

Quantification of sediment export from two contrasted catchments of the Mayotte Island: a multi-scale observatory to fight against soil erosion and siltation of the lagoon in Mayotte Island

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As a consequence of a dramatic increase of its population, the Mayotte Island is undergoing significant land use changes, mainly through an increase in agricultural areas as well as unplanned urban sprawl. Resulting soil erosion in natural degraded areas, in agricultural fields or from rural habitat threatens the sustainability of agriculture, as well as the balance of the lagoon ecosystem, one of the largest in the world, by siltation of the aquatic environment by sediments and adsorbed pollutants. In order to implement pertinent and sustainable remediation measure there is a need to quantify the sediment fluxes, identify the sources areas and raise awareness of population on land degradation.

To this end, a multiscale hydro-sedimentary observatory was installed on two coastal watersheds representative of the morphology, geology and land use observed on the island of Mayotte: the Mtsamboro basin (19 ha) and the Dzoumogné basin (343 ha). On the Mtsamboro basin, rainfall, runoff and sediment monitoring is carried out by two stations in order to distinguish the urbanized downstream part (11 ha) from the upstream part under agro-forest cover (8 ha). A single hydro-sedimentary station was installed at the outlet of the Dzoumogné basin insofar land use is homogeneous and represented by agro-forest cover. The observatory is completed by a survey of runoff and erosion on experimental plots installed on the main types of land use of the island of Mayotte.

The cumulative rainfall of this first year of monitoring is closed to the long term mean (1934-1997) with 1200 mm rained over the wet season (December - April). During this period, recorded rainfall events reached a maximum of 90 to 120 mm in 24 hours. The soil erosion rate over this year at the outlet of the Mtsamboro basin is 5.4 t.ha⁻¹. On the upstream part of the watershed, the soil erosion rate decreases to about 1 t.ha⁻¹, clearly lower than the tens of tons generally observed at the plot scale for this context. Therefore, despite very steep slopes (> 20%), the scale effect on soil erosion rates is extremely marked with massive deposits of sediments on hillslopes and on the streambed of the stream network. The soil erosion rate is 0.3 t.ha⁻¹ for the Dzoumogné basin. This figure is explained by a larger drainage area and an agroforestry cover offering more possibilities for sediment deposits. These results provide initial insight into the dynamics of hydro-sediment transfers on these basins and will be enriched and deepened as part of the multi-year survey of this observatory.