



Responses of populations for coping with an extreme event: Saint-Martin and Saint-Barthélemy in the wake of hurricane Irma

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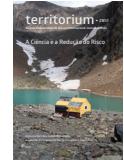
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**RESPONSES OF POPULATIONS FOR COPING WITH AN EXTREME EVENT:
SAINT-MARTIN AND SAINT-BARTHÉLEMY IN THE WAKE OF HURRICANE IRMA***

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**RESPOSTAS DA POPULAÇÃO PARA ENFRENTAR EVENTOS EXCEPCIONAIS:
O EXEMPLO DAS ILHAS DE SÃO MARTINHO E DE SÃO BARTOLOMEU À PASSAGEM DO FURACÃO IRMA**

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ABSTRACT

The intense hurricane season of 2017 in the North Atlantic brought a number of major hurricanes including Hurricane Irma (cat. 5), which landed on the French islands of St. Martin and St. Barthélemy. These two French Overseas Collectivities, separated by a distance of some 20 kilometres, have very different territorial and social characteristics. The study reported in this article is part of a scientific feedback conducted a few weeks after Irma. The social approach to the disaster conducted within this research framework aims to characterise the behaviour and implications of the inhabitants in the experience of the event, placed in a social and territorial context thanks to narrative interviews administered *in situ*. The comparative approach reveals similar behaviour before and during the hurricane, but individual and collective social and territorial factors guided very distinct post-event reactions.

Keywords: Hurricane, disaster, behaviour, vulnerability, recovery.

RESUMO

A intensa temporada de furacões de 2017 no Atlântico Norte incluiu uma série de furacões importantes, como o Furacão Irma (cat. 5), que afetou as ilhas francesas de São Martinho e São Bartolomeu. Estas duas colectividades francesas ultramarinas, a cerca de 20 quilómetros uma da outra, têm características territoriais e sociais muito diferentes. O estudo relatado neste artigo é parte de um *feedback* científico realizado algumas semanas depois de Irma. A abordagem social da catástrofe conduzida neste quadro de investigação visa caracterizar o comportamento e as implicações das populações na experiência do evento, colocada no contexto social e territorial, graças a entrevistas narrativas administradas *in situ*. A abordagem comparativa revela comportamentos semelhantes antes do evento e durante o furacão, mas factores sociais e territoriais individuais e colectivos guiaram a reacções pós-evento muito distintas.

Palavras-chave: Furacão, desastre, comportamento, vulnerabilidade, recuperação.

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Introduction

Harvey, Irma, Maria, a few of these successive hurricanes, marked the intense 2017 hurricane season in the North Atlantic, which was devastating and considered “*among the nine most ‘energetic’ seasons since 1851*” (Chauvin et al., 2017, p. 1). Hurricane Irma, although it did not cause the greatest number of victims (124 deaths), was the “exceptional” event. It was the first major hurricane (category 5) to land on an island in the Lesser Antilles (Météo-France, 2017). Irma hit the northern islands of Saint-Martin and Saint-Barthélemy, surpassing the reference event, Hurricane Luis (category 4), which hit these islands in 1995. Irma was responsible for 11 deaths on Saint-Martin and the cost of the damage amounted to €2 billion for the two islands. These French overseas territories, which are only 20 kilometres apart and have both common and distinct features, were hit by this high-energy event. The post-disaster phase is regularly the subject of expert appraisal and feedback missions (RETEX), the objectives of which aim to analyse the management of the event. These missions are often the prerogative of expert institutions or organisations, but scientific feedback is less frequent. Furthermore, investigations into the understanding of the phenomenon and the way in which the crisis was managed most often focus on the point of view of institutional or private players involved in collective management (local authority, emergency services, network managers, etc.). But few studies are dedicated to the involvement of the ‘great forgotten’ population (Fenet and Daudé, 2020, p. 1), which is the approach proposed in this article. Indeed, less than two months after the passage of Hurricane Irma, a multidisciplinary scientific RETEX was initiated, part of which dealt with the experiences and involvement of the populations of Saint-Martin and Saint-Barthélemy. We believe that the populations that have suffered from the phenomenon also represent key players in crisis management. An analysis of the experience of the event and therefore of the behaviour of the population in the face of the event provides information on their involvement in crisis management (from preparation to post-crisis), which contributes to individual and, more widely, territorial recovery. Behaviour in the face of risk and a crisis depends on numerous factors such as “*the characteristics of individuals, social processes and cognitive mechanisms*” (Etner, 2011, p. 17). They are also linked to “*hostile environmental pressure*” (Provitolo, 2004, p. 15). From interviews that were semidirective and based on the temporality of the event, the role and involvement of the population in crisis management (from preparation to post-crisis) had to be determined in the context of an intense climatic event. Beyond the analysis of reactions, the comparison of two territories helps to explore the contribution of territorial factors (geographical context, politics, attachment to the territory, etc.) in behaviours. Taking an interest in the territory proves to be

a determining factor in the characterisation of territorial vulnerabilities, which define the response capacities of the territory and its populations. The presentation of territories and of hurricane Irma which hit the two islands in September 2017 will provide a portrait of territorial vulnerabilities. The hurricane is the starting point for a scientific experience feedback, so we will then present the methodology for collecting testimonies. Finally, the last part, an analytical description of the results, will show the similarities and differences in the involvement of the populations of the two islands.

French west indies, tourist lands and lands at risk

The territorial context as a vector of vulnerability

Saint-Martin and Saint-Barthélemy, brought back into the forefront after the passage of hurricane Irma, are still perceived as exceptional tourist destinations. While these sister islands, “*so close and so different*” (Hartog and Chardon, 1996) share a common destiny, some of their distinct social and territorial characteristics help to explain crisis management preparedness and post-disaster territorial recovery. The characterisation of territories based on development indicators provides information on the vulnerability of the territory (D’Ercole, 2003).

Dependent but autonomous French Island

Saint-Martin (fig. 1) and Saint-Barthélemy (fig. 2) (french overseas territories) have experienced recent and spectacular economic development. Their politico-legal status explains the large degree of autonomy of these French territories, even if the State retains its presence in certain areas of competence.

This duality of governance sometimes even leads to contradictory strategies or objectives. (Re)discovered in 1493 by Christopher Columbus, Saint-Martin was successively occupied by the French, Dutch, Spanish and British in the course of the wars, before being definitively taken over by the French and Dutch. The Treaty of Concordia in 1648 divided the territory into two parts, French in the north and Dutch in the south. Saint-Barthélemy, for its part, belonged to France, then to Sweden, before being ceded back to France in 1877. The beginnings of the current status of the two islands date back to the 19th century, when Saint-Martin acceded to the legal regime of Guadeloupe (1816), before benefiting in 1862 from commercial, customs, fiscal and economic advantages. These same advantages were granted to Saint-Barthélemy after its retrocession (1878). From 1946, the two islands were attached as communes to the department of Guadeloupe and under the control of the Prefecture of the Northern Islands in 1963. The “*geographical, social and economic specificities of the territories*” (IEDOM, 2020a and 2020b, p. 17) mark the

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Fig. 1 - Land use and urbanization phases in Saint-Martin since 1969 (Source: RGE alti 2016, BD Topo IGN 2017, aerial photo IGN (1969, 1984, 1999, 2017), Defossez and Gherardi, 2020, 2021).

Fig. 1 - Uso do solo e fases de urbanização em São Martinho desde 1969 (Fonte: RGE alti 2016, BD Topo IGN 2017, aerial photo IGN (1969, 1984, 1999, 2017), Defossez and Gherardi, 2020, 2021).

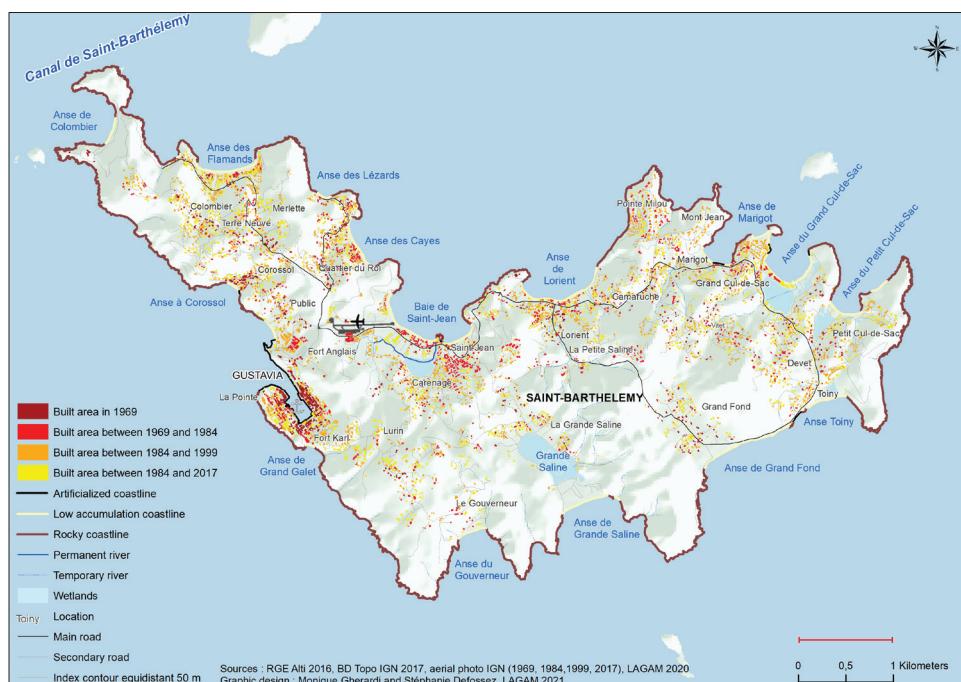


Fig. 2 - Land use and urbanization phases in Saint-Barthelemy since 1969 (Source: RGE alti 2016, BD Topo IGN 2017, aerial photo IGN (1969, 1984, 1999, 2017), Defossez and Gherardi, 2020, 2021).

Fig. 2 - Uso do solo e fases de urbanização em São Bartolomeu desde 1969 (Fonte: RGE alti 2016, BD Topo IGN 2017, aerial photo IGN (1969, 1984, 1999, 2017), Defossez and Gherardi, 2020, 2021).

desire for a statutory evolution towards greater autonomy carried by the elected representatives and approved by referendum by the populations of Saint-Martin (76.17%) and even more so in Saint-Barthelemy (95.51%). In 2007, the two islands were granted the status of overseas collectivity (COM) with wider powers, but did not opt for the same integration into the Community area. Saint-Martin is an Outermost Region (OR) while Saint-Barthelemy chooses the status of Overseas Country and Territory (OCT). The State remains present with a prefecture delegated to Sint Maarten and Sint Barthélémy and competent in certain areas (criminal, commercial, monetary, banking and financial law). Thus, on a common basis, the two islands are marked by some differences in governance, in particular a greater desire for autonomy for Saint-Barthelemy. For both territories, the advantageous tax regime has contributed to the economic boom based on tourism, stimulated by the "Pons" tax exemption law of 1986.

Recent tourist areas

The economic and demographic development of Saint-Martin and Saint-Barthelemy began in the 1960s and strengthened in the 1980s. The objective of the Pons law (1986) to encourage investment in these overseas territories really gave a boost to a new territorial dynamic. Between the 1982 and 1990 censuses, population growth rates appear to have been spectacular, with 65% for Saint-Barthélemy and 253% for Saint-Martin (fig. 3). The 2016 census reports 9793 and 35746 inhabitants respectively (Census of population, Insee 2016).

The logic of urbanisation, which is different on the two islands, has a deterministic dimension, as the geography of the territory has primarily influenced the settlement of the population on the coasts. In Saint-Martin (fig. 1), a few towns on the coastline or along the edge of ponds spread in the 1960s and 1970s, then the bays became denser, including some areas that are very exposed to hydro-climatic phenomena, such as "Baie Nettlé" and "Sandy Ground" built on a lido. The French West Indies have a tropical maritime climate, with a rainy season

from June to November (hurricane season) and warm temperatures throughout the year. The urbanisation of Saint-Martin is also marked by socio-spatial repartition, with precarious, self-constructed housing neighbourhoods rubbing shoulders with high-standard areas, testifying to structural and social vulnerability. In Saint-Barthelemy (fig. 2), socio-economic disparities exist without, however, presenting precarious housing areas. The windhouses and very high-standard dwellings are spread out from the coastline with a gradation of standing towards the heights.

The economy is based on the tertiary sector, almost exclusively tourism and all associated activities. This quasi-monopoly makes the territory dependent and vulnerable to external events, be it economic (2008 crisis), natural (Hurricane Irma) or health (COVID 19). At the beginning of 1980, the work of A.L. Sanguin (Sanguin, 1981, 1982) on the northern islands already envisaged the tourist future of Saint-Martin and Saint-Barthelemy, a trend which is emerging on the scale of the Caribbean basin (Ururuela, 2004). The changes have been felt since the 1970s when the last agricultural activities were in decline. At the beginning of the 1980s, even before the law of tax exemption, these islands had already started a "*tourist and residential revolution*" (Sanguin, 1981, p. 65, 1982, p. 128) based on an upper-class, American-dominated clientele, rejecting mass tourism and aiming for luxury tourism (Magnan, 2008; Theng, 2014). Saint-Barthelemy operates selective tourism facilitated by transport infrastructures which are insufficiently sized to accommodate boats and large aircraft, but which has the disadvantage of creating a partial dependence with the international airports of Juliana (Saint-Martin) and Pointe-à-Pitre (Guadeloupe). This same dependence falls to Saint-Martin which is moreover in competition with Sint-Maarten to capture tourist flows. The construction and real estate sector derives from tourism and provides a large number of jobs. The impact of Irma on these sectors of activity has followed a similar logic in the two islands but with different temporalities (Defossez et al., submitted). The curve of tourism has fallen while that of construction and public works has increased the time of the (structural) reconstruction, which is almost completed

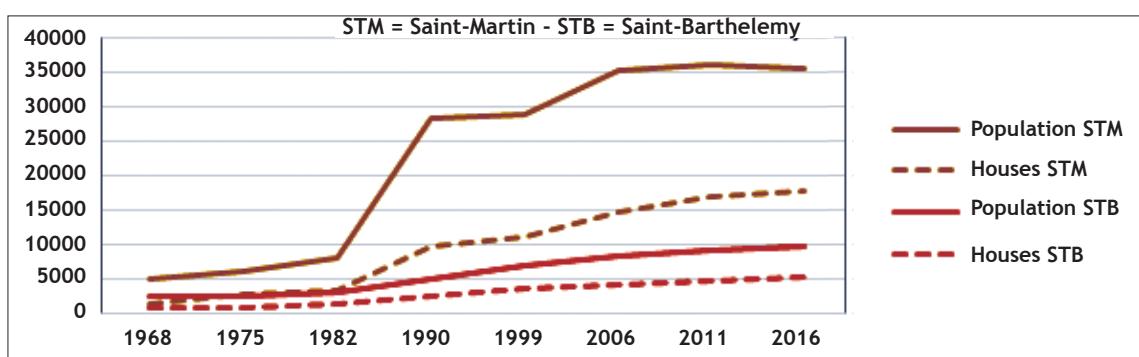


Fig. 3 - Demographic change in Saint-Martin and Saint-Barthelemy since 1968 (Data source: INSEE, 2016).

Fig. 3 - Mudança demográfica em São Martinho e São Bartolomeu desde 1968 (Fonte dos dados: INSEE, 2016).

on Saint-Barthelemy, continues on Saint-Martin. Overall, Saint-Martin has weaker development indicators than Saint Barthelemy with a GDP per capita of 14,700 and 35,700 euros (in 2010) (CEROM, 2014) and high intra- and inter-territorial income disparities. Furthermore, unemployment rates, reflecting social vulnerabilities, are around 4% for Sint Barthelemy and over 30% for Saint-Martin, although this high figure masks the reality of informal work (IEDOM, 2020b and 2020a).

Cosmopolitan and attractive territories

Social vulnerability is expressed through economic factors but is also based on the composition of society. The way in which society is organised is, in our opinion, based on territorial attachment and knowledge of the environment in which it evolves. The organisation can be linked to the involvement of actors in risk and crisis prevention. In this respect, the situation is different between Saint-Martin and Saint-Barthelemy. The external population represents more than 30% of the inhabitants of the island of Saint-Martin (IEDOM, 2020b). It originates from the Caribbean basin and mainly Haiti, but is also European and greatly influenced by American culture, with a large proportion of the population being English-speaking with a St. Martinian identity (Sanguin, 1982; Redon, 2006). Economically, the island is considered to be dominated by the metropolitans (Duvat, 2008). Saint-Barthelemy has also attracted a significant proportion of metropolitans described as “neo-St. Barts” (Chardon and Hartog, 1995: 275) and West Indians. Nearly 40 nationalities (mainly European) make up the foreign population (15% of the island's population in 2011), of which more than half are Portuguese (IEDOM, 2015), settled by construction and public works activities (Chardon and Hartog, 1995).

French west indies in the eye of the hurricane

The North Islands are situated in the cyclogenetic basin of the North Atlantic. Before Irma, which caused 11 deaths on Saint-Martin, the last deadly hurricanes were in 1819 and 1898 (Leone et al., 2020). More recently (in 1995), Hurricane Luis (category 4 on the Saffir-Simpson scale), which hit Saint-Martin and Saint-Barthelemy and was the reference event, was replaced by Irma in September 2017. The 2017 hurricane season in the North Atlantic was marked by a succession of hurricanes, including 3 hurricanes (Harvey (cat. 4), Irma and Maria (cat. 5)). Just a few hours after Hurricane Irma passed over Saint-Martin and Saint-Barthelemy, they were again threatened by José (cat. 4), then less than two weeks later by Maria (cat. 5) and finally spared. Tropical storm Irma takes shape west of the Cape Verde Islands on 30 August 2017, after hitting the northern islands, it continues its course towards Cuba before running out of steam on the west coast of Florida (Météo France, 2017). Irma is qualified as exceptional, the

only one having landed on the French west indies, it is the strongest hurricane ever recorded in the North Atlantic. Very low atmospheric pressure reached up to 916hPa, with maximum sustained winds recorded at around 290 km/h (Cangialosi et al., 2018) and modelled at over 350 km/h (Cécé et al., 2020). Cyclonic surges reached 2 and 3 metres accompanied by waves of 3 to 10 metres, with maximum heights mainly affecting rocky and urbanised coasts already eroding, accentuated by the anthropisation of the coastline (Pillet et al., 2019; Rey et al., 2019). Considerable structural damage has been estimated at more than two billion euros, and 11 deaths add to the trauma for Saint-Martin.

Interviewing populations identified as playing a role in crisis management

The feedback widely used after a disaster is destined to learn, to draw lessons from crisis management in order to improve strategies in the face of a future event. The process of analysing the kinematics of the event and the management of the crisis focuses more on the institutional and managerial players, and less on the point of view of the populations (Goutx, 2012) who are affected by the event but who also participate in its management at their own level (Campbell, 2009; Weiss et al., 2010). Determining the knowledge, risk awareness and involvement of the population in the complete crisis management process (from anticipation to recovery) has guided this approach based on semi-directive interviews set within a temporal framework (before - during - after), with reactions depending on the temporal phases of the disaster (Provitolo et al., 2015). In our view, the place of the population in crisis management processes is based on a necessary involvement that is partly independent of institutional management. It is also based on psychosocial and territorial determinants. However, the involvement of populations depends on certain official (institutional) recommendations. Moreover, the individual level is integrated into collective mechanisms (institutional or citizen) which manage the anticipation and recovery strategies on which individuals are totally dependent (for example the restoration of networks).

The semi-directive interviews used in the RETEX methodology (Wybo et al., 2003) were conducted among the populations of Saint-Martin and Saint-Barthelemy in October/November 2017 and May 2018 (fig. 4a and 4b).

Then a cohort was followed up until today (2020). On the basis of an interview grid marked by before-during-after temporalities (fig. 5), the interviews were conducted face-to-face and almost exclusively in French (some interviews in English and Creole). The interviewers intervened as little as possible with reminders in order to 1) collect the expected information, 2) gain access to the respondent's thought process and 3) to more personal information such as social status.

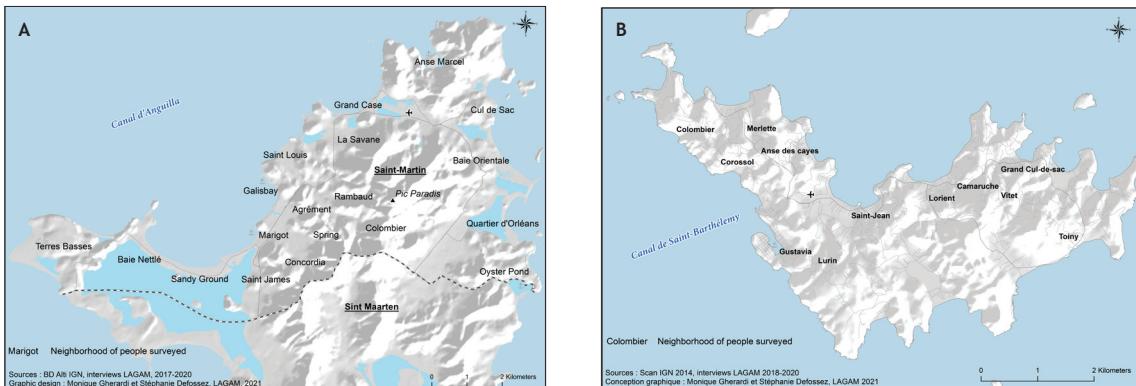


Fig. 4 - Neighborhood of people surveyed in (a) Saint-Martin and (b) Saint-Barthelemy
(Sources: BD alti IGN, interviews S. Defossez and M. Gherardi in 2017, 2018, 2019, 2020)

Fig. 4 - Neighbourhood of people surveyed in (a) Saint-Martin and (b) Saint-Barthelemy
(Fonte: BD alti IGN, entrevistas S. Defossez e M. Gherardi en 2017, 2018, 2019, 2020).

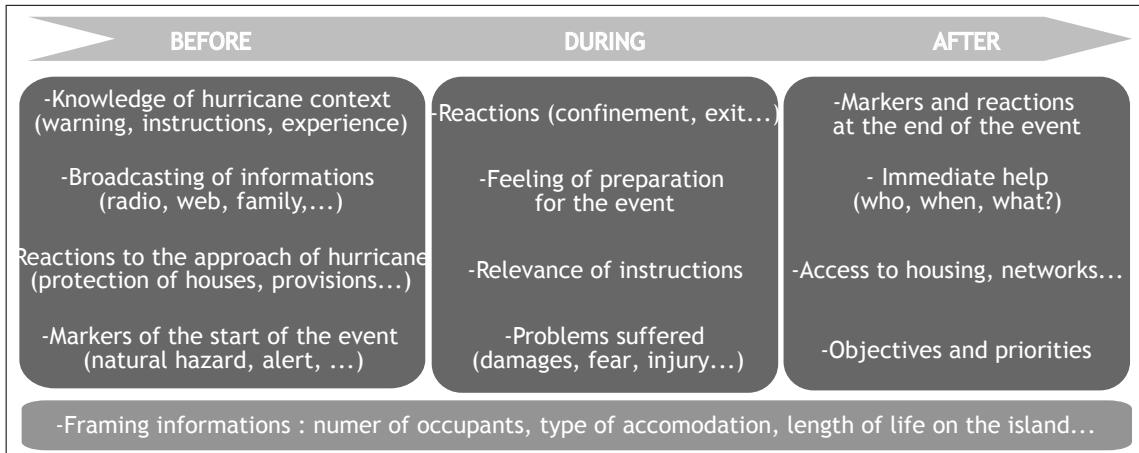


Fig. 5 - Interview guide for the populations of Saint-Martin and Saint-Barthelemy in 2017 and 2018 (Defossez and Gherardi, 2020)

Fig. 5 - Guia de entrevista para as populações de São Martinho e São Bartolomeu em 2017 e 2018 (Defossez e Gherardi, 2020).

Although it is understood that post-disaster reconstruction is a long-term process, the primary objective was to ask people about their short-term experiences, from a few days before the hurricane (as soon as its direction towards the West Indies was announced) to a few weeks afterwards (emergency phase). An initial series of interviews therefore took place in Saint-Martin and Saint-Barthelemy in October 2017 and May 2018, with 102 and 17 interviews respectively, divided between men and women and representative of the composition of society (native, non-native (metropolitan, West Indian, immigrants)). Then a cohort of around twenty people on the two islands agreed to give us their impressions of the long-term reconstruction (thanks to meetings in March 2019 and October 2020). The survey took place in several districts of Saint-Martin and Saint-Barthelemy. The interview, which was introduced by a general phrase “tell us how you experienced the hurricane, before, during and after”, was very well received, with a

return rate approaching 100%. In Saint-Martin, no prior contact was made, so the presence of the interviewers in the island's daily life was enough to build trust and encourage people to give themselves up. In Saint-Barthelemy, the same approach was taken, in addition to the publication of an advertisement in the Saint-Barth newspaper offering volunteers the opportunity to share their experience with us.

While each testimonial is unique and depends on the intrinsic nature of the individual, the behaviour and experience show similarities, particularly in the phases preceding the impact. Disparities, and even inequalities, are even more obvious in the emergency and recovery phases, both within a given territory and, above all, between the two islands.

Individual and collective behaviours explained by territorial vulnerabilities and capacities but also by the determinants of knowledge and risk awareness.

Behaviour in the face of a crisis depends on many determinants (psychosocial, geographical, financial, etc.) and is organised according to a proactive approach (I anticipate, I make people look for information and know-how), a reactive approach (I react accordingly to an injunction to react or following an event that has just occurred) or a passive approach (I do not react, not knowing what to do or paralysed by the situation).

Prepared for an underestimated risk?

In addition to specific events, the islanders of the French West Indies are aware of the risk of cyclones, without, however, estimating the frequency and potential intensity, and know the period of the cyclone season (which here runs from June to November). Many of the interviewees say that they are more attentive to weather forecasts during this period and then to the announcement of a particular event, and their interest is even greater. From 30 August onwards, the emerging tropical storm from Cape Verde is the subject of attention by scientists who anticipate its trajectory and intensity. By the next day, the storm had already reached category 2 hurricane status, and by 5 September it had reached category 5 (Météo France, 2017). In Saint-Martin and Saint-Barthélemy, those questioned are following the evolution of the situation, for some a few days before, but for others only a few hours before. The influence and geographical proximity of the United States attract people to rely on the forecasts of the National Hurricane Center and to consult information from American television and websites. However, the meteorological vigilance of the French meteorological institute (Météo-France) is also monitored. The insularity of the island and the practice of the sea by many of those questioned also encourage them to consult specialised marine meteorological websites. Most of the people questioned took a proactive approach in seeking information, even if some of them were not very aware of the danger and remained passive. This information from various sources was the trigger for preparing for the impact of a highly probable trajectory on the northern islands. One unknown factor remained: the intensity of the phenomenon. The announcement of the passage of hurricane category 4 to 5 occurred in only a few hours, the speed at which the phenomenon evolved did not always allow the best possible anticipation of the preparation of the populations. On 4 September, the hurricane reached category 4 and very quickly moved up to category 5, which was announced to the population on 5 September at 12 noon!

Preparing to await the impact consists of better protecting one's home (if possible) and constituting reserves of food, water, but also batteries, candles, etc. to be able to compensate for network cuts at least temporarily. The feedback from the interviewees shows

a more committed preparation in Saint Barthélémy than in Saint-Martin, with a collective dynamic that helped to raise awareness of the imminent event. Moreover, on Saint Barthélémy, more than on Saint-Martin, the non-natives largely emphasised the vernacular transmission from the natives on how to prepare for a hurricane. The levels of vigilance issued by "Météo-France" guided the preparation (over time) but the orange vigilance level "prepare yourself" very (too) quickly gave way to the red vigilance level "protect yourself", taking some people who were already unaware of the reality of the danger by surprise. Some of those interviewed, particularly on Saint-Martin, organised themselves only a few hours before the impact. But how to prepare for the hurricane, on what reference? Some have never lived, others have already had to cope here or elsewhere. Inexperienced respondents relied on a representation or experience shared by others, therefore in a rather vague context. The respondents with experience of a hurricane in the French West Indies all had the same reference event in mind, Hurricane Luis in 1995. It was with the memory of Luis that the preparation was organised. Hurricane Irma exceeded it in intensity, all those interviewed identified Luis as a category 5 hurricane whereas it was a category 4, even though it caused serious damage. On the basis of this reference, many underestimated the reserves needed for their consumption several days after the hurricane. This preparation phase also represents an opportunity to take shelter outside one's home, possible through early, spontaneous or 'organised' evacuations. Very few respondents left their accommodation before Irma's arrival, especially in Saint-Martin. The few departures were unanimously spontaneous and the place of refuge was with personal relations (friends, family). However, on both islands safe shelters exist, their list is distributed at the beginning of the hurricane season and in the event of an imminent event. There are three main reasons for the nearly complete absence of early evacuation. On Saint-Barthélemy, interviewees expressed confidence in their homes that they would not need to seek shelter elsewhere, and on Saint-Martin, moreover, in the safe shelters, where they believe promiscuity prevails. Furthermore, the desire to protect their homes was expressed, even if, in the opinion of the interviewees themselves, their presence would not change the possible damage. This behaviour refers to attachment to the place, the will not to leave one's bearings and therefore a reassuring place. Leaving would accentuate concerns about the potential damage to the home and material goods and especially goods of sentimental value. These two reasons are evoked in both islands. Finally, on Saint-Martin alone, the justification most frequently put forward concerns the mistrust of official safe shelters. The resilience of buildings allocated for the security of the population is widely questioned and here again the spectre of Luis appears in addition to the uncertainties of the institutions regarding the safety

of certain safe shelters. During Hurricane Luis, some safe shelters were badly damaged, thus not engaging the confidence of the populations. Moreover, a few hours before Irma passed through, two safe shelters were closed because they were too exposed to sea submersion... fortunately, they were largely damaged or even partially destroyed (photo 1).

Finally, the reactions in the phase preceding the hurricane remained fairly similar between the two territories, even if the Saint Barts seemed more involved in preparing for the event (fig. 6). Even though the populations had prepared themselves on the whole, the intensity of the event exceeded expectations. The risk may have been underestimated, particularly with the reference event (which was either really less intense or was forgotten), but also due to the lack of experience, and finally due to the performances (Weiss *et al.*, 2010). In this phase, although individual mechanisms prevail, they are also



based on collective considerations, particularly with the dissemination of information on the approach to the phenomenon and the associated safety instructions.

To cope with an intense event: confine yourself

The violet weather vigilance “confine yourself” led the Saint-Martinois and Saint-Barths to effectively confine themselves and the intensity of the phenomenon to prohibit any other possibility. Unanimously, the people questioned often stayed indoors with family or friends in order to better support this experience, which for some of them was new. Even if each experience is singular, the passage of Hurricane Irma, whether in Saint-Martin or Saint-Barthelemy, led to similar behaviour. It is above all the knowledge or not of the natural phenomenon, and in particular the calm during the eye, that was able to guide the interviewees. The interviewees generally



Photo 1 - Two shelters evacuated before the hurricane (Photographs by M. Gherardi, taken at 30/11/2017).

Fot. 1 - Dois abrigos evacuados antes do furacão (Fotografias de M. Gherardi, tirada a 30/11/2017).

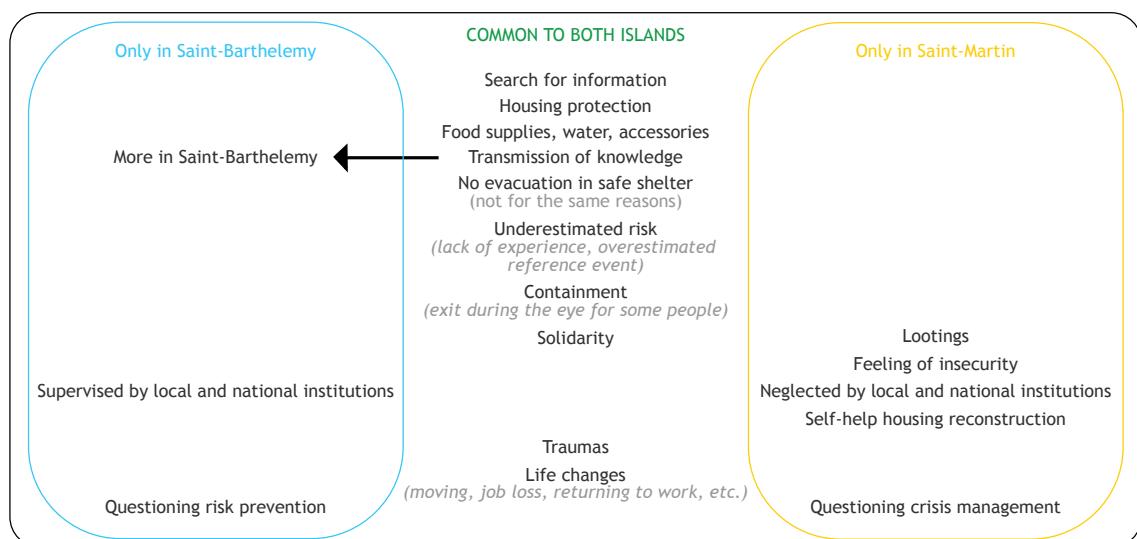


Fig. 6 - Main behaviours and feelings noted during the interview in Saint-Martin and Saint-Barthelemy
 (Sources: BD alti IGN, interviews S. Defossez and M. Gherardi in 2017, 2018, 2019, 2020).

Fig. 6 - Principais comportamentos e sentimentos observados durante a entrevista em São Martinho e São Bartolomeu
 (Fonte: BD alti IGN, entrevistas S. Defossez e M. Gherardi en 2017, 2018, 2019, 2020).

had a good “theoretical” knowledge of the hurricane, and after an initial phase of strong winds, the calm weather gave the interviewees the opportunity to go outside for a few moments to reinforce the protection of the openings, but above all it allowed them to take shelter elsewhere or to take in neighbours in danger (some ground floors took on water while the top floors had no roof). However, some of those interviewed seem to have perceived these different phases less, like the residents of the “Grand-Case” coastline, for whom the eye of the hurricane (period of calm) was not felt. The hurricane, which was perceived as very intense, gave an impression of violence and a combination of phenomena. Some people spoke of the shaking of the house similar to an earthquake, while others heard the sea packets comparing them to a tsunami. In spite of the frightening experience, all feel lucky to be alive after such an intense phenomenon. Moreover, the death toll (11 officials) convinced almost none of them and rumours multiplied. As communication was impossible, the end of the phenomenon with the “grey” vigilance could not be announced. The populations relied on the end of the wind and the outside noises that emerged.

Emergency management reveals individual and collective, citizen and institutional capacities

The impact gives way to desolation, to observation, and many of those questioned mentioned a perception of devastated areas after a war. In this post-event phase, a very different approach to management emerged between Saint-Martin and Saint-Barthelemy, in terms of the involvement of the local population and, above all, in terms of institutional support. Despite individual involvement, the post-disaster period requires collective institutional and private involvement (particularly network operators), which makes the population partially dependent.

In Saint-Barthelemy (fig. 3), all the testimonies converge towards an active approach on the part of everyone as soon as the hurricane was over. Spontaneous initiatives between neighbours, by neighbourhood and on a wider scale were launched, accompanied in fact by the local authority, which had partly anticipated the post-crisis organisation. The Saint-Barth mentality, widely mentioned by the disaster victims encountered, covers the desire to invest individually in territorial recovery and immediate action. First of all, according to them, it was necessary to clean up the area, particularly the roads, and so everyone began this clearing phase spontaneously, but in an organised manner. The Saint-Barthelemy “Collectivité” (local institution) had pre-positioned machines and vehicles that would be used for this operation. Unanimously welcomed and thanked, the Portuguese building and public works companies played

a key role, as they immediately and constantly became involved with everyone. Waste collection areas were made accessible free of charge. For some, 24 to 48 hours afterwards it was possible to circulate on part of the island. The other major concern was to communicate with relatives and neighbours. All of them took care to check whether their closest neighbours were now safe, and then waited anxiously for the possibility of communicating with the outside world. This opportunity presented itself 1 to 2 days later, with the installation by the local authority of Irma WIFI terminals, installed towards the airport. The management of the emergency phase by the local authority was unanimously appreciated, even though the president of the local authority (collectivité) announced the following day that he did not need the French Government’s help. Each of the interviewees agreed to appreciate this decision, even if the absence of the French Government was disturbing, according to them, material aid could have been provided once the emergency phase was over. In spite of this, the island benefited from the solidarity of the neighbouring Caribbean islands, the mainland and the United States, without however being able to clearly identify the donors in the speeches. The individual involvement for a rapid territorial recovery was explained by a strong willingness and motivation of each person to get the island’s economy going again, not based on personal needs, but part of a real willingness to do collective duty, largely linked to territorial attachment.

In Saint-Martin (fig. 3), the same concerns of communication and cleaning are mentioned, but are disrupted by the agitated situation in the days following Irma. The trauma of the event has been supplanted in the speeches collected by the feeling of insecurity and the images of looting in the days following the hurricane. Thus the scenes of looting, in Marigot as well as in certain commercial areas, came to the forefront of the trauma, leading some interviewees to say that the looting hurt more than the hurricane. Thefts or burglaries were not unusual in Saint-Martin and the interviewees insisted on the difference between necessity and organised robberies. Some of them also took part in necessity robberies in shops that had already been vandalised, making necessity goods “available”. But the insecurity seemed to be growing and violent. It should be remembered that on this territory, precarious and high standing neighbourhoods are found side by side. Also in some neighbourhoods where the organisation into gated communities is frequent, the inhabitants have organised themselves into a “militia” to ward off possible robberies with violence. Sometimes it is neighbours or acquaintances who are identified as looters, leaving a feeling of mistrust. In spite of everything, the population has organised itself to start clearing the gates but has not been able to count on institutional help. The community was considered to be

absent without having anticipated this emergency phase and the interviewees felt that the state had intervened too late without, for example, the pre-positioning of law enforcement and rescue forces. The imminent arrival of Hurricane José, announced as soon as Hurricane Irma was over, contributed in part to the impossibility of action. These factors, external to the organisation of the post-crisis period, gave rise to a feeling of abandonment, often evoked in the event of a major event (Dourlens, 2003). They also reveal, according to the interviewees, a lack of anticipation and organisation of institutions. Supplies were set up by institutions or NGOs (Non Governmental Organization), which were considered to be disorganised or sometimes totally unsuitable (canned food to be cooked when the electricity networks were out of order, no information on the places and times of distribution). Faced with this, some of the interviewees have adapted by recovering, for example, wood from damaged buildings as cooking wood for food. But these substitutes were worthwhile in the short term. Fortunately, the island has benefited from a great deal of organised solidarity thanks to local associations (distribution of food, clothing, etc.) and reinforcements sent to repair the networks (electricity for example).

In both islands, once the emergency phase is over, the time has come to rebuild, renovate and repair housing, at their own expense or with the help of insurance companies. The insurance penetration rate is lower than the national values, with 2/3 of insured properties on Saint-Barthelemy and half on Saint-Martin. There are several explanations, the main one for Saint-Martin refers to the last major hurricane (Luis) and the low compensation payments that followed, but also to fragile financial situations that do not allow a share of the budget to be allocated to insurance. The recourse to insurance does not always preserve the possibility of finding decent housing as soon as possible, which is part of the population's expectations. The time taken to process applications was considered to be very uneven: for some very fast and for others the wait was several months later.

A last common element is the trauma and life changes observed by the interviewees (fig. 3), identified in other cases of natural disasters (David *et al.*, 1996). The traumas took place over several months, or even years in some cases. The setting up of a psychological unit immediately after Irma was not very successful, as the people interviewed still felt that they were in the thick of it. Speaking out is still perceived as a difficulty, a challenge that not everyone is ready to take on. It is sometimes the trigger or catalyst for situations that are in the process of change with positive or negative life changes (divorce, marriage, pregnancy, professional reconversion, moving house, etc.). These situations are discussed in a personal capacity, while the subject of voluntary departures (temporary or definitive) in

the days following the hurricane is addressed by the interviewees in a collective dimension. As soon as possible, the two islands organised the departures of women and children who wished to leave the island by air. A feeling of frustration and injustice was born from these departures. First of all among those who wanted to leave the island with a lack of understanding of the organisation in the order of departure. Then, among the people who stayed, because they had no place to take refuge or simply because they did not want to leave the territory to which they were attached and/or native. The impression of being abandoned was expressed, and very quickly replaced, at least in the speeches, by an opportunity to "sort out" the inhabitants, leaving only those attached to the island.

Long term recovery

Irma's impact has more broadly questioned crisis management in Saint-Martin and risk prevention in Saint-Barthelemy, which can be attributed to the reconstruction time estimated to end in Saint-Barthelemy less than two years after the passage of the hurricane (interviews conducted in March 2019). Saint-Martin is characterised by organisational vulnerability, as is the command post located at the prefecture which was devastated by Irma. But also the turnover of state civil servants, which is detrimental to a good knowledge of the territory and the phenomena it may undergo. In the emergency phase, the duality between the competences of the local authority and national authority, in addition to the insecure context of the territory, complicated the implementation of relevant strategies. It is then the regulations that have led to the emergence of underlying tensions and polemics on the management of natural risks with the revision of the Risk Prevention Plan with its share of injustices perceived by the coastal populations. This entire prevention strategy was also called into question in Saint-Barthelemy, where everyone considered crisis management to be very effective. The problem lies in the galloping urbanisation on the coasts, which was not slowed down by Hurricane Irma, or in the building standards which are not adapted to the cyclone risk. The mistrust of institutions, especially local ones, is even greater on Saint-Martin.

The monitoring of a cohort of around 20 people in Saint-Martin and Saint-Barthelemy showed differentiated recovery capacities, as perceived by the interviewees themselves. In Saint-Barthelemy, the discourse suggests a rapid but not totally finished reconstruction, but the comparison with Saint-Martin allows us to put into perspective what a long reconstruction is. On Saint-Martin, the populations interviewed are tired of the time taken to restore the buildings, the lack of priority in the reconstruction (for example, schools which are not in the

priorities) and also compare with Saint-Barthelemy, for whom everything goes faster. The comparison on both sides is based on economic factors, but also, and above all, political factors, with a greater willingness and stronger investment on the part of the Saint-Barthelemy community and the population.

Discussion/Conclusion

The crisis situation, managed at the level of institutions, relies de facto on the populations whose involvement is essential (Weiss *et al.*, 2010) in the different temporalities before, during and after. Individual reactions are based on psycho-sociological determinants, depending on experience and knowledge and awareness of the risk, but also on personal capacities (Sattler *et al.*, 2000; Kouabéhan, 2007; Etner, 2011). However, they cannot be totally disconnected from institutional collective management, particularly in the post-crisis phase. While the population is in control of the situation in terms of anticipation (protection of its housing, securing the surroundings of the dwelling, etc.), it is largely up to the institutions after the impact. However, as Saint-Barthelemy shows, collective and individual mechanisms can go in the same direction. The root causes, territorial vulnerabilities influence these mechanisms (Duvat *et al.*, 2021). External factors also disrupt preparation and recovery (Defossez and Gherardi, 2020), which are partly dependent on root causes. Organised robberies in Saint-Martin took place in a deteriorated social context, and then state intervention either ruled out the community's strategies or, on the contrary, allowed the situation to be brought under better control. Beyond crisis management, Hurricane Irma, like any crisis, exacerbated existing problems (Leone and Vinet, 2006) at all levels. At the individual level, with changes in life that were previously envisaged without ever coming to fruition. At the collective level, on the population side, the paradox of solidarity/robbery has degraded social relations; on the institutional side, dysfunctions have been highlighted. At the territorial level (island), socio-economic gaps have become more pronounced, especially on Saint-Martin, which has more marked vulnerabilities than on Saint-Barthelemy. Moreover, the disaster did not only raise questions about the crisis and crisis management, but more generally about risk prevention, with the views measured between Saint-Martin and Saint-Barthelemy explained in part by the political context. On the one hand the will to rebuild on the coastal strip the economy which depends almost exclusively on seaside tourism and on the other hand the necessity to stop the urbanisation of the coastal strips in order not to expose oneself even more to risks. These dissonances give rise to tensions and contradictory decisions, “*individuals can change their behaviour [...] and decide, for example, to stop investing in prevention as they consider that it has not been sufficiently effective*” (Etner, 2011, p. 25).

Faced with a major “predictable” phenomenon such as cyclones, populations find their place in crisis management preparedness. The collective and individual scales tend to converge, overlap and sometimes contradict each other. The involvement of populations is based on numerous factors of vulnerability and intrinsic capacities, but also on the nature, intensity and scale of the natural phenomenon and on collective (mainly institutional) strategies. What people learn from such an event depends on the actors and scales of decision-making and the social commitment to deal with it.

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Bibliography

- Campbell, J. R. (2009). Islandness vulnerability and resilience in Oceania. *Shima: The International Journal of Research into Island Cultures*, 3(1), 85-97.
- Cangialosi, J-P., Latto, A-S., Berg, R. (2018). *Hurricane Irma; Tropical Cyclone Report*. National Hurricane Center: Miami, FL, USA. Available online: https://www.nhc.noaa.gov/data/tcr/AL112017_Irma.pdf
- Cécé, R., Bernard, D., Krien, Y., Leone, F., Candela, T., Péroche, M., Biabiyan, E., Arnaud, G., Belmadani, A., Palany, P., Zahibo, N. (2020). A 30-m scale modeling of extreme gusts during Hurricane Irma (2017) landfall on very small mountainous islands in the Lesser Antilles. *Natural Hazards and Earth System Sciences*. DOI: <https://doi.org/10.5194/nhess-2020-241>
- CEROM. (2014). *Estimation du PIB par habitant de Saint-Barthélemy*. IEDOM, AFD, INSEE, 8 p.
- Chardon, J. P., Hartog, T. (1995). Saint-Martin ou l'implacable logique touristique, *Les Cahiers d'Outre-Mer [En ligne]*, vol. 48, n° 189, 21-33. DOI: <https://doi.org/10.3406/caoum.1995.3541>
- Chauvin, F., Degrâce, J-N., Kapikian, E., Montout, C., Soubeyroux, J-M. (2017). Une saison cyclonique 2017 particulièrement dévastatrice pour les Antilles, *La Météorologie*, n.° 99, 3-4.
- Defossez, S., Gherardi, M. (2020). Face au cyclone Irma! Le rôle des populations dans la gestion de la crise à Saint-Martin (Petites Antilles, îles du Nord), *EchoGéo [En ligne]*, 51. DOI: <https://doi.org/10.4000/echogeo.18987>

- Defossez, S., Rey, T., Leone, F., Gherardi, M., Vinet, F., Péroche, M., Lagahé, E., Cécé, R., Didier, B. (submitted). Capacités de relèvement d'un territoire insulaire français face à un ouragan extrême : *Retour d'expérience sur l'ouragan Irma à Saint-Barthélemy (Petites-Antilles)*, submitted in december 2020 to les Cahiers d'Outre-Mer.
- Dourlens, C. (2003). *La question des inondations. Le prisme des sciences sociales*, Ministère de l'équipement, des transports et du logement, CERPE, 105 p.
- David, D., Mellman, T. A., Mendoza, L.M., Kulick-Bell, R., Ironson, G., Schneiderman, N. (1996). Psychiatric morbidity following Hurricane Andrew, *Journal of Traumatic Stress*, vol 9, 607-612.
- D'Ercole, R. (2003). Catastrophes et disparités de développement dans le Bassin Caraïbe, *Mappemonde*, 72, 37-42.
- Duvat, V. (2008). Le système du risque à Saint-Martin (Petites Antilles françaises). *Développement durable et territoires* [En ligne], dossier 11.
DOI: <https://doi.org/10.4000/developpementdurable.7303>
- Duvat, V., Volto, N., Stahl, L., Moatty, A., Defossez, S., Desarthe, J., GrancherD., Pillet, V. (2021). Understanding interlinkages between long-term trajectory of exposure and vulnerability, path dependency and cascading impacts of disasters in Saint-Martin (Caribbean), *Global Environmental Change*, Elsevier, 2021, 67.
DOI: <https://doi.org/10.1016/j.gloenvcha.2021.102236>
- Etner, J. (2011). Comment comprendre les comportements face à l'évolution des risques? Une approche par les modèles de décision, *Humanisme et entreprise*, n.° 301, 13-28.
DOI: <https://doi.org/10.3917/hume.301.0013>
- Goutx, D. (2012). *Rôle des individus dans la prévention des risques d'inondation et de la gestion de crise*, In Thevenot, D. 23èmes Journées Scientifiques de l'Environnement - Risques environnementaux: détecter, comprendre, s'adapter, Jan 2012, Créteil, France. JSE, vol. 13, *Journées Scientifiques de l'Environnement*.
- Hartog, T., Chardon, J-P. (1996). Saint-Martin et Saint-Barthélemy; deux "paradis touristiques" si proches et si différents, *Méditerranée*, tome 84-3, 41-44.
- Fenet, J., Daudé, E. (2020). La population, grande oubliée des politiques de prévention et de gestion territoriales des risques industriels: le cas de l'agglomération rouennaise, *Cybergeo: European Journal of Geography* [En ligne], Espace, Société, Territoire, document 932, online 07 february 2020.
DOI: <https://doi.org/10.4000/cybergeo.34020>
- IEDOM. (2015). *Saint-Barthélemy, rapport annuel 2014*.
- IEDOM. (2020a). *Saint-Barthélemy, rapport annuel 2019*.
- IEDOM. (2020b). *Saint-Martin, rapport annuel 2019*.
- Kouabénan, D. (2007). Incertitude, croyances et management de la sécurité, *Le travail humain*, vol. 70(3), 271-287.
- Leone, F., Vinet, F. (2006). *La vulnérabilité des sociétés et des territoires face aux menaces naturelles*, Analyses géographiques, Collection Géorisques, vol. 1, Publications de l'université Paul-Valéry, Montpellier 3.
- Leone, F., Battut, S., Bigot, V., Cousin Thorez, G., Candela, T., Vinet, F. (2020). Mortalité et cyclones en Guadeloupe (Antilles françaises), *EchoGéo [En ligne]*, 51 | 2020.
DOI: <https://doi.org/10.4000/echogeo.18919>
- Magnan, A. (2010). L'espace littoral a-t-il toujours de la valeur? Réflexion à partir du cas de l'île de Saint-Martin (Petites Antilles), *Norois* [En ligne], 206 | 2008/1. DOI: <https://doi.org/10.4000/norois.242>
- Météo-France. (2017). *Saison cyclonique 2017: synthèse chiffrée*. Direction interregionale Antilles-Guyane, 6 p.
- Pillet, V., Duvat, V. K., Krien, Y., Cécé, R., Arnaud, G., Pignon-Mussaud, C. (2019). Assessing the impacts of shoreline hardening on beach response to hurricanes: Saint-Barthélemy, Lesser Antilles, *Ocean Coastal Management*, 174, 71-91.
- Provitolo, D., Dubos-Paillard, E., Verdière, N., Lanza, V., Charrier, R., Bertelle, C., Alaoui, M.A.A. (2015). Les comportements humains en situation de catastrophe: de l'observation à la modélisation conceptuelle et mathématique, *Cybergeo: European Journal of Geography* [En ligne], Systèmes, Modélisation, Géostatistiques, document 735.
DOI: <https://doi.org/10.4000/cybergeo.27150>
- Redon, M. (2006). Saint-Martin/Sint-Maarten, une petite île divisée pour de grands enjeux, *Les Cahiers d'Outre-Mer* [En ligne], 234 | Avril-Juin 2006.
DOI: <https://doi.org/10.4000/com.73>
- Rey, T., Candela, T., Péroche, M., Leone, F. (2020). Changements côtiers et inondations suite au passage d'un ouragan extrême (Irma, 2017) aux Petites Antilles, *EchoGéo [En ligne]*, 51.
DOI: <https://doi.org/10.4000/echogeo.18666>
- Sanguin, A-L. (1981). Saint-Barthélemy. Île normande des Antilles françaises, *Études Normandes*, 30e année, Normands d'ici... et d'ailleurs..., n°4, 1981. 57-77.
DOI: <https://doi.org/10.3406/etnor.1981.2520>
- Sanguin, A-L. (1981). Saint-Martin, les mutations d'une île franco-néerlandaise des Antilles, *Cahiers d'outre-mer*, n° 138 -35e année, 123-140.
DOI: <https://doi.org/10.3406/caoum.1982.3019>
- Sattler, D. N., Kaiser, C.F., Hittner, J.B. (2000). Disaster preparedness: relationships among prior experience, personal characteristics and distress. *Journal of applied social psychology*, 30, 7, 1396-1420.
- Theng, S. (2014). L'île de Saint-Barthélemy (Petites Antilles): une destination du tourisme de luxe. *Études caribéennes* [En ligne], n° 27-28.
DOI: <https://doi.org/10.4000/etudescaribeenenes.6831>
- Ururuela, Y. (2004). Les perspectives limitées du tourisme en milieu insulaire. Le cas de la Caraïbe et des Antilles françaises, *Espace, populations, sociétés*, 2004-2, 387-396.
- Weiss, K., Girandola, F., Colbeau-Justin, L. (2010). Les comportements de protection face au risque naturel: de la résistance à l'engagement?, *Pratiques psychologiques*, n°17, 251-262.
- Wybo, J.-L., Godfrin, V., Colardelle, C., Guinet, V., Denis Remis, C. (2003). *Méthodologie de retour d'expérience des actions de gestion des risques*. Ministère de l'Ecologie et du développement durable, Programme "Evaluation et Prévention des Risques", rapport final.