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## CLIMATE CHANGE, HAZARDS AND VULNERABILITY: MULTISCALE ANALYSIS IN NORTHERN COAST OF SÃO PAULO, BRAZIL

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### Abstract

Several researches have showed the importance of coastal zones for anthropogenic uses such as industrial development and urban expansion. As in many parts of the world, the coast of Brazil is home for the majority of its population. However, as natural frontline systems, coastal areas are directly exposed to multiple, and in many occasion conflicting, uses, natural hazards with different risks and vulnerabilities. The study area, the coast of São Paulo state is no exception. Growing investments in the Pre-Salt deep oil and gas exploration offshore are in constant conflict with the need to protect coastal and marine systems. On land, for instance, the 'Serra do Mar' region presents conflicts between different uses and occupation with significant implications for the socio-environmental hazards and vulnerability. In this context, population growth associated with an increase in consumption and waste-sewage disposal, and inefficiency of sanitation infrastructure represents a large pressure for the coastal system and exposes the population to different social and environmental hazards. This study focus into two different approaches to assess hazards and vulnerabilities: (1) the geospatial indicators and (2) modelling of debris flow and flooding events. The integration of both methods through a multiscale analysis: (i) in a regional scale, geospatial indicators show the priority watersheds for risk reduction in the different hazards - landslides, flooding and rising sea level, (ii) locally, the analysis based on a 1967s extreme event in Caraguatatuba - with rainfall variation of 115-420mm and max. 841mm - show the consistent analysis of historical data of tidal levels and the rainfall effects of flooding and debris flow in the districts of 'Santo Antônio' river basin. The results also indicate that multiscale analysis does not necessarily require the same approach for a regional-local analysis, once the social dynamics and environmental interactions are complex and require different analysis processes according to the scale of the phenomenon. Moreover, whenever possible, it is necessary to use mixed methods approach to analyze the vulnerability of a particular place (regional-local scale). These findings can benefit research on large regional changes subject to extreme events under the influence of megaprojects on areas, and population exposed to different hazards and vulnerabilities. Results of land use and cover change analysis can also support the review of coastal management plans, urban planning and disaster response strategies.

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