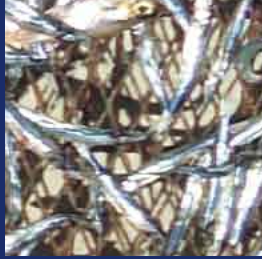




Economic Analysis of Mangrove Forests:

A case study in
Gazi Bay, Kenya



This publication, *Economic Analysis of Mangrove Forests: A case study in Gazi Bay, Kenya* is prepared as part of the efforts of the United Nations Environment Programme of promoting coastal intertidal forests as a significant green economy asset for Kenya which require consideration when calculating national accounts.

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Contributors and Reviewers

Author: Janis Hoberg, Department of Business and Economics, Free University of Berlin, Germany

UNEP Production Team: Mwangi Theuri, Jane Muriithi, Eugene Ochieng

UNEP Reviewers: Pushpam Kumar, Christian Lambrechts, Alberto Pacheco; Nick Bertrand, Derek Eaton, Ashbindu Singh, Johannes Akiwumi, Neeyati Patel

Field data support: Dr. J. G. Kairo (Kenya Marine and Fisheries Research Institute, Mombasa), Caroline Wanjiru (University of Nairobi), A. Hamsa (Gazi Women Boardwalk, Gazi Village)

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A case study in Gazi Bay, Kenya

* Free University of Berlin, Department of Business and Economics



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EXECUTIVE SUMMARY

This study was undertaken as part of UNEP efforts of promoting forests as a significant green economy asset for Kenya. Forests should be taken into account when calculating the national accounts because the global rush for land and the increasing demand for agricultural products and urban infrastructure continue to intensify the pressure on tropical and coastal forests. The fact that forests provide goods and services which currently have no value assigned to in economic markets exacerbates the deforestation and land conversion.

Mangrove forests are among the most productive and valuable ecosystems on earth. However, the economic value of the diverse functions they provide such as shoreline protection, nursery habitats and carbon storage are not accounted for by decision-makers. This study aims to demonstrate the economic value of mangrove forest services in Kenya, using the Gazi Bay mangrove forest ecosystem as an illustration.

The study quantifies the Total Economic Value (TEV) of the Gazi Bay mangrove forest. The variables are divided into direct use, indirect use and non-use value. Direct use values include fishery, timber, eco-tourism, research and education, aquaculture and apiculture. They account for 20 per cent of the TEV. Indirect use values of the mangroves are shoreline protection, carbon sequestration and biodiversity. They represent 25 per cent of the TEV. The existence value, which represents the value of mangroves in an unharmed state, accounts for 55 per cent of the TEV. The analysis results in a TEV of US\$ 1,092 per hectare per year.

To quantify the value of the goods and services, different methods were applied. Most of the direct uses were calculated using the market value of the products. The Damage Costs Avoided Method was used to value the shoreline protection function of the mangroves. Biodiversity and existence value were derived using the Benefit Transfer Method (BT).

It is acknowledged and stressed that this study suffers from research limitations. One reason is the lack of primary data and appropriate peer reviewed studies. Application of the BT should also be considered with caution. It is, however, recognized as one of the most widely used methodologies in the field of environmental valuation and serves as a first approach in determining non-marketable mangrove services. Therefore the results of this analysis should be considered as a first step towards quantifying the value of Kenyan mangrove goods and services.

The results of the analysis are also compared with other economic analyses of mangroves in Africa, although only a few mangrove valuations have been conducted. Recommendations for future research on mangrove valuation are made.



INTRODUCTION

Economic analysis of mangroves in Kenya aims to quantify the value of the mangroves and the goods and services they provide in order to promote their significance in the Kenyan economy. The purpose of the study is to demonstrate to local policy-makers the economic value of mangroves and to take into account their value when making decisions on land uses and when calculating the national accounts. The specific objectives of this study include:

- (a) Quantifying the value of alternative direct mangrove uses for the Kenyan economy;
- (b) Determining the non-marketable services of mangroves; and
- (c) Calculating the existence and biodiversity value of mangroves in their unharmed state.

The world's coastal ecosystems are facing significant pressure. A combination of geographical shifts in human settlements, an exponentially increasing population and climate change are causing considerable changes in land uses. Natural habitats are being converted into agriculture plantations and tourist destinations.

Around 3.2 billion people occupy a coastal strip of 200 kilometers wide, which represents only 10 per cent of the earth's land surface. High urban population growth leads to competition for land in coastal regions. In the past, mangrove forests have been the victim of this competition, leading to significant degradation. According to Giri *et al.* (2010), mangroves globally encompass an area of only 137,760 km². Approximately 75 per cent of mangroves are concentrated in just 15 countries and barely 7 per cent of these lie in protected areas.

The situation in Eastern Africa is of special concern as people migrate from rural areas to the coast in order to benefit from the dynamic growth occurring in those areas. The population of coastal cities in Eastern Africa has grown by around 4 per cent per year (Hinrichsen, 1998). Since mangroves compete with urban development along the Eastern African coast they are threatened with degradation and extinction. As one of the upcoming economies in Africa, Kenya aims at conserving indigenous traditions and values on one hand while keeping up with the rapid social development and economic growth on the other. Kenya's natural resources offer attractive tourists destinations, rich biodiversity and a substantial array of goods and services. However, this natural asset does not play a significant part in Kenya's national accounts.

Mangroves are among the most productive ecosystems on earth, but since a large part of the mangrove services do not have assigned "market prices", the value of this unique ecosystem is generally underestimated. However, mangroves provide a broad array of goods and services to the local community. They play an important role in on- and offshore fishery, providing juvenile fish with nursery habitats and shelter. They are also a source of timber and fuel wood for the adjacent villages. Mangroves feature rich biodiversity; they can store and sequester significant amount of carbon; protect the shoreline from soil erosion and tsunamis and attract funding for research and education.

Recreational activities in mangroves are also part of services. Ecotourism is becoming increasingly important and mangroves offer a clear synopsis of the functions and links between marine ecosystems and therefore attract "green-minded" tourists. Alternative uses include apiculture (beekeeping) and aquaculture (fish breeding ponds). Bees use nectar from the mangrove flowers to produce honey while juvenile fish from the mangroves are used for breeding in commercial fish ponds. These benefits show the high dependence of local communities on mangroves for their well-being.

Major drivers of environmental change which negatively impact on Kenyan mangroves include climate change, population growth, urbanization and pollution of the environment. Climate change leads to a rise in sea-level, which puts significant pressure on mangrove forests from the seaward side. Changes in precipitation patterns, temperature surges and increase in the frequency and intensity of heavy storms and tsunamis exacerbate the situation (see Appendix A). The rapid growth of population and the progress of urbanization causes competition for land since coastal areas are usually densely populated and demand for land conversion into urban infrastructure continues to grow. This goes hand in hand with notable air and water pollution which hampers valuable mangrove functions such as water regulation and leads to loss of biodiversity. Table 1 shows a summary of drivers of change for the Western Indian Ocean region.

Table 1: Summary of the drivers of change in the Western Indian Ocean (WIO)

Direct drivers	Indirect drivers
LOCAL	LOCAL
Changes in land uses & cover	Poverty
Species introductions	Community health
Habitat degradation	
Overfishing	
Pollution	
Agricultural practices	
Erosion	
NATIONAL	NATIONAL
Natural disasters	National policies
Migration	Legislation
Industrial development	Tourism development
Water quality	Education
Catchment management	Migration
	Industrial development
GLOBAL	GLOBAL
Climate change	Globalization
	Economics

Source: UNEP (2009)



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