

EROSIVE PROCESSES IN URUCUTIUA RIVER BASIN: PAÇO DO LUMIAR TOWN – MA

Wanderson Barbosa Cirillo wbc@bol.com.br

Francicléia Vieira Ribeiro clleivieira@yahoo.com.br

Márcia Fernanda P. Gonçalves marciafernandageo@hotmail.com

Antonio Cordeiro Feitosa feitos@terra.com.br

INTRODUCTION

The modeling of the terrestrial prominence is the result of the endogenous and exogenous agents, denominated as erosion agents, that constitute a set of forces that contribute to the soil erosion development and the prominence modeling that can be a risk to man according to the modifications of the humanized environment.

In Brazil, the problem of erosion is old. The states of Parana, Sao Paulo and Rio Grande do Sul are the states that have the best exponents of control for these processes. In the rest of the country, the lack of interest of the government institutions results in absence of reference materials to detail the studies so that the planner have difficulties to understand the situation to prevent it.

This study justifies itself because the area in question has been invaded without a compatible plan where we observe environmental problems in different frequencies and magnitudes whose the final product is the elaboration of the map of vulnerability to the erosive processes in Urucutiua river hydrography basin that will subsidize the redefinition of the process of local occupation that is inserted in area of high susceptibility to erosion according to Cirillo (2003, p. 50).

MATERIALS AND METHODS

Firstly, there was a bibliographical review and reading of publications related to the theme with field activities as the delimitation of field and the definitions of the areas where there were more intensive superficial erosion. An interpretation of the hydrographical basin cartographical material was done and the erosive processes were roused based on Canil's methodology (2001) that consists in geological, geomorphological and pedological data, where some parameters correlated to the erosive processes were suscitated, added with

the use and occupation, the cross of the classes of high, medium and low susceptibilities, determined in each attribution.

The materials used to the office and field activities were the data of the IBGE census from 1970 to 2000; aerophoto of Maranhão state done by INPE; scale 1:15.000, strip 1, number 2, of 1999; DSG planialtimetrical maps, in partnership with SUDENE; scale 1:10.000, sheets 08 and 09, year of 1980; stereoscopy, compass, GPS, camera, PC, and inkjet printer.

AREA CHARACTERISTICS

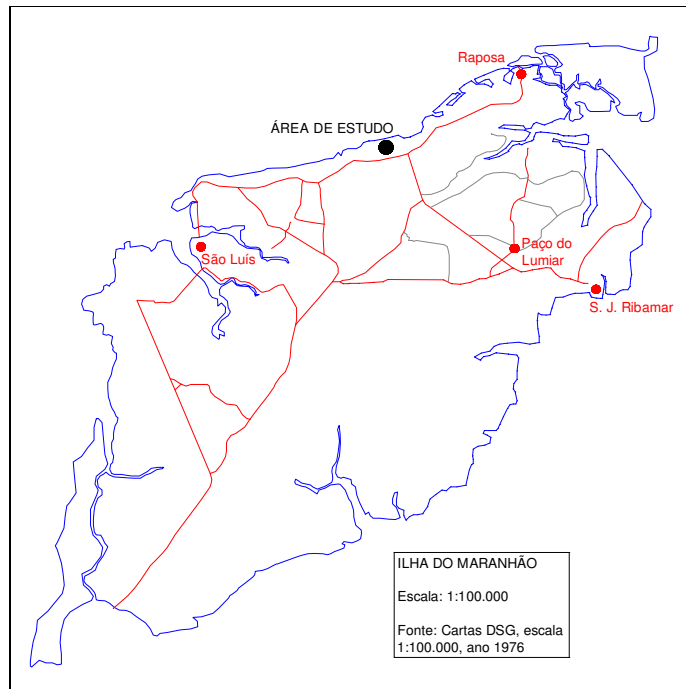
Location and geographical situation

Paço do Lumiar town is located in the northeast of the Maranhão island, with an area of 121,4 kilometers square and its limits are: on north Raposa town and Atlantic ocean, south, east and west São José de Ribamar town. The Urucutiua river hydrographical basin, with an area of 2,7 kilometers square, is located in the northwest part of Paço do Lumiar town (map 01), between the geographical coordination $02^{\circ} 27' 42''$ S and $44^{\circ} 10' 47''$ W (to the north); $02^{\circ} 28' 44''$ S and $44^{\circ} 11' 08''$ W (to the south); $02^{\circ} 28' 14''$ S and $44^{\circ} 10' 39''$ W (to the east); and $02^{\circ} 28' 17''$ S and $44^{\circ} 12' 01''$ W (to the west). It is possible to get there by highways MA-203 and MA- 204.

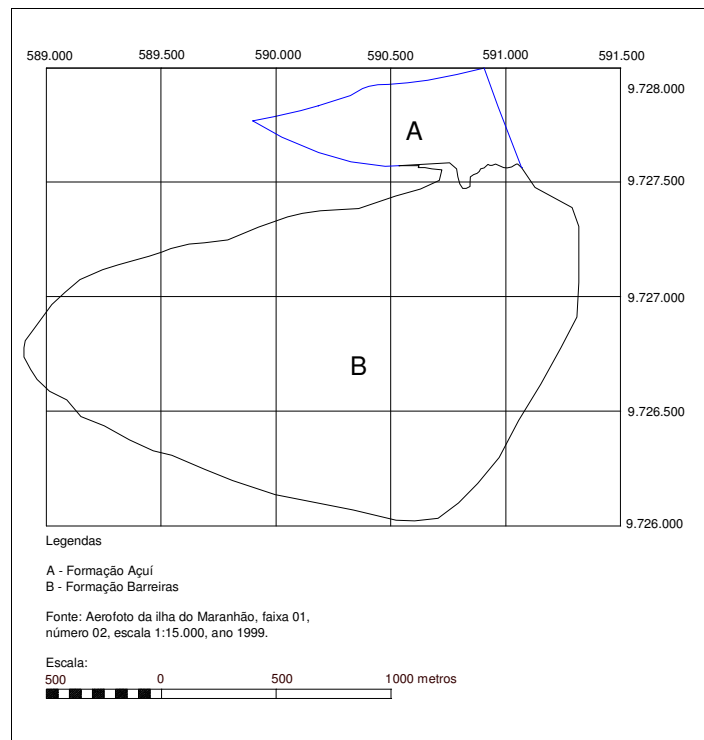
Physiology

Two kinds of geological formations encircle the area of study (map 02), the Acuí Formation, consisted of “depósitos aluvionares recentes, formados por cascalhos, areias e argila, dispostos em faixas estreitas ao longo dos principais cursos d’água” (CIRILLO, 2003, p.26), in Urucutiua river basin, these sediments appear in the medium and low course of the channel of the river; and the Barreiras Formation, where, according to Rodrigues et al. (1994, p.73), “[...] é composta de sedimentos areno-argilosos e ocasionalmente conglomeráticos, desorganizados, de cor rósea-avermelhados, ferruginizados, não a pouco consolidados”.

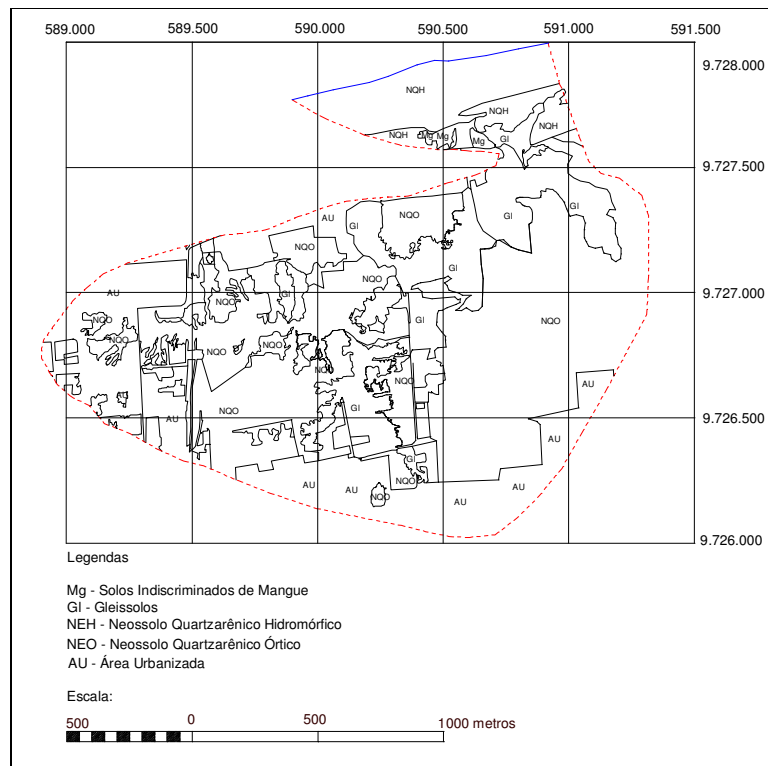
The predominant soils in the area, according to EMBRAPA new classification (CIRILLO, 2003, P. 43) “são Neossolo Quartzarênico Órtico, o Gleissolo, o Solo Indiscriminado de Mangue e o Neossolo Quartzarênico Hidromórfico” (map 03).



Map 01 – Location for studies area
 Source – CIRILLO (2003, p. 18)



Map 02 – Geological Map for Urucutua's river basin.
 Source – CIRILLO (2004, p. 33)



Map 03 – Soils Map for Urucutiua’s river basin.
 Source – CIRILLO (2004, p. 36)

The prominence of the basin is flat, with medium decline of 5%, but near the channel, the decline increases 10% in the medium course because of the form of inserted valley, in the high and low declines varies around 2%. The vegetation removed is predominant on area, with border thicket and mangrove swamp in small areas in the low course. The hydrography is characterized by dendritic whose contributors are most intermittent channels. The climate of the area resembles the climatic type of the island with “temperatura média anual de 27,8°C com amplitude térmica média de 8,5°C” (PEREIRA & ARAÚJO, 2001, p. 144), with the predominance of soft winds of the northeast and raininess of 1.800mm/year (SEMA, 1999, p. 10).

Human aspects

According to Cirillo (2003, p.31) “o processo de ocupação do interior da referida ilha e das regiões circunvizinhas seguiu o sentido noroeste-leste, difundindo-se nos interflúvios dos principais rios da ilha”. With the enlargement of the road system, the access to the other areas has been facilitated including the human occupation of these areas. According to Luz (2003, p. 23) “[...] a área do Araçagi onde está inserida a microbacia do rio

Urucutiua, ocorreu o início do processo de ocupação no período compreendido entre as décadas de 60 e 70 [...]” in the twentieth century. With the population increase in Paço do Lumiar, in the 80’s (CIRILLO, 2003, p. 34), the urban and rural population increased a lot (table 01), mainly in the west part of the town where the Urucutiua river basin is, according to Luz (2003, p. 24) the population increase in Araçagi area “intensificou-se nas últimas décadas a partir da especulação imobiliária, com demarcações, legalização e vendas de lotes” caused by touristic reasons.

ANO	POP. URBANA	POP. RURAL	POP. TOTAL
1970	524	12.963	13.487
1980	588	16.621	17.209
1991	1.147	52.048	55.729
2000	1.188	75.000	76.188

Table 01 – Paço do Lumiar’s population of 1970, 1980, 1991 and 2000.
Source – CIRILLO (2004, p. 21).

Main erosive processes in the area

Processes of the physical environment

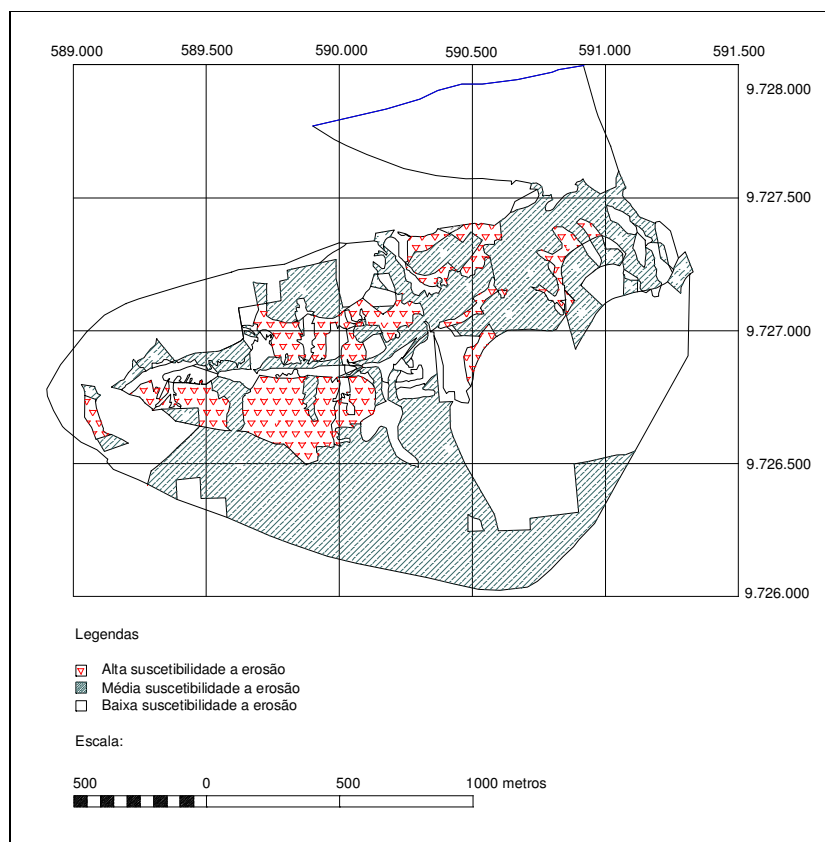
The main erosive processes identified in the area are: laminar erosion, furrow, ravines and excavations of the riverside.

The laminar erosion predominates in the basin thanks to the sharing process of the area and because people prioritized the flat area, taking the vegetation off. The ravines are in the main and secondary roads of the area, without appropriate pavement. The excavation of the riverside is the most serious form of erosion in the area. It contributes to the destruction of the Urucutiua River and its tributaries. It offers many problems to people who live in the riverside area as well as to piezometric surface because of the solid residues thrown in the channels as if the river were garbage.

PROPOSITIONS

Located in an area of high susceptibility of erosion, the Urucutiua river hydrography basin had its area mapped, standing out its physical attributions and the soil occupation form, making cross of these items based on the susceptibility to erosion, the preliminary susceptibility map to erosion in the Urucutiua river hydrographical basin were

made (map 04), identifying places where erosion could happen thanks to the interference of human action.



Map 04 – Erosions Map for Urucutiua's river basin.
Source – CIRILLO (2004, p. 39)

The low susceptibility on the edge of the high and low course of Urucutiua River predominates, thanks to the presence of vegetation and absence of human actions. The attributions decline, pedology, use and occupation of the soil contribute to the limitation of the susceptibilities in the area, but the geology will predominate in the edges with high decline.

Control action can be taken to a good plan, doing some constructions whose purpose are to avoid or decrease the energy of drainage of the superficial water making parallels construction to streets to the level curve, installation of hydraulic energy dissipater, pavements of streets, gutters, pluvial water galleries, and many more. The creation of a committee of the basin is another solution to the existent problems and in short time the analysis morphometrical and hydrological of the basin to make a plan.

CONCLUSION

The results obtained can be used in any activities of environmental plan in areas of hydrographical basins or other kinds of unities of landscape. The edges of the fluvial channels of the Urucutiua river basin have a vegetation covering that, despite of its secondary character, decreases the erosive processes. In areas where the vegetation was taken off and there is no meaningful presence of human activities as residents and agriculturist, the susceptibility increases to the highest level.

With the participation of the population in helping and supervising the government in the local plan, the problems of environmental degradation in area of Urucutiua river hydrographical basin could be reduced, balancing the physical environment, but also the solid one, improving the welfare of the community and valorizing the citizenship of people.

REFERENCES

ALMEIDA FILHO, Gerson S., RIDENTE JÚNIOR, José L.; **Diagnóstico, Prognóstico e Controle de Erosão**. In: VII Simpósio Nacional de Controle de Erosão, Goiânia, 2001.

CANIL, Kátia. **Metodologia para Elaboração da Carta de Risco de Erosão do Município de Franca, SP**. In: VII Simpósio Nacional de Controle de Erosão, Goiânia, 2001.

FRANK, Beate, BOHN, Noemia, SCHULT, Sandra I. M., CÓRDOVA, Rolando N. **Gerenciamento de Bacias Hidrográficas: Considerações sobre o Método de Rede**. Blumenau: Instituto de Pesquisas Ambientais da Universidade Regional de Blumenau, retirado do site www.riob.org/relobbriotajai.htm, às 01:41 do dia 25 de fevereiro de 2004.

GUERRA, Antonio J.T., SILVA, Antonio S. da, BOTELHO, Rosângela G.M. (org.). **Erosão e Conservação dos Solos: conceitos, temas e aplicações**. Rio de Janeiro: Bertrand Brasil, 340 p., 1999.

INFANTI JÚNIOR, Nelson, FORNASARI FILHO, Nilton; **Processos de Dinâmica Superficial**. In: OLIVEIRA & BRITO, Antonio Manoel dos Santos, Sérgio Nertan de Alves

Brito. **Geologia de Engenharia**, São Paulo: Associação Brasileira de Geologia de Engenharia, 1998.

LUZ, Maria H.M. **Problemas Ambientais na Área da Microbacia do Rio Urucutiua, Paço do Lumiar – MA**, monografia de graduação em Geografia/Licenciatura, São Luís: UFMA, 2003.

CIRILLO, Wanderson B. **Detecção de Áreas Suscetíveis à Erosão no Município de Paço do Lumiar – MA**, monografia de graduação em Geografia/Bacharelado, São Luís: UFMA, 2003.