



FSM atoll groundwater resource inventory



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Atoll islands are uniquely vulnerable to drought. During the most severe droughts production from rooftop rain catchments ceases completely, and groundwater can become too saline for human consumption, or even disappear entirely as the shallow, thin groundwater lenses of the atoll islands become depleted. State officials and island leaders in the Federated States of Micronesia need reliable estimates of the amount and rates at which water can be extracted under drought conditions, and the rate at which the freshwater lens can be expected to recover as precipitation returns to normal. Such knowledge will enable more effective management of emergency water supplies during droughts and provide a basis for sustainable management.

The research team conducted a comprehensive literature and database search on the geology and hydrology of Pacific atoll islands, from which information was extracted and compiled into a GIS database. Using the geological and hydrological data they incorporated static (steady-state) analytical equations into a GIS model to calculate groundwater reserve and sustainability estimates for each atoll island in the database. During the summer field season the team visited Yap State, FSM, to substantiate the applicability of the GIS model by field checking the underlying assumptions and methodology against actual conditions on a representative atoll island. They interviewed residents to learn about their water use practices and needs.

Specific objectives of the literature/database search included collecting the following information for each of the atoll islands in the FSM:

- Island locations, geographical dimensions, and hydrogeological data (e.g., hydraulic conductivity, water table response to tides) gleaned from previous studies by others.
- Land use information on each island, to include the proportion of each island covered by various types of vegetation, both natural and agricultural, and the evapotranspiration characteristics of the vegetation.
- Meteorological information for each island, to include historical rainfall records and regional estimates, where data on individual atolls are unavailable.
- Demographic information related to water use, such as population and daily water consumption, types of use, usage patterns, and responses to previous droughts.

Specific objectives for the GIS database and hydrologic model to be constructed for the project include the following:

- Estimates of the steady-state groundwater reserve associated with rainfall over the range of interest—i.e., historically normal to historically low rainfall amounts.
- Estimates of the rate and amount of water that could be extracted from each island aquifer under drought conditions.
- Estimates of the rate at which island groundwater reserves can be expected to recover as rainfall returns to normal.