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ENVIRONMENTAL ANALYSIS OF AQUIDAUANA RIVER FLOOD PLAIN OF THE PRELUDE OF SOUTH MATOGROSSENSE'S PANTANAL: FLOODS AND RISKS TO REVERBERATE IN AQUIDAUANA/MS TOWN

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ABSTRACT: The Aquidauna town is located in the western region of the state of Mato Grosso do Sul, Brazil, is considered part of the Plain Pantaneira's Protection Zone. This work seeks to reflect the environmental vulnerability of floodplain inundation on the right bank of the river Aquidauna within the city, emphasizing the degree of risk to which it is exposed population, urban mapping function in flood area, identify the intensity of the magnitudes seasonal flooding between 1976 and 2013 to determine the chronological time of exceptional magnitude floods occurred in this period within the urban area of the municipality of Aquidauna. To achieve the objectives questionnaires on the right bank of the river Aquidauna were performed within the floodplain, site visits, job mapping through CAD software for design, survey data quota, flow through the system and rainfall at Hydro Web system. The results of the study identify flood risks associated with the housing, which can be classified in Low - R1, Medium - R2, and High - R3. It was found that the area about 40 % of the homes is in a high risk situation (R3), demonstrating that environmental vulnerability associated with rainfall excesses arising from climatic extremes exposes the society to a critical situation and susceptible to frequent flooding , when the magnitude of the water moves toward its floodplain flood impacting the Aquidauna town. Becomes plausible structural measures, compliance with what is established in the legal instruments and the federal, state and municipal levels, as well as preventive and emergency actions converging minimization and solution to the impacts resulting from the demonstrations in the coming episodes of flooding at the climate extreme.

Key words: Vulnerability, Risks, Aquidauna River, Rainfall Excesses, Flood

1. INTRODUCTION

The Pantanal is the result of periodic flooding cycle and its biodiversity is related to the height reached by seasonal floods. The episodes overflow channels are characteristic of the Brazilian South Mato Grosso's Pantanal, these seasonal peaks of increased river flow in the region is the to instigate the ecosystem of Pantanal biome. However, with the advancement in the use and occupation of space, especially in the economic activities in the areas of extremely flat altimetry process. Significant impacts have been sedimented in the prelude to the Pantanal, especially in the flood plain of the Aquidauana/MS town.

The Aquidauana River has its drainage head in the "Serra de Maracaju"- Campo Grande in the municipality of São Gabriel do Oeste north of South Mato Grosso state. Its waters have cut the "Piedmontese" following the central direction of state, bathing municipalities that make up its basin, when abruptly changes its course in the direction west-central and northwestern entering the municipality of Aquidauana in the beginning of lowland river emptying into Miranda river. From the source of the Maracaju Plateau, in the municipality of São Gabriel do Oeste, to the confluence with the Miranda river, region in Pantanal Plain, has 689 km of extension.

Viscount of Taunay leading pioneer team in the region at the time of the War of the Triple Alliance ensures that:

> Cutting part of the southernmost district of Mato Grosso and con-fluent Miranda, who still retains the nickname of *Guaicuru Mbotety* and out by the Portuguese christened

> *Mondego* - so beautiful they seemed to mind wistful - is born of Aquidauana strands away from big hills of Serra de Maracaju or Amambaí "(TAUNAY 1921 p. 7).

The upper course of the river is fed by many tributaries of the Central region - North of South Mato Grosso, to covering the municipalities of the Corguinho, Rochedo, Terenos and Dois Irmãos do Buriti; approximately in the downstream of the Aquidauana town, begins a typical plain behavior. But the impact of extreme weather events materializes, with greater intensity, in the Aquidauana town.

Located in the Midwest of Brazil, the Aquidauana town is inserted in the western portion of the of South Mato Grosso state, prelude of South Mato Grosso's Pantanal, in geographic coordinates "20º 28' 15" south latitude and "55 º 47 '13 " west longitude. Its altitude is approximately 147.663 meters (NR 259K) in relation to sea level, the total area is 16,960 km ² (IBGE, 2013).

The geologic/geomorphologic constrains of the area that bordering the canal, are relevant in the process of flooding of the Aquidauana town because the topography in this area lies with dimensions ranging between 136.00m and 143.00m, which corroborates in floodwaters for sprinkling of water towards the exceptional riverbed, making this area highly vulnerable to natural disasters, especially when the region is affected by episodes of excessive rainfall, the influence of Humidity Convergence Zone (HCZ) or system large-scale Convergence Zone of South Atlantic (CZSA).

It is observed that the floods in urban areas are responsible for major disasters and losses and is the result of two processes that can occur alone or integrated:

> Flooding of coastal areas are natural floods occurring in most riverbeds because of the temporal and spatial variability of precipitation and runoff in the watershed; flooding due to urbanization: the floods are occurring in urban drainage because of the effect of soil sealing, pipe flow or obstructions to flow (TUCCI, 2008 p.104- 105).

Referring to the Aquidauana town from the 1950s went through changes in public policy, when the municipal government authorized the allotment area for the passage of flood zone. Thus, gradually the floodplain, identified as "exceptional riverbed" (CHRISTOFOLETTI, 1980), became the urban space vulnerable to natural disasters, periodically reaching the population that occupies the largest area of danger/risk of the municipality. Instigating the use and occupation of the "Riverside Area" for more than four decades, the public power corroborated that would trigger the feeling of topophilia and resilience in the population, which makes difficult the removal and demolition of these buildings. Ideals emphasized by Correa (1989) that the feeling of resistance and there is very strong within the urban space. One of the factors present in the analyzed medium, that leading people refuse to leave the flooded area.

According to the Glossary of the National Secretariat of Civil Defense - SEDEC (CASTRO, 19 - , pag.102) flood is the "normal water overflow trough rivers, seas, lakes and ponds, or accumulation of water by deficient drainage in areas not normally submerged". Or yet, the same author (CASTRO, 2003, p. 48) reveals whether they are gradual "water tower of gradual and predictable manner, keeps in full situation for some time and then, if seep gradually. Normally, gradual floods are cyclical and seasonal clearly.

The spillovers are natural phenomena of hydrological courses seasonally invade areas designed to track the movement of flood, from this moment turns into flood depending on its magnitude and evolution. Through comparative long-term data, the Civil Defense ranks flooding as a function of magnitude.

> Exceptional floods; floods of great magnitude; normal or regular flooding; flooding of small magnitude. Depending on developments or yours evolutions, floods are classified into: floods or gradual flooding; mudslides or flash floods; flooding; coastal flooding caused by the sudden invasion of the sea (CASTRO, 2003, p.40).

In this perspective, this study presents an approach on the subject of periodic flooding suffered by the population occupying the floodplain flooding within the city limits of Aquidauana town, passing by the level of detail of the vulnerability that the population is exposed, relating to the spatial area risk (R/1,

R/2 and R/3) in sectors of the urban web, and defining the permanent preservation areas (APP) as Aquidauana River according the Forest Code Law No. 12.651 (BRAZIL, 2012).

Thus, the research product is a contribution to the mapping of urban function within the floodplain area in the Aquidauana town, approaching the carrying capacity of the area and a model of sustainable land management for families affected by natural disasters triggered by extreme climate in the Aquidauana town.

2. METHODOLOGICAL PROCEDURE AND ANALYSIS METHODS

To achieve the objectives outlined the methodology was based on the literature on the subject which will assist in planning and urban management, where theoretical approach were based in the Corrêa (1989), Maricato (2011) and Villaça (2012). For the processes of settlement and urbanization bibliographic authors dealing with this subject Silva & Joia (2001) and Neves (2007) were performed. To the understanding of urban flooding, hydrology, urban and environmental geomorphology of the study area was based on Christofoletti (1980), Tucci (1995, 2003 and 2008) and Jorge (2011) studies.

The concepts of risk, vulnerability and natural disasters the study bolstered in Castro (19 -, 1999 and 2003) and Basic Training for Civil Defense conducted through the course of long distance through the link: <http://www.defesacivil.cursoscad.ufsc.br/dc/4 /> in the period from 04/29/2013 to 06/14/2013.

The Laboratory of Cartography and Topography of UFMS/CPAQ released the CAD system, the images from Google Earth (2010) and ArcGIS 10® software for manufacturing and making layouts of the maps delimitation of permanent preservation areas (APP) zoning area risk, and urban function.

The topography was the variable representing satisfactorily the scale of the work, since by definition of quotas can determine the magnitude of flooding, and to establish the parameter for defining the area of risk. To determine the susceptibility elected aspects of weather, since the vegetation area is uncharacteristic and the slope in the study area is smooth.

For definition of vulnerability were analyzed the location of buildings and construction standards of residential and commercial activities, added to the intensity of this magnitude were also used socioeconomic analysis through interviews in 160 homes and 33 commercial activities established in the study area.

On Glossary for Civil Defense " vulnerability: probability of a particular community or geographic area to be affected by a potential threat or risk of disaster, established from technical studies" (CASTRO, 1999, p.15)

The classification of the different degrees of risk and danger was determined through the characterization of the study area; intensity of the magnitude of water which this population was exposed, based in the Ministry of Cities/Institute for Technological Research - IPT (BRAZIL, 2007), and according to the records of the quotas Aquidauana River in the Aquidauana town, where went established the river flow toward the floodplain at an elevation of 8.00 m; beginning of the flood. We identified the following risk levels in the study area:

> R/1 - Low - maintained existing conditions not expected to occur of destructive events in the period for a normal rainy season.
>
> R/2 - Medium - maintained the existing conditions it reduced the possibility of destructive events during episodes of intense and prolonged rainfall, the period for one rainy season.
>
> R/3 - High - maintained the existing conditions it is quite possible the occurrence of destructive events during episodes of intense and prolonged rainfall, the period for one rainy season (Adapted from IPT - BRAZIL, 2007).

From the site visits and interviews with residents, it was possible to reconcile the information with rainfall, flow and the quota of Aquidauana River, this way, handmade delimited area was subject to

flooding and urban mapping function taking as a basis the flood of exceptional magnitude of March 2011, since this was the most significant in 20 years, marking the ruler of the monitoring station No. 66945000 responsibility of the National Water Agency (NWA) positioned at the Roldão Carlos de Oliveira Bridge the quota the dimension of 10.50 m when normal is 2.96 m.

3. RESULTS AND DISCUSSION

The rivers that are part of the Upper Paraguay River Basin, as Aquidauana River present feature channels that have to cut the plateau has a slope greater than 6 cm/km; and on entering the plain channels shall have a slope 1-3 cm/km (BRAZIL, 1997). Such physical characteristics associated with high rainfall cause flooding of large areas in the region.

The word flood is latin origin and means to make full or filled (KOBIYAMA & GOERL, 2011). When the river waters rise up to the height of the gutter, without overflowing the areas of your surroundings, it is correct to say that a flood occurs. From the moment in which the water overflows, flooding occurs.

Referring specifically to Aquidauana River entering the medium course loses its competence, and the ability of dry cargo (then Palmeiras District), due to the reduction of land slope. As the river channel follows the longitudinal profile towards to Aquidauana town, hydrology and fits through the moving riverbed is shaped the landscape, making it a typical river with convenient characteristics to episodes of flooding according to the author (TUCCI, 2003).

"The flood floodplain of a river grows significantly in its middle and lower courses where the slope decreases and increases the incidence of flat areas" (TUCCI, 2003 p.55).

The floods in the basin of river flooding of Aquidauana River tend to be fast, but are linked to the flow regime of the Pantanal. All rivers of the Pantanal have riverbed with enough time to evacuate the means and insufficient filled for large floods that always cause partial flooding, the vulnerable space to the episode, as occur in the Aquidauana town.

In smaller watersheds such as the case of the Aquidauana River there is a rapid response between precipitation and river levels, because the response time of rising river levels depending on the rainfall amount upstream is below the detection limit (PADOVANI, 2010).

Understanding the problems plaguing the swamp area of the Aquidauana town moves through to understanding river system and the concept of riverbeds that command the fluvial dynamics of the region: ebb, lower, higher seasonal and exceptional greater.

> The riverbed of ebb, which is included in the smaller riverbed and is used for the disposal of low water. Constantly he meanders along the banks of the lower riverbed, watching “talvegue”, which is the line of greatest depth along the riverbed;
> The smaller riverbed, which is well defined, usually embedded between well defined margins. The water runoff in this riverbed has an enough frequency to prevent the growth of vegetation often. Along the lower riverbed there is an irregularity with deeper stretches, depressions (mouille or pous), followed by shallower parts, more rectilinear and oblique in relation to the apparent axis of the riverbed, designated threshold (seuils or rifles);
>
> The greater periodic or seasonal riverbed is regularly occupied by floods at least once every year; and
>
> The exceptional riverbed where to place the highest floods, “the floods”. It is submerged at irregular intervals but, by definition, not every year (CHRISTOFOLETTI, 1980, p.83).

It is observed that successive environmental mistakes made by many city managers potentiated the repetitive process of flooding, the result of the transformation range of river flooding of Aquidauana River in urban housing development, articulated by the municipal government. The significant fragmentation of river banks was initiated in January 1956, headed west to the east of the city, the

area of “Nossa Senhora da Imaculada Conceição Square” until the June 13 street, now called Francisco de Castro Street (SILVA & JOIA, 2001); corresponds to Permanent Protection Area (APP) in accordance with the Forest Code of 1965 and the new Forest Code, Law No. 12.651/2012 (BRAZIL, 2012).

The water levels that affect the urban area of Aquidauana town are measured through the slit installed in the position of monitoring station No. 66945000 responsibility of the National Water Agency (NWA) positioned at Roldão Carlos de Oliveira Bridge, popularly known as "Old Bridge", to observe them, it appears that only at times when the river exceeds the quota of 8.00m starting to trigger problems related to flooding that affects the population.

> The rivers during the rainy seasons they leave their smaller riverbed and take up most of the higher riverbed, inside a natural process. As this occurs irregularly over time, the population tends to occupy the higher riverbed being subject to the impact of floods (TUCCI, 2003, p.16-17).

The floods in urban areas are responsible for major disasters and losses and is therefore, according to Tucci (1993), of two processes that occur in isolation or integrated: flooding in riverside areas, which are natural and flooding caused by urbanization that occur due to soil sealing through the paving of roads and buildings and the reduction of green areas, which in turn increases the amount of water flowing over a precipitation event and increase the limit of the floodplain area.

According to (CASTRO, 1999 p.7) definition of disaster "[...] results from adverse events, natural or manmade, on a vulnerable ecosystem causing human, material and environmental damage and consequently economic and social losses". Thus Castro (1999) states that heavy rains are not disasters, but the main trigger of the problem, since this only happens when it finds a vulnerable environment.

This study showed that floods of greater intensity and exceptional magnitude in recent thirty- seven years correspond to May 1990, with rates not computed by NWA, but that the population mostly considers most of the last fifty years; October 1991 with quota of 9.66 m; December 1997 account quota of 9.88 m; March 2000, when the quota was measured 9.82 m and in March 2011 with quota of 10.50 m.

However, the case that can be considered exceptional is related to rainfall extremes that have exhausted all Brazilian Midwest regions working in the South Mato Grosso state since the end of 2010 until March 2011, boosting the typical seasonal flooding in the region. It was an episode of considerable size occurred at the eve of the carnival holiday when was necessary the assistance from various agencies in serving the local community. The Municipal Coordinator of Civil Defense Major Claudiney da Silva Quintana fired employees in the municipality of Aquidauana: 1st Sub grouping of Fire Brigade, 7th Battalion of Military Police, 9th Battalion of Combat Engineer and City Hall of Aquidauana town (COMDEC, 2011).

It should be emphasized that numerous disorders have been minimized through emergency and palliative measures made by the Municipal Coordination of Civil Defense (MCCD) and collaborators during the days of records of extreme rainfall volume. The episode highlighted the need to integrate prevention measures to extreme weather events and public policy especially in relation to urban planning and management, since the beginning in the XXI century accounts are four floods in the city with registration quota overflow of the river between 2001/9, 14m; 2006/8, 8m; 2010/8,99m and 2011/10,50m.

However, it is noted that during the episodes of flooding in the last episode recorded were the highest ever experienced by the local population and the public investment restructuring of the damage were considered. It can be inferred that such factors are coming intensifying in the processes of urban function in space, especially in the riverside area, besides the increase in the rate of sedimentation of the Aquidauana River.

Emphasized by (TUCCI, 1993) the occurrence of localized flooding in urban areas, are usually associated with busses to "strangle" the section of the river. These busses are made, mostly, by ducts or

bridges poorly scaled, landfill or siltation of excerpts from the riverbed, which is consistent with the characteristics that the Aquidauana River gets when, enters the urban perimeter of the Aquidauana town.

Specifically referring to the Aquidauana town, during the rainy season, the flow reaches a magnitude that can overwhelm the discharge chute of the watercourse and spill over marginal areas not normally occupied by water. This escape featuring the flooding, and the marginal area, which periodically receives such water excess is called in this study as a flood plain, floodplain or larger riverbed.

In the form of Damage Assessment (AVADAN, 2011) prepared by the Municipality of Aquidauana, losses exceeded twenty million of "reais" in urban areas and districts of Camisão, Piraputanga and Taunay totaling 10.560 people affected. In this quantitative, 675 families were left homeless.

The most affected region of the whole municipality, according to MCCD (2011), the flood of March 2011 was the Guanandy neighborhood where were recorded occurrences for 63 families between February 28 and March 19 days, necessitating removal, shelter and food of the Municipal Civil Defense. The episode had the support of the 9th BE Cmb who performed the installation of crosswalk aluminum, with 170.00m and helped people in crossing providing lifejackets (BRAZILIAN ARMY, 2011).

These numbers are significant for the Midwest region of Brazil but the reports of the Ministry of Integration, responsible for supplying the cities that have problems related to extreme weather events, shows no computed data for the Aquidauana town (BRASIL, 2012), factor which can be linked to lack of records of deaths related to the flooding episode. The natural disaster was an adverse event associated with the social and environmental vulnerabilities of the city generated material and environmental damage, with economic and social losses. In the region beyond this disaster have caused deterioration in the living conditions of the population, increased public spending for bringing a structural disorganization for the city and society itself.

However, George (2011) highlights that despite the floods bring great harm to the population of these occurrences overflow of water from river channels is a natural phenomenon that is part of the dynamics of rivers.

However the fact was due to the climate variability of rainfall and river levels in the region associated with the topography of the city and unsuitable use and occupancy of the larger riverbed as shown on the map of urban function (Figure 1) prepared for the this study. It is a primary database which included numerous site visits *in loco* throughout the all study area, job search and interview and mapping of flood plain located between the right river bank of the João Dias stream and the left river bank of the Guanandy stream and delimited to north by Cândido Mariano street.

In the area vulnerable to the risk in the Aquidauana town, Figure 1, it can be inferred that within the floodplain area subject to periodic flooding there are 349 lots. The dwellings were divided into questioned residences, tourist residences, closed residences, abandoned residences and mixed residences totaling 237 proprieties. Were quantified 61 vacant lots, there are 05 institutional activities in the area. The area also has 02 soccer fields (consisting of 8 lots) and 02 churches. The tertiary sector, pattern for this area, consists of 17 trades and 13 services, and 3 properties that serve as trade and services; 4 abandoned trades, 2 abandoned services and 1 closed service. The Fisherman's Island was considered as one module (lot), even though there exist 14 residences because the plot is legally considered unique.

Noteworthy is that 18% of the area consist of vacant land, a fact that could have been tapped by municipal managers to spatial reorganization, because expropriation of the lots would facilitate the restoration of riparian vegetation and prevent future buildings.

The resident in the floodplains of Aquidauana River quantitative, 36% attributed the causes of flooding in Aquidauana River primarily to siltation; secondly 31% of respondents makes the relationship between rain and floods periods; already 9% think that deforestation is the main cause; while 7% blaming the siltation and deforestation and the amount of 17% blame among other factors trash on the

river banks.

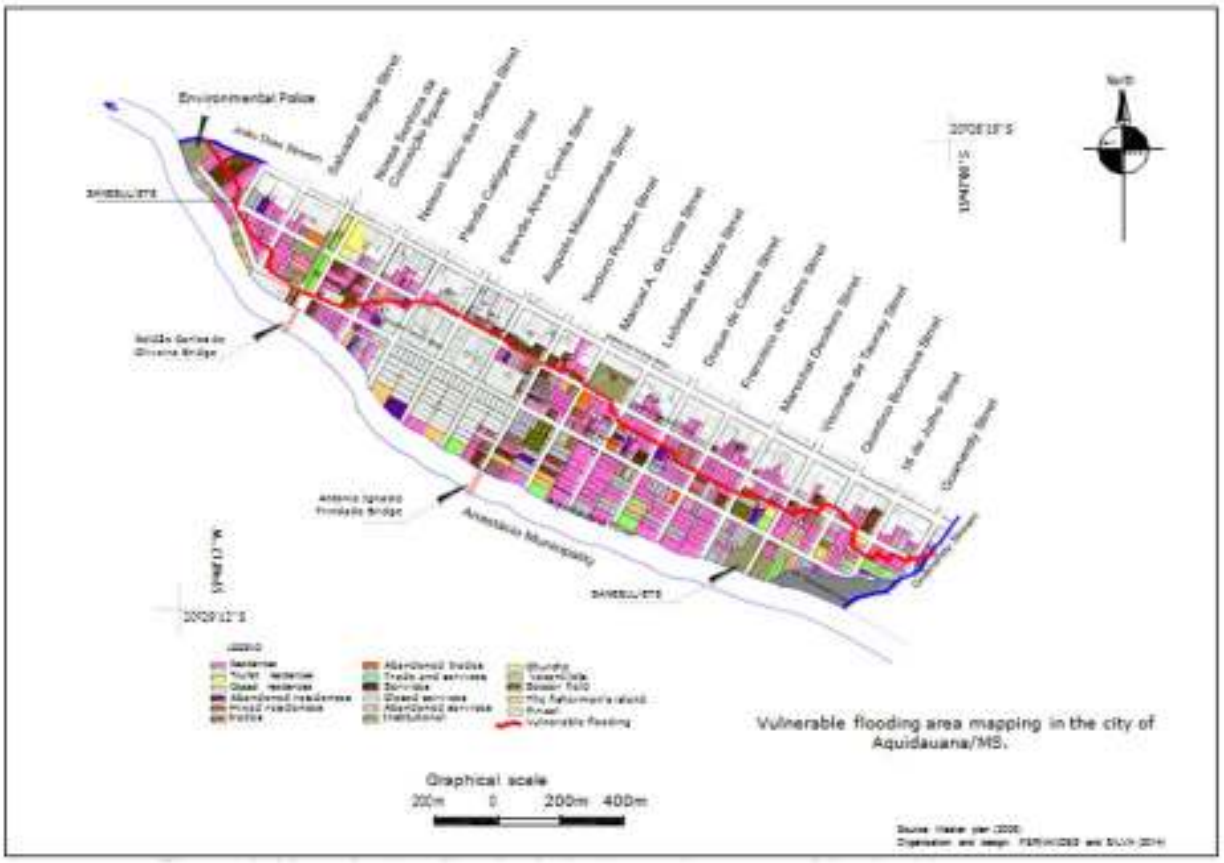

Figure 1: Map of urban function in the hazardous area of the Aquidauana town

The river siltation of Aquidauana River for older residents is a determining factor in the floods, people who live a long time with the Aquidauana River remember the rapids that existed in the past decades and today disappeared. These rapids are famous and Viscount of Taunay (TAUNAY, 1921) already mentioned that they were the threshold for delineation of navigation of Aquidauana River.

For the population involved in ongoing processes of seasonal flooding, which responded to the survey, 68 % said that the restoration of riparian vegetation along the river banks can help reduce flooding, but 32 % think this does not influence.

In Figure 2 is seen that 46% of the area likely to flood is comprised of families that actually residing locally. However, the number of lots with no human activity is a significant, 33 % of the lots. These indices suggest greater accessibility to land and buildings are negotiated with their owners, as they are closed.

It is noteworthy that the area comprises residents from different social classes, but the homes are mostly proletarian, economical and simple patterns. The education level of the respondents shows that 33 % have secondary course in this college or have already graduated; 9 % have not completed secondary school; 15 % completed primary school and 5 % declared themselves illiterate. But the majority of the population, 38 % not completed primary education. What makes this population vulnerable because misinformation and ineffective training increases the number of incorrect actions that intensify the problem, how to land the banks of the river with the remains of buildings.

Commercial activities, mostly, are clustered near the Pirizal area, the main area of the Aquidauana River escape. The lot with trades and services are abandoned and closed were minority and located into the areas hits by small and medium floods fact that makes unmotivated owners to remain with the activities in the field area.

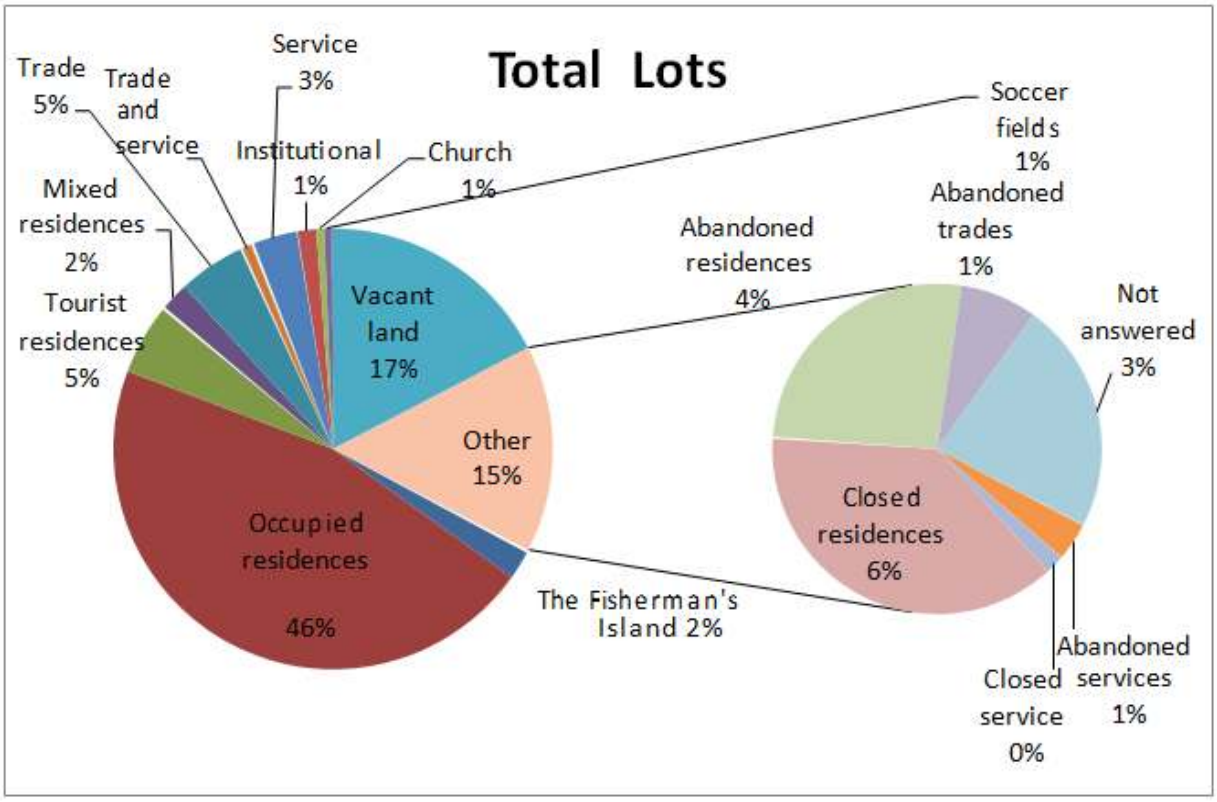

Figure 2: Graph of allotment of urban function in the hazardous area of the Aquidauana town

These numbers instigates a reflection that the problem of periodic and exceptional floods could have already been minimized. However, it is assumed that the region settled what is popularly known as "Industry of floods", since the Federal Government, when clicked, allocates resources; however, it is assumed that most often does not reach the specifically to needy.

The survey found that 160 interviews conducted in homes represent 419 adult (considered here over 16 years) and 140 children were hit in 2011 by the flood waters of the Aquidauana River. Totaling 559 individuals the number of children was small, 25 % more justified by the marital status of the population that resides there, as married/partner corresponds to 50 %, and 25 % responded unmarried, 13% separated and 12% widowed.

The vast majority of respondents live in the area or have friends living there a long time; the population' age who answered the survey averaged above 35 years, occupation of public employees, housewives and retirees. The genre most commonly found during the search was the females with 61% and 39 % for males.

With a population of mostly women, elderly, widowed or separated the problem worsens further, because in the event that the waters invade the homes they are most vulnerable and need the help of relatives and neighbors to remove their belongings and leave their homes. In the region there are at least six elderly people who cannot get around by themselves and two disabled children.

According to information from the Hydrological Monitoring System of the National Water Agency (NWA, 2013) from the record of the 6.19 quota the organs as Civil Defense should already be on alert since the level considered normal for Aquidauana River is 2.96 m. The population not directly occupies the area of risk is achieved with flooding from the time when the river level reaches 9.50 m.

Despite the diversification of social classes in the area , the population of B class is established in the post edge flood of Aquidauana River, live in their own homes, the area is reached sporadically fact that helps to prevent material damage, as can visualize the magnitude flood and remove their belongings. The commercial activities are well structured and composed of owners who have invested in the region because of its proximity to the city center and are grouped at the entrance of

the city in Teodoro Rondon street that giving access to Cel. Antônio Ignácio Trindade Bridge. This population is affected when the Aquidauana River exceeds 9.15m (R1), as Figure 3.

The C Class mostly occupies own homes, they are concerned about the damage, and are attentive to the movement of water in related rain seasons in the region. Owners of commercial activities in this area are composed of people who have low purchasing power and tenants of the establishments. This population is achieved when the river exceeds 8.50m (R2).

The D Class consists of fishermen who are accustomed to living in river dynamics in assigned or own homes, the other portion is in a very humble people who came from other places and found there financial conditions to settle down, live in leased homes or leased but live in this region by necessity, but would like to change, since they are affected every time when the Aquidauana River overflows. This population is achieved when the river exceeds 8.00 m (R3).

Figure 3: Floods of 1990 and 2011, respectively, when the water level reached the R1

It is deeply complex control land occupation when much of the population is expelled from the field or drawn to the cities, but it does not fit (MARICATO, 2011).

Survey data revealed that 75 % of respondents are aware of the vulnerability they face during floods and 55 % confirm that not allow be removed from the site once that they have resilience, strengthening the idea that the repetition of extreme events in society makes her to exercise their ability to adapt to problems in relation to their own evolution.

The study found that there are 33 inserted differentiated economic activities in the area of risk to flooding of the Aquidauana town, and 8 are mixed patterns (residence and business activity) within the area reached by the waters, was found near the area of risk other houses who practice commercial activities, but is not affected by the flood.

The expansion of the urban web area associated with the price of land in recent decades prompted the search for cheaper land as well as rental compatible with the vast majority of low- income workers who live in urban centers. The executive and legislative is encouraging residents to remain in these areas since through protectionist measures promised discounts and even tax breaks for the residents of these areas of risk. The residents of this riverside environment are becoming hostage of his own tragedy because the cycle has already become vicious and settled in this population, leaving home every extreme weather event, often losing all their belongings becomes compensatory because people want live closer to the city center, and end up thinking that rent setting and lots compatible with your financial situation.

4. FINAL CONSIDERATIONS

The resulting waters, especially the upper and middle reaches of the Aquidauana River, coming from the high levels of precipitation cause the increase in the flow channel for a certain period of time. This increase in the water discharge triggers floods or flooding, which the invading homes and businesses

established within the floodplain of the Aquidauana River in the urban web area of the municipality of Aquidauana has resulted in floods of varying intensities and magnitudes and called out entailed various losses, featuring events such as natural disaster on the eve of the South Matogrossense's Pantanal.

It is assumed that the degree of magnitude of floods that ravage Aquidauanense community is related to the degree of social and environmental vulnerabilities of the area and intensity of rainfall in this region. The disorganization of urban territorial expansion of the Aquidauana town allied to the inefficiency of environmental planning and management since its foundation contributed to the activities of the social agents producing the space, especially since the 1950s, stimulated the occupation of risk areas, increasing the use and occupation of the border and flood basin of the river channel that is cut in this cross section by the cities of Aquidauana and Anastácio. We observed that despite the consecutive seasonal flood episodes of the past three decades the social actors involved in the issue of flooding remain inert.

The study suggests the development of a project to contain ravines along the banks of the Aquidauana River through restoration of riparian forests and other green areas that are part of the part of the surrounding environment; also recommends setting to implementation of permeable floors within the area already occupied, so it is chosen to extensive structural measures, which aim to positively impact the hydrological system, but without direct intervention on the channel.

Within this premise, in order to measure the use of non-structural method is proposed to draw up an effective plan for the riverside area zoning and building an Alert System, in partnership between City Hall Aquidauana, Civil Defense and Federal University of South Mato Grosso/Aquidauana Campus (UFMS/CPAQ). The UFMS has a staff of professors and technical in various areas of Geography able to help in support, in preparation and execution of the project.

The fact of not having news of deaths arising from numerous floods in the Aquidauana town is a determinant factor for the residents interviewed claim, in most cases, the floods of the Aquidauana River not frighten them. Thus, people residing on the banks of rivers and streams in the Aquidauana River ignore their vulnerability and that this fact is a threat; and also unaware that the process of occupation in susceptible area to spillovers is the main factor that produces the degree of risk to which they are exposed; because 60% think the culprit by hydrological disturbances they experience every new flooding is the river.

Thus, the performance of non-structural measures as conform to certain environmental laws at the federal, state and municipal levels; addition to structural measures with preventive actions to vacate the areas of Risk 3 and recovery of green areas certainly converge to minimize the negative impacts from the events of episodes of flooding from extreme weather events.

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