



Sustainable Conjunctive Use of Groundwater and Rain Catchment Water Under Variable Climatic Scenarios for Atoll Island Communities of Yap State: Ifalik, Eauripik, Satawal, Ulithi



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This year's modeling study will address several outlying low islands of Yap State: Ifalik, Eauripik, Satawal, Ulithi. (FSM Critical Needs, October 16, 2014: Items II.4, II.8 and II.15 of Water Quantity Projects, and III.2, III.3 of Education and Professional Training.) Water shortages are a persistent concern for residents of atoll islands. Under normal rainfall conditions, water demand is able to be met by rooftop rain catchment, but prolonged droughts, such as those associated with ENSO events in the western Pacific region, can exhaust water storage, leaving residents dependent on groundwater or imported water from distant islands. With island residents dependent upon both rain catchment water and groundwater, a complete assessment of water resources available to atoll island communities must include a time-dependent analysis of both stored rain catchment water and available fresh groundwater. Furthermore, the conjunctive dependence on both sources of water varies in time according to climatic stresses such as decadal patterns in rainfall variability, drought, and sea-level rise, and hence these must be taken into account in the analysis. In order for conclusions of such an analysis to be adopted by local island communities, clear and concise presentations and training for the water resource managers and government officials of the FSM should be conducted, and basic water conservation practices should be communicated to the general population. WERI researchers have developed an accurate, readily portable groundwater management spreadsheet tool that is based on results from numerical modeling simulations. The tool can be used to assess groundwater and rain catchment volumes during average rainfall or drought

conditions, and can also be used to design a community's rain catchment system that will maintain adequate freshwater volumes during drought conditions. The tool was presented to the FSM Advisory Council and other water and environment personnel in October 2014, and training was conducted.



Rain water storage tank in the FSM.

This project aims to build on the previous year's results by using the new groundwater-rain catchment storage calculator to assess daily freshwater water supply for specific islands in the FSM. Three-dimensional modeling of the freshwater lens using the USGS code SEAWAT (Langevin et al., 2008) also will be used to assess lens thickness and lens volume. These assessments will be performed under various climatic scenarios, such as rainfall variability, drought, and sea-level-rise to provide a broad range of application. Presentation and training to the FSM water and environmental officials will occur at the FSM Advisory Council in October 2015, and educational pamphlets will be created for distribution to FSM atoll island schools.