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Assessment of the landslide and flood risks in São Paulo City, Brazil

Bianca Vieira (1) and Fabrízio Listo (2)

(1) Department of Geography,University of São Paulo, São Paulo, Brasil (biancacv@usp.br, 55 11 3091-3159), (2) Department of Geography,University of São Paulo, São Paulo, Brasil (fabriziolisto@hotmail.com, 55 11 3091-3159)

In Brazilian cities, especially during summer, the landslides and floods cause disaster and economic losses. Aricanduva basin is one of the most critical in the Metropolitan Region of São Paulo (RMSP), where many types of morphodynamic processes occur. This is the largest river basin in São Paulo City. The current situation is characterized by intense urbanization, soil sealing and consequent reduction of soil infiltration, increasing the frequency of flood events in this area. Thus, the main objective of this paper is to map risk areas of landslides and floods in the sub-basin Limoeiro, located in the head of the Aricanduva basin. For mapping the risk areas, we prepared a record field to floods and landslides, based on several studies. Initially, it were identified the natural indicators (vegetation, topography, surface cover and drainage) and anthropogenic (urban pattern, soil cover, building types, occupation density, road conditions, infrastructure, drainage systems, distance between houses and slope, at the top and base, and the drainage channel). On the second step of this research, we identified the evidences of mass movements (scars, cracks, subsidence, trees, poles and inclined walls). Thus, on the basis of this analysis it was possible to define the risk probability: R1 (low or no risk), R2 (moderate), R3 (high) and, R4 (very high). Subsequently, by means of oblique photographs (taken from helicopter flight) it was possible to define risk areas in the basin. In all the sectors identified, were recorded approximately 903 urban settlements. The results showed that from the 25 sectors of risk, 14 sectors (56%) presented landslide risk and 11 (44%), flood risk. Of the sectors that showed landslide risk areas, 21% have very high probability (R4), 21% high (R3), 29% moderate (R2) and 29% low (R1). The sectors at flood risk presented 45% of very high probability (R4), 10% high (R3), 18% moderate (R2) and 27% low (R1). There is large presence of sediments from landslides, debris and remnants of buildings. The drainage systems are precarious and there is runoff on the surface and sewage pipes on soil surface. Some houses were built without keeping safe distance from the top and bottom of the slope, increasing landslide risk. Others were built very close to the stream. There are cracks in the houses and walls and trees inclined by mass movements and riverbank erosion. In general, the urban occupation, after deforesting, characterized by land fragmentation and by settlements without urban infrastructure, occurred in the terrain less favorable to the occupation, where a natural susceptibility to landslides and flood processes exists. Thus, we believe that this mapping can help the identification of the active processes (landslides and floods) and the assessment of risk areas. Therefore, these maps can be used by public administration on identifying areas more appropriate to urban occupation.