

## **Laura Lens Conservation and Management Manual**

The Majuro Atoll, which contains the capital city of Majuro in the Republic of the Marshall Islands (RMI) in the Pacific Ocean, has a population of about 28,000. Freshwater in particular is a fragile resource because there are no rivers or lakes. People in the Majuro Atoll depend on Laura Island's freshwater lens (Laura Lens) for domestic and irrigational use. Laura is an island village situated on the western edge of Majuro Atoll, with an area of 1.8 km<sup>2</sup>, an average altitude of a few meters, and a population of approximately 2,300. As a result of population growth in Majuro Atoll, water demand on the atoll is expected to rise and put increasing pressure on Laura Lens. Moreover, the presence of El Niño in the Pacific region often causes droughts in the RMI. There is also a concern that climate and meteorological changes caused by global warming may expand drought areas or cause them to shift. Thus, Laura Lens is in a critical state. Normal water-pumping rates can result in saltwater upconing (i.e., partial upward intrusion of saline water) at the Laura Lens boundary if monthly rainfall is reduced even slightly below normal levels.

In order to develop a method for conserving Laura Lens, a numerical simulation was performed using the SEAWAT model. To analyze water usage, numerical experiments were carried out in which monthly rainfall and daily pump discharge were set under varied boundary conditions. Saltwater upconing, which should not reach the shaft (lateral well), was simulated to obtain the sustainable daily pump discharge for Laura Lens. This manual, therefore, describes the "safe" daily pump discharge in accordance with the rainfall level, and recommends the dispersed pumping method (i.e., increasing the number of intake wells to reduce pumping pressure on one location) to maintain a healthy Laura Lens based on scientific findings.

To conserve the freshwater lens, it is important that the daily pumping discharge be reduced as the monthly rainfall decreases. It is thus desirable to devise a new groundwater intake system in which the wells are being pumped at low intensities. On February 3, 2016, a state of emergency was declared in the RMI because of the drought caused by El Niño. This manual is serving its purpose as it is being widely used by the Drought Committee, among others, in ensuring the sustainable use of a healthy Laura Lens by drought-affected people.

*(K. Koda and T. Kobayashi)*

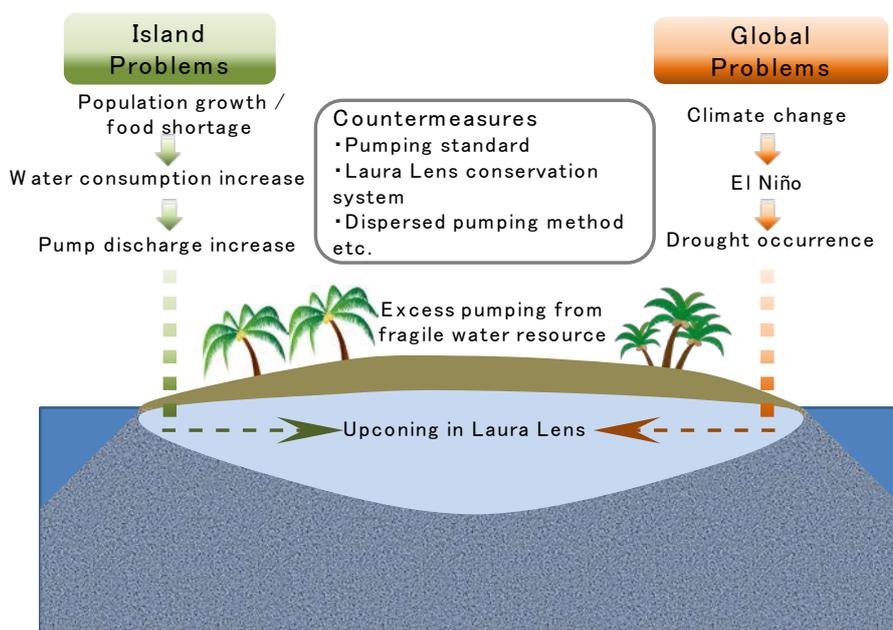


Fig. 1. Problems and Countermeasures in terms of Water Use



Fig. 2. Laura Lens Conservation and Management Manual

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