



# SUSTAINABLE

Water Management Conference

2018

## Water for our Island

How One Community Survived  
after Losing their Sole Source of Fresh Water



# Water for our Island

An aerial photograph of a tropical island. The island is covered in dense, dark green vegetation. It has several white sandy beaches and is surrounded by shallow turquoise water that transitions into deeper blue ocean water. The sky is bright blue with scattered white clouds. The overall scene is idyllic and scenic.

Ron Gonzales, PE

Island Life Engineering, LLC

# Kayangel Atoll, Palau



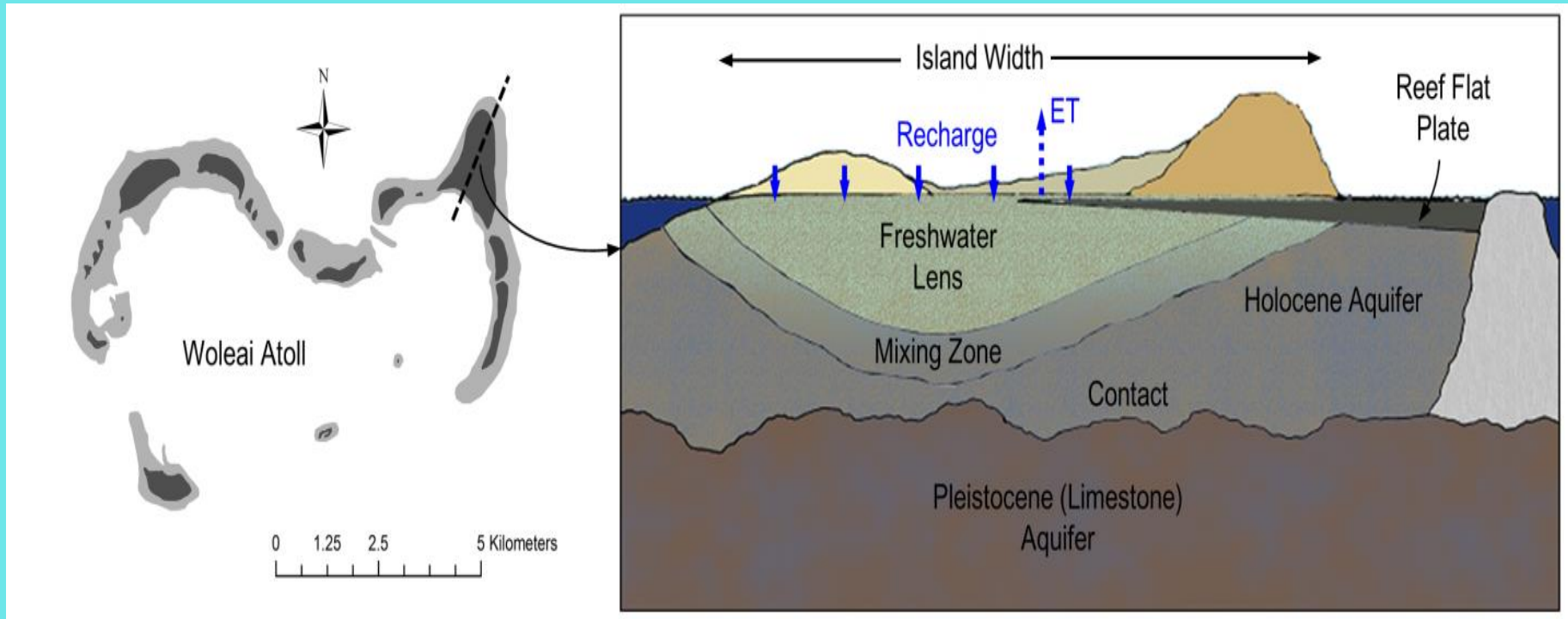
Photo by Wallpaperweb.org

# How Kayangel Lost its Water Supply



**Ngerimel Reservoir,  
Airai, Palau**

# Atoll Hydrogeology



**Conceptual model of atoll island hydrogeology  
(after Ayers and Vacher, 1986)**

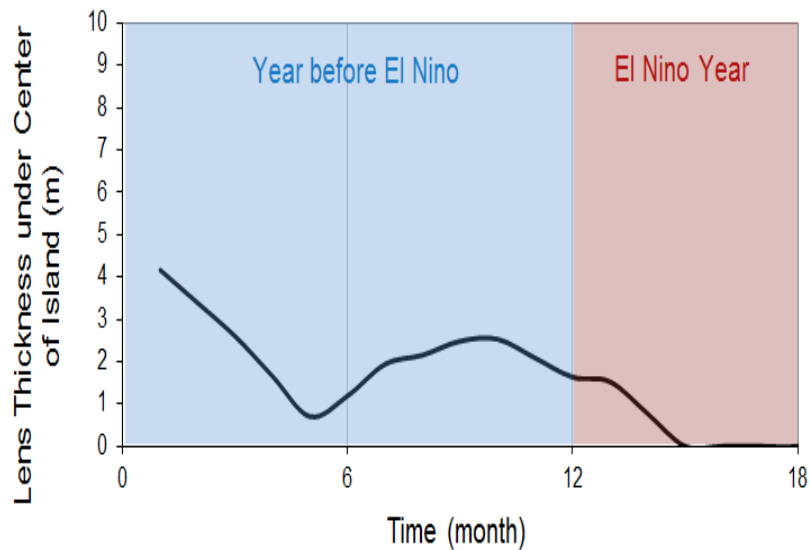
# Climate Change Impacts

- **2013 Supertyphoon Haiyan**
- **2016 Severe El Nino**
- **2017 Mild El Nino**
- **Brackish water intrusion**
- **All potable water imported**

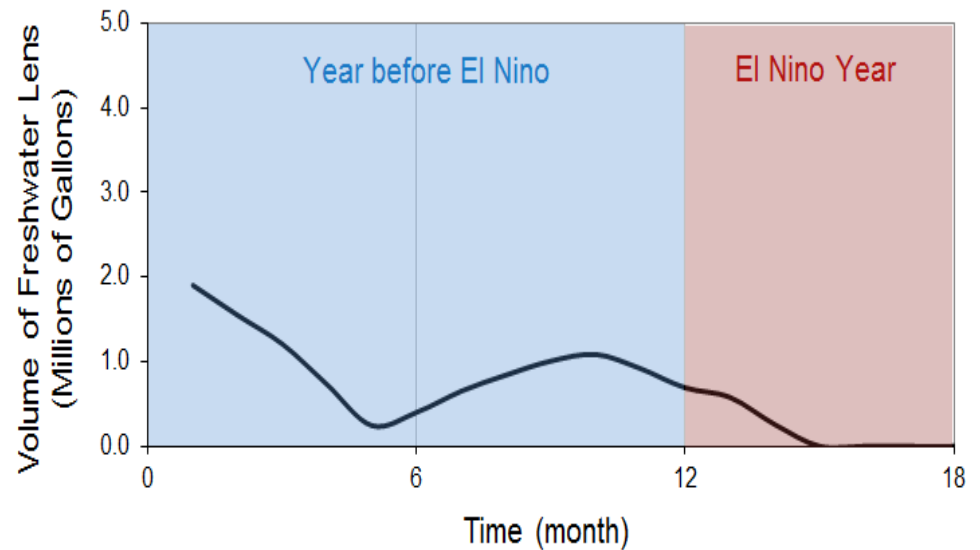


# Kayangel Freshwater Lens Depletion

Kayangel Island



Kayangel Island



Estimated (A) lens thickness under the northern section of Kayangel and (B) total lens volume during an El Nino drought, comparable to the 1998 drought. The estimates are calculated using a recently published algebraic model by Bailey et al. (2010) and Bailey et al. (2014)

# Climate Change Adaptation

- **Water Storage**
- **PV power to pumphouse & chlorination unit**
- **Connect desal unit to existing water system**
- **Rainwater catchment**



Photo by Allied Pacific Environmental Consultants, Inc.



# Technical Scope/Objectives

- Provide alternate potable water supply to 70 residents
- Restore fresh water lens
- Provide 3000g storage
- MMP (Mobile MaxPure)  
Unit Provides 3500gpd potable water @ 20psi  
(50gpd/capita)  
30,000 TDS seawater to <1,000 TDS



Image by World Water & Solar Technologies

# Kayangel Solution

- **SPREP Grant Install tank and PV pump**
- **USDA Grant for portable PV desal unit**
- **Shut down groundwater lens for recovery**
- **Estimate 2 year recovery under normal rainfall/no typhoons**



Photo by APEC, Inc

An aerial photograph of a tropical atoll. The water transitions from a deep blue in the open ocean to a vibrant turquoise near the reef edge, and then to a dark, almost black lagoon in the center. The reef is visible as a white sandy edge. In the background, there are more atolls and a large, bright white cloud against a clear blue sky.

Questions?

Ke Kmal Mesulang!

Ron Gonzales, P.E.