International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

Vol. 39 No. 1 June 2023, pp. 358-369

Water, Sanitation And Hygiene (WASH) Issues In Food-Deprived Households Living In Low-Lying Areas Case Study Of Andohatapenaka, Antananarivo

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Abstract – Everyone prepares to protect themselves and their property. The aim of this article is to highlight the importance of this preparation for people living in flood-prone areas. The research was carried out in a vulnerable neighborhood, described as eternally flooded, in the *Commune Urbaine d'Antananarivo*. This recurring phenomenon raises the issue of the resilience of the resident population of Andohatapenaka and prompts us to ask the following question: *Are the behaviors of the inhabitants of the slums moving towards a culture of resilience*? The results show that when respondents mention an attitude or behavior in relation to Disaster Risk Reduction (DRR), this in no way means that they act as they do, but it is already a step in the direction of a culture of resilience.

Keywords – Antananarivo, Behavior, Flooding, Low-Lying Areas Madagascar, Resilient Household, Vulnerability.

I. CONTEXT OF THE STUDY

The cyclone seasons in Madagascar are characterized by cyclones accompanied by heavy rainfall and incessant downpours. The low-lying districts of Andohatapenaka in the city of Antananarivo combine these flood risk factors: every year and every cyclone season, they fall victim to flooding of varying degrees of severity, but paradoxically the resident population continues to occupy these flood-prone areas. Does this mean that they have become resilient?

This repetitive situation inevitably raises the issue of the resilience of the resident population of Andohatapenaka and prompts us to ask the following questions:

(i) Are the people of Andohatapenaka vulnerable to flooding?

(ii) Is Andohatapenaka doomed to be forever vulnerable to flooding?

(iii) Is there a desire for resilience among these residents?

(iv) Are the behaviors of inner-city residents moving towards a culture of resilience? and

(v) Does being prepared protect against damage caused by hazards?

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In order to answer these questions, we propose to verify the following hypothesis: H1: The welfare mentality is a brake on the culture of resilience. H2: Thinking about being prepared is a culture of resilience. H3: Resilience depends on financial and physical capacity.

II. METHODOLOGY

The methodology adopted in carrying out this research was inspired by the literature review and the exploitation of the following documents: those relating to the understanding of the various notions, key concepts of DRM, documents related to flood risks, other national references on DRM, and other areas necessary for the research.

As the survey could not be exhaustive, a selection of neighborhoods and sampling were used to define the physical boundaries of the survey area. The objectives of the questionnaire, which was administered to the households involved in our study, focused the survey on the following areas, among others: the population's opinion/wishes according to the cycle and the themes relating to DRM, vulnerability and the culture of resilience.

Before starting the survey on the whole sample, we tested the questionnaire on a few individuals in order to refine and complete the questions. We used probability random sampling. The sample size was set at 202 households after consultation with the *fokontany* chief.

For the actual fieldwork, five teams of two interviewers each were formed, supervised by three supervisors who recorded the GPS data for each dwelling. Since the questionnaire was in Malagasy, the opinions were translated into French and coded. For example, the opinions coded P (Preparation) stated that in order to prepare or forecast

Opinions arguing that the occurrence of a flood requires help of some kind for them are coded A (Help): food, financial, material, administrative, general help, solidarity. Opinions arguing that people should put up with the shock as best they can are classified as H (shock) :

After this coding, the pivot table technique was used to produce highly expressive representations of the distribution of these opinions and wishes according to three (3) clear-cut attitudes [Preparation (**P**), Help (**A)** and Shock (**H**)].

III. EMPIRICAL AND THEORETICAL REVIEW

The importance of the literature on the concept of resilience is indicative of the growing importance of natural hazards and disasters in scientific debates. The Hyōgo Framework for Action (2005-2015) chose as its theme "*Building disaster resilient nations and communities".* The recurrence and intensity of the impacts of floods on habitat are such that in recent years there has been a proliferation of publications on the subject (Verrhiest, 2005). There is a wealth of literature on the subject, but we shall confine ourselves to what interests us here, i.e. the resilience of housing in urban environments and the behavior of residents.

Madagascar's National Risk and Disaster Management Office (BNGRC, 2010), in its cyclone-flood contingency plan for 2010-2011, notes that the poor generally live in areas exposed to hazards and build homes that offer no security in the event of a disaster. Poor infrastructure amplifies the impact of disasters on the population, especially for the most vulnerable people and in vulnerable areas, in our case flood-prone areas. As a preventive measure, the mandate of the BNGRC's3 "habitat" sector group is to rebuild or rehabilitate housing, while promoting the adoption of norms and standards adapted to the climatic conditions specific to each region. There are nine sectoral groups (themes) within the BNGRC, namely: nutrition, food security, logistics, housing, washing, protection, IEC, health and education. It must be acknowledged that the cost of housing rehabilitation is one, if not the main problem facing households after a flood. (Aviotti, 2011)

3 In this article, it is important to note that the food safety sector group is included under nutrition.

We cannot talk about vulnerability without talking about resilience, because vulnerability and resilience are two sides of the same coin. In fact, to reduce vulnerability we need to increase resilience. Understanding resilience therefore implies understanding vulnerability. Vulnerability is a complex phenomenon with social, economic, health, environmental and cultural dimensions. It has two facets: the degree of exposure to disasters (sensitivity) and the ability of a society or community to cope with or bounce back from the consequences of a disaster (resilience). Disaster Risk Reduction (DRR) programs aim to reduce exposure/sensitivity and increase resilience. It is therefore impossible to talk about resilience without talking about vulnerability.

The literature on urban vulnerability has been developing steadily over the last twenty years. Research by Pelling (2003), Chardon (1996), Cutter *et al.* (2000) and Weichselgartner (2001) has paved the way by focusing on social vulnerability, population vulnerability, economic vulnerability, etc., while the work of D'Ercole et al. D'Ercole *et al* (2009) have attempted to shed important light on the geographical understanding of the social dimension of vulnerability. In particular, they referred to the work of Pigeon (2005) and Coanus and Pérouse (2006*)*, who concluded that the combination of hazard and vulnerability was conceptually ineffective. Analyses have slowly shifted to understanding what makes people vulnerable and what makes them resilient, since areas subject to hazards are often already heavily urbanized and protective structures have shown their limitations.

D'Ercole and Metzger (2009) have taken a significant step forward in defining the concept of intrinsic vulnerability, which they consider to be the specific weaknesses that characterise each issue (e.g. the low socio-economic level of the population, the age of the installations, deficiencies in the components of the technical systems and the poor quality of the buildings). The question is therefore whether a good quality building with well-maintained installations is safe. Salagnac (2006) gives us the answer to this question by saying that water is a building's number one enemy. We might therefore be led to believe that you need to have a metre of water in your home to be classified as a disaster victim, but Vinet and Defossez (2006) note that as soon as water penetrates an inhabited or occupied area, whatever the water level (20 cm or 1.5 m of water), it's a disaster.

In the previous section we said that vulnerability and resilience are two sides of the same coin. How can we define resilience? The degree of resistance to a shock is the most simplistic definition of resilience. A more elaborate definition, and perhaps the most widely cited in the scientific literature (UNISDR, 2009), notes that resilience is the capacity of a system, community or society exposed to hazards to resist, absorb, accommodate and correct the effects of a hazard, in a timely and effective manner, including through the preservation and restoration of its essential structures and basic functions.

The resilience of a community can be defined as: (i) the capacity to manage or maintain certain basic functions or structures (Randrianalijaona, 2008), (ii) the capacity of that society to absorb the shock through resistance or adaptation (Ballet *et al.* 2003) and finally (iii) the capacity to recover or 'bounce back' after a shock. Resilience therefore has a temporal dimension. It assumes that resilience can only be assessed after a shock, and there is a whole range of methods for calculating resilience time or recovery time. Obviously, this temporal definition of resilience divides the scientific community. On the one hand, there are those who consider resilience to be the capacity of a community to prepare 'before' the shock and to recover 'after' (D'Ercole *et al.* 2009). On the other hand, there are those who believe that a shock must first occur in order to determine a community's resilience in the face of that shock (Randrianalijaona 2008). Consequently, the multidimensional nature of resilience makes its definition complex. There are several indicators of resilience, and measuring it is not easy.

This literature review section cannot end without mentioning the concept that is often associated with resilience: capacity. A resilient society is one that has the capacity to cope with and recover from disasters. Many of their coping mechanisms are sustainable and beneficial, but others can also be harmful. Resilience measures or assessments must therefore identify the positive strategies that increase resilience, but also identify the reasons that lead a community to adopt negative strategies.

In the quest for development, the notion of capacity building is now one of the essential steps for the effective success of actions undertaken. And in this field, capacity has its own meaning depending on the level considered (Andrianiaina, 2013). But at the individual level, capacity refers to a change in mentality and behavior in order to acquire aptitude and performance. (MEDD**,** no date)

NGOs working in the field of DRM also propose indicators to assess the level of local governance of risks and disasters. To develop these indicators, it is essential to mobilise all stakeholders. The process begins with risk awareness, followed by the ability to reduce these risks by adopting specific protective behaviors. (Andrianiaina, 2013)

At the same time, a sociologically-oriented analysis (d'Ercole, 1994, Thouret and d'Ercole, 1996, Metzger and d'Ercole, 2001) seeks to identify the factors that make a society vulnerable, such as socio-cultural factors (behavior patterns in the event of a crisis, perception of danger, etc.) and technical factors (poor quality of construction, undersizing and lack of maintenance of structures, etc.). This raises the question of how to behave in the event of a crisis.

Lazarus and Launier (1978), have two types of response, adaptation and coping. Lazarus (1966, 1976) was the first to introduce

the notion of "coping". Adaptation corresponds to an automatic response based on pre-established behavioral models. Coping[1] is an active process that leads to changes designed to improve control over the situation. It involves a variety of strategies and behaviors, ranging from external, conscious behavioral strategies to more internal, unconscious psychological processes. Sattler et al (2002) focus more specifically on acceptance of the situation, positive evaluation by putting the benefits of the situation into perspective, and comparison with those who cope less well.

Sorensen and Mileti (1987), for their part, were mainly interested in the adjustment of individuals and their behavior. For them, adjustment corresponds to conscious or unconscious actions whose purpose is to cope; these are behaviors of self-protection and preparation for the event, what they call behavioral strategies.

For a better understanding of what follows, the reader is well-advised to read the compilation of the definitions of certain terms5 relating to the GRC cycle in the literature (UNISDR, 2009)[2]

IV. BEHAVIORAL ANALYSIS

Madagascar was ranked the third most vulnerable country to climate change by the Maplecroft[3] Institute6 in 2011. Disasters caused by natural hazards can have far-reaching socio-economic impacts, increasing the vulnerability of exposed populations. Many governments are emphasizing the importance of preparedness for all stakeholders, both public and private, in their national GRC policies.

1. In relation to the DRM cycle

In the case of the inhabitants of Andohatapenaka, the following figure gives us an overview of the behavior of the population in relation to their activities according to the GRC cycle.

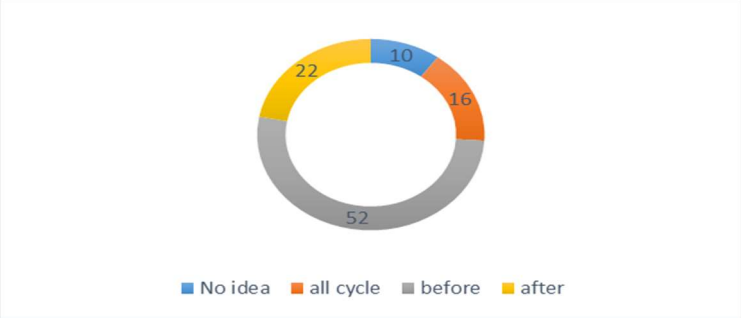

Figure n°1: Activities of inhabitants according to the DRM cycle
Source: CERED, 2014

This graph shows that a high percentage of residents (10%) had no opinion when asked about their preparedness or prevention activities. The majority of respondents (52%) said that they prepare before the onset of the rainy season, i.e. the cyclone season. 16% were classified in the "all cycle" category, i.e. they were carrying out DRM activities before, during and after the disaster.

However, it is interesting to disaggregate our results. In fact, the respondents' answers can be divided into two categories: alone or combined. By *Alone* we mean respondents who do only one CRM activity. Respondents who carry out several activities (for example: before and after) will be classified under the *combined* label. The figure below represents this disaggregation.

[1] *Coping:* term commonly used in French scientific literature to designate coping strategies

[2] UNISDR, 2009. Terminology for disaster risk reduction.

[3] Maplecroft, Climate Change Risk Atlas, 2011, http://www.maplecroft.com/about/news/ccvi.html. The countries identified as the most vulnerable are: 1- Bangladesh, 2- India, 3- Madagascar, 4- Nepal, 5-Mozambique, 6- Philippines, 7- Haiti, 8- Afghanistan, 9-Zimbabwe, 10- Myanmar

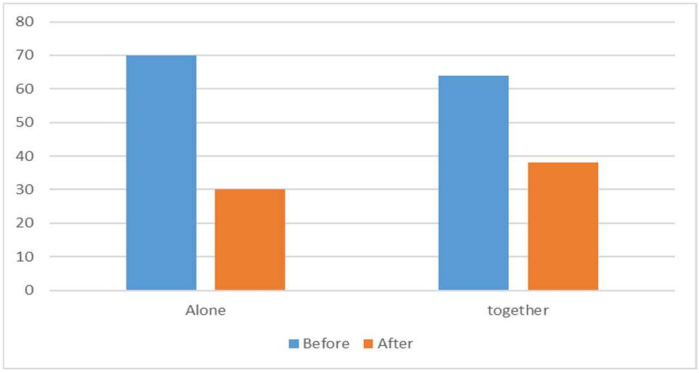

Figure n°2: Disaggregated activities of inhabitants according to the DRM cycle

Source: CERED, 2014

The results of the survey show that 70% of respondents said that they had carried out CRM activities even before the rainy seasons arrived. 62% of them carried out just one CRM activity. The remaining 8% carried out a combination of activities (e.g. before and after, before and during).

The analysis of residents' behavior can be approached in two ways: temporal and thematic (sector/cluster). The first part of this analysis of the results was devoted to the temporal analysis, i.e. in relation to the CRM cycle. In the following section, we will present the results of the survey by classifying them according to the different GRC themes.

2. In relation to the themes

There are nine sectoral groups (which we will call themes) within the BNGRC's Cercle de Réflexion des Intervenants en Catastrophes (CRIC): nutrition, food security, logistics, housing, washing, protection, IEC, health and education. When carrying out the survey, it is important to note that food security is included in nutrition because the respondents do not distinguish between food security and nutrition. This should be borne in mind when interpreting the following figure.

The results of the household survey show the following themes in descending order: nutrition comes first, followed by WASH, logistics, housing, IEC, protection and education. Health comes last in terms of priority for residents.

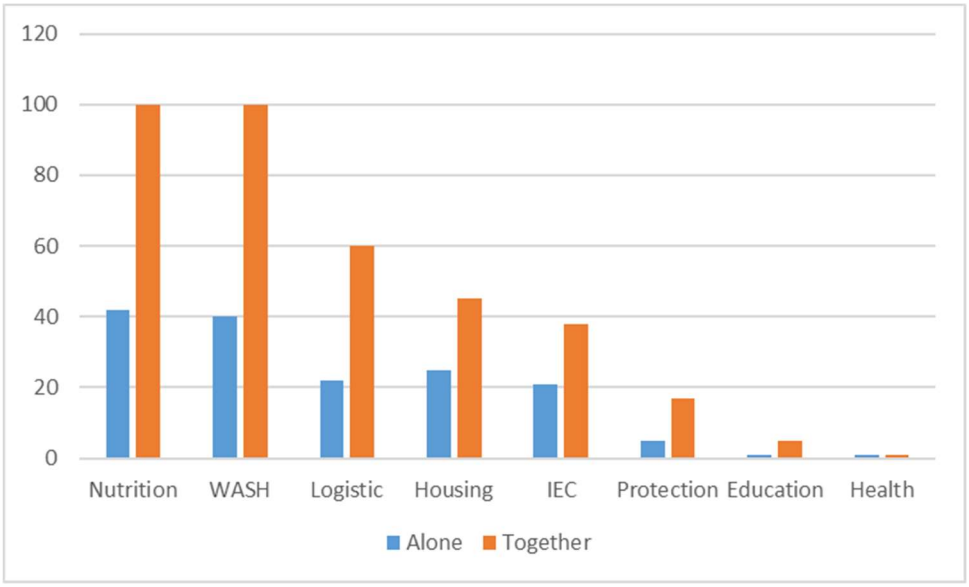

Figure 3: Inhabitants behavior according to the thematic of DRM

Source: CERED, 2014

For the remainder of this study, we focused our attention on the first four themes that stand out: nutrition, WASH, logistics and housing. We thought it would be useful to look at how and why health, which is a very important issue for slum dwellers, came last.

As with the previous section, it is interesting to disaggregate our results because the respondents' answers can be divided into two; alone or combined.

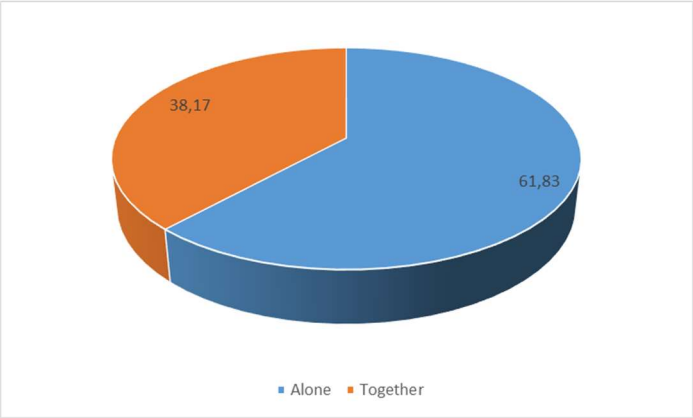

Figure n° 4: Disaggregated behavior of inhabitants according to the thematic of the DRM cycle

Source: CERED, 2014

The results of the survey show that the majority of residents, i.e. 61.83%, responded by giving a single theme. In other words, their behavior is categorized as "*single". In* contrast, 38.17% of residents' behavior can be described as "*combined"*, as their behavior encompasses more than two themes (for example: nutrition and logistics).

3. Food vulnerability

For communities living in neighborhoods vulnerable to flooding, the issue of food is a major concern; it is also the most used niche, as the following table shows.

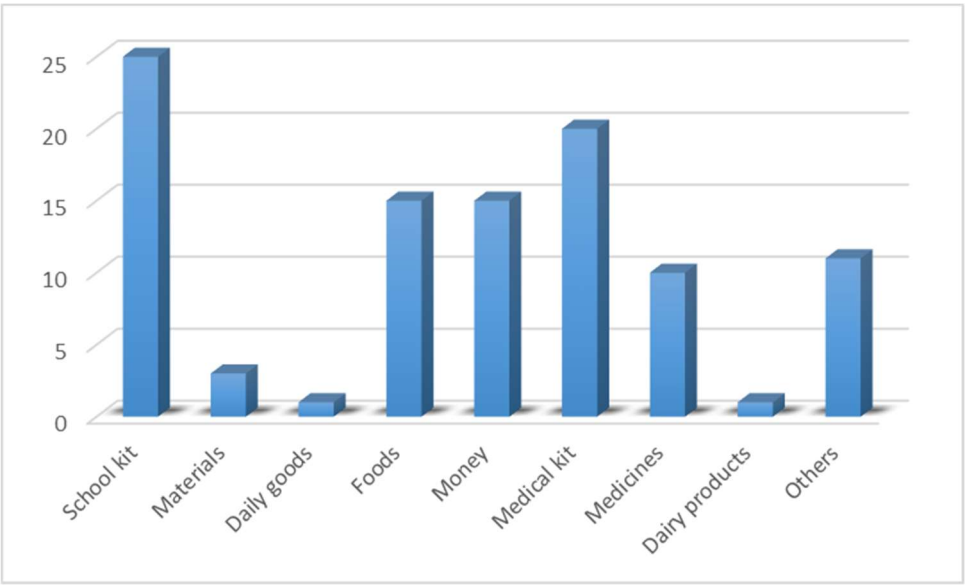

Figure 5: Help distribution according to the type of aid

Source: CERED, 2014

According to this figure, it can be said that food aid was of great importance. The distribution of school kits was an official aid measure for all families in the country, but not specifically for parents in the disaster areas.

Food aid (13.16%) is also significant. This is explained by the fact that it is easy to give this type of aid. Lastly, only around 1.32% of donations were in the form of PPN. In total, for the type of aid in Andohatapenaka: (i) 23.68%: school kits, (ii) 19.74%: health kits, (iii) 13.16%: food and (iv) 1.32%: PPN.

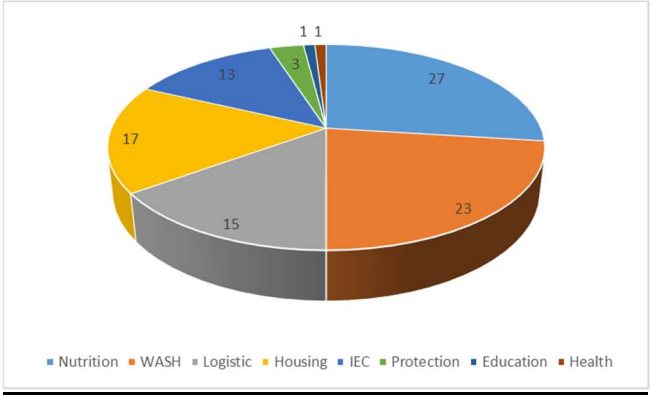

Figure 6: Households behavior according to the thematic of DRM

Source: CERED 2010

This figure shows that nutrition and WASH play an important role in household behavior with regard to DRM issues.

4. Analysis of the vulnerability of the population according to the WASH theme

In this section, we look first at sanitation, then water supply and finally waste management.

4.1 Means of sanitation

Sanitation behavior has a major impact on the health of the home. In order to highlight the express desire for responsible sanitation, we have grouped the categories in the following graphs.

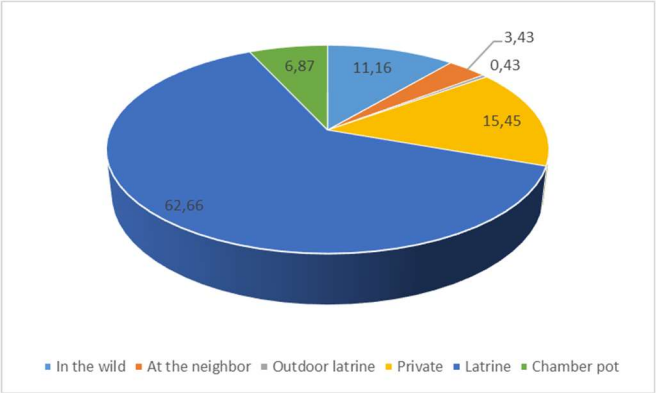

Figure 7: Households behavior according to sanitary and WASH habits

Source; CERED Survey 2004

Despite health campaigns on the need for latrines, it is still important to note that almost 20% of households pollute their environment on a daily basis and relieve themselves in the open (canal, etc.). In total, 81.97% of households in Andohatapenaka relieve themselves in a suitable place, whether that place is public, the household's own (private), or borrowed in one way or another.

As far as public toilets are concerned, it would have been interesting to know who uses them; Figure No. x on sanitation is not

sufficiently explicit as far as the "latrine" category is concerned; the proportion of those who say they use latrines does not make it possible to know the proportion of public toilets. It should be noted, however, that the dirtiness of the environment around these public toilets discourages some potential users, leading them to use nature as a place for sanitation.

4.2 Water supply

The Fokontany has a network of standpipes managed by the communities. Without going into the management of the standpipes, it should be noted that at many standpipe points, there is a clear effort to improve the immediate environment.

The water supply is a good indicator of the poverty and vulnerability of the inhabitants. Only 3% of households in Andohatapenaka have a JIRAMA[4] connection. It can be said that the vast majority of households get their water from standpipes (94.85%).

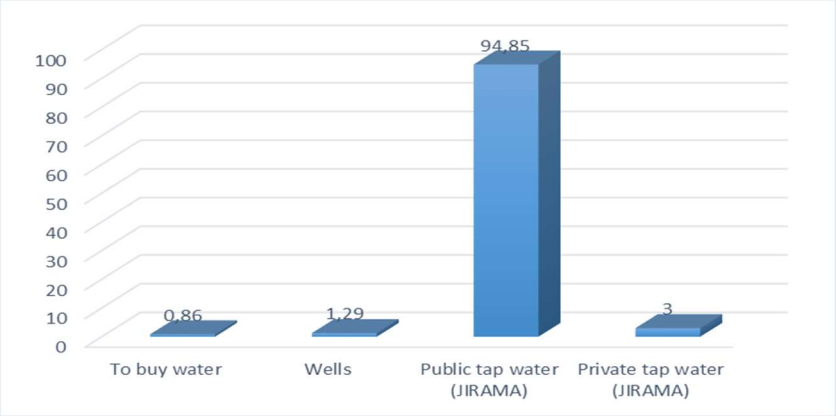

Figure 8: Household access to water
Source: CERED Survey 2010

This aspect of vulnerability can also be analyzed according to the distance from the standpipes and the length of the queue. The distribution of standpipes in the Fokontany makes it easier or harder for people to spend time waiting for water, which is a daily necessity for them.

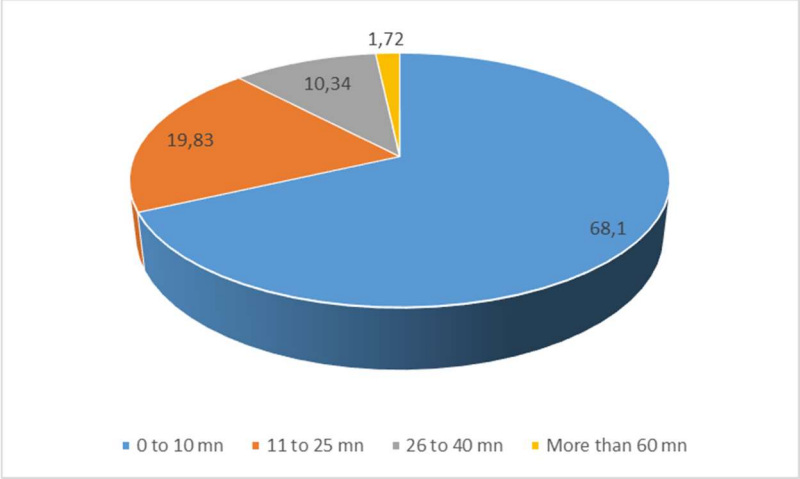

Figure 9: Household access to water according to distance and time to wait in line
Source: CERED Survey 2010

[4] JIRAMA: Jiro sy Rano Malagasy, a public-owned water and energy supplier in Madagascar

The graph above shows the cost in terms of time in obtaining water from standpipes. It turns out that around 68.10% of the population of Andohatapenaka is more advantaged in terms of water supply distance. Indeed, the percentage of households spending the least time is 68.10%. It should no doubt be pointed out that it is not so much the geographical distance that matters but the waiting time at peak full stops.

4.3 Waste and household refuse management

The behavior of residents with regard to household waste explains the general appearance of their environment. The figure below shows the distribution of households according to their waste and household refuse disposal practices.

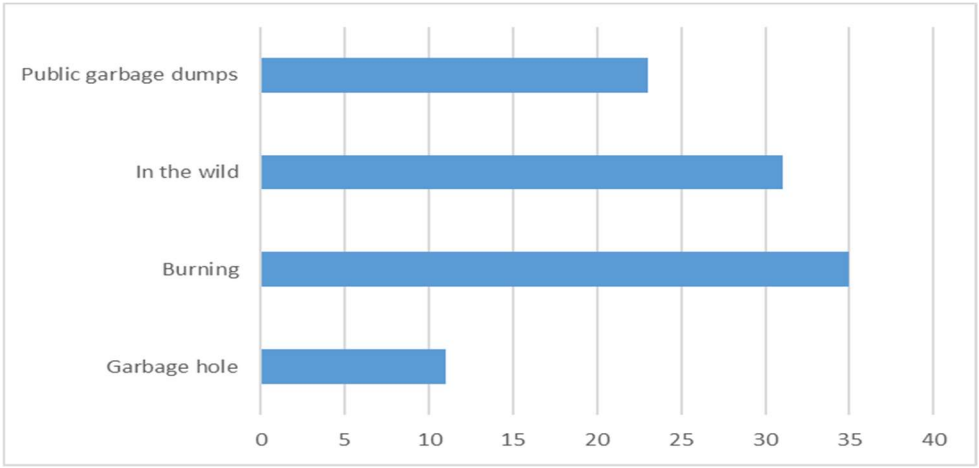

Figure 10: Household distribution according to waste management

Source: CERED Survey 2010

By grouping together, the attitudes adopted by household respondents, this graph shows the risks incurred for the environment by the burning of this rubbish (35%). Moreover, the worst behavior is undoubtedly that of throwing rubbish out into the open (31%), which is none other than the immediate environment and often the canals or slabs that can no longer serve their purpose. Only 23% of households in Andohatapenaka use public rubbish tips (rubbish bins or places designated for this purpose).

V. CONCLUSION

Intellectual honesty obliges us to say that this article should be read with the following limitations in mind. Firstly, despite the precautions taken, there was some reluctance and enthusiasm on the part of some local people, who had to be calmed down to avoid biasing our sample. In Madagascar, a survey is often equated with a subsequent distribution of aid, which would require lists of beneficiaries to be drawn up. We had to explain that the study on the floods did not mean that the survey was being carried out with the aim of obtaining compensation or aid of any kind. Despite these explanations, the interviewers found that some respondents underestimated or overestimated their problems.

Secondly, despite the precautions taken, some questions were not answered, which sometimes necessitated the designation of N.A. entry or simply blank. It should also be pointed out that a high percentage of residents had no opinion (10%) when asked about their preparedness or prevention activities.

Thirdly, in the methodology section we wrote that the GPS positions of each dwelling were recorded. These surveys are not exhaustive, given the density of the dwellings and the absence of any real alleyways. Some passages are so narrow that they had to be crossed in profile.

Fourthly, just because we say we're going to do something doesn't mean we're actually going to do it. When residents mention an attitude or behavior in relation to the GRC, this does not necessarily mean that they will act as they do, but it is already an advantage that they are aware of it. In this article, the culture of resilience means that, for the moment, local people are focusing on preparation, which will lead them to resilience.

With regard to the notion of *coping, the* results of our survey carried out in this *fokontany* show that, contrary to Sattler et al (2002) in their literature review, *coping* only means waiting idly by and accepting one's fate. And finally, emergency response: this is the set of coordinated activities aimed at meeting the needs of people affected by a disaster, but also the set of decisions and actions taken during and immediately after a disaster, including immediate relief.

Firstly, the inhabitants of Andohatapenaka are eternally condemned to live with flooding because they have built in flood-prone areas. Secondly, in general, the behavior of the inhabitants of the low-lying districts is not geared towards a culture of resilience, even if some of them do want to be resilient. With regard to our hypotheses, the following can be said (i) The first hypothesis, which stipulates that a dependency mentality is an obstacle to a culture of resilience, has been verified. (ii) The other hypotheses were all rejected because the wishes and opinions expressed were not followed up by corresponding actions. Finally, simply thinking about being prepared does not constitute a culture of resilience, which is largely dependent on financial, physical and other capacities. One question relating to building in flood-prone areas and the difficulty of accessing drinking water remains unanswered and should be the subject of further research.

VI. ACKNOWLEDGEMENTS

The surveys and this research are the fruit of a collective effort. We would therefore like to thank:

- CERED for its logistical and financial support;
- The leaders of the Fokontany, public institutions, NGOs (Non-Governmental Organizations) and the inhabitants of the Fokontany of Andohatapenaka for their availability, their reflection, their welcome, their availability and their participation;
- The Centre de Développement d'Andohatapenaka (CDA)[5] , which greatly facilitated our work, and finally
- All those who contributed in any way to this study (interviewers, supervisors, guides, Fokontany presidents, neighborhood chiefs etc....)

REFERENCES

[1]. **Andrianiaina Seheno Fanantenana (2013)** « Gouvernance locale des risques et des catastrophes : Capacité des acteurs locaux » Mémoire de fin d'études pour l'obtention du Diplôme d'études supérieures spécialisées Multidisciplinaire en Gestion des Risques et des Catastrophes. Faculté de Droit d'Economie de Gestion et de Sociologie. Université d'Antananarivo. Madagascar.

[2]. **Autorité pour la Protection contre les Inondations de la Plaine d'Antananarivo,** 15 Novembre 2006, Le système de drainage de la ville d'Antananarivo, Notre Guide à l'usage du personnel d'exploitation ;

[3]. **Aviotti A.** (**2011**). Contribution à la caractérisation de la vulnérabilité de l'habitat individuel face à l'inondation. Vers un outil d'autodiagnostic, thèse de doctorat, École nationale supérieure des mines de Paris.

[4]. **Ballet J., Dubois J.L., Mathieu FR.,** (**2003**). Le développement socialement durable : un moyen d'intégrer capacités et durabilité, paper for the 3rd Conference on the Capability Approach, University of Pavia.

[5]. **BNGRC** (**2010**). Plan national de contingence sur les cyclones et les inondations 2010-2011, Version N°4, Ministry of the Interior.

[6]. **Bureau du projet de développement de la plaine d'Antananrivo**, BCEOM, INFRAMAD-JARY, Mai **1999**, Urbanisation de la plaine Nord d'Antananarivo, Note d'expertise hydraulique.

[7]. **Chardon A.-C.** (**1996**). Croissance urbaine et risques " naturels ". Évaluation de la vulnérabilité à Manizales, Andes de Colombie, PhD thesis, Université Joseph Fourier - Grenoble.

[8]. **Conseil de Développement d'Andohatapenaka**, February **2007**, Programme d'urgence 2007 ;

[5] Père Couture created the Andohatapenaka Development Council in 1982, and the center was recognized as an NGO in June 1987, governed by Ordinance 60-133 of 3 October 1968.

[9]. **Cutter S.-L., MitShell J.T., Scott M. S.** (**2000**). Revealing the vulnerability of people and places: a case study of Georgetown county, South Carolina, Annals of the Association of American Geographers, 90(4): 713-737.

[10]. **D'Ercole R. and Metzger P.** (**2009**). "La vulnérabilité territoriale : une nouvelle approche des risques en milieu urbain", Cybergeo, Vulnérabilités urbaines au sud, article 447, online since 31 March 2009, modified on 14 May 2009. URL: http://cybergeo.revues.org/index22022.html. Accessed on 01 March 2010.

[11]. **D'Ercole R., Gluski P., Hardy S., Sierra A.** (**2009**). "Urban vulnerability in developing countries. Présentation du dossier", Cybergeo, Vulnérabilités urbaines au sud, online since 06 April 2009, modified on 14 May 2009. URL: http://cybergeo.revues.org/index22151.html. Accessed on 01 March 2010.

[12]. **Jousseaume Valérie, Landrien Julie Et Mercie Denis, (2004)** La vulnérabilité des hommes et des habitations face au risque d'inondation dans le Val nantais (1841-2003) entre législation nationale et pratiques locales, Norois numéro 192. 16

[13]. **La Loire** (**2008**) Sociétés, risques, paysages, environnement, Presses Universitaires de Rennes. Pp.18

[14]. **Lorion David, (2006),** Endiguements et risques d'inondation en milieu tropical : l'exemple de l'île de la Réunion, Norois issue 201, Dynamiques fluviale et littorale, activité viticole, Presses Universitaires de Rennes, pp23 ;

[15]. **Mark Pelling** (**2003**). The Vulnerability of Cities: Natural Disasters and Social Resilience. London: Earthscan Pub.

[16]. **Ministère de l'Ecologie et du Développement Durable (MEDD).** (No date) Stratégies de faire face dans le cas d'une inondation catastrophique : Analyse des paramètres psychosociaux dans les procédures de gestion de crise. Laboratoire de Psychologie Environnementale UMR 8069/Université René Descartes

[17]. **Nomdo Christina Et Coetzee (2002)** Urban Vulnerability: Perspectives from Southern Africa, a Periperi publication, pp.207.

[18]. **Randrianalijaona T.M** (**2008**). Gestion communautaire des ressources naturelles et développement durable : Dans quelles mesures les contrats de transfert de gestion à Madagascar peuvent-ils contribuer durablement à la lutte contre la pauvreté en milieu rural tout en préservant l'environnement ? Thèse de Doctorat, Université d'Antananarivo, Madagascar.

[19]. **Razanarison Josée et Raobijaona Bruno,** Février **2001**, Habitat, diagnostic de l'insécurité urbaine et stratégie de prévention à Antananarivo, Programme des Nations Unies pour le Développement (PNUD), Centre des Nations Unies pour les Etablissements Humains CNUEH, sous la coordination de Soraya Smaoun, CNUEH (Habitat- et Marc GIRARDOT (SCTIP), pp 96 ;

[20]. **Royaume du Maroc.** (**No date**) Le renforcement des capacités des acteurs, la stratégie. Agence de Développement Social p4. Site visité le 17 juillet 2013

[21]. **Salagnac JL**., (**2006**), Vulnérabilité des bâtiments à l'inondation : qualification du comportement des matériaux, Décembre 2006.

[22]. **Sattler, D.N., Preston, A.J., Kaiser, Ch.F., Olivera, V.E., Valdez, J., Schlueter, Sh.** (**2002**). Hurricane Georges: A Cross-National Study Ex amining Preparedness, Resource Loss, and Psychological Distress in the U.S. Virgin Islands, Puerto Rico, Dominican Republic, and the United States. Journal of Traumatic Stress, Vol. 15, No. 5, , pp. 339-350.

[23]. **Soliman, H.H., Lingle, S.E., & Raymond, A.** (**1998**). Perceptions of indigenous workers following participation in a disaster relief project. Community-Mental-Health-Journal. Vol 34(6): 557-568.

[24]. **Sorensen, J.H., & Mileti, D.S.** (**1987**). Programs that encourage the adoption of precautions against natural hazards: review and evaluation. In Taking care, Weinstein N. D. (Ed), Cambridge University Press.Pp.208-230

[25]. **Thouret, J.-C. and d'Ercole, R.** (**1996**). Vulnerability to natural hazards in urban areas: effects, factors and social responses, Cah. Sci. hum. 32 (2), 407-422. 17

[26]. **UNISDR** (**2009**). Terminology for disaster risk reduction, Geneva, Switzerland.

[27]. **Verrhiest** G. (**2005**). Synthèse bibliographique relative à la vulnérabilité au risque d'inondation Présentation des

principaux documents publiés, CETE méditerranée.

[28]. **Vinet F., Boissier L., Defossez S.** (2011). La mortalité comme expression de la vulnérabilité humaine face aux catastrophes naturelles : deux inondations récentes en France (Xynthia, Var, 2010), Paris : L'Harmattan.

[29]. **Weichselgartner J**. (**2001**). Disaster Mitigation: The Concept of vulnerability Revisited, Disaster Prevention and Management, vol. 10, no 2, p. 85-94