VALUING THE ARC

Linking Science with Stakeholders to sustain Natural Capital

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Ecosystem Services and 'Natural Capital'

Readers of the Arc Journal will know that the Eastern Arc Mountains and the coastal forest region of Tanzania together represent a globally important biodiversity hotspot. In addition, this region is economically significant, both for the natural products provided to the wider economy of Tanzania but also as the primary resource for local people living around the forests. Previously the Arc Journal has outlined how critical the Eastern Arc Mountains are in the provision of water to hydroelectrical power generation plants, and also as drinking water to the coastal cities of eastern Tanzania. Aside from this essential resource provision to the citizens of Tanzania there is growing global concern about the impacts of forest removal on speeding up climate change and the importance of the carbon that is stored in natural vegetation, especially trees. Cutting trees removes this storage capacity as well as eventually releasing Carbon to the atmosphere in the form of CO_2 – a gas which is one of the major causes of global warming.

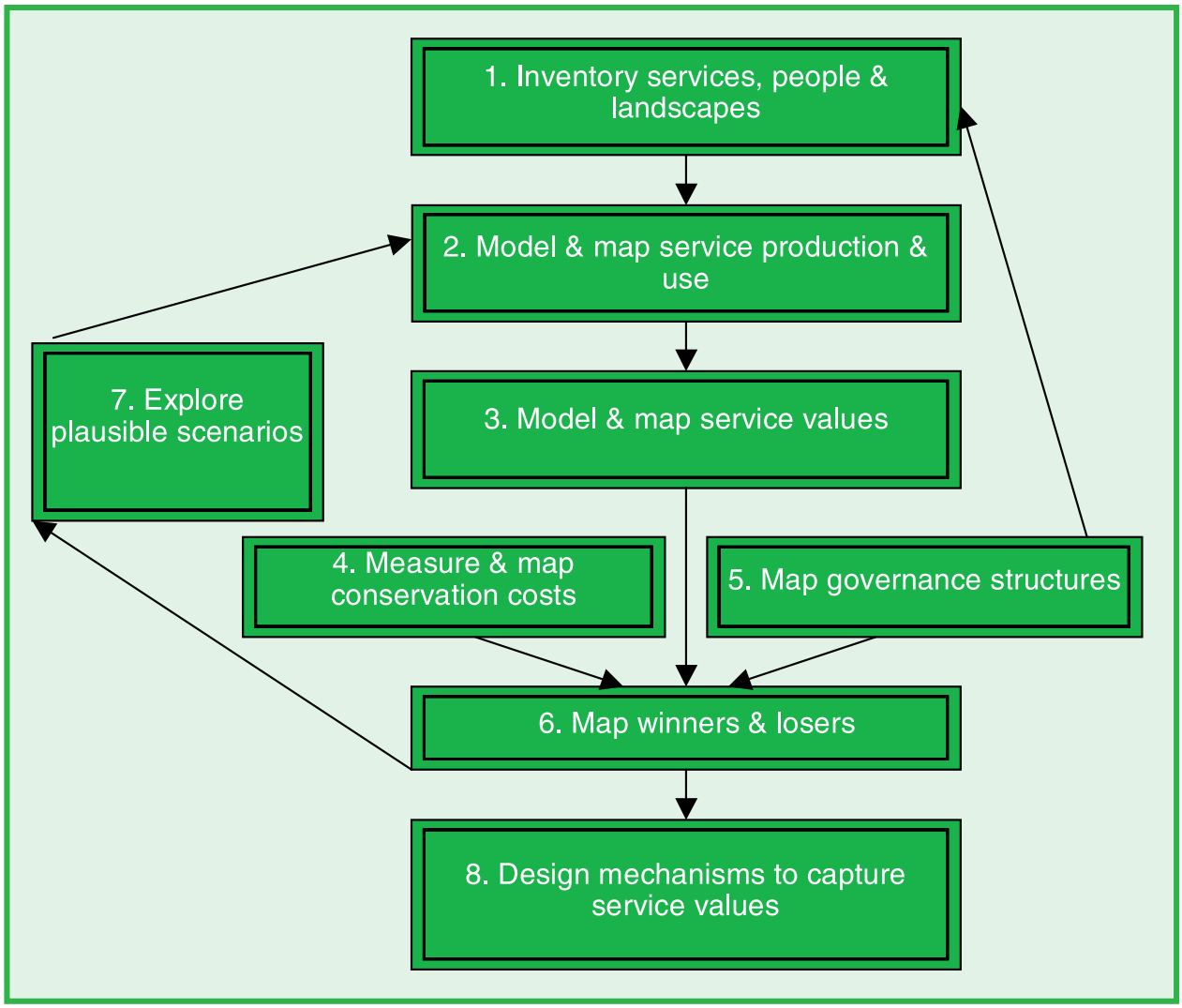
Collectively – issues such as the storage of carbon in trees, the regulation of water supplies, provision of non-timber forest products to local people, and the ecotourism opportunities provided by rare and endemic animals and plants – are known as 'ecological services'. These services are provided for free by natural habitats, but are then turned into economic values by people. The economic values of these services are commonly known as 'natural capital' which can be stored, or is often used by people to generate other forms of capital, such as buildings or money.

A major project of the United Nations, termed the "Millennium Ecosystem Assessment' (www.millenniumassessment.org) described in detail these ecosystem services and what they contributed to human wellbeing and the conservation of natural habitat. This groundbreaking work changed the way that many conservation and human development agencies saw their work, and made it evident that human development in many countries is dependent of natural resources and the services that nature provides freely for human use.

The Valuing the Arc Programme

The Valuing the Arc Programme was established as a collaboration between UK and Tanzanian Universities and the WWF network in the form of WWF USA and WWF Tanzania. The aim of the Valuing the Arc programme is to map ecosystem services derived from the Eastern Arc Mountains and surrounding areas, work out where these services are used, and to place a value on the service to Tanzania, and in some cases to people living far away from Tanzania. The project has started by mapping and valuing present service provision in Tanzania today, but critically, we are seeking to make predictions of future service flows under two plausible development futures; one a hopeful future where Tanzanian development policies are working, and another where life continues on its current path (the 'business as usual scenario').

Figure 1 - Conceptual model that explains the process that the Valuing the Arc programme is following within the Eastern Arc region of Tanzania



Valuing the Arc is working on the following ecological services: a) carbon storage in natural habitats of eastern Tanzania, b) water provision within river basins draining the Eastern Arc Mountains, c) the provision of timber and non-timber forest products from natural habitats, d) ecotourism opportunities provided by mountains and their forests, e) pollination of crops by wild bees and other insects living in natural habitats. At the same time the programme is also mapping biodiversity priorities across the region, based on a compilation of existing data, and is trying to look at the economic values of the ecological services and the costs of conservation. More detail is provided on www.valuingthearc.org.

Progress so far

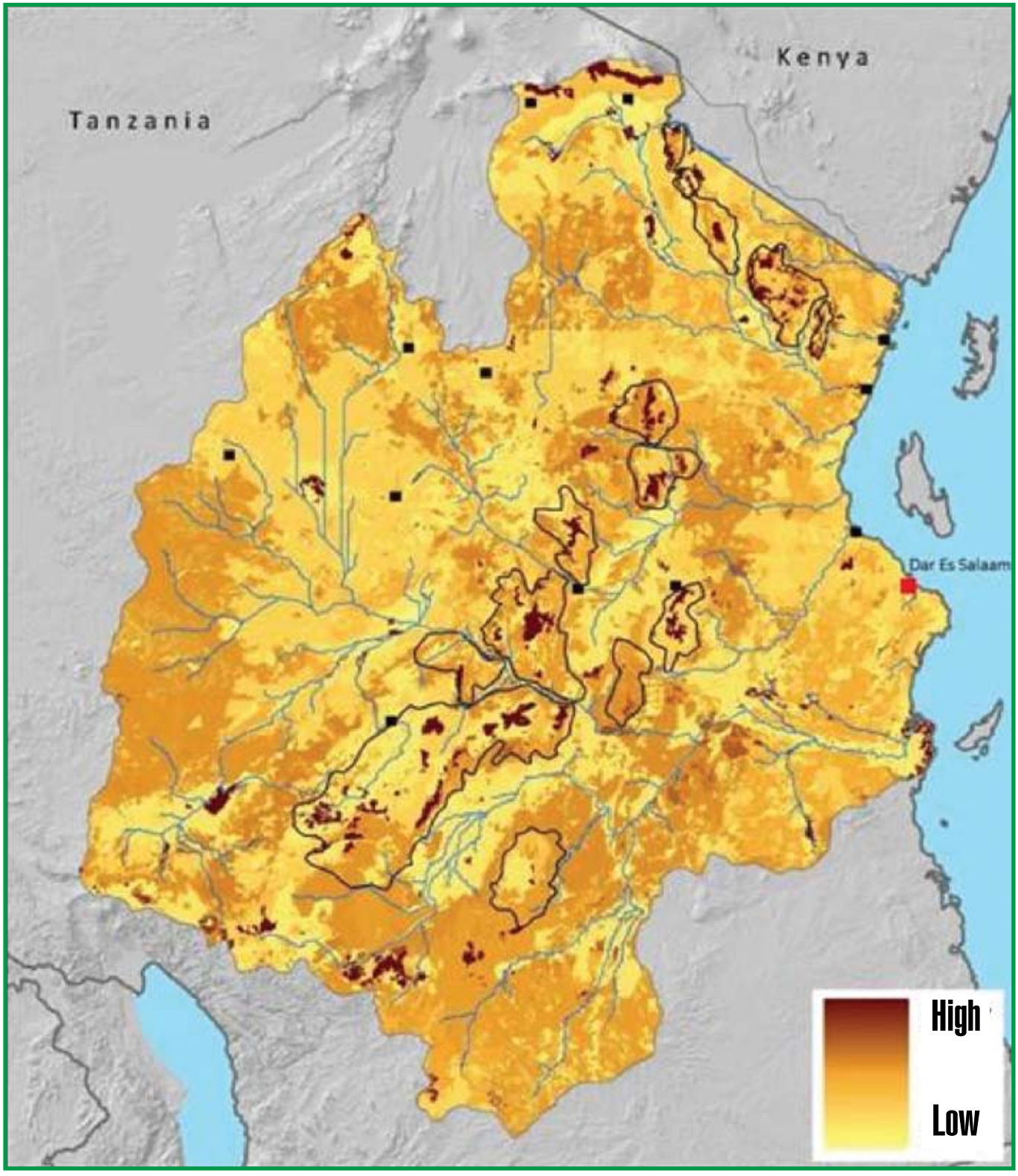
The Valuing the Arc programme lasts for 5 years, and has been working in Tanzania since January 2007. Over the first two years the programme has developed collaborations among institutions in Tanzania, the UK and the USA. Three PhD and Seven Masters students, supported by 20 professional scientists are now working on the programme. Linkage to the policy process in Tanzania and globally is provided by the WWF network, particularly in Tanzania through the Policy Programme of the WWF Tanzania Office.

Over the past year the collaborations have started to produce some important results that are relevant to conservation in the Eastern Arc and Coastal Forests regions of Tanzania. Some of the questions we are using these results to address are outlined below.

How much carbon is stored in eastern Tanzania? We have used maps of land cover and data on carbon storage in vegetation and below ground, to develop simple tables and maps (see Figure 2) of the amount of carbon stored in eastern Tanzania. These preliminary data suggest that lowland swamps and mangroves contain the highest

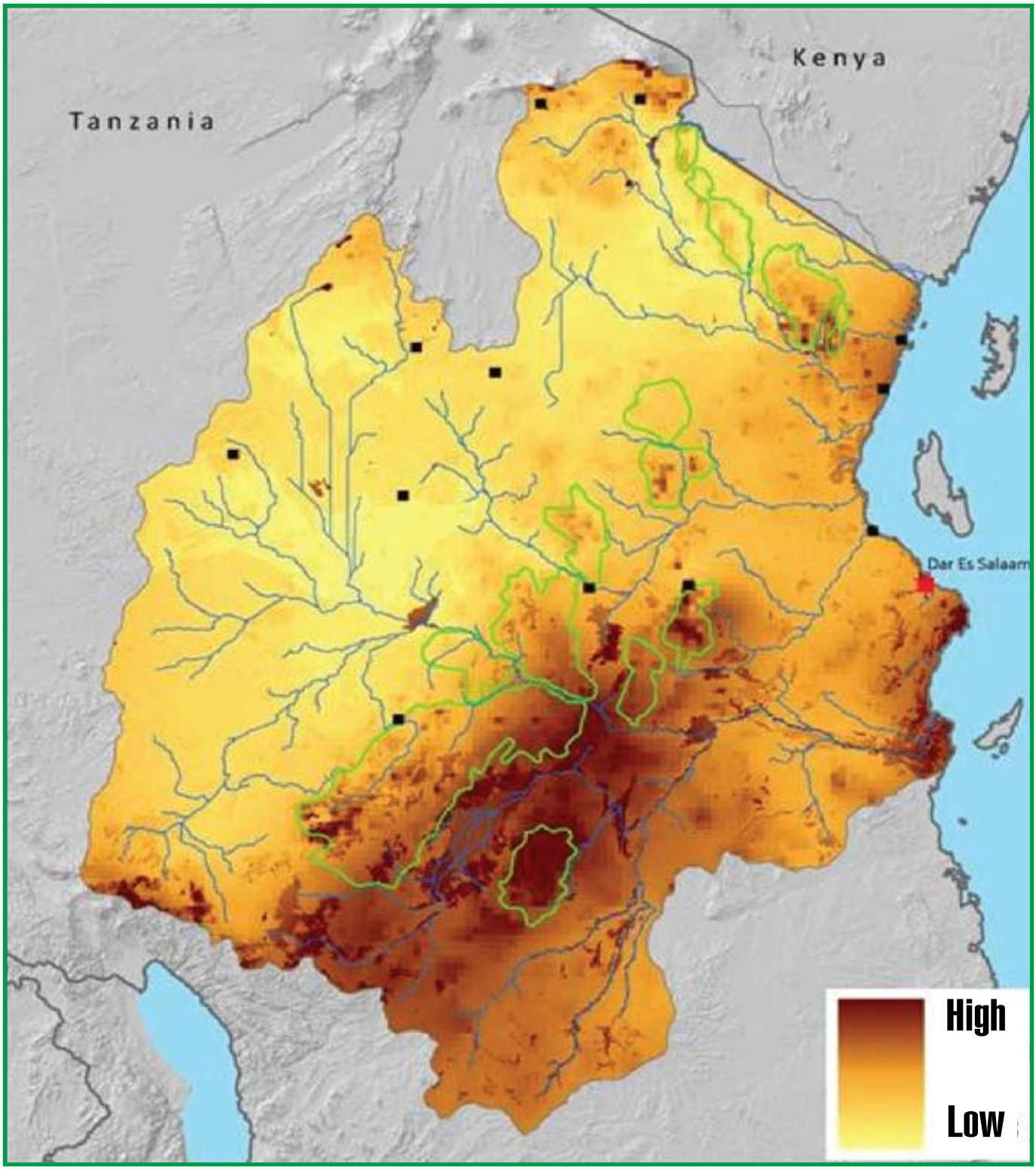
density of stored carbon (over 600 tons carbon per hectare, in the soil), followed by forest habitats in the Eastern Arc Mountains (up to around 300 tons carbon per hectare, mainly above ground). Looking at the protected area network it appears that around 35% of the carbon is within protected areas, with the highest density found in Forest Reserves and Nature Reserves managed by the Forestry and Beekeeping Division. The largest unprotected carbon stores are found in wetlands, and in unprotected forest habitats, mainly on the Eastern Arc Mountains.

Figure 2 – Map of carbon storage in eastern Tanzania. The darker the brown colour of an area the greater the amount of stored carbon. Outlines of the main Eastern Arc Mountains are also shown, extending from the North and South Pare Mountains in the North west, to the Udzungwa and Mahenge Mountains in the south.



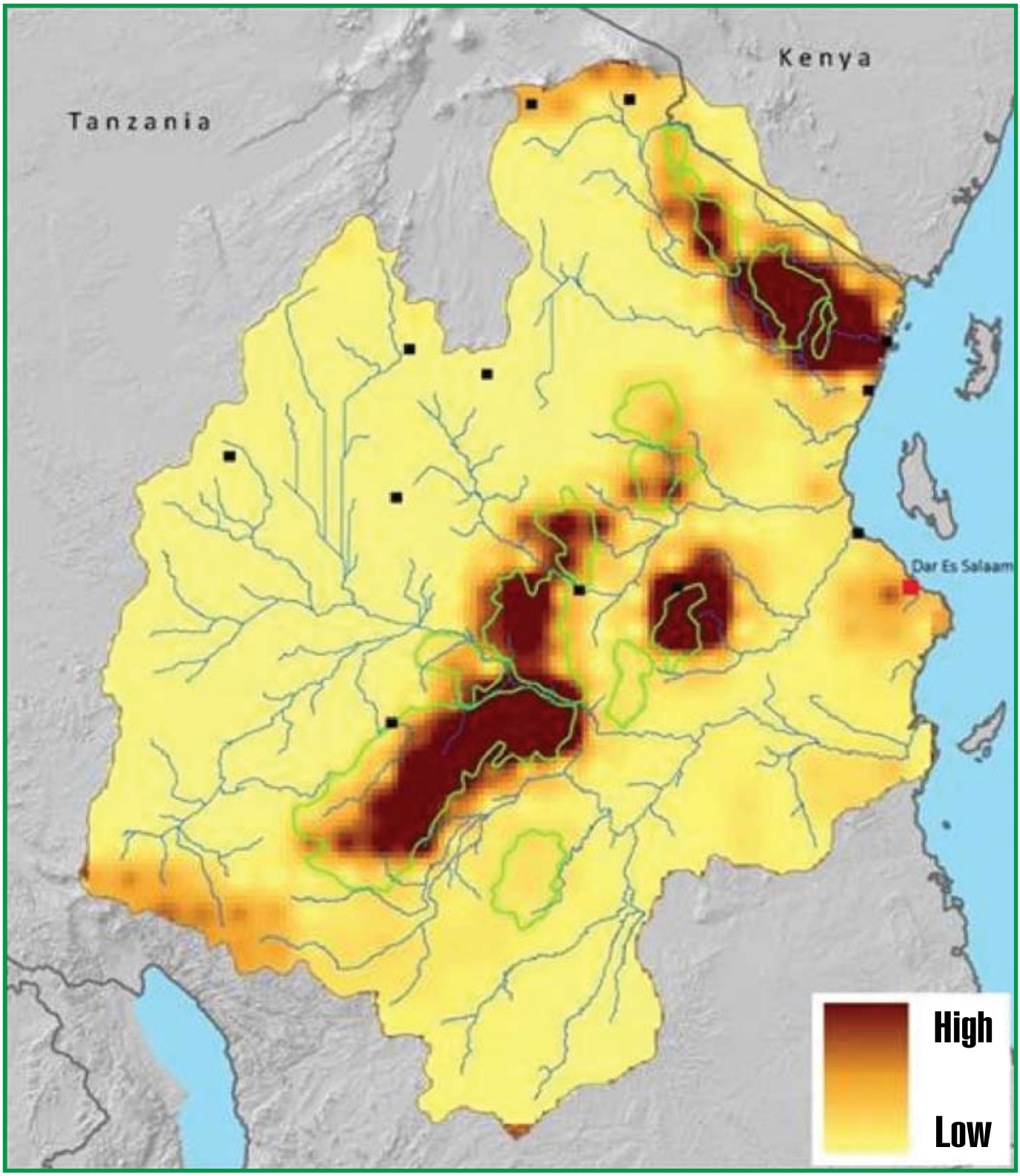
Where are the most important areas for water supply? Our initial maps of water runoff indicate that there are three different types of landscape important for water provision (Figure 3). The first and most important areas are the large wetlands – for example the Kilombero Valley to the south of the Udzungwa Mountains, the Mkata wetlands to the north of the Mikumi National Park – which are seasonally inundated swamp areas. Secondly the Eastern Arc Mountain peaks are also significant sources of water, especially those peaks closest to the Indian Ocean – such as the Ulugurus, East Usambara and Udzungwa ranges; thirdly the coastal area adjacent to the Indian Ocean is also highlighted as an area of water provision. Inland of the Eastern Arc Mountain range the water yield is particularly low and these areas experience water shortages for large parts of the year.

Figure 3 – Map of water yield in Eastern Tanzania. The darker the brown colour the higher the annual yield of water from that area. Eastern Arc Mountain blocks are marked in green outlines.



How do priorities for ecosystem services map onto priorities for biodiversity conservation? An initial map of the biological importance of eastern Tanzania has been developed using maps of the distribution of forest birds across the country (Figure 4). This map shows the high importance of the Eastern Arc Mountains in terms of forest birds. An initial analysis shows that these priority areas for forest birds fall in the same mountains that contain high carbon value forests and areas that are important for water runoff, and the Valuing the Arc Programme will be further investigating these correlations in coming years.

Figure 4 – Important areas for forest birds. Darker brown areas have the highest concentrations of forest birds. Outlines of the Eastern Arc Mountain blocks are shown in green. The underlying bird distribution data was provided by Jon Fjeldså in Denmark.



How can we make these results useful to support the policy process in Tanzania? We believe that our results are already useful to the Tanzanian policy process, in particular to the emergence of large internationally funded collaborations that are looking at Reducing Carbon Dioxide emissions from deforestation and degradation of forest habitats. A decision at the thirteenth meeting of the United Nations Framework Convention on Climate Change (UNFCCC) in Bali in 2006, made it clear that forest carbon would be included in the re-negotiation of the Kyoto protocol. This decision recognised that 20% of global CO_2 emissions came from forest destruction and degradation, and that paying to keep forests standing might be one of the cheapest ways to reduce CO_2 increase in the atmosphere and hence slow global warming.

The proposed mechanism to assist the reduction of CO_2 emissions from forests is titled 'Reduced Emissions from Deforestation and Degradation'. The final steps in the re-negotiation of the Kyoto climate agreement will take place at the Copenhagen climate change conference in 2009. Tanzania is one of the countries selected to pilot potential REDD mechanisms, even before the Copenhagen agreement is finalized. For example, the Norwegian government has approved a 100 million US$ grant for the implementation of REDD in Tanzania. There is also considerable interest from other nations, the United Nations and the World Bank

Plans for the coming years. The Valuing the Arc programme aims to complete its mapping of ecosystem services in the Eastern Arc Region by the end of 2009. At the same time as mapping the distribution and flow of services, there will be an analysis of the values of the various services. This provisional analysis will be refined in 2010, leading to the main outputs by 2011. All the work is being done as a collaboration between UK and Tanzanian Universities, and the WWF network. It is hoped that this work will provide guidance for policy development in Tanzania and be an example of the kinds of work that might be possible, and useful, in other countries.