

Anthropogenic pollution sources and pathways on a semi-arid tropical SIDS – a hydrogeochemical study on Curaçao

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Among the most urgent water-related challenges for small island developing states (SIDS) are low water quality and its availability. Sewage pollution has often been identified as a cause of this water quality deterioration and related groundwater contamination is observed for several islands.

Curaçao, having a semi-arid climate with distinct wet season, is dependent on groundwater for irrigation purposes both for agriculture and households. Wastewater collection is mostly decentralized through cesspits and septic tanks that leak into the groundwater. At the same time existing WWTP's only perform partial treatment, while the effluent is widely used for irrigation as freshwater is limited. This leads to environmental contamination with not only implications for human health, but which also poses a risk to vulnerable nearshore coral reef ecosystems.

For both water management and nature conservation a thorough understanding of the hydrogeochemical situation is required in order to

- 1) link potential onshore pollution sources to (ground)water quality;
- 2) identify dominant pathways of contaminants from land to sea

During two measurement campaigns groundwater samples were collected in the wet season. Additionally rain, surface runoff, seawater and wastewater was sampled. In-situ measurements include field parameters, E.coli and radon (Rn²²²). Analysis of main ions, nutrients and trace elements were carried out in the lab. Preliminary hydrochemical analysis show a clear link between groundwater nutrient pollution and urbanized areas indicating inadequate wastewater management.

Future endeavors include radon surveys along the coast to detect submarine groundwater discharge (SGD) hotspots and quantify nutrient fluxes to sea. In addition, environmental N-isotopes will be used to determine pollution sources and potential subsurface denitrification. SGD fluxes will be compared to estimated nutrient fluxes through surface runoff and direct wastewater discharge to decide on effective mitigation strategies that limit nutrient inputs into terrestrial and the nearshore environment.

This research aims to understand and enhance sustainable water quality management on SIDS. It is part of SEALINK; an interdisciplinary research team comprising nine PhD projects from Dutch universities that aim to link terrestrial input to coral