Adaptive Management of Forest Fires in Periurban Areas in the Federal District, Brazil: A Case Study From the Urubu Valley Rural Community[1]

Gabriel Constantino Zacharias[2] and Renata Marson Teixeira de Andrade[3]

Abstract

In a climate change scenario, where global warming increases the critical period of drought, the risk of wildfire is expected to increase. In the Federal District (DF) - Brazil, wildfire in periruban areas have economic, financial, environmental and public health significance, however it is poorly studied. Thus, one wonders if the DF is prepared to deal with the higher risk of wildfire in periurban areas as well as if a periurban community is able adapt to increasing risk of wildfire under climate change. This research presents a case study of the Urubu Valley Rural Community, located inside the Urubu Creek watershed, one of the largest rural community, more than 200 families, living only 10 km away from Brasilia-DF. We surveyed 40 families living in the Urubu Valley Rural Community, and measured their perception of environmental risk, in special wildfire risk, and adaptive and organizational capacity to cope with wildfire under climate change scenario. With this study, the community perceive that wildfire is high risk in many locations, in specially close to roads and public lands, and new real state development. This community perceives local nature very positively and values its environmental services (aesthetics, water supply, local climate and biodiversity); has great sense of belonging to the region and undertands the environmental risks they face under climate change. This perception has been attributed to the knowledge gained over the years due to local environmental activism: local environmental NGOs working in partnership with state and civil society organizations, such as environmental agency, universities and international NGOs dealing with climate change adaptation, led to the creation of a wide social network that supports the activities of wildfire prevention and combat in the Urubu Valley. The combination of risk perception, the capacity for mobilization and social networking were the key factors for implementing the first local

[1] An abbreviated version of the paper was presented at the fourth international symposium on fire economics, planning, and policy: climate change and wildfires, Nov 5-11, 2012, Mexico City, Mexico.

[2] Brazilian Institute of Environment and Renewable Natural Resources, gabrielzacharias@yahoo.com.br.

[3] Professor at Universidade Católica de Brasilia, renatamar2@gmail.com.

wildfire risk management under climate change scenario in the Rural Community in the Urubu Valley, the first a periruban community to implement a wildlife prevention plan in this region. Finally, to improve the local wildfire risk management of the Urubu Valley Rural Community and allow the implementation of these standards in other periurban communities throughout the Brasilia-DF, we used the ISO31000 risk management guidelines and the Firewise Communities USA program's experience. We hope that improved local wildfire risk management allow environmental managers in Brasilia DF to implement a local wildlife risk plan as part of an adaptation to climate change plan in many periurban communities in Brazil.

Key Words: environmental risk perception, firewise communities, wildfire risk.

Introduction

The Federal District (DF), Brazil, suffers every year with the forest fires in suburban areas. The National Institute for Space Research, since 2007 have been detected more than 1200 hotspots, and between 2010 and 2011 this number was approximately 800 foci in the Federal District, including Brasilia. And according to studies of climate change for the Cerrado region the trend is to increase the incidence of fires in the region with the increase in average temperature of the earth.

We chose to investigate forest fires in suburban areas because is has no such studies in Brazil, and also because periruban regions are home to communities that suffer from a lack of social and public services, depending heavily on aspects of the environment in terms of health, supply of electricity and housing (Sao Paulo 2004, p.19). In the DF, there are many inhabited periruban regions and constant threat of fire. We chose to study the Urubu Valley Rural Community, which is located in the watershed of Urubu creek, because of the historical social mobilization on participatory management of forest fires. This community has created an active social network, the Save the Urubu Valley Movement, supported by residents and local NGOs, in addition to a project to adapt to climate change, Aclimar Project, supported by HSBC Solidarity Institute, in partnership with the Catholic University of Brasilia and international NGOs such as WWF. This social network has organized a forest fires brigade, looking for support from the Federal and District governments to implement the Local Fire risk Prevention Plan.

This article focuses on a case study in an outlying area of the DF, and accesses the perception of environmental risk in a rural community, the process of environmental governance and social mobilization against forest fires, as forms of adaptive management to climate change. The Environmental Risk is expressed in this study by the combination of the consequences of an event and the probability of

its occurrence (Brazilian Association Of Technical Standards 2011, p. 01). To support the development activities of the rural community of the stream of the Urubu, this paper presents also recommendations from the local reality, the experience of the Firewise Communities Program American and ISO31000, which gives standard guidelines for risk management.

Methods

To study how the population of the Urubu Valley Rural Community organized an operating plan and a brigade for preventing and fighting forest fires, it was used bibliographic data collection, pre-existing studies and interviews with leaders the region.

The most important pre-existing studies used in this research was the Ecomapeamento Creek Watershed of the Urubu (Pedroso and Santos 2008), the Study of Perception of Environmental Risk and Climate Change in the Stream Watershed of the Urubu (Andrade and others 2011) and Operational Plan for Preventing and Fighting Forest Fire in the Urubu Valley Rural Community (Gouveia 2011).

Using these studies plus some open interviews with local leaders it was possible to understand the social context and the forest fire problem at the rural community and then compare this reality with the ISO31000 and the Firewise Program.

This comparison allow us to notice the similar points in this structures and the points it was necessary to improve in the reality of the rural community, in order to implement a risk management plan .

Results and Discussion

Urubu Valley Rural Community was able to create a social network which depend on individual engagement on environmental ethics and high mobilization capacity. According to Andrade and others (2011) there is among the community perception of high risk of fires in the region, and mobilization on firefighting and fire risk reduction was a priority.

Social mobilization in Urubu Valley Rural Community has emerged at various times from the 1980s, when an association was organized for the land tenureship process undergoing in the region, however environmental concerns became part of the agenda put by some individuals. Environmental problems, such as water scarcity, water contamination, waste disposal, deforestation, biodiversity loss, soil erosion, floods and fire were shared among some residents. A growing feeling of belonging

and stewardship for the region helped to boost nature preservation, agroforestry and agroecology initiatives and water management projects (Pedroso and Santos 2008).

This feeling of belonging comes from the perception of the residents who sees their home as a living watershed – "ecobacia", as an area of many springs that feed in the Paranoá Lake, and has ecological corridors for many species, even though this region lies very close in the green belt of Brasília. Some of the most important features of local residents are (Pedroso and Santos 2008):

- Residence time 90% of the residents arrived since 1990
- Higher education 40%; 15% Basic
- Household income: 27% less than US $ 933. 00 and 20% higher than US $ 3420. 00
- Quality of life: good 65%, 10% bad
- Reasons to dwell in the region: 45% nature and 44% Leisure

The beautiful natural scenery - remnants of savannah, rivers, waterfalls, small mammals and birds - attracts people and boost in them the need to organize themselves to protect and preserve their environment. The Rural Community area is near to roads and areas of urban growth, as showed in Picture 1.

Picture 1— Location of Creek Watershed of the Urubu and its subdivisions.
Source: **http://www.ibram.df.gov.br/sites/400/406/00001637.pdf**

The Community has movements, associations and institutions created by the local population, to work on improving the quality of life. Among these institutions, the Instituto Salvia has been in the region since 1998, and developed the Aclimar Project - Planting Trees and Water Harvesting, in partnership with the Catholic University of Brasília. This project in particular has been important, among other things, for developing studies on Perception of Environmental Hazards and Climate Change in the Urubu Watershed for their baseline approach (Andrade et al 2011).

This study, using questionnaires, built the array of perceived environmental risks in the region, from the perception of the frequency of 22 environmental hazards, ranging from 1 (low frequency) to 4 (high frequency) and the perception of environmental impacts in the persons and property, ranked from 3 (least impact) to 9 (greatest impact), as Table 1 shows below.

Table 1—*Matrix of frequency, impact and risk classification of risk perception*

Frequency (F)	Impact (I)	Risk (FxI)	Classification of Risk
1 - 4	3 - 9	3-8	Negligible
		8-14	Tolerable
		14-28	High
		28-36	Critical

Source: Andrade and others (2011)

This study shows that Risk Perception of the residents on average consider bush and forest fire among the six high-level risks, as shown in Figure 1.

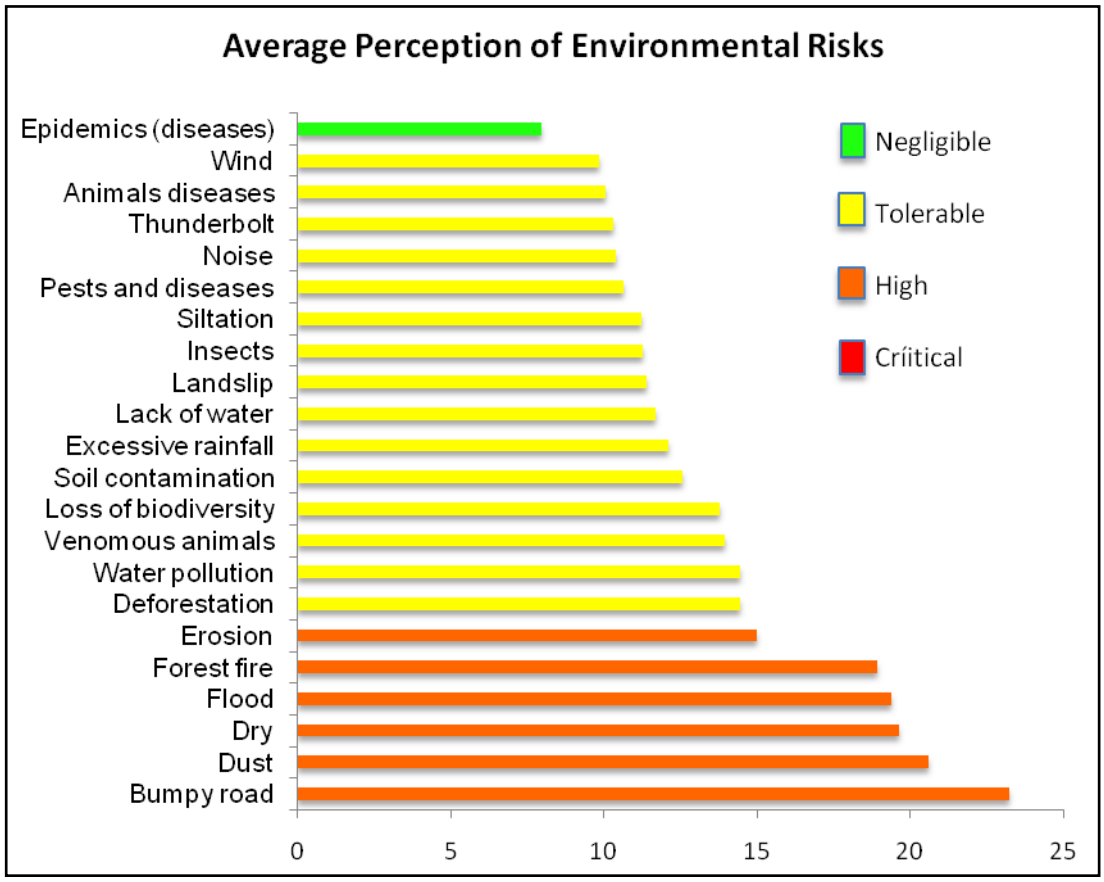

Figure 1—Perception of environmental risk rating for each of the 22 threats in the Urubu Valley Rural Community
Source: Andrade and others (2011)

In spite of the average of risk perception to forest fire been "high", at some areas on the rural community this risk has been classified as "critical", as show in Figure 2. These critical areas are near the urban growths areas.

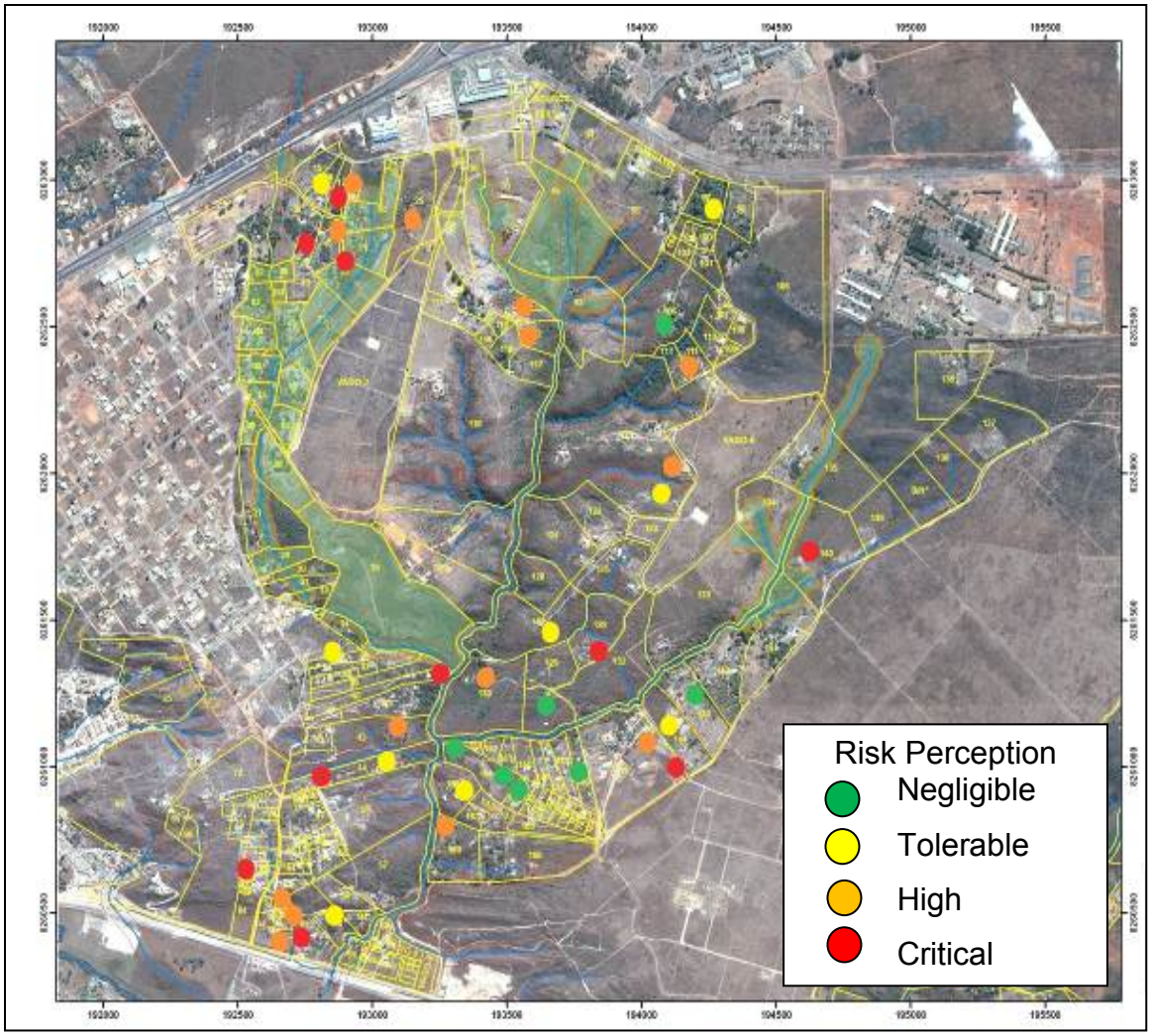

Figure 2—Spatialized perception of forest fire risk in the Urubu Valley Rural Community
Source: Andrade and others (2011)

The risk perception helps to understand how this community has been organized around the prevention of wildfires. So people began to act in a more organized in relation to forest fires lacked the 'how to', which came through the completion of a course Training Brigades for the Prevention and Combat of Forest Fires, prompted by local institutions with the National Center for Prevention and Combat of Forest Fires - Prevfogo the Brazilian Institute of Environment and Renewable Natural Resources - IBAMA.

This brigade was only possible because of the social network that works in the region, bringing together residents who have worked with forest fires, which are university researchers, as the Catholic University of Brasília, which work to protect

water sources and NGOs such as WWF and the Save the Urubu Valley Movement. This network has helped to build local fire hazard brigade capacity and performance, providing logistic means as transportation, media and storage of equipment and tools.

For the development of fire management plan for Urubu Valley Rural Community, this study made a comparison between local reality and the Firewise Communities program, based on the Technical Standard for the Environmental Risk Management ISO31000.

At this paper we show some of the most important correlation between the ISO31000 structure and the reality at the rural community and the Firewise Communities:

- **Mandate and commitment:** it is important to the rural community understand that, as at the Firewise Communities Program it is necessary to define who will be responsible for risk management and coordination of the whole process. At this point, the community is still failing.
- **Establishment of Policy Risk Management**: at the Firewise Program, the community holding meetings to establish how best to act in that region. At the Urubu Valley Community an Operating Plan was created to guide the creation of a policy of risk management more broadly, by a partnership between some institutes and a person how works with forest fire.
- **Responsibility**: it is necessary to the rural community formalize responsibilities for forest fires between the government and the community, as it is done at the Firewise Program.
- **Integration into organizational processes**: at the Firewise Program, technicians have previous knowledge in order to interact with the reality of the communities, seeking the best application of prevention techniques to the reality. The rural community has yet to discuss the integration of knowledge, the presence of the brigade and management in the homestead properties.
- **Reporting mechanisms and reporting internal and external publication**: The Community should encourage increased community participation in decision-making meetings and processes, and can improve their work proposing something like the "Best Practices - Communication Plan", from the Firewise Program.
- **Implementation of the framework for risk management**: the implementation depends on the entire structure created and local characteristics. The structure of risk management should be implemented in due time, allowing owners and institutions devote their efforts to this goal, including training sessions and information

Using the ISO31000 structure to implement an environmental risk management plan, after creates the entire framework, it is necessary to implement. During this stage, the most important is to define how to work with the risk, defining, identifying and the treatment necessary to success the risk protection.

As a part of the implementation, the ISO31000 proposes:

- **Defining risk criteria**: At the Firewise Program the criteria to measure risk are generally three: type of plant-based fuels, topography and slope of the frequency of climatic conditions conducive to forest fires. The Urubu Valley Rural Community needs to define the criteria to be used that could be: a risk matrix developed in this study, the accumulated data of hotspots and areas of significant interest to the community. Spatial data is needed, and maps of hotspots.
- **Identification of risks**: The Firewise Program provides the knowledge and materials needed to help people identify the main sources of risk to the community. The rural community could read these materials and a survey of people and institutions that work on the subject should be done to identify the main causes, origins and consequences of fires in the region.
- **Risk analysis**: At this stage the rural community should stipulate the frequency and severity of forest fire occurrence and identify which category this risk belongs, by risk matrix constructed in step Definition of Risk Criteria.
- **Risk assessment**: materials produced by the program to allow residents to know what the best action to avoid the risk of giving fire support to Urubu Valley Rural Community decision on treatment to be adopted. With categorized risks, should be compared with the initial context, to define what type of treatment will be given for each area. Should continue with the methodology adopted by the project acclimatize
- **Treatment of Risk**: Based on meetings, training and materials distributed, the community must deploy the appropriate treatments. The treatment given to the risk of fires in different areas should be defined individually, using the new knowledge and practices already employed in the region, as done by the project acclimatize.
- **Monitoring and review**: The program foresees the importance of monitoring its operation. This step should involve the actors participating in the Management Plan directly, including firefighters, owners and organizations to assess their functioning.
- **Records of the process of risk management**: communities are encouraged to report on the decision-making in an organized and standardized, which facilitates the registration of the management process. All activities of the brigade and the meetings on the issue of forest fires at the Urubu Valley Rural Community must be registered in order to be able to track the paths of decision making.

Conclusion

The perception of forest fire risk, the ability to mobilize and the social network helped to create and maintain the fire brigade at the Urubu Valley Rural Community.

However, it is necessary to recognize the responsibilities and to improve the knowledge about forest fire management to success at the community protection. A way to improve this knowledge is knowing others experiences like the Firewise Communities Program, their philosophy, materials and "way to act".

The experience of Urubu Valley Rural Community is a successful example that the Government could use to protect all the periurban areas in the Federal District.

References

Andrade, R.M.T.D., Delphino, R.M., dos Santos, M.J., Souza, M., Miccolis, A. 2011. Study of Perception of Environmental Risk and Climate Change in the Stream Watershed of the Urubu, Brasilia – DF, 2011. XIV Encontro da Rede Luso-Brasileira de Estudos Ambientais. Recife.

Brazilian Association of Technical Standards. NBR ISO 31000:2009. 2011. Risk management - Principles and Guidelines. Rio de Janeiro: ABNT,

Gouveia, G.P. 2011. Operational Plan for Preventing and Fighting Forest Fire in the Urubu Valley Rural Community. Brasília: Movimento Salve o Urubu.

Pedroso, M.D.S.C., Santos, V.J.D. 2008. Ecomapeamento Creek Watershed of the Urubu. Brasilia: Seeding Education,. Under revision.

São Paulo (State). Secretary of Environment.. 2004. Environmental Atlas of Sao Paulo - The green, the territory, the human being: Diagnosis and bases for the definition of public policies for the green areas in the city of São Paulo. São Paulo