MULTISCALE APPROACHES TO ANALYSE RISKS AND VULNERABILITIES IN THE COASTAL ZONE (BRAZIL)

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INTRODUCTION

In the context of environment and climate change with impacts to life and livelihoods of people in the cities of coastal zones, this work proposed an geospatial analysis using environmental (e.g. forest cover, slope, geology and geomorphology and others) and sociodemographic (e.g. education, outcome, age, gender and others) variables. The study area is a coastal zone of São Paulo in Brazil, region with a the major rate of population growth in relation of others municipalities of São Paulo, besides frequent problems with landslides, flooding and sea level rise events.

The objectives of this work were: (i) identified the risk areas of landslides, flooding and sea level rise and social vulnerabilities in different scales of analysis; (ii) analyse the risk perception of people living in this risk areas; (iii) found a common dialogues between sciences and communities to inform policy and decision-making in the different socioeconomic sectors.
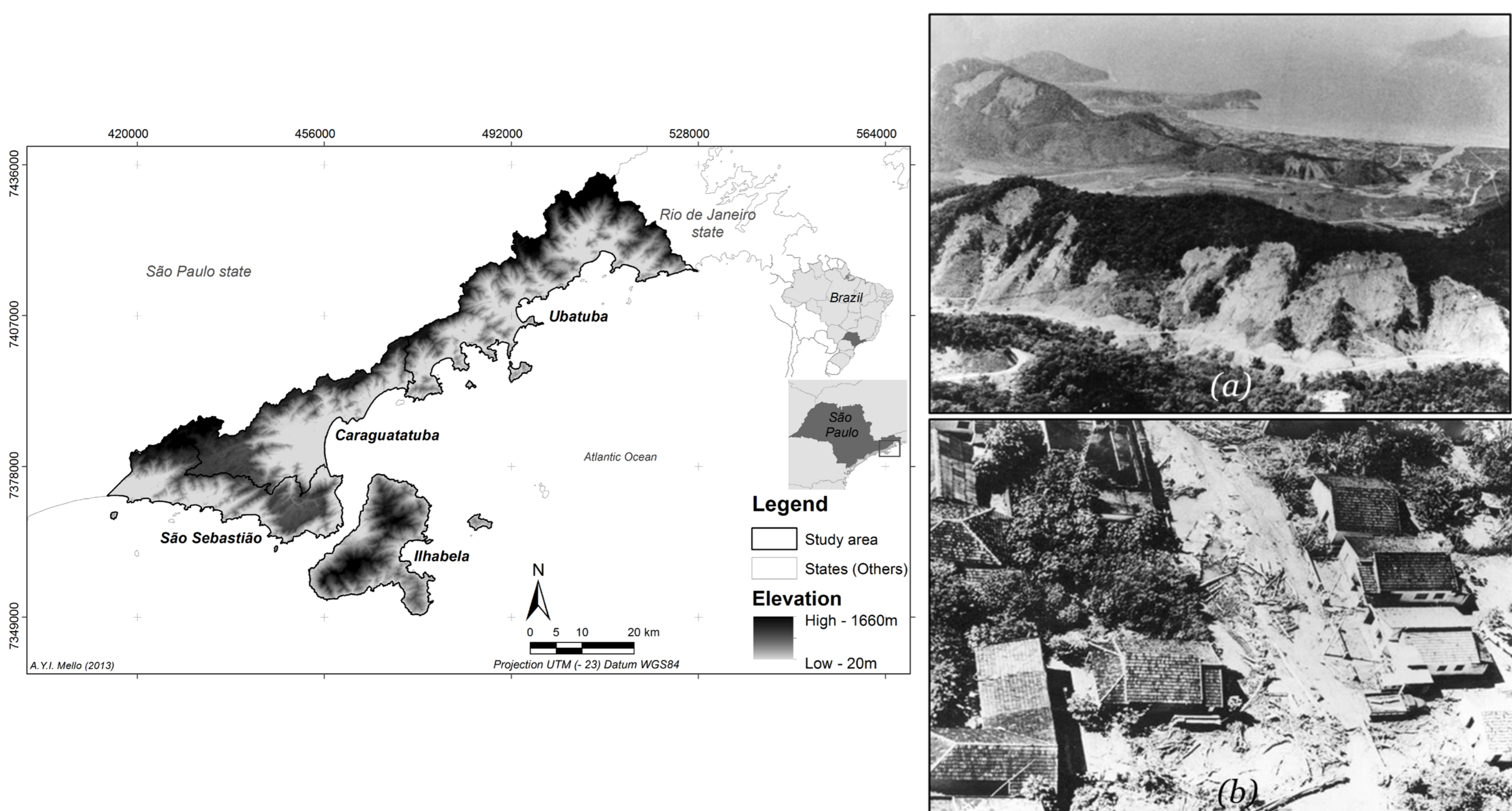

Fig 1. Study area: Northern coast of São Paulo state and 1(a)(b) disaster in 1967 (landslides and debris flows)

Coastline erosion - Massaguaçu/Caraguatatuba (Souza, 2007)

Landslides risks – Barra Velha/Ilhabela (field work, 22/11/2011)

Landslides risks Cantagalo/Caraguatatuba (IPT, 2010)

Landslides risks and irregular occupations in protected area – São Sebastião (Estadão, 11/09/2010)

Landslides risks - Sta Tereza/Ilhabela (field work, 22/11/2011)

Flooding risks - Ubatuba (O Globo, 24/04/2011)

MULSTISCALE APPROACH AND RESULTS

An multiscale analysis approaches was used considering the regional level (municipalities and watershead – Northern coast basin) and local level (people living in risk areas – landslides, flooding and coastal erosion or sea level rise). The method approaches was based in three sections:

(I) multiscale analysis of risks and vulnerabilities to climate change, including (a) geographic data of sociodemographic and environmental variables; (b) social and environmental indicators in different scales (indicators spatially explicit) (c) multiscale approaches – mapping of risks and vulnerabilities (social and environment) to climate change.

(II) risk perception analysis of people living in the risk areas, including (d) questionnaire on risk perception of individuals – four themes: socioeconomic profile, environmental and climate change, social and environmental risks and communication and risk governance, (e) sampling to select individuals at risk and (f) survey of risk perception, with total n = 916 interviews;

(III) treatment and analysis integrated, linking the results of social and environment vulnerabilities to climate change and risk perception of people at risk to climate change.
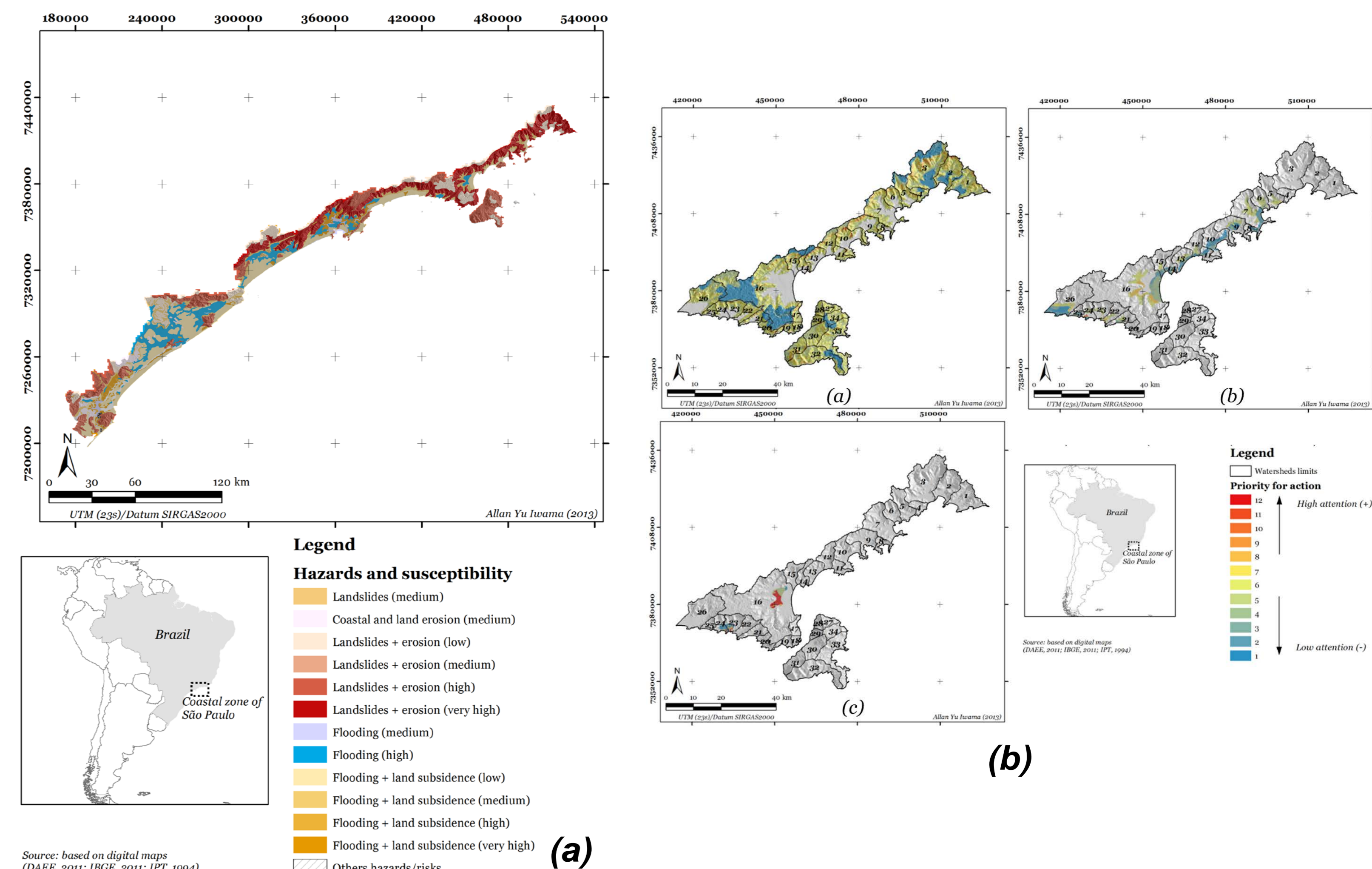

Fig 2. (a) Coastal zone of São Paulo (SP) – regional analysis. (b) Watersheds in Northern coast of SP – regional-local analysis: the landslides, sea level rise and flooding risks.

The integration of environmental and sociodemographic variables indicated high risk in areas of flooding, landslides and coastal erosion, higher and lower vulnerability in Brazilian Southeast coastal zone. These results are presented in different scales of analysis of (1) municipalities, (2) watershed basin. Also, the survey (916 interviews) of risk perception shows: the climate and environmental changes are happening; the mainly causes that have contributed to these changes are human activities; the risk perceptions changing by location (geographic area) and the temporality of climatic or environmental events (such as rainfall, landslides and flooding). The results suggest that individuals who live in areas at risk have a relationship of belonging to the place where they live (Figure 3 show some places of risk perception interviews to climate change.
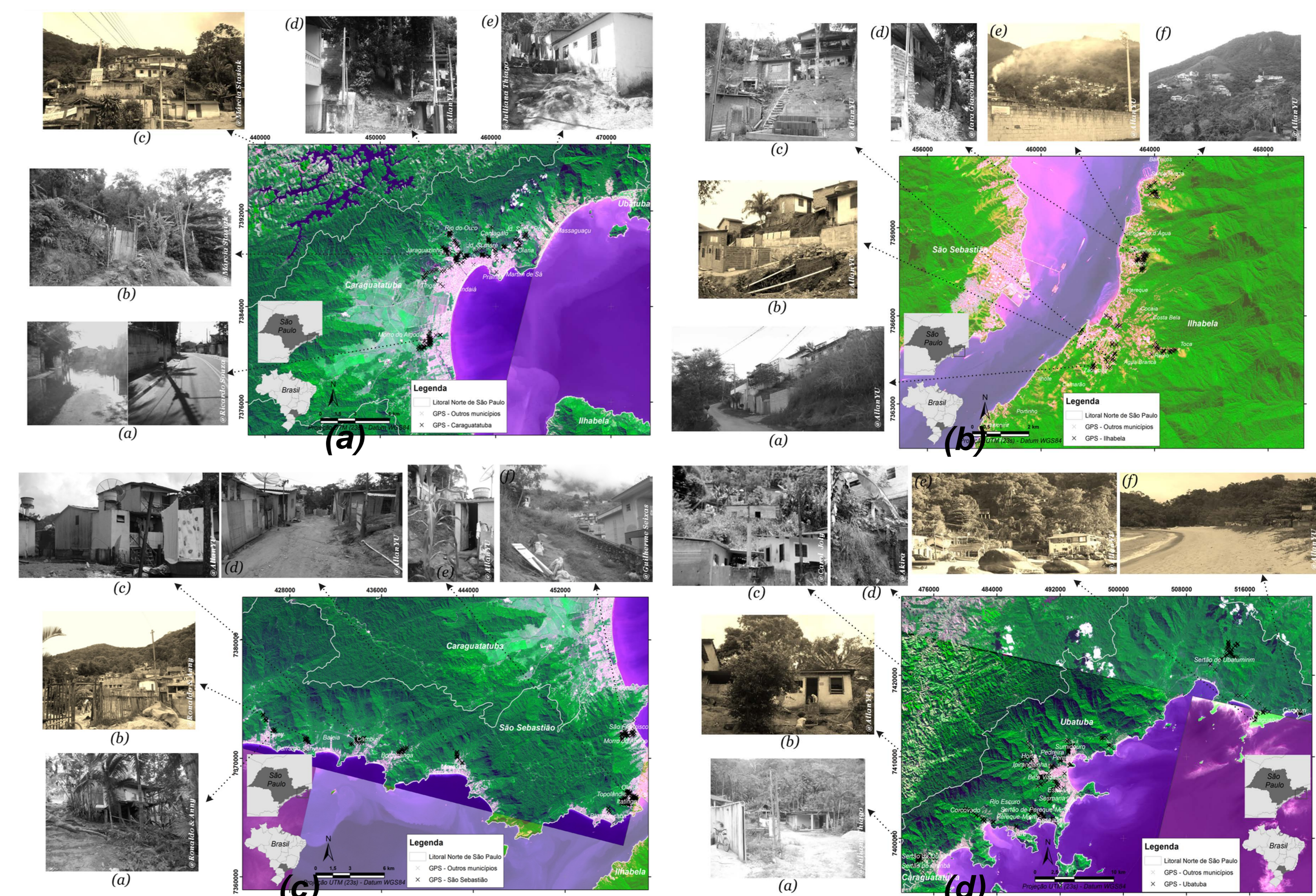

Fig 3. (a) Caraguatatuba city, (b) Ilhabela city, (c) São Sebastião city and (d) Ubatuba city in Northern coast of São Paulo, Brazil (risk perceptions interviews).

DISASTER RISK MANAGEMENT FRAMEWORK

The results indicate the need to integrate the analysis of risks and vulnerabilities in different scales of analysis to understand how the effects of climate change and environmental occurs to reduce the negatives effects of climate change. Also indicates the need to articulate the technical-scientific research with management, to reduce the natural and social disasters (Figure 4).
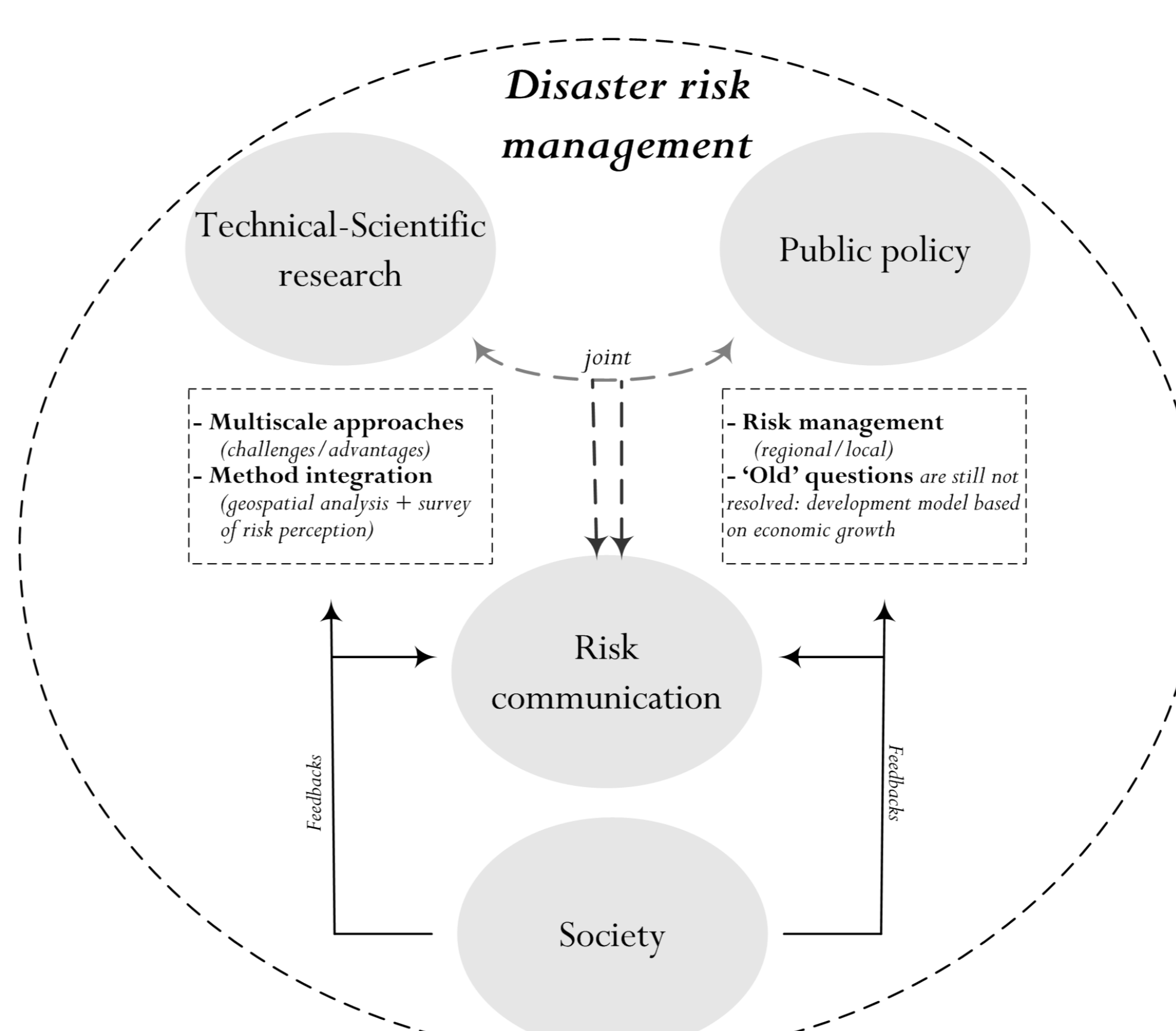

Fig 4. Disaster risk management: framework.