

# CHARACTERIZATION OF THE RISK AREAS IN PETRÓPOLIS - A CASE STUDY OF THE LOPES TROVÃO COMMUNITY

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## INTRODUCTION

Nature models the environment, provoking several physical processes as mass movements, erosion and sedimentation. Human action tends to intensify and accelerate environmental impacts, that become harmful to society, causing accidents that, depending on the intensity, can cause tragedies.

Mass movements are one of the processes that can cause more damages to the physical environment and to society. According to Hamblin and Christiansen (1998), mass movements include all types of collapses on the slopes. There are several types of mass movements, but landslides are the most important ones, because it possess several condition factors and are events that cause more problems to society.

The increase of the urbanization Rio de Janeiro State causes the occupation of the slopes in an irregular and disordered way, resulting settlement, considerable environmental impacts on the controlling factors of the natural processes, causing other impacts, such as mass movements, that degrade not only the landscape, as well as people's life (Oliveira, 2000).

Some authors call the attention to the fact that the environmental degradation is, by definition, a social problem (Blaike and Brookfield, 1987). Some environmental processes, as leaching, erosion, mass movements and floods can happen with or without the human intervention. In this way, characterizing physical processes, as environmental degradation, is to take into consideration social approaches that relate land use, or at least, with the potential of several use types (Cunha and Guerra, 2003).

The environmental impacts have different types of causes: one of them could be from the quick growth of the population of an area to unfavorable natural conditions, as concentrated rains, bare soil and high steepness, that acting together with the inadequate use of the soil, it enhances the environmental degradation, generating serious problems to the urban and rural areas that are located close or on the slopes.

The municipal district of Petrópolis has been suffering of several slides along the history, causing material and social damages, leaving hundreds of homeless people. Many areas of the city suffer eminent landslides risk, most of them due to the disordered occupation that happens mainly on slopes, that turn them more susceptible to sliding (Gonçalves and Guerra, 2001).

Lopes Trovão street is located in Petrópolis, on Serra do Mar Mountain Range. The municipality has high slope angles, usually over 45°. It presents altitudes around 845m, and an area of 811 km<sup>2</sup>, with 293,947 inhabitants and its climate is mesotermic super humid.

At this community, the population of low income prevails, resulting in irregular slope settlement, which causes damages to the environment and population's health. Public agencies do not carry out any sort of inspection to avoid unauthorized constructions (Figures 1 and 2) .



**Build on top of the hill and embankment area.**

**Picture A.J.T.Guerra 5/7/04**



**Steeper slope on *Servidão do Brás*.**

**Picture A. J. T. Guerra 5/7/04**

## **OBJECTIVES**

This work has as a general objective: the mapping of risk areas, inclined to landslide in the Lopes Trovão community and to point it as priority with respect to the development of prevention and recovery programs, intending to avoid new catastrophes, human life damages, material losses and environmental degradation.

To reach the intended objective it was necessary to pursue the specific objectives:

- to evaluate the characteristic geology, soils and geomorphology;
- to characterize soil use as regular, irregular and illegal;
- to identify and to survey the current environmental impacts triggered by the land occupation and soil use;
- to describe the current infrastructure;
- to elaborate the environmental assessment of the risk areas;
- to identify the factors that cause mass movements that have already happened in those areas;

## **METHODOLOGY**

For this paper several data sources were used following three stages.

At the first stage it was defined the area for risk map and data collection. Regarding the risk areas definition suggested by the Public Ministry through the following data sources:

- registration of the occurrences of Civil Defense Coordination (COMDEC), regarding the accidents caused by landslides, due to the rains of 20 and 21 of January/2003;
- Satellite Images analysis, aerial photos, and all cartographic material available, with scales of 1:50.000 (IBGE and DSG) and 1:10.000 (Municipal City Hall of Petrópolis), embracing the Municipal district of Petrópolis;

The second stage regards the inspection of the areas, object of the risk map. Such areas are inspected, so that if it carries through the environment inventory, *in situ*, aiming the mass movements diagnosis and prognostic elaboration.

- contact with the local communities' leaders for explaining the objectives of the project and ask them cooperation;
- to take photos of the area;

A simple inspection table was elaborated to assist the surveys with the following information: location; general references; contact community leadership; physical parameters (soil, vegetable cover, water, presence of erosive processes, mass movements and other aspects) and human parameters (such as land and soil use, management interventions and anthropic action)

The third stage consists of the systematization and analysis of the collected data, which should have as results:

- the environmental assessment with the evaluation of the characteristic geology, soils and geomorphology;
- the photos with informative captions;
- definition of the steepness, altitude and coordinates;

The fourth stage consists of the elaboration of landslides risk map with the following considerations:

- delimitation of the slope stretches risks of landslides;
- delimitation of the areas where the houses have to be removed due to landslides risk;
- delimitation of the houses that can be maintained with controlled occupation.

## **EXPECTED RESULTS/ FINAL CONSIDERATIONS**

Field work has been carried out, in order to collect physical and social information to create a databasis.

The constructions on those slopes, are mainly at risk areas, however, even knowing the risks they might suffer, population refuses to leave their houses, to be settled in new residences, offered them by the government. They claim cultural reasons, attachment to the place and economic reasons as proximity to work.

The current legislation is adapted to refrain those areas against settlement, however, there are few qualified people for inspection.

Considering the proposed objectives and the methodology, it's expected to contribute with plans and programs of development aiming to minimize or solve the problems provoked by the slopes occupation and to contribute to the environmental problems solution, through habitation policy and environmental management on urban areas.

This work is a part of a larger project on development within an agreement between the Public Ministry of Rio de Janeiro State and the Laboratory of Environmental Geomorphology and Soil Degradation of the Geography Department of Rio de Janeiro Federal University.

## REFERENCES

- BLAIKE, P. e BROOKFIELD, H. (1987). *Land Degradation and Society*. Methuen Ltda., Inglaterra, 296p.
- CIDE (2001). Centro de Informações de Dados do Rio de Janeiro. Anuário Estatístico do Estado do Rio de Janeiro.
- CUNHA, S. B. e GUERRA, A. J. T. (2003) Degradação Ambiental In: *Geomorfologia e Meio Ambiente*, GUERRA, A. J. T. e CUNHA, S. B. (Orgs), Rio de Janeiro: Editora Bertrand Brasil, 4ª. Edição, 337 – 376.
- GATE (2003). Grupo de Apoio Técnico Especializado do Ministério Público. “Ocupação Desordenada em Áreas de Risco” (Relatório). 4p.
- GONÇALVES, L.F.H. e GUERRA, A. J. T. (2001). “Movimentos de massa na cidade de Petrópolis (Rio de Janeiro)”. In: *GUERRA, A. J. T. e CUNHA, S.B. (orgs) Impactos Ambientais Urbanos no Brasil*, Bertrand Brasil, pp. 189-252.
- GUERRA, A.J.T. e FAVISMORTLOCK, D. (2002). “Movimentos de massa em Petrópolis Rio de Janeiro/Brasil.” In: *Desastres naturales em América Latina*. José Lugo Hubp e Moshe Inbar (Compiladores), Fondo de cultura econômica, México, Primeira edición, pp. 447-460.8
- HAMBLIN, N.K. e CHRISTIANSEN, E.H. (1998). Slope Systems In: *Dynamic Systems*,
- CLERICE, A. e PEREGO, S. (2000). Simulation of the Parma River Blockage by the Corniglio Landslide (Northern Italy), *Geomorphology* 33, 1 – 23.
- NIMER, E. (1989) *Climatologia do Brasil*. Departamento de Recursos Naturais e Estudos Ambientais, Rio de Janeiro: IBGE.
- OLIVEIRA, F. L. (2000) A Importância dos Fatores Geológicos Geomorfológicos para a Identificação de Áreas de Riscos aos Movimentos de Massa na Vertente Sul do Maciço do Gericinó Mendanha, Rio de Janeiro. Projeto de Pesquisa – Estágio de Campo I: Rio de Janeiro: Departamento de Geografia UFRJ.
- SILVA, A. S. Comportamento físico e erosão dos solos em uma topossequência em Correias (Petrópolis RJ). Dissertação de Mestrado. PPGUFRJ.63p. 1997.