

# Environmental assessment of the area surrounding Dam Rio Verde – Parana / Brazil. An overview of environmental geomorphology

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## Abstract

This paper presents a brief essay on the situation in which the environment of the dam of the Rio Verde Basin-Paraná, from the vision of environmental geomorphology. The area is located between the cities of Campo Magro and Campo Largo, Paraná plateau in the first part of the Alto Iguazu basin. This study aims to raise the concepts relating to environmental geomorphology, to identify the anthropogenic impacts caused in the reservoir areas, identify the environmental compartments found around the dam and characterize the geologic and physiographic region. It was found that the area has intense anthropogenic influence, as urban growth is present in areas and wavy and rough terrain, subject to mass movements and floods. Besides these aspects, the use of land for agriculture contributes to fragility of the area.

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## Introduction

Since the environmental debate has become academic discussions of the applicant, the need to address the various dimensions of the environment was becoming increasingly necessary. Studies with vertical approaches have been developed over the decades in different areas of knowledge seeking to answer more specific questions, without considering a broader approach. Accordingly, the environmental geomorphology seeks to advance beyond the couple and vertical scale studies in an attempt to understand the dynamics of the landscape.

This understanding of the information passing through surveys of the physical environment such as soil, geology, slope, topography, hydrography, land use and vegetation cover and also seeks to address the historical information on occupation, socioeconomic, political, *i.e.*, integrated analysis of landscape. This work was done as a brief test approach from the environmental

geomorphology in the area surrounding the dam located in the Rio Verde, metropolitan region of Curitiba (Fig. 1).

## Materials and Methods

When it comes to human activities in the physical environment, we must consider the extent of environmental impacts caused by these activities. In seeking to understand and / or mitigate these problems, studies are developed guided by the environmental analysis. Several areas of science have sought such interpretation, and in that context there is the Environmental Geomorphologia. As Guerra and Marçal (2006) "The environmental geomorphology arises from the recognition of the role of human action geomorphological processes and the evolution of landforms, or the man acting as a geomorphological agent."

For studies that may become applicable and consistent with reality it is necessary to have an integrated view of the elements of nature. The analysis from this perspective was studied by many

**Table - 1:** Characterization of the environmental compartments identified

Compartments	Characterization
<b>I – Edge of the sedimentary basin -</b>	
Location	Comprises a strip of land that stretches from north to south of the basin, involving almost all the springs and the left bank.
Altitude	Ranging 920-1000 m
Relief	The landscape presents itself irregular, predominantly flat to gently undulating topography, with strong corrugated portions near the drainage channels and streams
Soils	Red - Yellow potions in the flatter, deeper in Cambisol plains and in the shallow portions strong typic corrugatedHydromorphic altitude - deserve special attention since they constitute the reservoir of water from the headwaters of the river and its major tributaries.
Major Risk	Water contamination by pesticides, fertilizers and sediments due to inappropriate agricultural management. Destruction of the lowlands of altitude.
<b>II – Rugged relief -</b>	
Location	Includes land on a gentle slope. It stretches from north to south of the basin, where the right margin on the Group rocks Açungui.
Altitude	Ranging 900 - 1030 m
Relief	Tops aligned and elongated in the direction NE-SW. The topography presents a mosaic, predominantly undulating slopes and strong wave.
Soils	Shallow Cambisols and Neossolos
Major Risk	Water contamination by pesticides, fertilizers and sediment in case of intensive use of the area. Does not include farm intensively.
<b>III – Undulating topography -</b>	
Location	Is present to a small extent, on the southern portion of the basin, on the left bank, where it occurs lithology of phyllites lithologic contact with argillites compartment I
Altitude	Ranging 920 - 1000 m
Relief	The landscape presents itself irregular, predominantly flat to gently undulating topography, with strong corrugated portions near the drainage channels and streams.
Soils	Degraded cambisols in undulating topography and shallow cambisols. Presence of neossolo strongly undulating in portions that is not in use. Red-yellow Podzolic where currently advancing the urban city
Major Risk	The area is in an advanced stage of degradation, with intensive agricultural use and low potential, highlighting the risks of water contamination by sediment, pesticides and fertilizers. The urban advances on all tracks including the relief occupying drainage areas and flood plains, affecting the supply of streams and contaminating them with garbage and domestic and industrial effluents (Fig. 2)
<b>IV – Floodplain -</b>	
Location	The banks of Itaqui and its major tributaries are formed recent fluvial deposits, a flat topography, featuring a flood plain and wetlands.
Altitude	Next to 900 m
Relief	Plain
Soils	Gleissolo
Major Risk	Advance the urban and industrialization in a region characterized by hydrostatic level near the surface, thus increasing the risk of contamination

researchers seeking a more coherent analysis of the landscape with the dynamics of nature.

### Results and Discussion

Human action has caused many impacts on river basins, mainly in the riverbed, such as we have groups of human-induced changes in river (Cunha, 1995) in which the first relates to changes made directly into the river channel as dams, extraction of materials, plumbing and other works. The second refers to human activities developed in the area of the drainage basin as deforestation, agricultural use and inappropriate buildings and places. It is known that such changes cause impacts over the entire channel, but the initial analysis failed to scale the spread of these impacts. Dealing specifically with the construction of dams, Cunha (1995) noted the changes caused in three distinct areas:

The first part of the dam is where lifting occurs from the base level and the consequent change in the channel and the ability to transport solid. As a result there is the silting of the reservoir and tributaries besides altering the river biota. The second change occurs in the reservoir area with the change of a lotic (running water) to lentic (standing water). The action of wind on the extensive water depth increases the power abrasive edges. There is a great material loss, may be the formation of beaches and lake beyond fans of siltation. The third area corresponds to the downstream sector of the reservoir occurring due to the lowering of the base, causing a notch in the bed deposition and erosion in the downstream.

The Little Rio Verde basin is part of the Iguaçu river basin, more specifically High Iguaçu, on the left side, presents an area of 257 km<sup>2</sup> and is now part of the EPA (Environmental Preservation Area) do Rio Verde, created specifically for “the protection and



Fig. 1: Geographical location of Rio Verde Dam

conservation of environmental quality and natural systems that exist there, especially the quality and quantity of water for public supply, establishing measures and instruments to manage all phenomena and conflicts arising from their varied uses and antagonistic. This research is based on a study of an area around the Rio Verde Dam, more specifically, the portion located in the middle course of Rio Verde.

The area is located in the First Plateau of Paraná, which according to Maack (1968) is characterized by a zone of eversion between the Serra do Mar and the Devonian Scarp (St Luiz do Purunã) that forms the eastern boundary of sedimentary basin Parana.

Point Dam in its geological point of the dam is in the current area of alluvium, derived from the quaternario (Holocene) sediments composed of sandy-silty-clay deposited in a fluvial environment, interspersed with layers of fine sand to coarse gravels and beyond, shows areas of gneissic-migmatitic complex in the presence of quartzite outcrops of Proterozoic and lower training Guabirotuba the Quaternary (Pleistocene), with the Curitiba basin sediments, including clays, arkose, sands and gravels deposited in the environment semi-arid. From the geomorphological point of view, it lies in the orogenic belt of the Atlantic, called the first plateau of Paraná, with dissection medium, with elongated and flattened tops with convex slopes and valleys in V. The original vegetation of this area is mixed forest (forest with Araucaria forest of pine forests). Nowadays, most of the area is being used for agriculture and expanding urban areas. His solo shows and that sort of diversity on its left bank (river) has the Oxisol cambic, Alic interspersed with clayey Ultisol melanin indiscriminate and clayey, and that is mostly composed of red-argisols yellow associated with dystrophic red-yellow podzolic and podzolic typical dystrophic red-yellow sandy loam Oxisol. The climate of the entire region is Cfb, subtropical or mesothermal humid.

Centre Dam and backwaters of the dam, because the extent of the fill area of the lake's dam, physiographic features, geology,

geomorphology and other characteristics will be similar to that presented in point barrage.

For this study, we observe the changes contained in the area. To facilitate the studies pertinent to the subject, we attempted to perform a mapping of key environmental compartments found in the study area that corresponds to the middle course of Rio Verde. We then identified the environmental compartments arranged in the form of a table, noting that the area of the dam the flood plain was flooded with the filling of the reservoir

The production of geomorphological knowledge is the basis for planning the use and conservation of soil from an area. This must be one of the reasons for establishing procedures for the zoning in order to properly manage the river basin.

In the case of sub-basin of the Rio Verde and more specifically the dam, it was perceived by the survey, that the advancement of urban areas on it, is jeopardizing the quality of water, another risk factor is the advance of agricultural areas on the banks of the dam and the river itself, facilitating silting and contamination by pesticides.

One can not fail to mention the occupation in areas of mountainous terrain, which can lead to major disasters, and preventing the distribution of natural rainwater. These facts show that preventive measures are needed, as well as an urban redesign for this reservoir does not lose its function of preserving manacian or serve as a reservoir of water for the local community.

## References

- Bezerra, M.C.L. and M. Burstyn: Science and technology for sustainable development. Ministry of Environment and Natural Resources: Joint CDS/ UNB/ IBAMA (2000).
- Cunha, S.B.: Fluvial geomorphology. In: An update bases and concepts. Rio de Janeiro: Bertrand, Brasil. Guerra, A.J.T.; Curna, S.B. (Eds.) Geomorphology: pp. 211-241 (1995).
- Guerra, A.J.T. and M.S. Marçal: Environmental geomorphology. Bertrand, Brasil: Rio de Janeiro. pp. 42-46 (2006).
- Maack, R.: Physical geography of the state of Paraná. MaxRoesner, Curitiba, Brasil, p. 350 (1968).