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Intra-urban differentials in the exposition and vulnerability to landslides: the human fatalities in the 2011 Nova Friburgo-RJ disaster

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Introduction

The “Mega disaster” in the mountainous region of Rio de Janeiro took place on the 11th and 12th of January in 2011 and reached seven municipalities. According to Petley (2012), global and local landslide mortality is poorly quantified.

Objetives

- To determine spatial distribution of the human fatalities associated to landslides occurred in the municipality of Nova Friburgo in 2011.
- To increase the understanding about the critical factors involved in *exposure* and *vulnerability* related to landsides.

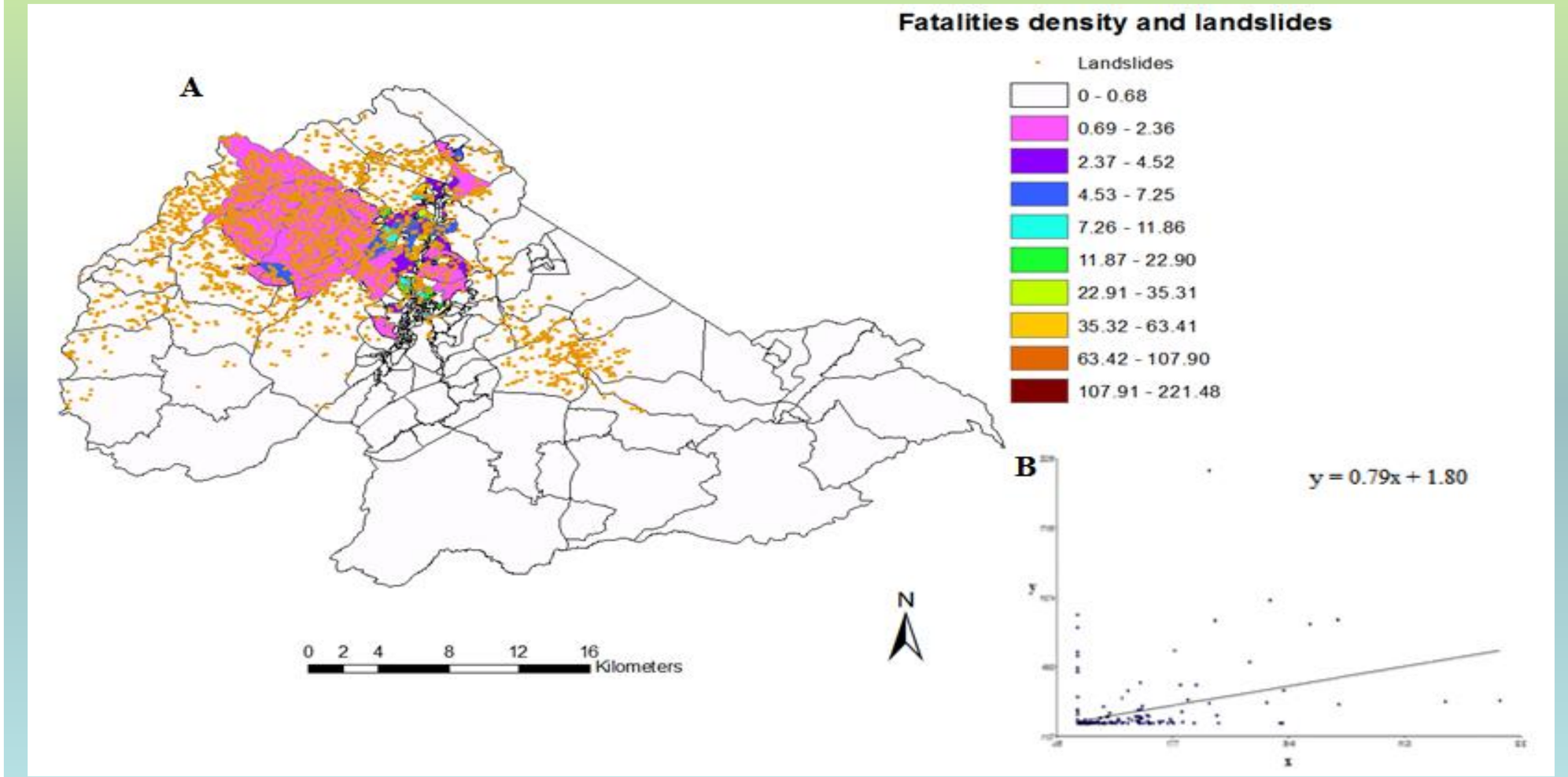
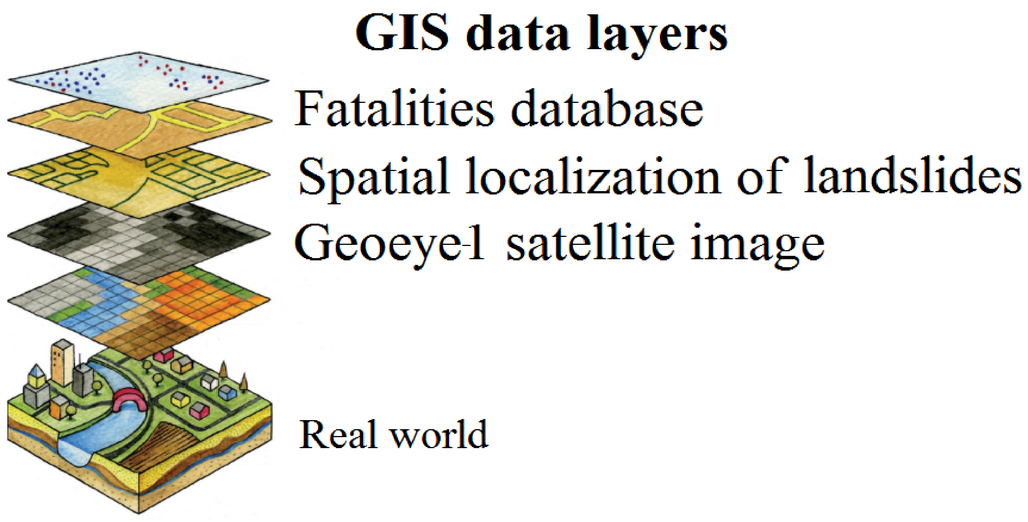


Figure 1 - Loss of human life from landslides in Nova Friburgo, Rio de Janeiro State during disaster occurred in 2011. **A)** Fatalities density and presence of landslides. **B)** Plot of simple linear regression analysis between fatalities density (fatalities per km^2) and landslides density (landslides per km^2).

Materials and Methods



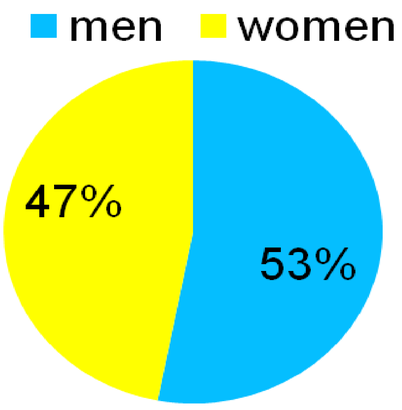
As the 2011 landslides events have occurred during night-time, it is assumed here that most of the people in Nova Friburgo were in their residences. By consequence, for geoadressing purposes we assumed that the deaths have occurred at the household premises or close to it.

Results

The Total number of landslide-related deaths was 434 (205 women and 228 men).

From these, 25% were children between 0 to 9 years old and 19% elderly with or above 60 years old.

Fatalities were concentrated in the North of the municipality, especially in the urban area; while landslides were prone to occupy a larger area including both urban and rural zones (Figure 1).



As expected, a simple linear regression analysis revealed that only 16% of fatalities were explained by the presence of the landslides ($y = 0.79x + 1.8$; $R^2 = 0.16$; $p < 0.0001$).

References
* Petley, D. 2012. Global patterns of loss of life from landslides. Geology, 40 (10):927-930.

Preliminary Appointments

Fatalities are linked with the existence of both intra-urban differentials in *exposition* and *vulnerability*, which also shape differentials in *response capacity* of the citizens.

In zones with high fatalities density probably occurred three factors simultaneously:

1) an *exposure* to landslides,
2) a poor disaster preparedness in all levels and,
3) a *low response capacity* (both individually and collectively).

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We thank Michele Ramos and Melânia Hoelz from the Municipal Health Authority of Nova Friburgo for fully support with the access to the data records.

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