Epilogue: Coastal Environmental Conservation and Regional Development

In the past five issues we have discussed the importance of mangrove ecosystems and AAI's activities to conserve them. In case of the mangrove species *Avicennia marina* found in the area stretching from India to East Africa, as a timber resource the stems are used as raw material for dhow boats and other constructions, and the leaves as medicines and forage for livestock. As a forest resource it plays an important role not only for the nurturing of marine (aquatic) resources but also for the conservation of the coastal environment and landscape. However, in Oman the mangrove forests have been destroyed by excessive logging and over-grazing in the past years, and today the government is making an effort to draw up an appropriate plan of mangrove restoration, conservation and management. In other countries also the mangrove forests have been shrinking, and the establishment of a management plan for sustainable use of mangrove forests is given a priority.

From the view point of the global environment, the mangrove ecosystem, which is the only ecosystem capable of existing in low brackish tidal wetlands, plays an important role in storing carbon dioxide and conserving valuable biodiversity. Forests play a big role in the global carbon cycle by storing carbon dioxide in the air. Especially in wetland vegetation carbon dioxide gets trapped more in the soil than in the plants themselves. In some parts of mangrove forests an underground peat layer is formed beneath the trees, indicating that the forests are actively trapping carbon dioxide. On the other hand, the sea level rise due to the climate change (global warming) has a big impact on mangrove forests standing between the sea and the land. It can be said that mangrove forests exist in a delicate balance of various environmental changes. Plants, small animals such as fish and insects, as well as larger animals form a food chain completed within a mangrove ecosystem. As a home to a variety of species of fauna and flora, the mangrove ecosystem plays a very important role for biodiversity conservation.

Therefore, mangroves not only support the livelihoods of local people, but also they are important for the global environment. However, in many places mangroves forests are being lost rapidly due to development and other human activities, leading to drastic changes of the coastal environment. Today many countries are trying to restore the lost mangrove forests. What is important here is not only to plant mangroves in order to physically restore them, but also to try to restore the entire natural ecosystem with the plantation activities as just the beginning. For this purpose, it is necessary to study in details the complex ecosystem of the local mangrove forests as well as their relationship with people, so that more effective ways of plantation may be elaborated. Whatever small restoration we may be able to achieve to start with, it will be helped by the power of nature to grow bigger. We do not have to aim at restoring everything by ourselves: we just have to help facilitate the natural restoration process.

Public participation on the part of local people is very important for this sort of activity. As reported in Part 3 of this series, in Oman the plantation is being carried out in collaboration with local people. Some time after planting seedlings, seaweed that got tangled around them need to be removed. Local school children take part in this work, and through this they physically feel the growth of mangroves. After a year from planting seedlings, aerial roots start to grow. Then shellfish appear around them, followed by crabs and small fish. This is an indication that the ecosystem has started functioning, and the plantation ground becomes a wonderful school of environmental education for children. The government of Oman has an idea of establishing a mangrove information centre in the capital Muscat, in order to monitor the process of mangrove restoration as well as raise public awareness on the importance of mangrove forests. Such an information centre may allow more researches on mangrove ecosystems and may provide potential regional development projects including tourism and ecotourism activities. In Zanzibar, walkways through the existing mangrove forest are being built with help from local people to allow close observation of the forest. We hope that the information centre in Oman will exchange information with other countries regarding such existing initiatives, and eventually play a central role in mangrove conservation activities in the range countries all the way from India to East Africa.

Removing seaweed from mangrove seedlings

Observation walkway in the mangrove forest in Zanzibar