

# Pacific Island Water Resources: An Overview of East Timor, Kiribati, Solomon Islands, Tuvalu and Vanuatu

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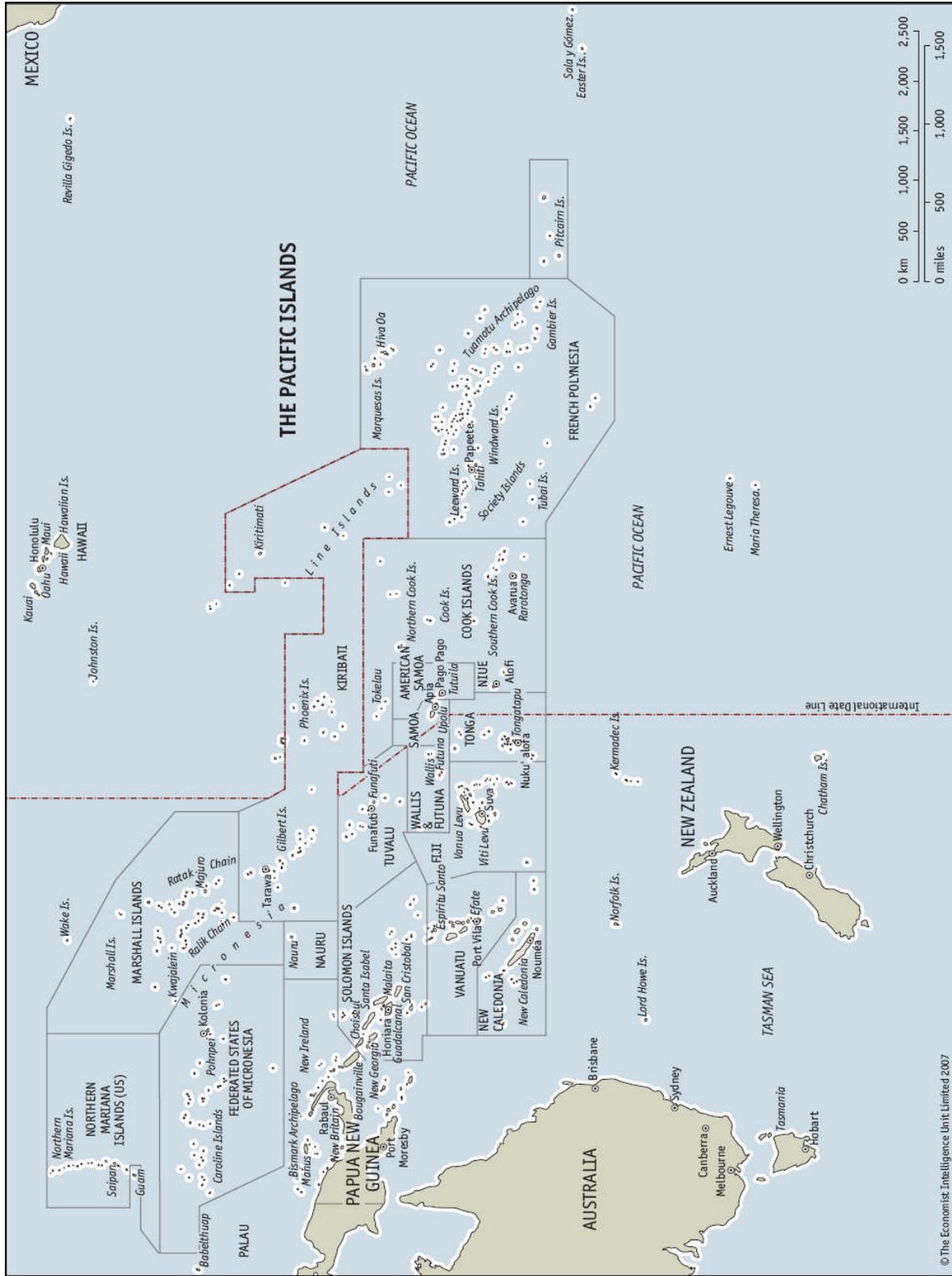
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# Map of the Pacific Islands, excluded East Timor



Source: The Economist Intelligence Unit 2007

## Map of the Pacific Islands



Source:

<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/PACIFICISLANDSEXTN/0,,contentMDK:20469142~menuPK:1044651~pagePK:1497618~piPK:217854~theSitePK:441883.00.html> (6<sup>th</sup> December 2007)

# EAST TIMOR

## Location and Climate

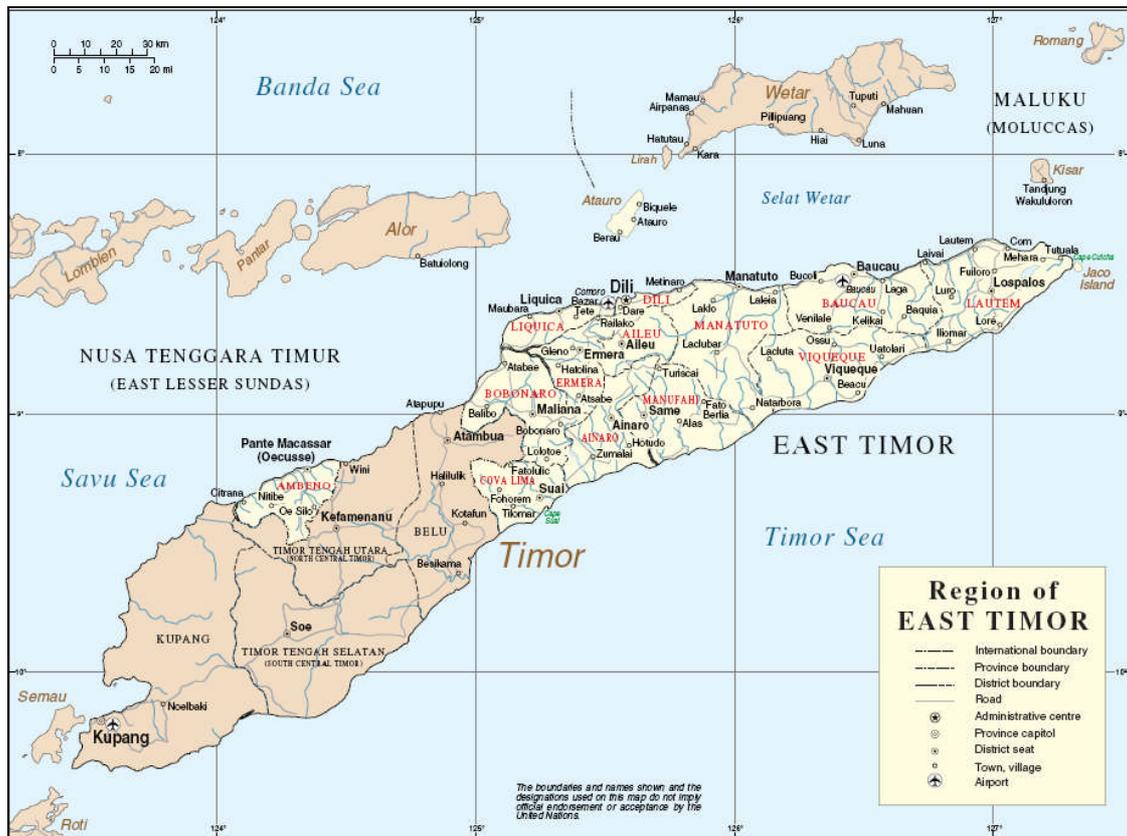
East Timor (or Leste Timor, 'Leste' is 'East' in Portuguese language) is located in south-eastern of Asia, northwest of Australia in the Lesser Sunda Islands, at the eastern end of the Indonesian archipelago. East Timor lies between the South China Sea and the Indian Ocean (The Economist Intelligence Unit 2006).

The national territory is 14,609 Km<sup>2</sup> and it includes the enclave of Oecussi (Ambeno), located within West Timor (Indonesia), and the islands of Pulau Atauro and Pulau Jaco (Figure 1). The capital of East Timor is Dili and the island is divided in thirteen districts (see Table 1).

East Timor is located near the equator, it has a Tropical climate with heavy monsoon rains, followed by a dry season. The north coast has a brief rainy season from December to February; the south coast has a double rainy season from December to June, with a break in March.

East Timor has been subject to the El Niño effect that influences the variability in country's climate. In El Niño years, The Southern Oscillation alters the timing and volume of rainfall. In all places, El Niño causes reduced rainfall in the January-March wet season, with some places receiving only 25% of the usual volume. In general, in El Niño years the wet season is delayed by two to three months, with significant adverse impacts on food production and security. In the year following an El Niño, rainfall can be higher than average, which might lead to flooding with associated damage to crops and infrastructure. Recent episodes of droughts due to El Niño include those in 1997-98 and 2002-03, with the droughts occurring one in four years (Barnett, Dessai and Jones 2003 in UNDP 2006).

Figure 1: Map of Timor East



Source: United Nations, Depart Department of Public Information Cartographic Section January 2000

## Political background<sup>1</sup>

Timor was first colonized by the Portuguese in 1520. The Dutch, who claimed many of the surrounding islands, took control of the western portion of the island in 1613. Portugal and the Netherlands fought over the island until a treaty in 1860 which divided Timor, granting Portugal the eastern half of the island as well as the western enclave of Oecussi (the first Portuguese settlement on the island). Australia and Japan fought each other on the island during World War II; nearly 50,000 East Timorese died during the subsequent Japanese occupation.

In 1949, the Netherlands gave up its colonies in the Dutch East Indies, including West Timor, and the nation of Indonesia was born. East Timor remained under Portuguese control until 1975, when the Portuguese pulled out after 455 years of colonization. The Portuguese withdrawal left the island vulnerable. On 16<sup>th</sup> July 1976, nine days after the Democratic Republic of East Timor was declared an independent nation, Indonesia invaded and annexed it. Although no country except Australia officially recognized the annexation, Indonesia's invasion was sanctioned by the United States and other western countries, who had cultivated Indonesia as a trading partner.

East Timor's resistance movement to Indonesia's invasion was suppressed by Indonesian military forces and more than 200,000 Timorese were reported to have died from famine, disease, and fighting since the annexation.

After Indonesia's president Suharto left office in 1998, fighting between separatist guerrillas and pro-Indonesian paramilitary forces in East Timor has intensified. On 30<sup>th</sup> August 1999, 78.5% of the population voted to separate from Indonesia, but in the days following the referendum, pro-Indonesian militias and Indonesian soldiers retaliated by razing towns, slaughtering civilians and forcing a third of the population out of the province. After enormous international pressure, Indonesia finally agreed to allow UN forces into East Timor. Led by Australia, an international peacekeeping force began restoring order to the region.

After the referendum for independence, the United Nations Transitional Authority in East Timor (UNTAET) was formed to ensure stability and it started to govern the territory for nearly three years. To help rebuild the country, the Trust Fund for East Timor (TFET) was established with contributions from various funding agencies; ADB and the World Bank were selected as joint administrators of the fund (ADB 2004).

On 20<sup>th</sup> May 2002, nation was declared: this means that East Timor is one of the world's newest nations. José Alexandre Gusmão, who was imprisoned in Indonesia from 1992 to 1999, was elected the nation's first president on 14<sup>th</sup> April 2002.

In the presidential elections of April 2007 (the first since the country gained independence) none of the candidates won a majority and other elections have been carried out. Estanislau da Silva took over as interim prime minister, replacing Ramos-Horta. In August, President Ramos-Horta named independence activist Xanana Gusmão as prime minister. The move sparked violent protests led by supporters of the Fretilin party, the former governing party. Fretilin won the most seats in elections, but Gusmão formed a majority coalition, called the Alliance of the Parliamentary Majority.

Suffrage is universal at 17 years of age. The Popular council for the defence of the Democratic Republic of East Timor (CPD-RDTL) is largest political pressure group.

The executive branch is composed of the president, which plays a symbolic role but is able to veto some legislation, the Prime Minister and of the cabinet which is the council of ministers elections. The president is elected by popular vote for a five-year term.

The legislative branch is formed of the unicameral national parliament; the minimum number of seats is 52 and maximum is 65 seats. The members elected by popular vote serve five-year terms.

The judicial branch is composed of the supreme court of justice; the constitution calls for one judge to be appointed by national parliament and rest appointed by superior council for judiciary.

## Population

UNDP has estimated the Human Development Index for Timor-Leste as 0.514, which gives the country a rank of 150<sup>th</sup> out of 177 countries with data in 2005 (UNDP 2005).

According to the 2004 national census (the first one post-independence), Dili, Baucau, Ermera and Bobonaro remained the four largest districts in term of population, together accounting for around 50% of the country's

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<sup>1</sup>Source: <http://www.infoplease.com/ipa/A0902237.html> (consulted 19<sup>th</sup> October 2007).

population, as it is possible to see in the Table 1 (The Economist Intelligence Unit 2006). Table 1 shows the population by districts and the number of male and female.

The national census of 2004 appraised that the gender ratio has remained fairly stable and the 49.4% of the population were female but there is a concentration of males in and around Dili reflecting the movement of males, particularly young men, to the capital in search of work. This leaves a disproportionate number of females in the rest of the country, especially in the eastern districts of Viqueque, Baucau and Lautem. Moreover the 2004 national census estimated that East Timor has a very young population with 43% of the population under 15 years of age.

**Table 1: Population by districts and gender - 2004 census**

District	Total	Male	Female
Aileu	36,889	19,049	17,840
Ainaro	53,629	26,964	26,665
Baucau	104,571	52,483	52,088
Bobonaro	82,385	40,955	41,430
Covalima	55,941	28,018	27,923
Dili	167,777	88,373	79,404
Ermera	103,169	51,960	51,209
Lautem	57,453	28,174	29,279
Liquica	55,058	27,786	27,272
Manufahi	44,235	22,564	21,671
Manatuto	38,580	19,363	19,217
Oecussi	58,521	29,119	29,402
Viqueque	66,434	32,949	33,485
<b>TOTAL</b>	<b>924,642</b>	<b>467,757</b>	<b>456,885</b>

Source: National Directorate of Statistics 2004

According data from World Banks, the East Timor's total population and the fertility rate have increased in recent years. In Table 2 the population Indicators are visualized.

**Table 2: Population Indicators**

	2000	2005	2006
<b>Population, total</b>	783.6 thousand	975.5 thousand	1.0 million
<b>Population growth (annual %)</b>	0.5	5.4	5.3
<b>Life expectancy at birth, total (years)</b>	54.1	56.7	n/a
<b>Fertility rate, total (birth per woman)</b>	6.6	7.5	n/a
<b>Mortality rate, infant (per 1,000 live births)</b>	84.8	51.5	n/a
<b>Mortality rate, under-5 (per 1,000)</b>	106.8	61.3	n/a
<b>Prevalence of HIV, total (% of population ages 15-49)</b>	n/a	0.2	n/a
<b>Immunization, measles (% of children ages 12-23 months)</b>	n/a	48.0	n/a

Source: World Development Indicators Database April 2007

The official languages are Portuguese and Tetum; English and Bahasa Indonesian are used as working languages. Numerous local languages, including Tetum, Galole, Mambae and Kemak, are also in use. The ethnicities present are Austronesian (Malayo-Polynesian), Papuan and small Chinese minority. The major religion is Roman Catholic (90%), other religions present are Islam (4%), Protestant (3%), Hindu (0.5%), and a small percentage of Buddhist and animist (1992 est.)<sup>2</sup>.

## Education

The education infrastructure was seriously damaged during the post-referendum violence. The standard of education was low during Indonesia's rule and has not improved in the post-independence period, owing to the lack of highly skilled and experienced teachers. Only in the recent years there have been improvements in enrolment rates: in 2000/2001 the net enrolment rate was 67.7% and had risen to 86.2% by 2004/05. The secondary enrolment has also increased from 15.9% in 2000/2001 to 33.6% in 2004/05. The poor standard of

<sup>2</sup>Source: [http://www.ip2stats.com/East\\_Timor\\_fact.html](http://www.ip2stats.com/East_Timor_fact.html) (consulted 19<sup>th</sup> October 2007).

education in East Timor is reflected in the literacy rates of its population: only 48% of the adult population (15 years and older) are literate (The Economist Intelligence Unit 2006).

## **Health**

In the aftermath of Indonesian occupation, the standards of health in East Timor have worsened owing to the total breakdown of the healthcare system through the destruction of buildings, the loss equipment and drugs and the departure of senior medical staff. The healthcare infrastructure has been rebuilt, but the situation remains poor and the public health resources are scarce and inadequate for undertaking promotional activities (ADB 2007). Moreover the prevalence of water-borne and sanitation-related diseases is estimated to be high and malaria is prevalent. The ADB stated that the malnutrition is a serious problem for children under five; vaccination programs are not extensive, maternal health indicators are poor, with a low incidence of assisted births and there is also a limited use of contraceptives prevail.

According to the World Bank, the life expectancy at birth and the infant mortality rate per 1,000 live births have improved between 2000 to 2005 and the mortality rate have (Table 2).

## **Infrastructure and communication**

The transport infrastructure is poorly developed and has been inadequately maintained. The results of a survey in 1999 showed that East Timor had 1,414 Km of paved roads but the 57% of the network was damaged; in addition, less than 50% of villages had access to paved roads (The Economist Intelligence Unit 2006). In 2006 the Asian Development Bank was funding a project to strengthen around 123 Km of important roads in rural areas in order to improve access to these areas and, consequently, to increase the agricultural productivity, reduce poverty and enhance the food security.

There is no railway transport. There are eight airports, but only three have paved runways and there are limited international air services. The port infrastructure includes services at the capital Dili and Laleia Carabela Port (The Economist Intelligence Unit 2006).

Much of the telecommunications infrastructure was damaged in 1999. In July 2002 a consortium led by Portugal telecom was selected to run the nation's telecom services as Timor Telecom (TT). In late 2004 there were 25,000 mobile subscribers using a GSM network covering of major cities, including Dili, Aileu, Baucau, Liquica, Manatuto, Oecussi and Viqueque. In 2004 there were also 2,100 fixed lines in use (The Economist Intelligence Unit 2006).

Internet usage is limited (The Economist Intelligence Unit 2006).

## **Energy provision**

The electricity supply is unreliable. Fossil fuels provide the source for all electricity production, but there may be potential for hydro-power (The Economist Intelligence Unit 2006).

In late 2002 the government decided to implement a programme of reforms in the power sector and an agreement was reached between the Macau Electricity Corporation (MEC) and the state power authority (Electricidade de Timor-Leste, EDTL), but in 2005, the EDTL's director assumed that there had not been any improvements in the sector (The Economist Intelligence Unit 2006).

East Timor's offshore gas and oil reserve have seemed to be the only real hope for lifting the country out of poverty, but there was a disagreement with Australia over the rights to the oil reserves in the East Timor Sea. In 1989 Australia received 82% of the oil revenues and East Timor just 18%, however in May 2005 the two countries redefined the parts in a more even way (The Economist Intelligence Unit 2006).

## **Economy**

East Timor is one of the world's poorest country and the economy, made up of subsistence farming and fishing, is small. This is stated by the values of the indicators of Table 3.

**Table 3: Key Social and Poverty Indicators. Per capita GDP (2005, current): US\$ 374**

Indicators	2002	2003	2004	2005
Current acct. balance/GDP (%)	7.6	5.1	35.1	42.6
Fiscal balance/GDP (%)	0.4	3.2	9.8	32.4
Inflation rate (end of period, %)	4.8	7.1	3.2	1.8
Money supply (M2) growth (%) (a)	6.8	4	16.2	n/a
Debt service ratio (% of exports)	0.0	0.0	0.0	0.0
Official reserves (gross, US\$ m)	na	na	na	na

na =not available; (a) Excludes money in circulation, for which no data is available. Source: Asian Development Bank 2007

In Table 4, the same indicators for some countries in the Pacific Ocean show very different values giving an idea of the East Timor's economic condition.

**Table 4: Comparative economic indicators, 2004**

	East Timor	Australia	Indonesia	New Zealand	Papua New Guinea	Fiji
<b>GDP (US\$ bn)</b>	0.3	607.6	259.6	95.6	5.0	2.7
<b>GDP (per head (US\$))</b>	366	30.200	1,151	23,500	866	3,216
<b>Consumer price inflation (%; av)</b>	3.2	2.3	6.1	2.3	2.2	3.3
<b>Current-account balance (US\$ bn)</b>	0.1	-40.0	2.8	-6.5	0.05	-0.3
<b>Exports of goods(US\$)</b>	0.01	86.9	1.1	19.6	2.6	0.6
<b>Imports of goods (US\$ bn)</b>	0.2	104.4	71.7	20.8	1.5	1.1
<b>Foreign trade (% of GDP)</b>	61.4	31.5	28	42.3	82.0	65.1

Source: Asian Development Bank; IMF in The Economist Intelligence Unit 2006

East Timor's economy has poor infrastructure, high cost, low labour skills, incomplete legal and institutional frameworks. According to East Timor's development partners (World Bank and IMF), the government has made significant progress in implementing its National Development Plan (NDP), but it lacks budget execution capacity to meets its targets (ADB 2007).

In January 2000, the authorities decided to adopt the US dollar as national currency. The introduction of this monetary unit helped East Timor to avoid some economic problems, like the overvalued in the exchange rate. On the other side, the adoption of the US dollar has caused problems in agricultural communities due the fact they had not familiarity with the new current and contains the government control over domestic monetary policy (The Economist Intelligence Unit 2006).

According the ADB in the medium to long term, East Timor is expected to benefit from the commercial exploitation of oil/gas resources in the Timor Sea projected to increase government revenues significantly. The medium term outlook is for gradual growth and improvement in social conditions such as the priority on educational and healthcare. This is proved by the 21% of total expenditure allocated to the first sector and the 12% to the second (ADB 2007).

Between 2000 and 2006 the economy has recorded some developments, as the data of Table 5 show. According the ADB, the 40% of the population living below the poverty line mainly in the western districts, while only 14% of people in Dili and Baucau districts live below the poverty line. The urban poverty is about 25% and the rural poverty reaches the 44%. Besides more than 75% of the poor live in rural areas and survive on subsistence and seasonal agriculture (ADB 2007).

Concerning food security, it is aggravated by natural hazards in fact the country is subjected to drought, floods and the islands are vulnerable to earthquakes and tropical cyclones. Then the food aid is necessary to supplement food production and imports (ADB 2007).

**Table 5: Economic Indicators**

	2000	2005	2006
<b>GNI, Atlas method (current US \$)</b>	n/a	736.4 million	865.0 million
<b>GNI per capita, Atlas method (current US \$)</b>	n/a	750.0	840.0
<b>GDP (current US \$)</b>	316.2 million	350.0 million	356.0 million
<b>GDP (growth (annual %))</b>	13.7	2.3	-1.6
<b>Inflation, GDP deflator (annual %)</b>	3.0	0.9	3.4
<b>Agriculture, value added (%of GDP)</b>	25.8	31.8	32.8
<b>Industry, value added (%of GDP)</b>	18.5	15.2	12.8
<b>Services, etc., value added (% of GDP)</b>	55.7	53.0	55.0
<b>Gross capital formation (% of GDP)</b>	25.6	19.1	19
<b>Time required to start a business (days)</b>	na	92.0	92.0

Source: The World Bank April 2007

Other interesting data concern the annual rate of inflation. In table 6 the different values for Dili and the national average highlight the difference in the economic activities between the urbane and rural areas.

**Table 6: Consumer prices (% change, year on year)**

	2000	2001	2002	2003	2004
Dili	3.0	-0.3	9.5	4.2	1.8
National average	n/a	3.6	4.7	7.2	3.2

Source: IMF, Democratic Republic of Timor Leste: *Selected Issues and Statistical Appendix*, June 2005 in The Economist Intelligence Unit 2006

## Economic sectors

### Agriculture

The economy is based on a low agricultural productivity and the 90% of the population rely on agriculture and the subsistence economy for their livelihoods, but the subsistence farming and seasonal agriculture do not create adequate employment. The most important crop is coffee although its productivity is low. According the World Bank investments are necessary in the infrastructure, replanting, transport and marketing.

Other relevant crops are cocoa, cashew nuts and vanilla (The Economist Intelligence Unit 2006).

### Mining and Semi-processing

Under the Timor Sea treaty, which came into force in March 2003, East Timor is allowed to 90% revenue from oil and gas projects in the 6,200 sq Km Joint Petroleum Development Area in the Timor Sea. Production at the Bayu Undan gasfield, the majority-owned by the US's ConocoPhillips, started output of gas liquids in early 2004; this project has also been improved by the pumping of dry gas through a pipeline to the liquid natural gas plant in Darwin, Australia (The Economist Intelligence, 2006).

East Timor's natural resources include also reserves of natural gas and oil, reserves of gold, manganese and marble, which are sufficient for the commercial exploitation (National Statistics Directorate 2006).

### Manufacturing and Construction

Manufacturing accounts for only the 3-4% of GDP and it is based on cloth-wearing and furniture-making sector. It is developing in the last years, while the construction sector has undergone a loss in GDP after 2000 (The Economist Intelligence 2006).

### Other services

There is some potential for developing East Timor as a tourist destination especially in terms of niche market of ecotourism. The hotel and resorts are few and the prices in the tourism sector are high. Moreover there is the problem of the security risk; for this reason, in May 2006, the Australian government was advising people about the potential risks of travelling to East Timor especially near the Indonesian border (The Economist Intelligence 2006).

The financial services are limited but has been noticed an increasing in banking sectors and loans. In fact the deposits reached US\$ 97.2m at end 2005 up from US\$ 83m at end 2004. The commercial banks are three and they are located in Dili. Also the Western Union bank has started a money transfer service. The Trust Fund for East Timor has implemented a microfinance development project to provide credit on a small scale (The Economist Intelligence 2006).

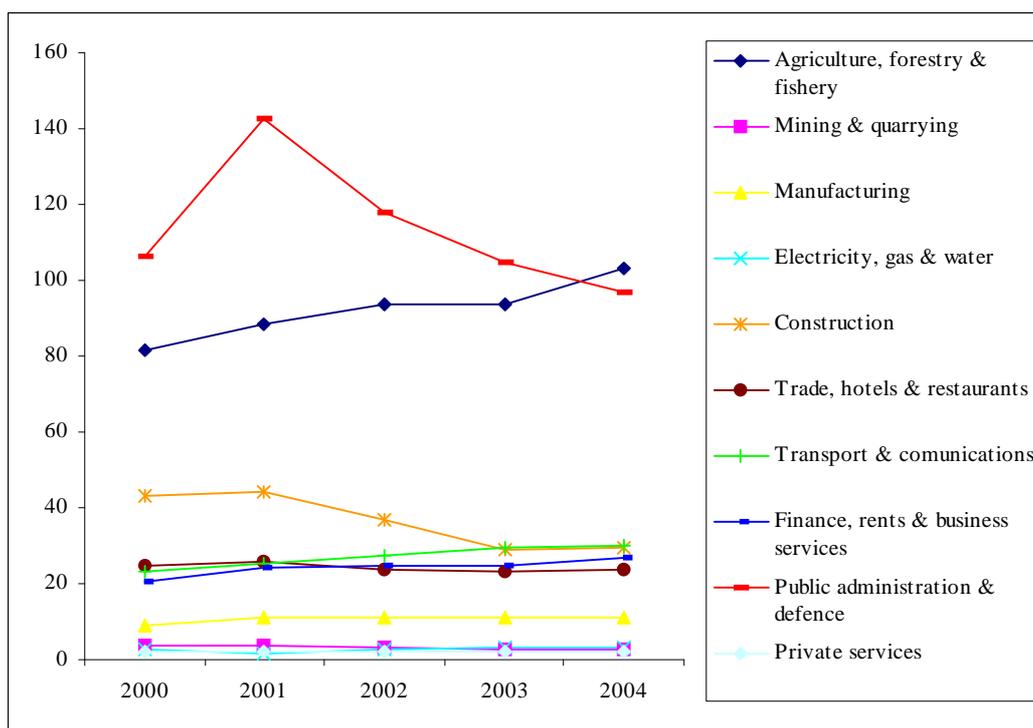
In Table 7 and in the Figure 2 it is described the trend of the Gross Domestic Product by sector at constant price.

**Table 7: Gross Domestic Product by sector at constant price (US\$ m; constant 2000 market prices)**

	2000	2001	2002	2003	2004
<b>Agriculture, forestry &amp; fishery</b>	81.5	88.6	93.9	93.5	102.9
<b>Mining &amp; quarrying</b>	3.7	3.8	3.2	2.5	2.7
<b>Manufacturing</b>	8.7	10.9	11.0	11.0	11.2
<b>Electricity, gas &amp; water</b>	2.6	1.4	2.7	3.3	3.3
<b>Construction</b>	43.3	44.1	36.9	28.8	29.4
<b>Trade, hotels &amp; restaurants</b>	24.7	25.6	23.9	23.3	23.5
<b>Transport &amp; communications</b>	22.9	25.4	27.4	29.3	29.9
<b>Finance, rents &amp; business services</b>	20.5	24.1	24.8	24.5	27.0
<b>Public administration &amp; defence</b>	106.3	142.7	118.0	104.5	97.0
<b>Private services</b>	1.9	1.9	2.0	1.9	1.9
<b>GDP</b>	316.2	368.5	343.8	322.6	328.5

Source: IMF, Democratic Republic of Timor Leste: *Selected Issues and Statistical Appendix* June 2005 in The Economist Intelligence Unit 2006

**Figure 2: Gross Domestic Product trend by sector (2000-2004)**



Source: IMF, Democratic Republic of Timor Leste: *Selected Issues and Statistical Appendix* June 2005 in The Economist Intelligence Unit 2006

## External sector

Although the 1999 political disorder, the export revenue has been increasing in the recent years from US\$ 4m in 2001 to US\$ 8.1m in 2005. Coffee is the main merchandise exports (National Directorate of Statistics, 2006).

Merchandise imports are petroleum, consumer goods (mainly cereals and food products) vehicles and electrical equipment.

In Table 8 is summarized the foreign trade for the 2005 and in Table 9 the current account for the 2004.

**Table 8: Foreign trade, 2005**

	US\$ m
Merchandise exports	8.1
Merchandise imports	-101.6
<b>Trade balance</b>	<b>-93.5</b>

Source: National directorate of Statistics 2005 in The Economist Intelligence Unit 2006

**Table 9: Current account, 2004**

	US\$ m
Trade balance	-194
Services balance	-34
Income balance	30
Net transfers	317
<b>Current account balance</b>	<b>119</b>

Source: IMF, Democratic Republic of Timor-Leste: *Selected Issues and Statistical Appendix*, June 2005 in The Economist Intelligence Unit 2006

East Timor depend on foreign aid flows. It is estimated that in 2005 the multi-donor Trust Fund for East Timor had disbursed around US\$ 148m to improve the agriculture, education, healthcare and infrastructure sectors (The Economist Intelligence Unit 2006). In Table 10 it is shown the amount of foreign assistance.

**Table 10: Net official development assistance (US\$ m)**

	2000	2001	2002	2003	2004
Portugal	52.6	58.0	75.9	42.7	25.6
Australia	82.4	37.3	37.5	28.9	35.3
US	1.4	4.3	27.5	22.7	22.7
UK	16.4	8.7	10.6	-12.7	0.4
<b>Bilateral</b>	<b>212.3</b>	<b>153.9</b>	<b>187.0</b>	<b>127.3</b>	<b>133.7</b>
EU	17.5	27.5	21.2	15.3	12.1
UN Development Programme	0.3	1.5	2.2	2.2	1.5
Un Children's Fund (UNICEF)	0.7	1.6	0.9	2.0	1.2
<b>Multilateral</b>	<b>20.6</b>	<b>40.7</b>	<b>31.4</b>	<b>27.3</b>	<b>19.0</b>
<b>TOTAL</b>	<b>232.9</b>	<b>195.0</b>	<b>219.8</b>	<b>154.9</b>	<b>152.8</b>

Source: OECD, *Geographical Distribution of Financial Flows to Aid Recipients* in The Economist Intelligence Unit 2006

## Employment

Geographically, employment patterns are similar throughout the country with the one exception being Dili district. In Dili, agriculture, fishing and forestry are much less significant than they are in other districts, employing only 41% of the active labour force against the national rate of 78%. In this district, the UN and other donor agencies employ relatively large numbers of people, as do the public sector and the hospitality sector (wholesale, retail, hotels and restaurants).

A comparison of male with female employment patterns reveals some differences: home industries sector employ 7.4% of women and less than 0.1% of economically active men work. On the other hand, males hold most of the public sector jobs. 9% of the active male labour force works in the public sector, whereas for females the rate is only 4.5% (National Statistics Directorate 2006).

## Environmental issues

Timor-Leste is characterized by a big variety of landscapes: the broad plains along the south coast, the undulating plateaus of the east and the steep rugged mountains of the western interior. In terms of elevation the country is divided into three zones, each with its own physical, cultural and economic characteristics. The first zone, between 0 and 500 meters above sea level, occupies approximately 65% of the total area,

including a broad band along the entire length of the south coast, most of Baucau, Lautem and Viqueque districts in the east, and a narrow band along the north coast. This low-lying zone has most of Timor-Leste's arable land and is best connected in terms of transportation and communications infrastructure.

The second zone lies between 500 and 1,500 meters above sea level and this is the coffee-growing zone of the western highlands. The third area (2.6% of the land) is higher than 1,500 meters above sea level. It is the most sparsely populated and least productive of Timor-Leste's three elevation zones (National Statistics Directorate 2006).

In general the terrain is semiarid and mountainous, making the transport difficult. The land is made up of limestone, coral, thick clayey soil, sand and a small amount of volcanic material. According the World Bank only the 7% of the land area is irrigated and in 2000 the agricultural land was 22.7% of the total area (The World Bank Group and ADB 2007).

The use of "slash and burn" agriculture techniques has contributed to deforestation and soil erosion causing floods and landslides. Moreover land degradation is likely to affect water, biodiversity and soil. In addition, other forms of natural resources such as deep sea fisheries may be subject to overexploitation.

In general the country lacks the capacity to use in a sustainable way its natural resources; for this reason part of Timor-Leste's investment in the future can be improving Timor-Leste's environmental institutions and legal framework (The World Bank Group and t and ADB 2007).

The Asian Development Bank has estimated that the forests, home to 25 rare and endangered bird species, is fast disappearing with an estimated 31% of its land area seriously degraded. It also observed that the lack of monitoring and data on environmental impacts do not consider the conservation of watershed and marine resources (ADB 2007).

Timor-Leste's mountains, plateaus and coastal plains are dissected by numerous river valleys. Many rivers are dry from May to October, but several of the larger ones, including the Laclo, Seical, Irabere, Bebui, Dilor, Karau Ulun, Nunura, Loes and Tono, carry at least some water all year round. Then the agricultural activities are concentrated near the larger rivers that provide fresh water year-round (National Statistics Directorate 2006).

## Water resources

During the conflict in Timor East, the water supply in Ermera and nearby villages was disrupted, but the systems have since been rehabilitated under the Water Supply and Rehabilitation Project administered by the Operations Evaluation Department of the Asian Development Bank. The Water Supply and Sanitation Rehabilitation Project (WSSRP) has been characterized by two Phases. The first one was approved in July 2000 and it was completed in December 2001; the WSSRP II was approved in March 2001 and completed in April 2003 (ADB Dec 2004).

The goal of the project was to provide water access and sanitation services to the all the communities in East Timor with because water as been "considered essential for public health, for protection of the environment, and for promotion of economic growth based on appropriate technology and management systems" (ADB Dec2004). Each phase of the project had three components. The planned outputs and the effective outputs are described in the following Table 11 and 12, extracted from the report "Water Supply and Sanitation Rehabilitation Projects Phase I (Grant 8185-TIM[TF]) and Phase II (Grant 8189-TIM[TF]) in Timor-Leste" by ADB (Dec 2004).

Table 11: Detailed Project Outputs for WSSRP Phase I

Component	Actual Outputs
<b>Component 1: Water Supply and Sanitation Sector Management and Implementation Program</b>	
Establishment of a Project Management Unit (PMU) in the United Nations Trust Administration for East Timor's (UNTAET) Water Supply and Sanitation Service (WSS).	PMU established; regular contacts maintained with the East Timor NGO Forum and local and international NGOs and development partners involved in the sector.
Planning for the sector: preparation of program implementation document (PID).	Project implementation document completed and approved by UNTAET. Sector management and investment framework completed and approved by UNTAET.
<b>Component 2. Capacity Building and Institutional Development Program</b>	

<p>Short-term support (i.e., priority activities in support of ongoing rehabilitation projects, as identified by WSS and the PID)</p>	<p>WSS offices and stores constructed and renovated in all 12 district towns.</p> <p>PMU and WSS district offices provided with priority tools and vehicles, equipment, and materials.</p> <p>Radio equipment procured and installed in 12 WSS district offices.</p> <p>The following technical assistance was provided: Water supply design (documentation and contract supervision); Information, education and communication program developed and implemented; Policy, legislation and guidelines prepared; Water supply tariff study completed; Water supply and sanitation technical standards and guidelines completed; Solid waste management plan for Dili completed; Water quality improvement plan completed.</p>
<p><b>Component 3: Water Supply and Sanitation Implementation Program</b></p>	
<p>Quick response facility (provision of resources sufficient to respond rapidly to urgent town and village water supply and sanitation repair and rehabilitation needs of Timor-Leste)</p> <p>Dili water supply repair and rehabilitation program (provision of resources to repair and rehabilitate Dili water distribution network to complement upstream rehabilitation being undertaken by the Japanese Government)</p>	<p>Three bores completed in Dili and two in Suai; one Suai bore abandoned.</p> <p>Completed River crossing pipe realignment (Viqueque).</p> <p>Solid waste removal from damaged buildings and drains in Dili completed by Sanitation Section of WSS.</p> <p>Four generator sets with associated equipment supplied to WSS. Subcontract for drafting services awarded and work completed.</p> <p>Design and construction works in Bidau Santana and works for Bekosi bore and Becora completed.</p> <p>Pipe replacement in Motael area and zone Isolation deferred because the Japanese project design for the Dili Water Supply Project was delayed.</p> <p>Information, education, and communication (IEC) programs implemented by Bia Hula, a local NGO.</p> <p>Solid waste management plan for Dili prepared with tender documents.</p> <p>Meter and valve procured for consumer connections.</p> <p>Minor civil design, documentation, supervision and civil construction work completed.</p> <p>Water supply rehabilitation works completed in eight districts through NGO contracts.</p> <p>Water users groups formed by NGOs in order to implement activities based on need, willingness to pay and funds availability.</p> <p>Completed Design and documentation of transmission, storage, and distribution for new bores in Suai and Liquica.</p> <p>Completed asset mapping and feasibility study for Oecussi.</p> <p>Completed Borehole rehabilitation in Suai.</p>

**Table 12: Detailed Project Outputs for WSSRP Phase II**

Component	Actual Outputs
<p><b>Component 1: Water Supply and Sanitation Implementation Program</b></p>	
<p>Quick response facility</p>	<p>Minor design tasks completed; drafting services contracted.</p> <p>Electrical supply upgrading in Dili pumping stations; fencing and associated land acquisition works completed in Dili; small-scale drain cleaning and manhole rehabilitation in Dili; improvement of water supply infrastructure in Dili's Zone 10.</p> <p>Pump procured for Bidau Santana borehole; materials procured for upgrading of water treatment plant for Dili and Oecussi.</p> <p>Nine university students given on-the-job training to assist PMU and WSS staff members.</p> <p>Detailed implementation program prepared and agreed upon with WSS.</p>



Information technology and communications equipment (comprising computer equipment, including local area network and communications system for WSS, including the PMU office)	WSS and the PMU implemented and improved the local area network, back-up facility, Internet access and advanced photocopying capability within the PMU; capacity to provide services to WSS in the future made Available. Internet and e-mail access provided.
<b>Component 3: Project Management Unit</b>	
Establishment of the PMU within WSS	PMU established; close coordination maintained.

The project in general has been successful and the performance of ADB and the Government were satisfactory.

Water supply has improved to the levels that existed under the Indonesian administration but these levels are still inadequate for achieving the country's reasonable public health goals. Sanitation facilities, including wastewater, solid waste and drainage systems, have not yet been entirely restored. In many cases, having access to safe water has allowed people to resume some profitable activities (ADB 2004).

The sustainability of the project's WS&S outcomes now depends on the capacity of the Timor-Leste's Government and WS&S to maintain the systems provided by the project. Moreover the external support to the sector is essential. Water user charges must be also introduced. Improvements are needed to achieve public health, human dignity and environmental protection goals (ADB 2004).

Despite the positive outcomes of the WSSRP, according the WB and the ADB in more recent years (2007), urban waste water management is almost entirely a private responsibility and there is no sewerage system or Government owned and managed communal septic tanks. Moreover in Timor-Leste there isn't any urban water supply system properly working.

Related to the low percentages of improved sanitation and safe drinking water, there are the infections and diarrhoea diseases, among both children and adults, which are also causes of death of children under the age of five. In addition, the lack of adequate infrastructures and the mountainous landscapes worsen the access of water in the rural areas. In general women are the primary collectors and end users of water (The World Bank Group and ADB 2007).

Data on Water Supply and Sanitation (WSS) show that the service is unreliable, moreover only about 13% of families have house connections and 16% are served by community taps. Urban water supply estimates vary greatly, for instance, if access to 24-hour continuous piped safe water is the benchmark, only about 25% of Dili households are adequately served (The World Bank Group and ADB 2007).

There are problems with willingness to pay, willingness to charge, technical difficulties in maintaining systems. To reach the Goal 7- Target 10 and to improve the water sector in East Timor, it will be necessary developing investment strategies, allocating adequate funding and changing the attitudes of the people (The World Bank Group and ADB 2007).

Data relating to the water access to an improved water source and to improved sanitation have been estimated by the United Nations Statistic Division and they refer to 2004 (UNDP 2006). The indicators of Goal 7 Target 10 are shown in the Table 13.

**Table 13: Indicators of Goal 7, Target 10**

	<b>2004</b>
Proportion of population with sustainable access to an improved water source, total	<b>58%</b>
Proportion of population with sustainable access to an improved water source, urban	<b>77%</b>
Proportion of population with sustainable access to an improved water source, rural	<b>56%</b>
Proportion of population with access to improved sanitation, total	<b>36%</b>
Proportion of population with access to improved sanitation, urban	<b>66%</b>
Proportion of population with access to improved sanitation, rural	<b>33%</b>

Source: United Nations Statistics Division 2006

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# KIRIBATI

## Location and Climate

Kiribati is a remote and widely scattered Pacific nation. It has the largest exclusive economic zone<sup>3</sup> (3.5 million sq.Km) of any Pacific developing member country of Asian Development Bank.

The total area of the country is approximately 811 sq km. The country is composed by 33 coral atolls, 23 of which are inhabited, which are divided in three distinct groups of islands: the Gilbert Group (319 sq.km, 16 atolls), the Phoenix Group (28 sq.km, 8 atolls) and the Line Group (430 sq.km) (Figure 1).

Kiritimati Island (Christmas Island), which is part of the Line Group, is the largest atoll, it covers an area of 327 sq.km and it accounts almost half the total land area of Kiribati (The Economist Intelligence United 2005).

All of the Kiribati islands except Banaba, located about 450 km to the west of the main Gilbert Group, are low-lying coral atolls usually rising no more than 4 or 5 metres above sea level. In most of the atolls, a reef encloses a lagoon, on the east side of which are long narrow stretches of land seldom more than 100 m wide. Banaba is a raised coral island, 6.5 sq.km in area and with a maximum elevation of 87 m (IWMI).

The southern Gilbert Islands, Phoenix Islands and Banaba have a dry maritime equatorial climate, whereas the islands situated further north have a more humid tropical climate. Temperatures range between 24° and 30°C, with little variation between the islands (IWMI).

The annual rainfall is variable, not only between islands but also from year to year. The average annual rainfall in the Gilbert Islands ranges from 1,000 mm in the vicinity of the equator to over 3,100 mm in the northern islands. In the Phoenix Islands, most islands receive an annual rainfall in the range 750-1,300 mm; while in the Line Islands, the annual rainfall ranges between 690 mm on Malden to 2,900 mm on Teraina (IWMI).

Kiritimati, situated on the border between the wet and dry belts north of the equator, is relatively dry in most years. The main rainy season extends from November to April, with rain falling in sharp irregular squalls. Banaba, the southern Gilberts and the Phoenix Islands, are subject to periodic droughts when as little as 200 mm of rain may fall in one year (IWMI).

The official residence of the president and the main meeting place (*maneaba*) are on Bairiki islet on Tawana atoll (The Economist Intelligence United 2005).

## Political background

In the past Kiribati was part of a British protectorate and colony (the Gilbert and Ellice Islands), then in January 1977 attained self-government and in July 1979 it became an independent sovereign and democratic republic. The president is head of government and head of state, and presides over a cabinet that includes the vice-president, the attorney-general and no more than eight people who are selected from the parliament by the president (The Economist Intelligence United 2005).

The first president was Ieremia Tabai who was succeeded in 1991 by Teatao Teannaki. In 1994 a motion of no confidence resulted in the election of a new president, Teburoro Tito who was re-elected in February 2003, but new parliamentary elections were called after a vote of no confidence. The opposite candidate, Anote Tong, won the presidential election in July. One of the key issues of the campaign was the future of a Chinese satellite base on the atoll of South Tarawa that was being used to spy on a US missile-testing range. In November 2003 Mr Tong switched allegiance to Taiwan which has established a mission at Tarawa. China closed down its mission in protest and cut all financial aid to Kiribati. The Chinese-funded aid projects were continued by the Taiwanese government (The Economist Intelligence United 2005).

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<sup>3</sup>Under the law of the sea, an exclusive economic zone is a seazone over which a state has special rights over the exploration and use of marine resources.

Figure 1: Map of Kiribati



Source: <http://www.ip2stats.com/maps/KR-map.gif> (consulted 24<sup>th</sup> October 2007)

## Population

According The World Bank, the population has increased from 2000 to 2006 (Table 1). The Asian Development Bank has estimated a high population density (96.1 people per sq Km at the 1995 census) which seems to be much higher in more recent years (The Economist Intelligence United 2005).

Tarawa is the most populous island (The Economist Intelligence United 2005) and, supporting over 33% of the population, is one of the most densely populated islands in the world (IWMI).

The great majority of the population (95%) live in the Gilbert Islands and all the islands in this group are inhabited. In the Line Islands, only Kiritimati (Christmas Island), Tabuaeran (Fanning) and Teraina (Washington) in the northern group are presently inhabited by I-Kiribati.

Nearly all land in the Gilbert Islands is under private ownership in small hereditary holdings, whereas in the Line and Phoenix Islands, all land is owned by the State Government (IWMI).

The languages spoken in Kiribati are English (official language) and Gilbertese (The Economist Intelligence United Limited 2005).

Main religions are the Catholics, Kiribati Protestant Church, the Seventh Day Adventists, Mormons, Bahai and Church of God<sup>4</sup>.

Table 1: Population Indicators

	2000	2005	2006
<b>Population, total</b>	90,700.0	99,000.0	100.6 thousand
<b>Population growth (annual %)</b>	2.6	1.2	1.6
<b>Life expectancy at birth, total (years)</b>	61.9	na	na
<b>Fertility rate, total (births per woman)</b>	3.8	na	na
<b>Mortality rate, infant (per 1,000 live births)</b>	52.0	48.0	na
<b>Mortality rate under-5 (per 1,000)</b>	70.0	65.0	na
<b>Immunization, measles (% of children ages 12-23 months)</b>	80.0	56.0	na
<b>Primary completion rate, total (% of relevant age group)</b>	98.9	128.7	na
<b>School enrolment, primary (% gross)</b>	109.5	112.2	na
<b>School enrolment, secondary (%gross)</b>	98.7	87.1	na

Source: The World Bank April 2007

<sup>4</sup> Source: <http://www.unesco.or.id/APGEST/pdf/kiribati/kiribati.pdf> (consulted 24<sup>th</sup> October 2007).

## **Education**

In terms of income and access to services, Kiribati is one of the poorer among ADB's Pacific Developing Member countries (PDMCs). In 1996 approximately 50% of the population fell below the national poverty line.

However, there has been some progress toward achieving Millennium Development Goal targets by 2015, in fact education indicators have improved and available data suggest that universal primary education has almost been achieved. The target of eliminating gender disparities in education has nearly been reached at the primary level and has been achieved at the secondary level. Nevertheless in the outer islands the school enrolment need to be improved (ADB 2007).

## **Health**

Generally, health indicators have improved slowly but steadily. Outer island facilities remain poorly supplied and maintained. Child mortality has decreased slightly (Table 1) but is still comparatively high. Maternal mortality ratios have been reduced considerably, but are still among the highest of PDMCs (ADB 2007).

Despite improvements, the outer islands are still disadvantaged in terms of access to crucial services such as education, health, water, sanitation and communications. These disparities increase because of the continuing migration to South Tarawa, where population density is already putting significant pressure on water resources and sanitation services. Progress in achieving MDGs by 2015 will require sustained public investment in education, health, and water and sanitation sectors (ADB 2007).

## **Infrastructure and communication**

Ships of the Kiribati Shipping Corporation visit each island about once a month for the collection of copra (dry coconut), delivery of cargo and transport of passengers. The main port is Betion on Tarawa. Some inhabited Kiribati islands have airports served by the government-owned airline, Air Kiribati.

The main international airport is in Tarawa.. International air services are provided by Air Nauru and Air Pacific (Fijan national carrier) linking Fiji, Christmas island and Hawaii (The Economist Intelligence United 2005).

A statutory body, the Broadcasting and Publications Authority, runs a radio service and a weekly newspaper. The former president, Mr Tabai, launched the country's first independent newspaper in 2001 (The Economist Intelligence United 2005).

There are more than 3,000 vehicles of which nearly three-quarters are motorcycle (The Economist Intelligence United 2005).

## **Economy**

In Kiribati it is used the Australian currency (A\$). The exchange rate on September 12<sup>th</sup> 2005 was A\$1.29:US\$1 (The Economist Intelligence United 2005).

In general the economic performance in Kiribati has been poor, particularly in the early 1990s. However, growth slowed to an annual average of just 0.3% in 2000-02 and to average 3.5% in 2003-04. Table 2 shows the economic indicators for the years 2000, 2005, 2006.

After the independence in 1979, the Government has focused on the Line and Phoenix Islands for further development, and Kiritimati, the administrative centre for these two groups, has now become a commercial centre.

The first major economic use of the islands was as a source of phosphate in the second half of the 19<sup>th</sup> Century. So far Government finances are supported by a well-managed trust fund worth more than US\$ 400m, which has built up with revenue from a former phosphate mine. When the Guano deposits were exhausted by the turn of the century, the attention was then transferred to the coconut (copra) industry.

This was successful in the Gilbert Islands, on the northern Line islands and on two of the Phoenix islands, but widely fluctuating world prices of copra prevented a profitable industry. Although the three Northern Line islands of Kiritimati, Tabuaeran and Teraina are still worked regularly, the problems with unfavourable world prices and the high shipping expenses continue to threaten the industry. (The Economist Intelligence United 2005).

**Table 2: Economic Indicators**

	2000	2005	2006
<b>GNI, Atlas method (current US\$)</b>	93.0 million	115.4 million	124.1 million
<b>GNI per capita, Atlas method (current US\$)</b>	1,030.0	1,170.0	1,230.0
<b>GDP (current US \$)</b>	49.0 million	66.4 million	70.7 million
<b>GDP growth (annual %)</b>	1.9	-0.2	5.8
<b>Inflation, GDP deflator (annual %)</b>	-0.4	-2.9	2.1
<b>Agriculture, value added (%of GDP)</b>	7.0	na	na
<b>Industry, value added (%of GDP)</b>	9.7	na	na
<b>Services, etc., value added (% of GDP)</b>	83.3	na	na
<b>Exports of goods and services (% of GDP)</b>	9.6	na	na
<b>Imports of goods and services (% of GDP)</b>	65.2	na	na
<b>Gross capital formation (% of GDP)</b>	na	na	na
<b>Time required to start a business (days)</b>	na	21.0	21.0
<b>Fixed line and mobile phone subscribers (per 1,000 people)</b>	40.3	na	na
<b>Internet users (per 1,000 people)</b>	16.5	20.2	na
<b>Merchandise trade (% of GDP)</b>	88.9	117.0	86.3
<b>Official development assistance and official aid (current US\$)</b>	17.9 million	27.8 million	na
<b>Workers' remittances and compensation of employees, received (US\$)</b>	7.0 million	7.0 million	7.0 million

Source: The World Bank April 2007

In recent years, other opportunities for economic development have been investigated, especially commercial fishing, salt production and tourism. There is very little permanent agriculture in Kiribati because of the poor quality of the soil which is composed largely of coral sand and rock fragments (IWMI).

The annual rate of inflation in the recent years has accelerated and eased. Its values are visualized in the following Table 3 (The Economist Intelligence United 2005).

**Table 3: Consumer prices inflation**

	2002	2003	2004
<b>Consumer price inflation</b>	4.3%	2.6%	1.9%

Source: ADB in The Economist Intelligence United 2005

## Economic sectors

Kiribati depends on income from abroad, from development assistance and the sale of fishing licences. Then the country relies on imports for most of its basic food needs and manufactured goods (The Economist Intelligence United 2005).

Most islanders are involved in subsistence activities like fishing, growing of bananas, vegetables, breadfruit and papaya. Copra is the leading export which contributes for two-thirds of export earnings.

Other exports include pet fish, shark fins and seaweed.

Revenue from fishing and the sale of licenses to foreign fleets (allowing them to fish in Kiribati's waters) are important sources for the revenue of the government (The Economist Intelligence United, 2005).

The tourism industry is underdeveloped, attracting only 3,000-4,000 visitors each year.

The Kiritimati's wildlife is a source of attraction for a small flow of sports fishermen from Hawaii, but the island doesn't provide of a big tourism service. Also the relics from the second world war in Tarawa and Butaritari appeal tourists (The Economist Intelligence United 2005).

## Environmental issues

The flora and fauna of most islands have been totally changed by the introduction of exotic species of plants and animals and large-scale clearance for coconut plantations. Only a few small atolls, especially Birnie in the Phoenix Islands and Vostok in the southern Line Islands, remain in a undisturbed condition. All of the islands have extensive coral formations, in general present as fringing and lagoon reefs. In 1988 UNEP/IUCN provided a general account of the coral reef systems and the reef resources, and also gave detailed information on three of the atolls (Tarawa and Onotoa in the Gilbert Islands and Kiritimati in the Line Islands) (IWMI).

In mid-1998, Kiribati protested against the potential environmental impacts of the Boeing Corporation's Sea Launch project, which involved a satellite launch pad converted from an oil-rig platform positioned 20 Km

outside the exclusive zone of Kiritimati island. Launches have gone without disaster, but the whole Pacific Islands Forum group remain opposed because of pollution risks.

Kiribati is vulnerable to severe weather and high waves. Moreover many of the atolls do not exceed 4–5 meters above sea level (ADB 2004). These natural environmental conditions are worsened by the rise in sea levels as result of climate change which will have an effect on the population.

In August 2005, the World Bank announced a three year project designed to combat sea-rise in Kiribati. This project involves: improving coastal protection by planting of mangrove forests; fresh water-supply projects and the relocation of people to less crowded islands. It is considered a pilot project for application later to other atoll countries (The Economist Intelligence United 2005).

## **Water resources**

The availability of water in Kiribati has been for a long time a question to handle.

Freshwater is limited to larger islands, where lenses of freshwater ‘floating’ on seawater have developed in the underground. The freshwater lenses are floating on the higher-density seawater lower than the atolls (FAO 2002). Freshwater lenses occur on those parts of islands where the central area of coral sands and gravel is sufficiently wide (over 250-300 m). This water can be extracted using infiltration galleries (Taboia Metutera 2002).

In general the major water sources in Kiribati are groundwater and rainwater. Groundwater resources are commonly contaminated from human and other solid wastes. This is caused by the inadequate use of proper toilet facilities and lack of infrastructure in the sanitation sector (FAO 2002)

There are three departments dealing with water (ADB and SOPAC 2002):

- The Environmental Health of the Ministry of Health and Family Planning (MHFP): has the responsibility for water quality monitoring and the provision of sanitary facilities to the villages.
- The Water Unit of the Ministry of Works and Energy (MWE): the Water Engineering Section of the PWD was established in 1986 to coordinate Outer Island water activities by conducting investigation of new water supply schemes, preparing designs and estimates, preparing project documents for funding submissions and managing Outer Islands water supply projects. The Water Engineering Section have been very recently delegated the responsibility for an overall water resources management in the country.
- The Public Utilities Board (PUB): the Board of Directors are responsible to the Minister for Works and Energy, and the Chairman of the PUB Board of Directors is the Secretary for Works and Energy or other nominated officers from the Ministry of Works and Energy.

## **Water resources constraints**

In South Tarawa, where population density is higher than in any other place in Kiribati, drinking water supply from the existing reticulation is insufficient and often restricted to one hour a day. Moreover the rainwater collection by individuals and institutions is not widespread enough and many existing roof-collection installations are inoperative, in spite of existing regulations. The water supply and sewerage systems are not adequately maintained over the past few years and the increase in population has worsened the water crisis(ADB and SOPAC 2002).

Whit the increase of the population, also the sustainability of the lens is threatened and water becomes a scarce resource and the lenses are also vulnerable to pollution from sewage and other contaminants (ADB 2004)

The water is charged at a very low rate (\$5.00 to \$10.00 per household per month) to domestic water users while commercial users are charged a very high rate of \$5.00 to \$8.00 per 1000 litres. Income generated from commercial users represents some 20% of water produced, which is not sufficient to meet the operation and maintenance costs of the water system (ADB and SOPAC 2002).

The high incidence of water-related diseases (mainly diarrhoea) can be attributed to the fact that many people still use shallow open hand-dug wells contaminated by nearby sewage soak pits or leaking toilet pipes and fixtures. Numerous water supply and sanitation facilities installed in the rural areas have broken down (ADB and SOPAC 2002).

Outer island villages mainly need the improvement and rehabilitation of old and damaged water systems originally installed under UNDP Project. Other villages where the system is not installed need it in order to have better access to limited freshwater water sources.

Another problem faced is the brackish of water from seawater intrusion to shallow wells particularly in narrower width lands which most have resulted from coastal erosion (ADB and SOPAC 2002).

The main constraints that Kiribati will be facing and the actions should be taken in order to improve the water sector are described in the following Table 4.

**Table 4: Main constraints and actions in the water sector**

<b>Constraints</b>
Lack of water
Vulnerability to climate change
Lack of community awareness
Usage of appropriate Technologies
Setting of an appropriate water tariff
<b>Actions</b>
Improve utility operation (achieving cost effectiveness, maximizing revenue base through efficient marketing, billing and collection procedures)
Improve coordination of water projects between various ministries
Utilization of appropriate technology
Better utilization of existing water resources (leakage control, consumer education and awareness, pricing policy and plumbing measures that discourage high water demand)
Developing additional or supplementary freshwater resources (more rainwater catchments, groundwater protection measure, into the possibility of using desalination)
The Regional and International Organisations can assist Kiribati by providing technical assistance in terms of water experts and providing funding to projects.

Source: ADB and SOPAC 2002

In order to improve the water and sanitation sector, with a focus on health and environmental issues, loan and grants were assigned by the Asian Development Bank (ADB) to implement a Sanitation, Public Health and Environment Improvement Project. The project was approved in December 1998 and implemented through 2003. It is concentrated on the most populated areas of Kiribati, primarily South Tarawa, and selected areas of North Tarawa (ADB 2004).

The objectives and the major obstacles to the project implementation are illustrated in the following Table 5:

**Table 5: Objectives and Obstacles to project implementation**

<b>Objectives</b>	<b>Obstacles</b>
Improve the quality and availability of the safe drinking water	Cultural issues
Improve the water supply system	Difficulties for the restructuring of the PUB
Expanding the sewerage and sanitation systems	PUB has been slow, because of past inefficiencies
Implement institutional reforms throughout the Public Utilities Board (PUB)	Difficulties for the resettlement of squatter communities living within the water reserve areas, but progress remained slow
Promote hygiene and sanitation through better solid waste management	New tariffs on water and sewerage were approved, but slow to be implemented

Source: ADB 2004

In 2004 the ADB stated that it was too early to judge whether or not the project has been successful. However, the physical construction side of the project has planned and the public awareness has increased (ADB 2004).

The United Nations Statistics Division has estimated the Indicators of the Goal 7-Target 10 of the Millennium Development Goals for the year 2004. The values are illustrated in the following Table 6.

**Table 6: Indicators of Goal 7, Target 10**

	2004
Proportion of population with sustainable access to an improved water source, total	<b>65%</b>
Proportion of population with sustainable access to an improved water source, urban	<b>77%</b>
Proportion of population with sustainable access to an improved water source, rural	<b>53%</b>
Proportion of population with access to improved sanitation, total	<b>40%</b>
Proportion of population with access to improved sanitation, urban	<b>59%</b>
Proportion of population with access to improved sanitation, rural	<b>22%</b>

Source: United Nations Statistics Division 2006

In 2004, less than half of the population had access to improved sanitation and the percentage of the population using improved water source was still low.

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# SOLOMON ISLANDS

## Location and Climate

Solomon Islands is the third largest archipelago in the South Pacific (ADB 2007). The archipelago extends over approximately 860 km of the Southwest Pacific between latitudes 5°S and 12°S and longitudes 152°E and 170°E (IWMI).

The Solomon Islands consist of a double chain of six main islands (Guadalcanal, Choiseul, Santa Isabel, New Georgia, Malaita, San Cristobal) with approximately 992 smaller islands, atolls and reefs peripheral. The capital is Honiara on Guadalcanal island (Figure 1). The total land area of Solomon Islands is 27,556 square km. The capital is Honiara on Guadalcanal island (The Economist Intelligence Unit 2007).

Solomon Islands are characterized by large and mountainous islands clothed with primary rainforest (the largest being Guadalcanal with an area of 5,310 sq km) and by small, bare sand and coralline atolls.

The Solomon Islands form part of the Pacific "Ring of Fire" and there is hence constant seismic activity including earthquakes and volcanoes. The larger islands are almost entirely of volcanic origin and consist of a range of lavas and they are characterized by ridge-valley landscapes predominate with moderately high to very high relief. Because of their recent emergence, most islands are surrounded by uplifted coral terraces (IWMI).

The proximity of the Solomon Islands to the equator give them a typically tropical climate with relatively high and uniform temperature (31°C), high humidity and abundant rainfall. The mean annual rainfall ranges from 3,000 to 5,000 mm; the wide variation depending on topography, latitude and orientation of the islands to prevailing winds (IWMI).

The cooler and dry season is from April to November; the warmer season is from November to April, occasionally accompanied by cyclones (The Economist Intelligence Unit 2007).

Figure 1: Map of Solomon Islands



Source: <http://www.ip2stats.com/maps/BP-map.gif> (consulted 29<sup>th</sup> November 2007)

## **Political background**

The Solomon Islands became independent from the UK in 1978. The mid-1990s was characterized by a financial crisis caused by the mismanagement of the government and by the ethnic hostilities between the people of Guadalcanal (the largest island) and the many thousands from Malaita. The Malaitans, who had moved to Guadalcanal, came to dominate the public service and the police. By the end of the decade, the hostilities had developed into militia warfare (The Economist Intelligence Unit 2007).

A new government, led by Bartholomew Ulufa'alu, was elected in 1997, but an armed Malaitan militia forced the government from office in June 2000 and installed an administration led by the former opposition leader, Manasseh Sogavare, who had also been minister of finance in the Ulufa'alu government (The Economist Intelligence Unit 2007).

Mr Sogavare called a general election in December 2001. A new coalition government was installed under Sir Allan Kemakeza. Under his leadership, the Solomon Islands government began to disintegrate. In July 2003, order was restored following intervention by the Australian-led Regional Assistance Mission to the Solomon Islands (RAMSI). The situation was continuing to be instable and unsure. In fact, after the general election of March 2006, riots started against the ethnically Chinese population of Honiara. Afterwards, Mr Snyder Rini was elected prime minister and Mr Sogavare, nominated by a parliamentary vote. But the social stability was not reached yet because Mr Sogavare was against Australia over the authority of the RAMSI mission.

In April 2007 a tsunami damaged the north-western part of the country, destroying thousands of homes and killing at least 52 people. International aid arrived and the relationship between the government and RAMSI temporarily became more co-operative (The Economist Intelligence Unit 2007).

## **Constitution and administration**

The Solomon Islands is a constitutional monarchy with the British sovereign as head of state, represented by a governor-general, who must be a Solomon Islander. The prime minister leads the cabinet which manages the executive power. The national legislature is a unicameral 50-seat parliament, elected for four-year terms by universal adult suffrage (The Economist Intelligence Unit 2007).

There are nine provincial governments and a system of councils and assemblies.

In 2004, assisted by UN advisers, a replacement in the current constitution of the government was undertaken and the adoption of a federal form of government was proposed. The idea was to substitute the British monarch with an elected president and transfer to the provincial governments the political, financial and legal powers. However the high costs needed and other critics to the federal structure are preventing the implementation of the federalism system (The Economist Intelligence Unit 2007).

In July 2006 Mr Sogavare announced the formation of four decentralised economic zones in Guadalcanal, Malaita, Temotu and Choiseul. The aim is improving the economic prosperity throughout the country, until now only present in the island of Guadalcanal (The Economist Intelligence Unit 2007).

## **Population**

At the last national census, held in November 1999, the total population was 409,042 people, up from 286,043 in the previous census in 1986 (The Economist Intelligence Unit 2007).

The World Bank has estimated the population in 2000, 2005 and 2006 and an increased has been reported. In the same years, fertility rates have declined (Table 1).

According to the UN Population Fund (UNFPA), in 2005 an estimated 17.1% of the population lived in urban areas and the median age of the population was 18.8 years, with 20.3% of the total between the age of 15 and 24 (The Economist Intelligence Unit 2007).

The languages spoken are English (official language), Pidgin and other 87 local languages are in use (The Economist Intelligence Unit 2007).

The Human Development Index (HDI) for Solomon Islands is estimated 0.602, which gives the country a rank of 129<sup>th</sup> out of 177 (UNDP 2005).

## **Education**

Normally about one-half to two-thirds of children are in formal education, but with the near breakdown of public services many schools have closed for lack of funds to pay teachers and maintain facilities. Both the

New Zealand and Australian governments have supplied funds to restore the education services (The Economist Intelligence Unit 2007).

According the World Bank, the percentage of the school enrolment both in primary and secondary school are increased from 200 and 2005 (Table 1).

According the UNDP, the Adult literacy rate in Solomon Islands is 76.6% of people of ages 15 and older, which shows a rank of 87<sup>th</sup> out of 177 countries (UNDP 2005).

**Table 1: Population Indicators**

	<b>2000</b>	<b>2005</b>	<b>2006</b>
<b>Population, total</b>	418.7 thousand	477.7 thousand	489.2 thousand
<b>Population growth (annual %)</b>	2.8	2.5	2.4
<b>Life expectancy at birth, total (years)</b>	61.8	62.9	na
<b>Fertility rate, total (birth per woman)</b>	4.5	4	na
<b>Mortality rate, infant (per 1,000 live births)</b>	25.9	23.6	na
<b>Mortality rate under-5 (per 1,000)</b>	31.5	28.7	na
<b>Immunization, measles (% of children ages 12-23 months)</b>	87.0	72.0	na
<b>Primary completion rate, total (% of relevant age group)</b>	na	na	na
<b>School enrolment, primary (% gross)</b>	85.6	96.5	na
<b>School enrolment, secondary (%gross)</b>	19.2	29.5	na

Source: The World Bank April 2007

## Health

The World Health Organisation and the Australian governments foreign aid agency, AusAID, have been key in maintaining funding for rudimentary health services since 1999. There were 15,172 malaria cases per 100,000 people in 2000. Efforts to curb malaria were stepped up after the Australian-led RAMSI intervention of mid-2003 (The Economist Intelligence Unit 2007).

Diabetes and HIV/AIDS are also public health concern (The Economist Intelligence Unit 2007).

Life expectancy at birth has slightly increased from 2000 and 2005, according to the World Bank database (Table 1). The rate of infant mortality has also slightly improved (Table 1).

## Infrastructure

The central and provincial governments maintain about 1,300 km of roads, of which about one-third are classified as main roads (The Economist Intelligence Unit 2007).

There is an intensive shipping system inter-island and international shipping services between the Solomon Islands and Australia, New Zealand, Hong Kong, Singapore, Taiwan and some European ports (The Economist Intelligence Unit 2007).

There is one international and 25 domestic airports. Domestic services are operated by Solomon Airlines. International air services are managed by Solomon Airlines (to Australia, New Zealand and Vanuatu), Air Nauru, Air Pacific and a limited service by Air Niugini (Papua New Guinea).

The presence of the Regional Assistance Mission to the Solomon Islands (RAMSI) has increased the demand for international telecommunication services. However Telecoms charges remain high, because of a lack of investment and competition. Internet connections are improving, but most government websites are out of date, with the exception of the Central Bank of Solomon Islands (The Economist Intelligence Unit 2007).

## Energy provision

The assistance form Australia and Japan has supported the Solomon Islands Electricity Authority to renovate the service. In 2006, 86% of electricity came from the two main stations in Honiara, whereas the provincial stations in Noro, Gizo and Auki are often at a loss. The electricity authority also reported an increase in electricity theft through illegal connections, maybe as consequence of the higher prices (The Economist Intelligence Unit 2007).

## Economy

The currency used in Solomon Islands is the Solomon Islands dollar (SI\$)=100 cents. The Average exchange rate on July 11 2007 was: SI\$7.65:US\$1 (The Economist Intelligence Unit 2007).

Solomon Islands is one of the least developed of Asian Development Bank's Pacific developing member countries (PDMCs). The country lacks an adequate social infrastructure and services and does not generate enough employment opportunities for a fast-growing population. In general unemployment is rising, particularly among the youth (ADB Sept 2006).

The World Bank has estimated the Economic Indicators (Table 2) for the country for the years 2000, 2005 and 2006. When the data are available, it is interesting looking at the improving of the general economic situation afterwards the riot in 2000.

**Table 2: Economic Indicators**

	<b>2000</b>	<b>2005</b>	<b>2006</b>
<b>GNI, Atlas method (current US\$)</b>	284.6 million	298.5 million	330.9 million
<b>GNI per capita, Atlas method (current US\$)</b>	680.0	620.0	680.0
<b>GDP (current US \$)</b>	299.3 million	298.1 million	334.8 million
<b>GDP growth (annual %)</b>	-14.3	5.0	5.3
<b>Inflation, GDP deflator (annual %)</b>	10.7	7.7	7.8
<b>Exports of goods and services (% of GDP)</b>	39.6	na	na
<b>Imports of goods and services (% of GDP)</b>	59.0	na	na
<b>Gross capital formation (% of GDP)</b>	21.7	na	na
<b>Time required to start a business (days)</b>	na	57.0	57.0
<b>Fixed line and mobile phone subscribers (per 1,000 people)</b>	21.1	28.1	na
<b>Internet users (per 1,000 people)</b>	4.8	8.4	na
<b>Merchandise trade (% of GDP)</b>	53.8	97.3	98.6
<b>Workers' remittances and compensation of employees, received (US\$)</b>	2.0 million	2.0 million	2.0 million

Source: The World Bank April 2007

The economic growth is largely determined by the performance of the agricultural sector and about 90% of the population relies on subsistence agriculture.

Exports are almost entirely of agricultural commodities, of which timber is the largest category. Other important exports include fish and fish products, palm oil, copra and cocoa, although all were affected by the recent political disorder (The Economist Intelligence Unit 2007).

The sale of fishing licences to foreign ships has been a major source of revenue for the government in recent years (The Economist Intelligence Unit 2007).

Progress has been made on the restoration of some of the activities abandoned in the aftermath of the revolt in mid-2000. In April 2005 a new project, Guadalcanal Plains Palm Oil (GPPOL), started to deal with the expansion of oil palm plantations on the Guadalcanal Plains, which had been abandoned by the British former operator because of the violence that began in 2000. A Malaysian company, New Britain Palm Oil, is leading this project in a joint venture with landowners (The Economist Intelligence Unit 2007).

## **Economic Sectors**

### **Agriculture**

Coconut products are traditionally the main agricultural output. In 2002 production of copra dropped to under 2,000 tonnes, from 19,000 tonnes in 2000 and 27,000 tonnes in 1998. Production improved between 2003 and 2005, but declined by 19% year on year in 2006, because of a combination of a decline in prices, lack of copra driers and a shift in many areas from copra to coconut oil production (The Economist Intelligence Unit 2007).

Coconut oil production increased in 2006 to 316 tonnes, supported by the demand from pharmaceutical firms and the food industry. Cocoa production declined by 22% in 2006, as a result of bad weather (The Economist Intelligence Unit 2007).

The commercial fish production was dropped from 49,000 tonnes in 1998 to 29,400 tonnes in 2005, but price rises have helped to mitigate revenue losses (The Economist Intelligence Unit 2007).

Forests and woodland cover 84.8% of the total land area of the country, which is the reason that the logging industry is the dominant sector within the economy. According to the IMF and the Department of Forests, Environment, and Conservation, logging at this rate is unsustainable and forest resources will be mainly destroyed by 2010. The government has undertaken some steps to avoid illegal forestry (The Economist Intelligence Unit 2007).

## Mining and semi-processing

Surveys have indicated that there are deposits of phosphates amounting to 10m tonnes on Bellona Island, and deposits of asbestos, zinc, bauxite, lead, cobalt and nickel have also been found on the islands (The Economist Intelligence Unit 2007).

The production of Gold by the Gold Ridge mine on Guadalcanal was suspended in mid-2000 because the mine was destroyed by militants during the turmoil of that period. In May 2005 the government signed an agreement with an Australian company, Australian Solomons Gold (ASG,) which is planning to start again the commercial production in mid-2008 with a rate of 150,000 oz of gold a year (The Economist Intelligence Unit 2007).

## Manufacturing

Manufacturing activity is concentrated on the processing of agricultural products, particularly fish and timber. After the political disorder by the 2000, it has begun to make progress due to the arrival of the Australian-led Regional Assistance Mission to the Solomon Islands (RAMSI) in July 2003 (The Economist Intelligence Unit 2007).

## Financial services

From late 1996, the activity in much of the banking sector was blocked by the scale of government debt. The situation was exacerbated by the events of 2000. By May 2003 the security situation had deteriorated and the banks had to close temporarily owing to bomb threats. Only the Australian intervention has improved the conditions in this sector (The Economist Intelligence Unit 2007).

## Other services

Tourist arrivals have start to increase after 2002. In 2005 about 9,400 tourists have visited Solomon Islands, increasing form the previous years. But in 2006, because of the political unrest, the number of visitors are estimated to decrease (The Economist Intelligence Unit 2007).

Although the largest hotel of the country was destroyed in the riot of April 2006, two new hotel opened at the end of the same year. The Solomon Islands Visitors Bureau hopes to develop eco-tourism, game-fishing, tours of battlegrounds from the second world war and canoe trips in the lagoons of the country.

Also if there are projects to develop the tourism sector, tourism facilities are not well-developed compared with other Pacific islands, and there are problems accessing some of the islands (The Economist Intelligence Unit 2007).

In Table 3 the are compared the real GDP produced by different economic sectors since 2002.

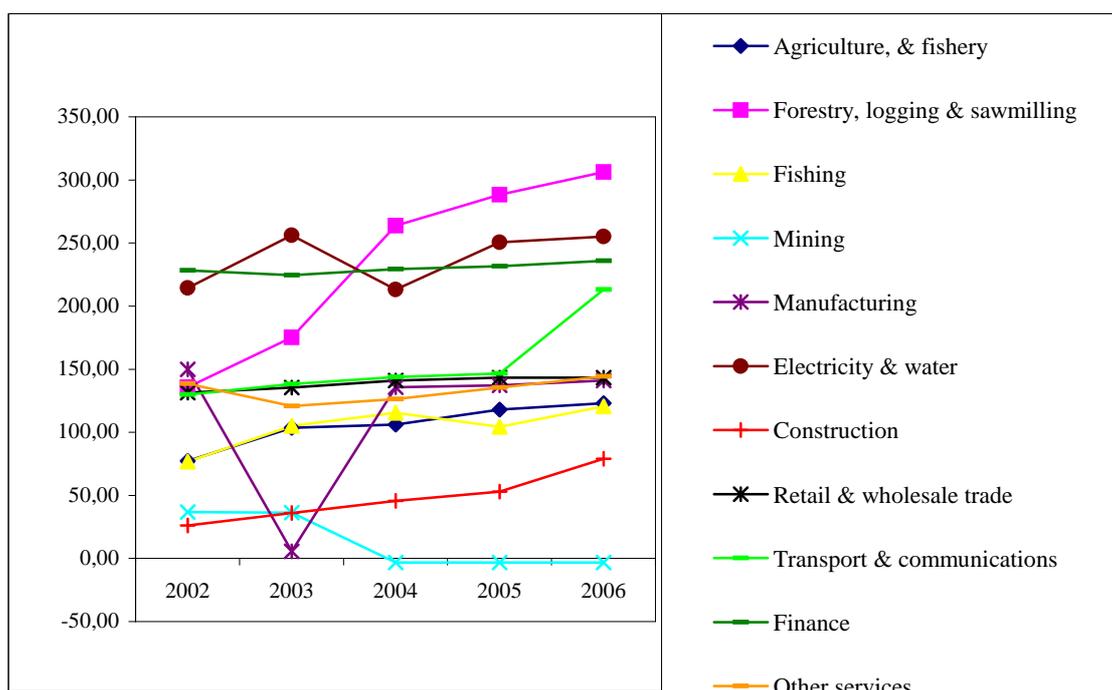
**Table 3: Real gross domestic product by industrial origin (index 1985=100 unless otherwise indicated)**

	2002 <sup>a</sup>	2003 <sup>a</sup>	2004 <sup>a</sup>	2005 <sup>a</sup>	2006
<b>Agriculture, &amp; fishery</b>	77.3	103.3	106.2	118.1	123.1
<b>Forestry, logging &amp; sawmilling</b>	135.6	175.1	263.6	288.3	306.3
<b>Fishing</b>	76.8	105.1	263.6	288.3	306.3
<b>Mining</b>	36.7	36.3	-3.3	-3.3	-3.3
<b>Manufacturing</b>	149.8	134.3	135.8	137.1	141.0
<b>Electricity &amp; water</b>	214.4	256.1	213.2	250.6	255.0
<b>Construction</b>	26.1	35.9	45.6	52.9	79.1
<b>Retail &amp; wholesale trade</b>	131.5	135.5	140.9	143.3	143.3
<b>Transport &amp; communications</b>	129.8	138.2	143.9	146.7	213.2
<b>Finance</b>	228.3	224.5	229.4	231.7	236.0
<b>Other services</b>	138.5	120.7	126.4	135.4	144.2
<b>TOTAL GDP</b>	125.7	133.9	144.6	151.8	162.1
<b>% change</b>	-2.8	6.5	8.0	5.0	6.1

Source: Centre Bank of Solomon Islands, *Quarterly Review* in The Economist Intelligence Unit 2007. a Estimates.

In Figure 2 the trends for each sector from 2002 to 2006 are shown.

Figure 2 Real gross domestic product by industrial origin (index 1985=100 unless otherwise indicated)



Source: Centre Bank of Solomon Islands, *Quarterly Review* in The Economist Intelligence Unit 2007

In Table 4 is visualized the amount of the economic assistance that has support Solomon Islands in the last years.

Table 4: Net official development assistance (US\$ m)

	2001	2002	2003	2004	2005
<b>Bilateral</b>	<b>20.2</b>	<b>20.3</b>	<b>57.9</b>	<b>117.6</b>	<b>142.3</b>
Australia	20.1	19.0	69.0	103.0	144.4
New Zealand	6.5	3.3	6.2	11.6	10.4
US	0.1	0.1	0.1	0.0	0.0
Japan	0.1	-2.2	-18.9	2.9	14.2
<b>Multilateral</b>	<b>34.2</b>	<b>5.0</b>	<b>3.7</b>	<b>5.4</b>	<b>25.9</b>
International Development Association	1.0	-0.1	-0.3	0.4	0.1
EU	31.5	4.0	4.9	3.2	22.8
Asian Development Bank	-0.4	-	-1.8	-0.2	1.6
<b>Total incl other donor countries</b>	<b>54.3</b>	<b>25.1</b>	<b>61.5</b>	<b>125.0</b>	<b>168.2</b>

Source: OECD, *Geographical Distribution of Financial Flows to Aid Recipients* in The Economist Intelligence Unit 2006

## Water resources

Freshwater in the country is abundant due mountainous topography. The longest river in Solomon Islands is Lungga River with a catchment area of 377 km<sup>2</sup> since 1965 (SPREP).

In spite of this, atolls and islets rely on rainwater and underground aquifers of thin fresh water lens. Water quality and quantity in Solomon Islands are reducing at an alarming rate and lack of adequate reliable hydrological data and funds to collect detail data are the major constraints (ADB 2002).

Moreover the common practices such as logging and the traditional slash and burn method of farming have gradually destroyed the rivers and streams, threatening the availability water to many parts of the country (ADB 2002).

Data collected by the Earth Trends (from Food and Agriculture Organization of the United Nations) have assessed that in the period from 1977 to 2001 the water resources has amounted as following:

**Table 5: Water Resources and Freshwater Ecosystem (2003)**

<b>Total Internal Renewable Water Resources<sup>5</sup> (surface water + groundwater-overlap<sup>6</sup>)</b>	<b>Per capita Internal Renewable Water Resources<sup>7</sup> (2001)</b>	<b>Natural Renewable Water Resources (includes flows from other countries)</b>	<b>Per capita, 2002</b>	<b>Water Withdrawals<sup>8</sup> (1987)</b>
45 cubic km	93,405 cubic meters	45 cubic km	93,405 cubic meters per person	Agriculture: 40% Industry: 20% Domestic:40%

Source: Earth Trends Country Profiles 2003

The water resources in the country is controlled by government but owned by the Landowners. The government is trying to deal with legislation in order to improve the water sector but it has not yet solve this concern. At present, there is limited water legislation that effectively protect water in the country and the regulations only refer to urban areas (ADB 2002).

There are three government ministries involved in the assessment, planning, development and management of water resources: the Ministry of Mines and Energy (MME), the Ministry of Health and Medical Services (MHMS) and the Ministry of Transport and Aviation (MTWC).

The MME has a water division that deals with issues regarding water. The MHMS is responsible for implementing the Rural Water Supply and Sanitation Programme (RWSS). The Water Resources Division in the Ministry of Mines, Energy and Water is responsible for the following (ADB 2002):

- Drafting of new water resources legislation for the optimal use of water resources and for the protection of the resource from over exploitation.
- Assessing groundwater resources and providing adequate surface water resources information, both for domestic and industrial water supplies and irrigation.
- Evaluation of stream flows suitable for potential hydropower development.
- Assessing of flood flows and their frequencies for bridges and roads design and river control projects.

RWSS is a programme expected to improve the quality and access of clean water to the rural areas. It has been actively involving rural people in assisting in implementing rural water supply and sanitation projects, while the Solomon Islands Water Authority is responsible for the Urban Centres.

## **Water resources constraints**

In accordance with Pacific Programme for Water Governance (PFWG) selection criteria, in 2005 the Solomon Islands was selected as one of three Pacific Island Countries to benefit from a consultant initiative to promote the application of effective water governance in institutions, systems and structures in the country. The project started in November 2006 and lasted 12 months. It is carried out by the consultancy firm KEW Consult Ltd in collaboration with the Solomon Islands Government and SOPAC. The main activities of the project were (SOPAC 2007):

- initial consultations with relevant stakeholders;
- review the existing water governance situation and identify constraints, opportunities and priorities;
- with SOPAC, develop a programme rationale and define of selection criteria for IWRM/governance issues in the Solomon Islands.

<sup>5</sup>Total Internal Renewable Water Resources is the sum of surface and groundwater resources minus overlap.

<sup>6</sup>Overlap is the volume of water resources common to both surface and groundwater.

<sup>7</sup>Internal Renewable Water Resources (IRWR) include the average annual flow of rivers and the recharge of groundwater (aquifers) generated from endogenous precipitation--precipitation occurring within a country's borders. IRWR are measured in cubic kilometers per year.

<sup>8</sup>Totals may exceed 100% due to groundwater drawdowns, withdrawals from river inflows, and the operation of desalinization plants.

The project has started with the water data collection and discussions with relevant stakeholders in the water sector has been undertaken. The stakeholders involved in the consultation process were: the MME, the MHMS and the MTWC; the RWSS under the ministry of Health and Medical Services, the Ministry of Finance; the Solomon Islands Water Authority (SIWA), established under the Act of Parliament to look after the urban water developments; the Solomon Islands Meteorological Services and the Worldwide Fund for nature (ADB 2002).

The main goal of the consultation process was to achieve an abundance of clean water that is accessible to all Solomon Islanders which means the protection of all water sources, the sustainable use and development of water and making sure that high quality water is accessible to all levels of society (ADB 2002).

According the Asian Development Bank, the Government, with the assistance of donor partners, have to undertake the recommendations of the Table 6 in order to improve the water sector (ADB 2002).

**Table 6: Recommendations for the Government**

Develop an institutional strengthening and capacity building program within various government departments and statutory authority
Develop a comprehensive network and program for effective data collections
Undertake a comprehensive assessment of water resources and developing local understanding of the impact of the climate change and variations to the islands and fresh water resources
Review the existing rural water supply and sanitation project
Develop a sustainable management mechanism: provision of training of village water supply and sanitation technician and tariff for maintenance and operation
Develop a comprehensive education and training program on water resources
Develop clear policies and regulations for the management and protection of water resources in the country
Work together with regional and international organizations to address common problems and issues related to the water resource

Source: ADB 2002

The United Nations Statistics Division has estimated for 2004 the Indicators of the Goal 7, Target 10 of the Millennium Development Goals, visualized in the following Table 7. From the data it is evident the wide different between the rural and urban population in the access to improve sanitation and improved water source, then dire necessity to improve the water sector.

**Table 7: Indicators of Goal 7, Target 10**

	<b>2004</b>
Proportion of population with sustainable access to an improved water source, total	<b>70%</b>
Proportion of population with sustainable access to an improved water source, urban	<b>94%</b>
Proportion of population with sustainable access to an improved water source, rural	<b>65%</b>
Proportion of population with access to improved sanitation, total	<b>31%</b>
Proportion of population with access to improved sanitation, urban	<b>98%</b>
Proportion of population with access to improved sanitation, rural	<b>18%</b>

Source: United Nations Statistics Division 2006

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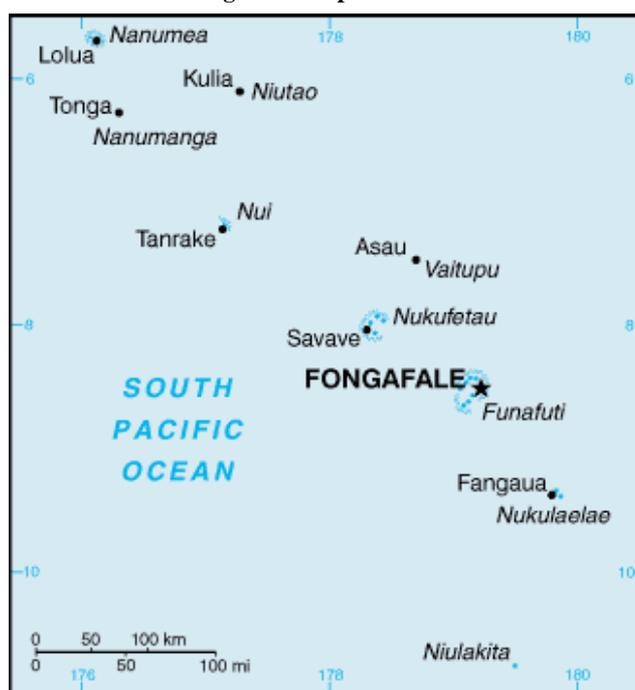
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# TUVALU

## Location and Climate

Tuvalu has a total land area of approximately 26 square km. The country is made up of nine coral atolls, located in the South West Pacific, to the south of the equator. The islands are scattered of 1.3 million square km of the Pacific Ocean. The major islands are: Funafuti, Vaitupu, Niutao and Nanumea (ADB 2002) (Figure 1). The capital of the country is Funafuti (The Economist Intelligence Unit 2005)

Figure 1: Map of Tuvalu



Source: <http://www.ip2stats.com/maps/TV-map.gif> (consulted 28<sup>th</sup> October 2007)

The islands are occasionally affected by hurricanes, especially in the period from October to March. The climate is tropical and the temperature varies from 22°C to 38°C, with high humidity and high rainfall. The mean annual rainfall varies from a low 2737 mm to a high of 3498 mm. The northern part of Tuvalu has the lowest rainfall. Average monthly and annual rainfall for the nine islands is given in Table 1 (ADB 2002).

Table 1: Mean Annual Rainfall (mm)

Island	Period	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Total
Nanumea	1947-84	386	271	298	253	215	202	214	223	166	170	181	306	2891
Niutao	1947-84	357	285	273	247	196	195	218	201	164	171	214	278	2799
Nanumanga	1955-84	309	250	296	232	168	173	180	209	167	193	218	342	2737
Nui	1941-84	402	347	347	221	206	196	218	231	201	220	281	375	3245
Vaitupu	1948-84	354	357	282	219	211	194	197	243	198	220	282	360	3117
Nukufetau	1955-84	337	300	269	205	178	189	192	204	189	189	255	324	2831
Funafuti	1941-84	402	356	314	246	240	230	260	270	210	266	291	413	3498
Nukulaelae	1953-84	382	333	354	221	219	223	248	240	211	253	266	341	3291
Niulakita	1945-84	380	351	362	249	239	226	239	237	225	301	316	353	3478

Source: Asian Development Bank 2002

## Political background

Tuvalu is one of the smallest sovereign countries in the world. The islands were declared a British protectorate in 1892 and in October 1978 Tuvalu became independent from the UK (IWMI 1987).

Tuvalu is a constitutional monarchy with the British sovereign as head of state, represented by a governor-general, who must be a Tuvaluan. Its parliamentary system is based on the Westminster model, with free elections and a cabinet directly responsible to the parliament. The parliament consists of a single chamber with 15 members elected for four-year terms. The parliament elects the prime minister, who selects four other members of parliament to form the cabinet (The Economist Intelligence Unit 2005).

There are no political parties. Each island has an elected council (The Economist Intelligence Unit 2005).

## Population

According to the Asian Development Bank, the population and the density are increasing from 1990 to 2006 (Table 2). Moreover the majority of the population lives on Funafuti.

Table 2: Population data

	1990	1995	2000	2002	2003	2004	2005	2006
<b>Total population thousand; as of 1 July</b>	9.04	9.23	9.47	9.56	9.61	9.66	9.71	9.76
<b>Population density persons per square kilometre</b>	353	360	369	373	375	377	379	381

Source: Asian Development Bank 2007

a The adjusted population data were based on the average annual growth rate between 1991 and 2002 censuses.

There are no data to estimate the Human Development Index and there are a wide lack in data regard population (eg Life expectancy at birth, Total Fertility rate and many other), however UNDP places Tuvalu as Developing Country (UNDP 2007).

The health services is not properly efficient and the educational services focus more on the skills for overseas employments than on sustainable livelihoods within the country. Moreover a rapid urbanisation has become to press on the physical resource in Funafuti.

Many Tuvaluans work abroad, mainly in phosphate mining on Nauru or on foreign ships but there is also an excess of skilled labour, in fact of around 1,000 people in paid employment, one-half work for the government (The Economist Intelligence Unit 2005).

The languages spoken are English, Tuvaluan (official languages) and a Gilbertese dialect spoken on Nui (The Economist Intelligence Unit 2005).

## Economy and Infrastructure

The Australian currency (A\$) is the legal tender, but Tuvaluan coins are also in circulation. The average exchange rate on September 12<sup>th</sup> 2005 was: A\$1.29:US\$1 (The Economist Intelligence Unit 2005).

Tuvalu has a low economic base. Government finances are supported by foreign aid and the Tuvalu Trust Fund, a publicly owned investment vehicle established in 1987, of which Australia provided about one-third, the UK and New Zealand most of the rest, with contributions from Japan and South Korea (The Economist Intelligence Unit 2005).

The soil of the country is poor, the majority of the population is supported by subsistence farming and fishing. Tuvalu only export copra. Coconuts, bananas and breadfruit are produced, but resources are limited, in fact Tuvalu is dependent on imported food, petroleum, building materials and manufactured goods, which come mostly from Australia and Fiji (The Economist Intelligence Unit 2005).

The manufacturing industry consists only of handicraft and article of clothing, and there is little tourism (about 800-900 overseas visitors each year). Most overseas visitors are aid workers, consultants and government workers. The government mainly earn from sales of fishing licences, stamps and access to its international telephone codes (The Economist Intelligence Unit 2005).

The isolation of Tuvalu and the distance between its islands make all forms of transport difficult. In 2001 the government bought a substantial shareholding in Air Fiji, which operates the service between Suva and

Funafuti. In general island roads are made of crushed coral and have little traffic. Only Funafuti's roads are becoming crowded because the number of vehicles continues to rise.

There is a good telecommunications system and limited but adequate Internet access (The Economist Intelligence Unit 2005).

According the Asian Development Bank has elaborated the trend of the gross domestic product by sector at constant price or the years, from 1990 to 2002. In Table 3 and in the Figure 2 these data are represented.

**Table 3: Gross domestic product by sector at Constant 1998 Factor Cost (Thousand Australian dollars; calendar year)**

	1990	1995	2000	2002	2003	2004	2005	2006
<b>GDP by industrial origin</b>	10280	11940	15809	16947	n/a	n/a	n/a	n/a
<b>Agriculture</b>	2427	2355	2380	2099	n/a	n/a	n/a	n/a
<b>Mining</b>	118	115	149	161	n/a	n/a	n/a	n/a
<b>Manufacturing</b>	366	300	280	364	n/a	n/a	n/a	n/a
<b>Electricity, gas, and water</b>	98	476	952	1214	n/a	n/a	n/a	n/a
<b>Construction</b>	766	750	891	931	n/a	n/a	n/a	n/a
<b>Trade<sup>b</sup></b>	2162	1801	2329	2629	n/a	n/a	n/a	n/a
<b>Transport and communications</b>	103	804	1741	2253	n/a	n/a	n/a	n/a
<b>Finance<sup>c</sup></b>	1314	1477	1793	1924	n/a	n/a	n/a	n/a
<b>Public administration</b>	2820	3578	5006	5035	n/a	n/a	n/a	n/a
<b>Others<sup>d</sup></b>	105	284	999	1209	n/a	n/a	n/a	n/a

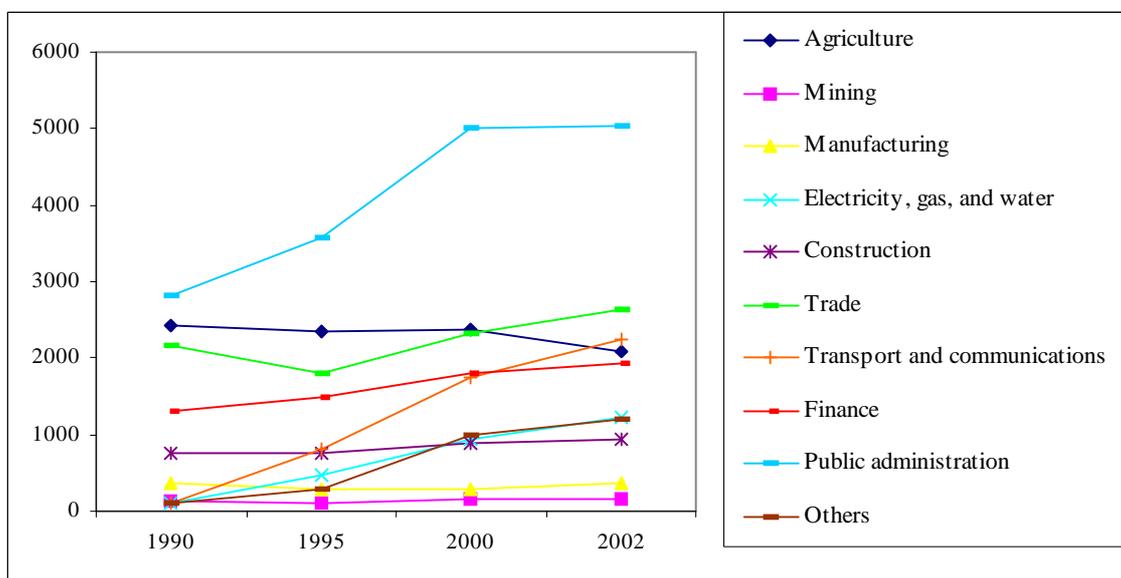
Source: Asian Development Bank 2007

b Includes hotels and restaurants.

c Includes real estate and business services.

d Refers to community and personal services. Includes imputed bank service charges less subsidies up to 1995.

**Figure 2: Gross domestic product by sector at Constant 1998 Factor Cost (Thousand Australian dollars; calendar year)**



Source: Asian Development Bank 2007

## Environmental issues

In 1998, the South Pacific Regional Environmental Programme (SPREP) surveyed Tuvalu for sites containing Persistent Organic Pollutants (POPs) and four POP-contaminated sites were found on Funafuti. There is no legislation on hazardous wastes, this means that medical and other hazardous wastes are burnt in open. Because the population is increasing, the waste production from houses and small business represents serious problem in Funafuti. The lack of waste management have impacts and on the quality of the water and on the health of population, in fact disease have been identified as resulted of contaminated drinking water. The Public Health Act is old and it needs to be revised. Then waste management remains an urgent problem that the Government of Tuvalu should face (Kingston 2004).

According the Ministry of Natural Resources, Environment, Agriculture and Lands (2007), the most damaging effects of climate change in Tuvalu are: the tropical cyclones, the coastal erosion, the salinity intrusion and the drought.

These have affected crops, fruit trees and human livelihood. At present the current challenges, exacerbated by climate change, that stakeholders have to face are (Ministry of Natural Resources, Environment, Agriculture and Lands 2007):

- Coastal erosion, saltwater intrusion and increasing vector and water borne diseases due to sea level rise.
- Inadequate potable water due to less rainfall and prolonged droughts.
- Decreasing fisheries population.
- Pit pulaka<sup>9</sup> salinisation due to saltwater intrusion.

The atolls are less than 6 metres above sea level. The rising of the sea level has caused an increase saline intrusion into the groundwater, contaminating a part of the nation's very limited freshwater supplies and decreasing fruit trees' yields of coconut, banana and breadfruit (Ministry of Natural Resources, Environment, Agriculture and Lands 2007).

Adaptation measures are required to improve community livelihood and promote sustainable development by reducing adverse effects of climate change, variability and extreme events. The National Adaptation Programme of Action (NAPA) for Tuvalu, prepared initially under the Office of the Prime Minister, and completed under the Ministry of Natural Resources and Environment, is an opportunity for Tuvalu to address urgent needs for adaptation to adverse effects of climate change (Ministry of Natural Resources, Environment, Agriculture and Lands 2007).

Moreover the NAPA should strengthen the water master plan which has been launched more ten 10 years ago and it has not been completely implemented.

A key point of NAPA preparation is that the adaptation measures will be established with the involvement of different stakeholders of every level of society and sector expert suggestions. Some adaptation measures have already been undertaken in Tuvalu at community level on some islands such as coastal protection and increasing household water storage facilities. These have shown some successes on some islands and failures on others. The adaptation measures will reduce the adverse impacts of climate change, but it will not solve all the problems. The NAPA has selected the following adaptation projects (Ministry of Natural Resources, Environment, Agriculture and Lands 2007):

- 1) **Costal:** increasing resilience of Coastal Areas and Settlement to climate change.
- 2) **Agricultural:** increasing subsistence pit grown pulaka productivity through introduction of a salt-tolerant pulaka species.
- 3) **Water:** adaptation to frequent water shortages through increasing household water capacity, water collection accessories, and water conservation techniques.
- 4) **Health:** improvement of community health through control of vector borne/climate sensitive diseases and promotion access to quality potable water.
- 5) **Fisheries:** strengthening of community based conservation programmes on highly vulnerable near-shore marine ecosystems.
- 6) **Disaster:** reinforcement community disaster preparedness.

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<sup>9</sup>Pulaka is the traditional food crop in Tuvalu; it grows in deep pits dug into the atolls. The size of Pulaka is can go from a metre or more and tens kilos in weight.

## Water Resources

There are three main sources of water supply in the outer islands and Funafuti: well water, rainwater and desalination (ADB 2002).

### Wells

The wells are found in all the islands of Tuvalu except Niulakita in the southern group and Nanumaga in the Northern group. Most wells are deep from 600 mm to 900 mm across water levels and some could be 3.6 meters across ground level. All wells are vulnerable to pollution by surface waste, rotting vegetation and animal wastes. The water from the well is collected through a small bucket with a long pole tied to the bailer by a rope. Washing or bathing close to the wells is strictly prohibited. The water from these wells is classified as brackish, but sometime could be used for drinking if the supply of rainwater is very low.

The Government has also procured solar operating pumps to some of the outer islands to pump water from these wells up to overhead tanks and distributed by a tractor and trailer to the village (ADB 2002).

Groundwater is an important source of water for agriculture, plants and crops (Ministry of Natural Resources, Environment, Agriculture and Lands 2007). Most islands groundwater is available under the main village settlement thus making it contaminated because of the extensive use of pit latrines, septic tanks and animal wastes. Therefore to protect and to use groundwater, toilet flushing or different uses should be adopted (ADB 2002).

In the *Briefing Country Paper* written by Asian Development Bank (2002) are reported the extents of underground water area for each island of the country, explored using the Schlumberger techniques. They are listed in the following Table 4.

**Table 4: Extent of underground water**

Island	Location	Area
Nanumea	Main Village	0.10 km <sup>3</sup>
	Matagi	0.63 km <sup>3</sup>
	Lakena	0.53 km <sup>3</sup>
Nanumaga	Majority	0.90 km <sup>3</sup>
Niutao	Eastern Half	0.81 km <sup>3</sup>
Nui	Fenua Tapu Limited	0.08 km <sup>3</sup>
	Meang Central	0.15 km <sup>3</sup>
Vaitupu	Northern	0.94 km <sup>3</sup>
	Motufoua	0.34 km <sup>3</sup>
Nukufeatu	Fale	0.21 km <sup>3</sup>
	Savave	no test
Funafuti	Fongafale	no test
Nukulaelae	Fagaua	0.03 km <sup>3</sup>
	Fenualago Central	0.02 km <sup>3</sup>
	Tefakai Northern	0.02 km <sup>3</sup>
Niulakita	Western half	0.15 km <sup>3</sup>

Source: Asian Development Bank 2002

## **Rainwater**

In Tuvalu the only reliable and potable water resource is rainwater (ADB 2002).

Most houses in the Tuvalu have corrugated galvanized iron and aluminium roofing. The rainwater is collected from these roofs, which have PVC gutters that bring water through pipes into tanks that can be made of different materials. In all the islands of Tuvalu there are large public buildings that use their roof to collect rainwater that runs into large public water cisterns ranging from 100 m<sup>3</sup> to 400 m<sup>3</sup>. Then the water is distributed to the community by buckets. The use of hand pump to supply water into the house by the use of gravitational pressure is also common (ADB 2002).

## **Desalination Water**

The desalination technology was introduced into the country during the first declaration of the state of emergency in the month of August 1999 for Niutao and Nanumaga and the second declaration of a state of emergency was declared on November 1999 for Funafuti.

This island has been affected by drought conditions due to El Niño and the resulting irregular rainfall. Moreover in Funafuti, because of the increasing population, the water storage capacity is insufficient. Then the desalination plant has started to work on a daily basis to satisfy public water demands producing 65 m<sup>3</sup>/day (Ministry of Natural Resources, Environment, Agriculture and Lands 2007).

Desalination water is very reliable sources of water, but operational and maintenance costs are too expensive for a developing country like Tuvalu (ADB 2002).

## **Water resources constraints**

After Tuvalu became independent (October 1978), there has been an increase in the national priority to provide an adequate supply of water, sanitation facilities and waste disposal. Tuvalu population requires (ADB 2002):

- potable safe drinking water and suitable water for domestic, agricultural, commercial and industrial;
- to control methods of disposal for different form of wastes whether its solid or liquid. This would enable the minimization of water related disease and spread of disease resulting from direct or indirect contact with infected and polluted water.

Tuvalu has a 10-year water master plan that stated the priorities described before, but it needs to be officially adopted by Government. The Asian Development Bank (2002) stated that most families buy their water requirement from Government because they don't have proper water storage to collect rainwater and also the rainwater storage in the islands is unknown, with the exception of Funafuti.

Tuvalu has received assistance from the non-governmental organization which have been involved in the past, but it is not sufficient. The Government should implement any initiatives in the water sector, but actually there are some constraints mainly concern the financial resources (ADB 2002).

There are also problems within the Government Institutional structure because a lack of planning, policy making, legislation, insufficient human resources capacity and fragmentation in the water sector. Therefore the current structure of the water authority should be strengthened and reorganized (ADB 2002).

## **Action already undertaken**

The Asian Development Bank (2002) stated that the Water Authority (represented by the Public Work Department, PWD) has carried a water survey to all storage capacity in Funafuti and it has envisaged to undertake water survey to all the islands of Tuvalu. The survey will provide data for better monitoring and management of the distribution of the available water during dry spell. The data will also develop a database to accurately monitor and predicts the existing and new storage requirement.

Tuvalu currently is not quite equipped to use the new technology such as GIS system of water monitoring due to lack of appropriate technical staff. The Water Authority will get the assistance of Government to continue its support to provide the financial resources (ADB 2002).

## Future Actions Needed

The issues that still should be solved by the Government are described in the following Table 5 (ADB 2002).

**Table 5: Recommendations for the Government to improve the water sector**

Update and approve the Draft Tuvalu Water and Sanitation Plan: this needs to review the criteria for water supply in the light of present and future circumstances
Implement regulations to require minimum storage sizes for all the buildings
Implement regulations to ensure that households maintain their rainwater collection and storage systems in good condition, and regulations to check that water saving strategy are used in houses
Develop plumbing standards

Source: ADB 2002

The Public Works Department (PWD) will be in charge to implement the objectives of the action plan and the Development Coordinating Committee will approve any formal decision. The responsibility to promote the implementation of the action plan will bear by the Government. International Cooperation will be also required to provide assistance in many areas where Tuvalu is lacking the ability to implement some of the pressing issues (ADB 2002).

The United Nations Statistics Division has estimated for the year 2004 the Indicators of the Goal 7, Target 10 of the Millennium Development Goals, visualized in the following Table 6.

**Table 6: Indicators of Goal 7, Target 10**

	<b>2004</b>
Proportion of population with sustainable access to an improved water source, total	<b>100%</b>
Proportion of population with sustainable access to an improved water source, urban	<b>94%</b>
Proportion of population with sustainable access to an improved water source, rural	<b>92%</b>
Proportion of population with access to improved sanitation, total	<b>90%</b>
Proportion of population with access to improved sanitation, urban	<b>93%</b>
Proportion of population with access to improved sanitation, rural	<b>84%</b>

Source: United Nations Statistics Division 2006

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# VANUATU

## Location and Climate

The Republic of Vanuatu is an archipelago of about 80 islands located near the eastern limits of the Indo-West Pacific region between latitudes 13° and 21° South and longitudes 166° and 170° East. These islands form a different bio-geographic unit separated by the adjacent land (IWMI).

The total land area of the country is 12,190 sq km. The major islands are: Efate, Espiritu Santo, Malakula, Tanna, Erromango (Figure 1). The capital is Port Vila (The Economist Intelligence Unit 2007).

The climate is tropical and it can vary from hot, very wet and humid in the north to a warm and less humid in the south. The annual average rainfall is about 4,200 mm in the north and about 1,500 mm in the south. The temperature range goes from 22°C to 27°C. Vanuatu is subject to cyclones that may happen between November and April. Over the last 40 years, 2.6 cyclones per year have occur in the islands (IWMI).

Figure 1: Map of Tuvalu



Source: <http://www.ip2stats.com/maps/NH-map.gif> (consulted 29<sup>th</sup> November 2007)

## Political Background

Vanuatu became independent in 1980 after being governed as an Anglo-French condominium since 1906. There has been a severe political instability in Vanuatu since the early 1990s and coalition governments remaining only short periods. Rivalries between the two security forces, the Vanuatu Mobile Force and the police force, which partly had their origins in the Anglo-French condominium, are now diminished and it seems that there is no risk of revolt. The next election will take place in 2008 (The Economist Intelligence Unit 2007).

The president is the head of state; he is elected for a four-year term by secret ballot by an electoral college comprising the parliament and the heads of local government. In August of 2004 Kalkot Mataskelekele was elected president.

The unicameral parliament, expanded to 52, is elected by universal suffrage for a four-year term. The electoral system includes an element of proportional representation. The Council of Ministers (cabinet) holds the executive power. A national council of chiefs, elected by the district councils of chiefs, leads the matters of custom, tradition, culture and language (The Economist Intelligence Unit 2007).

## Population

The HDI for Vanuatu is 0.674, which gives the country a rank of 120<sup>th</sup> out of 177 countries with data (UNDP 2005). Because of the low agricultural productivity and the poor infrastructure facilities in rural and outer island areas, there are large income disparities between urban, rural and outer island areas (ADB 2007).

Most of the population lives along the coast, and the internal area of many islands are almost uninhabited (IWMI).

According to the World Bank, the population and the life expectancy at birth have increased from 2000 to 2006, like it is visualized in Table 1.

According to the UNDP's Human Development Indicators, in 2005, the adult literacy rate (% ages 15 and older) was 74%.

Data regard population, education and health elaborated by the World Bank (April 2007) are shown in Table 1.

**Table 1: Population Indicators**

	2000	2005	2006
<b>Population, total</b>	191.5 thousand	211.4 thousand	215.3 thousand
<b>Population growth (annual %)</b>	2.0	1.9	1.8
<b>Life expectancy at birth, total (years)</b>	67.7	69.5	na
<b>Fertility rate, total (birth per woman)</b>	4.3	3.9	na
<b>Mortality rate, infant (per 1,000 live births)</b>	38.3	31.0	na
<b>Mortality rate under-5 (per 1,000)</b>	47.7	38.0	na
<b>Immunization, measles (% of children ages 12-23 months)</b>	94.0	70.0	na
<b>Primary completion rate, total (% of relevant age group)</b>	84.2	87.3	na
<b>School enrolment, primary (% gross)</b>	112.9	118.0	na
<b>School enrolment, secondary (%gross)</b>	33.8	na	na

Source: World Bank April 2007

Women, especially in rural areas, are disadvantaged from different points of view: social, economical and political. Poor nutrition of both mothers and infants is a major health concern. 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 (ADB 2007).

The official languages are English, French and Bislama (Pidgin) in addition to about 110 local languages (The Economist Intelligence Unit 2007).

## **Infrastructure**

There are some 1,130 km of roads in the country, but only about 5% of these are in good conditions. The principal ports are at Port Vila (Efate) and Luganville (Espiritu Santo), and there are smaller ports on most islands and an extensive network of inter-island shipping services (The Economist Intelligence Unit 2007).

Eight companies operate international shipment services to Vanuatu. The government-owned Air Vanuatu operates services to Australia, New Zealand, Fiji and New Caledonia (The Economist Intelligence Unit 2007).

Telecommunications and utilities are deficient because private suppliers have been granted non-transparent and they are poorly regulated. Moreover the services are available only in the cities of Port Vila and Luganville and not in the rural areas. This inefficiency worsens the geographical difficulties, as the isolation and the fragmentation between the islands (ADB 2007).

In April 2007 the Minister of public utilities made an initial telecoms policy statement in order to improve the services of Telecom Vanuatu, to reduce the costs and to establish other telecoms firms in Vanuatu (The Economist Intelligence Unit 2007).

## **Energy provision**

In the country there is no petroleum deposits. Interest is being shown in the use of coconut oil as a fuel, a trend that has major implications for the cultivation and sale of locally grown coconuts. The main disadvantage is that coconut oil solidifies at temperatures below 24°C, which happens even in the tropics at night. The new bio-fuel is to be used in all government vehicles operating out of both Luganville (city in Espiritu Santo) and Port Vila. Even Unelco, an energy firm, is currently buying 32,000 litres of coconut oil per month to use in its generating stations in the same cities (The Economist Intelligence Unit 2007).

## **Economy**

The economy of Vanuatu is dominated by subsistence agriculture. After this, fishing, offshore financial services and tourism (about 50,000 visitors in 2004) are the other main economic sectors. Tax revenues come mainly from import duties. However, an inadequate economic management and unstable political conditions have affected the economy of the country in the last years (ADB 2007).

The main constraints 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. After several years of recession, the economy grew in the last years, helped by tourism and some recovery in cattle output and cocoa production (The Economist Intelligence Unit 2007).

The currency is the vatu (Vt). The exchange rate on July 22<sup>nd</sup> 2007 was: Vt104.5:U\$1 (The Economist Intelligence Unit 2007).

The World Bank has estimated the Economic Indicators for the country in the years 2000, 2005 and 2006 regard the internal and external market. The values are illustrated in Table 2.

According to the ADB, the annual average rate of inflation was an estimated 1.6% in 2004, but declined to 0.9% in 2005 (The Economist Intelligence Unit 2007).

ADB states that the promotion of private sector investment and the creation of new job opportunities are the most important needs for the economy growth in Vanuatu, but there are some obstacles to the private sector investment, such as the high cost of financing and doing business, the lack of skilled labours and the political instability (ADB 2007).

**Table 2: Economic Indicators**

	2000	2005	2006
<b>GNI, Atlas method (current US\$)</b>	237.2 million	342.0 million	369.2 million
<b>GNI per capita, Atlas method (current US\$)</b>	1,240.0	1,620.0	1,710.0
<b>GDP (current US\$)</b>	244.6 million	368.0 million	387.5 million
<b>GDP growth (annual %)</b>	2.7	6.8	5.5
<b>Inflation, GDP deflator (annual %)</b>	1.2	2.0	1.6
<b>Agriculture, value added (% GDP)</b>	15.6	n/a	n/a
<b>Industry, value added (% of GDP)</b>	9.3	n/a	n/a
<b>Services, etc, value added (% of GDP)</b>	75.1	n/a	n/a
<b>Time required to start a business (days)</b>	n/a	39.0	39.0
<b>Fixed line and mobile phone subscribers (per 1,000 people)</b>	36.6	n/a	n/a
<b>Internet users (per 1,000 people)</b>	20.9	37.8	n/a
<b>Merchandise trade (% of GDP)</b>	46.2	48.6	50.3
<b>Long-term debt (DOD, current US\$)</b>	73.1 million	71.9 million	n/a
<b>Present value of debt (% of GNI)</b>	n/a	20.7	n/a
<b>Total debt service (% of exports of goods, services and income)</b>	1.0	1.3	n/a
<b>Workers' remittances and compensation of employees, received (US\$)</b>	35.0 million	11.0 million	11.0 million

Source: World Bank April 2007

### **Agriculture**

In general the agricultural sector accounts for just under 20% of real GDP and more than 75% of exports. The main cash crops are coconut, cocoa and squash (The Economist Intelligence Unit 2007).

The production of beef and timber has grown in importance for the economy. Vanuatu received support from New Zealand to export beef to that country in late 2002, and from the Australian government in 2003. Vanuatu produce beef of high quality and believed to be at low risk for such infections as BSE (mad-cow disease) (The Economist Intelligence Unit 2007).

In May 2000 Vanuatu joined the International Tropical Timber Organisation and is hoping that its forests will be certified (The Economist Intelligence Unit 2007).

There is considerable potential for agricultural development, particularly in smallholder cattle and cocoa production but at present there is no national strategy for agricultural development (ADB 2007).

### **Manufacturing**

Manufacturing, which contributed 3.6% of real GDP in 2003, is focused on the processing of agricultural and forestry products. Meat canning and fish freezing are important industries, although other products include soft drinks, building materials, furniture, fabricated aluminium items and printed materials (The Economist Intelligence Unit 2007).

### **Financial services**

An offshore financial centre was created by UK legislation in 1971 and many offshore banks were set up. But the OECD's Financial Action Task-Force has elaborated a lists of suspect jurisdictions that have included Vanuatu. Then the number of offshore banks operating in the country fell sharply after international clearing houses banned transactions involving entities registered in Vanuatu in 1999 (The Economist Intelligence Unit 2007).

### **Other services**

Tourism plays an important role also if Vanuatu has to compete with other Pacific Island destinations. A new Centre for Hospitality and Tourism was opened in April 2007 in Port Vila and it is supposed to become a centre of excellence for the whole Pacific region. The centre will provide training in the fields of catering, office work, accounting, travel agency operation and other aspects of the tourism industry (The Economist Intelligence Unit 2007).

Further increases in tourist arrivals should be aided by expanded and more competitive international air service as a result of the Government's open sky policy, and by the growing popularity of Vanuatu as a cruise ship destination (ADB 2007).

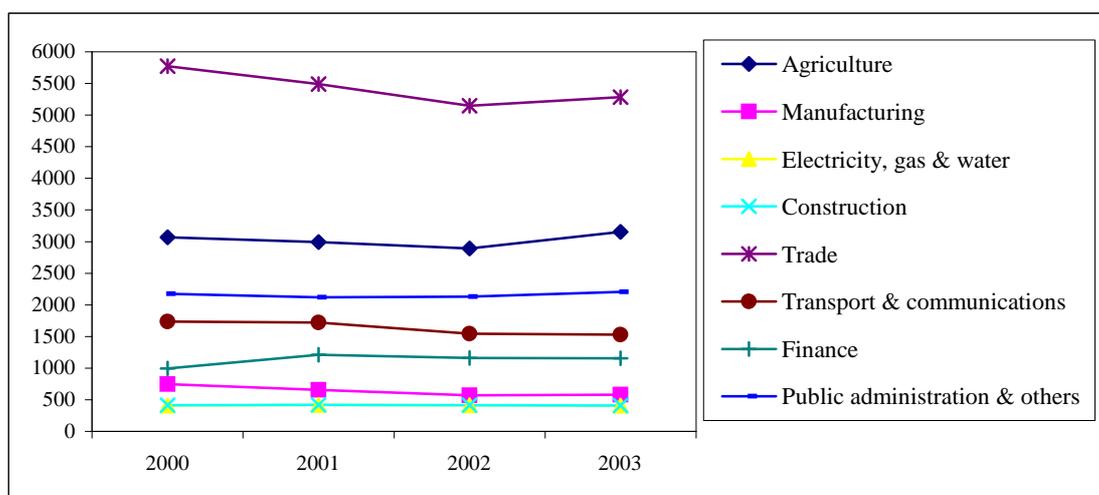
In the Table 3 and in the graph of the Figure 2, the Gross Domestic Product by sector is illustrated at a constant 1983 prices (Vt m) for the years 200-2003. Data regard this issue for the year 2004 are not available.

**Table 3: Gross Domestic product by sector (Vt m; constant 1983 prices)**

	2000	2001	2002	2003	2004
<b>Agriculture</b>	3,069	2,994	2,894	3,152	n/a
<b>Manufacturing</b>	746	655	569	579	n/a
<b>Electricity, gas &amp; water</b>	410	418	414	409	n/a
<b>Construction</b>	415	418	415	409	n/a
<b>Trade</b>	5,773	5,489	5,149	5,283	n/a
<b>Transport &amp; communications</b>	1,738	1,719	1,544	1,530	n/a
<b>Finance</b>	995	1,211	1,162	1,157	n/a
<b>Public administration &amp; others</b>	2,175	2,117	2,131	2,207	n/a
<b>GDP by industrial origin incl others</b>	<b>17,113</b>	<b>16,650</b>	<b>15,832</b>	<b>16,290</b>	<b>n/a</b>

Source: Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries* in The Economist Intelligence Unit 2007

**Figure 2: Gross Domestic Product trend by sector (2000-2003) (Vt m; constant 1983 prices)**



Source: Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries* in The Economist Intelligence Unit 2007

## The external sector

Vanuatu's exports are agricultural products, the most important is copra. Total export earnings increased from Vt3.252bn (US\$26m) in 2003 to Vt4.167bn in 2005 reflected the rising prices of copra and beef. Vanuatu is increasingly looking at Australia as a niche export market for organic beef and organic coffee (The Economist Intelligence Unit 2007). The export earnings for copra, beef, timber and cocoa estimated by ADB are reported in the following Table 4.

**Table 4: Main Exports (VT m; fob)**

	2001	2002	2003	2004	2005
<b>Copra</b>	323	174	282	446	302
<b>Beef</b>	239	194	287	286	181
<b>Timber</b>	334	197	249	247	203
<b>Cocoa</b>	95	50	45	30	126
<b>Total incl others</b>	<b>2,895</b>	<b>2,590</b>	<b>3,252</b>	<b>4,167</b>	<b>4,126</b>

Source: Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries* in The Economist Intelligence Unit 2007

Imports rose from Vt12.6bn in 2004 to Vt14.3bn in 2005. Japan, traditionally the country's most important export market, has been overtaken in recent years by Thailand and Malaysia, which together absorbed more than 65% of total exports in 2005 (compared with 7.6% taken by Japan). The main import products are: machinery and transport equipment, food, mineral fuel and basic manufactured goods (The Economist Intelligence Unit 2007). The Asian Development Bank has elaborated the amount of value for each kind of import from 2001 to 2005 and these data are shown in Table 5.

**Table 5: Main Imports by SITC<sup>10</sup> section (Vt m)**

	2001	2002	2003	2004	2005
<b>Machinery &amp; transport equipment</b>	3,219	2,960	2,621	3,057	3,422
<b>Food &amp; live animals</b>	2,240	2,216	2,490	2,756	2,863
<b>Mineral fuels, etc</b>	1,859	1,441	1,846	1,871	1,837
<b>Basic manufactures</b>	1,704	1,724	1,658	2,057	2,369
<b>Miscellaneous manufactured goods</b>	1,112	1,451	1,354	1,471	1,930
<b>Chemicals</b>	1,449	1,559	1,454	1,558	2,581
<b>Beverages &amp; tobacco</b>	362	456	713	551	537
<b>Unclassified goods</b>	450	205	240	435	395
<b>Crude materials excl fuels</b>	164	169	134	242	241
<b>Animal &amp; vegetable oils &amp; fats</b>	50	53	61	69	73

Source: Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries* in The Economist Intelligence 2007

## Official development Assistance

The Official development assistance (ODA) decrease from 2001 to 2004, but they jumped to over US\$50m in 2005 following a large inflow from Japan. Australia and Japan were the most important contributors of bilateral aid in 2005, followed by France and New Zealand as it is illustrated in the following Table 6. The US is set to be a substantial donor through its Millennium Challenge Corporation (MCC) (The Economist Unit 2007).

**Table 6: Net official development assistance (US\$ m)**

	2000	2001	2002	2003	2004
<b>Bilateral</b>	<b>24.1</b>	<b>22.4</b>	<b>28.2</b>	<b>17.9</b>	<b>45.2</b>
Australia	10.2	9.9	15.5	19.7	19.9
Japan	3.4	2.5	2.3	-1.1	19.8
France	6.0	5.5	4.1	6.8	5.2
New Zealand	3.7	3.3	4.7	4.7	5.0
<b>Multilateral</b>	<b>7.4</b>	<b>5.2</b>	<b>4.2</b>	<b>3.1</b>	<b>6.1</b>
Asian Development Bank	2.6	0.2	-0.4	-0.4	-0.4
EU	4.4	4.1	3.8	2.8	5.6
<b>UN Technical Assistance</b>	<b>0.5</b>	<b>0.9</b>	<b>1.0</b>	<b>1.0</b>	<b>1.2</b>
<b>TOTAL</b>	<b>31.6</b>	<b>27.5</b>	<b>32.4</b>	<b>21.1</b>	<b>51.3</b>

Source: OECD, *Geographical Distribution of Financial Flows to Aid Recipients* in The Economist Intelligence Unit 2007

## Environmental issues

Three major categories of vegetation can be identified in Vanuatu (IWMI):

- 1) evergreen tropical forests on lowland, wet and windward slopes;
- 2) semi-deciduous forests and fire-induced savannahs and grasslands on lowland, drier and leeward slopes;
- 3) evergreen forests of upland and summit areas where the cooler, wetter and more humid climate occurs in a forest of smaller trees.

In Vanuatu there are about 900 species of flowering plants, a low number compared with neighbouring island groups, and only 135 (15%) are endemic. The leaf flora is rich, with about 250 species known (IWMI).

According the United Nations Statistics Division (2006) in 2005 the percentage of land area covered by forest was 36.1% and the protected area to total surface area was 0.2%.

ADB (2007) states that the daily activities generate severe consequences on the environment such as reef depletion, watershed damage, soil erosion and contamination resulting from inadequate waste disposal. Also the growth of population and the urbanization play a role in the environment impacts.

Afterwards the global conventions on sustainable development (such as the definition of the Millennium Development Goals in 2000 and the World Summit on Sustainable Development in 2002), each countries

<sup>10</sup>SITC stands for Standard International Trade Classification, classification elaborated by the United Nation Statistic Division to group the commodity. URL: <http://unstats.un.org/unsd/cr/family2.asp?Cl=14> (consulted 30th November 2007).

should develop national reports in which the main objectives to achieve were described. An update National Assessment Report for Vanuatu is not available, but Vanuatu's 1993 National Conservation Strategy identifies key concerns and priorities for the achievement of the sustainable development (SOPAC). These issues are subdivided into three sectors of sustainable development (environmental, social and economic) and the concerns are shown the following Table 7<sup>11</sup>:

**Table 7: Sustainable Development concerns in Vanuatu**

<b>Environmental</b>
Sustainable management and conservation of natural resources
Intensifying demands on and exploitation of natural resources
Water supply and quality
Preservation of biodiversity
Vulnerability to natural disasters
Climate change and sea level rise
Need to promote understanding of environmental processes
Waste and hazardous material management
<b>Social</b>
Need to improve environmental education and awareness
Need for inter-departmental coordination between environment departments
Need to strengthen existing environmental institutions, administration, legislation and law enforcement
Erosion of traditional authority and customs
Geographical isolation, and limitations in communication and transport isolate communities
<b>Economic</b>
Localised population pressure
Land tenure system
Need for greater use of appropriate technologies
Need for rural and outer island development

In the section regard the Economy it has been said that Vanuatu has a poor economy, then problems mentioned in the Table 7 seem not to be solved also if years have been passed. Moreover in recent times (as it is described in the following paragraph), SOPAC and UNDP have stated that Tuvalu should still cope with the environmental concerns described in the Table 7, especially those regard water.

## **Water resources<sup>12</sup>**

### **Sources of water**

In Vanuatu ground and surface water resources are utilised for domestic purpose. In urban areas the main water resource is groundwater, whereas in rural areas the main sources come from wells, springs, rivers and rainwater.

Water supply systems are quite poor or do not exist. The quality of water is inadequate in many cases, and water sources are subject to contamination.

<sup>11</sup>Source: <http://www.sopac.org/tiki/tiki-index.php?page=Vanuatu+SOPAC+and+Sustainable+Development> (consulted 29<sup>th</sup> November 2007)

<sup>12</sup>The information of the paragraph "Water resource" is taken from the following sources (consulted 29<sup>th</sup> November 2007):  
<http://www.sopac.org/tiki/tiki-index.php?page=Vanuatu+Country+Profile;>  
<http://www.sopac.org/tiki/tiki-index.php?page=Vanuatu+Water+Resources+Monitoring;>  
<http://www.sopac.org/tiki/tiki-index.php?page=Vanuatu+Water+Supply+Improvements+Needs.>

If the boreholes or wells from where groundwater is abstracted are located away from source of contamination, abstracted water is of very good quality. In contrast, surface water sources are subject to bacteriological and other contamination.

In many parts of Vanuatu there are large quantity of water in the ground which could provide to cope with seasonal variations in rainfall. Spring or stream sources may dry up during periods of lower rainfall.

Groundwater has traditionally been exploited by constructing hand dug wells in low lying or coastal areas. These open structures are subject to contamination and often contain water that is unsuitable for drinking. Generally, drilling is banned where the groundwater is at a depth less than 100 m below the surface.

Water quality in both urban in Port Vila and Luganville is generally very good with only calcium hardness to note. The only treatment is chlorination.

## Water resources constraints

The access to safe water has become a national issue. SOPAC, SPREP and UNDP have supported the institution of catchment zones to protect Villa and Luganville catchments. Both aquifers are under increasing pressure from agriculture, housing and other developments within the catchment protection zones that have been established.

The Port Vila system should be improved and the leak reduction should be achieved. There are six existing water testing laboratories in Port Vila and Luganville, but they were not fully operational because of insufficient operator skills and low volume of water testing.

Rural supplies are more variable with many unprotected sources affected by pollution and, in some cases, contaminated by volcanic ash and gas emissions.

The United Nations Statistics Division (2006) has estimated the Indicators for the Goal 7-Target 10 of the Millennium Development Goals. These values (visualized in the following Table 8) show that there is a big difference between the rural and the urban population in the water access to an improved water source and to improved sanitation.

**Table 8: Indicators of Goal 7, Target 10**

	<b>2004</b>
Proportion of population with sustainable access to an improved water source, total	<b>60%</b>
Proportion of population with sustainable access to an improved water source, urban	<b>86%</b>
Proportion of population with sustainable access to an improved water source, rural	<b>52%</b>
Proportion of population with access to improved sanitation, total	<b>50%</b>
Proportion of population with access to improved sanitation, urban	<b>78%</b>
Proportion of population with access to improved sanitation, rural	<b>42%</b>

Source: United Nations Statistics Division 2006

The following agencies have an important role in the development of the Water Safety Plans (WSP) Programme in Vanuatu: department of Geology, Mines and Water Resources; Forestry Department; Meteorological Department; Ministry of Health, Provincial Council; Public works Department; Live and Learn; UNELCO<sup>13</sup>; NGOs.

In 1988 the UNICEF Pacific has begun a rural sanitation project (RSP) on Vanuatu. The goals were (Stitt 2005):

- provide the population of Vanuatu with Ventilated Improved Pit (VIP) and/or Water Seal Latrines;
- strengthen local management capacity by integrating sanitation and water supplies;
- improve communications support through education activities and publicity drives.

The Ministry of Health has increasingly involved in public education area nurses and village health workers in order to maintain quality control and to encourage active participation by community women. However the implementation of the Programme has to cope with the lack of legislation; moreover the rules, the standards and the responsibilities of the authorities in the water sector are not clearly defined (Stitt 2005).

<sup>13</sup>Since 1994 Port Vila's system has been in private hands under the monopoly operator UNELCO: it has operated the country's electricity supply since the 1930s, and is now a subsidiary of French-based Suez. Smaller town water supply is still managed by the Department of Public Works. URL: [http://www.mekong.es.usyd.edu.au/events/past/GeogConference2004/vanuatu\\_casestudy.pdf](http://www.mekong.es.usyd.edu.au/events/past/GeogConference2004/vanuatu_casestudy.pdf) (consulted 29<sup>th</sup> November 2007).

It is recommended that the government should select the Ministry of Health as the National Surveillance Agency giving them the necessary administrative power to perform surveillance activities and to provide the legislative basis (Stitt 2005).

The environmental Health Unit (EHU) should be responsible unit for surveillance activities and should develop a monitoring scheme for a short term including the chemical parameters to be monitored, sampling frequencies and inspection regimes. Besides National Drinking Water Quality Standards are required.

Cooperation of all the agencies, public awareness and modification of the community are necessary to eliminate contamination of water sources and to improve the water sector. Tuvalu should increase their annual investment in water supply and sanitation programs, but the inefficiency of the local government is a constraint in the improvement of these services (Stitt 2005).

## Relevant report and website

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## Comparative tables

### Population data: Human Development Index, Population growth, Health, Education

	East Timor	Kiribati	Solomon Islands	Tuvalu	Vanuatu
Human Development Index (UNDP)	0.514; 150 <sup>th</sup> (2005)	na	0.602; 129 <sup>th</sup> (2005)	na	0.674; 120 <sup>th</sup> (2005)
Total Population in 2006 (WB April 2007)	1.0 million	100.6 thousand	489.2 thousand	9.76 (source:ADB 2007)	215.3 thousand
Population growth in 2006 (annual %) (WB April 2007)	5.3	1.6	2.4	na	1.8
Life expectancy at birth, total (years) in 2005 (WB April 2007)	56.7	na	62.9	na	69.5
Fertility rate in 2005, total (birth per woman) (WB April 2007)	7.5	na	4	na	3.9
Mortality rate, infant (per 1,000 live births) in 2005 (WB April 2007)	51.5	48.0	23.6	na	31.0
Mortality rate under-5 (per 1,000) in 2005 (WB April 2007)	61.3	65.0	28.7	na	38.0
Immunization, measles (% of children ages 12-23 months) in 2005 (WB April 2007)	48.0	56.0	72.0	na	70.0
School enrolment, primary (% gross) in 2005 (WB April 2007)	151.1	112.2	96.5	na	118.0
School enrolment, secondary in 2005 (%gross) (WB April 2007)	51.8	87.1	29.5	na	na

Source: UNDP 2005; The World Bank April 2007; ADB 2007

### Economic data

	East Timor	Kiribati	Solomon Islands	Tuvalu	Vanuatu
GNI, Atlas method (current US \$) in 2006 (WB April 2007)	865.0 million	124.1 million	330.9 million	na	369.2 million
GNI per capita, Atlas method (current US \$) in 2006 (WB April 2007)	840.0	1,230.0	680.0	na	1,710.0
GDP (current US \$) in 2006 (WB April 2007)	356.0 million	70.7 million	334.8 million	na	387.5 million
GDP growth (annual %) in 2006 (WB April 2007)	-1.6	5.8	5.3	na	5.5
Inflation, GDP deflator (annual %) in 2006 (WB April 2007)	3.4	2.1	7.8	na	1.6
Exports of goods and services (% of GDP) in 2000 (WB April 2007)	na	9.6	39.6		
Imports of goods and services (% of GDP) in 2000 (WB April 2007)	na	65.2	59.0	na	na
Services, etc., value added (% of GDP) in 2000 (WB April 2007)	55.7	83.3	na	na	75.1
Time required to start a business (days) in 2006 (WB April 2007)	92.0	21.0	57.0	na	39.0

Source: The World Bank April 2007

### Net Official Development Assistance (US\$ m)

	East Timor	Kiribati	Solomon Islands	Tuvalu	Vanuatu
<b>Bilateral</b>					
<b>2002</b>	187.0	na	20.3	na	28.2
<b>2003</b>	127.3	na	57.9	na	17.9
<b>2004</b>	133.7	na	117.6	na	45.2
<b>Multilateral</b>					
<b>2002</b>	31.4	na	5.0	na	4.2
<b>2003</b>	27.3	na	3.7	na	3.1
<b>2004</b>	19.0	na	5.4	na	6.1
<b>Total</b>					
<b>2002</b>	<b>219.8</b>	na	<b>25.1</b>	na	<b>32.4</b>
<b>2003</b>	<b>154.9</b>	na	<b>61.5</b>	na	<b>21.1</b>
<b>2004</b>	<b>152.8</b>	na	<b>125.0</b>	na	<b>51.3</b>

Source: The Economist Intelligence Unit 2006 and 2007

### Indicators of Goal 7, Target 10

Year 2004	East Timor	Kiribati	Solomon Islands	Tuvalu	Vanuatu
Proportion of population with sustainable access to an improved water source, total	58%	65%	70%	100%	60%
Proportion of population with sustainable access to an improved water source, urban	77%	77%	94%	94%	86%
Proportion of population with sustainable access to an improved water source, rural	56%	53%	65%	92%	52%
Proportion of population with access to improved sanitation, total	36%	40%	31%	90%	50%
Proportion of population with access to improved sanitation, urban	66%	59%	98%	93%	78%
Proportion of population with access to improved sanitation, rural	33%	22%	18%	84%	42%

Source: United Nations Statistics Division 2006 (<http://mdgs.un.org/unsd/mdg/Data.aspx>)

### Main problems in the water sector and actions recommended to be undertaken by the Governments

	Problems	Action recommended
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<p><b>East Timor</b></p>	<ul style="list-style-type: none"> <li>- No urban water supply system properly working.</li> <li>- Sanitation facilities, including wastewater, solid waste and drainage systems, have not yet been entirely restored.</li> <li>- Related to the low percentages of improved sanitation and safe drinking water, there are the infections and diarrhoea diseases.</li> <li>- Lack of adequate infrastructures and the mountainous landscapes worsen the access of water in the rural areas.</li> <li>- Problems with willingness to pay.</li> <li>- Technical difficulties in maintaining systems.</li> </ul>	<p>It will be necessary developing investment strategies, allocating adequate funding and changing the attitudes of the people.</p>
<p><b>Kiribati</b></p>	<ul style="list-style-type: none"> <li>- Water-related diseases (mainly diarrhoea).</li> <li>- Numerous water supply and sanitation facilities installed in the rural areas have broken down.</li> <li>- Outer island villages need the rehabilitation of old and damaged water systems originally installed under UNDP Project.</li> <li>- Other villages need water system in order to have better access to limited freshwater water sources.</li> <li>- Brackish of water from seawater intrusion to shallow wells particularly in narrower width lands which most have resulted from coastal erosion</li> <li>- Lack of community awareness.</li> <li>- Usage of appropriate Technologies.</li> <li>- Setting of an appropriate water tariff.</li> </ul>	<ul style="list-style-type: none"> <li>- Improve utility operation (achieving cost effectiveness, maximizing revenue base through efficient marketing, billing and collection procedures).</li> <li>- Improve coordination of water projects between various ministries.</li> <li>- Better utilization of existing water resources.</li> <li>- Developing additional or supplementary freshwater resources (more rainwater catchments, groundwater protection measure, possibility of using desalination).</li> <li>- The Regional and International Organisations can assist Kiribati by providing technical assistance in terms of water experts and providing funding to projects.</li> </ul>
<p><b>Solomon Islands</b></p>	<ul style="list-style-type: none"> <li>- Limited water legislation that protect water in the country and the regulations only refer to urban areas.</li> <li>- Practices such as logging and the traditional slash and burn method of farming have gradually destroyed the rivers and streams, threatening the availability water to many parts of the country.</li> </ul>	<ul style="list-style-type: none"> <li>- Develop a comprehensive network and program for effective data collections.</li> <li>- Undertake a comprehensive assessment of water resources and developing local understanding of the impact of the climate change and variations to the islands and fresh water resources.</li> <li>- Develop a comprehensive education and training program on water resources.</li> <li>- Develop clear policies and regulations for the management and protection of water resources in the country.</li> <li>- Work together with regional and international organization.</li> </ul>
<p><b>Tuvalu</b></p>	<ul style="list-style-type: none"> <li>- Problems within the Government Institutional structure because a lack of planning, policy making, legislation, insufficient human resources capacity.</li> <li>- Need assistance from the non-governmental organization and international institutions.</li> </ul>	<ul style="list-style-type: none"> <li>- The current structure of the water authority should be strengthened.</li> <li>- Update and approve the Draft Tuvalu Water and Sanitation Plan.</li> <li>- Implement regulations to require minimum storage sizes for all the buildings.</li> <li>- Implement regulations to ensure that households maintain their rainwater collection and storage systems in good conditios.</li> <li>- Implement regulations to check that water saving strategy are used in houses.</li> </ul>

<b>Vanuatu</b>	<ul style="list-style-type: none"> <li>- Water supply systems are poor or do not exist.</li> <li>- The quality of water is inadequate in many cases, and water sources are subject to contamination.</li> <li>- The open wells to extract groundwater are subject to contamination and often contain water that is unsuitable for drinking.</li> <li>- The aquifers in Villa and Luganville are under increasing pressure from agriculture, housing</li> <li>- The existing water testing laboratories in Port Vila and Luganville are not fully operational because of insufficient operator skills and low volume of water testing.</li> <li>- Rural supplies are more affected by pollution and, in some cases, contaminated by volcanic ash and gas emissions.</li> <li>- Rules, standards and the responsibilities of the authorities in the water sector are not clearly defined.</li> <li>- Inefficiency of the local government.</li> </ul>	<ul style="list-style-type: none"> <li>- The Port Vila system should be improved and the leak reduction should be achieved.</li> <li>- The Ministry of Health should be selected as the National Surveillance Agency with the administrative power to perform surveillance activities and to provide the legislative basis.</li> <li>- Cooperation of all the agencies.</li> <li>- Public awareness.</li> <li>- Tuvalu should increase their annual investment in water supply and sanitation program.</li> </ul>
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SPREP, Pacific Regional Environment Programme: <http://www.sprep.org/sprep/about.htm>

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