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How global changes impact water resources in a southern coastal metropolis? Case of Recife (Brazil)

Lise Cary, Emmanuelle Petelet-Giraud, Paul Cary, Armelle Giglio-Jacquemot, Guillaume Bertrand, Axel Aurouet, Ricardo Hirata, Ana Melo, Eliot Chatton, Luc Aquilina, Lincoln M. Alves, Suzana Montenegro

The Recife Metropolitan Region is a hot spot illustrating the problems of southern countries on water issues where water resources are threatened both for quantity and quality in the context of global changes. Based on a transdisciplinary approach, the purpose of the study was to assess the impact of human activities on coastal aquifers, through the analysis of pressure on groundwater resources and their social and structural reasons, the identification of sources and mechanisms of groundwater quality degradation, and the evaluation of the impacts of global changes on water resources at the regional level. The methodology was based on a multi-isotopic fingerprinting of groundwater and surface water, on gas analyses, and on sociological and ethnographic investigations including ethno-photography to characterize the daily life of the Recife inhabitants facing the lack of water or its poor quality.

The results revisit the aquifer system functioning. In the deep aquifers, the groundwater displays a residence time over 10 000 y with a residual salinity inherited from the Pleistocene marine transgressions. Their recharge is very limited resulting in large water level decrease. Inversed flow directions due to overexploitation favour leakage from the surficial contaminated aquifers. The access to water and its social perception vary according to the social environment and to the residence location of individuals. Access to water is more a political problem than a technical one. The public authorities tend to deny the difficulties of poor people, especially in times of drought. The discredit of the water and sanitation public actors, and political and institutional rivalries and fragmentation are obstacles to technical solutions implementation. Integrated water management is urgently needed knowing that local climatic scenarios predict a reduction of rainfall volume of 20% together with a sea level increase of 18-59 cm by 2100.