7.12 Mozambique

Clousa Maueua

Instituto Nacional de Hidrografia e Navegacao, Karl Marx Avenue, 153
E-mail: clousam@yahoo.com.br

Capital city	Maputo
Population (2007 est.)	20,530,714 (INE, 2009)
GDP per capita (USD 2005 est.)	$1 242
Life expectancy at birth (2007 est.)	42.8 years (male - 45.2, female - 49) (INE, 2009)
Total Area	801,590 km^2 (land - 784,090, water - 17,500)
Length of coastline	2 306 km (Africa Pilot, 2006)
Highest point of elevation	Mt Binga, 2 436m
Coral reef area (2001 est.)	1 860 km^2
Mangrove area (2005 est.)	390,200 ha
Marine protected areas (2007 est.)	2 802.97 km^2 (4.01% of total territorial waters)
Capture fisheries prod. (2006 est.)	42,536 metric tones
Aquaculture fisheries prod. (2006 est.)	1 174 metric tones

Rivers to the Country's Coast: Mozambique has 25 rivers, of which the most famous and largest are the Zambezi (18°50'S 36°15'E) and the Limpopo (25°10'S 33°30'E). Other major rivers include the Rovuma, which forms part of the Tanzania border, and the Save. The country's rivers flow from the highlands of the west to the Mozambique Channel in the East. The largest body of inland water in the country is Lake Niassa, the Mozambique section of Lake Malawi. Lake Niassa forms part of the Malawi border and drains south through the Shire River into the Zambezi River (Africa Pilot, 2006).

Coastal Climate: Mozambique has a tropical climate, hot and wet from October to March, while it is cooler and dry from May to August. The coastal areas are much hotter than the highlands.

Coastal Geomorphology: Highlands dominate the west, especially at the borders with Zimbabwe and Malawi, but most of Mozambique is a low plateau, descending to the Indian Ocean, where the coast has many shallow lagoons.

The coastal lowland is narrow in the north, but much wider in the south, making Mozambique two-fifths coastal lowlands. Nearly half the country is less than 1 000 m (3 280 ft). Inland the altitude rises westward in a series of low hills and plateaus that reach high points of 2 436 m (7 992 ft) on Mount Bingo near the western border and 2 419 m (7 936 ft) in the Namuli Highlands of the north. To the northwest is the Angonia Plateau which forms the western rim of Africa's Great Rift Valley. Soils are generally poor, except along river valleys and in parts of the Angonia Plateau (Africa Pilot, 2006).

Coastal Habitats: The coastal ecosystems of Mozambique include mangrove, corals, and seagrass beds, all with significant ecological and socio-economic value. Local communities depend on these coastal habitats and they contribute significantly to the national fisheries. Mangroves contribute at least 250,000 tones of fish to annual production per year, at a rate of 0.5 tones of fish per hectare of mangroves. Corals

Figure 1. The GPS antenna installed in Inhambane Tide Gauge station.

Figure 2. Tide gauge at Kalesto, Pemba Quay, 2006.

are the source of production of an estimated 38,700 tones of fish annually, based on a figure of 25 - 30 tones of fish per km^2 for the 1 290 km^2 of the area of coral (Rodrigues and Motta, in press). About 75,000 artisanal fishermen and mussels' collectors, together with their families, depend at greater extent from the fisheries resources (MICOA, 1998).

Coastal Currents and Tides: The circulation patterns of ocean waters along the Mozambique coast are characterized by anti-cyclonic cells and by small vortices between these cells (Saetre and Silva 1982). There is a coastal current for the north caused by these vortices and winds. The patterns of tidal currents are barely known, studies carried out in some areas of Maputo Bay, have revealed that in some areas currents reaches values of 1.5 m/s (Moura,1973).

Coastal Observations: There are 4 operational tide gauges in Mozambique, as shown in Table 1.

Table 1. Tide gauges in Mozambique.

Station Name	Location (latitude; longitude)	Tide gauge type and model	Year of Installation	Responsibility
Maputo	25°58.5' South 32°34.2' East	Radar Gauge	1994/2007	INAHINA
Nacala	14°27.8' South 40°40.8' East	OTT R20 - 20102	1995	INAHINA
Pemba	12°58.0' South 40°29.3' East	OTTR20-20102/ astRadar gauge	1992/2005	INAHINA
Inhambane	25°87 South 35°38 East	Radar Gauge	2005	

Figure 3. Installation of the various types of tide stations in Mozambique. Red indicates the locations where the OTT R20 tide type were installed; yellow is the locations where the radar tide gauges were installed (GLOSS stations), and blue is the stations where INAHINA installed the radar tide gauges.

Figure 4. Mangroves destroyed for use as firewood.

Coastal Economy: Mozambique has a long coast which is one of its greatest economic assets. Tourism and fisheries are the principle economic activities, with tourism being one of the fastest emerging sectors, driven largely from South African tourists. The major centres on the coast are: Ponta de Ouro, Inhaca, Tofo, Pomene, Bazaruto and Quirimbas. The coast of Mozambique is one of its main assets. The fishing industry plays an important role in the country's economy.

Fisheries: Capture fisheries in Mozambique are an important sector and contribute significantly to the diet of the population. Approximately 75,000 artisanal fishermen and mussels collectors and families depend directly on fisheries resources (MICOA, 1998). Artisanal production in 2003 was estimated by the Ministry of Fisheries of Mozambique to be about 67,074 tones. In 2003 registered total catches (from industrial and semi-industrial fishing boats) were reported to be 22,037 tones and accounted for 10% of the country's total exports. In 2003 the annual value of exported fish products was US$ 79.7 million (DNEP, 2005).

Figure 5. Ms. Ana Maria Alfredo is demonstrating to the students the usage of marine databases at INAHINA.

Agricultural Products: Mozambique's major agricultural products include cotton, cashew nuts, sugarcane, tea, cassava, corn, rice, tropical fruits, beef and poultry.

Mineral Resources: Mozambique is rich in mineral resources including gold, marble, heavy minerals from coastal sands, pegmatite, iron ores, diatomite, bentonite, tantalite, graphite, precious and semi-precious stones, bauxite, granite, phosphates, clays, asbestos, beryllium and mica.

ADDRESSING KEY COASTAL ISSUES

Experts taking part in a national assessment of environmental and social issues and impacts identified a number of hot spots (currently suffering measurable degradation), sensitive areas (likely to be subjected

Figure 6. INAHINA Library and information centre.

Figure 7. The RV Bazaruto INAHINA's hydrographic survey vessel.

to some degradation in the future); and major issues of concern. These are reproduced in Table 2 (ACOPS 2002b).

Table 2. Results of the Integrated Problem Analysis undertaken for Mozamabique (ACOPS 2002b). All are number in order of precedence where prioritised.

Major issue of concern overall for the country
1. Modification of stream flow (abnormal river runoff, foods, draughts) 2. Loss and modification of ecosystems and ecotones (erosion, depletion of mangroves, destruction of corals and sea grass beds) 3. Over-exploitation of fisheries resources (shrimp resources, demersal fisheries) 4. Destructive fishing practices (use of mosquito nets, dynamites, fish poisoning)
Hot spots
Maputo Bay: threats include pollution of existing supplies, over-exploitation of fisheries resources, and solid waste *Sofala Bank:* threats include over-exploitation of fisheries resources, destructive fishing practices, and excessive by-catch and discards *Nacala and Mozambique Islands:* threats include degradation of infra-structure (cultural heritage), loss of ecosystem or ecotones, erosion, and solid waste
Sensitive areas
Bazaruto Archipelago: threats include modification of ecosystems, over-exploitation, destructive fishing practices *Quirimbas Archipelago:* threats include over-exploitation, destructive fishing practices, and modification of ecosystems *Inhaca and Matutuine Area:* threats include modification of ecosystems. impact on biological and genetic diversity *Marromeu and Zambezi Delta:* threats include reduction in stream flow, modification of ecosystems, and over-exploitation

DEVELOPMENT OF THE NODC

The Centro Nacional de Dados Oceanográficos (CENADO) is the Mozambique National Oceanographic Data Centre, hosted by the National Institute of Hydrograph and Navigation (INAHINA). The centre has two permanent staff who, in collaboration with staff from INAHINA and other Institutions, have collaborated on collecting data and information and developing products on the state of the coast and ocean of Mozambique. The centre assists scientists from the partner institutions, university students and interested members of the public by acquiring and providing relevant and necessary scientific marine data and information for management, research and study purposes.

The center has developed the following products and services:

- Data sets of the dilution coefficient in Espirito Santo Estuary
- Information on the water masses in Maputo Bay
- Information on the fisheries associated with Bazaruto
- Library catalogue that contain approximately 500 records
- Directory of marine scientists within the country
- Various public information materials such as brochures, newsletters, and a website

Figure 8. Participants at an "Advanced Leadership Workshop for heads of Marine institutions" hosted by INAHINA and INAM in Maputo, 2008.

Data collected under the National Institutions' mandate includes: sea level data, water transparency, sediments, and Conductive Temperature Depth (CTD) data. Meta-databases include information on: institutions, scientists, coastal districts level information, GIS layers, documents, programmes and projects.

Upgrades were done in 2007 to various sea level stations providing information to CENADO and the global community. The equipment installed enables accurate recording of observed data and near real-time transmission through the MeteoSat satellites system to the Tsunami centres, and GLOSS Fast Center at the University of Hawaii. This data, available at CENADO, is also accessible through the ODINAFRICA website.

MARINE RELATED PROGRAMMES AND ORGANIZATIONS

National institutions and programmes that work in collaboration with CENADO include:

- Fisheries Institute (IIP) - http:// moziip.gov.mz
- Meteorology Institute (INAM) - http://www.inam.gov.mz/
- Department of Physics and Biology of Eduardo Mondlane University
- School of Marine and Coastal Science - http://www.marine.uem.mz/

Contacts:
Clousa Maueua
Data Manager (ODINAFRICA WP 3 Coordinator)
Instituto Nacional de Hidrografia
e Navegacao, Karl Marx Avenue, 153.
Telephone: +258 21 430186/8
E-mail: clousam@yahoo.com.br