

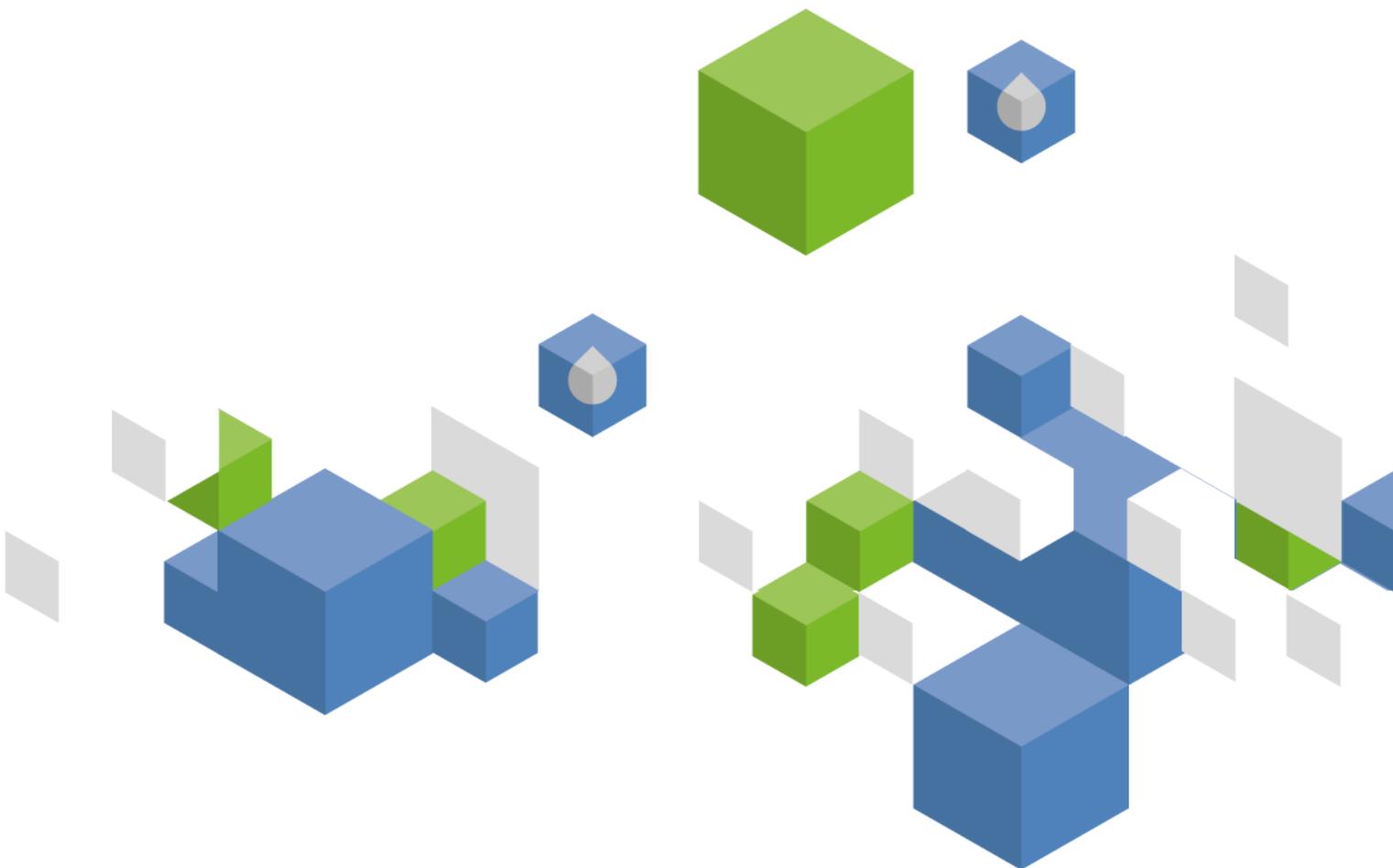


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Vanuatu

GEOGRAPHY, CLIMATE AND POPULATION

Geography

Vanuatu is a country in the South Pacific Ocean composed of about 80 islands of which only 65 are inhabited. The country has total area of 12 190 km². There are six main island groups in the country comprising the country's six provinces Malampa, Penama, Sanma, Shefa, Tafea and Torba. Only 12 islands are considered significant in terms of their economy and population. The largest are Santo in Sanma province (4 010 km²), Malekula in Malampa province (2 069 km²), Efate in Shefa province (980 km²), and Erromango in Tafea province (975 km²). The capital city is Port Vila and is located on Efate island.

The agricultural area, which is the sum of arable land, permanent crops and permanent meadows and pasture, is estimated at 187 000 ha, which is 15 percent of the total area of the country. In 2013, the total physical cultivated area was estimated at 145 000 ha, of which 14 percent (20 000 ha) consisted of temporary crops and 86 percent (125 000 ha) of permanent crops (Table 1).

TABLE 1
Basic statistics and population

Physical areas:			
Area of the country	2013	1 219 000	ha
Agricultural land (permanent meadows and pasture + cultivated land)	2013	187 000	ha
• As % of the total area of the country	2013	15	%
• Permanent meadows and pasture	2013	42 000	ha
• Cultivated area (arable land + area under permanent crops)	2013	145 000	ha
- As % of the total area of the country	2013	12	%
- Arable land (temp. crops + temp. fallow + temp. meadows)	2013	20 000	ha
- Area under permanent crops	2013	125 000	ha
Population:			
Total population	2015	264 600	inhabitants
- Of which rural	2015	74	%
Population density	2015	22	inhabitants/km ²
Economy and development:			
Gross Domestic Product (GDP) (current US\$)	2013	802	million US\$/year
• Value added in agriculture (% of GDP)	2013	28	%
• GDP per capita	2013	3 108	US\$/year
Human Development Index (highest = 1)	2014	0.594	-
Gender Inequality Index (equality = 0, inequality = 1)	-	-	-
Access to improved drinking water sources:			
Total population	2015	95	%
Urban population	2015	99	%
Rural population	2015	93	%

FIGURE 1
Map of Vanuatu



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Most islands are either mountainous or steeply undulating, covered by tropical forest. Coconut plantations, covering most of the permanent crop area, and agricultural crops, such as maize, roots and tubers and vegetables, are dominant on the narrow coastal plains. The highest peak in the country, located on Santo island, is Mount Tabwemasana at 1 879 m (SOPAC, 2007).

Climate

The climate of Vanuatu is tropical and maritime, varying from hot, very wet and humid in the north to warm and less humid in the south. The average temperature is 24°C, ranging from 22°C to 27°C. Average annual rainfall is estimated at about 2 000 mm. It varies from about 4 200 mm in the northern higher Banks and Torres islands groups in Torba province to about 1 500 mm in the southern islands. From May through September a fresh southeasterly breeze gives sunny days and cooler nights. November to April is the wet season with higher temperatures, heavy rain and occasional cyclones. Heaviest rain falls January to March. Over the last 40 years, 2.6 cyclones per year have occur on the islands (SOPAC, 2007; Sullivan; Guglielmi, 2007; Esau, Ioan and Vuti, 1999).

Population

In 2015, the total population was about 264 600, of which around 74 percent was rural (Table 1). Population density is 22 inhabitants/km². The average annual population growth rate in the 2005-2015 period was 2.4 percent. Most of the population lives along the coast and the internal areas of many islands are almost uninhabited

In 2014, the Human Development Index (HDI) ranks Vanuatu 134 among 188 countries for which information was available. Life expectancy is 72 years and the under-five mortality is 28 per 1000 births, both progressing from 65 years and 31 per 1000 in the 1990s. With no significant distinction between boys and girls, around 99 percent of the children in 2005 are enrolled in primary education and 52 percent in secondary education in 2010 (World Bank, 2015). In 2015, 95 percent of the population had access to improved water sources (99 and 93 percent in urban and rural areas respectively) and 58 percent of the total population had access to improved sanitation (65 and 55 percent in urban and rural areas respectively) (JMP, 2015).

ECONOMY, AGRICULTURE AND FOOD SECURITY

In 2013, the gross domestic product (GDP) was US\$ 802 million and agriculture accounted for 28 percent of GDP, while in 1993 it accounted for 18 percent.

Subsistence agriculture is the main economic sector in the country. Fishing, offshore financial services and tourism are the other main economic sectors. Tax revenues come mainly from import duties. In general, the agricultural sector accounts for more than 75 percent of exports, of which the most important agricultural product is copra, which is the dried meat or dried kernel of the coconut used to extract coconut oil. Coconut, cocoa and squash are the main cash crops. The production of beef and timber has grown in importance for the economy. Coconut oil is also used as fuel, a trend that has major implications for the cultivation and sale of locally grown coconuts.

The main limitations of the economic development are the few commodity exports, the vulnerability to natural disasters and the long distances from the main markets and between the country's islands (Sullivan and Guglielmi, 2007).

WATER RESOURCES

Surface water and groundwater resources

The distribution of water in the country varies with the topography of the island. The high raised volcanic islands have rivers and streams and groundwater while the low-lying coral islands rely on groundwater

or water obtained from rainwater tanks or from a lens of fresh groundwater floating on the underlying salt water. Some smaller islands such Mataso and Buninga in the Shepherd islands in Shefa province, all of Torres islands, and small islands off Malekula and Santo have neither surface water nor groundwater.

Despite the high precipitation in the country, most of its territory do not have perennial streams, because of their size and their rugged topography. River courses are short and the flows are short lived especially in dry periods. The only exception is on the main islands namely Efate, Malekula, Espiritu Santo and Pentecost).

In many parts of Vanuatu there are substantial amounts of groundwater. Groundwater can provide large amounts of water even during severe drought. Groundwater sources can be accessed to either through dug-wells or boreholes (SOPAC, 2007; Esau, Ioan and Vuti, 1999).

To date no countrywide assessment has been made of water resources (SOPAC, 2007). A rough estimate for renewable surface water resources could be 10 000 million m³/year. Renewable groundwater resources have been estimated at 4 377 million m³/year, which are considered to be drained entirely by the surface water network (overlap). The total annual renewable water resources in the country are thus estimated at 10 000 million m³ (Table 2).

TABLE 2
Renewable water resources

Renewable freshwater resources:			
Precipitation (long-term average)	-	2 000	mm/year
	-	24 380	million m ³ /year
Internal renewable water resources (long-term average)	-	10 000	million m ³ /year
Total renewable water resources	-	10 000	million m ³ /year
Dependency ratio	-	0	%
Total renewable water resources per inhabitant	2015	37 793	m ³ /year
Total dam capacity	-	-	million m ³

During periods of national disaster, such as cyclone damage to islands relying on rainwater catchment, the National Disaster Management Office (NDMO) has provided a desalination plant as a temporary measure, so that people at least have drinking water. Use of wastewater has been little discussed in Vanuatu. Bottled water is increasingly used in Port Vila and other urban areas (SOPAC, 2007).

Lakes and dams

There are no important natural lakes or artificial reservoirs in Vanuatu.

Water use

Two government departments, the Department of Public Works (DPW) and the Department of Geology, Mines and Water Resources (DGMWR), are in charge of urban and rural water supplies respectively. Water supply delivery in the urban centre of the capital Port Vila is privatized under concession until 2032 to the French operating company UNELCO, which withdraws water from a shallow aquifer.

There is no formal record of water use in Vanuatu. However, UNELCO and DPW record the water delivered and used through the reticulated supplies as a means for pricing and cost recovery. Where water extraction is monitored there is some knowledge and observation of the aquifer. In both the capital Port Vila on Efate island and Luganville on Santo island the aquifers are under increasing pressure from housing, agriculture and other developments (SOPAC, 2007; Sullivan and Guglielmi, 2007; DGMWR, 2008).

In Vanuatu, both surface water and groundwater are used for domestic purposes. In urban areas the main water source is shallow aquifers whereas in rural areas various sources are used such as bores, wells,

springs, rivers and rainwater catchments. The urban and rural tourism industry is serviced by the same water supplies as domestic users. Tourism is a fast growing sector, with resort development occurring across Vanuatu.

Industry is not significantly developed in Vanuatu and large consumers comprise only two percent of all UNELCO customers in Port Vila. Agriculture is also underdeveloped. Water withdrawal for livestock is from private bores that are unmonitored. Horticulture development is most advanced in Port Vila where there is easier access to markets and water is supplied by unmonitored bores and by UNELCO through the reticulated Port Vila water supply (SOPAC, 2007; DGMWR, 2008).

IRRIGATION AND DRAINAGE

Evolution of irrigation development

There is no information available on irrigation areas in Vanuatu. Irrigation is only reported in horticulture areas in Port Vila where water is available through the UNELCO water supply system and there is easier access to markets.

Women and irrigation

Women in Vanuatu society are rarely involved in family and community decision making, despite women traditionally managing water, sanitation, family health and childcare. In general women are involved in unpaid tasks and they work, on average, longer hours than men. Women are generally more successful in small businesses and are more reliable borrowers of bank funds. Nevertheless, they are seldom involved in decision-making processes.

Vanuatu is committed to a number of international and regional conventions for the advancement of women and gender equality. The Convention on the Elimination of all Forms of Discrimination against Women (CEDAW) obliges Vanuatu to accord rural women equal rights with men to enjoy adequate living conditions including water supply, housing and sanitation. The government has promoted community management of water resources and proposes women's representation in local water committees with a role in planning and managing the resource (Sullivan and Guglielmi, 2007; DGMWR, 2008).

WATER MANAGEMENT, POLICIES AND LEGISLATION RELATED TO WATER USE IN AGRICULTURE

Institutions

Several institutions are involved in water resources management:

- The National Water Resource Advisory Committee (NWRAC) is the nation's peak water body and the main mechanism for cross-sectoral coordination towards integrated water resource management (IWRM), although it has a low profile and meets infrequently (ISF-UTS, 2011).
- The Rural Water Supply (RWS) Section of the Department of Geology, Mines and Water Resources (DGMWR) within the Ministry of Lands and Natural Resources (MLNR) has responsibility for rural water supply system delivery countrywide. These comprise wells, boreholes, surface water collection, and rainwater catchments. Water supplies are operated and managed by local community committees (MLNR, 2015; SOPAC, 2007).
- Water supply delivery in the urban centre of Port Vila is privatized under concession until 2032 to the French operating company UNELCO, which withdraws water from a shallow aquifer.
- The Department of Public Works (DPW) within the Ministry of Infrastructure and Public Works Utilities manages water supply in smaller towns and urban areas, such as Luganville, Isangel and Lakatoro. The National Water Strategy 2008-2018 (NWS) proposes to transfer urban water

management from the DPW to the Department of Water (DoW) once it is established (ISF-UTS, 2011).

- The Utilities Regulatory Authority (URA) within the Ministry of Finance and Economic Management is the economic regulator of electricity and water services. URA approves tariffs for electricity and water services and also assists in resolving consumer complaints and advises the Government on policy and legislative matters related to electricity and water (URA, 2015).
- The Ministry of Health (MOH) is responsible for water quality surveillance of all water supply systems (ISF-UTS, 2011).

The Pacific Islands Applied Geoscience Commission (SOPAC) is an intergovernmental, regional organization including 18 Pacific island countries and territories, as well as Australia and New Zealand. SOPAC's work is carried out through its Secretariat, based in Suva in Fiji. While the initial focus of its work was on marine mapping and geosciences, during recent years other scopes such as hazard assessment and risk management, environmental vulnerability, oceanography, energy, water and sanitation have been included.

Water management

The National Water Strategy (NWS) 2008-2018 guides de water sector reform in Vanuatu, which follows the principles of IWRM. The National Water Strategy aims to address the constraints that limit sustainable development of the water sector including factors related to finances, human resources, institutions and operations. Reforms include institutional restructuring of the sector to relocate water sector responsibilities from the Department of Geology, Mines and Water Resources (DGMWR) within the Ministry of Lands and Natural Resources (MLNR) to a distinct Department of Water (DoW). The future DoW would oversee water resource management as well as urban scheme management and the sanitation subsector. The department will work towards acquiring and maintaining up-to-date knowledge of the country's land mass by means of systematic hydrological, hydrogeological and geotechnical surveys. The Department will have two sections, the Rural Water Supply section and the Water Resources Management section. The two primary responsibilities in relation to water resources management are monitoring the quality of water bodies of interest and managing their quantities (ISF-UTS, 2011; MLNR, 2015).

Finances

Urban water supplies are funded by fees and tariffs with prices set by government agreements, while rural water supplies are donor-funded and managed and operated by communities (SOPAC, 2007).

Policies and legislation

The Water Resources Management Act No. 9 of 2002, revised in 2014, provides for the protection, management and use of water resources in Vanuatu (MLNR, 2015).

The Environment Management and Conservation Act No.12 of 2002 provides for the conservation, sustainable development and management of the environment of Vanuatu, and the regulation of related activities (MLNR, 2015).

ENVIRONMENT AND HEALTH

Many water sources in Vanuatu are unprotected and affected by pollution, and in some cases contaminated by volcanic ash and gas emissions. Groundwater has traditionally been exploited by constructing hand-dug wells in low-lying or coastal areas that are subject to contamination and often contain water that is unsuitable for drinking. However, if the boreholes or wells from where groundwater is abstracted are located away from source of contamination, abstracted water is of very good quality. Surface water sources are subject to bacteriological and other contamination due to human activities or animals (Sullivan and Guglielmi, 2007; Esau., Ioan and Vuti, 1999).

Information on groundwater is sporadic and mostly focused on Port Vila and Luganville. Groundwater quality in both urban centres of Port Vila and Luganville is generally good with only calcium hardness to note. However, in both cases groundwater levels are decreasing while pumping demands are increasing. The growth of population and the urbanization play a role in the environmental impacts (SOPAC, 2007; Sullivan and Guglielmi, 2007).

Most of Port Vila and Luganville lack sewage and wastewater treatment systems and waste is generally disposed of via illegal stormwater connections, direct discharge, or into poorly designed and maintained septic systems, which leach contaminants into adjacent coastal and freshwater systems. There are currently no regulations for wastewater management. The lack of water quality data means that there is a limited ability to develop solutions to this problem (DGMWR, 2008).

Saline intrusion to groundwater is also increasing in the country.

The Tagabe river catchment area is the only source of water to Port Vila and villages to the east. Port Vila's residential districts have slowly been expanding into the catchment. This expansion heightens the risk of contaminating the downstream areas being the most vulnerable to this contamination as they collect their water directly from the river or from shallow wells in highly permeable soil. Agricultural and livestock activities occurring within the catchment are also endangering the area's water quality (SOPAC, 2007).

Scabies, skin diseases and malaria are water-related diseases and are the three most common health issues in Vanuatu. Poor drainage and waste management provide pools of water that are favourable breeding sites for malaria mosquito (SOPAC, 2007).

PROSPECTS FOR AGRICULTURAL WATER MANAGEMENT

Demands on existing water sources will increase as Vanuatu's population and tourism grow. These demands, when combined with the increasing risk of pollution and climate change, could be expected to limit the future availability of potable water and water for other uses. To ensure its availability, both government and non-government organizations must invest in water resources. This investment requires prior knowledge and database on the quantity and quality of water resources (MLNR, 2015).

Some measures to improve water management could be (SOPAC, 2007):

- To increase rainwater storage capacity through the use of water tanks and small dams that will benefit the community in times of water shortage.
- To implement methods to maintain and enhance the quality of surface water and groundwater resources.
- To improve water supply in urban areas
- To develop regulations and standards to manage sanitation
- To develop awareness and education material for water conservation
- To diversify cash crops and subsistence crops, encourage sustainable practices, and develop economic opportunities, that would contribute to environmental protection and resilience.

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