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Vulnerability of Brazilian Megacities to Climate Change: The São Paulo Metropolitan Region*

A major concern of contemporary society in relation to future climate projections relates to possible changes in the frequencies and intensities of extreme weather events. Megacities such as São Paulo have numerous social and environmental problems associated with patterns of development and transformation of space, which have been aggravated by increases in temperature and intensification of extreme weather events.

The risks will grow further due to higher temperatures and the associated increase in the frequency of rainfall events, especially in the summer. Preliminary studies project that between 2070 and 2100, an average temperature increase of 2°C to 3°C could double the number of days with heavy rainfall in São Paulo (Marengo et al., 2009).

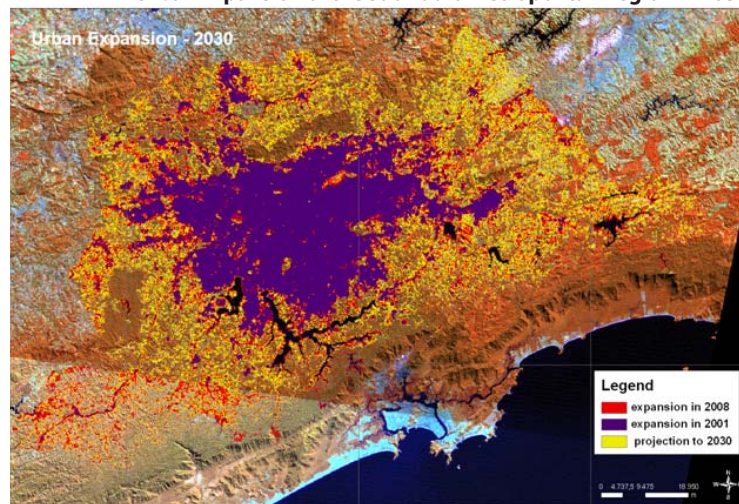
The São Paulo Metropolitan Region (RMSP), which already suffers from floods every summer, may experience an increased number of days with heavy rainfall by the end of the 21st century. Total rainfall of over 30 mm/day has the potential to cause severe flooding. Total rainfall above 50 mm/day, virtually nonexistent before the 1950s, now usually occurs two to five times a year in São Paulo.

In addition, changes in temperature trends indicate that the region will have more hot days, fewer cold days, more warm nights and fewer cold nights (ibid.). These projections may generate significant impacts, such as the intensification of heat island effects that affect the dispersion of pollutants. The concentrations of certain pollutants are expected to increase, especially the gases and particles generated through atmospheric photochemical processes (CETESB, 2006).

Projections indicate that if the expansion pattern of the RMSP continues along historical lines, the urban area in 2030 will be approximately 38 per cent larger than today, with increased risks of floods and landslides affecting the population as a whole, especially the poorest people. More than 20 per cent of these new areas of expansion would be susceptible to and could eventually be affected by natural disasters caused by heavy rains. Approximately 4 per cent of the predicted expansion areas may be at risk of landslides.

In general, significant changes in local climate are generated by the way these urban areas develop through uncoupled interventions such as intense vertical growth, soil compactness and suppression of vegetation and watercourses. Basically, the worsening of the drainage problem has always been tied to the occupation of the fluvial plain and the poor environmental quality of urban spaces, further provoked by illegal settlements in protected areas with increased areas of risk along watersheds etc.

Urban Expansion of the São Paulo Metropolitan Region in 2030



Source: Image from Landsat 7 TM + satellite orbit point 219/76 and 219/77.

Considering the fast pace of urban expansion and the delay in the implementation of adequate infrastructure to support the rate of growth of the urban area, there is a lack of preparedness for the expected effects of climate change.

In summary, the RMSP is facing a great challenge, since the environmental consequences of urban interventions and the lack of control can be tragic. This is clear given the consequences of extreme events such as floods, landslides and others. The risks and their magnitudes will depend on the severity, frequency and distribution of events related to climate change; yet the scale and frequency with which climate phenomena recur have not been precisely defined.

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