

Emic View from The Passage of Honde and Jude Tropical Cyclones in Semi-Arid Southern Zone of Madagascar

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Abstract- Tropical cyclones (TCs) are often associated with disasters due to the significant damage they cause to property and the loss of life they entail. Nevertheless, this article discusses the positive effect of tropical cyclones on climate outlooks based on the social context, geographical and cultural specificities of the inhabitants of Androy. We shed light on the anthropological aspects of cyclone-territory relations by highlighting the current social representation of cyclones affecting the country through 28 specifically selected individuals. The study was conducted in the seven coastal villages of the Ambovombe district by Ocean Indian. A mixed approach was used, with a Likert scale to assess variables related to the impacts of all tropical cyclones passing through the territories. Findings reveal that tropical cyclones have caused intense rainfall exceeding 100% and have become quantitative water suppliers in the Androy area. Vulnerable coastal communities wait for TCs passage so they can water their land. An analysis showing that TCs produce precipitation over the Androy region indicates that some arid/semi-arid zones in Madagascar depend largely on this effect to experience wet years. TCs are referred to locally as 'blessing winds'. Hence, including the positive effect of TCs in precipitation forecasts would be an advantage, similarly, in water management plans for every location in the water crisis, but it should also be essential for regional adaptation strategies against climate variability.

Keywords: Climate change, perception, precipitation, social representation, tropical cyclone, water management.

I. INTRODUCTION

According to the IPCC, the frequency of tropical cyclones (TCs) could decrease, while their intensity and associated precipitation rates could increase in the future (2081–2100) compared to 2000–2019. The report also highlighted a moderate to high threat to Madagascar due to increased extreme rainfall from projections near the centres of tropical cyclones that could make landfall along the eastern coast. Coastal and island communities in tropical and subtropical areas around the world are particularly vulnerable to their fury. In coastal areas, they are frequently associated with disasters given the adverse impacts that the related intense winds, storm surges, and heavy rainfall have on vulnerable regions (Smith et al., 2009). According to Dominguez C. and Magaña V. (2018). Tropical cyclones are essential elements of the hydrological cycle in tropical and subtropical

regions. Although, in some places TCs have a positive effect in terms of becoming the primary source of water to refill dams and other surface water reservoirs (Aguilar-Benitez, 2011; Trenberth and Fasullo, 2007). Better understanding the changes of climate extremes and their impacts are essential for human mitigation and adaptation in a changing climate.

Several studies show that the contribution of TCs to seasonal or annual rainfall may be up to 50% over some continental regions, depending on the evolution of their wind field, topographical effects, atmospheric humidity and size (Cervený and Newman, 2000 ; Rogers et al., 2000; Jiang and Zipser, 2010). TCs can account for substantial percentages of both average annual rainfall and total extreme rain events in different regions of the globe. TCs contributed well over 30 percent of the annual rainfall in some arid regions, such as northwest

Australia or Baja California, and in some regions with frequent cyclone activity, such as southeast China and the northern Philippines. Additionally, TCs account for a significant percentage of extreme rainfall events. In some regions, TCs can account for the majority of extreme rainfall events, depending on how exactly the term is defined (Dominguez C. and Magaña V., 2018).

However, these changes in regional precipitation are not always documented as important factors of seasonal precipitation for water planning in Androy region where shortage of rainfall is accurate. In the present study, the contribution of Jude (15 March to 16 March 2025) and Honde (28 February to 1st March 2025) TCs to seasonal precipitation the arid and sub-arid southern Madagascar (Androy region) is examined. Hence, precipitation brought by cyclone systems has long been known as a major contributor to devastating flood events elsewhere but TCs may be water suppliers during dry periods, ameliorating the effects of water crisis by Sisto et al. (2015) such as in arid and sub-arid area costal Androy. Then, understanding TCs and their precipitation behavior, particularly in the context of recent climate variability observations that severely impacts this region is crucial for assessing and mitigating hazards effectively.

Is risk awareness still felt in the face of heavy rains caused by a tropical cyclone in Androy? What psychological and societal changes have been brought about by the passage of two tropical cyclones in the context of climate change impacting precipitation levels? This article sheds light on the anthropological aspects of cyclone-territory relations, favouring a geographical and territorial approach to understand the positive impact of tropical cyclones on leading to wet dry seasons over coastal southern Madagascar. The study thus puts forward the hypothesis that: 'the passage of cyclones is eagerly awaited by rural populations because they are perceived as water suppliers in times of water crisis'. Specifically, this study highlights the current social representation of cyclones floating over the country (Fig. 1). At present, this study is amongst the first academic/ethnographical writings on the positive impacts of extreme weather events such as

TCs in the context of the water crisis in southern Madagascar.

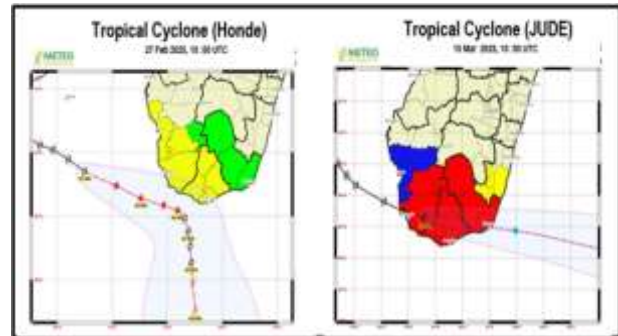


Figure 1. Tropical Cyclones (TCs) Honde and Jude trajectories

Cultural understandings

Others question the usefulness of climate change as a universal concept laden with catastrophic outcomes and urge a broader approach to thinking about how climate change is communicated and used (Moser, 2014; Brace and Geoghegan, 2011; Hulme, 2009). This approach tries to account for different experiences of climate and climate change, which are influenced by and grounded in everyday cultural and physical contexts. For example, Brace and Geoghegan assert that public understanding of climate change needs to consider the 'mingling of place, personal history, daily life, culture and values' (2011, p. 289). Other cultural considerations and influencers of climate change engagement include different perceptions of risk, proximity (for those not experiencing impacts, it is seen to be far away in place and time), personal agency and values.

Personal experience

Exposure to ostensible climate change impacts, as well as people's perceived subjective experiences of climate change, are an integral aspect of risk perceptions and emotional engagement with the issue (Reser et al., 2014). People often draw on their personal experiences with extreme weather to make inferences about the reality of climate change (McDonald et al., 2015). Some studies suggest that extreme weather experiences may have a transient effect on climate change concern (Konisky et al., 2016), or no effect at all (Whitmarsh, 2008). Others indicate that individuals' values, pre-existing beliefs and subjective attribution of their experiences often

moderate how extreme weather experiences shape responses to climate change (Bruine de Bruin et al., 2014; Ogunbode et al., 2017, 2019, 2020b).

Several studies also focus on the 'knowledge' of risks, which they explore through the concepts of perception and representation, but without necessarily referring to the culturalist or constructivist approach. The assessment of knowledge of hazards and exposure situations is based in particular on mental maps (Beck and Glatron, 2009; Lamarre et al. 2016).

Numerous studies question the memory of events (Dollfus and D'Ercole, 1995; Favier and Granet-Bisset, 2000; Le Blanc, 2010; November et al. 2011) in order to understand how they contribute to knowledge of hazards among populations and managers. Humans must learn about their environment: knowledge of environmental cycles and hazards is not innate . Environmental knowledge does not require direct experience, but its accumulation and usefulness depend on effective social transmission. If then TCs represent a catastrophic climatic phenomenon elsewhere, they may represent other things in the populations of the Androy coast.

II. EXPERIMENT

Materials

The study was conducted in the coastal region of Southern Madagascar (Ambovombe District), known for its frequent exposure to climate variability and where approximately 90% of the area is under dryland farming. Thus, Ambovombe was purposively selected to address in depth the life experience of coastal inhabitants in terms of social representation and perception of TCs.

We then randomly selected seven coastal villages located on the shores of the Indian Ocean, namely: Amboro, Ambotaka, Antseky, Beaniky, Beroroha, Ikonka and Isalo. Random sampling was adopted as a technique to understand societal change in the current perception of the contribution of TCs to post-disaster rainfall. A total of 28 farmers (four per village, men and/or women) were recruited for this study.



Figure 2. Map of Study sites

Methods

A descriptive research design was employed to assess community understanding and perceptions of TCs likely to be water suppliers during dry periods in the context of climate change. In addition, primary data were gathered through a structured questionnaire covering, among other things, cyclone-territory relationships during the passage of two TCs from February to March 2025 and social experience and perceptions of climate variability.

Secondary data concerned the history of precipitation and characterisation of cyclones. On the one hand, we aimed to evaluate the characteristics of cyclones and their historically associated precipitation compared to the precipitation recorded during normal periods in Androy. On the other hand, we investigated the perceptions and social representations of TCs passing through the area.

Through discourse analysis of local populations, the linguistic adjustment to the name that should be given to TCs following their passage was highlighted. The approach consists of asking an open-ended question; the Likert scale allows individuals to express the intensity of their approval by presenting them with statements previously incorporated into a scale and asking participants binary questions. Here, we couple precipitation data during normal periods and precipitation histories in the Androy zone to examine aspects of TCs.

The collected data were analysed using XL-STAT tools such as mean, frequency, standard deviation, range, and weighted mean method to draw conclusions. PivotTable were used to highlight the most recurrent variations according to societal perception and representation of the impacts of TCs in recent years. The qualitative variables studied are the current social representations attributed to a new societal name for the cyclone mentioned in the participants' discourse analysis. Dominance graph illustrates the degree of opposition or agreement between current social perceptions/representations and the positive contributions and impacts of TCs in terms of post-disaster rainfall.

Tropical cyclones become quantitative water suppliers in Androy.

Honde TC was associated with heavy rainfall between 70 mm to 130 mm/24hr in Ambovombe (ERCC, DG-Echo Daily Map, 03/03/2025) during 7 days: from 25 February to 03 March 2025 and followed by Jude one which produced an essential accumulated precipitation of 104 mm/24hr (ADAM, 12/03/2025) during 5 days: from 12 March to 16 March 2025. Hence, the Average Accumulated Precipitation (AAP) for each of the two tropical cyclones :

$$AAP_Honde = 70 \text{ mm} + 130 \text{ mm} : 2 = 100 \text{ mm}/24 \text{ hrs}$$

$$AAP_Jude = 104 \text{ mm}/24 \text{ hrs}$$

III. RESULTS AND DISCUSSION

Table 1. TCs Honde and Jude Rainfall accumulation in Androy

Period	Tropical Cyclone HONDE (1)							Tropical Cyclone JUDE (2)				
	25-02-25	26-02-25	27-02-25	28-02-25	01-03-25	02-03-25	03-03-25	12-03-25	13-03-25	14-03-25	15-03-25	16-03-25
AAP (mm)	100	100	100	100	100	100	100	104	104	104	104	104
Sum (mm)	700							520				
Total Précipitation (Tp) = Sum1+Sum2 =												1,220

The average annual rainfall in the Androy zone, which often does not exceed 400 mm/yr, was reached, exceeded and even tripled in just twelve days of cyclones (1,220 mm) due to the passage of tropical cyclones Honde and Jude.

Tropical cyclones are locally perceived as a source of rainfall.

Table 2. The variables processed related to TCs

Local languages	Translation
<i>Rotsakorambe</i>	Heavy rain
<i>Mitondra orana</i>	Bringing rain
<i>Mandatsakorana</i>	It's raining
<i>Vahaolana</i>	Solution
<i>Maniry</i>	Hoping
<i>Mahafaly</i>	Delightfull
<i>Fahasahiranana</i>	Difficulty
<i>Faly</i>	Happyfull
<i>Rivopitahiana</i>	Blessing wind
<i>Ivavahana</i>	Envied
<i>Tsymisyorana</i>	No rain

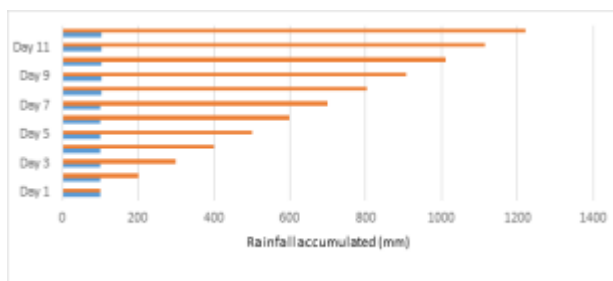


Figure 3. TCs Honde and Jude rainfall accumulation in Ambovombe

<i>Tsifisianorana</i>	rainfall crisis
<i>Lohataona</i>	Summer
<i>Isantaona</i>	Annual
<i>Loza</i>	Disaster
<i>Haintany</i>	Drought
<i>Tsymaniry</i>	unhoped
<i>Fahapotehana</i>	Destruction

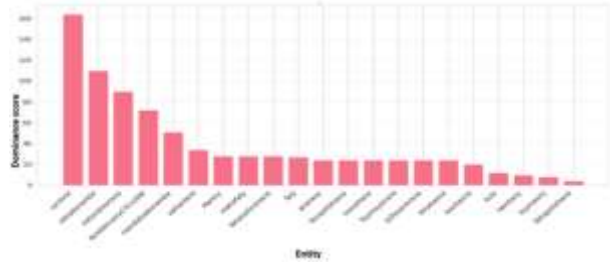


Figure 4. Variables dominance ranking

The passage of TCs is associated with heavy rainfall (rotsakorambe, mitondraorana, mandatsakorana), variables with a very high dominance score and pole position (score: 50 to 120). In fact, TCs are welcomed (maniry, mahafaly) by communities because each rainy season, water resources become scarce due to climate variability. TCs are obviously solutions (Vahaolana = dominance score: 50) that quench the thirst of the community and the dehydrated ecosystem. This is contextual, as elsewhere TCs are horrifying, but in Androy they are envied.

Heavy local rainfall vs multidimensional damage

Dangerous winds and storm surges can cause significant damage to property and loss of life. Similarly, TCs are associated with disasters given their adverse impacts in Androy. The variable (fahasahiranana) explains the post-disaster impacts of TCs. The community is inevitably confronted with this. In contrast, the positive impact is perceived and even palpable compared to the damage caused by the phenomenon. Community perception and psychology are influenced by the search for this water resource. The passage of TCs in Androy is not associated with disaster (loza, fahapotehana) as it is perceived elsewhere. These two variables occupy the last position of dominance in the ranking (Entities 18 and 22).

Tropical cyclones are now considered a ‘blessing’

Faced with the severe impacts of climate change causing a lack of rain and leading to drought (tsymisorana, tsifisianorana), the passage of TCs is now considered a blessing for coastal communities as a source of rain. The name given to TCs by the community is ‘blessing wind’ (rivopitahiana). This variable is found in the middle of the entities. Coastal communities are waiting, even pray for the passage of TCs in the hope of providing water to the territory.

Discussion

The study sought to gain an in-depth understanding of the life experiences of coastal residents of Androy in terms of their representation and social perception of TCs. Tropical cyclones Honde and Jude contribute to more than 100% of cumulative rainfall in Ambovombe Androy, in agreement with Dominguez C and Magaña V (2018) who state that in dry regions, where rainfall is generally less than 300 mm/yr, (as in most of northern Mexico and southwestern US), TCs may determine wet years. This is the case for local precipitation in Androy (relatively less than 400 mm/yr). Similarly, Shephard et al. (2007) found that TCs accounted for 8 to 17% of cumulative rainfall at different locations along the coastal zone of the southeastern United States.

Quantitatively, TCs have a positive effect in terms of becoming the primary source of water in Androy. The passage of TCs Honde and Jude is associated with heavy rainfall where, during each rainy season, water resources are absent. TCs are obviously community solutions for refilling dams and other surface water reservoirs (Aguilar-Benitez, 2011; Trenberth and Fasullo, 2007) and recharging aquifers, rivers and lakes (Díaz et al., 2008). In arid and semi-arid regions of southern Madagascar, TCs Honde and Jude made landfall from 25 February to 16 March 2025 and produced an average of 204 mm of rainfall in 24 hours over the Androy Area, which is close to half the average summer precipitation for the region.

While in some places tropical cyclones represent a catastrophic climatic phenomenon, they can represent something else for the populations of the Androy coast. They become desirable for communities. Under the impact of climate change, seasons are disrupted and the arrival of rains is no

longer predictable. This makes tropical cyclones an essential climatic element of the summer rainy season on the Androy coast. Similarly, TCs that are close to Mexico may contribute from 20 to 60% of the observed seasonal rainfall for some coastal regions (Englehart and Douglas, 2001; Breña-Naranjo et al. 2015).

Implication

Thus, TCs represent different things depending on the context and local understanding of the phenomenon. In the sight of thirsty communities and parched by the lack of water resources, cyclones are now a 'blessing' in Androy (if they are given a name). The assessment of post-cyclone results differs for different experiences of climate and climate change, which are influenced by and grounded in everyday cultural and physical contexts. The Ntandroy's experience of climate and climate change raises an anthropological peculiarity in the face of the positive impact of TCs. Local, contextual and cultural representations of TCs in southern Madagascar include different perceptions of risk depending on the personal history and daily life of the Ntandroy (Moser, 2014; Brace and Geoghegan, 2011). In short, including the positive effect of TCs in climate outlooks would be of great benefit in water management plans where water distribution is frequently decided on a yearly basis, especially during periods of drought (Neri and Magaña, 2016).

IV. CONCLUSION

This article discussed how TCs are known and understood, and furthermore, hoped for, according to the personal history, social context, geographical, and cultural specificity of the inhabitants of Ambovombe District. Better understanding the impacts of TCs is essential for human mitigation and adaptation in a changing climate, especially in semi-arid areas such as the Androy region. Hence, including the positive effect of TCs in climate outlooks would be of great advantage in water management plans for every location in terms of water needs and crises induced by climate variability. Changes in regional precipitation are now documented and examined through the contribution of Jude and Honde TCs to seasonal

precipitation in arid and sub-arid southern Madagascar. Effectively, precipitation brought by cyclone systems has long been known as a major contributor to devastating flood events elsewhere, but TCs may be desired and hoped for water suppliers during dry periods, ameliorating the effects of water crises, particularly in Androy. Tropical cyclone rainfall patterns and intensity do not necessarily correlate directly with harmful impacts. Nevertheless, research does indicate some important findings that can be applied to understanding and predicting TCs rainfall location, extent, and intensity.

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