al.*, 2019; Abdulkadir, 2017; Van Loon *et al.*, 2016). Indeed, human activity contributes significantly to the frequency of droughts through land-use changes, deforestation and the over-exploitation of natural resources which lead to soil degradation, water scarcity and which impact the hydrological processes associated with droughts. In the Somali case, the proliferation of water-catchments in rangelands lead to important water erosion, and land degradation is often caused by livestock overgrazing and agricultural activities (SIDRA, 2016; SIDRA, 2017; Haile *et al.*, 2019).

[1] Community resilience can be defined as "the ability of a social system to respond and recover from disasters and includes those inherent conditions that allow the system to absorb impacts and cope with an event, as well as post-event, adaptive processes that facilitate the ability of the social system to re-organize, change, and learn in response to a threat" (Cutter *et al.*, 2008: p. 599).

Image 1.1. Somalia's main livelihood zones[2]



Map elaborated by author. Data source: FSNAU & FEWS NET, 2016

In addition to being naturally exposed to droughts, Somalia's population is highly vulnerable to climatic shocks due to the predominance of resource-dependent livelihoods, particularly pastoral and agro-pastoral livelihoods (*cf.* Image 1.1.). Indeed, the agricultural sector represents 83% of all employment in the country (ILOSTAT, 2019) and approximately 75% of its GDP (World Bank, 2018), with agro-pastoralism acting as the backbone of Somalia's economy. Rainfed agriculture is therefore the main source of livelihood in Somalia, which makes the population highly sensitive to climate variations and to extreme weather events such as drought. Cereal crops represent agro-pastoralists' main food source,

[2] "In Somalia there are four broad categories of rural livelihood: *Pastoralism*, where the rainfall and ecology can support only livestock herding; *Agropastoralism* in semi-arid areas where the rainfall does support cereals cultivation but where livestock herding is also a substantial, if not dominant, part of the livelihood; *Riverine Agriculture*, meaning the irrigated zones along the Shabelle and Juba rivers devoted to cereals agriculture and market gardening and fruit; and *Coastal*, where the fishing may combine with pastoralism" (FSNAU, FEWS NET, 2016; p. 9).

and livestock their main source of income. Due to this high dependency on cereal harvests (mainly sorghum and maize) for Somalis' diet (FSNAU, FEWS NET, 2016), some areas play a crucial supplier's role. This is the case of the Bay region, on which this paper focuses and which produces approximately 60% of the annual sorghum supplies, with the city of Baidoa being the main trading centre for sorghum. Therefore, poor harvest resulting from drought in the Bay region can potentially impact the whole country, especially through market disruptions, as was the case in 2019 (FSNAU, FEWS NET, 2016).

This vulnerability is further exacerbated by a poverty rate of 69% (World Bank, 2019). Rural households, IDPs living in settlements and pastoralists are the most affected by extreme poverty, having limited access to basic services (i.e. health, education) and infrastructure (i.e. housing, sanitation, drinking water, electricity, marketplaces) (World Bank, 2019; Pape & Wollburg, 2019). As a result, these communities are further exposed to droughts and their vulnerability to future shocks has increased due to previous droughts (particularly those of 2010/2011 and of 2016/2017). A vicious circle is then triggered whereby drought increases the likelihood of being poor and of suffering from hunger, which then increases vulnerability to extreme weather events (World Bank, 2019; Eklöw & Krampe, 2019).

Droughts and the influence of climate change

An overall increase in drought frequency across the Horn of Africa has been observed in the past 50 years, which have been particularly severe in Somalia, Ethiopia and Kenya (Haile *et al.*, 2020). In Somalia, droughts have become more intense, gaining in frequency and severity over the last two decades (Abdulkadir, 2017). Somalia experienced particularly severe droughts in 2010/2011 and in 2016/2017, which both led to major humanitarian crises. In fact, Somalia has been facing a state of protracted drought since 2015, which Somalis have named "Sima", meaning "the leveler, ubiquitous or pervasive" (HIPS, 2017; ICRC, 2019).

This trend is likely to be partly due to the effects of climate change, notably to the steady warming of the Indian Ocean (Dai, 2011) and is likely to worsen in the future, with climate change leading to increased desertification and to land being more vulnerable to drought-related stress (Vicente-Serrano *et al.*, 2013; Haile *et al.*, 2020), which could in turn lead to more severe and widespread droughts. According to the Intergovernmental Panel on Climate Change (IPCC), Somalia is expected

to receive more rainfall in the future (Niang *et al.*, 2014). However, since recurrent droughts result in degraded vegetation cover and dry soils losing their water absorption capacity (Abdulkadir, 2017), extreme rainfall could bring even further damage by causing floods (SIDRA, 2017).

The resilience of local communities undermined by the combination of droughts and insecurity

The resilience of Somali communities has been severely affected by the recurrent drought events of the past two decades, which have eroded their coping mechanisms (USAID, 2018). The rural population, which is mainly composed of agro-pastoralists, has still not completely recovered from the drought of 2016/2017 (Abdulkadir, 2017; IDMC, 2020b). The impact of a severe drought can strongly affect a household's ability to cope with droughts in subsequent years. For instance, the size of pastoralists' livestock decreased up to 75% during the 2016/2017 drought (FEWS NET, 2018) and has not yet returned to its pre-crisis size, depriving households of an income that would allow them to live decently (Pape & Wollburg, 2019; IDMC, 2020b). By causing crop failures and killing livestock, each new drought undermines the capacity to recover until they have no other choice but to move to urban areas. Prices of water and food are also a determinant of displacement as these prices usually skyrocket during drought (Shiferaw *et al.*, 2014; IDMC, 2020b). Today, around 2.2 million IDPs live in urban and peri-urban settlements, representing 80% of the country's IDP population (Cortés Ferrandez *et al.*, 2020) Once displaced to cities, IDPs often do not return to their region of origin because they have lost most of their assets (IDMC, 2020b).

This situation is worsened by the general insecurity related to clan conflicts, tensions between herders and farmers, territorial claims, lack of government legitimacy and the presence of the extremist group Al-Shabaab (Ayana *et al.*, 2016; Eklöw & Krampe 2019). Indeed, in the early 1990s, Somalia experienced a civil war which has since then caused over 15,000 casualties, displaced 2 million Somalis, brought an estimated 4.5 million people to the brink of starvation and led to the collapse of the state (Eklöw & Krampe, 2019). Since 2000, Somalia has slowly transitioned to a federal government. However, Somalia's government remains fragile and must face, since 2008, the growing influence of the islamist group Al-Shabaab (Eklöw & Krampe, 2019), which controls a substantial part of rural areas in the South of the country (Sturridge *et al.*, 2018) and has gained power and legitimacy among local populations, especially

by providing amenities during droughts (Eklöw & Krampe, 2019). IDPs, young and unemployed men are particularly vulnerable to the recruitment efforts of Al-Shabaab, even within IDP sites as these usually lack social cohesion and security (Eklöw & Krampe, 2019). This complex situation undermines the peacebuilding process and causes insecurity in the country, making local communities even more vulnerable to disasters such as droughts.

The very low level of resilience experienced by Somalian rural communities is a result of a multifaceted and complex situation (Adaawen *et al.*, 2019), in which recurrent drought, famine events, insecurity and conflict-related issues interact and trigger internal displacements. Drought is rarely the sole reason for the displacement of people as it generally results from a combination of factors (Sturridge *et al.*, 2018). As noted by Castles (2002, p. 5), environmental factors are "*part of complex patterns of multiple causality, in which natural and environmental factors are closely linked to economic, social and political ones*". This multi-causality of variables further limits the resilience of Somali rural communities, whose livelihoods are mainly natural-resource dependent, and who are thus are easily affected (in terms of income, food access, food prices, etc.) in case of drought.

The 2019 drought crisis

Since 2015, Somalia has been facing an ongoing drought, characterised by consecutive below-average rainfalls during the *Gu* season. The 2019 *Gu* season was the third driest since the mid-1980s (OCHA, 2019; IOM, 2019), worsening the situation in a country that has not yet fully recovered from the 2016/2017 drought. Indeed, many of the one million people who had fled this extreme event were still displaced and living in dire conditions at the end of 2019 (IDMC, 2020b).

During the 2019 *Jilaal* season (January - March), drought conditions prevailed in Somalia, resulting from below-average 2018 *Deyr* rains (October - December) and unusually hot temperatures (*cf.* Figure 1.1.). Those drought conditions persisted through mid-May due to a two to three-week delay in the *Gu* season (April - June).

Figure 1.1. Timeline of the climatic conditions since late 2018

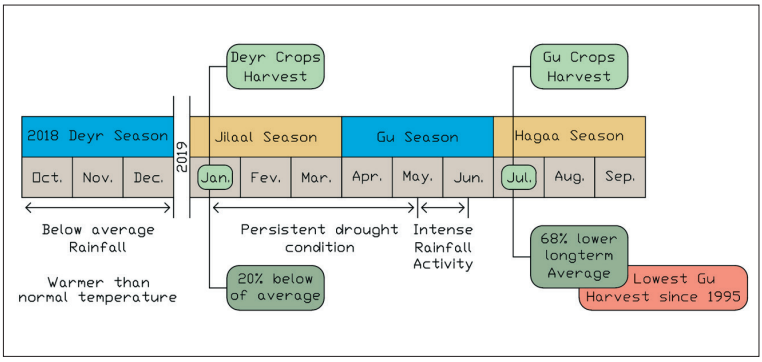
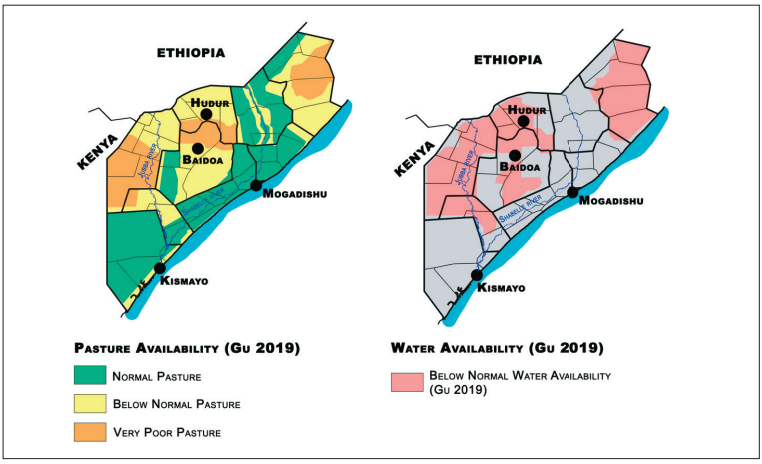


Figure elaborated by author. Data source: FSNAU & FEWS Net, 2019; FAO, 2019

Image 1.2. Consequences of the 2019 Gu season on pasture availability (left) and water availability (right)



Map elaborated by author, Data source: FSNAU, 2019

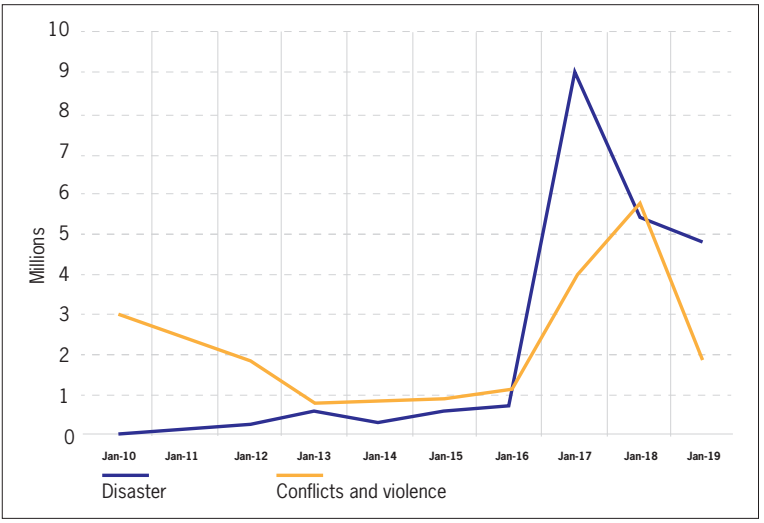
This led to pasture and water shortages (*cf.* Image 1.2.), notably in the north and south of the country, causing widespread crop failure and affecting livestock productivity. Those drought conditions were alleviated by moderate to heavy rainfalls from mid-May to early June. However, the delayed *Gu* rains shorten the growing season and, as a result, the surface planted (FEWS NET, 2020 and 2019). Because of erratic *Gu* rains and the

low water levels of the Juba and Shabelle rivers, cereal harvests were at their lowest level since 2011, down to 70% below average in southern areas (IOM, 2019). The *Gu* harvests were especially poor in Somalia's southwestern Bay area, where the city of Baidoa is located and which supplies 60% of the country's annual sorghum supplies (FSNAU, FEWS NET, 2016).

Drought-induced displacements: a focus on Baidoa

In 2019, 479,000 people were newly internally displaced in Somalia because of disasters, of whom 148,000 were drought-induced displacements (UNHCR, 2020). Disasters triggered more displacements than conflicts and violence, which accounted for 188,000 new displacements (*cf.* Figure 1.2.). This raised the total number of IDPs in the country to 2.6 million by the end of 2019 (IDMC, 2020a; UNHCR, 2019), which represents approximatively one fifth of the total population of Somalia.

Figure 1.2. New internal displacements in Somalia due to disasters and conflicts from 2010 to 2019

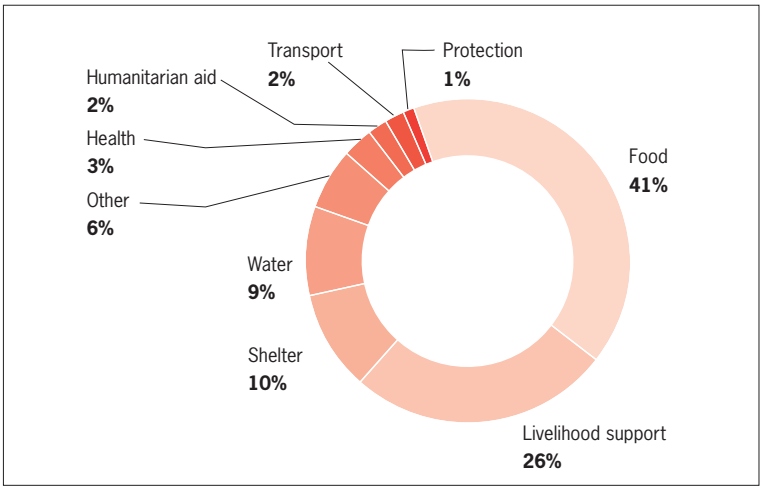


Graph created by author. Data source: IDMC, 2020

Food insecurity and drought-induced displacements

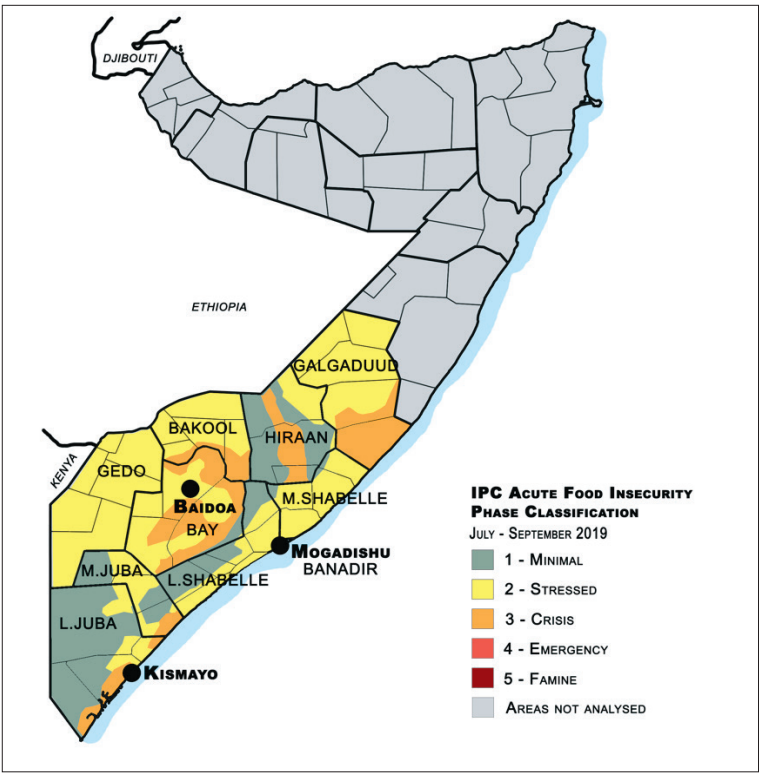
As shown in Figure 1.3. below, priority needs identified by drought-induced IDPs when arriving to IDP camps during the 2019 drought included food security, followed by livelihood support (UNHCR, 2020). Indeed, food insecurity increased by 36% in 2019 in comparison with the previous year, affecting an estimated 6.3 million people across the country (OCHA, 2019; Image 1.3). This is due to the abnormal *Gu* season which led to the lowest cereal production levels since 1995 and triggered an increase in the price of sorghum (*cf.* Image 1.4). For many rural households, this worsened their ability to recover from a drought. Many had barely recovered from the aftermath of the 2016/2017 drought. The protracted drought situation since 2015 has led to consecutive poor harvests, significantly reduced livestock size and contributed to the depletion of agricultural seed stocks. Indeed, according to OCHA (2019), the number of saleable animals remains low, which reduced livestock exports by 58% compared to the last four years. This rapid loss of assets faced by agro-pastoralists makes them more vulnerable to food insecurity and more prone to displacement.

Figure 1.3. Priority needs when arriving in IDP camps



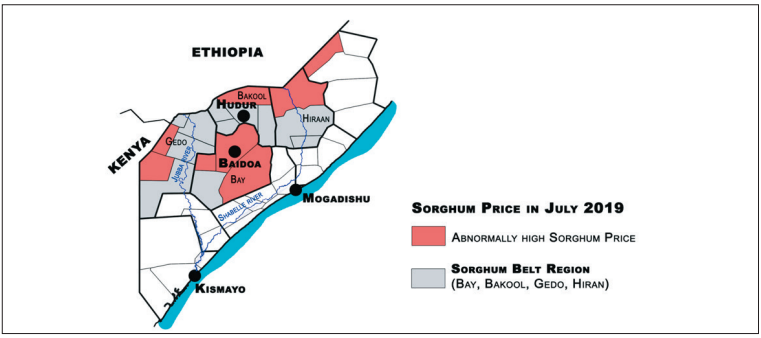
Graph elaborated by author. Data source: UNHCR, 2020

Image 1.3. Somalia Acute Food Security Situation (July – September 2019)



Map elaborated by author, Data source: FSNAU & IPC, 2019

Image 1.4. Increase of the Sorghum price in July 2019 as a result of a poor Gu's harvest

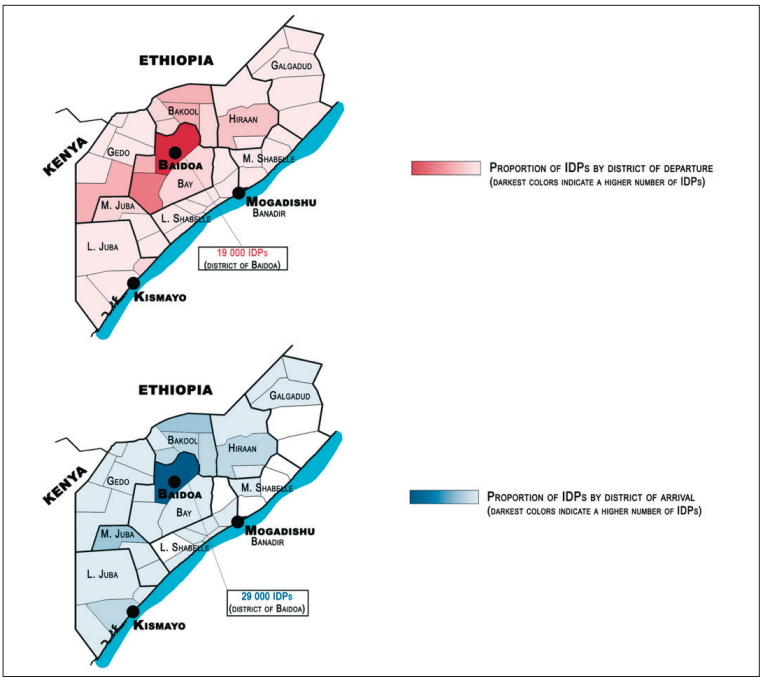


Map elaborated by author, Data source: FSNAU, 2019

Displacement patterns

The Bay region was the region the most affected by the drought in 2019 (IDMC, 2019; UNHCR, 2020). Most IDPs left rural areas to move to urban areas within their regions of origin.

Image 1.5. Proportion of drought-related IDPs by district of departure (above) and district of arrival (below) in 2019

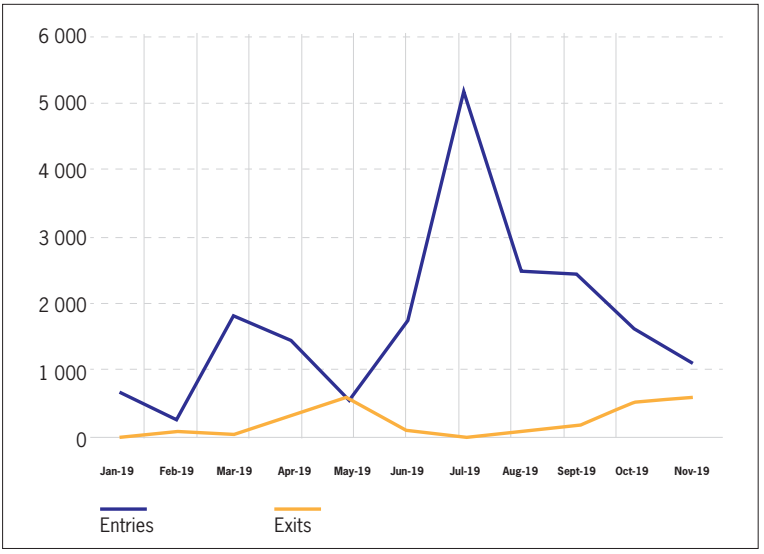


Map elaborated by author. Data source: UNHCR, 2020

In the Bay region, IDPs have essentially moved to Baidoa district: out of the 35,000 drought-induced displaced people, 28,000 moved within the region, amongst which 27,000 went to Baidoa (UNHCR, 2020; *cf*. Image 1.5.). Drought was found to be the primary cause of displacement for households in Baidoa while it is generally the secondary cause in other areas such as Mogadishu, Kismayo or Dollow (ReDSS, 2020). The number of IDP sites has skyrocketed in Baidoa since the 2017 drought, from 70 sites to 435 sites hosting 51,322 households in August 2019 (CCCM Cluster Somalia, 2019; UNHCR, 2019).

In Baidoa's IDP settlements, drought started to become an issue of concern as of March 2019, due to the very little rainfall that resulted in water shortages. In IDP sites, earlier-than-usual emergency water trucking services were provided by IOM to 6,307 households (IOM, 2019). Drought conditions have led to the deterioration of livelihoods, especially among agro-pastoralists which make up most of the population in Baidoa district (*cf.* Image 1.1.). The dry conditions worsened over the following months, causing an escalation in drought-induced displacements of rural populations from Bakool and Bay regions to urban areas. As shown in Figure 1.4., the number of IDPs entering Baidoa continuously increased as of March 2019 and reached a peak in July. Indeed, July witnessed an increase in arrivals of almost 300% in comparison with the previous month (IOM, 2019; CCCM Cluster Somalia, 2019).

Figure 1.4. Number of IDPs entering and leaving IDP sites in Baidoa in 2019



Graph elaborated by author. Data source: IOM, 2019

Implications for urban areas and IDPs' living conditions

Somalia is one of the countries with the fastest urbanisation rates in the world (IDMC, 2020b), and it is expected that its urban population will overtake its rural population by 2026 (Aubrey & Cardoso, 2019). The arrival of conflict- and drought-induced IDPs is the main explanation

for such rapid urbanisation. According to OCHA (2019), there were over 2,000 IDP sites across Somalia in 2019, 74% of which were located in urban areas and 85% of which consisted of informal sites on private lands. The absorption capacity of those cities is limited because of a lack of access to basic infrastructure and services, for both IDPs and the host communities (Taruri *et al.,* 2020; IDMC, 2020).

Unplanned urban and peri-urban settlements have contributed to rapid and uncontrolled urbanisation in most cities, especially in Mogadishu, Baidoa and Kismayo, which host the most IDPs (ReDSS, 2019). The growing number of IDPs in these cities puts further pressure on already weak and overcrowded urban systems. Just like many other Somalian cities, Baidoa was never subjected to urban planning, which has resulted in a non-hierarchical sprawl around the town. With the increasing arrival of IDPs, Baidoa has particularly expanded towards Horseed and Berdale. However, as this urban sprawling is mainly the result of the important influx of IDPs and the development of IDP settlements, it has increased significantly the overall density of Baidoa (MPWRH, 2020). Indeed, IDP sites are characterised by a 10 times higher density than the city centre and can reach 270 shelters/ha in Baidoa, or approximatively 1,620 people/ha (MPWRH, 2020). As a result, most IDP sites in Baidoa suffer from overcrowding and poor living conditions.

Living conditions in IDP sites: food insecurity and evictions

Most IDPs settle in informal sites in urban or peri-urban areas sites and live in precarious conditions with limited access to basic services and infrastructure. Indeed, most IDP settlements are affected by acute food insecurity (UNICEF, 2019).[3] At the end of 2019, out of 2.6 million IDPs, almost 1.3 million were 'stressed' (IPC 2) and 750,000 'in crisis' and 'in emergency' situations (IPC 3 & 4). Due to limited access to food and health services, IDPs are particularly vulnerable and exposed to

[3] The severity of food emergencies is described through the Integrated Phase Classification (IPC) which is composed of 5 phases: Minimal (IPC 1) where households are generally food secure; Stressed (IPC 2) where households are moderately food insecure; Crisis (IPC 3) where households are highly stressed in a phase of acute food and livelihood crisis; Emergency (IPC 4) where households have severe lack of food access with excess mortality, very high and increasing malnutrition and irreversible livelihood asset stripping; Famine (IPC 5) where households have extreme lack of food/basic needs even after full employment of coping strategies (FAO, 2011, p. 4).

malnutrition, with several IDP sites reporting a General Acute Malnutrition rate[4] exceeding 15%.

IDP settlements are generally controlled by private landlords coming from the host communities who own the land. They allow IDPs to settle temporarily on their land, but they might reclaim their property at any time, especially if there is an increase in the value of land (MPWRH, 2020; IDMC, 2020b). In some cases, camp gatekeepers – or settlement leaders – may act as a liaison between IDPs and the international aid community, controlling access to the sites, and collecting rents from IDPs to ensure their security (Yarnell, 2019). As a result, they are highly vulnerable to evictions, which have become the major trigger for secondary displacement. More than 246,000 IDPs were evicted throughout 2019 in Somalia (IDMC, 2020a). In Baidoa, 510 households (3,060 persons) in 7 IDP sites were evicted from their settlements in September 2019 (IOM, 2019). Forced evictions exacerbate the vulnerability of IDPs who, without a place to stay, see their living conditions deteriorate.

Moreover, IDPs live in overcrowded sites where they are highly exposed to floods, fires and disease. For instance, despite fire prevention and fire control workshops held in IDP sites, a fire broke out in March 2019, affecting 30 houses and 210 individuals (IOM, 2019). Such risks remain high because of the proximity of shelters and the unplanned design of IDP sites. Under the current COVID-19 situation, IDPs were likely put at a high risk of contamination due to congested sites, limited access to sanitation, handwashing and health facilities (CCCM Cluster Somalia, 2020). Living conditions in Baidoa's IDP sites remain precarious for most people who live in makeshift shelters made of substandard materials such as clothes, sticks, sheets and boxes.

Limited opportunities to return to the place of origin

Because of the gradual decline of their coping capacity over successive years of drought and conflicts, IDPs' opportunities to return to their place of origin are limited. The majority of people prefer to stay where they have been displaced to and to integrate locally (IDMC, 2019b; IDMC, 2020b). A survey conducted by the Research & Evidence Facility in Mogadishu, Kismayo and Baidoa in 2018 showed that 53% of interviewed people preferred to integrate rather than return to their place of origin (Sturridge *et al.*, 2018). However, this is context-dependent, and

[4] The General Acute Malnutrition rate measures nutritional status among children, assessing the severity of a humanitarian crisis.

the proportion of IDPs who want to return to their place of origin is much higher in Mogadishu where living conditions are harsher than in Baidoa, and where only 33% of people interviewed express their desire to return (Sturridge *et al.*, 2018). In another study from ReDSS (2020), this figure is much higher, with 99% of IDP households intending to stay in Baidoa for the next 6 months. As many IDPs had faced severe and irreversible losses due to drought, their main reason for staying in Baidoa was linked to the presence of humanitarian assistance (ReDSS, 2020). It is estimated that up to 80% of displaced people are not likely to return (UN-HABITAT, 2017). Many have lost most of their assets, rely on humanitarian assistance to survive and do not want to return to their place of origin, where they would face unemployment and insecurity. This is illustrated in Figure 1.4., which shows that, from January to November 2019, the total number of arrivals in IDP sites in Baidoa reached 19,228 people, while only 2,562 IDPs left and returned home. Indeed, according to IOM (2020), 89% of the observed movements in Baidoa in 2019 consisted of entries while exits accounted for only 11%. Out of these 11% who exited IDP sites, 88% were planning to go back home. Moreover, the longer they stay in IDP sites, the lower the probability of wanting to return is. The improvement (or lack thereof) of the security and livelihood conditions in the rural area of origin is also a determining factor in IDPs' decision to return (Sturridge *et al.*, 2018). Thus, recurrent drought and insecurity further limit the probability of return.

With the majority of IDPs in cities preferring local integration to return, local authorities have had to face the challenge of a growing number of people living in protracted displacement. Long-term and durable solutions become essential to improve the living conditions and resilience of IDPs in the face of future climatic crises. To be effective, durable solutions should deal with people's main concerns: eviction, precarious living conditions and the lack of land.

Long-term durable solutions for drought-induced IDP

With 2.6 million IDPs at the end of 2019, the majority of whom do not wish to return to their place of origin, durable solutions need to be developed from the federal to the state and municipality levels. The UN considers that "a durable solution is achieved when internally displaced persons no longer have any specific assistance and protection needs that are linked to their displacement and can enjoy their human rights without discrimination on account of their displacement" (UN General Assembly,

2010). Thus, durable solutions can be achieved through sustainable reintegration at the place of origin ("return"), sustainable local integration in areas where internally displaced persons take refuge (local integration) and sustainable integration in other parts of the country (UN General Assembly, 2010; Sturridge *et al.,* 2018).

Recent evolutions in IDP policies

Somalia only recently developed a policy framework to tackle internal displacement, starting in 2013. It required IDPs to leave their IDP site within 6 months, without offering any government support to organise return. Should people not comply with this time limit, they would face eviction. Since 2016, the government has however undergone a major positive shift by implementing the UN-backed Somalia Durable Solutions Initiative (DSI),[5] which acknowledges IDPs' desire to integrate locally. Amongst other actions, the DSI has pushed the introduction of durable solutions into different frameworks (e.g. National Development Plan, Recovery and Resilience framework) through policy dialogues, has introduced durable solution and resilience markers for humanitarian projects and has coordinated the establishment of several platforms (e.g. National Durable Solutions Secretariat, durable solutions units in several municipalities, a Durable Solutions working group). Quite importantly, Somalia's 2017 National Development Plan, includes a goal to:

> protect, respect and ensure the social, economic, cultural, political and civil rights of IDPs and refugee returnees, reversing social marginalisation and displacement-related discrimination through enhanced governance and rule of law ensuring access to relevant offices and justice mechanisms at district, municipal, state and federal levels. (Federal Government of Somalia, 2017, p. 152)

Further positive developments were achieved in 2019 at the federal level, among which the creation of a National Durable Solutions Secretariat (DSS) acting as a coordination platform for action at the regional state level provides a holistic governmental approach to internal displacement

[5] Launched in 2016 by the Federal Government of Somalia, the Deputy Special Representative of the Secretary General, and the Resident and Humanitarian Coordinator (DSRSG/RC/HC), the DSI aims to address protracted and urban displacement in Somalia and to implement durable solutions in a coordinated way, promoting a collective and integrated approach (with strong government leadership and efforts from humanitarian, development and state-/peace-building partners, and the inclusion of displacement-affected communities) (UN Somalia, 2019).

(TSIM, 2020). Hosted by the Ministry of Planning, Investment, and Economic Development, the DSS brings together 14 governmental institutions. This is a major step for the development of a national strategy on durable solutions as the lack of coordination between federal, state and municipal levels and between the different stakeholders had been regularly presented as an issue (ReDSS, 2019; Yarnell, 2020). Since its creation, the DSS has pushed for the integration of durable solutions for IDPs as a priority into the national political agenda. It succeeded in integrating durable solutions into the 9th National Development Plan (covering the period 2020-2024), which prioritises durable solutions to long-term displacement as an imperative cross-cutting policy and for which "*an overall metric for the success of this plan will be the return, resettlement or integration of IDPs*" (Ministry of Planning, Investment and Economic Development, 2019; p. 106). The next steps for 2020 will be the adoption of the National Durable Solutions Strategy and Action Plan for Somalia, working with the private sector and the civil society for long-term solutions, and supporting solutions that will help rebuild livelihoods for IDPs in their areas of origin (TSIM, 2020).

Significant legal improvements also followed in mid-November 2019 with the adoption of a National Policy on Refugee-Returnees and Internally Displaced Persons, whose main objective is "*to ensure that all refugee-returnees and internally displaced persons enjoy full equality and obtain the same rights as those given to all citizens*" (Federal Government of Somalia, 2019, p. 10). Through this law, the Federal Government of Somalia recognises "*their resourcefulness and the relevance of this population in engaging in the economic reconstruction, peacebuilding and stabilisation of the country*" (Federal Government of Somalia, 2019, p. 11). It establishes guiding principles (e.g. protection against forced displacement, the principle of voluntary return, the right to freedom of movement and to the choice of residence) and provides a roadmap towards ending displacement in Somalia by attaining durable solutions through return, local integration and resettlement.

Somalia also adopted National Eviction Guidelines in mid-November with the aim of addressing issues related to eviction, which constitutes a major obstacle to the achievement of durable solutions (ReDSS, 2020; Federal Government of Somalia, 2019). These guidelines help prevent forced evictions and ensure that any evictions are done in a planned and legal manner, and that alternative solutions such as providing land and/or housing are proposed. Some initiatives have also been taken at the Federal Member State level but no policies have been passed yet, with the

exception of the Benadir Regional Administration (BRA) IDP Policy. At a municipal level, Mogadishu and the BRA have been strongly committed to the development of IDP policies. For instance, the city of Mogadishu has established a Durable Solutions Unit in the Mayor's office in January 2019 (Yarnell, 2019; ReDSS, 2019).

Somalia has also ratified the African Union Convention for the Protection and Assistance for IDPs in Africa (or Kampala Convention) in November 2019, one of the few legally binding instruments which affirms the rights of IDPs in the continent and which recognises displacements caused by disasters and climate change. The Kampala Convention provides a legal framework with guiding principles to address IDP issues, and most importantly, obliges State parties to protect the rights of all IDPs (Kälin & Schrepfer, 2012). The ratification of the Kampala Convention by Somalia reinforces and acknowledges the current trend towards the recognition of IDPs' rights and the search for durable solutions. It is a crucial step towards the establishment of a strong legal framework for IDPs.

Thus, Somalia has recently elaborated a framework to tackle the issues raised by internal displacement, which should provide an enabling environment for the development of durable solutions. This framework still needs to be implemented, which will require more coordination between the different state levels and between the institutional stakeholders to ensure more effective action and coherence, and to avoid a duplication of efforts (ReDSS, 2019).

Durable solutions in Baidoa

In 2019, the city of Baidoa pledged that it would, with the support of the International Organization for Migration (IOM), provide durable solutions to displaced persons at risk of eviction by relocating 24,000 of them to a public site in the north of the city (IOM, 2019a; MPWRH, 2020). An integrated approach was developed to go beyond the traditional humanitarian focus and to include longer-term development needs. In this approach, IDP settlements are considered as part of the urban environment, and new IDP sites are planned in coherence with the existing urban system. Indeed, the aim was to provide both a short-term solution to the humanitarian crisis and to meet the long-term needs of the urban population. The initial plan was to relocate 40,000 people over 5 years in a new township following 3 phases: the relocation of 4,000 households in phase 1 (2018-2019), the relocation of another 4,000 households in phase 2 (2019-2022), and the transition into townships in a third

phase (MPWRH, 2020). The southwestern State provided public land to build these new sites. New facilities were built in early 2019, including pit latrines, a water system, water tanks, two police stations, streetlights, a school, roads and a health centre (IOM, 2019a). One thousand households were relocated to these sites between June and July 2019. During the second phase of the project, 2,442 households are expected to be relocated to another site (IOM, 2019a). However, two years into the plan, its implementation has been slower than expected, with a limited number of resettled households (MPWRH, 2020).

These relocation operations were in line with most IDPs' wish to integrate locally, providing them with better and safer living conditions (ReDSS, 2020; IOM, 2020). In the West, while people can easily access basic services, they face security concerns due to their proximity to the compound of the African Union Mission in Somalia (AMISOM). In the North on the contrary, settlements have expanded in an underserviced area (i.e. insufficient infrastructures such as roads or lights, long walking distances). Consequently, IDPs are less connected to basic services (UN-HABITAT, 2017; MPWRH, 2020). Relocation efforts in Baidoa have addressed the issue of difficult access to public services by establishing police stations, sanitation systems, a health centre and a school. However, in August, little water was available from boreholes due to drought conditions and water trucking was therefore needed to provide clean water to the residents of the new site (IOM, 2019). As such, solutions to ensure access to water and basic services still require improvement.

The relocation of IDPs in organised settlements that are conceived and planned as expansions of the city is a positive trend which illustrates concrete opinion shifts concerning the handling of IDPs. Local authorities appear to have taken into account their desire to remain at destination, in accordance with the evolution of the policy framework at the federal level. There is now a greater awareness that people may never return to their place of origin, and as such will require more than basic services, but a durable solution which will provide them with a decent livelihood (UN-HABITAT, 2017).

However, these initiatives concern only a minority of displaced households in Baidoa. In fact, 1,000 households were relocated in 2019, which represents only 1,9% of the IDP households accounted for in Baidoa (UN HABITAT, 2020). This dynamic will have to be improved greatly in order to cope with future influxes of IDPs. This would require a strategic urban planning framework to ensure the viable development of Baidoa

on a long-term basis, the purchase of land by the local government and increased cooperation with private landowners to tackle the eviction risk faced by IDPs. In addition to improving urban planning and providing durable housing solutions to IDPs, a long-term approach also needs to consider economic opportunities for IDPs. With an income below 1.90 dollar per person per day, most people rely heavily on the assistance of the international community to secure their livelihoods (World Bank, 2018). Durable solutions in Baidoa have focused more on housing aspects and have not fully considered the expansion of paid employment or training opportunities for IDPs.

Finally, there has been a recent shift in the focus of internal displacement policies from rural development to urban resilience which can be explained as a response to both repeated cycles of drought and fast-growing urbanisation issues (Sturridge *et al.*, 2018). Indeed, the financial impacts of cyclical drought are difficult to tackle in rural areas as agro-pastoralists' assets are regularly depleted, while in the meantime rapid urbanisation requires huge investments in planning, infrastructures and services. As explained by Sturridge *et al.* (2018), this creates a dilemma where investment in urban areas leads to decent living conditions and a better integration, but also diverts funding away from rural adaptation and resilience building which are essential conditions to provide opportunities to sustainable return. Parallel support to both rural and urban resilience is necessary (Sturridge *et al.*, 2018), but durable solutions aimed at supporting the return of IDPs to their place of origin are still lacking today. Investments in the support of drought-resilient livelihood in rural areas could encourage many IDPs to return in their place of origin (ReDSS, 2020). By supporting rural areas, more IDPs could consider return as an option, relieving in turn the growing pressure on cities and ensuring that relocation efforts become more effective.

Conclusion

Through destructing assets and worsening living conditions, droughts have become a major driver of internal displacement in Somalia. Their recurrence since 2015 further makes recovery more difficult and leads to protracted displacement in Somali cities which, as a result, face the challenge of rapid and uncontrolled urbanisation. The drought conditions of 2019 have yet again affected the coping capacity of rural communities who still have not fully recovered from the severe drought of 2016/2017.

The 2019 drought mainly affected the Bay region, causing large number of IDPs to arrive in the city of Baidoa in search of humanitarian assistance. IDP settlements expanded and relatively few people returned to their place of origin after the crisis. As they lost most of their assets, a large part of IDPs intend to stay in Baidoa where they can benefit from humanitarian aid (Sturridge *et al.,* 2018; ReDSS, 2020). However, the sustainable integration of IDPs locally remains limited due to low municipal means and the lack of capacity investments. As the costs of meeting the needs of all Somalis' IDPs have been estimated to be over 1 billion dollars for a year, which accounts for 21% of Somalia's GDP (IDMC, 2020a), finding more durable solutions where IDPs could be no more dependent to humanitarian assistance has become a priority.

A positive evolution of national IDP policies has been observed in recent years, with extensive improvements in 2019. The policy framework at a federal level has granted IDPs more rights and has favoured the development of durable solutions for effective local integration and sustainable return. However, the effective implementation of these policies remains limited in cities like Baidoa, demonstrating the lack of coordination between federal and local governments. As Somalia will continue to face drought conditions in the years to come, mainly as a consequence of climate change (IPCC, 2014), stronger implementation of durable solutions, in both rural and urban areas would allow communities to become more resilient to drought episodes. This would also require taking action beyond big cities such as Mogadishu, Baidoa and Kismayo which are still concentrating the majority of international aid.

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Asia

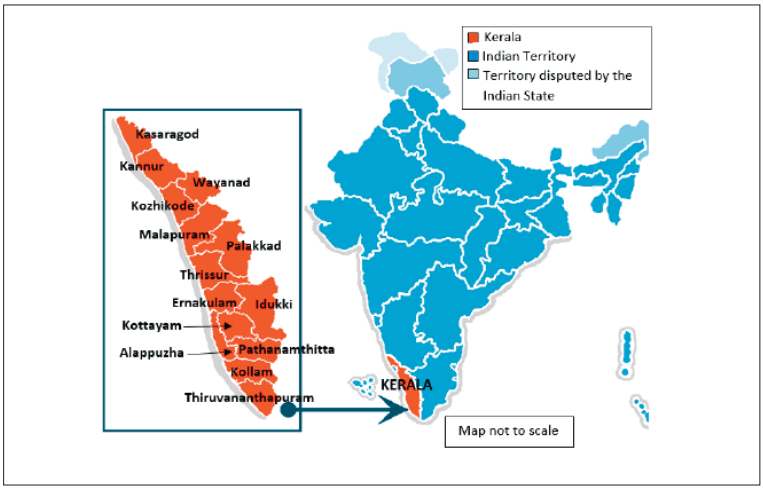
Performing an Invisibility Spell

Exploring the media's discourse on human migration in the aftermath of the Kerala floods and landslides of 2019

Víctor José Sánchez Juárez

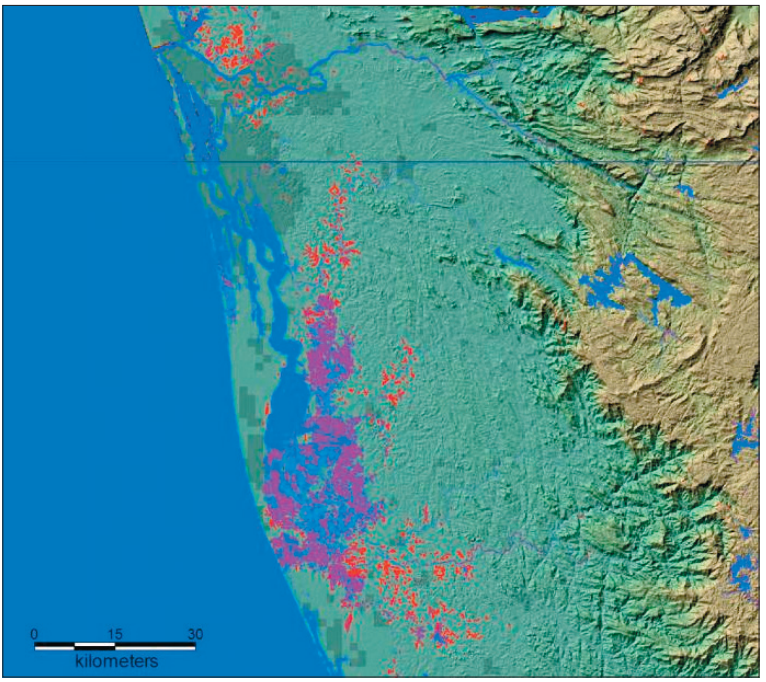
Kerala is a Southern Indian state which underwent major floods and landslides in August 2018 and in August 2019 (see Images 2.1 and 2.2). According to the Internal Displacement Monitoring Centre (IDMC), 2,675,000 disaster-related internal displacements occurred in India during 2018, of which more than half – about 1.5 million – were recorded in Kerala following the 2018 floods (IDMC, 2019). Data for new disaster-related internal displacements in the country for 2019 amounted to 5 million (IDMC, 2020). Regarding the displacement linked to the 2019 Kerala floods, it is estimated that, by the end of August 2019, 251,000 Keralites had sought refuge in 1,639 relief camps across Southern India (India Today, 2019).

Image 2.1. Map locating Kerala and its districts within India



Map Elaborated by the Author

Image 2.2. Observed flooding areas of Kerala during the 2018 floods



Map Courtesy of G. R. Brakenridge and A. J. Kettner (Brakenridge and Kettner, 2018)

Authors like Bankoff (2004) have shown how natural hazards only turn into disasters within social contexts. For instance, an earthquake will only be called a disaster when it harms populations that were vulnerable to it because they were unable to afford housing designed to stand seismic waves. To follow this social process, this paper will pay attention to the situation of Adivasis – or members of any of India's tribal communities.[1] This paper focuses on this population because Adivasis have historically been discriminated against across India (Dasgupta, 2018 and AIUFWP, 2020). The Keralite case, in particular, has been used by academics and social movements alike as an example of how land distribution patterns

[1] The term Adivasi has been translated by scholars of Adivasi studies as "original inhabitants" (Dasgupta, 2018). For a more detailed genealogy of the terms associated with Adivasis, see the same piece by Dasgupta (2018), where she elaborates on the (often ignored in common parlor) political significance attributed to different words like Adivasi, tribal or Scheduled Tribes. This paper practices the linguistic generalised equation of Adivasis and tribal communities but distinguishes Adivasi and tribal as general categories distinct from the legal category of Scheduled Tribes.

(Michael, 2019) and patterns of *invisibilisation* and generalised ignorance towards Adivasi communities (as well as Dalit – or "untouchable" – communities) exacerbated their vulnerability during the 2018 and 2019 floods (National Dalit Watch, 2019).

To engage with the claims and analyses put forward by social movements such as the National Dalit Watch, this paper studies the media discourse surrounding Adivasis in the context of human displacement during the 2019 Kerala floods. In recent years, discourse analysis has gained a relative popularity in the study of human mobility. However, most approaches, including those put forward by Horsti (2012) and Vezovnik (2018), focus on how the image of the immigrant coming from the Global South into the Global North is constructed in the host country. Regarding the sub-field of environmental migration, discourse analysis is gaining traction, for example through works applying critical approaches to the terminology used by the sub-discipline (Piguet, 2013) and through studies on how elite and non-elite populations in the Global South construct diverging discourses about the urgency to migrate when facing sea-level rise (Arnall and Kothari, 2015). Most of the scholarly work analysing discourses relies on close reading, which is understood as the critique of a handful of texts carefully selected by the authors (Moretti, 2013). This paper, however, applies distant reading techniques as a method to analyse media articles (see *Methods* section below). Following Viola and Veerhul (2019), the importance of the context under which the discourse under study was articulated will be highlighted to minimise the risk of conducting biased interpretations. By doing so, this paper seeks to bring context-based discourse analysis forward into the field of environmental migration while introducing an innovative set of techniques that allow scholars to engage with a large number of texts.

Regarding the structure of this paper, it will begin with a methodological discussion. Afterwards, the article will mobilise political ecology concepts to analyse the socio-environmental scenario in which the Kerala floods took place. More concretely, this case study identifies how previous development-induced displacements of Adivasis were linked to the creation of dams. Hence, by 2018 and 2019, when heavy rains hit Kerala, the vulnerability of Adivasi's communities was exacerbated. Furthermore, the policies meant to address their needs followed path-dependent patterns of *invisibilisation*, understood as the non-representation of a given group or their needs in a discourse (Herzog, 2018). After setting the stage, the paper will use distant reading methods to analyse elite discourses on human mobility and the Kerala floods and landslides.

This paper suggests that these methods can triangulate linguistic, social and historical data to identify patterns of vulnerability and *invisibilisation* influencing human displacement.

The main goal of this paper is to conduct critical discourse analysis in order to explore social relations of power, domination and inequality, and the ways these might be reproduced in discourses (Van Djik, 1995). More specifically, this paper explores whether (and how) the media represented the local Adivasi communities following the 2019 Kerala floods. This question will tackle the extent to which Adivasis were made invisible in public discourse and, hence, explore if the pattern of *invisibilisation* towards them was reproduced by the media.

Methods, and a few words of epistemic caution

This section introduces the concepts of distant reading and close reading, as well as some of the advantages and disadvantages of each. It then explores some of the scholarly criticism directed towards distant readers and digital humanists. While doing so, the epistemic importance of understanding that this piece is mediated by technology is highlighted. Lastly, topic modelling (one of the computational methods employed) and the data gathering strategies that yielded the corpus of media articles analysed are briefly described.

Distant reading is an approach developed within the field of digital humanities as a method to analyse textual discourses using computational tools. A term originally coined by Moretti (2013), distant reading is defined in opposition to close reading (taken as the minute analysis of individual texts). Distant reading is an approach that tries to uncover patterns across multiple texts by drawing statistical inferences using computational methods. Moretti argues that close reading is in a disadvantageous position since "it necessarily depends on an extremely small canon (when compared to the one distant readers can use)" (Moretti, 2013: 48) that has been handpicked by the analyst. By contrast, the promise of distant reading lies in its ability to draw inferences from a large number of texts and capture temporal variations. In defence of close reading, it should be noted that it can produce detailed studies of texts and analyse a given word or sentence in the context of a larger work. Unlike close reading, distant reading (or at least the version used in this paper) is "merely" dealing with macro tendencies across texts by looking at statistical data. Nevertheless, this technique is not an attempt to pass simplified statistics as academic

research. Computational inferences tend to be empty of meaning and thus require human interpretation (Moretti, 2005).

Scholars from the social and human sciences have criticised distant reading. For instance, Arac (2002) warns against uncritically pretending that the totality of discourses on a given subject can be captured with digital methods that use corpora written in English and that have been designed to work in European languages. Another potential critique of some works on digital humanities is the existing tendency to fetishize computational analyses as end products (Dobson, 2012). Articles whose code is veiled, undiscussed and hidden away from the final reader pose problems when it comes to the evaluation of scholarly work, the extent to which that knowledge can be democratised and the spirit of open experimentation and risk taking (Burdek *et al.*, 2012).

The specific methods employed are frequency calculations on R (a programming language and software), a semantic map made on Cortext (a distant reading interface), and a topic model. Topic modelling is an automatic process which codes the content of a textual corpus into meaningful clusters. This paper uses the latent Dirilecht allocation (LDA) algorithm to conduct topic modelling, which assumes that meaning can be found by grouping words according to their probabilistic distribution, effectively treating texts as "bags of words" to be categorised (Rule, Cointet and Bearman, 2015). As explained below, this paper uses a three-topic modelling approach.[2]

The aforementioned methods were applied to a corpus of 252 digital newspaper articles published between the 8th of August of 2019 (the day the floods started) and the 9th of May of 2020. Moreover, these articles had to mention one of the words defined in the search query as a signifier of human mobility (made out of 30 words included in Annex 1) and include the word "floods" or "landslide" in order to be part of the corpus.[3]

[2] To better understand how this textual analysis was mediated by computational methods, the reader can access the R Notebook which details the R scripts used as well as the project on Cortext, where parts of our analysis were conductedLink to the R Notebook: https://rpubs.com/vict/697975
Link to the Cortext Project: https://managerv2.cortext.net/project/85240002556

[3] The search query used was designed to search for articles published in English that discussed India and that included the words "Kerala", "floods" (-Kerala and floods-) and a series of terms related to migration, displacement, diaspora and remittances, which are detailed in annex 1. This dictionary was created in order to capture the usage of terms deployed by the media after reading 10 articles on the Kerala floods that discussed migration in 2018 and 2019. The last characteristic of the search query is that these words should appear within a distance of 30 words either to the left or the to the right of "Kerala" and "floods" (/N30/).

The reason for the focus on media articles is that they represent speech acts that influence (and are influenced by) policies, reports and public opinion. Besides the author's linguistic limitations,[4] the focus on elite discourses was chosen because of the above-mentioned interest in critical discourse analysis. In the Indian context, the ability to engage with the English media presupposes a relatively high level of cultural capital. Looking at the anglophone media allows us to explore how cultural products produced and consumed by a dominant group (anglophone elite) represent a dominated group (Adivasis).

Development-induced displacement and *invisibilisation* patterns

In order to consider the context in which I base my media discourse analysis, I first deconstruct the events that led to the 2019 Kerala floods and subsequent disaster-induced displacement. The United Nations and several newspapers categorised the Kerala floods and landslides of 2018 and 2019 as natural disasters (UN, 2018; India Today, 2019). Nevertheless, it might be useful to deconstruct the very idea of a *natural* disaster. This section proposes a historical analysis that illustrates how the Kerala floods became a disaster by transforming the local geography and displacing vulnerable Adivasi communities. By linking the building of dams to Adivasi lived experiences of vulnerability, this section explains why both the 2018 and 2019 floods can be analysed as the consequence of infrastructural failures related to large dams. The following section discusses the unseen and differentiated vulnerabilities of Adivasi communities.

Dams as an infrastructural vehicle for the disaster

Kerala has a thick hydraulic system characterised by large dams. In total, 61 large dams were reported in the national register of dams that, with the exception of three dams disputed with the neighbouring state of Tamil Nadu, are all publicly run by the government of Kerala (National Register of Large Dams, 2018). This system of hydraulic infrastructures can be contextualised as being integrated within developmentalist projects (Escobar, 1995). For instance, the damming of the Kallada river was completed with funding from the World Bank and was envisioned as part

[4] The author does not read neither Hindi nor Malayalam, two local languages spoken in Kerala.

of an irrigation system supporting development by boosting the production of hybrid coconuts that can be exported at higher prices but which required more water than the heirloom varieties (World Bank, 1982). This system was woven through a network of interests that connected the World Bank, public bodies of the Keralite Government, coconut plantation owners and transnational coconut buyers.

Even though the Central Water Commission of India (CWC) concluded that dams did not significantly contribute to the 2018 floods (CWC, 2018), a subsequent report by the UN disqualified CWC's findings. The UN's report stated that dams might not have played a role upstream but did play a role downstream, particularly when coupled with other infrastructural failures such as faulty drainage channels that should have discharged water into the sea (UN, 2018). Consequently, the so-called "natural" disaster under scrutiny may be more than that: in line with Sara B. Pritchard (2012), it could instead be portrayed as the product (or rather the catastrophic consequence) of what she calls an "enviro-technical system" – or the hybrid intertwining of environmental and technological processes. To make matters worse, this thick enviro-technical system was not scaled down after the 2018 floods. On the contrary, as of late 2018, new large dams were under construction, which might have increased the risk of malfunctioning infrastructures in 2019 (National Register of Dams, 2018).

The unseen and differentiated vulnerability of Adivasis

The construction of dams for economic development induced displacement of local communities and (re)produced structures of vulnerability in the state of Kerala. According to official figures, the *Lok Sabah* (Indian Parliament) estimated that since independence, and as of 2013, 1,115 families had been displaced as a result of developmentalist policies linked to water infrastructure in Kerala (Lok Sabah Secretariat, 2013). Between 40-50% of said displaced households belong to Adivasi communities (Lok Sabah Secretariat, 2013). This average is disproportionate in the case of Kerala where, according to data from the latest census, only 1.45% of the registered population belonged to a "scheduled tribe" (Government of Kerala, 2011).

As shown by the report commissioned by the Keralite government titled "Leaving No One Behind", the history of prior development-led displacement influenced the 2018 and 2019 floods. Following previous displacements linked to the construction of infrastructures such as dams, Adivasis

were usually allotted lands close to floodplains or in landslide prone areas, henceforth increasing their vulnerability to flooding and other disasters (Rajesh and Chandran, 2019). Furthermore, their historical relocation to relatively remote areas made it harder for relief teams to access these communities (Rajesh and Chandran, 2019). We could claim – as social movements such as the National Dalit Watch did in relation to the 2018 floods (National Dalit Watch, 2019) – that state's blindness to the needs of Adivasis exacerbated their vulnerability in 2019. For instance, some of the relief policies established by the government of Kerala were contingent on the formal ownership of either land or homes (Government of Kerala, 2019), something Adivasis usually struggle to get legally recognised (Bijoy, 1999).

The blindness towards Adivasi communities is not something new in Kerala: during the 1958 land reform policies implemented under the government of the Communist Party of India, land redistributions disregarded Adivasi populations (Guha, 2008). This is not to say that the local government actively seeks to flee its responsibilities towards Adivasis. The local government commissioned the report "Leaving No One Behind" in order to improve its policies. Nevertheless, the path dependency of discrimination towards tribal communities is deeply entrenched in India and in Kerala. Another account of this discriminatory dynamic can be found in the implementation of the Forest Rights Act of 2006. At the time, the Keralite government actively attempted to legally recognise the Adivasi ownership of forested areas. However, this act failed to do so because it required Adivasis to prove they were "traditional forest dwellers", when most tribal members in Kerala were landless laborers who did not inhabit forested areas (Münster and Vishnudas, 2012). Therefore, this generalised pattern of overlooking the Adivasi communities and their conditions can be characterised as part of a larger *invisibilisation* pattern that has rendered them more vulnerable to disasters.

Given the previous context of exacerbated vulnerability and lack of access to specific relief policies targeting the Adivasi community, this paper will explore the extent to which the media represented Adivasis and the depth of this representation.

Discourse Analysis

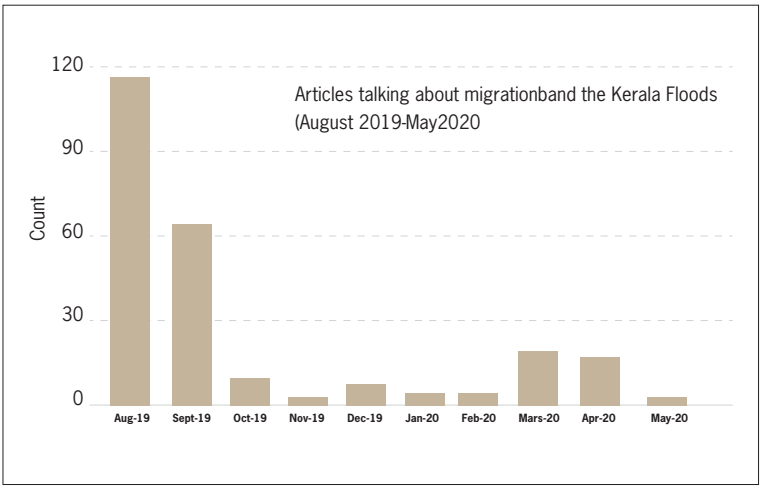
This section will analyse the results of the discourse analysis of media articles using computational methods (see *Methods* section above). It

further inspects the pattern of *invisibilisation* towards Adivasis and their specific conditions discussed in the previous section. By exploring the media discourse, I test how widespread the pattern of *invisibilisation* towards Adivasis is across society, particularly among the anglophone elite. Along the way, I explore the ways in which the discourse on human mobility was framed.

Describing the textual corpus: A generalised ignorance of Adivasi communities

Before analysing the selected corpus, it must be situated among the rest of news articles referring to the 2019 Kerala floods. The corpus captured 252 articles that discussed human mobility in the context of the 2019 floods and landslides, which constitutes only a small fraction of the more than 4,000 articles the anglophone media published on the 2019 Kerala floods and landslides. Figure 2.1 shows the distribution of the articles making up the corpus between August 2019 and May 2020. Unsurprisingly, the first characteristic of the corpus is that most articles (n = 183) were published between August and September 2019.

Figure 2.1. Month of Publication of the Selected Articles



Graph elaborated by the author using R

Topic modelling was carried out in order to analyse how the issues were covered by the media articles. After several iterations, the limit was set at three topics from which meaning could be extracted.[5] Likewise, for the sake of interpreting the topics meaningfully, the analysis will take into account only the first 10 words of each topic.[6]

The first topic featured the word 'migrant' predominantly, followed by words stemming from the word 'disaster', and accompanied by words such as 'need', 'work', 'worker', and 'health'. Here, one could argue that the media cares about portraying migrants in a disaster probably either as migrant workers facing a disaster and/or as health workers (likely migrant health workers) needed in a disaster. As the paper shows below, the prevalence of health-related words in this topic might be related to the emergence of a discourse on human mobility directly linked to the COVID-19 pandemic that indirectly mentioned the Kerala floods of 2019. This topic was coded as "migrants in a disaster".

The second topic is headed by words like 'district', 'rs' (rupees), and features words such as 'disaster', 'water', 'river', 'dam', the stem words of 'rescue', of 'insurance' and large Indian units of measurement (such as *crore* and *lakh*). Consequently, it could be said that this represents the media's concern for quantitative losses, particularly economic ones measured in rupees which follow in the aftermath of disasters related to rivers and dams. This second topic was therefore coded as representing the "quantitative impact of the floods."

The third topic is headed by the words 'landslide', 'mahrashtre' (an extraction I assume refers to the Indian state of Maharastra that also suffered from heavy rains in summer 2019), 'kill', 'heavy', the stem word of 'rescue', 'Wayanad' (a district in Kerala) and 'camp' (which is assumed refers to relief camps, the term used when referring to resettlement camps in India). Therefore, it could be said that this topic discusses deathly landslides that killed people in certain districts such as Wayanad, and which needed the intervention of rescue teams and evacuation to relief camps.

[5] For a given corpus, the researcher sets a number of topics into which they want to distribute the most frequently used words according to their probabilistic co-occurrences. After running several models, it was found that, using our corpus, three topics were the very limit at which meaning could be extracted, so these were chosen as input. In Cortext, the 30 most salient terms for each topic were ranked according to their overall and estimated frequencies. The higher they appear on each topic, the more used they are and the higher the estimated frequency the model calculated for them is.

[6] A table summarising the most salient terms for each topic can be found in annex 2. The ten most salient terms are written in Italics as to help the reader identify the 30 terms on which our descriptions of each topic are based.

Hence, this topic was coded as being related to a "deadly and localised disaster".

Regarding the variable of interest – the extent to which Adivasis were represented in the media – it was largely overlooked in the newspapers. As a matter of fact, no mention of "Adivasi" or "tribal" was found neither in the extended topic modelling taking into account 90 terms, nor on topic models considering up to 30 terms. Instead, the media privileged the representation of other realities linked to migration such as that of workers (Topic 1), the quantitative impacts of the disaster (Topic 2) and the deadly and localised impact of the disaster (Topic 3). In terms of frequency, only eight articles mentioned Adivasi communities, which is marginal given the 252 articles covered. This is further reflected in the fact that the list of the 500 most used terms and expressions did not include any reference to the Adivasis.[7]

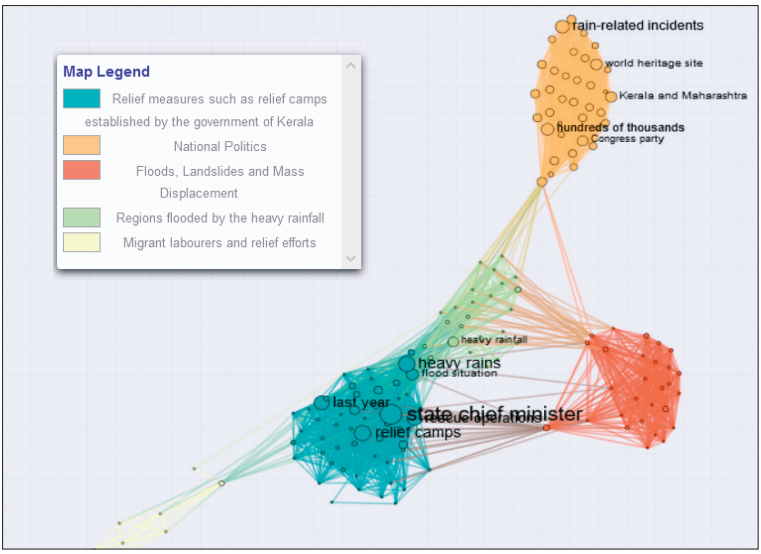
More importantly, none of the eight articles mentioning Adivasis focused on their situation. Indeed, most articles featured Adivasis as passive elements of a larger landscape. For instance, for three articles published throughout August and September 2019, the main topic was the visit of Rahul Gandhi (the leader of the Congress Party) to his constituency, Wayanad in Northern Kerala, where he "patiently heard the woes of the people who were displaced" (The Indian Express, 2019). Another article mentioned the word "tribes" in the context of relief efforts in the aftermath of the 2019 floods, particularly when talking about the visit of A.K. Balan – the Minister for the Welfare of Scheduled Castes, Scheduled Tribes and Backward Classes – (The Hindu, 2019). Other three articles mentioning Adivasis were published on Economic and Political Weekly (EPW), a weekly journal specialised on the social sciences. For example, an article in the EPW mentioned the case of Adivasis as an example of how vulnerable migrants carry out informal jobs in New Delhi, and another one discussed how the credibility of official statistics needs to increase. The last article that the query identified as discussing Adivasis was a letter to the editor of the newspaper "Scroll In". In this letter, the author referred to tribal communities in the Narmada valley (North India). In short, few articles used words like "Adivasi", "tribal" or "forest dweller". Moreover, whenever they talked about Adivasis, they did so in a passing manner.

[7] In order to account for the commonplace amalgamation of the terms "Adivasi", "tribal" or "forest dweller" in general parlance (Duha, 2018), I designed a script in R that would check for mentions of "Adivasi", "tribe", "tribal", "forest dwelling" and "forest dweller."

Two discourses gravitating around human mobility

After establishing that the media articles published during 2019 and early 2020 did not address Adivasis nor their vulnerabilities, the paper explores how the media framed human displacement and resettlement. For exploring the angle from which the media covered environmental migration, the paper will use a network map of co-occurrences and bump charts. The former visualises expressions and words that tend to co-appear next to each other,[8] while the latter illustrates the temporal evolution of the discourse on human displacement by showing how terms that co-appear with a word change over time.

Image 2.3. Network map of co-occurrences of terms



Elaborated by the Author using Cortext. NB: The reader is advised to visualise the graph using the following link https://bit.ly/2JKal3J

[8] The methods mobilised in this paper account for the creation of linguistic meaning as understood in Saussurean terms, as terms whose meaning is modified by other terms (De Saussure, 2007). It should be acknowledged that for some, inferring meaning using digital methods focused on co-occurrences might still run against Saussure's ideal of linguistical analysis. It is true that by using a corpus that was originally meant to be read, we avoid ignoring matters like intonation, what Saussure would call subjecting spoken speech acts to the "tyranny of text". Nevertheless, it cannot be denied that the approach undertaken subjects the corpus to what could be called the "tyranny of the algorithm". The renunciation to rich qualitatively understandings of media articles in exchange of gaining the ability to quantify co-occurrences and draw generalisations across 252 newspaper articles.

The network map (Image 2.3), which is best visualised online,[9] presents a snapshot of the words that are usually associated with each other in the overall corpus. The map groups 150 nodes (each node is an expression made up of 2 or 3 words) and was obtained from an indexation of the most frequent terms used by the articles making up the corpus. The resulting visualisation shows that the terms can be grouped into five different clusters: 1) Migrant labourers and relief efforts (white); 2) Floods, landslides and mass Displacement (red); 3) National politics (yellow); 4) Regions flooded by the heavy rainfall (green); and 5) Relief measures such as relief camps established by the government of Kerala (blue). One must note that none of these clusters of terms mention Adivasis or tribal communities.

An interesting approach is to analyse the relations between nodes. For instance, the only node that includes the stem of migration (that of 'migrant labourers') tends to be associated with terms like 'relief camps', 'relief and rehabilitation' and 'disaster management'. The fact that 'disaster management' itself is linked to terms such as 'last year' might indicate that recent media articles refer to the Kerala floods of 2019 as an example of a historical disaster, possibly both in the sense of it being a disaster which followed the 2018 floods and as a disaster referred to in articles written in 2020. In terms of nodes like 'relief camps', this word is at the centre of the most populated cluster (the fifth one), highlighting how the camps are one of the main topics covered by the media and is connected to nodes such as 'State Chief Minister of Kerala' and 'rescue operations'. This cluster is at the centre of the map and is connected to all the other clusters, hinting to the fact that the media discourse centred on the relief policies implemented by the regional authorities. In other words, the media discourse on migration gravitated around human displacement and the policies aimed to alleviate the situation of those displaced. Lastly, the mentions of displacement in the co-occurrences analysis take place in the second and third clusters. In the second cluster, 'mass displacement' is linked to terms like 'dam waters' and 'devastating floods', which could be interpreted as a reflection of articles discussing mass displacement as the result of devastating floods. The third cluster shows how 'lives and displacement' is a peripheral node connected to 'Kerala and Maharashtra', 'Southern State of Kerala', 'hundreds of thousands' and 'Congress Party'. This set of connections could be explained by considering that the media was trying to report on the displacements and deaths that occurred during the floods for an all-Indian audience.

[9] Link to the network map of co-occurrences, elaborated by the author using Cortext: https://bit.ly/2JKal3J

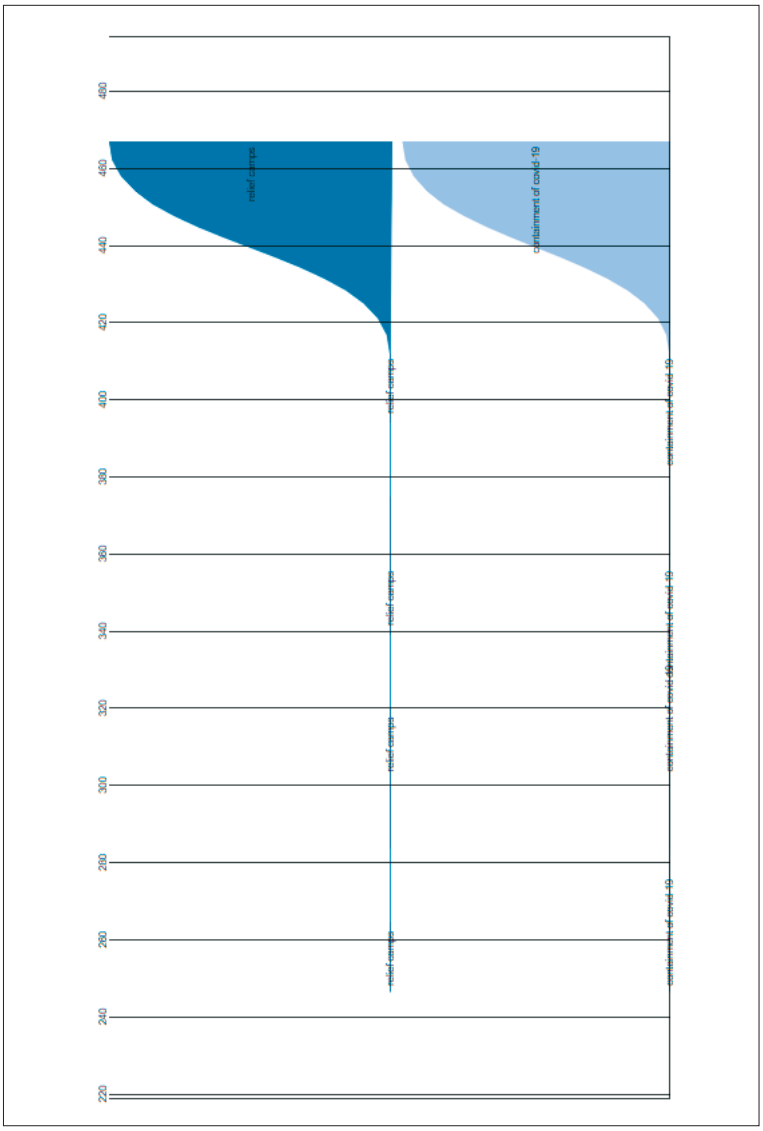
Finally, since the corpus spans over a period of eight months, I explore its temporal evolution through bump charts, a visual representation that shows the frequency of terms and expressions that tend to appear next to a given word. This technique is applied to the most frequent term related to human mobility in the data, 'relief camps'. Incidentally, this expression refers to the displacement induced by the floods and landslides since resettlement camps are the locations were displaced populations were relocated.

The bump chart showing the evolution of terms associated with "relief camps"[10] shows a clear temporal break. Originally, the term 'relief camps' was associated with extreme environmental events (e.g. 'rain-related incidents', 'floods and rains', 'several flood-hit') and terms about the policy implemented in Kerala (e.g. 'relief camps in the state', 'shelter in relief camps', 'relief measures'). However, from February 2020 onwards, the media shifted the context of expressions used to discuss relief camps and started discussing them exclusively in relation to migrant labourers and the containment of the COVID-19 pandemic.

Figure 2.2 represents another exploration of the terminological change in the anglophone media's discourse. It shows the proximity of terms associated with 'migrant labourers', the word that was most heavily associated with relief camps on articles published at later stages. The term 'migrant labourers' appears next to expressions such as 'relief camps' and 'containment of COVID-19'. In fact, the frequency of these terms rose simultaneously. This might indicate the presence of two separate discourses on relief camps linked to environmental stressors: an earlier discourse dealing with the displacement directly linked to the Kerala floods and landslides, and a second one referring to the relief camps that were established during the outbreak of COVID-19 in early 2020. Following the R script, this inflection happened in February 2020, since 35 out of 43 articles published from February 2020 onwards referred to COVID-19.

[10] Bump chart available here: https://documents.cortext.net/21ad/21ad6e41d42a9d28cc326da96bb206a0/184682/.bump.html?source=.2019-migration-august-may_bump/word_1_bump_0.json

Figure 2.2. Bump chart showing the evolution of terms associated with "migrant labourers"



Bump chart elaborated by the author using Cortext

Conclusion

This paper sought to explore the extent to which news reports on migration within the context of the 2019 Kerala floods represented the Adivasi population. In doing so, the context of development-induced displacement and the vulnerability of the Adivasi community were stressed as social factors that conditioned some of the human impacts of the 2019 floods. The first section provided an overview of the vulnerability of tribal communities that is ignored by governmental action. Next, as a way of checking if this *invisibilisation* pattern was widespread across the dominant anglophone elite, the discourse of the anglophone media was analysed using distant reading methods. Based on a corpus of 252 articles, it can be concluded that the media's discourse made the Adivasi community invisible. The media's coverage focused instead on representing the experiences of migrants in a disaster (Topic 1), the quantitative impact of the floods (Topic 2) and how the floods and landslides were a deadly and localised disaster (Topic 3). More specifically, the media tended to focus on instances of environmental mobility as they relate to relief camps ran by the authorities to cope with displacement in a context of flooding. Lastly, the paper tracked temporal changes in the structure of the corpus, showing how, after the breakout of COVID-19, the media used the 2019 Kerala floods and landslides as a reference point to talk about the settlement of migrant labourers in relief camps during the ongoing COVID-19 epidemic.

The anglophone media barely covered the experiences of Adivasis and, when it did, they portrayed Adivasis as passive subjects and not the main focus of their inquiries. This suggests that the content reproduced pre-existing patterns of marginalisation, casting a metaphorical invisibility spell that excluded Adivasis from its narrative. This further speaks to how widespread the *invisibilisation* of Adivasis is among dominant anglophone groups.

Some of the shortcomings of this paper included its inability to directly access the field under study and to produce a thicker description of Adivasi communities' everyday experiences with the 2019 disaster. Likewise, an additional limitation of this paper is that it is not focused on processes of displacement. Instead, trying to circumvent the lack of research and official statistics, it has explored the ways Adivasi communities are invisibilised in the dominant media's discourse. Therefore, it could be said that this paper has ultimately voiced the media and not the Adivasi themselves. Further research on environmental migration in Kerala could contribute to exploring how every-day experiences of Adivasi communities have been influenced by flooding events.

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Annex 1:

1) *Key words for human mobility and its activities*:

1) Migration

migration, emigration, immigration, migrant, migrants, emigrant, emigrants, immigrant, immigrants, Non-resident Indian, NRI

2) Displacement

displacement, displaced, IDP, Internally Displaced Persons

3) Diaspora

diaspora, diasporic

4) Remittances

Remittances, remittance

The word "floods" was chosen over "flood" to avoid capturing instances where the verb to flood is used in an article that talked about Kerala. Similarly speaking, words like "resettlement camps" or "relief camps" were not added to the search query as to keep it policy neutral and avoid skewing the data towards news articles covering policies.

Annex 2:

Here is the complete table summarising our three topics. It was decided to cut it down to 10 during our analysis because using such a small corpus (by digital humanities standards) makes words like "author" and "would" appear, which are relatively empty of meaning on their own. However, it

is important to include the complete list of models here not only for the sake of transparency, but also because by focusing on 30 terms, some very interesting results were ignored. For example, the first topic (coded as "Migrants in a disaster") includes words like health and COVID-19, which could be explained by the fact that the search query used captured the COVID-19 epidemic. Therefore, one could venture out that newspapers mentioning Kerala and the floods/landslides did so as a way of saying that a disaster already took place in the state in 2019 (or even most likely 2018 since it is a term in this topic). Other interesting terms appearing here is "women" which, might be related to the fact that several newspapers covered the situation of women in the relief camps established for relocating populations.

Topic 1: Migrants in a disaster	Topic 2: Quantitative impact of the floods	Topic 3: A deadly and localised disaster
migrant	district	landslid
disast	rs	mahrashtre
countri	crore	kill
need	disast	heavy
new	water	rescu
work	river	wayanad
time	dam	camp
worker	lakh	offici
health	rescu	district
data	insur	least
would	landslid	author
indian	centr	caus
mani	fund	monsoon
econom	heavi	water
come	saturday	hit
chang	toll	sunday
women	oper	congress
climat	kill	southern
one	continu	rainfal
like	damag	worst
back	due	thousand
say	ndrf	ganshi
use	releas	toll
even	pradesh	two
system	least	open
covid19	loss	friday
2018	one	indian
nation	vijayan	near
first	region	gujarat
take	per	hous

Table Elaborated by the author using a topic model conducted on Cortext

Disaster and Displacement Preparedness in the Indian State of Odisha and in Mozambique

A comparison of the management of cyclone Fani and cyclone Idai

Léa Sanz

Between the 2nd and the 4th of May 2019, category-4 Cyclone Fani made landfall on the Indian region of Odisha. Although it destroyed most of the infrastructures and the livelihoods in the region, the cyclone resulted in few human casualties. This limited toll was generally attributed to the large-scale pre-emptive evacuations of 1.2 million people (World Bank India, 2019). A few months earlier, Cyclone Idai – similar to Cyclone Fani in both strength and magnitude – had hit the coasts of Mozambique. The extreme weather event caused huge damages on the country's coast, notably in the city of Beira where most of the infrastructures and buildings were destroyed. Unlike in India, few pre-emptive evacuations were undertaken in Mozambique and 603 human casualties were reported (Ripoll & Jones, 2019).

The international community and the UN agencies praised Odisha state's disaster management and large-scale lifesaving evacuations during Cyclone Fani and attributed them to a high level of governmental and community preparedness to extreme-weather events (Red Cross Red Crescent Climate Centre, 2019). In contrast, Mozambique's low level of preparedness and lack of pre-emptive evacuations before Cyclone Idai led to important casualties, losses of livelihoods and long-lasting displacements (IDMC, 2020).

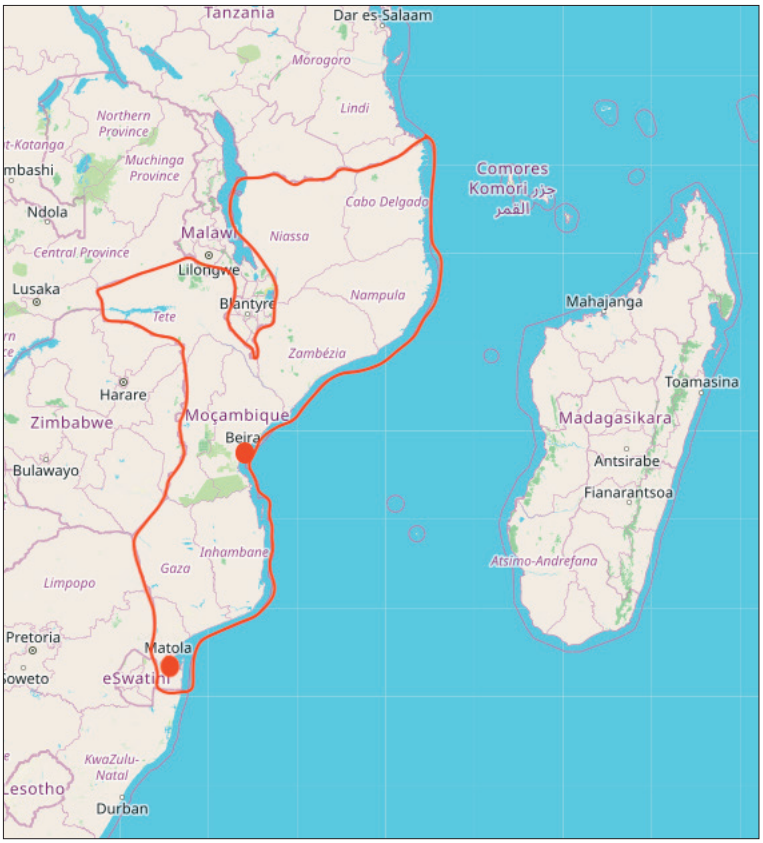
We decided to compare the Indian State of Odisha, formerly known as Orissa (Image 3.1) to the country of Mozambique (Image 3.2) as their shared characteristics, but also their differences, make their comparison interesting. Both zones are characterized by a long coastline along which populations' livelihoods depend on agriculture and mostly fishing: the Odisha state stands along the Bay of Bengal while Mozambique's coastline goes from Tanzania to South Africa along the Indian Ocean. Climate patterns in the two regions are however quite different: Mozambique's climate is mostly tropical and tends to be marked by two seasons, a rainy

season from December to February and a dry season from April to September (Dutch Sustainability Unit, 2015), while Odisha's climate is characterized by four seasons: winter, pre-monsoon, monsoon and post-monsoon. Both regions are cyclone-prone areas and most interestingly for our study, both of them experienced a major extreme weather-related catastrophe in the early 2000s, similar in strength and magnitude to the 2019 cyclones. Storm Eline made landfall in Mozambique, 50 miles south of Beira, in February 2000 and the 1999 Super Cyclone made landfall on Odisha state on the 29th of October 1999. Both events had huge impacts on disaster preparedness in the two regions, with the region of Odisha developing strong community preparedness systems while the Mozambican government favoured resettlement to flood-free areas. These different reactions to previous disasters will allow us to better understand how government and community disaster preparedness have impacted migration and displacement in both regions during the 2019 cyclones. Although the different geographical areas compared in this paper correspond to different levels of governance – we compare the response of the central government in Mozambique to the state response of the government of Odisha in India – this comparison can be explained by the fact that each of these governments at their own level are held accountable for disaster management. Indeed, it is the governement of Odisha that was held responsible for the lack of preparedness when the 1999 Super Cyclone hit the state (Thomalla & Schmuck, 2004) and later praised for the management of Cyclone Fani (World Bank India, 2019). Similarly, it is the government of Mozambique that is in charge of implementing the disaster management strategy and was held accountable for the management of Cyclone Idai.

Image 3.1. Geographic location of the state of Odisha in India

Map elaborated by author

Image 3.2. Geographic location of Mozambique within the Southern African region



Map elaborated by author

In terms of methodology, this paper was written following an extended review of existing academic and grey literature. In this paper, we investigate how previous disasters impacted government and community preparedness and how this in turn impacted mobility in the Indian state of Odisha during Cyclone Fani and in Mozambique during Cyclone Idai. Throughout the paper, we argue that the robust government preparedness system built by the Odisha state following the 1999 Odisha Super Cyclone led to growing awareness among the population and has showed its efficiency through large-scale pre-emptive evacuations during Cyclone Fani. However, although these evacuations limited the human

toll, the lack of attention to post-disaster recovery and livelihoods protection has led to medium- to long-term economic migrations (Chhotoray, 2019). Conversely, during Cyclone Idai, the lack of preparedness of the Mozambican government and its chosen focus on resettlement and post-disaster recovery has led to large waves of forced displacement, increasing the displaced population's vulnerability to future climate-related risks.

Lessons learnt from previous disaster events

According to Patt and Schröter (2008), "*risk* is the product of the magnitude and likelihood of harm, and *risk management* is the process of taking actions to improve expected welfare by reducing the likelihood or severity of future risks" (p. 459). Generally, as a population's and a government's risk awareness increase, risk management strategies develop as well. A recent study by Walch (2018) found that the likelihood that people evacuate prior to a disaster depends on their perception of the risks, this perception being in turn linked to how traumatic previous experiences were. In light of this, we start by examining the impact of the 1999 Odisha Super-Cyclone and of the 2000 Cyclone Eline on the disaster management strategies of the governments and communities of the state of Odisha and of Mozambique, respectively.

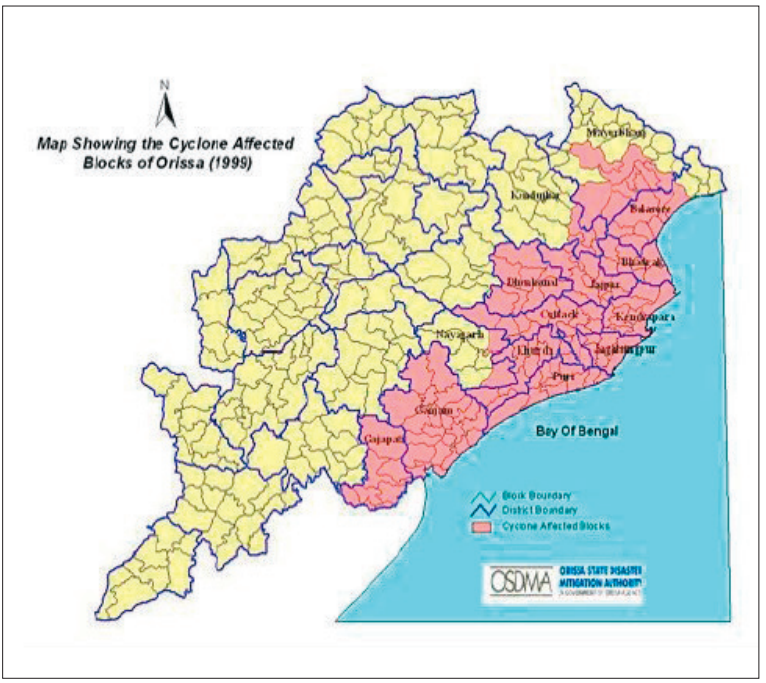
India's disaster management strategy during the Odisha Super-Cyclone in 1999

The Odisha region is an Indian state along the Bay of Bengal on the eastern coast of the country. Odisha state has been referred to as the world's region most affected by tropical cyclones (Thomalla & Schmuck, 2004). Due to the impact of climate change, warming oceans have modified cyclones' patterns, which tend to be now more frequent and more intense than before (Iwasaki, 2016). An environmental disaster can have severe impacts on farming and fishing activities as, when mitigation plans are not implemented, the livelihoods of communities depending on these activities erode. Mitigation here is defined as "means to reduce the severity of the human and material damage caused by the disaster" (WHO, EHA, 1999: 3).

In October 1999, a force-5 (on the Saffir-Simpson hurricane wind scale) cyclone, with wind speeds up to 350 km/h, hit the coastal region of Odisha. Called the Odisha Super Cyclone, it resulted in approximately

10,000 human casualties, although the actual number of deaths is probably much higher as many victims were migrants from neighbouring states who were not accounted for in the death toll (Thomalla & Schmuck, 2004). Furthermore, severe flooding caused by the cyclone destroyed the livelihoods of the population, who mostly rely upon climate-sensitive resources.[1]

Image 3.3. Odisha state's districts affected by the 1999 Super Cyclone



Source: Orissa State Disaster Management Authority, Government of Odisha

Iwasaki estimated that 14 out of the 30 districts in Odisha state were affected (Image 3.3), representing around 18.9 million people in 17,993 villages (Iwasaki, 2016). The Super Cyclone was a traumatic experience for the local population for whom the loss of lives and livelihoods had long-lasting impacts (Iwasaki, 2016). This trauma, however, triggered

[1] 62% of Odisha state's population depends on agriculture for their livelihoods (Government of Odisha, World Bank, UN India & ADB, 2019)

the development of disaster risk reduction[2] and disaster preparedness[3] strategies in the state and has allowed the development of strong risk awareness programmes among the population and the government. In one study, Walch (2018) concluded that:

> People interviewed in India all agreed that this change of risk perception was created as a result of the traumatic experience of the 1999 cyclone. This cyclone was a turning point for the state of Orissa [Odisha's former name] and the government of India in terms of taking disaster risk reduction more seriously (Walch 2018: 8).

Prior to the cyclone, the efficiency of the existing early warning system[4] was undermined by the inadequacy of the communication networks at the local level and the lack of real consciousness of cyclone risks in the state (Thomalla & Schmuck, 2004). At the time of the Super Cyclone, the only cyclone shelters that existed were the 23 cyclone shelters managed by the Red Cross as part of their local disaster management plan. When the cyclone made landfall, these shelters were the only safe buildings in the area, but they could only provide shelter to 40,000 people (Thomalla & Schmuck, 2004). This was insufficient compared to the almost 19 million people affected by the cyclone. After the cyclone, officials, who were criticized for their lack of preparedness, realized the importance of disaster preparedness and started putting new strategies in place (Thomalla & Schmuck, 2004). First, they created the Odisha State Disaster Management Authority (OSDMA), an institution which sought to oversee the state's strategy in preparation for tropical cyclones. The main idea was to "shift the institutional approach from the reactive approach of relief, restoration, and rehabilitation to the proactive approach of planning, preparedness, and prevention" (Iwasaki, 2016: 60). OSDMA's intended role was to promote and coordinate the disaster management activities

[2] According to the UNISDR, Disaster Risk Reduction is "the systematic process of using administrative directives, organizations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster." (UNISDR, 2009: 10)

[3] Preparedness is "the knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions." (UNISDR, 2009: 21)

[4] Early warning system is defined by the UNISDR as "The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss." (UNISDR, 2009: 12)

of all local stakeholders, ranging from government officials and NGOs to community-based organisations. OSDMA encouraged the implementation of local committees in charge of the local response to empower local stakeholders and populations (Iwasaki, 2016).

As the lack of awareness at the local scale was one of the main issues identified during the Super Cyclone, authorities decided to focus on increasing community disaster preparedness through education and training programmes on disaster behaviour. During the Odisha Super Cyclone, early warnings were not taken seriously by the population due to low risk perception. Thomalla & Schmuck (2004) showed that, even though most of the population received the warnings during the Odisha Super Cyclone, they did not realize the gravity of the situation nor think that they were targeted by the message. This explains why the various disaster management and risk reduction programmes that were undertaken by the Government of India, the State of Odisha and local stakeholders in the decade following the Super Cyclone were aimed at raising local awareness to risk and at building local communities' capacities. One of the goals of OSDMA's 2003-2009 Disaster Risk Management programme was to train village-level volunteers to disaster preparedness (Das, 2019).

In addition to raising local awareness, OSDMA's strategy included the building of numerous cyclone shelters, reaching almost 900 shelters in the region in 2019. OSDMA encouraged the local management of the shelters through the designation of volunteers responsible for their maintenance and preparation (Walch, 2018). Nationally, a new early warning system was implemented within the India Meteorological Department (IMD) to forecast the occurrence of extreme-weather events. Jointly, the IMD and the Odisha State Disaster Management Authority improved communication and warning dissemination through large press coverage and various visual and audible warning messages. Odisha's government put in place early warning systems which consisted in drills to alert the population and trained people through mock exercises (Walch, 2018). The Odisha Super Cyclone of 1999 led to genuine awareness raising amongst both the state's population and authorities, resulting in the adoption of new preparedness measures.

Mozambique's disaster management strategy following Cyclone Eline in 2000

Due to its geographic location and long coastline bordering the Indian Ocean, as well as changing weather patterns, Mozambique is at high risk

of extreme-weather events. The Global Facility for Disaster Reduction and Recovery ranked Mozambique the third African country most exposed to extreme-weather events (GFDRR, 2015). In 2000, a few months after the state of Odisha was struck by the Super Cyclone, Mozambique was hit by Cyclone Eline. The cyclone made landfall near the coastal city of Beira and brought heavy rains which caused large floods, killed 350 people and left 650,000 others homeless (UNICEF USA, 2000). It is also estimated that 250,000 people were displaced following the disaster (UNICEF, 2000). It is worth noting that those figures are comparable to those resulting from Cyclone Idai in 2019. Wiles, Selvester and Fidalgo (2005) noted that the 2000 floods led to a restructuring of the national disaster management strategy. The National Institute for Disaster Management (INGC) was given a new role, with the redefinition of the post-disaster recovery strategy, notably through the mobilization of resources and an improved transition from emergency to rehabilitation. In addition, "the floods resulted in an updating of [the government's and the international agencies'] strategy documents and a renewed commitment to disaster preparedness, response, and mitigation" (Wiles, Selvester & Fidalgo, 2005: 10). However, this strategy remained centralized and mostly focused on recovery. Recovery was indeed perceived by the government as a development opportunity in the context of the reconstruction efforts that followed the 1992 civil war (Wiles, Selvester & Fidalgo, 2005).

Early warning systems are crucial in the prevention of cyclones and floods (Carmo Vaz, 2000). However, during the 2000 floods, the early warning system, which consisted in flood warnings issued to traditional authorities in both rural and urban areas, failed due to poor communication with the population who either did not understand the message or did not believe it (Carmo Vaz, 2000). Instead, as part of its post-disaster response, the Mozambican government initiated a voluntary resettlement programme aimed at relocating households from flood-prone areas to higher grounds or areas less subjected to climate hazards. In 2000, the Mozambican government built entire villages on higher grounds for the people living in the flood-prone areas (Patt and Schröter, 2008). After the 2000 floods, an estimated 40,000 households were thus resettled (Wiles, Selvester & Fidalgo, 2005). However, as people kept returning to their lands in the floodplain to farm, the resettlement programme was considered to have failed. Consequently, the government of Mozambique then encouraged people to keep two homes: one in the higher grounds where the families would live and keep their possessions and one in the floodplain where people could farm (Patt and Schröter, 2008).

In 2007, Mozambique was hit by another series of floods along the Zambezi river basin[5] following which the Mozambican government chose a 'flood-free' approach again, which "stresses the need to resettle people living on the floodplains" (Artur and Hilhorst, 2014: 362). As the 2007 floods caused 110,000 displacements, the Mozambican government's reaction consisted in issuing a policy aimed at permanently resettling the displaced population away from flood-prone areas (Artur and Hilhorst, 2014). This strategy went against UN Habitat's recommendations and 'Living with the Floods' programme which promoted preparedness and early warning systems and encouraged "flood management practices that allow people to live on flood prone areas and take advantage of the fertile soils that result from the floods" (Artur and Hilhorst, 2014: 362). It is important to note that these governmental resettlement programmes were implemented during a critical post-civil war context, and that they formed part of the government's urbanization and development objectives. The resettlement was intended to favor the 'villagization' of the Mozambican population (Artur and Hilhorst, 2014). Four years after the implementation of the 2007 resettlement programme in the Zambezi river basin, it could be argued that although the development and security situations had improved, "the programme eroded resettled people's livelihoods as they lost their physical, economic, social and environmental assets and cultural identity" (Artur and Hilhorst 2014: 362). Those were, paradoxically, the very same assets that the programme had aimed to protect.

Unlike in the state of Odisha where the 1999 Super Cyclone acted as a catalyst for action and community awareness, the 2000 and 2007 floods in Mozambique were not followed by raised awareness among the population. The lack of attention devoted to and perceived significance of climate change and climate risks by the population partly explain the failures of the government's mitigation policies Pratt and Schröter (2008). This adds to the lack of preparedness measures put in place by the Mozambican authorities, who chose to focus on the recovery stage of disaster management rather than on preparedness.

[5] The Zambezi River basin is a transnational river basin which main flow is the Zambezi river. It starts in Zambia and flows to Mozambique through the Tete region in the North West of the country to empty in the Mozambique Channel of the Indian Ocean. The Zambezi river marks the natural border between the Sofala and the Zambezia provinces and the Manica and the Tete provinces of Mozambique. It crosses the four Mozambican regions of Tete, Manica, Sofala and Zambezia from the North-West to the East side of the country.

During the cyclones

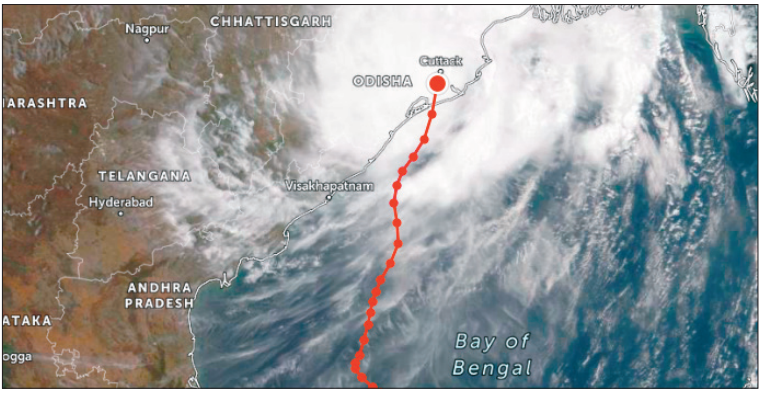
As stated above, in both Mozambique and in the Indian state of Odisha, new disaster management strategies were developed following cyclone experiences of the early 2000s. In 2019, both Mozambique and the Odisha state were hit by unprecedented cyclones during which these new strategies were put into action. We now turn to analysing how these disaster management strategies affected mobility.

In India: large-scale pre-emptive evacuations which saved lives, not livelihoods

On the 27th of April 2019, OSDMA was alerted by the Indian Meteorological Department of a possible cyclone hitting the country's eastern coast (Image 3.4) and started to rehabilitate Odisha state's 879 cyclone shelters (Seetharaman, 2019). On the 29th of April, as per OSDMA's recommendations, fishermen stopped going to sea. OSDMA sent 20 million text messages to people in the region to warn them of the coming cyclone. The National Disaster Response Force (NDRF) battalions stationed in the Odisha state and its neighbouring states were mobilized in preparation for the disaster that was expected to occur in the first days of May (Seetharaman, 2019). Similarly, the special unit of the Odisha police, the Odisha Disaster Rapid Action Force (ODRAF), was alerted and prepared for the cyclone. Although its occurrence at this time of the year was unusual, the early warning system allowed for massive preparations before the event. The evacuation of the population started on the 2nd of May, at 10 AM, and lasted until the 3rd of May, the day that the cyclone struck (Seetharaman, 2019). The NDRF and the ODRAF, along with other local forces, evacuated a total of 1.2 million people in state-built cyclone shelters (World Bank India, 2019). These pre-emptive evacuations were praised globally as they proved to be lifesaving. Although many of the evacuated individuals lost assets and goods, they were all able to return home once the cyclone had passed (IDMC, 2019). Although it was one of the strongest cyclones ever recorded, Cyclone Fani killed 64 persons (Government of Odisha *et al.*, 2019). This relatively low death toll has been largely painted as a success of early warnings and evacuation policies. Indeed, it is far from the underestimated 10,000 deaths of the Super Cyclone two decades earlier (Thomalla & Schmuck, 2004). Later, the state's special relief commissioner reported to the Indian Economic Times that "*The very fact that not a single fisherman died at sea shows we were able to reach the most vulnerable sections of society*." (Seetharaman, 2019:1)

If there are no doubts that the Odisha government and community evacuation strategy saved lives, it certainly did not spare livelihoods. The Damage, Loss and Needs Assessment report conducted between May and June 2019 and coordinated by the Government of Odisha, the World Bank, UN agencies and the Asian Development Bank, pointed out to the considerable destruction of sources of income during Cyclone Fani. Regarding fishing for instance, the report states that "6,416 traditional fishing boats, 8,828 nets, 2,524 fishponds, 157 aquaculture ponds covering an area of 77 ha, three fishing harbours, six fish landing centres and five fish farms have been damaged" (Government of Odisha *et al.*, 2019: 61). The agricultural sector suffered important losses too, with the death of 5 million poultries and hundreds of thousands of small and large animals. The financial losses associated with the death of livestock and poultry, as well as the decreased production levels which followed Cyclone Fani, are estimated at 146.50 *crore*[6] Indian rupees (approximately 20 million US dollars). The losses of livestock and infrastructures resulted in livelihoods losses, further impacting the resilience and recovery capacity of the region's population. This emphasised the need for Odisha state's disaster management strategy to focus more on capacity building so as to minimise assets and livelihoods losses (World Bank India, 2019). Today, its strategy focuses on prevention and early warning, but as far as recovery is concerned, little is done in terms of rebuilding infrastructure and providing financial support to the most affected communities.

Image 3.4. Trajectory of Cyclone Fani as of May 3rd, 2019



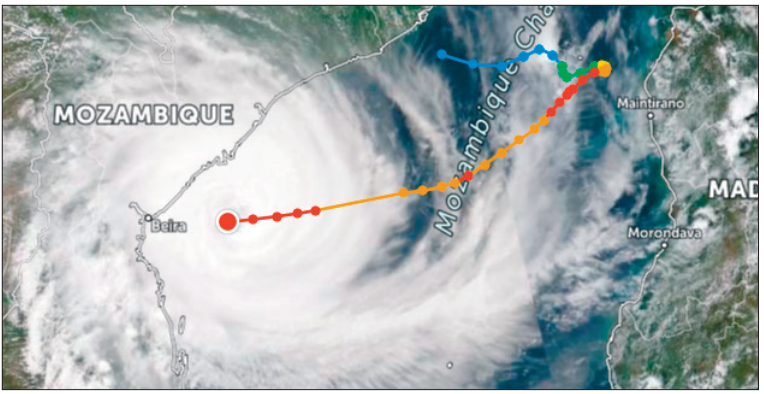
Source: Zoom Earth, NASA/NOAA/GSFC/EOSDIS, OpenStreetMap

[6] *Crore* is a term used to refer to large numbers in the Indian numbering system.

In Mozambique: A lack of preparedness which led to large-scale displacements

In early March 2019, Cyclone Idai made landfall twice in Mozambique, causing most of the disaster-related damages. The cyclone first made landfall after its formation on the 4th of March, hitting the three provinces of Zambezia, Tete and Niassa. On the 14th of March, it made a second and more destructive landfall, hitting the eastern coast of Mozambique near the 500,000-inhabitant coastal city of Beira, in the province of Sofala (Images 3.5 & 3.6) (IDMC, 2020). Situated near a delta, the city of Beira is prone to flooding.

Image 3.5. Trajectory of Cyclone Idai as of March 14th, 2019



Source: Zoom Earth, NASA/NOAA/GSFC/EOSDIS, Suomi-NPP VIIRS, JTWC, OpenStreetMap

Image 3.6. The four Mozambican provinces hit by Cyclone Idai

Map elaborated by author

The tropical cyclone brought heavy rainfall, leading to flooding in the Sofala province. The high-speed winds destroyed most of the buildings, leaving few spots to climb to safety when Beira was flooded the following days (Image 3.7). While the landfall occurred on a Thursday, the rescue teams were only able to reach the city on Sunday as the extent of the damage and of the flooding – notably the flooding of the N6, the main road to Beira and the country's key supply route – barred access to the city (OCHA, 2019). Human and physical damages were significant. Mozambican President Filipe Nyusi announced a death toll of 602 deaths and a count of 1,600 injured (Ripoll & Jones, 2019). The strong winds of the storm destroyed an estimated 90% of the houses in the city of Beira and the population was left without electricity for days due to the destruction of the infrastructure, leading to large-scale displacements. The IDMC estimated that Cyclone Idai triggered 478,000 new internal displacements in 2019 (IDMC, 2020). In early April 2019, over 131,000 people were sheltered in one of the displacement sites (OCHA, 2019). OCHA identified 136 displacement sites across the provinces of Manica, Sofala, Tete and Zambezia, which also happened to be the most cyclone-affected provinces. The Sofala province alone counts 107 sites, including 26 in Beira. The sites host individuals who lost their homes, amongst whom around 28,000 people identified as vulnerable by the Government of Mozambique, including children, female-headed households, elderly and people with disabilities (OCHA, 2019).

Image 3.7. Destroyed homes in Praia Nova, Beira, after Cyclone Idai

Source: IFRC/ Denis Onyodi

The government of Mozambique did not conduct any pre-emptive evacuations. In their "flood-free" strategy, the Mozambican authorities stressed the importance of population relocation plans but did not put in place effective early warning systems nor any evacuation plans (Patt & Schröter, 2008). When Cyclone Idai made landfall, the Mozambican government did not plan any evacuation, leaving people to fend for themselves and flee for safety. Few people self-evacuated prior to the disaster which partly explains the high number of deaths and displacements (IDMC, 2019). In addition, Mozambique's early warning system was inadequate and did not reach the majority of the population. Indeed, the Sofala province, which was the most devastated by Cyclone Idai, is populated by Shona and Sena ethno-linguistic groups, both of Bantu-speaking origin (Ripoll & Jones, 2019). Warnings made in Portuguese – the country's official language – were not understood by the majority of the population, especially in rural areas, where illiteracy rates are high, notably among women.

This section highlighted the ways in which the management of the disasters by the Mozambican and the Odisha state authorities differed. While a lot of efforts were made towards the evacuation of the population *prior to* the disaster in Odisha state, the population self-evacuated *in reaction to* the disaster, as an emergency response, in Mozambique.

Post-cyclone mobility

In India: medium to long-term migration of marginalized populations

In the state of Odisha, local communities were still dealing with the consequences of the cyclone months after the disaster. Its medium-term consequences led to economic migration by the most vulnerable and marginalized segments of the population: fishermen and craftsmen (Panda & Prasad Mishra, 2020). Indeed, the increased mechanization and industrialization of fishing all over India has led to the marginalization of small fishermen (Government of Odisha *et al.*, 2019). The annual fishing ban in Lake Chilika in Odisha, during the breeding season – between the months of April and June – added to the difficulties that fishermen face to make a decent living. In addition, the fishing opportunities that exist in Odisha's coastal districts have attracted intrastate migrants from less developed districts. Those migrant communities are also more vulnerable and marginalized (Government of Odisha *et al.*, 2019). Fishermen

and craftsmen were most at risk during the disaster but also during the recovery phase as their sources of livelihoods were destroyed. Contrary to Mozambique, where displacements related to Cyclone Idai occurred as an immediate survival strategy, migration in the Odisha state occurred as a medium to long-term recovery response to the disaster (Chhotoray, 2019). The drivers of migration were economic: the cyclone destroyed most of the livelihoods and consequently people needed to migrate to earn a living.

Praised for its management of the evacuations *during* the disaster, little attention has been given to the state's longer-term post-Fani recovery strategy, in a context where more than 14 million people in 14 out of the 30 state's districts were affected by the cyclone (Seetharaman, 2019). After the cyclone, most of the evacuated people returned to their homes although a large number of them were damaged. As an immediate response to the crisis, the Odisha government distributed INR 2,000 Indian rupees (around 25 US dollars) and 50 kg of rice per household. However, the distribution of relief packages was reserved to ration card holders (Government of Odisha *et al.*, 2019). Ration cards are delivered by the government of each Indian state to Indian nationals and creates rights to access government-subsidized essential products, such as rice. One of the application criteria for obtaining a ration card is to provide a proof of residency in the state. Because of this targeting of ration card holders, migrant communities have been systematically excluded from receiving relief packages (Government of Odisha *et al.*, 2019).

Although communities of fishermen and craftsmen were amongst the most vulnerable populations and were more affected by the cyclone than the rest of the population, they did not receive the same support. Although the government promised some aids for fishermen in order to repair or replace their damaged materials – 95,000 rupees (equivalent to 1,295 US dollars) for destroyed homes, and up to 600 US dollars for destroyed boats (Chhotoray, 2019) – fishermen pointed out that the compensation was negligeable compared to the value of the lost equipment (Pardikar, 2019). Two months after the cyclone, financial aid still had to be distributed. Additionally, many fishermen being intrastate workers, the consequences of the cyclone have been even harsher for them, as they faced difficulties in accessing their social protection benefits, making recovery all the more challenging (Government of Odisha *et al.*, 2019).

During the low fishing season, from April to June, fishermen tend to diversify their activities and migrate to the surrounding provinces in

search for work (Pardikar, 2019). The consequences of the cyclone, which occurred in May 2019, have exacerbated these migrations as it became harder for people to find activities and to make a living. Fishermen interviewed for the Outlook India explained that they had suffered huge losses during Cyclone Fani and that the lack of government response to these losses left them with no option but to migrate (Chhotoray, 2019). Even though Odisha state's level of disaster preparedness seemed to have become highly efficient, those efforts were curtailed by insufficient post-disaster recovery response targeting the most vulnerable segments of the population.

In Mozambique: forced migration in response to immediate danger

Contrary to the situation in Odisha, where most evacuees returned to their homes right after the disaster, Cyclone Idai triggered immediate and long-lasting displacements from the cyclone-affected zone, notably in the region of Sofala. A year after the disaster, a majority of the affected population is still displaced and does not have a home to return to (IOM, 2019). The destruction of buildings and homes, in addition to the floods, posed a direct threat to the lives of the people who faced no other choice but to escape the consequences of this extreme weather event. Indeed, the disaster and the subsequent degraded sanitary conditions led to a cholera outbreak in the city of Beira, which was declared by the Mozambican government on the 27th of March 2019 (Médecins Sans Frontières, 2019). Internal displacements took place to escape disease and seek shelter from the floods. People sought shelter in camps waiting to be able to resettle. The IOM conducted a multi-sectoral location assessment in December 2019 in the resettlement sites which emerged as a consequence of Idai, which can be defined as "sites where populations have voluntarily moved to after staying in accommodation centres" (IOM, 2019: 6). These sites include governmental, informal and humanitarian agencies' sites. Around 100,000 people lived in resettlement sites, of which 82% were located in the Sofala and Manica provinces, the two most affected provinces (IOM, 2019), meaning that people did not move far from their initial point of departure, thus leaving them exposed to climate risks. For instance, OCHA reported that floods caused by heavy rains in December 2019 in Mozambique had mainly impacted the people who had been previously displaced by Cyclone Idai. In fact, the post-Idai resettlement sites were the most affected by the subsequent December floods with around

3,676 damaged shelters and close to 500 destroyed shelters (OCHA, 2020). A year after the disaster, "nearly 100,000 people continue to live in makeshift shelters and are alarmingly vulnerable to future climate shocks" (Oxfam, Care & Save the Children, 2020: 1). Displaced women and children bore the brunt of disasters' impacts. Women suffer an additional burden as they have more chores to perform in addition to having to secure their livelihoods. Disasters also create additional difficulties for children who risk exploitation and who may lack access to proper education (Oxfam, Care & Save the Children, 2020).

Preparedness (or the lack thereof) impacted mobility in Mozambique in the sense that the limitations of the early warning system and the lack of pre-emptive evacuations led to sudden and forced evacuations by the population leading to long-lasting displacements. The displacements that took place during and following the disaster increased the displaced population's vulnerability towards environmental risks.

Conclusion

As demonstrated through this study of Mozambique and of the Indian state of Odisha during Cyclone Idai and Cyclone Fani respectively, preparedness and disaster management strategies play an important role in the mobility patterns resulting from extreme weather events.

Following the 1999 Odisha Super Cyclone, the local government and communities of Odisha developed a strong sense of awareness of climate-related risks. This encouraged the development of government and community preparedness and early warning systems to limit the death toll in the event of a disaster. However, such a disaster management strategy mainly focused on the immediate action of saving lives and little attention was paid to preserving livelihoods. Although the large-scale evacuations appeared to successfully reduce the number of human casualties, the lack of mitigation responses had significant consequences on the living conditions of the survivors, especially of those belonging to the most vulnerable segments of society. In the medium-term, this led to increased economic migration from coastal Odisha to inland states. The destruction of livelihoods during the cyclone, adding on to the pre-existing societal disparities, led to the departure of many fishermen and craftsmen in search of work. The environmental disaster has further exacerbated the already dire conditions of the most marginalized members of society, forcing them to migrate.

On the other hand, Mozambique, which has long been affected by floods, has been unable to efficiently implement preparedness strategies such as early warning systems and evacuations, its government focusing instead on recovery and rehabilitation. This has led to large-scale displacements of the population as a survival strategy in the face of the disaster and its immediate consequences. Displacements often occurred over short distances, therefore maintaining the population in at-risk locations. As of March 2020, 100,000 people were still living in makeshift shelters and waiting to be resettled. Displacements resulting from Cyclone Idai has made the population even more vulnerable to climate-related events.

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Europe

Floods and Displacement in Italy

The case study of Budrio

Massimo Colonna

We are entering an era of increasing climatic and environmental instability (IPCC, 2019): around the globe, both developing and developed countries are becoming more and more vulnerable to extreme weather events. This has been the recorded trend in Europe, where events such as floods and heatwaves have become more frequent and intense (Alfieri *et al.*, 2016; Madsen *et al.*, 2014). To respond to the increasing flooding risks, the European Commission published in 2007 the Flood Directive (Directive 2007/60/EC), which aims to "establish a framework for the assessment and management of flood risk, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods" (European Commission, 2007: 3). Crucially, it also urges European member states to pay special attention to "long term developments including impacts of climate change on the occurrence of floods" (European Commission, 2007: 4). Fostering the resilience of the European territory to increasingly intense flood-related events is set as a priority of the European Union, yet, the directive does not contain concrete guidelines of action, and, as research has shown, only few European member states have incorporated climate change into their national strategies through guidelines, standards, and plans of action (Madsen *et al.*, 2014). Nevertheless, the situation is urgent and neglecting the issue endangers European territory and communities. Some countries, such as Italy, are more at risk than other European member states due to geophysical factors and increase in precipitation levels (Madsen *et al.*, 2014). One of the largest economies of the Eurozone and a member of the G7, Italy was dramatically hit by weather-related events during 2019: the territory was struck by 160 disasters, 101 of which were flood-related, which caused 42 fatalities (Giorgi, 2019; Legambiente, 2019). In this paper, we explore the links between environmental degradation, extreme weather events, and population displacement through the case study of Budrio, a small town in Italy's Northern Emilia-Romagna region, where a major fluvial flood devastated the area in November 2019 and displaced around 300 people (Il Resto del Carlino, 2019; La Repubblica, 2019). This paper seeks to answer the

following research questions: How did local authorities respond to the crisis and how was this response perceived by affected individuals? What have been the social, economic, and political consequences of the flood on the displaced?

After a brief introduction of the research methodology, we describe Italy's vulnerabilities to extreme-weather events and provide a brief historical overview of flooding in the Emilia-Romagna region. We then describe in detail the disaster that hit areas surrounding Budrio in November 2019, including the cause of the disaster, and the authorities' immediate response. We subsequently examine the conditions of the displacement triggered by the flooding, as well as the socio-economic and political consequences of the floods on the displaced, before providing some concluding remarks.

Research Methodology

This research is mainly based on seven key informant interviews conducted via telephone with different individuals involved in the events. These are:

1. Presidio, M., member of the local *Protezione Civile*, the body that deals with the prevention and management of emergencies and disasters;

2. Silvestri, G., member of the region's Environmental Service and Budrio citizen;

3. Mede, V., and Valeti, M., directors of two health organisations affected by the flood;

4. Sata, C., and Coli, F., two farmers and entrepreneurs affected by the flood;

5. Moliori, A., local inhabitant who was displaced due to the flood – who was interviewed twice for this paper.

Originally, additional interviews were planned with representatives from the City of Budrio and the regional *Protezione Civile*, but follow-up emails and calls were not answered. This is understandable as the region and the city were then responding to the COVID-19 pandemic. The lack of discussion with civil authorities is indeed a limitation of the present study. However, the official, public response of the authorities, both of the City of Budrio and the regional *Protezione Civile* can easily be found in the media and in official reports. To complement the original information

of the interviews, cross-disciplinary literature review, of both academic and non-academic sources, was undertaken.

Extreme weather events in Italy and the Emilia-Romagna region

Weather-related events in 2019

According to the World Meteorological Organisation (2019), 2019 was one of the warmest years ever recorded, with global average temperatures 1.1°C warmer than pre-industrial levels. Italy saw similar trends, as the temperature recorded in October 2019 was the second warmest recorded since 1800, and regions such as Piemonte (a region bordering France and Switzerland,) recorded their highest temperature in 150 years (Giorgi, 2019; Legambiente, 2019). The year 2019 also saw an increase in the number and magnitude of extreme weather-related events in the country with 160 recorded events and 42 fatalities, against 127 events and 32 fatalities during 2018 as shown in Table 4.1 (Giorgi, 2019; Legambiente, 2018; Legambiente, 2019). In 2019, Italy recorded 101 flood-related extreme events.

Table 4.1. Extreme weather events in Italy in 2018 and 2019

	Rain Floods	River Floods	Storms	Landslides	Total
2019	85	16	54	5	168
2018	66	20	41	-	127

Source: Legambiente (2018, 2019)

Although the increase in the number of extreme weather events between 2019 and 2018 may not seem that significant, their impact and violence was unprecedented. This is shown not only by the number of fatalities but especially by the consequences on cities such as Venice and Matera, which were brought down to their knees and encountered significant economic damages during 2019 (Giorgi, 2019).

The devastating nature of 2019 weather events sparked protests from the Italian Environmentalist Association which urged the government to develop a plan for the resilience of the Italian territory on the phase of this changing climate (Giorgi, 2019). Such trends do not seem to have improved in 2020, as Southern regions have recorded a staggering 80%

drop in their average precipitation levels (Coldiretti, 2020), with consequences that, paired with the economic recession brought about by the COVID-19 crisis, could be devastating. It is clear that enhancing the resilience of communities to extreme weather events and their capacity to adapt to the instability caused by climate change should become a key priority for the country.

Floods in the Emilia-Romagna region

Italy has a long-standing history with floods: in the last century alone close to 1,000 events have affected approximately 4,500 people and killed 2,500 (Guzzetti, 2015). The Po river, which is the country's longest river, flooded 8, 20 and 5 times during the 18th, 19th, and 20th centuries respectively (Bacchi, Orlandini, & Pellegrini, 2007).

Image 4.1. Map of the region Emilia-Romagna

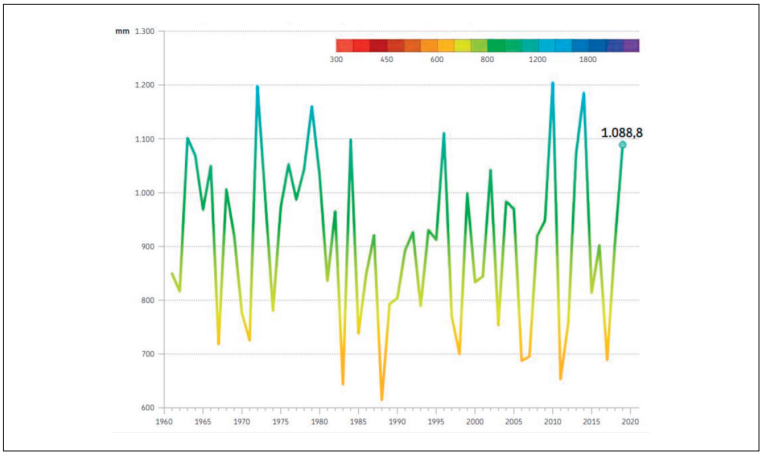
Source: Regione Emilia-Romagna, 2018

This is also the case for the Northern region of Emilia-Romagna (Image 4.1.), which was hit by disastrous floods numerous times over the last century (Guzzetti, 2015; Rosso, 2017). The geographic characteristics of the region, the increasing pressure on the environment, in addition to climate change, make the territory vulnerable to flooding events. In fact, 40% of the region is covered by the *Pianura Padana* plains, located between the river Po and the *Via Emilia* (a road built by the Roman emperor Marco Emilio Lepido in 189 BC), which are naturally alluvial. Another specificity of the *Pianura Padana* basin is its subsidence, which

refers to a natural lowering of the soil. Normally, subsidence should be comprised between 0.1 cm and 0.3 cm per year for an alluvial region. However, the recorded trends are much higher reaching 0.4 cm to 5 cm per year (Regione Emilia-Romagna, 2011). This contributes to increased flood risks in the area.

Moreover, the year 2019 has been one of the rainiest years ever recorded (see Figure 4.1.) (Antonioli, 2020). This holds particularly true for the area surrounding Budrio. Indeed, the areas situated in the vicinity of the Idice River are at the maximum level of flood risk, while surrounding areas are at intermediate risk, according to the flood risk management plan maps issued by the region following the 2007 EU Directive (Arpae, 2013). In fact, the area around Budrio has historically been subjected to flooding, as stated by Presidio, member of the Protezione Civile, and Silvestri, member of the region's Environmental Service (Presidio, M., personal communication, August 20, 2019; Silvestri, G., personal communication, August 22, 2019), as illustrated by Image 4.2, a 1966 photograph of a house in Budrio surrounded by waters due to the flooding of the Idice river. Episodes like this one are relatively common in the area as the level of the Idice keps on rising year after year (Presidio, M., personal communication, August 20, 2019; Silvestri, G., personal communication, August 22, 2019). Presidio and Silvestri both noted that precipitations in the area are increasingly more intense although less frequent: this is in line with projections of precipitation intensity (Brunetti *et al.,* 2001; Madsen, 2014; IPCC, 2018)

Figure 4.1. Average precipitations in the Emilia-Romagna region (1960-2019)



Source: Antonioli, 2020

Image 4.2. Flood in Budrio, 1966

Source: Presidio, M., personal communication, August 24, 2019

Case study: The Budrio flood of November 2019

Description of the event

This section provides a detailed description of the event: most of the information was collected during the interviews and was complemented by official accounts of the City of Budrio and the regional *Protezione Civile*, as well as by media reports.

During the week preceding the flood, an intense storm hit the region Emilia-Romagna and the regional *Protezione Civil*e issued a red warning for extreme weather events on Friday 15th of November. At 5 AM, on the 17th of November (a Sunday), the waters of the Idice were already abnormally high (Presidio, M., personal communication, August 20, 2019). Similarly, Valeti M., director of a local public health organisation, reported that the organisation had been alerted of the high waters by their private security guard very early that morning (personal communication, August 22, 2019). Between 10 AM and noon the same day, the water pressure became too strong and the banks of the river Idice broke, as shown by Images 4.3. and 4.4. The walls of the river broke around the road *Via Viazza Destra*, on the side facing the city of Budrio, an area mainly used for farming, but also inhabited.

Image 4.3. Close-up of the rupture

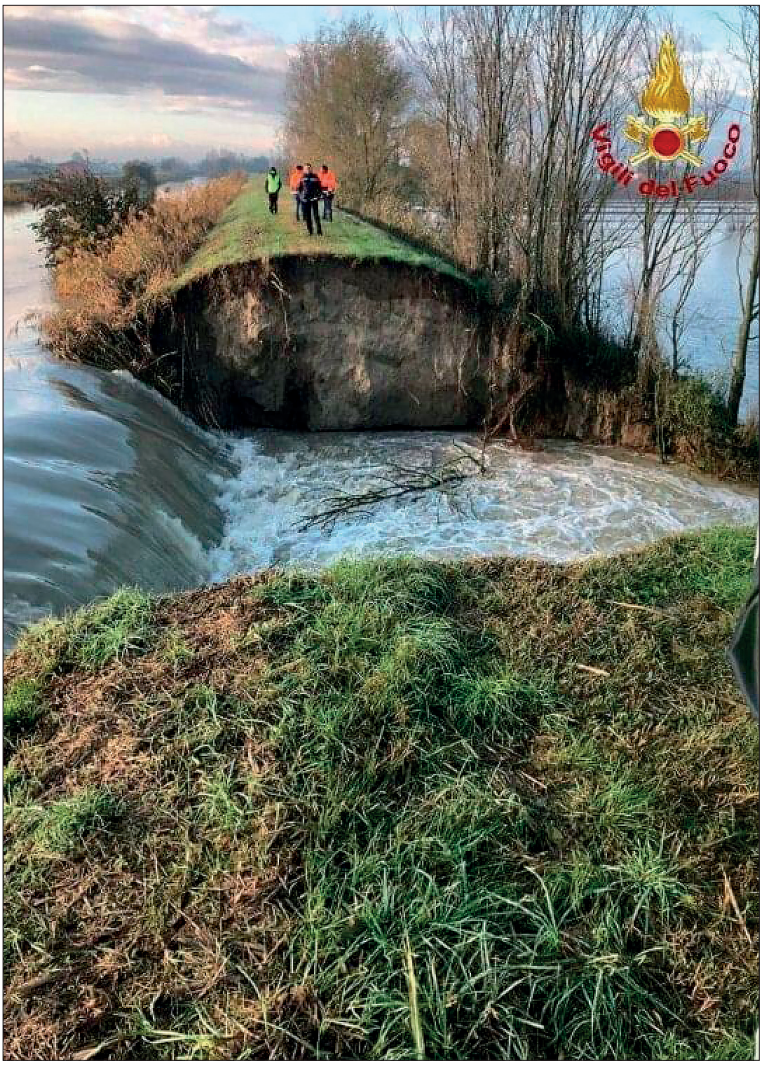


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Image 4.4. Aerial view of the rupture

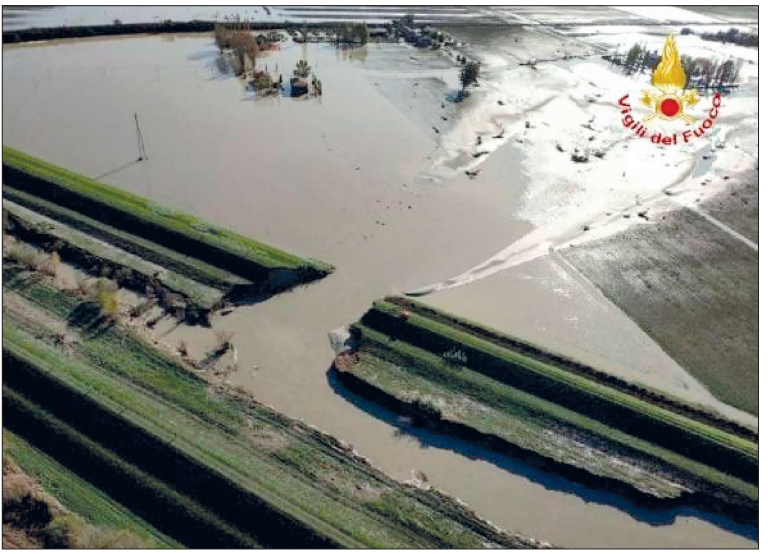

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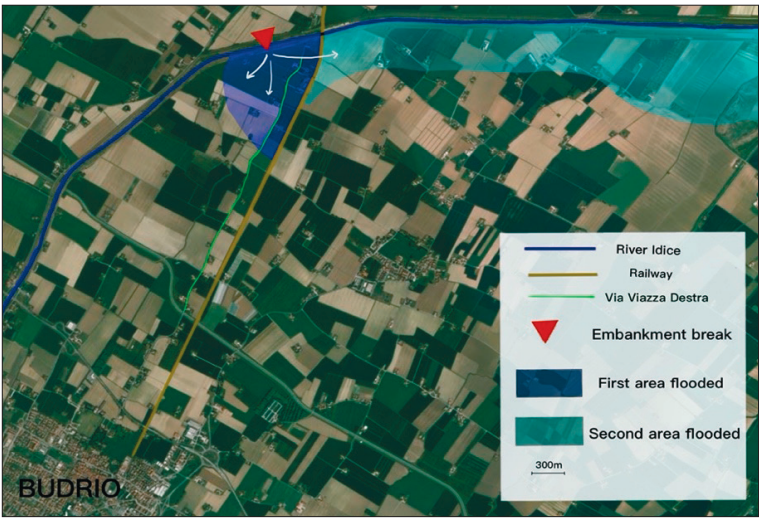
Image 4.5. Map of the flood



Source: map elaborated by the author

Image 4.5. shows the approximate location of the rupture (red arrow) and the direction in which the waters began to flow (white arrows). Water immediately invaded the outskirts of the city (in blue in Image 4.5.). As shown in the map, there is a railway line crossing the river (in Yellow), very close to the breaking point: the dyke created by the railway – which initially protected the areas behind – pushed water uphill, towards Budrio. The waters then broke the railway walls and invaded the land on its right, an area called La Motta (in Turquoise).

After being notified by local residents that the waters had invaded the countryside, the local and regional *Protezione Civile* and firefighters were immediately called into action and quickly arrived at the scene. Different units of the local authorities swiftly went around the zone of the breaking of the embankment to warn the inhabitants that there was a possibility that waters could reach them, urging them to evacuate their houses. Other inhabitants were warned by neighbours. Some who had not been warned, or that were too slow to evacuate, had to be saved via helicopter. Afterwards, the authorities started moving farm animals to safer locations and helping safeguard goods that would have been ruined by the waters by moving them at higher floors where possible, as confirmed by Presidio, Silvestri, Coli, a farmer and entrepreneur of the area, and Moliori, a citizen that was displaced during the event (Presidio, M., personal communication, August 20, 2019; Silvestri, G., personal communication, August 22, 2019; Coli, F., personal communication, August 24, 2019; Moliori, A., personal communication, August 24, 2019). The dyke remained broken for four days, pouring 4 million m^3 of water into Budrio's countryside (Arpae, 2020).

Causes of the disaster

High water levels and subsequent flooding of the river Idice are common, as mentioned above. One of the key informants confirmed that water levels had already risen to critical levels three times before in 2019, without serious consequences (Silvestri, G., personal communication, August 22, 2019). While this is true, official documents confirm that on November 17th, 2019, the water level of the river Idice in the Castenaso area (where the dyke broke) was exceptionally high: 59 cm above the maximum alert level – and the second highest level recorded since 1981 (Arpae, 2020; Regione Emilia-Romagna, 2020a). Nevertheless, a river flooding is very different from a dyke breaking event even though their consequences may be similar: flooding refers to the overflowing of the water above their

usual limits; while a dyke break does not necessarily mean waters have risen above their normal levels, it simply refers to the breaking of the dyke of the river that it is supposed to contain. Hence, the disaster was not due to a flood, but rather to the breaking of the dyke, which allowed waters to flow freely into the countryside. In fact, the water level of the Idice was relatively under control that day, before the dyke broke (Presidio, M., personal communication, August 20, 2019).

The causes of the breaking could be multiple and are, in fact, still unknown. As previously mentioned, the region had experienced a severe storm and most of the region's rivers were already under pressure. This could have created increasing pressures on the dyke. However, dykes are built to resist their river. For a dyke to break, water must have soaked it through, a process which normally happens over long periods of time. Vegetation and local fauna can speed up the process: vegetation by slowly infiltrating the dyke, weakening the soil with their roots; animals (such as nutrias and porcupines) by digging holes in the soils near rivers, favouring water intrusion (Orlandini *et al.,* 2015). In fact, Orlandini, Moretti, and Albertson (2015) had previously demonstrated the threat that animal burrows were placing on the dykes of Italian rivers. Also, physical obstructions in the river flow (such as debris) can increase the lateral pressure on dykes. As such, the riverbed and dykes of rivers should be regularly maintained and cleaned, especially if the said river is prone to flooding, as is the case of the Idice river. According to four of our key informants, this was not the case (Sata, C., personal communication, August 22, 2019; Silvestri, G., personal communication, August 22, 2019; Coli, F., personal communication, August 24, 2019; Moliori, A., personal communication, August 24, 2019). In fact, they considered that the authorities responsible for the maintenance of the river were partly responsible for what had happened, stating that the river was poorly maintained, especially in less accessible zones such as the one where the dyke broke. The latest response document of the region attributes the breaking to "uncertain causes" (Regione Emilia-Romagna, 2020a: 1), but probably to animal burrows, affirming however that no investigation had been conducted. The same document also affirms that the dyke of the river was found not to be solid enough, hence the causes remain unknown.

Aftermath

The area affected was left completely devastated, as can be seen in Images 4.6. and 4.7. Water, mud, vegetation and trash covered the

Image 4.6. Flooded area near the breaking point

Source: Presidio, M., personal communication, August 24, 2019

Image 4.7. Aerial view of flooded area

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countryside and stagnated for 3 to 4 days with water levels reaching up to 1 meter (Presidio, M., personal communication, August 20, 2019). The result was Italy's most important displacement event of 2019: the official toll reports 300 people displaced and hundreds of dead animals (Il Resto del Carlino, 2019; La Repubblica, 2019). Immediately after the event, the local and regional *Protezione Civile* with the help of firefighters, started working to clean up the area. The rupture of the dyke was repaired four days after the breaking (see Image 4.8.). Simultaneously, authorities had to pump out the water, clean and repair streets and dwells, remove animal carcasses, amounting to a total of 410 interventions (Protezione Civile, 2020). The very last intervention was conducted at the end of December 2019: a house was left untouched since the event: inside, muddy waters had solidified (Presidio, M., personal communication, August 20, 2019). All of our key informants praised the great work of the *Protezione Civile* in managing and helping people affected during the event.

Image 4.8. Reparation of the broken dyke

Source: Presidio, M., personal communication, August 24, 2019

Displacement

Disaster displacement is defined as a situation "where people are forced or obliged to leave their homes or places of habitual residence as a result of a disaster or in order to avoid the impact of an immediate and foreseeable

natural hazard" (Nansen Initiative, 2015: 28). Disaster displacement can be spontaneous, but also take the form of a forced evacuation ordered by the authorities or be completely involuntary; it can happen within national borders or consist of an international movement. The effects of climate-related disasters can be exacerbated by vulnerability factors such as marginalisation, inequality and poverty (IPCC, 2014; IDMC, 2020). Often, sudden-onset disasters, such as floods, lead to short-distance and temporary displacement (Piguet, 2013): this was the case for most of the displaced in Budrio (Moliori, A., personal communication, August 24, 2019).

The present section provides a detailed account of the displacement conditions of those affected during the disaster. The information contained here is based on the testimonies of Moliori, who was displaced with his family, and of Presidio, member of the *Protezione Civile*, who was involved in the management of the disaster and in assisting displaced individuals.

The breaking of the dyke in November 2019 impacted the inhabitants of the area struck by the disaster in different ways. The speed and unpredictability of the waters meant that some inhabitants living in the area were alerted of the disaster in time while others were not. In fact, some inhabitants, particularly those living in isolated locations and on the other side of the railway, were not alerted because it was largely unexpected that the waters would break the railway and invade the other side of the countryside. Therefore, some inhabitants were able to prepare better for the arrival of the waters by moving goods and furniture to higher floors, moving their cattle, sealing doors, etc. Others, on the other hand, were taken aback by the sudden arrival of the waters and did not manage to carry out any of these measures, to the extent that some were unable to flee and had to be rescued via helicopter. In the case of Moliori, he and his family had not been alerted by authorities but had been notified of the breaking of the dyke by other citizens. They had been alerted that, on the other side of the railway, waters were invading the countryside (Moliori A., personal communication, August 24, 2019). Not expecting the water would arrive to their location (on the right side of the railway, which should have acted as a barrier), they were caught by surprise. As waters were already dangerously close to their house, they rushed their elderly grandmother and family pets in the car and left as quickly as possible. They were thus unable to move their goods or furniture to safety or seal the doors.

As confirmed by the member of the *Protezione Civile*, around 300 people were evacuated from their homes. To accommodate the displaced, temporary housing was created at Budrio's sport palace, a large building which has the capacity to house around 300 people, should it become necessary (Presidio, M., personal communication, August 20, 2019). Immediately after the event, emergency beds, sheets, clothes, food and drinks were brought to the displaced with the help of the *Protezione Civile*, the City of Budrio and the solidarity of Budrio residents. The Sport Palace was divided in different sections, allowing every family to have their own space, and thus some privacy and relative comfort. However, around 20 used this temporary shelter, whereas the rest of the displaced preferred to stay in hotels or with relatives (Carusone, 2019a; Presidio, M., personal communication, August 20, 2019). This was the case for Moliori's family. The decision to stay in the Sport Palace was generally dictated by economic or social reasons: in fact, some could not afford a hotel as temporary accommodation and others did not have the social connections necessary to stay at a friend's or family members. Moliori reported that this had been the case for a family of Chinese nationals who did not have any close family member nearby to host them, and who therefore, after spending a couple of days in the Sport Palace, ended up traveling to another region in Italy to stay with relatives.

Schools remained open that Sunday so that children could be taken care of and pets that were brought to the palace were temporarily sent to an animal shelter. Presidio, who assisted the displaced at the Sport Palace during the first days, confirmed that there was a lot of solidarity with the displaced (personal communication, August 20, 2019). She highlights that there were no complaints from the displaced and that they were generally satisfied about the conditions of their temporary housing in the stadium (personal communication, August 20, 2019). Moliori, who knew many displaced families who had gone to the Sport Palace, confirmed that they seemed satisfied by the temporary housing they were provided with (personal communication, August 24, 2019). After three days, some 20 to 30 people were still inside the sports palace, unable to return home or to safely access the area (Presidio, M., personal communication, August 20, 2019). Others, such as Moliori, were unable to return home until early April due to the muddy waters, which after having stagnated for days on the land and in his house, had rendered the house uninhabitable. As of October 2020, most of the displaced had managed to return to their homes (Moliori, A., personal communication, October 6, 2020; Presidio, M., personal communication, October 3, 2020). Few

others had decided to remain at their parents' or friends' place because their houses were still under restoration (Presidio, M., personal communication, October 3, 2020).

Consequences for the affected

The consequences of the November 2019 events were dramatic for most affected individuals. The interviewees observed that the consequences of the disaster had been exacerbated by the ongoing COVID-19 crisis. Here, we seek to identify the main socio-economic and political consequences of the disaster on displaced individuals.

Socio-economic consequences

Being struck by a disaster can worsen the pre-existing vulnerability of affected populations (GFDDR, 2016). This was the case for some of the individuals struck by the Budrio disaster: many lives were changed, and many are still recovering. Moliori also stressed the psychological distress that can affect displaced people during and after the disaster: the loss of cattle and/or goods, the magnitude of the economic damage, the decreased property value, as well as the land and environmental destruction constituted a tragedy for many (personal communication, August 24, 2019). The majority of the displaced are still living in fear of a new flood or of another dyke break elsewhere (Moliori, A., personal communication, August 24, 2019). In fact, while the temporary housing offered to the displaced was satisfactory to them, when these individuals had to return to their homes they had to face the destruction caused by the river and many were left in sorrow and fear. These emotions rapidly transformed into anger, according to Moliori, because the authorities did not acknowledge that the dyke had failed, but instead referred to the event as a flood. This implies different responsibilities because a river flooding and the breaking of its embankment are very distinct events: the former refers to an increase in the water levels of a river, inducing it to overflow; while the latter refers to the physical rupture of the walls of the river, something that should not happen.

Many displaced individuals, such as Moliori, encountered damages amounting to hundreds of thousands of euros (Moliori, A., personal communication, August 24, 2019; Il Resto del Carlino, 2020). Others completely lost part of their belongings to the flood (Carusone, 2019b). Moliori's first damage assessment amounted to around 100,000 euros

(Moliori, A., personal communication, August 24, 2019). Muddy waters invaded his property and destroyed the first and lower floors of his house. Unable to move furniture and goods upstairs due to the speed of the waters, and unable to enter the premises right away due to safety constraints, many of those goods were lost. After settling down, the muddy waters left a thin layer of dirt which infiltrated the house to its core: the floors were cracked, the electric and hydro-sanitary system were destroyed, and the walls were soaked. Some have lost even more, according to Moliori. The only coffee shop in the area closed after the disaster, as the owner could not start his business from scratch again (Moliori, A., personal communication, August 24, 2019, Coli, F., personal communication, August 24, 2019). Another important factory in the area also encountered massive economic damages amounting to hundreds of thousands of euros (Coli, F., personal communication, August 24, 2019). Similarly, Mede stated that the organization he manages, which takes care of individuals with disabilities, was still closed as of May 2020 (personal communication, August 21, 2019). Moliori confirmed that the socio-economic effects of the dyke failure were still strongly felt by those who had been displaced as of October 2020, one year after the event, because of the magnitude of the damages (Moliori, A., personal communication, October 6, 2020).

The issue of compensation

In this case, the issue of compensation added to the socio-economic and political distress of the displaced. Compensation is usually managed by the region, and after the extreme weather event affected Emilia-Romagna, documents were issued to allow affected residents to file a compensation request. The general conditions promised up to 187,000 euros for those who had lost their homes and were forced to move out, and up to 450,000 euros to cover damages to businesses (Regione Emilia-Romagna, 2020b). However, several issues arose from these documents. The most important one, as expressed by Moliori and Coli, is that the official compensation documents did not attribute the disaster to the dyke breaking. In fact, in hundreds of pages, the words "dyke" (*argine* in Italian) or "rupture" (*rotta* or *rottura* in Italian) are never mentioned. The document instead only refers to the catastrophic and unprecedented nature of these extreme weather events (Regione Emilia Romagna, 2020c). Yet, Budrio's Mayor's testimonies, photographs (see images 4.3., 4.4., and 4.8.) and even the region's website, seem to indicate that the dyke of the river Idice broke. Asserting that there was no dyke break or ignoring it, reduces the responsibility of the authorities in the compensation process.

For this reason, Moliori, along with a dozen other displaced individuals, have sued the region. However, they are still stuck between the slow pace of Italian bureaucracy and the current COVID-19 crisis. For this reason, they are still at the beginning of the dispute. For instance, as of October 2020 Moliori is yet to receive compensation for any damage, even though he started the procedure to get around 18,000 euros, only a portion of what he lost (Moliori, A., personal communication, October 6, 2020), and many others are in the same situation (Il Resto del Carlino, 2020). He maintains that most of the displaced have not asked for the compensation money, deterred by the perceived difficulty of the process and the subsequent inspection of their property by the authorities (Moliori, A., personal communication, October 6, 2020). In fact, many cancelled their compensation request because of this inspection. If any elements of the property were found to be not up to standards during inspection – meaning not compliant with the regulations (for example, the property could be very old, and thus would be expected to have undergone some renovation to comply with current safety standards) – not only would the compensation be cancelled, but they would also have to pay to ensure that the renovation is taken care of, further adding to the economic burden of the displaced.

Furthermore, both Moliori and Coli noted various other issues with the compensation scheme (Coli, F., personal communication, August 24, 2019; Moliori, A., personal communication, August 24, 2019). Many affected individuals were simply not asking for damages or even cancelling their previous requests for multiple reasons: first, the compensation request documents are hundreds of pages long and require a professional to be compiled, which is costly. Second, the document must be complemented by a sworn appraisal of the amount required for compensation, representing yet another cost (Moliori, personal communication, August 24, 2019). According to Moliori, many people did not have the expertise nor the money required to carry on the request (personal communication, August 24, 2019).

Following the event, residents of the area created an organization to promote a sustainable relationship between people and the river, to ask for a better and more careful maintenance of the riverbank and dyke, and to promote the resilience of the at-risk area (Cambiamora, 2020). This tragic event has thus made part of the population aware of the need for a more sustainable and understanding relationship between humans and their natural environment.

Political consequences

As it is often the case when communities are struck by a natural disaster (Nel & Righarts, 2008; Pelling & Dill, 2010; Omelicheva, 2011; Nardulli *et al.,* 2015), the event had negative political repercussions. In fact, this event took place during the 2020 regional elections campaign. In light of this, the initial response was extremely fast and the presence of the authorities in the territory important. The broken railway that used to link Bologna, the capital city of Emilia-Romagna with other smaller cities such as Budrio, was rapidly repaired and operational again in mid-January 2020 (Presidio, M., personal communication, August 20, 2019). However, displaced individuals perceived this as a facade more than anything, and felt they were left helpless after the election concluded (Moliori, A., personal communication, August 24, 2019; Il Resto del Carlino, 2020). Emotions against the authorities ran high, particularly against the regional authorities who were deemed guilty for the abandonment and unkept promises. The issue of compensation, and the breaking of the dyke not being mentioned in official compensation documents, clearly fuelled the affected residents' anger. In fact, not only did denying the breaking of the dyke influence the financial compensation that displaced and other affected individuals would receive, it also fostered mistrust and resentment toward the authorities. A dozen of displaced people, including Moliori, have sued the region and now profoundly distrust the political authorities (Coli, F., personal communication, August 24, 2019; Moliori, A., personal communication, October 6, 2020; Il Resto del Carlino, 2020). Moreover, this poses a risk for future disaster events, as it can contribute to erase the memory of what really happened, making it more unlikely that concrete actions will be taken to avoid the dyke to break again in the future. As climate variability further increases the pressure on disaster-prone territories, it is all the more important that these territories are managed and maintained carefully.

Conclusion

Climate change is expected to increase the likelihood of extreme weather events at a global scale (IPCC, 2019; World Economic Forum, 2020). Studies and trends seem to confirm that Europe is indeed experiencing a rise in the magnitude of these events. Floods, as an example, are expected to become more common in some areas including Central and Northern Italy. These disasters often lead to serious socio-economic

consequences that can scar communities in the long term if the issue is not properly managed. In 2007, the European Commission published the Flood Directive to incorporate knowledge about climate change into national flood management plans, amongst other things. While developed territories are often prepared or used to small-scale weather events, things can change quickly when the unexpected happens: in our case study, the sudden breaking of a dyke significantly increased the destructive potential of the extreme storm and of the flooding of the river. The transformative effects of climate change increase the fragility of some parts of their territories and therefore increase the risk that is put upon communities.

In the present paper, we have demonstrated – using the case of Budrio, where a devastating flood hit the nearby countryside and displaced around 300 people – how environmental factors, when paired with managerial, organisational, or governmental issues, can be a trigger of displacement. The Budrio disaster was caused by the breaking of the dyke of the river Idice, which flows near the town. The inadequate maintenance of some sections of the river, paired with the extreme storm that hit the region, are the likely causes of the disaster. The rupture of the dyke poured around 4 million m^3 of water in the countryside and caused damages amounting to millions of euros. Residents of the area had to be evacuated and some had to live in temporary housing until their home was safe again. Through interviews with affected individuals, a review of official documents, and media reports, we analysed the socio-economic and political consequences of the disaster on affected individuals. In summary, the breaking of the dyke and subsequent flooding of some areas near Budrio has had very severe, yet very localised, consequences. The authorities' immediate disaster response was efficient, but many affected individuals remain vulnerable and have not yet fully recovered from this event, more than a year later. The support received by affected individuals from the authorities faded out after the initial interventions which aimed at cleaning up and repairing the flooded area. Similarly, the economic compensation scheme issued by the region was criticised by many and several displaced individuals and businesses of the area have sued the region. Therefore, many felt they were left alone and still resent the regional authorities.

Communities in developed countries are not immune to climate disasters and human displacement. Considering how climate change is altering usual weather patterns across the globe, our findings indicate that insufficient attention has been devoted to ensuring the security of areas at high flooding risk. That supports the call from local citizen organisations,

such as Cambiamora, to direct efforts toward ensuring a closer and more sustainable relationship with the river as a mean to strengthen the resilience of communities living in the area and avoid catastrophes such as the one studied in this paper. The case study of Budrio shows that many affected individuals have failed to fully recover economically, with negative consequences that even lead to angst, detachment, and general mistrust for the political authorities. Furthermore, the burden that was felt by the displaced individuals was exacerbated by the COVID-19 crisis, which deeply aggravated the socio-economic problems that they have encountered. The risk of multiple crises striking simultaneously will be an important threat in an era of ecological, climatic, and geopolitical instability.

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"They Could Predict *Acqua Alta* Every Day and We Would Still Stay"

(Im)mobility outcomes in the aftermath of the november floods in Venice

Judith García Moreno

Chronic light flooding due to high tides is an unmistakably distinctive feature of life in Venice, Italy, to the extent that Venetians use a specific word to refer to this phenomenon: *acqua alta* (literally translated as 'high water'). Typically, during a normal high tide, Venice's lowest lying areas such as the iconic Piazza di San Marco, for instance, become temporarily flooded (OECD, 2010). Besides chronic flooding, another phenomenon besets Venice: out-migration – or what Venetians call the "Venetian exodus" – whereby the impact of mass tourism on high real estate and consumer prices, as well as lack of employment opportunities in the non-tourist sector have mined the population by two-thirds since the 1950s, from 160,000 residents (Kington, 2009) to about 52,000 today (Comune di Venezia, 2019). Yet, among the factors pushing the population away, some Venetians also cite the nuisance caused by chronic flooding as reasons to leave (Giuffrida, 2019). Some even ascribe the acceleration of depopulation trends to the 1966 great floods (Kington, 2009) – or *acqua granda* – when an exceptional high tide of 194 cm inundated 90% of the historic city (Robbins, 2019).

On November 2019, a series of high tides inundated 80% of the city. This was deemed a catastrophic flood, only comparable to the great floods of 1966 (Robbins, 2019). The mayor, Luigi Brugnaro, blamed climate change and the government pledged 20 million euros to compensate damages estimated at one billion euros (Bastinello, 2019). Newspapers rushed to predict the next wave of out-migration (Smith & Talmazan, 2019).

Despite the extent of the damages to cultural heritage, houses and businesses, the loss of property, and the disruption to transport and economic activities, only four days after the last tide peak on November 14, life returned to normal (Venezia Today, 2019b). No displacement was reported and, according to the city council's (Comune di Venezia) population register, the number of individuals leaving Venice after November

2019 was not significantly higher than the one recorded in previous years (Comune di Venezia, 2019). From 2016 to 2019, around 900 individuals have left annually, which has led to a population decrease of about 1.7% (on average) per year due to out-migration.

Despite their catastrophic effect, it seems difficult to directly tie the 2019 floods with Venice's 2019 out-migration trends as these were practically unchanged. To ascertain that the flood did not have longer-term impacts on out-migration from Venice it would be necessary to look at the out-migration data as of the 31 December 2020, more than a full year after the disaster. Unfortunately, this data was not yet available at the time of writing.

Migration and displacement have typically been conceptualised as the sole mobility outcomes in the face of sudden-onset disasters or of gradual slow-onset events, as last resort strategies when other adaptive and coping mechanisms have failed. Nonetheless, a third outcome, in fact, has come to the attention of scholars: immobility (Black *et al.*, 2013). Immobility is defined as "an umbrella term covering the array of reasons and relative agency categorising the people who do not move" (Zickgraf, 2018: 75).

By acknowledging the different mobility aspirations and potential of individuals, this paper seeks to analyse how flooding and perceptions of environmental risk influenced (im)mobility outcomes during and shortly after the 2019 November floods and how these outcomes were further influenced by other factors unrelated to environmental risk. While the paper primarily focuses on deciphering the drivers behind the apparent immobility responses of the Venetian population in the aftermath of the 2019 November floods, it also tries to explain whether displacement or micro-mobility outcomes – such as across islands or from Venice's islands to the inland – took place in the aftermath of the floods.

Methodology

In order to answer the research questions laid out above, qualitative inputs were gathered through a survey targeted at residents of the Venice lagoon (see Annex 1).[1] The survey aimed at understanding how individuals usually cope with floods, the extent to which they perceive floods to disrupt their lives and how past experiences of floods informed the (im)mobility outcomes of respondents during the 2019 November floods.

[1] All responses collected were anonymous. Participants consented to the information they provided being used as input for this research.

The survey included questions about individual perceptions of floods and climate risks, coping and adaptation mechanisms, individuals' sense of self-efficacy[2] and trust in institutions to cope with floods, as well as feelings of attachment to Venice.

The survey was administered by We Are Here Venice, a local non-profit seeking to address Venice's challenges by advocating for evidence-based policy making.[3] We Are Here Venice posted the online survey designed for this research on the wall of their Facebook page. To ensure responses were collected solely from residents of the Venice lagoon, the first question of the survey, "Do you reside in the Venice lagoon?", was compulsory and exclusionary. Although the survey was targeted at any resident in the Venice lagoon, 30 out of the 32 participants who took the survey turned out to reside in the historic centre. Given the differences in exposure and vulnerability to high tides across the different islands in the lagoon, the analysis in this paper is limited to the responses collected from these 30 participants who resided in the historic centre to avoid possible misrepresentations of (im)mobility outcomes in the aftermath of the 2019 November floods. This paper defines Venice's historic centre as that which comprises the neighbourhoods, or sestieri, of S. Marco, Castello, Cannaregio, Dorsoduro, S. Polo, S. Croce, and Giudecca. This choice aims to mirror the area that Venice's council identifies as the historic centre to produce demographic data and track migratory patterns. The average number of years respondents had resided in Venice was 35. Furthermore, only 4 participants were neither Venetian nor Italian.[4]

[2] Grothman *et al.* (2005) define self-efficacy as "a person's perceived ability to perform or carry out adaptive responses" (p. 203).

[3] This NGO had been previously contacted by the author to enquire about qualitative and quantitative data about high tides in Venice, given its research outputs on Venice's water levels. Close liaison was kept with Jack Wright, a collaborator at We Are Here Venice, who kindly shared key information about floods in Venice, provided contacts for interviews and intervened on the author's behalf to circulate the survey designed for this research.

[4] To avoid discriminating against foreign residents, the survey was administered both in English and Italian. We Are Here Venice posted the link to the survey's Italian version but, at the top of the survey's consent page, which described the aims of the survey, participants made aware of the availability of the survey in English and a link to the form in English was provided therein.

Even though the survey could have certainly benefited from a larger sample,[5] its primarily qualitative nature enabled deeper insights into individual risk perception and sense of vulnerability, coping strategies, mobility aspirations and predictions of climate hazards. To add depth and context to the information obtained from the survey, semi-structured interviews were carried out with two Venice residents who had also experienced the 2019 floods. Cecilia de Gasperi shared her perspectives as a young resident engaged in several civil society networks and working in the cultural sector, one of the sectors most affected by the floods. Daniele Zappa,[6] shared his views both as a resident and as the owner of an art gallery that suffered significant damage during the floods.

The paper is structured as follows: the first section presents the characteristics that make Venice a flood-prone area and reviews the flood events of November 2019. The following section identifies and discusses the different reasons behind the (im)mobility outcomes that followed the 2019 November floods. This section is informed by the responses retrieved from the survey and interviews, and evaluates: (1) the past experiences of floods and risk perception, (2) social capital (3) the influence of the institutional framework and (4) the role of place attachment, as factors shaping and determining (im)mobility outcomes. The last section discusses the paper's findings and their implications, as well as suggested areas for future research.

Venice's environmental vulnerability

Built in the 5th century on salt-marshes, Venice gained prominence in the 10th century as a trade and maritime power (UNESCO, n.d.). It is located in the northern tip of the Adriatic Sea, shielded from the sea by a 45-km stripe of land but connects to it through three bocche di porto, or inlets: Lido, Malamocco and Chioggia (Fletcher & da Mosto, 2004)

[5] Participation in this survey might have been conditioned by the visibility of the post on We Are Here Venice's Facebook page. Nevertheless, due to the COVID-19 pandemic and lockdown at the time of writing, communication exchanges were severed and sometimes interrupted, which delayed processes in the collection of input data and impeded other interviews from taking place.

[6] Alias given by the author as the respondent preferred to remain anonymous.

(Image 5.1.). Venice is one of the largest wetlands in the Mediterranean,[7] spanning approximately 50 km long and 20 km wide. It encloses the world's famous heritage site and 118 other islands (Ramieri, 1999).

Image 5.1. The Venice lagoon and the three inlets that connect it to the Adriatic Sea

Source: MOSE Venezia, 2015

[7] According to the Ramsar Convention on Wetlands, a wetland is an area, either natural or artificial, where the land is covered by water or the water is near its surface. The water – whether salt, fresh or brackish – is the main element shaping the environment and the associated animal and plant life. Wetlands include areas such as floodplains, marshes, peatlands, rivers, lakes, mangroves, seagrass beds and saltmarshes as well as coral reefs and marine areas no deeper than six meters at low tide (Ramsar Convention Secretariat, 2013).

This so-called "inland-sea" – meaning an ecosystem in transition between land and sea (Ramieri, 1999) – continuously exchanges sediments and water with the Adriatic Sea: the sea's tide penetrates the lagoon twice daily, flushing and oxygenating it. Waves and currents, as well as the sediment deposited by the rivers that feed into the lagoon, shape its morphology (Fletcher & da Mosto, 2004). Venice's complex hydraulic works and network of canals merge into a unique urban system that is the expression of the imprint that water has carved onto Venice's identity, and of man's interdependence with the natural landscape. Without engineering, Venice would not exist today; it would have met every lagoon's fate to merge with either land or sea (Fletcher & da Mosto, 2004). This led the International Council on Monuments and Sites (ICOMOS) to recognize "Venice's victorious struggle against the elements, and the mastery men and women have imposed upon hostile nature" (UNESCO, 2007) upon its inscription on the World's Heritage Site List in 1987.

But what once seemed a harmonious relationship between man and nature has drastically changed in the last decades. Due to the environmental impact of man-made interventions in the lagoon during the 20th century, as well as global sea level rise, Venice's perennial symbol – water – has also, paradoxically, become its main threat.

Image 5.2. Tide gauge station at Punta della Salute in Venice

Source: Comune di Venezia, n.d.

Venice was built at sea level, with an average depth of about one meter (Ramieri, 1999), which makes it particularly vulnerable to frequent high tides. These are defined as tides that exceed 80 cm above average water level, taking as a reference point the datum (or 'reference zero' point) recorded at Venice's Punta della Salute (Image 5.2.) at the entry of the Grand Canal in 1897 (Ramieri, 1999). While a high tide of 80 cm is considered rather normal, one above 110 cm will be defined as a 'very

high tide' and, one of over 140 cm as an 'exceptional high tide' (Comune di Venezia, n.d.-a).

Table 5.1. Tidal range

Tide range	Classification
≥ +140 cm	Exceptional high tide
> +110 cm < +139 cm	Very high tide
> +90 cm < + 109 cm	High tide
> -49 cm < +89 cm	Normal tide
> -90 cm < -50 cm	Low tide
≤-90 cm	Exceptional low tide

Table elaborated by the author. Data Source: Comune di Venezia, n.d.-a.

The city is also naturally sinking by approximately 0.5 mm every year, or the equivalent of 10 cm per century, due to the movement of tectonic plates and the compaction of sediments beneath it (Madricardo *et al.*, 2019). However, its natural subsidence rate has been aggravated due to a set of human interventions that have eroded the city's foundations as well as the lagoon's salt marshes, Venice's natural barriers against waves, currents and tides. Groundwater extraction for industrial purposes; the dredging of the canals to make way for cruise ships; the wave energy generated by motor-boat traffic – which stirs up sediment and erodes the city's foundations – and water pollution – which corrodes the city's substructures – are among some of the factors that have disrupted tidal dynamics, strengthened the speed of currents and deepened the lagoon (Fletcher & da Mosto, 2004; OECD, 2010). As a result, higher volumes of water enter the lagoon when pushed by winds and tides, and even moderate or light tides can now cause flooding (Fletcher & da Mosto, 2004). Climate change has also increased the rate and intensity of climatic hazards, such as storm surges, associated with flooding. Meanwhile, global sea level rise is slowly, but steadily, eating away Venice and the lagoon's main physical features.

Although human-induced subsidence diminished in the 1970s once groundwater extraction stopped (Fletcher & da Mosto, 2004), water levels are approximately 30 cm higher compared to the levels of the 1880s as measured against the Punta della Salute reference level. At least 12 cm are to blame on local subsidence alone, while the rest can be attributed to global sea level rise (UNESCO, 2011). Consequently, areas that were once out of water's reach can now become flooded, too (Fletcher & da Mosto, 2004).

The frequency and intensity of high tides has increased over the past century. While in the 1900s moderate *acqua alta* would occur approximately 10 times per year, today, there can be more than 60 high tides within a single year (NASA, n.d.). Whilst, according to records, 30 very high tides (higher than 110 cm) occurred between 1875 and 1951, 34 high tides above 110 cm were recorded between 2014 and 2018 alone. High tides above 110 cm can now occur over ten times a year (Colantoni, 2019).

The floods in November 2019

On the evening of Tuesday 12 November 2019, an exceptionally high tide of 187 cm submerged at least 80% of the city of Venice (Image 5.3.). The water had not receded yet when, the next morning, another exceptional high tide of 160 cm occurred. The water ebbed in the afternoon, but it was again followed by two peaks of exceptional water levels of 120 cm and 130 cm respectively (Henley & Giuffrida, 2019). The flood extended to other islands in the lagoon and was particularly damaging in Chioggia, Pellestrina and Jesolo (Il Post, 2019).

Image 5.3. Flooding of a street in Venice after the extreme high tides in November 2019

Source: Comune di Venezia, 2019

(Im)mobility drivers

Risk perception

The recurrence of floods has forced residents in Venice to learn how to live with floods and adapt to them by adopting habits and practices that allow them to carry on with their daily lives, even during medium to high flood events. As research in other flood-prone areas (such as Indonesia or Vietnam) has shown, when floods are a frequent occurrence in everyday life, individuals learn to cope and adapt accordingly, despite the harm they may cause (Hellman, 2014; Reynaud *et al.*, 2013).

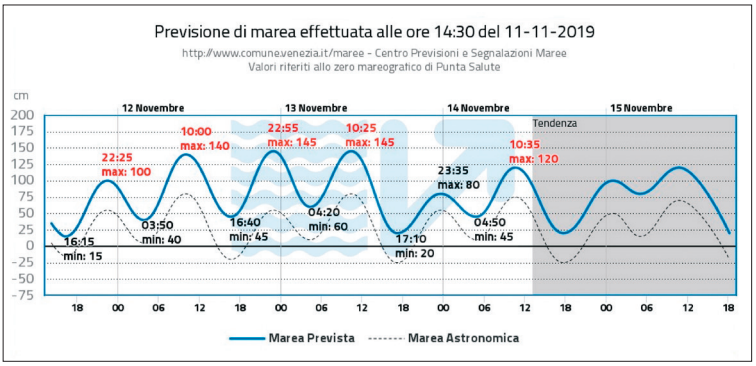
Despite the many inconveniences caused by floods, they occur so regularly that Venice's residents accept them as part of every daily life, which Cecilia de Gasperi helps illustrate "it's normal to see people continue doing their groceries just as the supermarket starts to flood" (personal communication, April 9, 2020). Moreover, as shown by the experience of floods in the UK, people's recent experiences of floods and, more specifically, the memory of the intensity of past floods, can be a powerful predictor of adaptation responses during environmental disasters (Harries, 2008).

Thus, when the CPSM, the Centro Previsioni e Segnalizazione Maree (or the Tidal Forecasting and Early Warning Centre) – the centre responsible for forecasting high tides – predicted on the afternoon of November 11th that there would be exceptional high tides the following day, individuals prepared for *acqua alta* as they always do. They placed wooden or metal panels (known as paratie) outside of doors to prevent water from coming in, switched off all electric devices, shifted the place of any valuables that may be damaged and arranged water pumps should the water enter their household or business (D. Zappa, personal communication, April 20, 2020; C. de Gasperi, personal communication, April 9, 2020).

The CPSM is integrated in Venice's early warning systems (EWS) and is tasked with providing timely information before a flood event in order to encourage individuals to act sufficiently in advance, thus reducing the possibility of harm or loss (UNDDR, 2012). It forecasts tides via its website, also accessible through the city's council, a mobile app "hi!Tide", local newspapers, information points spread across the city and a call centre (UNDDR, 2012). In case of flood risk, when high tides of at least 110 cm are forecasted, residents can receive constant updates through a free SMS service or via email – subject to prior registration through a link available on the council's website.

Furthermore, Venice's EWS also consists of 23 air-raid sirens dating from the Second World War – 15 located in the historic centre, 3 in the lagoon's islands and 5 along the coast – which alert the population when high tides are forecasted within the next three hours. Depending on the number of rings, the population can infer the forecasted level for the upcoming tide (whether if around 110 cm, 120 cm, 130 cm or 140 cm) and can therefore prepare accordingly. On November 12th, sirens rang four times, which predicted a high tide of 140 cm, although it actually reached 184 cm. The system failed to accurately warn the population simply because it is not configured to alert of higher tides than 140 cm. The CPSM also predicted high tides of maximum 140 cm on its website.

Figure 5.1. Venice's tidal forecast on 11 November 2019



Source: Comune di Venezia, 2019

High tides result from several complex hydrological factors, including the overflowing of the rivers that drain the basin during intense precipitation, especially when accompanied by storm surges and Bora[8] or Sirocco winds.[9] These winds push additional volumes of water from the Adriatic Sea into the lagoon, causing the tide to rise and flood streets, squares, buildings and historic monuments as a result (OECD, 2010). The height of *acqua alta* also depends on many other factors, including the moon's phase (Ramieri, 1999). For instance, the term marea astronomica refers to the prediction of the tide's level according to the influence of primarily the Sun and the Moon on the sea's surface. Under normal meteorological

[8] Bora winds are dry, cold and strong north-east winds in the Adriatic (Weather Online, n.d.-a).

[9] Sirocco winds are hot winds, either dusty or rainy, that blow from North Africa across the Mediterranean to Southern Europe (Weather Online, n.d.-b).

conditions, the water level of the forecasted tide, or marea prevista, will approximately coincide with that of the astronomical tide (Comune di Venezia, n.d.-c). But, under adverse meteorological conditions, the two will diverge, as shown in Figure 5.1. This multiplicity of factors proves the extreme difficulty of accurately predicting the height of a high tide.

The intensity of the 2019 November floods was, in fact, exacerbated by a full moon, southern sirocco winds and a storm surge (Cavalieri *et al.*, 2020). Although the increasing intensity of high tides over the past years seemed foretelling of a potential upcoming catastrophe – in 2018 for instance, a high tide of 140 cm flooded 70% of the city (Cavalieri *et al.*, 2020) – "nobody could expect 1966 (the high tide of 194 cm which inundated 90% of the historic city) would happen again" (D. Zappa, personal communication, April 20, 2020). This affirmation suggests that individuals' risk perception, their estimation of the probability to be exposed to climate hazards and of how harmful the impacts of disasters could be, were informed by their past experiences of floods as well as their reliance on Venice's EWS, which is likely to have limited mobility outcomes – such as preventive relocation – prior to the floods. However, it also showcases the exceptionalism attributed to the event by residents, which could find a parallel with the great floods of 1966. As conveyed by the literature on psychological cognition and adaptation to climate hazards, the experience of such an extraordinary event could have motivated individuals to seek protection against floods through alternative adaptive actions, including migration (Grothmann *et al.*, 2005; Reynaud, 2013), as it materialised the likelihood of extreme events taking place (Cavalieri *et al.*, 2020). But, as suggested by the municipality's out-migration record, it did not in this case.

When asked about the kind of long-term strategies they might consider in order to adapt to floods in the near future, only 10% of participants suggested they would use mobility to reduce their exposure to floods. One respondent said that she would "never live in an apartment at the floor level again", while another thought about "changing homes but would prefer to avoid it". Only one respondent suggested "changing cities". The other 90% said they "wouldn't know" or would "change little" and "continue to use the same precautions" such as "installing taller panels at the household door", "being careful about what I keep in storage (and might be damaged by water)", "buying insurance" or "using water pumps". The respondents' trust in their usual coping mechanisms as long-term coping and adaptation strategies against heightening flood hazards is nonetheless somewhat surprising given their overwhelming

awareness of climatic risks: 90% admitted feeling vulnerable to climate change as residents of the Venice lagoon and 76% said to expect more intense flooding in the next ten years. In other words, there seems to be a behavioural gap between awareness of climatic risk and adaptive actions. This finding seems consistent with the literature on risk perception and adaptation to climate hazards: despite an individual's awareness of climatic risk, her protective and adaptive actions are likely to be informed by her previous experience of weather hazards (Weber, 2006). Even the experience of an extreme weather event – such as the November 2019 floods – might still not translate into new individual protective and adaptive behaviour given the uncertainty about the nature and effects of future climate hazards (Weber, 2006).

The frequency of floods in Venice is such that, in fact, distinctions between coping in situ – understood as a short-term and reactive strategy occurring at the onset of an extreme event (Agrawal, 2009) – and adaptation – defined as a proactive and long-term strategy to deal with environmental risk (Agrawal, 2009) – seem blurred. As the examples given by survey respondents to how they would adapt to floods suggest, there is virtually no distinction between their adaptation strategies motivated by predictions of floods or their coping mechanisms occurring at their onset. In both instances, they resort to "the same precautions", which, as illustrated by the examples laid out, tend to exclude mobility either as a coping or adaptive strategy. In fact, only two survey respondents said that they had temporarily relocated elsewhere. The first one spent two days in the mainland while the other stayed at her secondary residence outside of Venice. Both returned to Venice eventually.

One important element to understand how experience of past floods and risk perception may have influenced (im)mobility outcomes is that, although *acqua alta* may be perceived to disrupt daily activities, it does not, fundamentally, threaten lives. The two deaths reported during the 2019 November floods were unfortunate atypical incidents. One man died by electrocution as he tried to manipulate a water pump and another man was found dead in his home (Robbins, 2019). Although the *acqua granda* event of 1966 left a permanent imprint on the Venetian psyche, it is widely regarded as an isolated and remote event (Cavalieri *et al.*, 2020). As suggested by our interviews, residents did not perceive significant risk to their livelihoods, lives, businesses or houses beyond what they had experienced until then and thus resorted to their usual coping strategies "to contain the situation" (C. de Gasperi, personal communication, April 9, 2020).

The city has, over time, also developed several coping strategies to deal with floods. Walkways, or passarelle, are set up over flooded areas so that individuals can walk safely (Image 5.4). These walkways, and other alternative pedestrian routes can be located in several maps accessible on the council's website. There are also altimetry maps describing and illustrating the areas expected to flood according to the forecasted tide (UNDRR, 2012). These can either be found on the council's website or via a mobile application "Water on the Venetian Floor". Furthermore, public water transport services are modified to minimise the disruption caused by the floods. These coping mechanisms are innate to life in Venice. Walkways, for instance, are integrated into Venice's scenery during most of the winter as they lay, ready to be set up, around Venice's lowest lying areas (Fletcher & da Mosto, 2004).

Image 5.4. Map of alternative pedestrian routes on elevated walkways during high tides

Source: Comune di Venezia, n.d. The red lines correspond to pedestrian routes on raised walkways during a high tide event. The green lines indicate the alternative pedestrian routes on raised walkways for high tides equal or higher than 120 cm

As the literature on disaster risk reduction suggests, these coping mechanisms can inform individual risk perception and adaptive capacity and are, therefore, an important determinant of the responses that the population will ultimately adopt to cope with disasters (Wisner *et al.*, 2012). Only four days after the catastrophic tide, tourists and residents were allowed into St. Mark's Square again (DW, 2019), schools and museums had reopened and public transport resumed (Venezia Today, 2019b).

Therefore, the apparent speed with which Venice coped with the floods minimized livelihood disruption and may have lessened pressure on individuals to relocate.

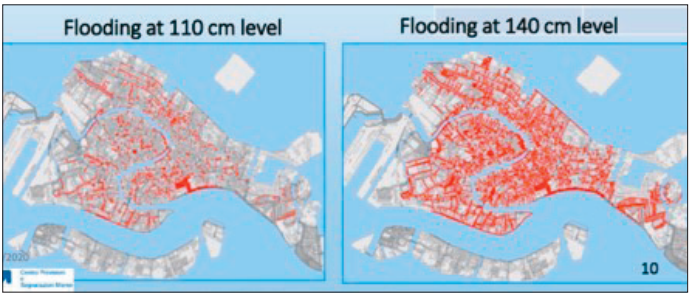
Moreover, despite what was represented in the media, Venice does not become totally submerged by water during *acqua alta*. As shown in Table 5.2., when tides reach 100 cm, only 5% of the city becomes flooded; when the tide rises to 140 cm, 59% is inundated (Image 5.5.); if the tide reaches 150 cm, 70% of the city is covered in water; and if it rises to over 190 cm, 88% of the city becomes submerged (Comune di Venezia, n.d.-b). Yet, given the heterogeneity of heights – or altimetry – across the historic centre and across the different islands in the lagoon, when the water reached 85% of the historic centre, not all areas were flooded to the same extent, if they did at all. For instance, even with a high tide of 140 cm, the water line in St. Mark's square (Piazza San Marco) – Venice's lowest lying area – will not exceed 60 cm (CPSM, 2020). As described by Daniele Zappa, even within his own street in the quarter of Dorsoduro, in the city's historic centre, the water did not flood the entire street nor did it consequently affect all the houses (personal communication, April 20, 2020). Therefore, individual vulnerability and exposure to floods varies widely but, remarkably, it also makes cooperation among neighbours and community resilience possible.

Table 5.2. Percentage of flooding according to tide level

Tide range	Flooding	Tide range	Flooding
up to 200 cm	91%	140 cm	59%
190 cm	88%	130 cm	46%
180 cm	85%	120 cm	28%
170 cm	82%	110 cm	12%
160 cm	77%	100 cm	5%
150 cm	70%	90 cm	2%

Table elaborated by the author. Data Source: Comune di Venezia, n.d.

Image 5.5. Areas flooded in Venice's historic centre at different high tide levels



Source: Centro Previsioni e Segnalazioni Maree (CPSM), 2020

Social capital

As noted by Adger (2003), adaptation is a dynamic social process. Social capital, defined as "informal network relationships built on norms of trust and reciprocity" (Pelling, 2005: 313), is a key factor determining how individuals cope with risk and adapt to disasters by building capacity and reducing vulnerability. Arguably, according to Cecilia de Gasperi, one silver lining of the so-called 'Venetian exodus' is the strong sense of community that characterises residents' relations (personal communication, April 9, 2020). As revealed by 26% of survey respondents and in our interviews, social capital, whether it be in the form of informal everyday social interactions based on trust – such as neighbour relations – or in the form of social networks of students, volunteer associations or local non-profits, operated as a safety net that alleviated immediate material needs. Some examples cited by survey respondents help illustrate the type of help that individuals obtained from neighbours. This included getting help to discard damaged furniture and to clean; borrowing a water pump or their neighbour's washing machines given the damage the water caused to electric systems and electronic appliances or even obtaining moral support against the harm and loss provoked by the floods. Individuals also cited the assistance offered by a volunteer group of electricians to revamp their electrical system and the support received from the associations Venice Calls, Veritas or Generazione 90' to cope with the floods by recovering damaged materials and goods.

These forms of social capital reduced individuals' vulnerability and helped ensure life resumed back to normal within a relatively short amount of time, which might have attenuated the potential pressure on

individuals to relocate. As highlighted by Marshall (2012), "social capital increases the capacity of individuals to adapt to incremental change but acts as a barrier to transformational change through migration" (p. 1). In fact, when asked about which long-term strategies they would adopt in the near future after having experienced the 2019 November floods, besides "doing the same as usual", some individuals referred to seeking long-term solutions to recurrent floods by participating in social networks. This included, for instance, "presenting a common request with neighbours to the town's council to raise the overall floor level in the city" and "seeking and stimulating more commitment by government and other institutions". Social capital then appears as an important long-term adaptive strategy at the community level, as opposed to other long-term adaptation strategies such as permanent relocation. Venetian volunteer and civil-society networks, such as Venezia non è Disneyland or Laguna Libre, enable residents to act together to bring about institutional change and pursue shared objectives. They typically announce meetings through social media platforms, at bars, or by hanging posters around the city. They hold meetings, protests and events, seeking to draw attention from the authorities or work on documents and collect signatures to make formal petitions (C. de Gasperi, personal communication, April 9, 2020).

Institutional framework and disaster risk preparedness

Yet, as much as individual adaptation processes can stem from collective action, they can also be influenced by the institutional framework and by individuals' interactions with it (Adger, 2003). After the November floods the municipality opened a service, from 2nd December 2019 to 30th January 2020, whereby individuals could claim up to 5,000 euros to compensate the costs of re-establishing essential apartment features (such as kitchens, flooring or bedrooms) and utilities (such as the electrical system). Businesses could claim up to 20,000 euros to make up for the costs needed to re-start their activity (Venezia Today, 2019a). As previously highlighted by the literature on psychological and behavioural processes in the context of adaptation to climate hazards, including Grothmann *et al*. (2005), if an individual receives financial support, their sense of vulnerability might diminish as a monetary compensation can fundamentally alter the individual's assessment of the costs associated with coping and adaptation. Refunds can lower coping and adaptation costs, potentially mitigating individuals' pressure to relocate, since their home or business could

be fixed. As revealed by experiences of floods in the UK, if individuals expect state authorities to compensate them following destructive events, they will believe in the possibility to continue life as usual (Harries, 2008).

Nevertheless, several elements impeded access to compensation in Venice. First, there was significant uncertainty about when the council would provide this support because it first needed to collect all petitions and then send a request to the national government, which would then decide what percentage to refund. Individuals were required to make an upfront payment for the damages and losses incurred, provided they could submit an audited assessment of the damages. Although individuals could be refunded for this audit, its cost would count towards the maximum amounts specified above (Venezia Today, 2019a), which would reduce the total amount available to repair their homes and businesses. As it emerged from the survey, despite 50% of respondents having suffered damage to their homes or businesses, only 26% did indeed claim compensation, citing the complexity and uncertainty related to the process as an obstacle. Few had time to carry out a proper assessment of the damages before the deadline closed. Others could not claim compensation because they were not the homeowners, and some were not able to determine if their damages would qualify for a refund. As experiences of floods in Indonesia or the UK have shown, uncertainty constrains adaptive action and delays adaptive responses (Hellman, 2014; Harries, 2008), whether that is revamping a home or business, or potentially relocating.

For Daniele Zappa, the possibility of claiming compensation did not change his attitude towards coping and adaptation in situ against floods. Because flooding is a chronic issue, the government's compensation could only be an interim solution for a city that lives in "perpetual emergency" (D. Zappa, personal communication, April 20, 2020). New floods are expected and will undoubtedly continue to bring about new damage. As such, Mr. Zappa preferred not to make "huge investments" and preferred to live "day by day" (personal communication, April 20, 2020). His testimony highlights once again the blurred lines between individual in situ coping and adaptation strategies, but it is also reflective of the general mistrust survey participants expressed towards the institutional measures put in place to prevent or repair the damage done by floods.

Indeed, the design and implementation of an effective system to prevent and deal with floods has been lacking and there have been significant delays and contestation about what should be done to prevent floods

(OECD, 2015). This can be explained by the presence of multiple governmental authorities with overlapping competences for overseeing, regulating and managing Venice and the lagoon (UNESCO, 2012, 2018). These fragmentation and coordination challenges are compounded by the existence of other public bodies and private actors that share functions in management, environmental and economic policy as well as planning (OECD, 2015).

After the great floods of 1966, the Special Law of 1973 attributed to Venice "pre-eminent national interest" and gave the Italian national government authority to safeguard the physical integrity and hydro-geological balance of Venice and the lagoon (OECD, 2010). But the largest effort to safeguard Venice and the lagoon from floods came in 1987 with the General Work Plan for the Protection of Venice and the Lagoon (OECD, 2010). It contemplated several measures: one strand proposed nature-based solutions to restore salt marshes to buffer the tides (OECD, 2010), another aimed to raise pavements, bridges and to restore buildings to deal with chronic *acqua alta*, not exceeding 110 cm (Fletcher & da Mosto, 2004). To deal with exceptional and extreme flooding, MOSE, short for Modulo Sperimentale Elettromeccanico (Electromechanical Module and Infrastructural System), was also designed as part of the 1987 Work Plan, but works only began in 2003 (OECD, 2010).

MOSE consists of a set of mobile barriers located at the three inlets that connect the Lagoon with the Adriatic Sea. These barriers are supposed to rise to the surface when high tides of over 110 cm are forecasted. The project was commissioned by the national government but is managed by an administrative body created in the aftermath of the 1966 floods – the Magistrato alle Acque – which allocates extraordinary budgets for water management and gives the municipality leeway to approve special laws and use special procedures regarding the management of *acqua alta*. It is also under the supervision of the Consorzio Venezia Nuova, a private consortium of engineering and construction firms, which is tasked with the morphological restoration of the lagoon to deal with moderate floods below 110 cm (OECD, 2010). Although the first set of measures proposed by the Special Law of 1973 has been largely completed (Robbins, 2019), despite some ongoing work-in-progress, the population is still awaiting the completion of MOSE. Originally due in 2011, its due date has been further postponed owing to budget overruns, a set of corruption scandals involving the former region's governor – which impacted the quality of design and the materials used – and other technical and engineering issues (Robbins, 2019).

Indeed, individuals appear to be upset with the flood prevention measures that the authorities have adopted so far, and blame MOSE for the difficulties, as illustrated by the following survey response:

> There are a series of measures, proposed by hydraulic engineers, such as the plan 'insulae', to make the historic centre safe, that have never been applied. Or the plan to raise Venice. Or the plan to amplify and manage the sandbanks. Nothing has ever been done. Only money for MOSE.

When asked to assess how responsible they held themselves or the different institutions overseeing the lagoon for effectively preventing damage to their homes, on a scale from 0 to 5, 30% of participants thought of themselves as "very responsible" (measured with a 5), whereas 50% of respondents said it was the state's responsibility. Respondents fundamentally held institutions accountable for flood prevention, risk management and the protection of their homes and blamed institutions for exposing the population to extreme events. They believed that, if better flood prevention systems were in place, their perils would end or significantly diminish. As one respondent argued: "We weren't ready (for the 2019 floods) and we shouldn't be ready" (C. de Gasperi, personal communication, April 9, 2020). This statement captures well the population's sense of frustration with the absence of effective preventive measures to protect Venice and the population from catastrophic tides. As research in flood-prone areas in Vietnam has shown, individuals are less likely to take precautionary actions or find alternative adaptive strategies, such as relocation, if they think a governmental authority is responsible for preventing and managing floods (Reynaud *et al.*, 2013). The population's discontent with the city's disaster risk preparedness and their belief that institutions are responsible for safeguarding their livelihoods and homes then appear as possible factors influencing their immobility outcomes in the aftermath of the 2019 floods.

Some survey responses further illustrate how individuals perceive their perils to be a by-product of the institutional framework. When asked whether they thought extreme floods (> 140 cm) could be effectively prevented and what needed to be done to that end, all answers pointed to solutions that require the intervention of public bodies or government authorities including "the completion of MOSE" or alternative preventive mechanisms such as "to increase and protect the lagoon's ecosystems (e.g. saltmarshes)"; "to end wave motion (from motor-boat traffic) and ban cruise-ships"; "to raise the city above sea level"; " to end the dredging of

canals for large ships"; "to respect the lagoon and its eaves"; "to restore the morphology of the lagoon" and "to restore the lagoon's inlets to the previous levels (above water)".

Place attachment

Although individuals were generally aware of their vulnerability to floods – 90% of survey respondents said they were aware of Venice's vulnerability to climate hazards, and 76% predicted there will be more floods in the next 10 years – this did not seem to impact their mobility aspirations. Sixty-nine percent of survey participants reported to feel a duty to remain to force effective and efficient flood preventive measures by exerting political and social pressure through social networks, and portrayed themselves as the last bastions defending a city against mass tourism and environmental degradation. As explained by Cecilia de Gasperi, if mass tourism, lack of employment opportunities and high real estate prices have not been sufficient reasons for people to leave, those who remain truly "love the city" and are willing to "fight for it" (personal communication, April 9, 2020). This idea is powerfully illustrated in the following survey response: "I don't think my problem (floods) would be solved by renouncing to live in Venice. I prefer to fight". Thus, it appears that for some residents, staying after the 2019 floods was an act of resistance. This is reminiscent of the persistence of Pacific islanders and indigenous communities threatened by global sea level rise, who, despite facing the necessity of relocating due to current and projected climate hazards, do not regard it as a viable option as it would entail leaving behind the place that signifies their culture and sustains their lives (Adger *et al.*, 2011).

As it emerged from the survey, affective feelings of place attachment, defined as a "collection of symbolic meanings and satisfaction with a spatial setting held by an individual or group" (Stedman, 2002: 563) are particularly strong. In that light, how individuals perceived risk and structured their adaptive decisions at the time of the floods seems to have been substantially influenced by their material and subjective well-being as well as their sense of residential satisfaction at large. The city's cultural heritage – which some report to also contribute to their conception of place, self and identity – their familiarity with the city and their affective ties with family members and friends are, as defined by Adger *et al.*, (2011) subjective, social, symbolic, spiritual and cultural elements that enhance individuals' sense of belonging to their locations and can

motivate them to engage in what Stedman (2002) calls "place-protective" action (p. 567).

It is worth noting that out of the 20% of survey respondents who admitted having considered moving away from Venice due to chronic flooding, only 5% expressed negative place attachment through obligations (Adams, 2016), such as being tied to a property, as reasons to remain. Nevertheless, they equally provided reasons associated with non-material aspects of place attachment, such as their inability to imagine a quality of life as all-encompassing as the one they enjoy in Venice elsewhere.

Indeed, it appears living in Venice gives meaning to the lives of its residents. Place attachment appears as an important factor to explain why individuals did not develop and/or express mobility aspirations in the aftermath of the 2019 floods. As remarked by Cecilia de Gasperi: "they could predict *acqua alta* every day and we would still stay" (personal communication, April 9, 2020). The survey shows that this holds true even for the 23% of individuals who reported to have significantly loosened their emotional ties with Venice given their awareness of its exposure to ever harsher climate hazards. As suggested by the literature on the psychology of place attachment, such emotional detachment could motivate individuals to relocate (Agyeman *et al.*, 2009; Lewicka, 2011). Yet, in the case of our respondents, it did not. Notably, the same survey participants assessed their sense of duty as last bastions of a city threatened by the floods on a 0 to 5 scale with the maximum score. Venice's residents go against the tides and persist, despite the existence of "apparent economic reasons for relocating, environmental hazards or long-term environmental change" (Adams, 2016: 430).

Conclusion

This paper found that the population's awareness of Venice's exposure and vulnerability to climatic risks did not appear to translate into mobility aspirations nor outcomes. Other factors seemed to outweigh considerations of environmental risk. Respondents' adaptive actions were modelled by their perception of flood risks and were shaped by their past experiences of floods, and by the institutional response to them. Simultaneously, the perceived inefficacy of the current institutional measures led individuals to believe that once effective flood prevention mechanisms are finally adopted, flood risks will diminish or disappear altogether. Due to institutional mistrust, many portray themselves as the last bastions

defending the city, a sentiment reinforced by a strong and positive sense of place attachment.

The role of psychological processes as well as the influence of institutions and socio-cultural values in shaping adaptive responses highlighted by this research provide a counterpoint to the literature on (im)mobile populations in the context of disasters and environmental hazards, which has mostly focused on financial barriers (Black & Collyer, 2014). It also highlights that mobility outcomes take place across a spectrum of agency, ranging from voluntary to involuntary (Zickgraf, 2018). The agency demonstrated by individuals in their decisions to remain should not, however, de-problematize floods. Although residents are widely aware of flood hazards, they do not intend to quit their homes in Venice, which can place them at greater danger in the face of new environmental disasters.

Although, as suggested by this research, the floods in November 2019 in Venice did not seem to translate into mobility aspirations as a long-term adaptive strategy, the answers collected in the survey suggest that temporary relocation could however constitute a coping mechanism for some individuals. Nevertheless, the fact that only two survey participants out of 30 said to have temporarily relocated suggests that this type of mobility outcome may be unrepresentative of general mobility responses. Yet, it highlights some important aspects. First, there is differentiated vulnerability; that is, not everyone suffers equally from floods and hence experiences the same pressure to either temporarily relocate, change homes or migrate. In future research, it may be worth exploring what factors are associated with mobility – whether related to flood exposure or determined by financial, physical or coping capabilities – to better understand the environment-(im)mobility nexus in Venice. Secondly, the fact that no displacement was officially reported suggests that some mobility outcomes go underreported, which could negatively impact the way these individuals may be supported and protected by policies. This also underplays the effects of floods on the local population.

As mentioned before, the survey's sample was limited and this research would have therefore benefitted from a larger sample. Although some of the respondents were neither Venetian nor Italian and equally reported a high level of positive place attachment, this research would have benefitted from more carefully targeting third country nationals and younger individuals to better control for the potential influence of nationality or age in feelings of place attachment and (im)mobility aspirations.

Equally, as suggested by Black *et al.* (2013), further research could focus on homelessness as a form of displacement. Indeed, despite not engaging with population displacement in the way in which it has traditionally been conceptualized, this might shed an even more nuanced insight into how individuals in Venice are affected by floods. In the same vein, exploring home-changing within Venice itself could be more illustrative of the impacts of floods on (im)mobility outcomes.

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Annex 1

Survey questions

1. Do you reside in the Venice Lagoon?
2. Did you experience the 2019 November floods?
3. How long have you lived in Venice?
4. Where do you live in Venice?
5. What is your gender?
6. How old are you?
7. Where are you from?
8. What is your occupation?
9. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent do high tides (to the exception of extreme high tides (>140 cm) disrupt your livelihood?
10. Was your home or business damaged by the 2019 November floods?

11. Did you claim compensation for the damages to the municipality? If not, were there any reasons why you did not?

12. Did you obtain help from neighbours in the aftermath of the 2019 November floods? If yes, could you give an example of the type of help you received from them?

13. Did you obtain support from crowdfunding initiatives in the aftermath of the 2019 November floods?

14. Did you receive support from local associations or volunteer groups to cope with the 2019 November floods? If yes, could you name these organisations and cite the kind of help you received from them?

15. Did you temporarily relocate elsewhere during the duration of the 2019 November floods? If yes, where did you go to and how long did you spend there before returning to Venice?

16. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent do you hold yourself responsible for the protection of your home from floods?

17. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent do you hold Venice's municipality responsible for the protection of your home from floods?

18. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent do you hold the Italian State responsible for the protection of your home from floods?

19. In the next ten years, do you predict there will be more, less or equal number of floods?

20. As a resident of the Venice lagoon, do you feel vulnerable to the effects of climate change? If yes, does this sense of vulnerability motivate you to seek long-term adaptive actions? Could you give an example?

21. Do you believe that extreme high tides (>140 cm) can be effectively prevented? If so, how?

22. Did you consider moving out from Venice after the 2019 November floods? If yes, what kept you from doing so?

23. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent do you feel satisfied with living in Venice?

24. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent do social ties, (e.g. family, friends, etc.) contribute to your overall sense of satisfaction with living in Venice?

25. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent does your economic wellbeing contribute to your overall sense of satisfaction with living in Venice?

26. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent does your familiarity with the city of Venice contribute to your overall sense of satisfaction with living in Venice?

27. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent would you say Venice's cultural heritage contributes to your sense of identity?

28. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent have floods weakened your affective ties with Venice?

29. On a scale from 0 to 5 (0 being the lowest score and 5 the highest), to what extent do you feel responsible to remain in Venice to exert social/political pressure and ensure that effective solutions against floods are found?

Oceania

Managing Population Displacement on Burning Land

State responsibility and community self-management during the 2019-2020 Australian bushfire season

Tomas Pierna

Between November 2019 and February 2020, Australia experienced its most devastating bushfire season on record, which caused major losses and damage, but also produced valuable lessons for future fire emergency management. Dozens of fires ignited in New South Wales (NSW) in late October 2019. Abnormally high temperatures and a lack of soil moisture facilitated their spread, the latter caused by a severe drought that has been affecting eastern Australia since mid-2016 (King, 2020). The situation quickly worsened until heavy rains helped contain the fires in February 2020 (Calma, 2020). The extent of the damage was immense. Over the course of three and a half months, more than 18 million hectares of land were burnt, mostly forested areas (Sullivan, 2020). More than one billion animals were killed in the fires while an unknown number of endemic animal and plant species were rendered extinct or pushed toward extinction (Bevege, 2020). The impact on humans was equally significant. The fires claimed the lives of at least 33 people and destroyed more than 5,600 buildings and 2,700 houses (Calma, 2020). Vast regions of southwestern Australia were evacuated because of direct fire danger and heavy smokes that caused high air toxicity (Jacobs, 2020; Wahlquist *et al.*, 2020).

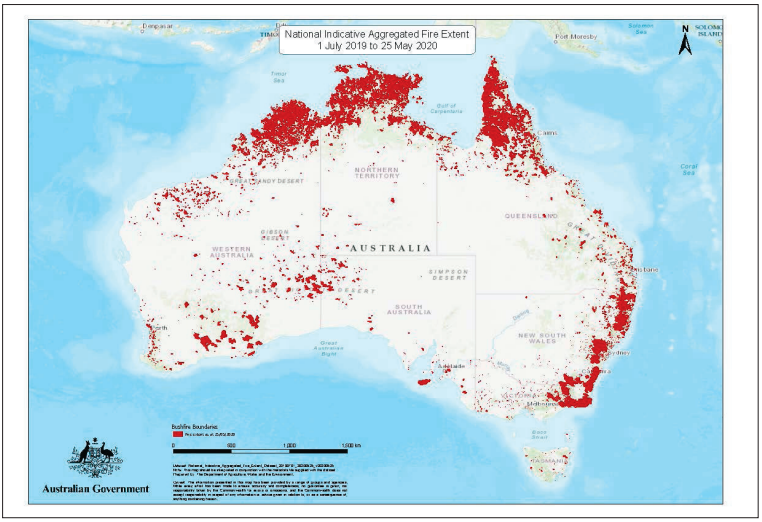
There are significant data gaps on internal displacement in Australia (Internal Displacement Monitoring Centre, 2020a). The event that is now referred to as 'the Black Summer' (Tolhurst, 2020) calls for more attention on the topic as an unprecedented number of people were forced to leave their homes and faced a difficult journey to safety. Indeed, an estimated 64,579 people were displaced by the Black Summer fires (Internal Displacement Monitoring Centre, 2020a).

The 2019-2020 bushfire season was unprecedented with regards to its impact on humans and wildlife as well as in terms of its geographic extent,

as shown in Image 6.1 below (Komesaroff & Kerridge, 2020). While the community response to the fires received important media coverage, demonstrating great reactivity and solidarity amongst Australian residents, the Australian central government faced high criticism for its inability to efficiently respond to fires and provide straightforward guidelines to generate a coordinated response across local governments in order to protect their residents (Wootton, 2020).

Did the unprecedented intensity of the fires trigger efficient survival strategies, anticipated evacuation, and lead to solidarity? Did the Black Summer events lead the government to change its fire response mechanism? This paper draws a comparison between the responses of the state – official governmental bodies – and of the community – individual citizens as well as local initiatives, associations and non-governmental organizations – describing the processes implemented by different stakeholders involved in a disaster requiring large-scale evacuations.

Image 6.1. National Indicative Aggregated Fire Extent between 1 July 2019 to 25 May 2020



Source: Australian Royal Commission, 2020

This paper is divided in three sections, following the phases of the disaster risk management cycle. The first section focuses on the *preparedness phase* preceding the arrival of the fires in populated areas, during which people prepared for potential fire emergencies, while the second

section turns to the *response phase*, during which the fires called for rapid evacuations or other response strategies. Lastly, the third section analyses the *recovery phase* following the fires, including reconstruction, and during which the resilience of affected communities was put to the test.

The preparedness phase

In Australia, bushfires, which form part of the functioning of natural ecosystems, regularly occur and are well-known to its inhabitants. Nonetheless, being prepared for what a fire event entails differs from merely acknowledging its possibility. The preparedness phase, by preparing people for the risk, is crucial in limiting the impact of a disaster (McLennan *et al.*, 2014). Although fire patterns and progression evolve quickly, it is possible to anticipate fire risks before they turn into a direct threat to individuals. Preparedness is key to ensure that individuals take the safest decision when a fire requires immediate action. Risk communication, as well as governmental guidelines on both preventive and reactive measures, are crucial to encourage safe behaviour (Whittaker *et al.*, 2020). Evacuation, amongst other preventive measures, must be anticipated as much in advance as possible as it may require leaving one's home for several days, weeks or months or, in the worst cases, permanently. The option of staying and protecting one's home is often envisaged but calls for a careful evaluation of the danger (Tibbits *et al.*, 2008). Additionally, psychological preparedness is crucial to enable people to cope with trauma in the aftermath of the event (Boylan 2016).

On the 11th of November 2019, a state of emergency was declared in Queensland and New South Wales as fires intensified in rural Queensland and started to threaten houses around the Greater Sydney area and along the coast, south of Brisbane. About 100,000 homes were already under threat, many of which had never experienced serious fires (Hannam & Gladstone, 2019).

In Australia, local governments are responsible for operating their own fire prevention and firefighting services. They follow the recommendations emitted by the Australasian Fire and Emergency Service Authorities Council (AFAC), the main body responsible for delivering fire emergency management documentation in Australia and in charge of communicating strategic directions to both local governments and the population. The AFAC recommendation framework for citizens facing fire danger is divided between evacuation – the "leave early" option – and staying to

protect one's home and locally buffer fire progression – the "prepare, stay and defend" alternative. These guidelines were developed in the 1980s when AFAC concluded that prepared houses could be defended against fire and provide shelter to people running from the flames (Tibbits *et al.*, 2008). Until 2009, the guidelines highlighted the role of the Australian citizens in protecting their community from fires:

> By extinguishing small initial ignitions, people of adequate mental, emotional, and physical fitness, equipped with appropriate skills, and basic resources, can save a building that would otherwise be lost in a fire. […] People should decide well in advance of a bushfire whether they will stay to defend them or leave if a bushfire threatens. (Australasian Fire and Emergency Services Authorities Council, 2005:6)

As stated by McLennan *et al*. (2014), the idea that individuals are responsible for themselves and their community is inherent to the Australian culture. This mindset is believed to promote the "stay and defend" option. Besides being riskier, staying and defending one's property can lead to late evacuations, which may constitute up to 32% of bushfire-related deaths in Australia (Haynes *et al.*, 2010). The disastrous 2009 Victoria fires killed 173 civilians out of which 113 reportedly died in their homes (Cooke, 2010). As argued by Griffiths (2012), not only did the AFAC policy fail to encourage early preventive evacuations, but it also led to the abandoning of traditional fire dugout refuges – underground fire shelters –, a cultural response to fires in Victorian forests, making sheltering more difficult during the 2009 Victoria fires. The 2009 fire disaster led to an intense scrutiny of the AFAC policy by the Royal Commission. As a result, the guidelines were updated to give more weight to the safer "leave early" option:

> People usually have two safe options when threatened by bushfire: leaving early or staying and defending adequately prepared properties. Leaving early is always the safest option. (Australasian Fire and Emergency Services Authorities Council, 2010)

Thereafter, all fire agencies across Australia updated their policies and education programs in line with the revised AFAC position. Nonetheless, forced evacuation policies remain extremely rare and are only possible in some states following the declaration of a state of emergency by the central government (Eburn, 2014).

The Fire Danger Rating (FDR) is a warning system that communicates bushfire risk. It provides an evaluation of fire propensity given climatic conditions and uses the following levels: low-moderate; high; very high; and extreme, as illustrated in Image 6.2 below. After the 2009 Victoria bushfires, "severe" and "catastrophic/code red" were added to the scale (Whittaker *et al.*, 2020). FDRs are issued daily via the weather forecast, radio, television, websites, and social media. On the side of the roads, drivers can see bushfire danger rating signs that communicate how severe a bushfire threat is evaluated; on the radio, the Standard Emergency Warning Signal is broadcast to alert communities of an imminent danger that can affect them (Department of Fire and Emergency Services, 2020). In a survey assessing the perception of evacuation warning by citizens, Whittaker *et al.* (2010) found that although a majority of participant deemed evacuations warnings "sufficiently clear", they rarely work as intended.

Image 6.2. Fire danger rating sign in the main street of Taradale, Central Victoria, Australia

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Despite the various mechanisms in place to incite people to evacuate, McLennan *et al*. (2018) found that some residents still decide to stay on their property to try and defend it. This includes those who delay their departure or those who are not present on their property during the warning broadcast and who will try to return. Several reasons were identified as to why evacuation warnings do not work as intended. For instance, official warning signals seem to be understood but are often overlooked, thus delaying responses to danger and decreasing the preparedness level of at-risk individuals. Indeed, the warning phase is filled with uncertainty and people usually seek to avoid an unnecessary evacuation and the costs it may entail. Subsequently, they often seek confirmation of the danger before taking any related measures (Perry, 1979). This suggests that fire emergency services should help people confirm the risk they are exposed to. Overall, efficient information-sharing is crucial to make people aware of the severity of the danger and generate any kind of reaction.

Besides policy recommendations and warning strategies, social biases can also influence one's response to fire emergency. Several studies have pointed out to the fact that attitudes towards fires and their related risks may differ according to gender. In particular, women are deemed more likely to prepare to evacuate, while men are expected to want to stay in dangerous areas (Bolin *et al.*1998). This observation is backed by an overrepresentation of men in bushfire-related fatalities (Haynes *et al.*, 2010). Gender expectations are at the root of such behaviours. Indeed, Tyler & Fairbrother (2013b) have stressed that the social construct of masculinity is a driver of bushfire prevention and response strategies. While the 'stay and defend', riskier, option is perceived as 'masculine', the safer 'leave early' alternative is considered 'feminine'. Perceived gender roles thus modulate the response to fire danger. For instance, women often take on care-giving responsibilities (e.g. towards children and elderly relatives) and as such, are more likely to avoid danger (Tyler & Fairbrother, 2013b). Furthermore, bushfire events can be seen as opportunities to accomplish heroic deeds, behaviours generally sought by men while women, perceived as less capable of fighting danger, are expected to flee from danger rather than face it (Tyler & Fairbrother, 2013b). The inefficiency of fire responses is partly due to the collective belief that staying and protecting constitutes an act of bravery while evacuating equates cowardice (Tyler & Fairbrother, 2013b). In order to avoid unnecessary risk-taking behaviour and encourage people to leave early, before the fires become an imminent danger, such biases must be addressed. Further research on gender behaviour related to bushfires can help build

a stronger understanding of gender's influence on decision making in the presence of a fire threat.

The 2019-2020 bushfire season, because of its unprecedented intensity, quickly got the attention of the international community. The Black Summer events were shared and broadcast on international newspapers, radio, and television channels. Social media played a major role in diffusing short stories, videos, and pictures of the fires and evacuees. As the bushfire season was making global headlines, Australians seemed to realize the scale of the fire danger, encouraging preparedness and safer behaviours. In a short interview I conducted for this study, Tadhg, a 25 year-old Australian currently living in Brisbane, shared his views on how the 2019-2020 bushfires were perceived by the Australian population and the role of social media in broadcasting information:

> Social media played a big role in sharing stories. Every day you would see new pictures and videos on Twitter or influencers raising money on Instagram. You would see people in shelters who fled their homes, evacuees on beaches waiting to be rescued, men and women picking up koalas before running to their car. It was so dramatic. But I think it made people aware of how destructive fires can be. Many of us do not know how dangerous they are. Did you know flames spread faster than you can run? (Personal communication with the author, March 14, 2020)

Tadhg then referred to the 2009 Victoria fires, the last severe fire event he could recall:

> They [the Victoria fires] killed many people, it was really tragic, but not as dramatic as the recent fires. I mean, we were talking about the apocalypse. The scale of these [2019/2020] fires is nothing compared to any fire we had, that is why they made the headline everywhere. (…) The fact that they're linked to climate change makes it a global issue. (Personal communication with the author, March 14, 2020)

The media has undoubtedly played a role in the recognition of the fire danger. The sharing of alarming stories may have favoured anticipation and allowed for better preparation, resulting in a relatively low death toll for such an intense fire season. Indeed, 18,6 million hectares burnt down during the Black Summer, causing the death of 34 people (Parliament of Australia, 2020). In comparison, fatalities were five times higher during

the 2009 Victoria bushfire while only 365,000 hectares were burnt (Cooke, 2010).

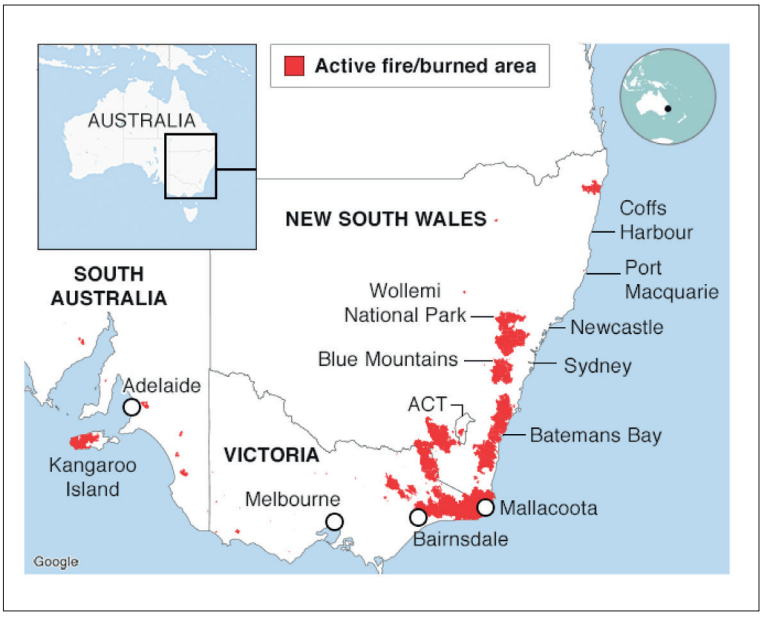
In the case of the 2019/2020 bushfires, imagination may have played a role in the community's response to the threat. Preparation to bushfire events is not just operational but also entails an important psychological dimension (Boylan, 2016). Psychological preparedness, although present in Australia's bushfire policy and encouraged by fire agencies, remains an under-researched area (Alston, 2020; Boyle & Lawrence, 2020). It is defined by Everya *et al.* (2019) as "people's ability to prepare adaptively for the mental effects and physical demands of both disaster warnings and the impact of the event" (p. 1). It enables people to better manage their emotions, which is crucial for efficient and sensible decision-making. Fire events sometimes require swift responses and immediate reactions under limited preparation. Anticipatory stress during the warning phase can lead to inadequate reactions, altering one's capacity to prepare for an evacuation or to protect oneself. This can in turn further increase risks and the psychological impact of fires.

The response phase

Contrary to popular belief, the 2019/2020 bushfires were not the largest fires the country has experienced. During the 1974/1975 fire season, 15% of the Australian territory – or 117 million hectares – were durably affected by fires (Australian Bureau of Statistics, 1995). The Black summer fires come in second place, burning about 18.6 million hectares of land. However, these fires had a greater impact on human communities and wildlife as they spread across biodiversity hotspots such as forested areas and densely populated regions of the Australian east coast (*cf.* Image 6.3).

The Black Summer was hence characterized by massive population displacements due to fire hazards. According to the Internal Displacement Monitoring Centre (2020b), in Australia, about 65,000 people had to leave their homes between September 2019 and January 2020 due to the fires. In comparison, roughly 11,000 people were displaced because of disasters (including bushfires) in the country throughout 2018 (Internal Displacement Monitoring Centre, 2020b). During the Black Summer, human displacement was driven either by direct fire threat or high air toxicity in the proximity of inhabited areas. Eastward winds brought toxic fire smoke to densely populated areas, as depicted by pictures of the sky over Sydney which turned brown for several weeks (*cf.* image 6.4).

Image 6.3. Fires spread on biodiversity hotspots such as Kangaroo Island, Wollemi National Park and the Blue Mountains region



Source: NSW Rural Fire Service and Victoria Country Fire Authority, 31 January 2020

Image 6.4. Sydney's brown sky during the Black Summer

© Steven Saphore, 5 December 2020

South Australia, New South Wales and Victoria were the regions most impacted by the fires. These are also home to half of the country's 865,000 Indigenous Australians (Australian Bureau of Statistics, 2020). Statistics show that a quarter of those living in New South Wales and Victoria were affected by the fires, including only a tenth of non-Indigenous people (Australian Bureau of Statistics, 2020). Villages that were exclusively inhabited by Aboriginal people were entirely destroyed by the fires (Williamson *et al.*, 2020). Conducting more research on Aboriginal communities during bushfire events would enable a better understanding of their vulnerability and constitute a basis for future evidence-based policy measures.

Overall, is estimated that more than 2,700 homes were destroyed in the fires (Calma, 2020), an increase from the 2,400 homes that went up in flames during the 2009 Victoria fires (Government of Victoria, 2010). Fortunately, the death toll remained inferior than during previous bushfires, with 33 fatalities compared to 173 in the 2009 Victoria bushfires (Nogrady, 2020).

In order to better understand the relatively low number of deaths compared to the intensity of the scale of the fires, a review of the responses at both the state and community level is required. On the one hand, community responses were often praised by the media for their capacity to generate solidarity and bring people to safety (Sokolov, 2020). On the other hand, the state was often criticized for being inefficient (Wootton, 2020).

Following the 2009 Victoria fires, Stephens *et al.* (2009) released a study on citizens' role in ensuring their own safety during fire hazards, comparing the Australian central government's guidelines to those of the United States. Although both countries experience similar fire events that threaten lives and properties, their fire emergency management strategies and responses differ. While evacuating one's house is not mandatory in Australia, making it possible for people to choose to 'stay and protect' and participate in fire relief efforts as civilians, evacuations in the sight of fire danger are a federal requirement in the US. As argued by Stephens *et al.* (2009), although unnecessary evacuations do happen in the US, fewer lives are put at risk. Australian states' fire responses face important criticism by journalists and scholars who call for a transformation of the state emergency response system (Bowman & Bradstock, 2020; Komesaroff & Kerridge, 2020). Australian fire emergency management is not centralized. While the central government provides firefighters through its fire

and rescue agencies, it is up to states to organize their fire response, from the deployment of firefighters to the issuance of evacuation guidelines to civilians. Cooperation issues arise due to such spatial fragmentation of fire response systems, as bushfires know no state boundaries. Australian authorities must deliver coordinated responses to effectively bring populations to safety. The issue of the compatibility of the communication systems across states is often pointed out and fails to be addressed, making evacuations difficult (Komesaroff & Kerridge, 2020). Indeed, bushfires require cooperation between different states, hence different emergency management techniques to be faced. The US have addressed this issue by passing the Interoperable Communications Act in 2016 after Hurricane Katrina revealed important failures in American emergency response mechanisms. They established a centralized communication system to achieved and maintain effective and timely communication during emergencies. Nicol (2020) encourages the Australian government to adopt a similar measure. Stephens *et al*. (2009) claim that requiring the early evacuation of civilians – following the American example – may help generate a more coherent response and avoid the aforementioned problems.

Besides, communication strategies are not always optimal. There has been an increase in the dependency on communication technologies over the last decade but installing better communication facilities is insufficient for two main reasons. First, as described in the first section, it is not because people have access to information that they will necessarily use it to respond as desired; secondly, if communication infrastructures break down, other alternatives must be available to trigger survival behaviour. In many cases, during bushfire events, rescuers and citizens have limited access to internet connections and telecommunication services, which prevents them from accessing safety mobile applications and generates severe delays to receive vital information (Nicol, 2020).

Nonetheless, response to bushfires is centralized when it involves the military. The army organizes the evacuation of populations who cannot easily leave their locations or are trapped in dangerous places. Such situations generally occur following road closures. Power interruptions, as well as fuel and food shortages can also require the intervention of the army as some communities become only accessible by air or sea. On the 31st of December 2019, the Australian Defence Force assisted 4,000 people in the town of Mallacoota, by mobilizing helicopters and two naval vessels to evacuate civilians, taking them on a 17-hour sea voyage to the HMAS Cerberus naval base at Western Port (see Image 6.5) (Australian Government, 2020; Walton, 2020).

Image 6.5. Evacuees from Mallacoota arrive at the port of Hastings, Victoria

© Ian Currie, 2020

The community response to the fires is characterized by individuals' spontaneous action and self-organization. Once people leave their home, they need to seek shelter. The range of options differs for individuals. Some people have secondary homes that they can move into, while others go live with relatives of friends for an undetermined duration. The worst-off must settle in improvised camps on vegetation-free campgrounds or facilities turned into evacuation centres (Robertson, 2020). Overall, important levels of solidarity and selflessness were observed among both affected and non-affected communities to support the most vulnerable (Shelton, 2020). More than 100 evacuation and relief centres were set up to provide displaced people with food, water, personal items and a safe place to stay (Australian Red Cross, 2020). Additionally, private individuals offered accommodation or paddocks (for livestock) for free, leading to the creation of databases to match shelter offers with related needs. For instance, more than 8,500 people offered accommodation to people in need on the online platform *Find a Bed*, which was created during the fires, facilitating the process of finding shelter (Tullis, 2020). People seeking shelter were asked to fill up a form indicating the number of guests and whether they were traveling with animals to find a place corresponding to their needs. Fundraising campaigns were also carried out to organize support. Locally, organisations called for donations and volunteers to support the functioning of the camps. Individuals offered their services for free or

organized raffles and bake-offs to support the firefighting efforts (Gleeson, 2020). The massive media coverage of the fires enabled to raise significant amounts of funds online: more than 73 million Australian dollars (50 million US dollars) were raised on Facebook donation pages and an additional 23 million through GoFundMe initiatives (Masige, 2020). Through social media, artists held auctions while celebrities publicly offered money to Australian organizations, encouraging people to do the same (Thomas, 2020).

The unprecedented scale of the fires coincided with unprecedented media coverage. The role of the media in generating support was particularly significant. Yell (2006) points to the importance of emotions in generating action during a catastrophic event, including by people who are not directly affected by such an event. She analyses media coverage of the 2009 Victoria bushfires and compares it with the coverage of earlier fire events. Yell shows an intensification of the emotional charge in the media across the years, which, she concludes, shapes the attitude of the public and its role during catastrophic events. Similarly, McGuigan (1998) explains that affect and emotions have the power to bring together a fragmented public sphere, which is what happened when Australia received massive domestic and international support during the Black Summer.

The recovery phase – healing, rebuilding and preparing for the future

In the aftermath of a disaster, it can be difficult and sometimes impossible to go back to how things were previously. Such a disruption to everyday life may be sudden but it can also have long-lasting effects. From a psychological point of view, people might experience trauma stemming from high stress or loss during the fires. Economically speaking, fires lead to financial difficulties for people who lost their homes, their business, or whose area was evacuated, resulting in interrupted economic activity. People who have lost their homes are faced with the question of rebuilding the destroyed houses or relocating to a new property.

According to Norris *et al*. (2002), there is a 5% to 15% increase in the incidence of mental health problems after a disaster. During the Black Summer, people experienced extreme stress resulting from the loss of homes, relatives, livelihoods, pets, and/or property. Such losses are generally difficult to cope with. In Australia, bushfires feature amongst the disasters associated with the greatest sense of loss (Anton & Lawrence

2014). Families who lost their homes often find this experience traumatizing, and this is the case among adults and children alike (Tondorf, 2020). The abruptness of the event is generally unexpected, and people may express a strong sense of disbelief when they realize that their homes have been completely destroyed in a short amount of time (Alston *et al.*, 2016). Official measures have been taken to help them cope with the events. In January 2020, the Australian government announced a pledge of 76 million dollars (55 million US dollars) to give emergency personnel and affected communities access to extended psychological support through free counselling sessions, Medicare-abated sessions and adapted, trauma-informed training for frontline emergency response workers (National Bushfire Recovery Agency, 2020).

In addition, economic difficulties arise as livelihoods are disrupted following bushfires. Many displaced people likely spent more than a day away from their home and workplace. In addition, for those who stayed, the absence of local residents and tourists represents a considerable loss of income. In the worst cases, businesses have been wiped out (Fryer, 2020) and it is difficult to resume activity, yet, minimum income is necessary to move forward and regain stability (Tondorf, 2020; Locke *et al.*, 2020). At least a quarter of Australian businesses were affected during the 2019/2020 fire season (Roy Morgan, 2020). Agriculture was particularly impacted (Fryer, 2020). Other places of activity such as schools and health centres were also severely damaged, impacting the jobs of many people (Tondorf, 2020). The Australian government created a recovery fund of 2 billion Australian dollars (1.5 billion US dollars) to ensure that the families, farmers and business owners hit by the fires get the support they need to recover (Australian High Commission, 2020). In the states of New South Wales, Victoria, and South Australia, small business, either directly or indirectly impacted by the fires, can apply to a 10,000 dollars (over 7,000 US dollars) grant if they experienced revenue loss. Directly impacted business can expect to receive up to 50,000 dollars (45,000 US dollars) to help cover rebuilding and cleaning expenses. Primary producers of affected areas can apply to a 75,000 dollars (55 US dollars) grant (National Bushfire Recovery Agency, 2020).

Moving forward often involves rebuilding destroyed homes or relocating to new places. For those who lost their home, the desire to return to their property often clashes with the traumatic reminders of loss and the thought of possibly being exposed to bushfires again. Choosing to relocate also depends on financial pressure and on whether previous businesses can still provide sufficient income or if better sources of income

are available elsewhere. Farmers fear that residents permanently leave rural areas because of reduced employment in the agricultural sector (Chisholm, 2020). The Australian government encourages relocation to limit the number of houses in fire-prone regions. It further offers to buy back burnt-down properties from their owners to incentivize them to relocate. This strategy was heavily used following the 2009 Victoria fires. Hundreds of people who lived in the highest-at-risk zones and who had survived the fires were offered by the state of Victoria to either rebuild their home to be more fire-resistant or to sell their land to the state. However, the assumption that the traumatic experience of the 2009 bush-fires and the cash payment would encourage people to relocate was proven wrong. Although the payback option was generally well-received by victims' families who felt incapable of looking for potential buyers, the majority of locals rebuilt their homes (Hercher, 2020). Under that scheme, 116 properties were bought back. (Florence & Hermant, 2020). Those who had no intention to rebuild did not want to let go of their land and empty lots became personal memorials (Hercher, 2020). This shows that people are generally deeply attached to their land despite the trauma they may have experienced.

In many places, rebuilding should not be an option, especially in urban suburbs that often extend into fire prone areas. There is compelling evidence that climate change will make these areas even more vulner-able to the fires as the coming years are expected to be increasingly hotter and dryer (Koksal *et al.*, 2019). In order to anticipate this growing threat, thought-out planning must prevail against the temptation to quickly rebuild what has been lost. Relocation is often the best option for those who lost their homes in the flames (Knight, 2020).

The recovery phase also includes the need to reflect on recent fire events in order to adapt to future threats. Fire risk reduction strategies are an essential part of the fire mitigation effort, but often lack efficiency. Current governmental practices involve the burning of vegetation to reduce fuel loads (DENR, 2011). Yet, they had little to no effect in limiting the extent of the 2019/2020 fires (Morton, 2020). Aboriginal land burning practices are neither widespread nor widely acknowledged although they could play a major role in improving fire hazard reduction (Betigeri, 2020). They consist in controlling early dry season fires to create patches of burnt and un-burnt savanna and prevent wild spread of fires across vast areas of land. According to the United Nations, this technique constitutes a great asset for biodiversity preservation, local carbon emission mitigation and landscape protection (United Nations University, 2009). In the context of

climate change, such knowledge provides a concrete basis for reducing the intensity and geographical extent of seasonal fires. Scholars increasingly call for greater recognition of Indigenous fire management expertise to improve environmental management and to advance social justice (Bardsley *et al.*, 2019; Weir *et al.*, 2020). There is still little academic evidence on Aboriginal fire management which could be used to inform regional fire management practices (Bardsley, 2019). This shortcoming must be addressed to assess the relevance of past practices in today's lands to improve fire management across Australia.

Conclusion

The 2019/2020 fire season in Australia was particularly destructive, but the scale of the fires fortunately did not lead to a massive death toll. Yet, about 65,000 people were displaced (Internal Displacement Monitoring Centre, 2020). The unprecedented severity of the event caught the attention of the media worldwide, which may have influenced the citizens' response to the fires. The community showed great solidarity (self-organised evacuation centres; acts of solidarity and selflessness to help victims; creation of online platforms to facilitate the process of finding accommodation; massive global fundraising to support firefighters and victims). As for the state, the fires revealed and confirmed malfunctions to be addressed in order to improve future fire emergency responses (lack of explicit guidelines for civilian response in times of fire danger; inefficient delivery of warning signals; incompatibility of emergency communication devices across states).

Important knowledge gaps remain on internal displacement caused by environmental pressure in Australia, which must be filled in order to improve preparedness, response, and recovery related to catastrophic events. Following the mastering of the 2020 fires, the government sought to address identified failures during both the warning and response phases. On the 20th of February 2020, the Australian prime minister announced the creation of the Royal Commission into National Natural Disaster Arrangements. Its main objective is to address the heterogeneity within the emergency response system, including inconsistencies in interstate communication and strategies. National standards are now being sought to improve warning, fire management and resilience among the displaced population. In August 2020, the Commission published a draft report, following a first interim observation report, based on the analysis of the 2019/2020 bushfire season (Royal Commission, 2020b). This report

seeks to provide a set of recommendations that aim to establish a nationally coordinated approach to natural emergencies under a single national body dedicated to disasters. Additional regional reports further acknowledge the vulnerability of Indigenous Australians. The Final Report of the NSW Bushfire Inquiry, published late July 2020, adopted a set of recommendations among which the inclusion of Aboriginal people in emergency planning and preparation (New South Wales Government, 2020).

As experts warn that bushfires will become more frequent in the future, adapting to an increasingly hostile environment has become an unavoidable reality for most Australians. In the future, people might have to permanently migrate to less fire-prone regions as the risk of extended bushfire increases.

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South America

Dam Failure in Brumadinho (Minas Gerais), Brazil

Short and long-term mobility following an industrial disaster

Léa Sobrevilla

The *Córrego do Feijão* dam – operated by Vale, the leading Brazilian mining company – breached on the 25th of January 2019 in Brumadinho, in the Brazilian State of Minas Gerais. The dam's purpose was to collect waste from mining production. As the dam broke, a mud wave of more than 12 million cubic meters of mining tailing – or materials left over from mining activity – comprising toxic chemicals detrimental to both the environment and human health, crashed onto Vale's administrative infrastructure and some areas of Brumadinho (see Image 7.1). Then, it poured into the Paraopeba river, advancing at approximately 80 km per hour (Franco 2019; Delgado & Correia 2019; Thompson *et al.*, 2020), covering more than 250 hectares of land (see Image 7.2) (IBAMA, 2019; Pereira, *et al.*, 2019). The human toll is, to this date, one of the most tragic of any iron-related disaster worldwide (Delgado & Correia, 2019).

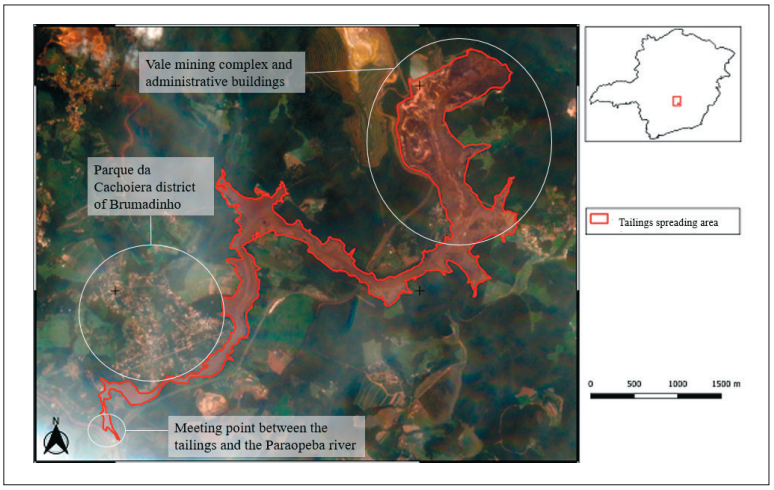
Image 7.1. Mud tailings spread due to the 2019 Brumadinho dam failure

Source: Corpo de bombeiros de Minas Gerais (2019)

By the end of 2019, 259 people had been reported dead, 11 people remained missing (Defesa civil, 2019b) and 138 were officially displaced due to the disaster (Freitas *et al.*, 2019; Rodrigues, 2019; Romão *et al.*, 2019). Many more experienced economic, cultural, and social losses (Freitas *et al.*, 2019; Silva, Gurgel, & Freitas, 2019). The disruption of ecosystem services from the river, the forest, and soils further affected the quality of life of a broad population as it jeopardized water consumption and agricultural production (Freitas *et al.*, 2019).

Moreover, leakage of tailings directly impacted nine of Brumadinho's districts, representing an estimated population of 3,485 people – or more than 10% of Brumadinho's total population (IBGE, 2020). Furthermore, leakage impacted 17 municipalities on the Paraopeba's riverbanks (MPMG, 2019a), affecting almost one million people according to the estimations of the Brazilian Institute of Geography and Statistics (IBGE, 2020).

Image 7.2. Analyzed satellite picture of the tailings spread area (left). Map of Minas Gerais and location of the satellite picture (top right)



Source: Adapted by the author from Fundação Estadual do Meio Ambiente (FEAM, 2019)

Mining represents a leading sector in the Brazilian economy – it represented 4% of the country's GDP and 23% of the country's total exports in 2019 (MME, 2020). The mining sector is especially important for small cities, including Brumadinho, which rely primarily on this activity (Freitas *et al.* 2019). The Brazilian territory counts 802 mining tailing dams, most

of which are in Minas Gerais. Thirty of these mining tailings dams in Minas Gerais have been classified at a high risk of breaking and at high damage potential according to the National Dam Safety Information System (SNISB 2020).

Disaster-induced migration – including human-induced disasters – is a common phenomenon in Brazil. For instance, the IDMC indicates that Brazil is significantly affected by environmental displacement and estimates that 295,000 new internal disaster-related displacements took place in 2019, mainly due to floods (IDMC 2020). Hunter (2005), for instance, distinguishes between *natural hazard-related disasters* such as storms, floods, and earthquakes, *technological hazard-related disasters* such as toxic material releases or construction or transportation accidents and *natural-technological (or "na-tech") disasters*, a category that describes "complex disasters for which there is a recognizable and substantial human contribution" (p. 15). The Brumadinho dam failure falls into this last category as it is human-induced and had severe environmental impacts – including a mud flood and the contamination of the Paraobepa River.

Investigations led by parliamentary committees released information and testimonies in the aftermath of the Brumadinho dam failure.[1] However, little attention has been paid to the human mobility outcomes induced by this disaster. This paper aims to analyse the Brumadinho dam failure through a focus on both environmental and mobility-related aspects. It seeks to answer the following research questions: how did the events unfold in the aftermath of the 2019 Brumadinho dam failure in terms of mobility? What prevented an adequate evacuation of the population? A literature review was conducted to address these questions, which included an analysis of committee reports, official communications, federal and state agency communications and scientific publications.

The paper is divided as follows: the first section contextualizes dam collapse-induced displacement in Brazil and describes how events unfolded during Brumadinho's dam failure. The second section looks at evacuation-related displacements and assesses Vale's disaster risk reduction strategy. The third section evaluates the range of impacts resulting from the dam collapse, analysing not only material destructions but also the social, political, economic, environmental and demographic

[1] Investigation commissions were carried out by the Chamber of Deputies, the Federal Senate, the Legislative Assembly of Minas Gerais, the Belo Horizonte City Hall and the City Hall of Brumadinho

consequences of the disaster and their potential impact on migration. The fourth section draws a comparison with a similar tailings dam-breaking which occurred in 2015 in Mariana (Minas Gerais), a city whose economy also rests mainly upon the iron mining activity of the Samarco mining company (Freitas *et al*. 2019).

Displacement and dam failure in Brazil and Brumadinho

This section contextualizes dam-failure induced displacement in Brazil. It includes a review of the official numbers of dam-failure induced displacement in the country, as well as the Brazilian legislation related to disaster-displacement. It then presents the events that took place in Brumadinho and the official displacement figures.

Dam failure induced displacement

The International Displacement Monitoring Centre (IDMC) identifies three types of internal displacement: the first type is associated with conflict and violence, the second with development projects, and the third with disasters (IDMC, 2018). During 2019, Brazil counted 295,000 new internal displacements, all disaster-induced, of which 1,400 continued to live in internal displacement as of 31st December 2019 (IDMC 2020). However, the IDMC believes that the number of Internally Displaced People (IDPs) are underestimated in the country due to limited data "concerning the duration of internal displacement in Brazil or the extent to which IDPs have achieved durable solutions" (IDMC 2020, p. 1).

The IDMC uses data from the Ministry of National Integration and the National Secretariat for Protection and Civil Defence (SEDEC), publicly available in the Integrated Disaster Information System (S2iD) database (IDMC 2020). This database records information about disasters collected by Civil Defence personnel in affected areas, and information about states of emergency and public calamities reported by the government or state authorities. The Civil Defence records include the number of *desabrigados* and *desajolados*. 'Desabrigados' are people whose homes have been destroyed or damaged by disasters or are located in areas at imminent risk of destruction, and who require temporary shelters (CEPED & UFSC, 2012). 'Desajolados' are the people whose homes were damaged or destroyed but who do not necessarily need temporary shelters, such as people who seek to stay with friends or relatives, reducing

the demand for disaster shelters (CEPED & UFSC, 2012). These categories are identified by the Civil Defence in the aftermath of disasters. As they focus on shelter needs, they help tailor the emergency response.

Disaster-induced displacement and Brazilian legislation

The IOM published in 2016 a policy brief analysing the current Brazilian legal framework for environment and migration, which analyses the legal framework related to natural and human-induced disasters as well as to migration (both internal and international). The report's authors found that Brazil had not ascribed to any international treaty related to internal migration as it had not even incorporated the 1998 United Nations Guiding Principles on Internal Displacement into its national system (IOM, 2016). Besides, they found that Brazilian legislation does not consider human mobility due to climate-change or disaster and does not even define the concept of migration (IOM 2016). Moreover, the policy brief found that proposals of new bills on migration at the Brazilian Congress did not mention environmental migration. On the other hand, several Brazilian states have included Civil Defence, prevention, and response to extreme climate events, as well as protection and assistance to the population exposed to risks in their climate-change policies and legislation, whereas others have also initiated activities and capacity building programs (IOM 2016).

More recent legislative protects migrants affected by environmental disaster yet the gap for disaster-induced internal displacement remains. For instance, the Law on Migration (LEI Nº 13.445) voted in 2017, includes environmental disaster as a circumstance to grant a temporary humanitarian visa to foreigners in Brazil. Also, the National Adaptation Plan to Climate Change (NAP), adopted in May 2016, considers the migration of population as a potential impact of climate-change and highlights the role of socioeconomic disparities (MME, 2016a). Furthermore, the strategies for urban development, vulnerable people, food and nutrition security acknowledge the link between climate-change and migration which is not the case of the disaster risk management strategy (MME, 2016b).

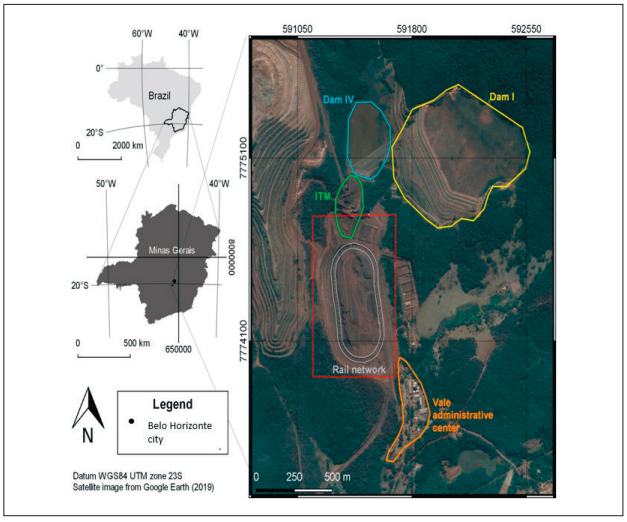
This lack of a conceptualisation of environmental migrants in Brazil "heightens the difficulty of their identification and categorization" (IOM 2016, p. 5), and invisibilizes the phenomenon of environmental migration and displacement, preventing its understanding and adequate responses (Muggah 2015). Muggah (2015) adds that another challenge lies in the

fact that current responses to environmental mobility are segmented and divided between different public institutions, NGOs, and advocacy groups.

The 2019 Brumadinho dam failure

The B1 dam of the *Córrego do Feijão* mining complex in Brumadinho (see Image 7.3) breached on the 25th of January 2019 at 12:28 PM (Delgado & Correia, 2019). The mud wave first crashed onto Vale's administrative buildings, which resulted in a tragic toll amongst Vale's workers (who made up 244 of the 250 deceased) (Delgado & Correia, 2019). The wave also collided onto some areas of Brumadinho, burying people and damaging houses at a speed of 80 km/h. Satellite picture analysis showed that the mud reached 31 houses (Romão *et al.* 2019). It then poured into the Paraopeba river at 3:50 PM, diffusing chemicals for hundreds of kilometres downstream. In the aftermath of the event, emergency aid (food and drinking water) was provided. People whose houses were destroyed or contaminated were relocated to local hotels at the expense of Vale. The Civil Defence led rescue operations to find survivors (and the search continued as of September 2020). As of November 2020, 11 people were still missing (Corpo de Bombeiros Militar de Minas Gerais, 2020).

Image 7.3. The B1 (Dam I) and B6 (Dam IV) dams and Vale administrative centre of the Córrego do Feijão mining complex



Source Porsani *et al.*, 2019

On January 27th – two days after the initial dam failure – at 5:30 AM, emergency sirens (which had not gone off on the 25th) went off to alert of a high risk of the B6 dam breaking, which is located close to the B1 dam. Almost 24,000 people were evacuated from their homes. Six municipalities in the Paraopeba Basin issued warnings to keep the population away from the riverbanks. However, some residents refused to evacuate for fear of being robbed and the military police had to start patrolling to protect houses from robbers (Abdala 2019).

On January 29th, the Civil Defence counted a total of 143 'desabrigados' (in need of shelter), 55 'desalojados' and 49 destroyed houses in Brumadinho (MDR, 2020). The Brazilian government relayed Vale's information stating that more than 430 families (115 in Brumadinho) were forced to leave their homes, unable to return for safety reasons, and those families remained in hotels or rented homes at the expense of Vale as of December 2019 (Rodrigues 2019b). Unfortunately, there is very little information about those families and how (or where) they will be relocated. Six days after the first dam failure, the Civil Defence published a preventive orientation and alert meeting points map for each neighbourhood in the flooded risk area of Brumadinho (Defesa civil, 2019a).

The response to dam-failure induced displacement appears to be limited to an emergency framework: the Civil Defence quantifies the displaced right after the event with a focus on the need for shelter, but there is no institution in charge of following up with these individuals in the long term. Furthermore, Brazil lacks any official categorization of internal displacement – including of people displaced by disasters – which further invisibilizes the phenomenon of dam failure-induced displacement and prevents the identification and categorization of displaced individuals/communities according to their needs.

Emergency response: implementation of Vale's disaster risk reduction strategy

This section studies how the evacuation during the disaster took place, focusing on two components – the emergency system and the population's preparedness. It then interrogates Vale's disaster risk reduction strategy through its emergency plan and whether it integrated all components of risk, including vulnerability and exposure.

Evacuation in impacted areas

According to UNISDR, disaster risk reduction is:

> the concept and the practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events. (UNISDR 2009, pp. 10-11).

The Sendai Framework for Disaster Risk Reduction 2015-2030, a global (non-binding) agreement recommending concrete actions for protection against disasters, endorsed by the UN General Assembly, recognizes the role of early warning systems to achieve a substantial reduction of disaster risk and loss of lives, livelihoods, and health (UNISDR, 2015).

However, as the dam of the *Córrego do Feijão* mining complex in Brumadinho broke in January 2019, the emergency sirens failed to go off, preventing people from evacuating. The emergency system includes sirens at Vale's industrial sites and downstream. The investigation initiated on the 25th of April 2019 and led by the Parliamentary inquiry committee revealed that the entire emergency system was not activated (Delgado & Correia, 2019). One of the reasons discussed by the Parliamentary inquiry committee is that the procedure needed to activate the emergency system was complex and bureaucratic, preventing its timely activation (Delgado & Correia, 2019). Besides, during evacuation exercises, these sirens were not triggered either (Delgado & Correia, 2019). As the refectory and the administrative buildings were located just below the Córrego do Feijão dam, Vale's workers made up 244 of the 250 deceased. This proximity made it impossible to evacuate even if the emergency system would have been activated (Assembleia legislativa de Minas Gerais, 2019; Graziela Aguiar, 2019). Furthermore, the government's news agency collected testimonies from individuals who claimed that they had neither received any instruction nor training about evacuation in case of emergency (Graziela Aguiar, 2019).

On the other hand, instances of preemptive evacuations were also observed. For instance, the Inhotim Museum was evacuated (Laboissière 2019) although it is located 20 km from the passage of the wave and according to the museum, the topography prevents any damage from reaching it (Inhotim 2019).

Emergency plan and disaster risk reduction strategy

Under the National Dam Safety Policy, it is mandatory for mining dams in Brazil to have an emergency plan. This policy was revised in 2020, and now integrates a substantial focus on safety and accessibility of the emergency plan (LEI Nº 14.066, 2020; Senado Notícias, 2020). In 2019, this emergency action plan required a series of technical and administrative information regarding the dam safety such as technical data of the dam, manuals for inspection procedures and safety reports. (Quintão 2019, p. 39). Owen *et al.* (2020) argue that "the industry is focused on the integrity of tailings dam structures and the management systems in place during operation" and "little effort has been spent on demonstrating the significance of local context vulnerabilities" – including, for instance, high demographic pressure and poor economic status (p. 2). This appears to be the case of Vale's emergency plan which contains information regarding the dam (technical characteristics and accesses), its monitoring system, the classification of potential anomalies, their causes and associated emergency levels, the responsibilities for activating emergency protocols and the role of external institutions (the Civil Defence, the National Mineral Production Department and the Emergency Control and Communication Center), as well as the available equipment in case of emergency (e.g. ambulances or signalling cones), the flooded patch and also the self-rescue zone. Nevertheless, the plan underestimated the number of municipalities affected. Indeed, it considered only the potentially flooded area to amount to 65 km long, downstream of the dam (Vale 2018), forgetting to mention the toxicity of the mud spread through the Paraopeba river, which reached more than 300 km from the source, crossing 21 municipalities, and making the water either unfit to use or inaccessible (SOS Mata Atlântica 2019). Indicators related to people's vulnerability were another major missing component of Vale's emergency plan. For instance, the number of residents in flood-prone areas was not included. By focusing on the dam's characteristics and not on population exposure and pre-existing vulnerabilities, the Vale's emergency plan failed to accurately plan and prevent the impact of the dam's failure on populations. Owen *et al.* (2020) add that the disclosure of risk to the local population is an equally important feature to include in order to assist them in "their decisions about how, or whether, to live within a potential disaster footprint of tailings dams" (p. 2). Yet this element was absent from Vale's emergency plan.

In addition, the Parliamentary inquiry committee revealed that there was a high risk of failure as the safety indicator – a number calculated worldwide by engineers to estimate the probability of failure – was lower than Brazilian standards (Delgado & Correia, 2019; Luis, 2018). They also pointed out to a lack of law enforcement by competent authorities which contributed to increased risk: even though the dam was classified as unsafe, this did not lead to any procedure by qualified authorities (Delgado & Correia, 2019). Since the event, new laws have been adopted by the state of Minas Gerais for dam safety and the National Mining Agency prohibited the construction of the same type of dams in the country (Quintão, 2019). However, these new measures continue to ignore vulnerability and exposure in assessing the dam's risk in Minas Gerais (Agência Nacional de Mineração, 2020).

Despite Brazil's legal framework, Vale's disaster risk reduction strategies failed to consider people's exposure and vulnerability. The emergency communication around evacuation procedures were insufficient and inadequate compared to the risks faced by the population. This has led to a lack of disaster preparedness from both the population and the authorities, which can partly explain the lack of evacuation during the 2019 dam failure.

Mobility as a mean to adapt to the impacts of dam failure

This section includes elements from another dam failure that occurred in Mariana, 125 km from Brumadinho, back in 2015. The cases of Mariana and Brumadinho are indeed quite similar: they both took place in Minas Gerais within less than five years, they represent a similar disaster (the rupture of a tailings dam), a large proportion of the affected populations in both cases was rural, and the two cases led to environmental impacts which included material destructions and pollution (Paaz & Da Rocha De Souza, 2018). Indeed, analysing the Mariana case helps us understand the social impacts of the disaster and consider longer-term issues related to pollution for instance.

The first part of this section looks at resettlement following material destructions, using the case of the Mariana dam failure. Although over a hundred people are homeless[2] in Brumadinho and resettlement appears

[2] The "desalojados" and "desabrigados" typology is normally used just after a disaster to know whether people are in need of shelter or not. However, a family might not need a shelter as they could go to their friends, but at the end as they lost their home, they are homeless. Here, the author considers that the people who cannot return to their homeare homeless so this concept is used instead.

to be a relevant issue, it has been less visible and studied than in the case of Mariana, probably as more people (around 600) were concerned then. The second part looks how both of these dam failures impacted other drivers of mobility, including economic and environmental drivers.

Failed adaptation strategy in the case of resettlement in Mariana

On November 5th, 2015, the Fundão tailings dam broke, entirely covering with mud the rural village of Bento Rodrigues, located 2.5 km from the Fundão dam, which caused the death of 17 residents and made an additional 600 homeless (SEDRU, 2016). Homeless people were temporarily relocated to hotels or rented homes in Mariana, the closest city, whilst waiting for the reconstruction of a settlement in a new area. Indeed, the former residents of Bento Rodrigues voted to elect their favourite urban planning project to rebuild their village among three location options (Miranda *et al.*, 2017). Even though the community could choose their resettlement site, most of them faced difficulties in adapting to it (Fernando *et al.*, 2010).

A field investigation undertaken by Paaz & Da Rocha De Souza (2018) with people who had been relocated and social assistance workers showed that the former had lost their social life as they were scattered in Mariana. Also, their transition from rural to urban livelihoods affected their way of life and their consumption habits – many residents were used to practicing at least some form of subsistence farming, for insance. In their new homes, this was no longer possible, and they had to buy food items at full price, which proved costly and potentially led them to eat less diverse foods (Paaz & Da Rocha De Souza, 2018).

These changes also generated fears among newcomers, who may experience discrimination in their new neighbourhoods. Some newcomers were, for instance, blamed for the harms caused by the temporary interruption of mining and tourism activities and for the considerable economic impacts, while others were accused of being inactive and taking advantage of compensations (Paaz & Da Rocha De Souza, 2018). These issues, combined with the trauma of having faced the disaster itself, produced a range of difficulties among the relocated people. In an article titled "32 crazy for Bento Rodrigues", the BBC reported that a group of people coming back on the weekends to the devastated Bento Rodrigues, celebrating around shared food (BBC, 2017). The same report mentions a farmer coming from Paracatu (a village near Bento Rodrigues) who did not

manage to adapt to this new urban life and preferred to come back to his previous one. The notion of place of attachment, i.e., the affective bonds that a person has with their location, can explain the links that people have maintained with their previous location (Adams & Neil Adger, 2013). Adams & Neil Adger (2013) showed cultural ecosystem services – non-material benefits people obtain from nature (Millennium Ecosystem Assessment, 2005) – play a major role in creating the attachment.

Other impacts on migration drivers

Agriculture is a major economic sector in Brumadinho and in the municipalities affected downstream the Paraopeba river (Delgado & Correia, 2019). In the aftermath of the disaster, farmers' primary resources (cattle and land) were either contaminated, lost, or suspected of being contaminated (Delgado & Correia, 2019), impacting communities who rely on small scale agriculture and fishing. Furthermore, the touristic sector was also seriously hit as Brumadinho is located 50 km from Belo Horizonte, the regional capital, and its touristic sector had been expanding (Observatório do Turismo de Minas Gerais, n.d.). However, since the disaster, this sector has been experiencing losses, according to the government's news agency – hotel occupancy in Brumadinho and the number of visitors to the Inhotim cultural site (which counts thousands of visitors per month) halved (Índio do Brasil, 2019). On the other hand, in some cases, the reconstruction efforts that follow a disaster can boost the economy and attract a new and different workforce (Black *et al.*, 2013). In Brumadinho, there has been an economic boom in the construction sector and a rise in consumption since the disaster. This expansion could be associated with compensations paid by Vale: more than 100,000 individual compensations, the compensation to municipalities (80 million of *reais* or 15 million US dollars) and more than 200 million of *reais* (or 40 million US dollars) invested in tailings management as well as water and sanitation infrastructures (Vale, 2020a, 2020b). Veja, a Brazilian newspaper, mentions that all the shops are expanding, especially the ones selling building materials (Borges, 2019). Furthermore, El País Brasil states that the economic boom drove immigration to the city, besides people trying to get compensation from Vale (Mendonça, 2020).

The impacts of the disaster on the environment were considerable, mainly due to the contamination of hundreds of kilometres of the rivers and the underground aquifers used for agriculture.In the aftermath of the 2015 Mariana dam failure, people were exposed to soil pollution (such

as high concentration of heavy metals), which has medium and long-term impacts and mainly affects the most vulnerable (pregnant women, children and the elderly) (Freitas *et al.*, 2019). Furthermore, there was an increase of various health problems, such as parasitic infections, diarrhea and gastro- enteritis, or dermatitis and upper respiratory tract infection due to contact with the slurry dust (especially among children), anxiety, systemic arterial hypertension and diabetes mellitus; and the re-emergence of previously-controlled diseases such as dengue (Freitas *et al.*, 2019). Those long-term impacts need long-term monitoring and in Brumadinho, the Secretariat of Health Surveillance began controlling the direct and indirect impacts on populations related to environmental pollution of water, food and soil (Oliveira *et al.*, 2019). Mental health risks also play a fundamental – yet less studied – role among climate-related health problems (Albrecht *et al.*, 2007). In Brumadinho, the Parliamentary inquiry committee's investigation alerted of a significant increase in the consumption of anxiolytics and antidepressants (Delgado & Correia, 2019).

On the other hand, the loss of ecosystem services due to the pollution caused a sharp decline in land and river productivity in Brumadinho and along the Paraopeba river, which a major issue for rural communities whose livelihoods depend on these resources (Delgado & Correia, 2019). Among them are indigenous communities living on the riverbanks of the Paraopeba river. For them, beyond productive ecosystem services, cultural ecosystem services have also been greatly reduced as they are no longer able to perform rituals in the Paraopeba river. This is extremely important as their survival relies on the group's ability to preserve their identity and cultural autonomy (Paaz & Da Rocha De Souza, 2018). According to the Brazilian National Indian Foundation, 80 indigenous communities live on the Paropeba riverbanks (FUNAI, 2019). The Naô Xohã village, whose inhabitants belong to the Pataxó ethnic group is one of them. However, they were not officially recognized as indigenous community by the municipality in which they live, which initially prevented them to receive any compensation from Vale, increasing their precarity in the aftermath of the disaster (Delgado & Correia, 2019).

The Public Ministry of Minas Gerais led a Public Civil Action against Vale, which brought the number of forcibly displaced people (after having lost their homes) to 273 people. It further documented various cases of migration in the report released on the 29th of April 2019 (MPMG, 2019b). Those cases included families who were still traumatized by the disaster and workers left without income (fishers, farmers and employees

of the touristic sector) (MPMG, 2019b). In those isolated reports, migration drivers, especially economic drivers and their interaction with environmental drivers as well as the provision of ecosystem services for rural communities relying on farming and fishing can be recognized.

Conclusion

This paper aimed to answer the following research questions: how did the events unfold in the aftermath of the 2019 Brumadinho dam failure in terms of mobility? What prevented an adequate evacuation of the population?

Firstly, displaced populations are absent from the Brazilian legal framework. Official numbers evaluate citizens' need for shelter directly after the event. However, these numbers do not look at the longer-term effect, for instance, whether displaced populations can return or not to their area of origin, or what elements prevent them from doing so. This gap does not only make them less visible and unprotected, hence more vulnerable but also prevents the learning process for responding to this issue in the aftermath of tailings dam failure as the Brumadinho dam failure.

Secondly, short-term forced displacement is a survival strategy to face the disaster as it is happening. In the case of the Córrego do Feijão dam failure, the emergency system did not work as expected, and people were unprepared in the face of the disaster. These two factors limited people's mobility and evacuation options. The disaster risk reduction strategy in Vale's emergency plan failed to inform and consider populations' exposure and vulnerability, which increased their risks.

Thirdly, as we studied the consequences of the 2019 Brumadinho dam failure on migration drivers, we recognized that indigenous and rural communities who rely on small scale agriculture and fishery were amongst the most affected because of the disaster's impacts on the environment they depend directly upon. Reports mentioned isolated cases of migration of fishers, farmers, and employees of the touristic sectors showing that the loss of their livelihoods caused by the environment's degradation forced them to migrate. The interaction between economic with environmental drivers and the ecosystem services' provision appeared as a determining factor for them.

Finally, more than a hundred people were left homeless because of material destructions related to the 2019 Brumadinho dam failure. Very

little information is available about them, for instance, about whether local hostels are still hosting them at Vale's charge. The 2015 Mariana dam failure further draws attention to the difficulties that may arise from resettlement, partly due to the loss of the place to which one is attached to and the initial place's cultural ecosystem services.

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Dr. Caroline Zickgraf is Deputy Director of the Hugo Observatory: Environment, Migration, Politics in the Department of Geography at the University of Liège. Dr. Zickgraf's main areas of research are the migratory impacts of climate change on coastal populations, transnationalism and transnational families, and (im)mobility, primarily in West Africa, but also in Comoros, Viet Nam, and Morocco. She has contributed to several international research projects on environmental issues including HELIX (2013-2017), EDGE (2016-2019), and MISTY (2018-2021), and most recently the HABITABLE project (2020-2024). She also teaches at the University of Liège, the Institut des Hautes Etudes des Communications Sociales (IHECS), and Sciences Po's Paris School of International Affairs (PSIA). In addition to her teaching and research, Dr. Zickgraf has consulted for the World Bank, the Green European Foundation (GEF), the International Center for Migration Policy Development (ICMPD), UN Environment, and the Food and Agriculture Organization of the United Nations (FAO) on the links between climate change and human mobility. She holds degrees from Michigan State University (BA), Leiden University (MPhil), and the University of Liège (PhD).

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Tatiana Castillo Betancourt is a Project Manager at the Hugo Observatory. There, she supports the daily activities of the recently launched HABITABLE project - Linking Climate Change, Habitability and Social Tipping Points: Scenarios for Climate Migration – the largest research project on climate change and migration to have ever been funded by the EC's H2020 programme. Before joining the Hugo Observatory, she worked at the UNDP Regional Service Centre for Africa in Ethiopia, where she co-produced the *Scaling Fences: Voices of Irregular African Migrants to Europe* report. She has also consulted for the Entrepreneurial Institute of Yucatan in Mexico and the Alberto Lleras Camargo School of Government in Colombia. She holds a double Master's Degree in Economic Development and Growth from Lund University (Sweden) and Universidad Carlos III de Madrid (Spain). She completed her Bachelor's studies in Economics and Business Administration at Universidad de los Andes in her hometown Bogota, Colombia.

Elodie Hut

Elodie Hut is a PhD candidate at the Hugo Observatory. Her thesis is conducted in the framework of the Horizon 2020 MAGYC project on migration governance and asylum crises and analyses how citizens of Italy, Greece and Turkey residing in Brussels are perceiving the migration situation back in their country of origin, looking more specifically at how individual perspectives and experiences relate to othering or solidarity practices towards migrants. She previously worked as a research assistant at the Hugo Observatory, where she supported the daily activities of the centre and conducted research for the MIGRADAPT project (which examines the potential role of migration to Belgium as an adaptation strategy to environmental changes). Prior to joining the Hugo Observatory, Elodie worked at the UNHCR and the IOM in South Africa, for GIZ in Senegal, and in a disaster risk reduction consultancy firm in South Africa. Elodie holds a Master's degree in Humanitarian Action and Law from the Institute of International Humanitarian Studies of Aix-en-Provence, as well a second Master's degree in International Relations from Sciences Po Aix-en-Provence.

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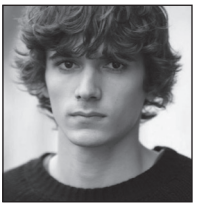

Born in Italy, Massimo is a recent graduate from the Master in Environmental Policy at Sciences Po Paris and holds a degree at University College London, where he specialised in Environmental Sciences. During his bachelor's degree, he also spent a year at the Ecole Normale Supérieure in Paris. Interested in migration studies and environmental change, Massimo interned at the Hugo Observatory at the University de Liège at the end of 2020. There, he conducted interviews and qualitative analysis for Theme 2 and 3 of the MISTY project, which studies the relationship between migration and sustainable development in cities.

Judith García

Judith García will graduate in 2021 from the Master's degree in Environmental Policy at Sciences Po with a specialisation in diplomacy and European studies. She holds a bachelor's degree in International Relations from IE University, Spain, and has worked as a project evaluator in the field of sustainable development for several NGOs. Judith is currently collaborating with the World Bank on Results Based Finance to promote energy access in low and medium income countries. Her areas of interest range from food security to cultural diplomacy. She looks forward to further delving into how cultural heritage and traditional knowledge and practices can be leveraged to meet today's environmental and sustainability challenges.

Romane Messac

Romane Messac is a Master student in International Energy at SciencesPo PSIA. She graduated from University of Rennes with a Master degree in Environment and Law, after completing a Bachelor degree in biology. Her academic background reflects her interest in climate change issues and the ecological, energetic and social transition. Romane is particularly interested in energy sufficiency and energy poverty issues, and how the way in which the society consumes energy can become more sustainable. Currently, Romane is interning at the Global Fund for Cities Development (FMDV) as a policy officer in finance and low-carbon transition, where she is working on urban transition issues.

Tomas Pierna

Tomas Pierna recently finished his first year of a master in Environmental Policy at Sciences Po Paris. Tomas also holds a dual bachelor's degree in natural and social sciences which he obtained at Sciences Po Paris and Sorbonne University. During a third year of study abroad at the University of Queensland, Australia, he followed his strong interest for ecology by taking part of a research project on the Great Barrier Reef. Passionate about environment and culture, he aims to work as a scientific mediatior and policymaker for the ecological and social transition

Victor José Sánchez Juárez

Born in Albacete, Southern Spain, Víctor is a master's student enrolled in the dual programme taught by Sciences Po Paris and King's College London. At PSIA, he recently finished his master's on Environmental Policy with a concentration on research methods. He is currently studying International Political Economy at KCL. As part of his undergraduate studies on Social and Political Sciences at Sciences Po's Euro-Asian campus, he was lucky enough to read courses about South Asia like "Migration Studies with a focus on South Asia". Likewise, he spent a year abroad at Ashoka University, India. A time when he gained exposure to ethnographic research methods, social theory and the political ecology of the Indian Sub-continent. He hopes to be able to conduct doctoral research in the future. His academic interests include human mobility, political ecology, digital humanities and the politics of social movements.

Léa Sanz

Born and raised in France, Léa pursued her bachelor in the Euro-American campus of SciencesPo. Currently enrolled in a Master 2 in International Development at SciencesPo Paris, Lea is specializing in poverty reduction with a focus on the Environment and the African continent. Throughout her cursus, Lea has been in contact with precarious population and refugees by volunteering in several association. Last year, she accompanied two young refugees in their integration journey. Today, she is interning in the international action sector of GROUPE SOS, first European social enterprise and works on various subjects such as social entrepreneurship and social innovation at the service of vulnerable populations.

Léa Sobrevilla

Native from rural areas from Southern France, Léa is an environmental engineer who graduated from AgroParisTech. She specialized in the environmental management of tropical ecosystems and collaborated with an NGO (PlantYourFuture) and a research Institute (ICRAF) in the Peruvian amazon on sustainability and agroforestry projects. She is currently pursuing her studies with a master's degree in International Development at Sciences Po to complement her knowledge with all aspects related to environment and resources management in developing countries

List of images

List of figures

List of tables

Essai

Edited by The Hugo Observatory of the University of Liège, this volume is the tenth in the annual series and the fifth of its kind published with the Presses Universitaires de Liège. *The State of Environmental Migration* aims to provide its readership with the most updated assessments on recent events and evolving dynamics of environmental migration throughout the world. Each year, the editors select the best graduate student work from the course "Environment and Migration" taught by Caroline Zickgraf at the Paris School of International Affairs (PSIA) of Sciences Po. This year's authors focus primarily on sudden-onset displacement events, including the Australian megafires, the dam failure in Brumadinho (Brazil), the floods in Budrio (Italy), the Kerala floods (India), and cyclones Idai and Fani in Mozambique and India. The relationship between drought and conflict-related internal displacement in Somalia's Bay Region, as well as the importance of populations' perceptions of environmental risk on (im)mobility outcomes during *acqua alta* in Venice are analysed and discussed.

Caroline Zickgraf is Deputy Director of the Hugo Observatory as well as Post-doctoral Fellow with the Belgian Fund for Scientific Research (F.R.S.-FNRS). **Tatiana Castillo Betancourt** is Project Manager at the Hugo Observatory. **Elodie Hut** is PhD candidate at the Hugo Observatory.

Édité par l'Observatoire Hugo de l'Université de Liège, ce volume est le dixième de la série annuelle et le cinquième du genre publié aux Presses Universitaires de Liège. Cet ouvrage vise à fournir à ses lecteurs les évaluations les plus à jour sur les événements récents et l'évolution de la dynamique des migrations environnementales à travers le monde. Chaque année, les éditeurs sélectionnent les meilleurs travaux d'étudiants diplômés du cours « Environnement et migrations », dispensé par Caroline Zickgraf à l'École des Affaires Internationales (PSIA) de Sciences Po (Paris). Les auteurs de cette année se concentrent principalement sur les événements de déplacement soudain, y compris les feux australiens, la rupture du barrage à Brumadinho (Brésil), les inondations à Budrio (Italie), les inondations au Kerala (Inde) et les cyclones Idai et Fani au Mozambique et en Inde. La relation entre la sécheresse et les déplacements internes liés au conflit dans la région de la baie de la Somalie, ainsi que l'importance des perceptions des populations du risque environnemental sur les résultats de l'(im)mobilité lors de l'*acqua alta* de Venise sont également analysées et discutées.

Caroline Zickgraf est directrice adjointe de l'Observatoire Hugo ainsi que post-doctorante au Fonds belge pour la recherche scientifique (F.R.S.-FNRS). **Tatiana Castillo Betancourt** est responsable de projet à l'Observatoire Hugo. **Elodie Hut** est doctorante à l'Observatoire Hugo.

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