# Research at the Botanics

A new study documents waves of forest degradation advancing 120 km across East Africa in just 14 years. Scientists from 12 organisations in Europe, Africa and the USA showed that forest exploitation started with the removal of the most valuable products first, such as timber for export, followed by the extraction of less valuable products such as low value timber and charcoal in strict sequence. This ‘logging down the profit margin’ in tropical forests follows the same pattern of removal seen for fish in unmanaged oceans.

The study published in Proceedings of the National Academy of Sciences USA tested an economic model that predicts the sequential removal of products from high-to-low value. Researchers visited forests at varying distances up to 220 km from Tanzania’s largest city, Dar es Salaam, in 1991 and again in 2005, tracking the trees that remained. They found that waves of degradation moved, on average, 9 km a year out from the city. For example, charcoal extraction extended 50 km from Dar es Salaam in 1991, but in 2005 it was found up to 170 km from the city.

In 2005, on average, forests had 48 tree species per sample and stored 46 tonnes of carbon per hectare at 200 km distance, but this had declined to only 14 species and 5 tonnes of carbon in the forests closest to the African city.

Dr Antje Ahrends, Royal Botanic Garden Edinburgh and lead author of the paper said, “The degradation waves have spread rapidly. Urban migration and rising demand for timber, particularly in China, are amongst the major reasons for this. By the end of the study, high value timber logging production took place over 200 km from the city. This is very likely to be unsustainable.”

The ability to predict forest degradation is essential if new plans to protect forests using payments for ecosystem services are to be successful. Such schemes, like the proposed ‘Reducing Emissions from Deforestation and forest Degradation’ (REDD) being negotiated under the UN Framework Convention on Climate Change, may channel billions of dollars into conservation and poverty alleviation if these instruments can be shown to verifiably reduce carbon dioxide emissions from deforestation and degradation.

Co-author on the study, Professor Neil Burgess, University of Copenhagen and WWF, said “REDD would create incentives for developing countries to conserve tropical forests and to adopt low-emission strategies for sustainable development. REDD could rapidly cut carbon dioxide emissions from deforestation and degradation, which are currently responsible for 15% of total emissions from human activity”.

Much logging in Tanzania is illegal resulting in major financial losses. A trade survey by TRAFFIC estimated that in 2005 some 96 per cent of harvested timber was exported illegally, losing the Tanzanian government an estimated US $58 million of revenue. Charcoal burning is similarly mostly illegal, but carried out by local people
who have no alternative means of income, and is used in towns by poor people to cook their food. Policy interventions therefore need careful tailoring to the type of degradation activity, and care needs to be taken to provide alternative income sources and prevent increasing levels of poverty in an already poor country.

Co-author Dr Simon Lewis, University of Leeds, added, “This study highlights the value of strong interdisciplinary research coupled with large-scale and long-term datasets. Both are needed if scientists are to provide the knowledge to assist managing the natural world sustainably whilst

benefiting local people.”