

FRESHWATER under THREAT PACIFIC ISLANDS

Vulnerability Assessment of Freshwater Resources to Environmental Change



United Nations Environment Programme



Secretariat of the Pacific Community
Applied Geoscience and Technology Division

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Foreword

Water is essential for life. It is also essential to most of the Millennium Development Goals (MDGs). Yet the world's freshwater resources remain vulnerable and a reliable assessment of its current vulnerability is needed. Major constraints to such an assessment have been the lack of an operational framework for vulnerability assessment and widespread lack of accurate and timely data at basin, and more significantly, sub-basin scale. However, progress in our understanding of what exactly is meant by vulnerability, as well as data gathering and processing techniques offer promising avenues to overcome these constraints.



The United Nations Environment Programme (UNEP) joined hands with a number of regional partners from Africa and Asia to address the issue of vulnerability of water resources on these continents. This assessment of freshwater resources vulnerability of the Pacific Islands, produced in collaboration with the Secretariat of the Pacific Community is one of the outcomes of this partnership.

The 14 Pacific Island Countries (PICs) are home to over 9 million people, the majority of whom live in rural areas. These countries have about 1,000 islands covering a land area of just over 500 thousand square kilometres, spread across 180 million square kilometres of ocean, more than one third of the earth surface. The term Small Islands Developing States (SIDS) recognizes the specific social, economic and environmental vulnerabilities of the 14 PICs. This Assessment concludes that their greatest vulnerability is the lack of freshwater resources in low-lying islands, exacerbated by limited human, financial and management resources, and increasing population densities. It includes a focused analysis of selected islands, which concludes that the Pacific island nations' economies, fragile ecosystems and livelihoods are particularly vulnerable to climate variability and change.

The water challenge is real and immense in PICs. This report reveals that about 10% of all deaths of children under five in the Pacific island countries are attributable to diarrhoeal diseases, and about 90% of these diseases are due to poor hygiene, lack of adequate sanitation treatment systems and high levels of poor quality drinking water.

The study finds that there is no one solution for the Pacific and a unique mix of policy intervention and preferred management measures is available to reduce water vulnerability in each Island State. It is our hope that this pioneering assessment will lead to a long-term process of periodic review and update, providing an authoritative picture of water-related vulnerability, and contribute to the empirical basis for sustainable development in the Pacific.

A handwritten signature in black ink that reads "Young-Woo Park". The signature is fluid and cursive, with the first name "Young" and last name "Park" clearly legible.

Young-Woo Park

Regional Director and Representative for Asia and the Pacific
United Nations Environment Programme

Acronyms and Abbreviations

ADB	Asian Development Bank
CV	Coefficient of Variation
DALY	Disability Adjusted Life Years: a WHO measure of the loss of life and quality of life associated with diseases
DP	Development Pressures
DPSIR	Driver, pressure, status, impact response
EH	Ecological Health
ENSO	El Niño Southern Oscillation
ES	Ecological Insecurities
EU	European Union
FSM	Federated States of Micronesia
GDP	Gross Domestic Product
GEO	Global Environment Outlook (UNEP)
GEF	Global Environment Facility
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management
MC	Management Challenges
MDG	Millennium Development Goal
ODA	Official Development Assistance
P	Population
PICs	Pacific Islands Countries
PIFS	Pacific Islands Forum Secretariat
PNG	Papua New Guinea
R	per capita water resources ($\text{m}^3 \cdot \text{annum}^{-1} \cdot \text{person}^{-1}$)
RMI	Republic of the Marshall Islands
RS	Resource Stresses
SIDS	Small Island Developing States
SOPAC	Pacific Islands Applied Geoscience Commission; or SPC Applied Geoscience and Technology Division
SPC	Secretariat of the Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
STAR	Science, Technology and Resources Network
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNICEF	The United Nations Children's Fund
UN-OHRLLS	UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States
USGS	United States Geological Survey
VI	Vulnerability Index
WHO	World Health Organization

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Executive Summary

The fourteen developing Pacific Island Countries (PICs) of the Pacific Region are home to over 9 million people, speaking about 1 200 languages, with the majority of Pacific islanders (about 80%) living in rural areas. These Pacific Island countries have about 1 000 islands covering a land area of just over half a million square kilometres, spread across 180 million square kilometres of ocean. The ecosystems supported across these islands are unique and among the most endangered in the world.

The water resources of the PICs represent global extremes, with annual water availability in Papua New Guinea around 120 000 m³ per person versus Fongafale Islet in Tuvalu and Nauru having no confirmed freshwater resources, reliant on rainwater harvesting and desalination.

The PICs face similar challenges managing freshwater resources to other developing countries. Access to sanitation and safe drinking water, protecting sensitive ecosystems and generating productive use of variable water resources are among these issues. Often the challenges are associated with simply too little or too much water. Nevertheless, constrained by their remoteness, small size, fragility, natural vulnerability and limited human and financial resources, PICs face unique challenges managing water resources. These challenges require innovative approaches and tailoring of solutions not just to the region, but often to the complex combination of geographical and socioeconomic constraints of an individual island.

This study undertakes a vulnerability assessment of the freshwater resources of the PICs, based on input from technical experts and regional resource managers. The approach assumes that the vulnerability of freshwater resources is dependent upon the resources available to meet the productive, consumptive and environment uses; the pollution and development pressures; and the management capacity to respond to these pressures. This approach highlights the importance of drivers such as climate variability and change, population growth, urban migration and economic development to water resource vulnerability through their influence on the state of freshwater resources and the associated pressures.

Throughout the Pacific water resources are typically managed on an island-by-island basis as inter-island transfers across hundreds of kilometres of ocean are generally impractical and cost-prohibitive. Accordingly, this assessment has reviewed the water resource vulnerability of individual islands. A selection of islands was chosen for the study, representative of the two main island forms: (i) atolls and limestone islands dependent on rainwater and groundwater – Nauru, Majuro Atoll (in Republic of the Marshall Islands) and Fongafale Islet (Tuvalu); and (ii) volcanic islands with river systems – including Rarotonga (Cook Islands), Viti Levu (Fiji), New Guinea (Papua New Guinea) and Upolu (Samoa).

In compiling this water resource vulnerability index, it was necessary to make a range of assumptions to enable assessment of islands with significant variation in hydrology, geography, environment, socio-economic status

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