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THEMATIC STUDY ON MANGROVES

MOZAMBIQUE

COUNTRY PROFILE

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INTRODUCTION

Mangroves are found along sheltered coastlines in the tropics and sub-tropics where they fulfil important functions in terms of providing wood and non-wood forest products, coastal protection, conservation of biological diversity and provision of habitat, spawning grounds and nutrients for a variety of fish and shellfish. High population pressure in coastal areas has led to the conversion of many mangrove areas to other uses and numerous case studies describe mangrove losses over time. However, information on status and trends at the global level is scarce. The first attempt at estimating the total mangrove area in the world was undertaken as part of the FAO/UNEP Tropical Forest Resources Assessment in 1980, where the world total was estimated as 15.6 million hectares. More recent estimates range from 12 to 20 million ha. For many of these studies, countries with small areas of mangroves were excluded due to lack of information and because their combined area of mangroves would not significantly affect the world total.

A recent initiative by FAO aimed at facilitating access to comprehensive information on the current and past extent of mangroves in 121 countries and areas (FAO. 2003). This built on the earlier FAO/UNEP assessment and on the recent FAO Global Forest Resources Assessment 2000 (FRA 2000). An extensive literature search yielded additional information. More than 2800 national and sub-national datasets were collected, with the earliest estimates dating back to 1918. One of the results was an updated list of the most reliable, recent estimate for each country, mostly based on inventories or analysis of remote sensing imagery. Regression analyses based on earlier data provided estimates for 1990 and 1980 and an extrapolated estimate for 2000 for each country.

The preliminary results of this initiative showed that mangrove deforestation continues, albeit on a slightly lower rate in the 1990s than in the 1980s. The relatively large mangrove deforestation rates in Asia, the Caribbean and Latin America in the 1980s reflect large-scale conversion of mangroves for aquaculture and tourism infrastructure. Most countries have now banned the conversion of mangroves for aquaculture purposes and require environmental impact assessments prior to large-scale conversion of mangroves areas for other uses.

In order to provide the most accurate and comprehensive evaluation of current mangrove status, FAO is presently updating the above cited preliminary results, which have been sent out to all countries and areas in which they exist (124) for information and validation. Additional literature search, active collaboration with national and international mangrove experts and the use of remote sensing imagery interpretation have further supported the preparation of the final report, which will be published in 2005.

Readers are strongly encouraged to provide feedback and additional information to help update and improve this database for the benefit of all those who may have an interest in mangroves.

Mozambique

Vegetation description

Mangroves are widespread along the coasts of Mozambique; they are located in all river mouths and in many sheltered, bays and lagoons, mainly in the north of the country, becoming more sporadic towards the south of the country. The most important stands are those of the estuaries of the Messalo, Zambezi, Pungué, Save, Limpopo and Maputo Rivers. The coastline is the wettest part of the country, although most areas receive only about 800-900 mm rain per year with some pockets receiving up to 1 400 mm. The coast is warmed by the southward flowing Mozambique current. The full diversity of mangroves from the region is found in the country, with some of these species having their southern limits in the country. In the far north mangroves form a nearly continuous narrow strip along the many sheltered bays and river mouths. Between Mozambique and the Zambezi Delta, the sheltering fringing reef disappears, but mangroves are found in the many small deltas all along this stretch where alluvial deposits are considerable. These rivers may be tidal for many kilometres upstream and the mangrove communities typically grade into swamp forest. Mangrove swamps are extensive throughout the lower delta of the Zambezi, along the deltaic coast that extends to Beira and in the many river mouths and sheltered bays to the south. Floristically, the mangroves between Beira and the Save River are probably the best developed in the country. In many areas they reach inland for 5-15 km and extend up to 50 km inland along the Save. In these areas, and in the Zambezi Delta, the canopy may reach 25 m or even 30 m in height. Northward pointing spits, formed by eddies from the southward flowing offshore current, protect a number of mangrove-filled bays. In the far south of the country mangroves are well developed along the southern shore of Maputo Bay.

Uses and threats

Most areas of mangroves have been used by man, especially closer to centres of high population density, notably in the north of the country and close to ports. Trees, especially *Rhizophora mucronata,* are widely used for timber, firewood and charcoal. Traditional Arab trade along the East African coast was mostly with Kenya and Tanzania, but also occurred as far south as Beira. There is some artisanal fishing in mangroves and permanent fish traps are a feature of many areas.

FAO, UNEP. 1981. *Tropical forest resources assessment project. Forest Resources of Tropical Africa. Part II: Country Briefs.* FAO,UNEP. 586 pp.

Spalding, M.D., Blasco, F. & Field, C.D., eds. 1997. *World Mangrove Atlas*. The International Society for Mangrove Ecosystems, Okinawa, Japan. 178 pp.

National level mangrove estimates

In order to provide the whole range of the information currently available on mangrove area extent for this country, all the national level mangrove area estimates collected so far have been reported in the following table.

Differences in methodologies, classifications, mapping scales etc. may have led to discrepancies in estimations. Only the figures considered as the most accurate and reliable (marked in the Trend column in this table) have been used for the analysis of the area changes over time; the remaining have been reported, but not used for the trend analysis.

Year	Area (ha)	Source	Trend	Methodology/Comments
1963	1 500 000	**FAO**. 1994. *Study for the determination of the rate of deforestation of the mangrove vegetation in Mozambique.* By Saket, M., Matusse, R. V. Field document MOZ/92/013. FAO, Rome, Italy. 9 pp.		Figure based on information provided by Direçao Provincial de Agricultura.
1972	455 000	**FAO.** 1981. *Evaluación de los Recursos Forestales de la Republica Popular de Mozambique.* By Malleux, J., Field document MOZ/76/007. Rome, 97 pp.		Remote Sensing
1972	408 079	**FAO.** 1994. *Study for the determination of the rate of deforestation of the mangrove vegetation in Mozambique.* By Saket, M., Matusse, R. V. Field document MOZ/92/013. FAO, Rome, Italy. 9 pp.	X	Remote sensing. The document provides the breakdown of mangroves extent for each province.
1978	85 000	**FAO.** 1994. *Study for the determination of the rate of deforestation of the mangrove vegetation in Mozambique.* By Saket, M., Matusse, R. V. Field document MOZ/92/013. FAO, Rome, Italy. 9 pp.		Figure based on information provided by IUCN.
1980	456 000	Malleux, J. 1980. *Avaliação dos Recursos florestais da Republica Popular de Moçambique.*		Visual interpretation of LANDSAT TM with field inventory. Scale 1:1 000 000.
1980	345 900	**Spalding, M.D., Blasco, F. and Field, C.D.,** eds. 1997. *World Mangrove Atlas*. The International Society for Mangrove Ecosystems, Okinawa, Japan. 178 pp.		Map analysis. Mangrove data were taken from the 1:2 000 000 (reduced from 1:1 000 000) scale map *Mapa Florestal, 1980* produced by the Ministerio da Agricultura and published under Projecto UNDP-FAO MOZ/76/007 by Ministerio da Agricultura, Dto Florestal e de Fauna Bravia, República Popular de Moçambique.

Year	Area (ha)	Source	Trend	Methodology/Comments
1987	90 000	**Commission of the European Communities.** 1987. *Mangroves of Africa and Madagascar. Conservation and reclamation: The Mangroves of Madagascar.* CML, Centre for Environmental Studies, University of Leyden, 24 pp.		Secondary reference, no primary source provided. The "Year" is the publication year.
1990	396 080	**FAO.** 1994. *Study for the determination of the rate of deforestation of the mangrove vegetation in Mozambique.* By Saket, M., Matusse, R. V. Field document MOZ/92/013. FAO, Rome, Italy. 9 pp.	X	Remote sensing. The study also provides the breakdown in provinces.
1990	276 000	**FAO.** 1994. *Study for the determination of the rate of deforestation of the mangrove vegetation in Mozambique.* By Saket, M., Matusse, R. V. Field document MOZ/92/013. FAO, Rome, Italy. 9 pp.		Figure based on information provided by World Conservation Institute – 1990/1991
1992	100 000	**Hughes, R.H. and Hughes, J.S.** 1992. *A Directory of African Wetlands.* IUCN, Gland, Switzerland and Cambridge, UK/UNEP, Nairobi, Kenya/WCMC, Cambridge, UK. 820 pp		Area calculated for each country in this book derived from analysis of maps or remote sensing imageries; no specific scale is given. The "Year" is the publication year.
1993	500 000	**Sam Moyo, Phil O'Keefeand, Michael Sill.** 1993. *The southern African environment.*		Cited in: **FAO.** 1994. *Study for the determination of the rate of deforestation of the mangrove vegetation in Mozambique.* By Saket, M., Matusse, R. V. Field document MOZ/92/013. FAO, Rome, Italy. 9 pp Approximate estimate.
1994	399 000	**Saket, M.** 1994. *Report on the updating of the exploratory national forest inventory.*		Updates the information from 1980. Visual interpretation of LANDSAT TM, with support from aerial images and minor fieldwork
<u>1997</u>	<u>392 749</u>	Zambezia, Sofala, Inhambane, Maputo: **IGNFI-CENACARTA**. 1999. *The Classification System Definition of the Land Cover Types.* Rural Rehabilitation Project. Cabo Delgado, Gaza, Nampula: **FAO.** 1994. *Study for the determination of the rate of deforestation of the mangrove vegetation in Mozambique.* By Saket, M., Matusse, R. V. Field document MOZ/92/013. FAO, Rome, Italy. 9 pp.	X	Combined National Level Mangrove Estimate. The "Year" is the weighted average year. The studies used are based on remote sensing imagery analysis.

Year	Area (ha)	Source	Trend	Methodology/Comments
1999	362 772	**IGNFI-CENACARTA.** 1999. *The Classification System Definition of the Land Cover Types.* Rural Rehabilitation Project		Remote sensing. Three districts are missing.
2003	546 600	**EarthTrends**. 2003. Coastal and Marine Ecosystems—Mozambique. http://earthtrends.wri.org/pdf_library/country_profiles/Coa_cou_508.pdf		Mangrove estimates were calculated by the World Conservation Monitoring Center (WCMC) by compiling many national and regional data showing forest extent. The legends of these maps were harmonized into 15 different tropical and 11 non-tropical forest types for the globe, defined specifically for this study. Full technical notes on-line at http://earthtrends.wri.org/searchable_db/variablenotes_static.cfm?varid=317&theme=1

Mangrove species checklist

Following Tomlinson 1987 classification, mangroves may be divided into three groups according to their features: major elements (strict or true mangroves), minor elements and mangrove associates. Tomlinson list of true mangrove species have been here modified by adding some species commonly found as exclusive mangrove species (Saenger et al. 1983)

In the context of this assessment, only true mangrove species found in the present country will be reported:

Acrostichum aureum
Avicennia marina
Bruguiera gymnorrhiza
Bruguiera cylindrica
Ceriops tagal
Heritiera littoralis
Lumnitzera racemosa
Rhizophora mucronata
Sonneratia alba
Xylocarpus granatum

Trends in mangrove area extent over time
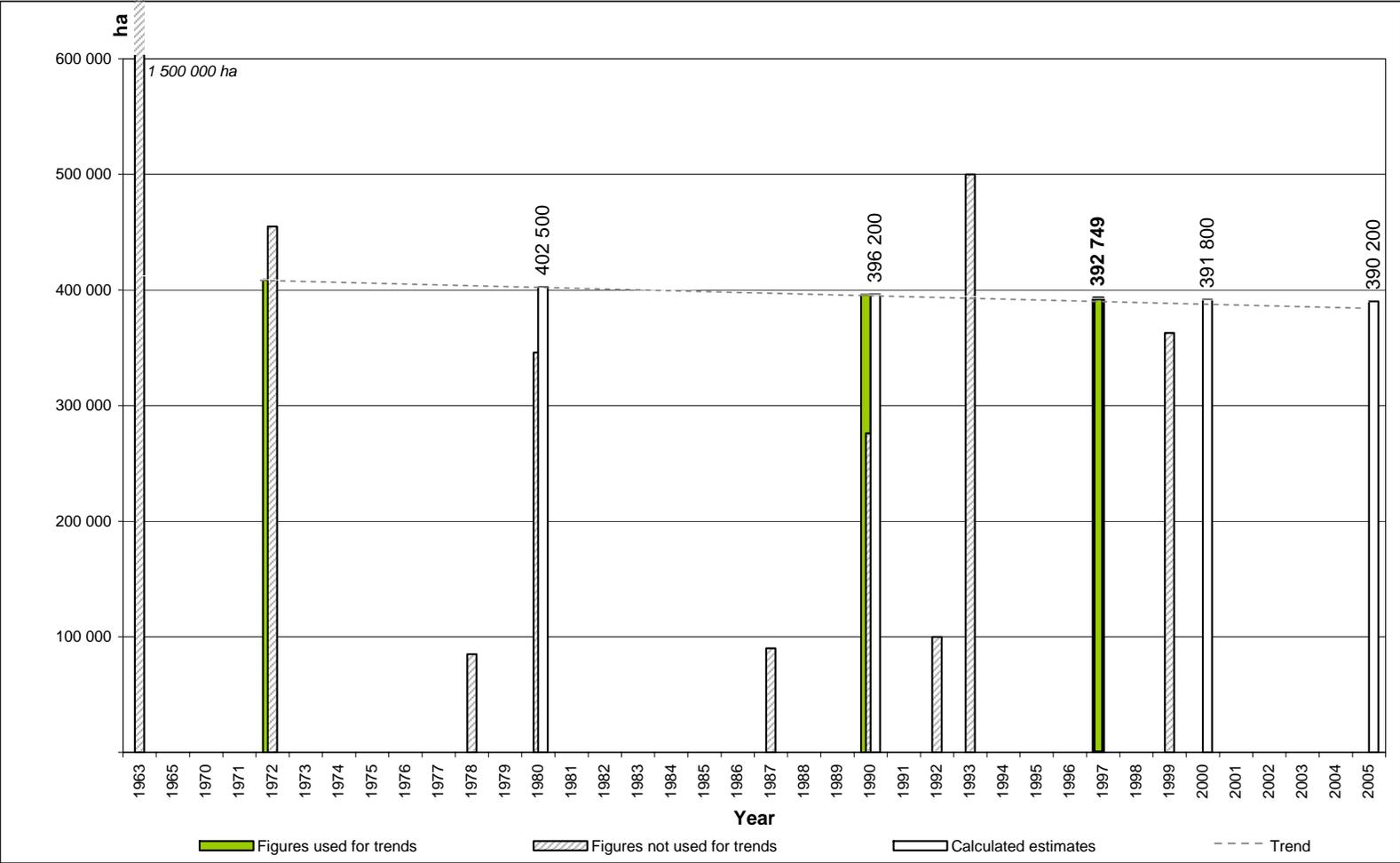
Summary status of mangrove area extent over time

	Most reliable, recent mangrove area estimate		Mangrove area estimate 1980	Mangrove area estimate 1990	Mangrove area estimate 2000	Mangrove area estimate 2005
	ha	year	ha	ha	ha	ha
Mozambique	329 749	1997	402 500	396 200	391 800	390 200

References

FAO. 1995. *Forest Resources assessment 1990: Global synthesis.* FAO Forestry Paper No. 124. Rome, 46pp.

FAO. 2005. *Global Forest Resources Assessment 2005: main report.* FAO Forestry Paper. Rome. *In press*

FAO. 2003. *Status and trends in mangrove area extent worldwide.* By Wilkie, M.L. and Fortuna, S. Forest Resources Assessment Working Paper No. 63. Forest Resources Division. FAO, Rome. *(Unpublished)* http://www.fao.org/documents/

Saenger, P., Hegerl, E.J. & Davie, J.D.S. 1983. *Global status of mangrove ecosystems.* Commission on ecology papers No. 3. Gland, Switzerland, IUCN.

Tomlinson, P.B. 1986. *The botany of mangroves.* Cambridge Tropical Biology Series, Cambridge, 419 pp.

Explanatory notes

Figures used for trends

The estimates used for the trend analysis have been marked with an "X" in the "Trend" column of the national level mangrove estimates table; they have been coloured in green - with no patterns - in the chart.

Most recent reliable figures

The figure chosen as the most recent reliable is underlined in the national level mangrove estimates table; it has been bolded in the chart.

Formulas used for the trend analysis

Polynomial trend line:
$y = b + c_1 x + c_2 x^2 + c_3 x^3 + .. + c_n x^n$ where b and $c_1...c_n$ are constants.