

# 3 Mangroves

*If someone plants a tree he or she will be rewarded with the same amount of fruit which is produced by that tree. (Musnad Ahmad)*

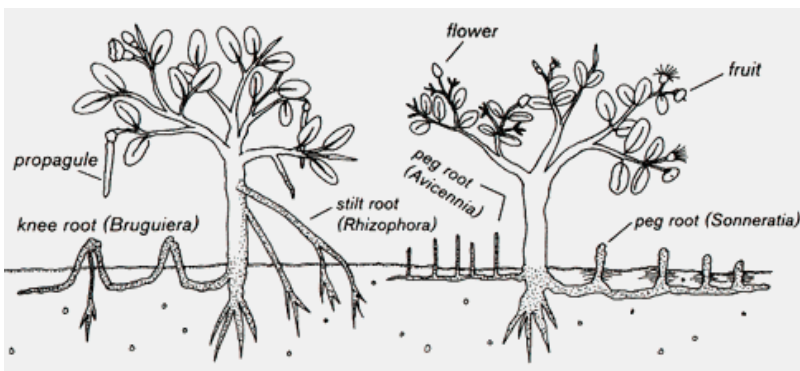
## What are mangroves?

Mangroves are forests (and the trees that form them) found along coastlines in the tropics and subtropics, that are able to grow in the salty, very wet soil of the intertidal zone, where they can survive being partly covered by the sea twice a day at high tide. Mangroves also need some fresh water, so they grow best in sheltered estuaries, **lagoons**, **bays**, and **inlets**, where fresh and salt water mix. In the right conditions, mangrove forests can extend many kilometres inland, and some **species** of mangrove tree can grow up to 40 metres tall.

## What is special about mangroves?

Most plants can't live in the intertidal zone, but mangroves have adapted special features to enable them to **flourish** in this challenging **habitat**. Because the water level changes by several metres with the **tides**, **salinity** levels and availability of oxygen change all the time. In addition, the variable amount of freshwater in the mangrove's favoured **habitats** – **tidal lagoons** which become diluted when it rains heavily, and concentrated during hot, dry spells – make living there impossible for less specialised plants, because fluctuating conditions are particularly difficult to adapt to.

High levels of salt are usually poisonous to plants, but mangroves **cope** with high **salinity** in the soil and water in three main ways. Firstly, they have special cells in their roots and trunk that minimise the entry of salt. Mangrove trees can also **excrete** salt through their leaf pores. Finally, they store excess salt in special sacrificial leaves. The tree then sheds these yellow leaves, which you may have noticed on mangrove trees in Zanzibar. Mangrove leaves are thick and **waxy**, with hairs on the underside, and these **adaptations** all help the tree conserve fresh water.



Some types of mangrove aerial roots (**pneumatophores**)

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Different **species** of mangrove tree are adapted in different ways, and so they survive better in different conditions according to the amount of time their roots and trunks are covered by the sea on each tide or according to the amount of freshwater in their environment. As a result, if you walk through a mangrove from dry land to the **seaward** edge, you will see distinct zones where different mangrove **species** dominate.

Mangroves have other special **adaptations** too. Some mangrove **species** develop specialised seeds called **propagules**. These large green seeds vary in length from 10 – 40 cm. The seeds germinate into baby trees while still hanging on the tree, and then these seedlings drop into the mud or sea below and start growing straight away! **Propagules** can survive many months and travel long distances floating in the sea before settling on a suitable soil surface and growing roots.

Plant roots need air, so how do mangroves **cope** in the wet mud they grow in? Well, many mangrove **species** have special roots that grow in the air (called aerial roots, or **pneumatophores**) which rise above the mud, so they can absorb oxygen from the air. There are three types of aerial root: knee, stilt and peg. These specialised roots also help support the tree in the unstable soft, mud.



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Mangrove **propagule**  
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## Mangroves in Zanzibar

Zanzibar has about 18,000 hectares of mangrove forest: 6,000 ha on Unguja Island and 12,000 ha on Pemba Island. The largest mangrove stands on Unguja Island are found in Chwaka Bay, and on Pemba Island at Ngezi / Micheweni. Ten species of mangrove grow in Zanzibar, but red mangrove (*Rhizophora mucronata*), black mangrove (*Bruguiera gymnorrhiza*) and mangrove apple (*Sonneratia alba*) are the most common.

## Why are mangroves important?

Mangroves play a number of vital natural roles in coastal systems throughout the tropics, including Zanzibar. Globally, mangroves are valued at US\$ 200 - 900 per hectare for their natural services. Zanzibaris, especially those in coastal communities, have a very close relationship and dependency on mangroves for livelihoods and food.

**Protecting the land** – Mangroves create a natural barrier between land and sea. From the sea, they protect the shore from erosion and storm damage. They absorb energy from wind and waves, and reduce the impact of storms, cyclones and tsunamis. For example, after the 2004 Indian Ocean tsunami, there were fewer deaths and less damage to property in areas with healthy mangroves than in areas where mangrove had been destroyed. Some areas are protected by artificial barriers, however mangrove will recover on its own, and be beautiful, whereas man-made barriers are expensive to build and repair so are not as effective (or nice to look at).

**Protecting the sea** – Water flowing from land to the sea slows down when it reaches the mangrove. The sediment settles out. Without mangroves the sediments can smother corals and seagrass beds and make the water too cloudy so light can't reach the plants growing on the bottom. Along with the sediment that mangroves lay down and secure, any pollutants, such as sewage, carried in water runoff from the land will also settle out in mangrove mud instead of washing onto more sensitive seagrass and corals. The pollutants are not good for the mangrove, but mangroves can tolerate them better than other marine habitats such as seagrass beds and coral reefs.

**Biodiversity and fisheries** – The complex physical structure of mangrove roots, trunks, leaves and branches provides many places for animals and plants to live. They therefore support a high diversity of marine and terrestrial life. The fishing industry of Zanzibar depends on mangroves. One of mangroves' key services is to provide breeding, nursery and feeding habitat for fish and shellfish, which also find shelter from predators among the roots. This includes many commercially important species. Prawns, lobsters and mud-crabs spend their whole lives in mangrove, while young snappers and other commercially important fishes spend their first few months in this habitat before migrating to seagrass and coral reefs nearby as they mature. Reefs and seagrass beds near mangrove consequently yield higher fish catches than those without mangroves nearby. Mangroves also provide habitat for mammals such as the endemic red Colobus monkey, snakes, lizards and many birds, as well as sponges, worms and insects. These make mangroves a very attractive habitat for people interested in wildlife.

**Climate Change** – Like all plants, mangroves absorb carbon dioxide for photosynthesis, and turn it into carbohydrates which are stored in the wood (of course, if we cut the mangrove and burn it, the carbon dioxide is released into the atmosphere again). Replanting and restoring mangroves therefore helps reduce greenhouse gas emissions – but cutting them contributes to climate

## Ulikua unajua...?

- All mangrove in Zanzibar is designated forest reserve!
- Red mangrove propagules can survive floating in the sea for up to a year until they wash up in a suitable place to grow!
- It isn't only people who find it hard to climb through the roots of a mangrove forest – predators do too! So mangrove roots provide a very important refuge for fish, crabs, prawns, and other marine animals to hide from underwater predators, while many birds nest in mangrove trees out of the reach of land predators.



Mangrove roots provide a refuge from predators for small fish  
© Wikimedia commons

change. Mangroves themselves are **resilient** to climate change, and by protecting against threats such as erosion, healthy mangroves will help Zanzibar combat the impacts of climate change such as sea level rise and more frequent **storms**.

**Direct uses** – We use mangrove products for many things, such as fuel wood and charcoal for cooking. Our homes are built using mangrove poles and with lime made using charcoal. Mangrove timbers make strong boats, and fishing traps and seaweed farms also use mangrove poles. Mangroves are also used for **tanning** leather and making dyes – this used to be a very major industry; fewer people are involved now, but it is still carried out on a small scale. The fruits of the cannonball mangrove (*Xylocarpus granatum* / mkomafi) are used as a traditional medicine to treat rashes and stomach pain.

#### Tembea ujione!

- Visit your local mangroves
- Jozani-Chwaka Bay Conservation Project on Unguja Island
- Michewni on Pemba Island

### What are the threats to Mangroves in Zanzibar?

**Deforestation** – Most loss of mangrove is deforestation due to unsustainable cutting of timber for construction of boats (dhows, masts, boats, paddles), buildings (roof poles, **scaffolding**, window and door frames), fishing traps and floats, and for firewood and charcoal. These traditional activities are threatening the survival of mangroves because coastal populations have increased, and demand for mangrove timber products has never been higher. The quality of timber remaining has declined to the extent that the construction poles available here are not good quality so many people now buy imported timber from the mainland.

**Beach creation** – Hotel developers want to provide tourists with white sandy beaches for which Zanzibar is famous. To create beaches, some people therefore cut down mangroves – which were protecting their property from erosion. After a few big **storms**, without the protection of the trees, the sand washes away, smothering nearby seagrass and coral, and leaving the property and buildings unprotected from the waves.

**Fisheries and aquaculture** – Mangrove poles are used in dema fish traps and seaweed farming. In some areas, people cut down mangrove to make space for ponds to raise fish and shellfish.

**Pollution** – Oil **spills** are very dangerous to mangroves, because the oil coats the aerial roots and suffocates the trees because they can't get oxygen from the air. Other kinds of pollution are not as threatening to mangrove trees as to other marine ecosystems because mangrove trees themselves can survive exposure to polluting chemicals and some levels of sewage. However the diverse wildlife they support, including fish and shellfish that we eat, is still seriously affected. Furthermore, fish and shellfish collected from polluted mangroves are dangerous for us to eat.

**Salt making** – producing salt damages mangrove in two ways. Some people boil salt water over mangrove-charcoal fires, which takes 7 kg wood to make 1 kg salt. The other way is to make a large flat pool in the mangrove in which salt water flows in and evaporates, by **chopping** down the trees.

**Land reclamation** – in some areas mangroves are filled in with soil, then deforested, to turn intertidal land into freshwater land for agriculture. But this land is poor quality as the soil is salty.

**Population pressure** – the population of Zanzibar is increasing rapidly, largely driven by the **boom** in the tourism industry. This means that demand for natural resources such as mangrove is increasing. Extraction has now increased beyond sustainability or replacement levels, and so mangrove forests are shrinking rapidly: in the past 50 years one third of Zanzibar's mangrove has been lost.

### How can we protect mangroves?

Communities use local mangroves for many things. Some of these uses are very long-standing traditions and are sustainable uses of the **habitat**. Others, unfortunately, are either new or increasing uses and are causing serious problems to this important ecosystem.

**Alternative livelihoods** – we do not need to destroy mangroves to benefit from them economically. Some non-destructive mangrove-friendly livelihood options follow.

**Ecotourism** – Mangroves and the diversity they support are beautiful and attract tourists interested in wildlife. For example, at the Jozani-Chwaka Bay Conservation Area, they have built a walkway through the mangrove enabling guests to walk through the forest and see the trees, birds, crabs and other creatures living there.

**Mud-crab fattening** – Provided mangrove is not cut down, small cages can be built to protect juvenile mud-crabs from predators, and enable them to grow quickly to marketable size. Other kinds of fish and shellfish aquaculture are also able to provide sustainable income.

**Mangrove nurseries** – Mangrove seedlings cost little, and we can take surplus seedlings from healthy mangroves to replant and restore mangroves in other areas.

**Bee keeping** – Honey made from mangrove flowers commands high value in local and tourist markets. Bees are very important pollinators, so keeping bees is great for biodiversity too.

**Bio-briquettes** – Bio-briquette making is a sustainable technology that can be used as an alternative source of energy for cooking instead of charcoal or wood. It uses non-woody agricultural waste: dry leaves and other waste vegetation such as coconut husks. Bio-briquettes can be used for cooking by the community that makes them and also be sold to neighbouring communities, providing an alternative sustainable income.



Young mangrove trees replanted in Nyamanzi © Nell Hamilton

**Sustainable forestry** – Using timber from mangroves can certainly continue, but in order to preserve the industry, it is crucial that it be managed sustainably. Some healthy trees of the commercially important species must be left healthy to act as ‘mothers’ providing seedlings for repopulating harvested areas. In Chwaka Bay, this is already occurring. However it is unlikely that the mangroves on Zanzibar can continue to supply all the timber needs of the archipelago without significant mangrove restoration, so alternative sustainable building materials should be sought where possible, or timber should be bought only from well-managed forests which replant new seedlings for every tree cut. Rotation is important on a 10 year cycle. *Rhizophora mucronata* is a preferred species for restoration as it is a good habitat builder and grows quickly. Cut areas need time to recover before being recut. Stronger enforcement of legislation designed to prevent illegal cutting of mangrove, and greater involvement of communities in developing sustainable forest management programmes, would be the most effective strategies to protect our mangroves.

### Kitunze kidumu!

- Dispose of rubbish in proper places, not into the sea or mangrove areas.
- Avoid buying lime which was made using mangrove as firewood.
- If available, use alternative fuels such as driftwood, dead or fallen wood, bio-briquettes and solar cookers instead of mangrove wood and charcoal.
- Report illegal mangrove cutting to the authorities.
- Set up a mangrove nursery in your community, or volunteer for a local programme to replant mangrove seedlings.
- Urge local and international NGOs and relevant government departments for greater protection of your mangroves through community-based mangrove management, to promote mangrove-friendly alternative incomes for people dependent on mangrove cutting for their livelihoods, and to pilot briquette making and efficient burners in your community.
- Let family and friends in your community know how important mangroves are.
- Work together with community to protect local mangroves by stopping damaging activities e.g., start or join community-led initiatives to patrol and protect the local mangroves.