



The Arc Journal

Tanzania Forest Conservation Group

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STATE OF THE ARC IN 2005

Special Issue on Eastern Arc Mountains Monitoring Baselines

This special issue of the Arc Journal provides summaries of a series of baseline studies on the Eastern Arc Mountain forests produced in 2004 and 2005. They include information about the state of the forests, the rivers and the biodiversity; the pressure that the forests are experiencing from human disturbance; and the responses that the Government of Tanzania, civil society organizations and others are making to address the problems experienced in the forests.

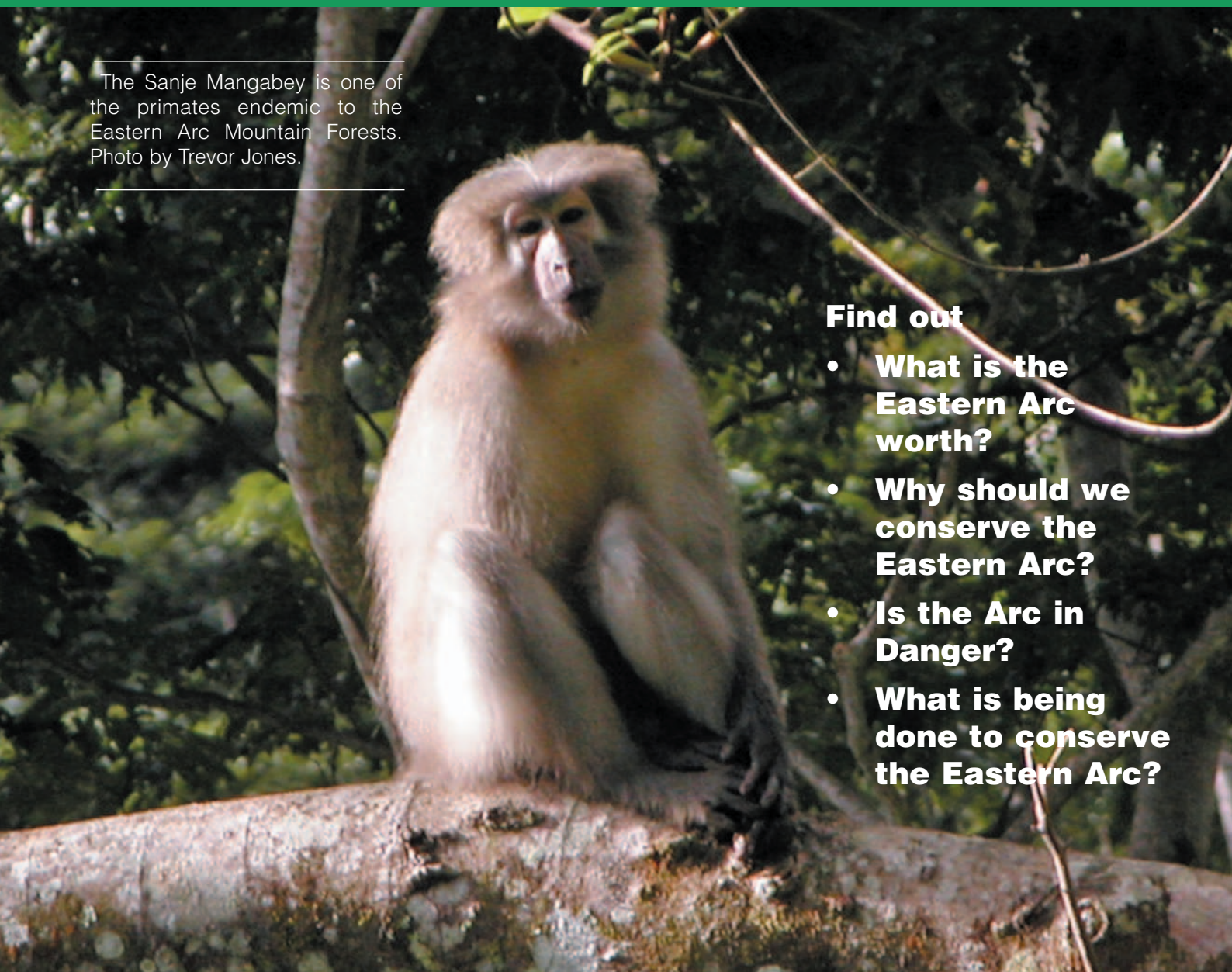
The studies were commissioned by Conservation and Management of the Eastern Arc Mountain Forests (CMEAMF), a project of the Forest and Beekeeping Division of the Ministry of Natural Resources and Tourism in Tanzania.

Fuller reports and much more detailed information, including the full datasets will be made available on the web site www.easternarc.or.tz

The Sanje Mangabey is one of the primates endemic to the Eastern Arc Mountain Forests. Photo by Trevor Jones.

Find out

- **What is the Eastern Arc worth?**
- **Why should we conserve the Eastern Arc?**
- **Is the Arc in Danger?**
- **What is being done to conserve the Eastern Arc?**



BIODIVERSITY

How many species are confined to the Eastern Arc Mountains?

The Eastern Arc Mountains are globally important because they have so many endemic plants and animals. Recent surveys have shown that the number of endemic species is even higher than was previously known.



This Callulina species was recently discovered in the South Nguru Mountains. Photo by Michele Menegon

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The Arc Journal has often reported the biological values of different Eastern Arc mountains. These are truly exceptional in global terms as has been recognized by many organizations, for example by Conservation International, World Wide Fund for Nature (WWF), Birdlife International and the World Conservation Union (IUCN). The

Tanzanian government has also recognized this importance and has facilitated the development of a project focused on developing a conservation strategy for these mountains 'Conservation and Management of the Eastern Arc Mountain Forests'. The Government of Tanzania has also assisted in the creation of a conservation endowment fund to provide long term finance for conservation efforts in the area, the 'Eastern Arc Mountains Conservation Endowment Fund'.

But just how many species of animals and plants are endemic (confined to) the Eastern Arc? This question is often asked as the answer changes over time. The lack of stability in the answer is not due to confusion, but because new species are still being discovered every year so that the number of endemic species is constantly increasing. At the same time some species thought to be confined to the Eastern Arc are then also found in the lowland coastal forests, or elsewhere, which means that they are no-longer regarded as endemic to the Eastern Arc. This article summarises the biological values of the Eastern Arc according to the data available in November 2005. It is almost certain that what is written here will be outdated within a couple of years as more surveys discover further

new species. That is part of the excitement of working in this area!

Number of endemic animals and plants

Current knowledge shows that **97 species of vertebrate animal are endemic to the Eastern Arc Mountains**, split as follows: 10 mammals, 20 bird, 29 reptile and 38 amphibian species. More than 10 additional new species are in the process of being described. In addition to this, another 71 species are only found in the Eastern Arc and either the lowland coastal forests, or the montane forests of the Southern Highlands in the south or Kilimanjaro in the north. These are termed near-endemic species. **Seventy two of the endemic or near-endemic vertebrates are threatened by extinction** (8 Critical, 27 Endangered, 36 Vulnerable), with an additional seven more wide ranging threatened species. This is one of the highest concentrations of threatened species in the world and shows that the Eastern Arc is one of the places where species could disappear from the face of the earth in coming years. Indeed one species, the Kihansi spray toad, seems to be on the edge of extinction in the wild.

It is more difficult to provide a precise estimate for the number of endemic plants in the Eastern Arc. However, **botanical experts have identified at least 68 endemic tree species and hundreds of species of endemic shrubs and herbs, with the total number of endemics likely to reach 1,500 species.** The Uluguru mountains alone has more than 135 plant species that are confined to that single mountain block, and 100 or more endemic species are also known on the East and West Usambara, and Udzungwa ranges. The number of threatened plant

species in the Eastern Arc is similarly difficult to calculate precisely, but a recent estimate was that around 1,000 plants are threatened with extinction.

Importance of different Eastern Arc blocks

By just adding up of the number of endemic and near-endemic species in each mountain block, it is possible to obtain simple estimation of biological value and priority for conservation investment (Table 1; Figure 1). Based on current knowledge three blocks are of the highest importance : Uluguru, East Usambara and Udzungwa. The Nguru and Rubeho come close behind in this ranking. These five blocks are the most important for conservation attention, although every part of the Eastern Arc has high value in global terms, and the lack of study in some areas means that rankings may change in the future.

Table 1. Numbers of endemic and near-endemic vertebrates and trees in different Eastern Arc Mountain blocks (November 2005)

Mountain block	Approximate forest area remaining (hectares)	Single block endemic (one mountain only)	Eastern Arc endemics (one to 13 blocks)	Near endemic (also coastal forest, Southern Highlands, or Kilimanjaro area)	Number of Eastern Arc endemic trees
Taita (Kenya)	300	6	8	11	8
North Pare	2,500	0	5	12	0
South Pare	13,540	2	8	19	1
West Usambara	26,500	5	22	48	27
East Usambara	25,800	4	35	78	40
Nguu	24,900	0	9	27	6
Nguru	34,000	0	20	52	25
Uluguru	27,000	14	45	82	26
Ukaguru	17,400	1	10	27	4
Rubeho	47,400	2	12	35	0
Malundwe	450	0	0	2	4
Mahenge	1,940	0	2	11	5
Udzungwa	102,400	17	41	96	37

Discoveries in past couple of years

To show that we do not have complete knowledge of these mountains, a new species of large monkey - a mangabey (*Lophocebus kipunji*) was described in 2005 from the Udzungwa Mountains and the Southern Highlands further south. In addition, a new species of shrew (*Congosorex phillipsorum*) was described during 2005 from the same Udzungwa mountain forest; and three new bird species have been named from various mountains in the past couple of years, along with five new species of amphibian. At least another 10 new species of vertebrates will be described in the next few years. It seems that detailed study of each mountain block will continue to discover additional species that are unknown to science.

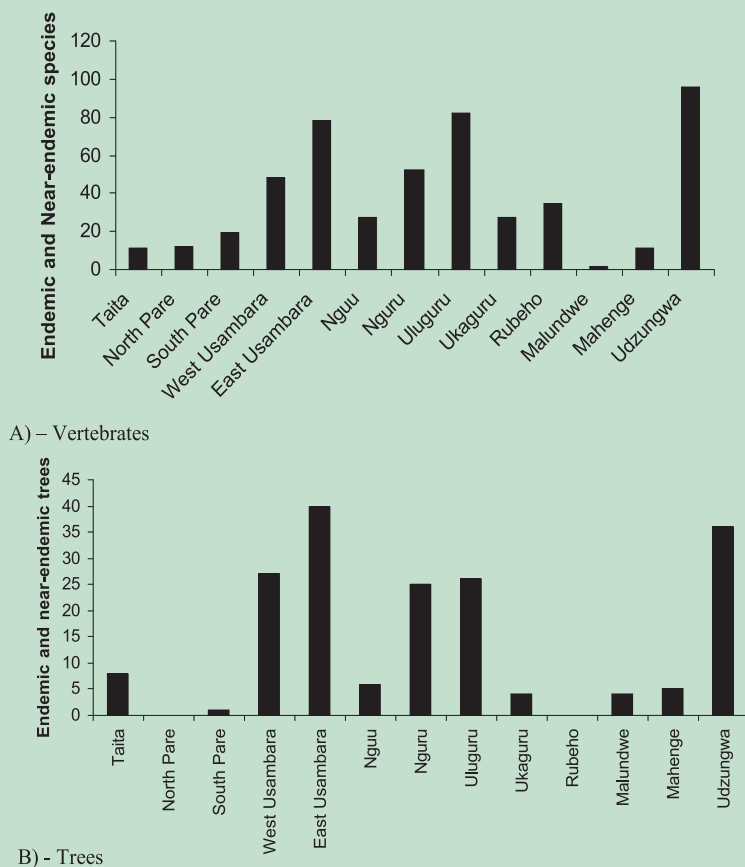
Filling study gaps

Some major gaps in biological knowledge remain in the Eastern Arc, with several mountain blocks being almost unknown for anything other than birds. Investments by the Critical Ecosystem Partnership Fund (CEPF), the TFCG - PEMA programme, and CMEAMF aim to fill these knowledge gaps. Work will focus on the poorly known North Pare, Nguu, Nguru, Rubeho, Mahenge and Ukaguru blocks. Given that studies by Michele Menegon during the past year in the Uluguru and Nguru have found a number of new species of amphibian, we believe that much remains to be discovered in these lesser known areas.

Further reading

Eastern Arc Mountains species table (see www.easternarc.or.tz)

Figure 1. Ranked importance of Eastern Arc mountain blocks for endemic and near endemic vertebrates (A) and endemic trees (B)



How much forest is there in the Eastern Arc Mountains?

The Eastern Arc Mountains are one of the smallest and most threatened biodiversity hotspots in the world. It is estimated that over 70% of the forest area has been lost but new research indicates that the rate of loss is slowing.

Photo by: Andrew Perkin

Boniface Mbilinyi and Japhet Kashaigili, Remote sensing and GIS laboratory, Sokoine University of Agriculture, Morogoro.

Introduction

There are at least existing two estimates of the area of forest remaining on the Eastern Arc Mountains, the first being digitized from the 1995 Tanzania land cover map and the second derived in 1998 by adding up published estimates of forest cover for different mountain blocks. Both methods have their limitations, although both arrive at forest area estimates in the region of 3-5,000 sq km. These studies also estimate rates of forest loss by calculating the original forest cover and working out the percentage of that which had been converted to farmland or other forms of land use over the past few hundred years. **This indicates that at least 70% of the original forest cover has been lost from the Eastern Arc.** But what is the precise amount of forest on the Eastern Arc today, are the trends in deforestation continuing, and how fast is the current loss of forest cover?

In order to answer these questions, CMEAMF contracted the Sokoine University remote sensing and GIS laboratory to look in detail at forest changes over the past two decades (1970s to 2000s). This Tanzanian institute was joined in their effort by the Centre for Applied Biodiversity Science from Conservation International, USA, using funding provided by the Critical Ecosystem Partnership Fund.

Work is ongoing and we aim to add forest cover data for 1955 (from aerial photographs) and 2006 (from digital photography), to eventually show forest changes over a 50 year period.

Sources of data

Forest cover from the 1970s through to the early 2000s was analysed using remote sensing data from satellites. In the 1970s data sources were the MSS (Landsat 4) images with 79 m resolution. For the 1980s and to the late 1990s data sources were Landsat TM giving 28.5 m resolution, and after 2002 data sources included some SPOT imagery with 20 m resolution. Cloud free images from the dry season were obtained as close to 10 years apart as possible for each mountain block. These images were then used to analyse forest cover changes over time, and to map the distribution of forest in the early 2000s.

Changes in forest cover over time

Across the Eastern Arc our preliminary results show that 38,400 ha of forest was lost between the 1970s and the late 1980s/early 1990s. Since the 1990s the amount of forest loss has been smaller, with only 3,930 ha lost until the early 2000s (Table 1). The rates of forest loss have slowed appreciably over the past 10 years, probably because there is little forest left outside the reserves and people have cleared forest up to the boundaries.

One Eastern Arc block with obvious forest loss is the Uluguru Mountains (Figure 1). Large areas of sub-montane forest have been converted to farmland outside the northern edge of Uluguru North Forest Reserve.

Field assessments in 2005 indicate that the loss of forest in this area of village/general land is still continuing and also that there is 530 ha of encroachment into the Uluguru South Forest Reserve.

Reasons for forest cover change

These data illustrate two important issues with regard to forest conservation on the Eastern Arc Mountains. First, in the 1970s and into the late 1980s and early 1990s there was extensive loss of forest in some mountains (e.g. the Usambara). This was primarily from land outside of the existing network of Forest Reserves, which remained largely intact over that period. The rates of loss between early 1990s and 2000s were much less, but this is mainly because little forest remained outside the reserves, and farming extended right to the reserve borders in most mountains. In some Forest Reserves there are villages within the legal boundaries (e.g. Ubiri within the Nguru South FR in the Ngurus) or extensive areas of farmland (e.g. Mangalisa in the Rubehos). In some other reserves, farmland areas are creeping within the boundaries where there is a lack of management control. The few forest areas that remain outside of reserves are typically clan or sacred forests, or proposed as reserves (e.g. Derema in the East Usambara Mountains)

Further reading

Mbilinyi, B. and Kashaigili, J. (2005). Eastern Arc forest change analysis. CMEAMF, Morogoro. www.easternarc.or.tz

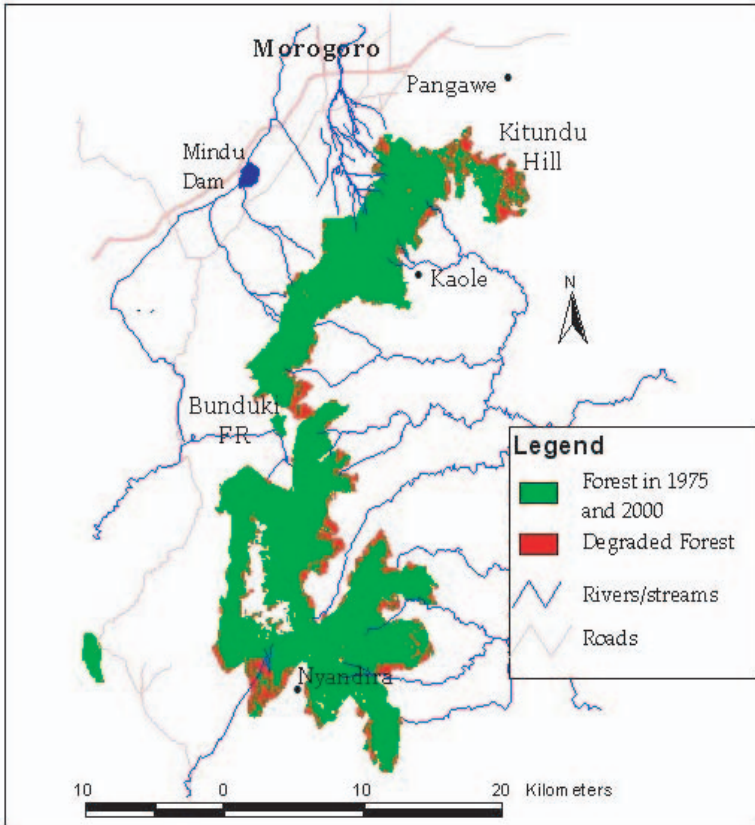


Figure 1: Forest cover change between 1975 and 2000 in the Uluguru Mountains

Table 1: Forest area changes over time in the different Eastern Arc Mountain blocks of Tanzania

Mountain block	Forest area in 1970s (ha)	Forest area in late 1980s/early 1990s (ha)	Forest area in 2000s (ha)	Forest area change 1970s-1980/90s (ha)	Forest area change 1980/90s-2000s (ha)	Forest area change 1970s-2000s (ha)	Proportion of forest loss 1970s-2000s (%)
North Pare	2920	2580	2580	340	0	340	12
South Pare	16000	13580	13540	2420	40	2460	15
West Usambara	38230	27700	26500	10530	1200	11730	31
East Usambara	32620	27030	25820	5590	1210	6800	21
Nguu	29210	24960	24930	4250	30	4280	15
Nguru	36260	34140	34040	2120	100	2220	6
Ukaguru	17970	17620	17430	350	190	540	3
Uluguru	30970	27920	27050	3050	870	3920	13
Rubeho	52150	47740	47460	4410	280	4690	9
Malundwe	Not assessed	Not assessed	Not assessed				NA
Udzungwa	107670	102440	102430	5230	10	5240	5
Mahenge	2050	1940	1940	110	0	110	5
Total	366050	327650	323720	38400	3930	42330	

WATER:

Is the amount of water flowing from the Eastern Arc Mountains decreasing or increasing?

The Eastern Arc Mountains are the source of water for up to 25% of Tanzanians. The flow of water from these mountains is declining. Why?

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Introduction

The rivers flowing from the Eastern Arc Mountains supply many large towns in eastern Tanzania with their drinking water. This includes Dar es Salaam, Tanga, Morogoro, Iringa, Ifakara, Lushoto, Mwanza, Same, Korogwe, Soni, Kilosa, Muheza, Kibaha, Mpwapwa, Turiani, Mvomero, Gairo, Mikumi, Chalinze, Kilindi, Handeni and Kilolo. Many of

these towns are either Regional or District administrative centres, and Dar es Salaam is the economic power of the nation. The same water sources are also used to generate hydroelectrical power and to supply the large sugar estates of Kilombero and Mtibwa.

There is a broad perception that the water flows in these rivers are declining and that this will negatively

affect the economy of the nation and its ability to attain the various Millennium Development Goals. But, is this perception supported by data? And if the rivers flowing from the Eastern Arc Mountains are really in decline what are the possible reasons for this?

In order to better address this critical development issue, CMEAMF contracted the Water Resources Engineering Department, College of Engineering and Technology (CoET), University of Dar es Salaam to investigate changes in flows in rivers originating in the Eastern Arc Mountains and the linkage to changes in rainfall and other factors. This paper summarizes some of the key results of that study.

Sources of information

River flow data has been measured in Tanzania since the 1950s. From this time until the early 1970s an extensive network of river gauging stations and rainfall stations was established and maintained. As the economy of Tanzania faltered and declined in the late 1970s and into the 1980s the system of hydrological

and rainfall stations fell into disrepair, with the majority of river gauging stations ceasing to function by the early 1990s. Economic revival over the past decade has resulted in some of the stations being rehabilitated, particularly in the Pangani and Rufiji River Basins. The data available are therefore detailed and comprehensive for the period 1950-1975, declining dramatically in the period 1975-1995, and increasing again since the late 1990s. Where possible we have used modeling techniques to fill in data gaps, but for several rivers our results only relate to the period ending 15 years ago, and any changes since that time are not captured.

The rivers considered in this study are: Pangani, Sigi, Ruvu, Wami, Kilombero, Kihansi and Great Ruaha. Most are sourced entirely within the Eastern Arc Mountains, except for the Pangani (also flowing from Kilimanjaro and Meru) and Great Ruaha (also flowing from Kipengere mountains).

In comparison, rainfall data for the same areas of Tanzania go back further in time, generally to the 1940s and in some cases to the 1920s. We have also captured the rainfall data within the same geographical areas as the river flow stations. Some of the available rainfall and river flow data provide the basis of this short paper.

What are the trends in river flows?

Flow trends from 19 gauging stations in the Eastern Arc mountains were analysed to determine the magnitude of the flow rate changes over time. These are particularly marked in the dry season.

Dry season flow reductions are found in January and February in Northern catchments and August to October across the whole of the Eastern Arc. Stations which show a decrease in river flows include two

stations on Ruvu (stations 1h5 and 1h8), one on the Mkomazi (1db17 located at Gomba sisal estate), one on the Luengera (1da3a near Korogwe town), and one on the Wami (1G5A). The rate of decrease in flows in these rivers differs widely, with some declines being statistically significant. Over the whole of Eastern Arc there is negative trend in seasonal flows over time. The short rain season (October November December) has the least rate of flow decrease and the long rain season (March, April, May) has the highest rate of flow decrease. This is mainly due to high rates of flow decreases in Wami, Ruvu and Kilombero rivers.

What are the reasons for the trends observed?

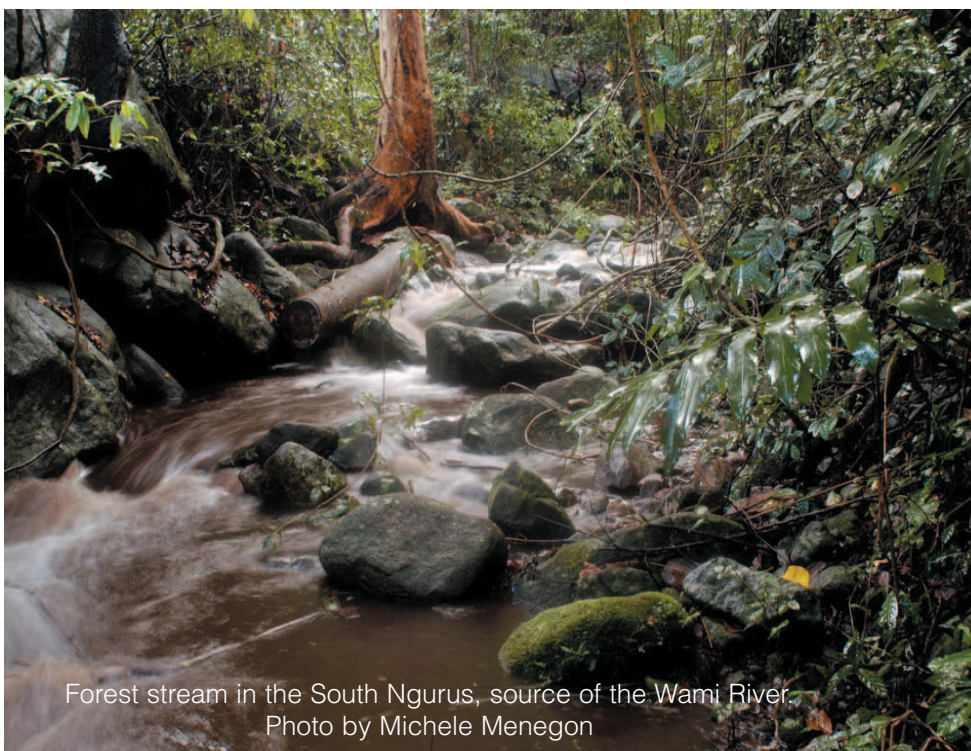
A number of potential variables might explain the observed declines in flows from the Eastern Arc Mountains. Foremost amongst these are changes in the rainfall of the region, changes in forest cover that might affect retention and speed of run-off, and increased rates of extraction for human use. Available data on rainfall were compared with the river flow data to show if the trends track each other over time. Overall declines in rainfall are significant. Among the 26 rainfall stations monitored in the Eastern Arc Mountains forests most of them showed negative trends in all seasons except the short rain season (October November and December). This agrees well with observed changes in river flows.

Other factors may also be influencing the declines in flow rates observed in these rivers. Examples are the loss of forest that might reduce rainfall and also hasten the speed of runoff to the sea, and leaving little runoff in the dry season. Another factor could be increased extraction for agriculture and for human uses in villages, towns and industries. Since the 1950s we know that forest cover has declined in the Eastern Arc Mountains, in some cases (e.g. Ulugurus) by up to a third (area decline from 300 sq km to 230 sq km). We also know that extraction for irrigation and for the use of an increasing human population has also increased, but this has not been well quantified.

Investigating the causes of the declining flows in the Eastern Arc rivers is a subject worthy of further scientific study, including on the consequences of these changes to the economic development of Tanzania.

Further reading

BICO (2005). Hydrology of the Eastern Arc Mountains. CMEAMF Morogoro, Tanzania. www.easternarc.or.tz



Forest stream in the South Ngurus, source of the Wami River.
Photo by Michele Menegon

How much of the Eastern Arc Mountains is protected and what needs to be done to complete the protected area network?

Tanzania has included most of the remaining Eastern Arc Mountain forests within one or another kind of protected area. But is this enough? What more can we do to ensure that the forests get the legal protection that they need?



The Derema Forest in the East Usambaras is one of the proposed forest reserves. Here a team from Forestry and Beekeeping Division meets with local community leaders to discuss the proposed gazettement.

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Introduction

The Eastern Arc Mountains contain an extensive network of forests protected under various different laws and managed by a number of different organizations. The government of Tanzania protects forests as national forest reserves and forest 'nature reserves' managed by the Forestry and Beekeeping Division of Ministry of Natural Resources and Tourism, as local authority forest reserves managed by District Council, and as National Parks managed by the Tanzania National Parks Authority. Villages protect forests as either sacred/traditional/clan forests without legal status, or as Village or Community Forest Reserves that can be legally recognised. Private companies also protect forests within their land-holdings (e.g. East Usambara Tea Company Ltd.), primarily to provide an improved microclimate and prevent soil erosion for crops such as tea and coffee.

But how much of the Eastern Arc is actually protected by these various forms of ownership, and what needs to be done to improve the protected area network? This paper summarises the reserve network as of June

2005 and suggests steps that need to be taken to improve the Eastern Arc protected area network.

Protected Areas in the Eastern Arc

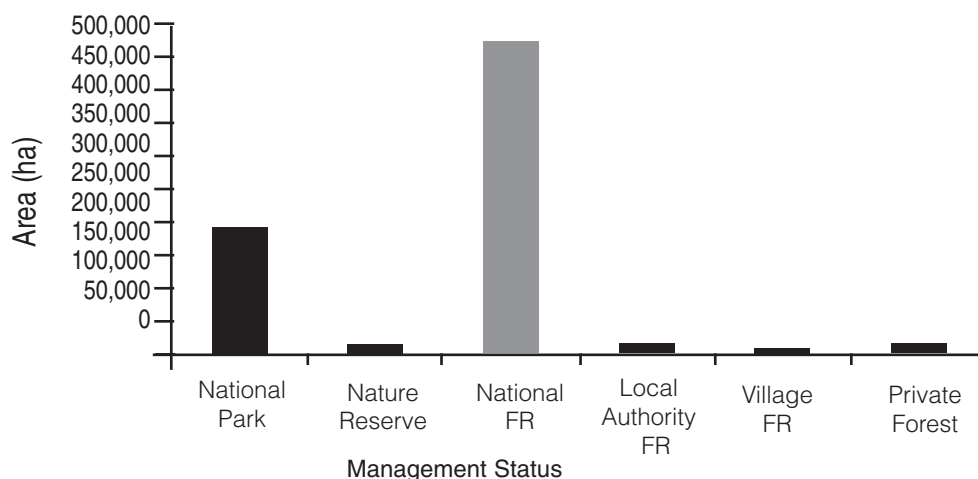
The Eastern Arc Mountains contain only two reserves that are recognised according to the international IUCN system of protected areas - Mikumi National Park (the forest area is not well known, but is estimated that about 450 ha of Eastern Arc habitat is found on Malundwe Hill within this large savanna-woodland park) and Udzungwa Mountains National Park (190,000 ha). All the other reserves in the Eastern Arc Mountains, including all Forest Reserves managed by Forest and Beekeeping Division, are 'uncoded' according to the IUCN protected area system and hence do not feature in IUCN protected area statistics for Tanzania.

Other reserves in the Eastern Arc

Despite difficulties of obtaining consistent data on the forests of the Eastern Arc, our records indicate that the Eastern Arc Mountains contain 556,443 ha of land within reserves that are not accorded any IUCN protected area code. These areas are one government Nature Reserve (8,380.0 ha), 107 national Forest Reserves (534,592.9 ha) managed by FBD, 32 Local

Authority Forest Reserves (12,193.4 ha) managed by the District Councils, and c.6 Village Forest Reserves (1,270.0 ha) managed by villages (Figure 1). In addition there are 9 proposed Forest Reserves (61,192.0 ha), and 14 proposed village FRs (2,211.0 ha) (Figure 1). These data only include those reserves found in sub-montane altitudes and above (over 500 m); all lowland forest areas have been excluded.

Figure 1. Area of land under different categories of reserve or forest ownership within the Eastern Arc Mountains (June 2005). Black bars - reserve that have an IUCN protected area code. Grey bars - reserves that do not have IUCN protected area codes. Lowland forests transitional between Eastern Arc and coastal forest types have been excluded



Private and Village forests

Tea estates in Mufindi (Udzungwa), East Usambara and West Usambara and the Magrotto oil palm estate in the East Usambara mountains all contain significant areas of natural forest. In most cases these are maintained to provide suitable microclimate for the commercial crops being grown by the estates. In some mountains the local inhabitants also protect small patches of forest for rituals and as burial groves. This practice is particularly well developed among the c.300 clan forests of the North Pare Mountains, but it is also strong in South Pare and West Usambara.

Completing the network of protected areas

The protected area network in the Eastern Arc mountains is currently incomplete. Several areas of work need to be undertaken to address this situation.

- 1) The first challenge is to seek an overarching and globally recognized status, such as World Heritage, for all the most important Eastern Arc forests. This would recognise the universal values of the Eastern Arc.
- 2) A second challenge is to code the existing national Forest Reserves and the Amani Nature Reserve as protected areas according to the IUCN system. CMEAMF and the Catchment Forest Project of the Forest and Beekeeping Division have started this work with the assistance of the

IUCN World Commission on Protected Areas.

- 3) The third challenge is to complete the gazettement of proposed Forest Reserves that contain Eastern Arc habitats. These are as follows: Mwanga District (Kamwala I - 199 ha, Kamwala II - 193 ha, Kiverenge - 2,155 ha), Same District (Mwala - 1,373 ha, Kamwenda - 583 ha), Muheza District (Derema - 968 ha, Bamba / Kwamgumi / Segoma / Kwamtili extension - c.3,500 ha), Kilosa District (variation orders for Mamiwa-Kisara North and South - 13,000 ha), Mpwapa District (Kiboriani - 54,000 ha), Kilolo District (Kitonga-Kimala - c.9,000 ha). There is also an area of forest on the Rubeho Mountains - Ilole that is not even proposed and its area is unknown. It needs to be visited and potentially gazetted. Magombera forest in the lowland Udzungwa also needs to be included within the Selous Game Reserve.
- 4) The fourth challenge is to enhance the connectivity between some of the existing reserves to reduce the chances of species disappearing simply because the remaining forest area is too small to support them. Key connectivity issues in the Eastern Arc are a) the Derema corridor in the East Usambaras, b) Bunduki gap between Uluguru North and South FRs in the Uluguru Mountains and c) the Matundu-Uzungwa Scarp FRs gap in the Udzungwa Mountains.
- 5) A fifth challenge is to seek the upgrading of some of the most important Forest Reserves to recognize their role in the conservation of globally important biodiversity. Changes in status to 'Nature Reserve' or even 'National Park' might be warranted for the reserves of the highest value - provisionally determined as Nilo FR in the East Usambara Mountains, Nguru South FR on the Nguru Mountains, Uluguru North and South FRs on the Uluguru Mountains and West Kilombero Scarp and Uzungwa Scarp FRs in the Udzungwa Mountains.
- 6) A final important challenge is to provide legal status for the clan and traditional forests of the Eastern Arc, particularly in the North and South Pare and in the West Usambara Mountains.

Further reading

Burgess and Kilahama 2005 - Arc Journal. www.tfcg.or.tz and Eastern Arc protected area list on www.easternarc.or.tz

What do people know and what do people want to know about the Eastern Arc?

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The majority of people are not aware of the Eastern Arc Mountain forests and their values. We outline a strategy to encourage people to improve their 'Arc Awareness'.

The Eastern Arc Mountain forests benefit millions of people through their water

catchment, biodiversity, soil conservation and climate services. But are people aware of this? We asked over 2000 people what they knew about the values and management of the Eastern Arc Mountain forests. We used a combination of focus group discussions, semi-structured interviews and questionnaires to ask these questions to people from villages surrounding the Eastern Arc, from Central and Local government, from civil society organizations and from the private sector.

What do people know about the Eastern Arc?

Have you heard of the terms Eastern Arc Mountain Forests or Misitu ya Milima ya Tao la Mashariki'?

- 70% of Eastern Arc community representatives said **NO**.
- 72% of government staff, traders and NGO representatives said **YES**.

This indicates that the phrase 'Eastern Arc Mountain Forests / Misitu ya Milima Tao la Mashariki' is understood by many district government staff, but that communities are much less aware of it, instead relating themselves to the individual mountain block where they live.

Why are the Eastern Arc Mountain forests important?

BIODIVERSITY

- 5 % of Eastern Arc community representatives mentioned biodiversity as a forest value.
- 11% of District staff mentioned biodiversity as a forest value.

WATER

- 79% of Eastern Arc community representatives mentioned water as a forest value.
- 63% of District staff mentioned water as a forest value.

Knowledge about the unique biodiversity of the Eastern Arc forests was generally very low while there was more awareness of the role that the forests play in water catchment.



Awareness of the Arc

Have you seen a copy (or summaries) of the forest policy and laws?

- 91% of Eastern Arc community representatives said **NO**.
- 71% of district, ward and NGO staff knew about the new forest policy and laws but of those only 46% had seen copies.

From these results we concluded that detailed knowledge of the new forest policies and laws is low particularly within communities.

The team from the Tanzania Forest Conservation Group responsible for undertaking the survey and for facilitating the development of the communication strategy also asked people what they want to know more about and how they wanted to communicate about it. Based on what people told us, we have developed an information, education and communication strategy for the Eastern Arc Mountains forests which is centred around five themes:

1. Economic growth and poverty reduction in Tanzania depend on the sustainable management of the Eastern Arc Mountain forests.
2. The Eastern Arc Mountain forests are globally important.
3. The Eastern Arc Mountain forests are under threat from human activities.
4. Stakeholder's roles and responsibilities in achieving the conservation of the Eastern Arc Mountain forests.
5. Stakeholder's roles and responsibilities in implementing the National Forest Policy and the Forest Act in the Eastern Arc Mountain forests.

The Eastern Arc information, education and communication strategy has now been finalised and TFCG are now piloting activities from the strategy. The strategy aims to improve communication between stakeholders using a variety of media including radio, printed materials and events such as environment days and drama competitions. The strategy should ensure that when we return in five years time to those same communities, people can say, 'YES we know about the Eastern Arc Mountains and why it is important for us to continue supporting its conservation.'

\$\$ What are the Eastern Arc Mountain forests worth to Tanzania? \$\$

Money talks. The Eastern Arc Mountains provide valuable services to Tanzania. But do we know how valuable these services are? This article presents estimates of the dollar value of some of the forests' services.

The Eastern Arc Mountain forests are the water catchment area for cities such as Dar es Salaam and Morogoro as well as agricultural estates such as the Kilombero Sugar Estate (see photo) Photo by Andrew Perkin.

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Introduction

The main economic worth of the Eastern Arc Mountains is not found in the timber but rather in the services provided by the forests, including climate stabilisation, carbon storage, protection of hydrological function, and biodiversity conservation. These are not accounted for within Tanzania's

Gross Domestic Product, and thus receive low allocations in the Government budget. This affects not only recurrent but also development expenditures, and is seen for example in the Eastern Arc Mountains. Here the government provides funds for the salaries of the 320 staff (around USD 400,000 per annum) managing the 150 forest reserves covering more than 7,000 square kilometers of land. With an operational budget of less than USD 50,000 per annum when donor contributions are excluded, this adds up to a total of about USD 450,000 per year.

How does this allocation of funding compare to the economic value of the Eastern Arc to Tanzania? Research in 2001 estimated that the Total Economic Value (taking consideration of timber, water, power generation, biodiversity, carbon sequestration etc.) of the catchment forests in the Eastern Arc Mountains was USD 621.4 million. We further illustrate some of

the values of the Eastern Arc forests, below.

Water

A number of major Rivers have their sources and catchments in the Eastern Arc Mountains, e.g. Sigi, Wami, Ruvu, Kilombero, parts of Pangani, and part of the Great and Little Ruaha. At least 10 % of the total population of Tanzania, and perhaps as many as 25%, get their water from these rivers. We have computed a rough estimate of the value of this water as follows:

- Total population of Tanzania = 34,443,603 people (2002 census)
- Average size of a household = 4.9 (household budget survey)
- Percentage of Tanzanian population living in towns receiving water from Eastern Arc = 10% (2002 census)
- Estimated annual cost of water per urban household = US\$ 100 (Norconsult 2002)
- Percentage of households paying for water in these towns = 25% (estimated)
- Therefore total annual value of Eastern Arc water to town people = $34,443,603 / 4.9 \times 10\% \times \text{US\$ } 100 \times 25\% = \text{US\$ } 17,573,226 \text{ per annum}$

Published predictions indicate that the catchment function in the Eastern Arc (interception, retention and slow release) might be reduced through forest loss and degradation by an estimated 50%. Such a

reduction is predicted to quadruple the cost of water by 2020. The value of keeping the Eastern Arc forests intact may therefore be the difference between current water costs and potential future costs, some hundreds of millions of dollars. Engineering replacements of the lost natural storage of water in catchments if forest and woodland cover is destroyed will also cost hundreds of millions of dollars.

Hydroelectrical power

Hydropower is the major source of commercial electricity in Tanzania. The four major hydropower plants that use Eastern Arc water are Kihansi, Kidatu, part of Mtera and part of Pangani Falls. Hydropower has been estimated as 62 percent of the total electricity supply of Tanzania (559 MW of 892 MW). Deducing hydropower generated from water originating outside the Eastern Arc, we estimate that around 50 percent of Tanzanians' electricity is provided by water flowing from the Eastern Arc Mountain forests. The forests are particularly valuable in maintaining water flow in the dry season and hence allowing the hydro-electrical facilities to continue generating power. A rough calculation of the value of the Eastern Arc in terms of electricity supply to households is as follows:

- Total population of Tanzania = 34,443,603 people (2002 census)
- Average number of people per household = 4.9 (household budget survey 2002)
- Proportion of Tanzanian households with electricity = 10% (household budget survey)
- Approximate household use of electricity = 225 KWh per annum (46 KWh per capita x 4.9 people; Tzonline)
- Basic cost of a each unit of power = 120 Tsh/KWh (=0.1 US\$: TANESCO)
- Proportion of electricity generated using hydropower from Eastern Arc = 50%
- Therefore total annual value of Eastern Arc electricity to domestic users = $34,443,603 / 4.9 \times 10\% \times 225 \text{ KWh} \times 0.1 \text{ US\$} \times 50\% = \text{US\$ } 7,907,970$

Biodiversity and non-timber forest products

Attempts to monetarize biodiversity values contained in Tanzanian forests have been made by a number of studies. Most valuations rely on existence and option values, which are not generally considered within national accounting systems. Norconsult (2002) estimated that forest products are worth at least US\$ 100 per rural dweller per year in nutritional and medicinal value. Given that around 1,509,000 people live around the Eastern Arc Mountain forests (www.easternarc.or.tz) a simple calculation indicates that forests may be generating **US\$ 150 million** of value per annum to these people.

Agriculture

The forested Eastern Arc Mountains maintain a suitable microclimate for growing vegetables, spices and fruits. There is a major export from the mountains



Non-timber forest products such as butterfly pupae, honey, medicinal plants and forest foods are worth on average US\$ 100 to people living in the vicinity of the forests.
Photo by Theron Brown

to Dar es Salaam and other cities of: bananas, potatoes, peas, leeks, tomatoes, pears, apples, plums, strawberries, cardamom and cinnamon. This provides a contribution to local livelihoods. Large agricultural irrigation schemes, such as Illovo and Mtibwa Sugar Company and various rice schemes rely on water from the Eastern Arc Mountains.

In addition to the values estimated above, there are also large timber values, but current government policy does not allow harvesting in the Eastern Arc and hence these values cannot be captured legally.

Another way of demonstrating the monetary value of forests is to analyse the cost of repairing the damage caused by their loss.

Given that fertilisers are too expensive for most farmers, agricultural productivity in Tanzania largely depends on the natural fertility of the soil. Rainfall runs off exposed soils much faster than off vegetated soils, carrying away the most fertile top layer of soil. The value of crops grown in the sub-soil that remains after serious erosion is greatly reduced, impacting negatively on agricultural productivity. Soil formation occurs at about 1 ton/ha/y in the region, and thus heavily eroded soil is not replaced within a human generation.

The water, hydropower and non-timber forest products of the Eastern Arc Mountain forests generate over US\$ 175 million every year for the people of Tanzania. The Government invests less than 0.3% of that value in their management.

Although the figures above should not be interpreted as anything more than crude estimates, their comparison with the budget allocated for the management of these forests reveals a gap in public financing. Increasing funding for natural resources sectors, such as Forestry, becomes even more justifiable if the cost of repair or replacement, which are often associated with resource degradation, are included in financial calculations.

How disturbed by human activities are the Eastern Arc Mountain Forests?

How much tree cutting is going on inside the Eastern Arc Mountain Forests? Which forests are the most disturbed? Which forests are the best managed? Researchers from Sokoine University visited 25 Eastern Arc forests in order to answer these questions. They recorded tree cutting in all reserves. Their findings have shown that reserves managed by the private sector have the lowest rates of tree cutting while those managed by the Districts have the highest levels of disturbance. These results provide a valuable baseline for future monitoring.



Photo by Andrew Perkin

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Introduction

Apart from a few small areas of traditionally protected or private forests, Forest Reserves and the forest they contain, now supply the majority of the woody and non-timber forest products required by forest adjacent communities - and these are also often commercially exploited for use in towns far from the forest edge. Despite several past studies, there are no general summaries of the levels of forest

disturbance to the forests of the Eastern Arc. And there is no answer to whether the levels of disturbance are declining or increasing. In this paper we present a preliminary analysis of baseline forest disturbance data collected through a consultancy provided by CMEAMF to FORCONSULT at Sokoine University of Agriculture in Morogoro. The intention is that these

data, when combined with that collected by other recent studies (e.g. Frontier Tanzania and TFCG), will allow forest quality to be easily monitored across the Eastern Arc Mountains.



The Sokoine and TFCG teams preparing to conduct disturbance surveys in the South Nguru Mountains. Photo by David Loserian.

Collection of disturbance data

A disturbance assessment in the forests of the Eastern Arc Mountains was undertaken between January and April 2005, and involved the authors from Sokoine University and a team of foresters, two each from the 14 Districts supporting Eastern Arc Mountain forest. Forest disturbance was assessed by this team in 25 forests, with additional work being undertaken by Tanzania Forest Conservation Group staff in the Nguru South Forest Reserve.

The methods used to collect the forest disturbance data are simple and easily repeatable. They involve counting the number of live, dead or cut trees and poles (newly or old cut) along a 10 m wide strip (5 m on either side of a 50 m transect) through the forest. Trees were defined as all standing woody plants with straight stems for at least 3 m and with a diameter (dbh) over 15 cm. Poles/saplings were defined as all standing woody plants with straight trunks at least 2 m in length and with a diameter (dbh) of 5 - 15 cm. A GPS, compass, rope and recording sheets were all that was required to complete the work. In addition to collecting data on human activities that affect the trees and poles, notes were also made on other signs of human activity - such as the number of charcoal pits, snares, paths, fields and even houses. Taken together these data provide a good overview of the state of the habitats within each reserve.

Comparable data have also been collected by Frontier Tanzania in other Eastern Arc Mountain forests. For example, such data are already collected from all the Forest Reserves of the East Usambara Mountains



Illegal logging is prevalent on the edges of many Central Government Forest Reserves such as the Nguru South Forest Reserve. Photo by Michele Menegon.

(1999-2002), in the West Kilombero Scarp and New Dabaga forest of the Udzungwas (1999-2000), in Uluguru North and South Forest Reserves in the Ulugurus (2005) and in Mahenge Scarp and Nambiga Forest Reserves in Mahenge (2002-2003). Forest disturbance data were also collected by WCST in the Uluguru reserves in 2001. All these data can be found in reports available on www.easternarc.or.tz

Just how disturbed are the Eastern Arc forests?

Data collected during 2005 shows that across all the transects from the 25 surveyed forests there are 340 live trees and 418 live poles per hectare, in comparison with 58.08 dead trees and 29 dead poles per hectare. In terms of cutting the sample of all forests shows 42 old cut trees and 49 old cut poles per hectare, and 2 new cut trees and 3 new cut poles per hectare. As an old cut tree might not rot away for more than 10 years the fact that there over 10 times more old than new (less than 6 months old) cuts is not surprising. Comparisons with forests studied some years ago indicate that there is not much change in the levels of disturbance of the forests, for example in Mtai and Nilo in the East Usambara Mountains.

What types of forest are most disturbed?

We also looked at how disturbance rates vary between forests under different management regimes. Although the

sample sizes were not even, differences in disturbance levels are striking and these conform to our general impressions from visiting many other forests within the Eastern Arc (and Tanzania in general). Forest areas under private ownership are the least disturbed in terms of pole and (especially) tree cutting (Figures 1 and 2). The private forests are followed in their level of disturbance by the Forest Reserves under the management of central government (CGFR) and protected as 'catchment' Forest reserves for the conservation of water supplies and biodiversity values. No legal extraction of timber is permitted in these reserves. The proposed reserves and the Local Authority Forest Reserves (LGFR) both have much higher rates of disturbance in terms of both tree and pole cutting. Although not presented here, past work in the Uluguru Mountains looked at levels of disturbance in open access and reserved forest. This showed rates of tree cutting to be up to 4 times higher in the unprotected forest than in the adjacent Uluguru North Forest Reserve (Hymas (2001 www.africanconservation.com/uluguru).

How to reduce rates of forest disturbance in the Eastern Arc?

The results of this study indicate that tenure has a significant impact on levels of forest disturbance in the Eastern Arc. However, more sampling from a larger sample of different reserve categories and more intensive sampling within those reserves will be necessary to fully test this hypothesis. Another issue worthy of further study is whether reserves under participatory forest

management arrangements have more or less disturbance that reserves than are not under this arrangement. This would also be an issue worthy of further study, but is not one we can resolve with the available compiled data.

Figure 1. Mean number of cut trees per hectare in Proposed forests (n=2), Private forests (n=2), Local Government Forest Reserves (LGFR) (n=3) and Central Government Forest Reserves (CGFR) (n=19) in the Eastern Arc Mountain forests of Tanzania

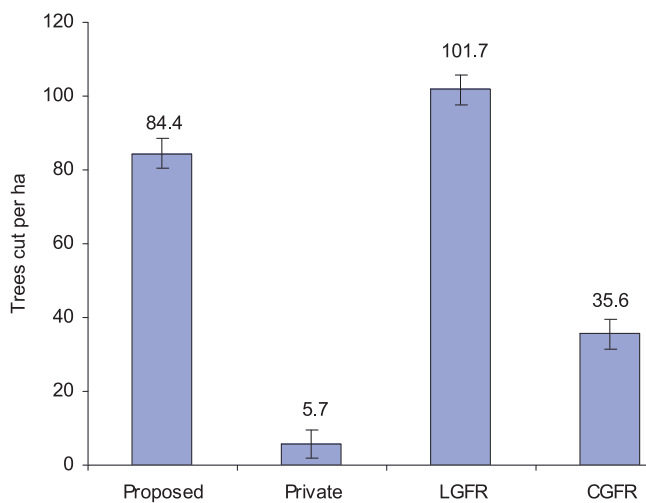
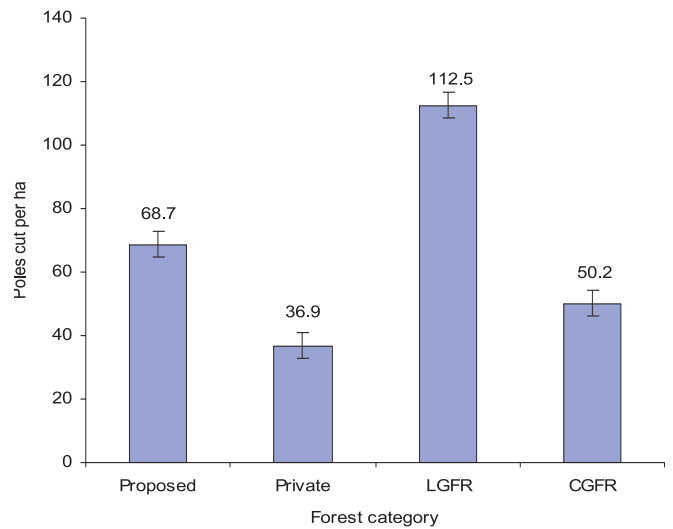


Figure 2. Mean number of cut poles per ha in Proposed forests (n=2), Private forests (n=2), Local Government Forest Reserves (LGFR) (n=3) and Central Government Forest Reserves (CGFR) (n=19) in the Eastern Arc Mountain forests of Tanzania

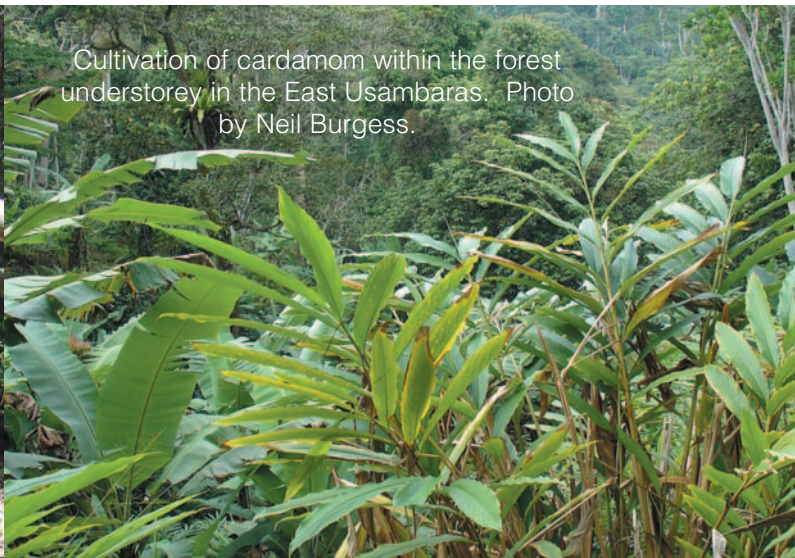


Further reading

Madoffe, S. S. and Munishi, P.T.K. (2005). Forest Disturbance report. CMEAMF, Morogoro. www.easternarc.or.tz



Pitsawing in Chome Forest Reserve. Photo by Neil Burgess



Cultivation of cardamom within the forest understorey in the East Usambaras. Photo by Neil Burgess.



Forest trees being cut for fuel wood for the tea factories in the East Usambaras.



Hunting for animals such as duikers is another form of forest disturbance widely recorded in Eastern Arc Mountain Forests. Photo by Neil Burgess.

What are the main threats facing the Eastern Arc Forests and how serious are they?

Fire is the biggest single threat to the Eastern Arc Mountain forests according to the people that live around the forests. Illegal logging is also a widespread problem. There is an urgent demand for more information and support to enable people to tackle these issues.

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Introduction

Commonly reported threats to the Eastern Arc Mountain forests are fire, logging for timber, agricultural encroachment, fuel wood collection, hunting, pole harvesting, and medicinal plant collection. CMEAMF has tried to assess the scale of threats facing the Eastern Arc, and to provide a baseline measure against which the reduction of key threats can be measured. Such information is essential in order to design a comprehensive conservation strategy that aims to address the most important threats. It is also vital to any education and

awareness campaign, because reducing the threats would be one of the key measures of the success of implementing such a campaign.

Threat to the Eastern Arc forests was assessed in a variety of ways between October 2004 and October 2005. Summary data from three different pieces of work are presented here.

Sources of threat data

Perceptual and quantitative information on the threats facing the Eastern Arc forests was gathered using three separate approaches.

First, the FBD/Sokoine University forest assessment team that surveyed 25 forests across the Eastern Arc completed 'threat reduction assessment' questionnaires for these forests. This method provides a quantitative measure of the degree to which a threat has been reduced over time.

Second, the TFCG Information, Education and Communication (IEC) strategy team visited 6 Districts and 12 villages to gather data on the perceived threats facing six Eastern Arc forests. Four methods were used to gather data on forest threats: questionnaires (37 people), semi-structured interviews (57 people), focus group discussions (1079 people) and forest

walks (257 people).

Third, CMEAMF has undertaken a series of 'stakeholder' workshops in all 14 Districts of the Eastern Arc that have brought together representatives of District, Ward and Village governments, village environment committee members, NGOs and CBOs, local business interests and other players involved with the management of the Eastern Arc forests. In nine Districts, 68 groups of stakeholders were asked what the main problems facing the forests are. In the other five Districts, 58 groups of local stakeholders were asked what the solutions to the main threats were.

What are the main threats?

The main threats to the Eastern Arc Mountain forests, according to a range of stakeholders, are summarized from the three studies outlined above (Table 1). All three approaches identified fire as the major threat to the forests of the Eastern Arc. Fires can start in farmlands outside the forest and move up slopes and into the forest, but can also be started within the forests by some forest user groups (honey gatherers, loggers, charcoal burners, hunters, herders). The destructive potential of these fires - especially in some of the drier parts of the Eastern Arc where grasslands intermingle with forests - can be considerable.

The other major threats identified during these three studies fall in different rank order, but included in the top five threats for all approaches are illegal logging and agricultural encroachment. Also mentioned as important threats are hunting, grazing, pole cutting, firewood collection, charcoal burning, mining and medicinal plant collection. Lack of awareness and poverty were also prioritized in the district stakeholder meetings (see Fig 1).

Analysis of the threat reduction assessment data across the four main categories of forest in the Eastern Arc shows that the private forests have the greatest percentage of their threats met (reduced) (Fig 2). In comparison the proposed, local authority and central government Forest Reserves have similar levels of percentage threat met (reduced). This may reflect a lack of sensitivity in this methodology to detect

Table 1. Ranked primary threats to Eastern Arc Mountain Forests according to data from five different methods undertaken by three groups a) FBD and Sokoine University (SUA) - forest disturbance team, b) TFCG - Information, Education and Communication strategy and c) CMEAMF - main strategy component

Method	Threat 1	Threat 2	Threat 3	Threat 4	Threat 5
FBD/SUA Threat Reduction Assessment (25 forests across 14 Districts) *	Fire	Pole cutting	Agricultural encroachment	Livestock grazing	Illegal logging
TFCG Information, Education and Communication strategy (6 Districts and 12 villages n=7,215 people) **	Fire	Illegal logging	Hunting	Agricultural encroachment	
CMEAMF District meetings (479 people, 9 Districts) ***	Fire	Illegal logging	Lack of awareness	Livestock grazing	Hunting

* Additional ranked threats are 6=Firewood collection, 7=charcoal burning, 8=mining, 9=hunting, 10=medicinal plants

** Districts were Handeni, Kilolo, Kilombero, Mwapwa, Muheza, Same. Only four principal threats were identified using this approach derived from information provided from seven different data gathering approaches.

*** Districts were Kilindi, Kilombero, Kilolo, Korogwe, Lushoto, Muheza, Mvomero. Additional highly ranked threats are 6 = agricultural encroachment, 7 = poor farming methods, 8 = poverty, 9 = mining

differences in threats between these forest management categories, because notable differences were seen in terms of forest disturbance and management effectiveness scores.

What do people say should be done about these threats?

In addition to collecting information on the threats to the Eastern Arc forests, CMEAMF also asked people in five of the 14 District stakeholder meetings how they would solve the main threats to the Eastern Arc. For fire, the three most popular solutions were environmental education, new by-laws and improved agricultural practices. For illegal logging, the three most popular solutions were community education, enforcing laws and marking Forest Reserve boundaries. For agricultural encroachment, the three popular solutions were community education, collaboration between government sectors, education on improved livestock keeping and (fourth) tree planting.

Further reading

MNRT (2005a). Information, Education and Communication Strategy. CMEAMF, Dar es Salaam.

MNRT (2005b). CMEAMF Information, Education and Communication Strategy: Data report. TFCG, Dar es Salaam.

Forconsult (2005). Forest disturbance report. Sokoine University of Agriculture, Morogoro.

CMEAMF (2005). District stakeholders analysis report. TFCG, Dar es Salaam.

Reports are available on: www.easternarc.or.tz

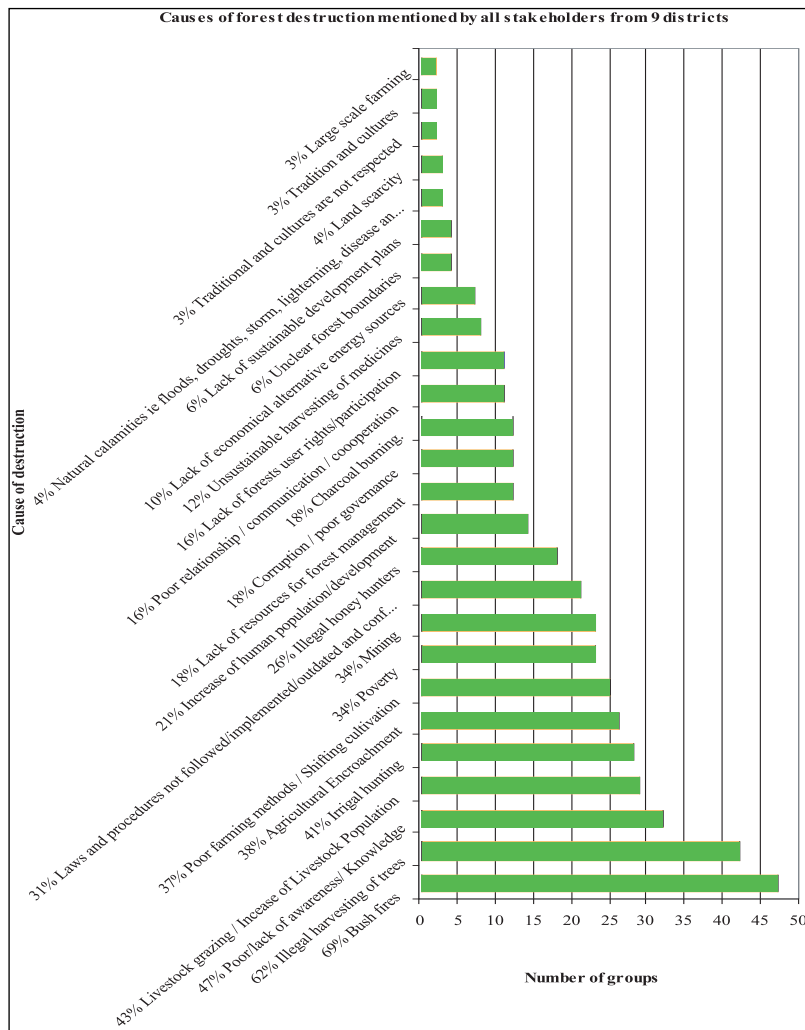
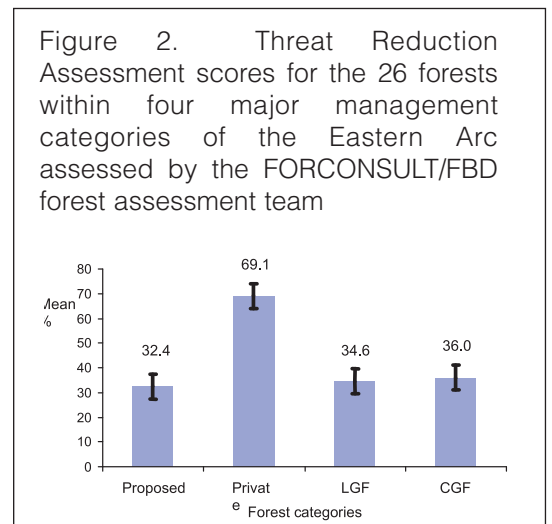


Figure 1. Ranked threats mentioned by 7,215 village and District representatives from nine Eastern Arc Districts (Handeni, Kilindi, Kilombero, Kilolo, Korogwe, Lushoto, Muheza, Mvomero and Same)





FIRE

Is the fire problem getting better or worse in the Eastern Arc Mountains?

Using the latest technology, scientists attempt to answer the question 'Are the number of fires increasing or decreasing in the Eastern Arc Mountains?' While the number of fires appears to be increasing slightly over the whole area, the number of fires within forest reserves remains fairly constant with the greatest damage occurring in dry years. Working with stakeholders, CMEAMF will be developing a fire strategy for the Eastern Arc building on local, national and international experiences.

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Introduction

Fire has been identified as the most important threat facing the long term survival of the forests and natural grasslands of the Eastern Arc Mountains. Fires are natural in Africa but many are now started by people for a variety of reasons - to clear farmlands, to assist hunting, or for various traditional reasons. Despite the magnitude of the threat, hard data on the number and extent of fires are lacking, and most statements on the fire issue are based on anecdote and opinion.

To try and more systematically answer the question 'are the number of fires in the Eastern Arc Mountains increasing or decreasing' we have used a technological solution that has become available over the past 5 years. One of the satellites circling the world measures the surface temperature of the land and feeds this data back to earth. High temperature spots equate to the location of fires and these are captured every day by the MODIS instrument aboard NASA's satellites. By plotting these data on maps the number of fire points over time can be determined and changes assessed.

How have we organized the fire data?

The fire data from MODIS was organised in the computer to show the number of fires across the Eastern Arc. First, fire points were mapped within the

Central Government, Local Government and proposed Forest Reserves across the Eastern Arc, and within forest plantations. This aimed to show if there are differences in the number of fires in these different types of land. Second fire points were mapped within the boundaries of the Eastern Arc Mountains ecoregion, which follows the 'undifferentiated montane vegetation unit' mapped in the 'Vegetation of Africa' by Frank White. Parts of 14 Districts are included within the Eastern Arc ecoregion in eastern Tanzania: Mwangi, Same (Kilimanjaro Region), Lushoto, Korogwe, Muheza, Kilindi (Tanga Region), Mvomero, Morogoro, Kilosa, Ulanga, Kilombero (Morogoro Region), Kilolo and Mufindi (Iringa Region) and Mpwapwa (Dodoma Region). This aimed to show differences in fire intensity between Districts across the 5 years of available data.

Changes in fire intensity over time

Annual summaries of the fire point data within forest reserves, plantations and the remaining Eastern Arc portion of 14 Districts shows that there has been a slight increase in the number of fire points over the past 5 years



Many communities need training, information and support to tackle the fires. Photo by Andrew Perkin.

(Figure 1). The most fire prone year was 2003, a year of drought in the region. However, between January and September 2005 there were already 1,643 fire points across the Eastern Arc. Of note is that the number of fire points per square kilometer of land is much lower in Forest Reserves than in plantations or general District land.

Same. The other Districts have moderate numbers of fire, with little variation between them.

Problems with interpreting fire point data

Remote sensing data such as those from MODIS are not without problems. First, many of the fire points recorded relate to fires set by farmers to clear their fields, which are contained within the fields and hence pose no threat to the forests or natural grasslands. Remotely sensed data cannot distinguish between legitimate fires and 'wild fires' that escape and burn large areas of natural habitat, including entering into natural forests. Second, other fires are from the burning of rubbish in towns and villages. Again these are controlled fires that pose no threat to the forests. Finally, there is a correlation between the number of fires recorded and the rainfall in a given year - with drier years having more fires. Recent droughts may have contributed significantly to the increasing fires in the region.

What can be done to improve the situation?

Developing and implementing fire management strategies with District authorities and especially with villages is the only conceivable way to reduce the number of fires in the Eastern Arc. Fire strategies have been developed in all villages in the North Pare Mountains of Mwanza District, based on locally agreed and implemented bye laws. National laws preventing fires also exist, but tend not to be respected in the rural areas where local bye laws are more important. CMEAMF is in the process of gathering and synthesizing knowledge on fire management strategies in the Eastern Arc, and hopes that this can help understand ways to reduce the number of fires in the region and prevent further loss of forest to this cause.

Figure 1. Fires per square kilometer of land across the Eastern Arc mountains over the past 5 years (note that data for 2000 are only for November and December and for 2005 are for only 9 months until the end of September). Black bars = fires in Forest Reserves (central government, local government and proposed); Grey bars = fires in plantations; White bars (fires within remaining lands of the Eastern Arc mountains inside 14 districts).

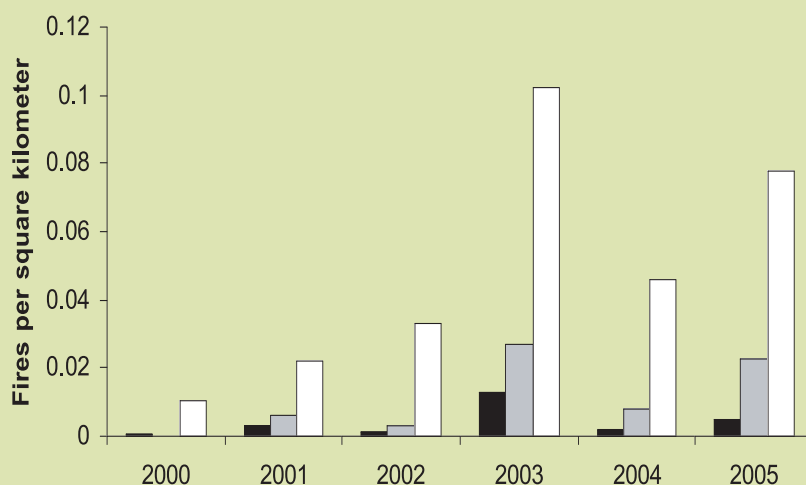
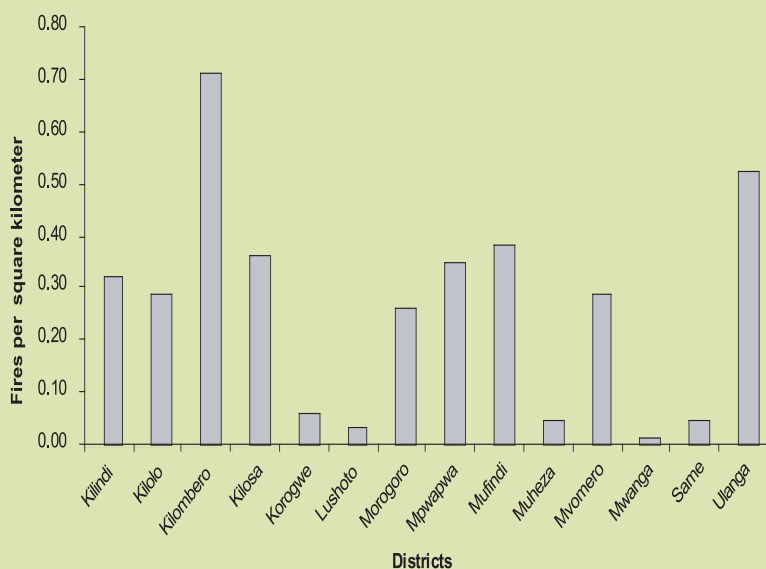


Figure 2. Mean number of fires per square kilometer of land over the past 5 years within the Eastern Arc portion of 14 Districts in eastern Tanzania



A summary of the fire data by District shows that some districts have more fires than others (Figure 2). Districts with numerous fires are Kilombero and Ulanga, whereas other Districts have far fewer, in particular Korogwe, Lushoto, Muheza, Mwanza and



Photo by: David Loserian

MINING

Has the mining problem in the Eastern Arc mountains been solved?

Mining in the Eastern Arc reached its peak in early 2004 with as many as 90,000 people involved. Protected area authorities and others have since succeeded in bringing the problem largely under control. This article asks 'what have we learnt?' from the experience.

Photo by Neil Burgess

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In early 2004 gold mining was identified as a serious threat to the forests and streams in the East Usambara Mountains. The mining camps were also causing serious social problems for nearby villages ranging from violent crime, thefts, poor sanitation and disease; damage to agricultural crops; rapid deterioration of roads from vehicles transporting the miners and potential for increased HIV transmission rates. At that time, mining was affecting Amani Nature Reserve and Semdoe, Nilo and Longuza Forest Reserves and

Derema proposed forest reserve. There were also large numbers of miners outside of these reserves, in particular at Sakale, Nelusanga and Mlesa - with perhaps 40,000 miners found in these areas. In addition a peak of 40,000 people was recorded gold mining in the Balangai West forest reserve in the West Usambaras in early 2004. Prospecting teams were also found in other parts of the West Usambaras, for example in Baga I, Baga II and Ndelemai forest reserves.

Early in 2004 there were also around 3,000 gold miners in farmlands and forests in the North Nguru (Nguu) mountains, including Pumula, Derema and Kilindi forest reserves. In the Ulugurus small numbers of miners were found panning for gold in the Kimboza, Ruvu and Mvuha/Chamanyani Forest reserves, within the rivers and streams.

Interventions by government, village leaders and concerned citizens have tried to bring the situation under control since early 2004. A combination of

interventions by international agencies, the president Benjamin Mkapa (Daily News article of 1 April 2004 - 'water is more precious than gold'), Regional and District Commissioners, Forestry and Water authorities, projects such as CMEAMF and NGOs such as TFCG and WCST made it more difficult for the miners to operate illegally within reserves or openly outside them.

The number of miners present in the East and West Usambaras is now considerably reduced. At the Sakale mine site in the East Usambaras only a few tens of miners remain. Around Amani in the other forest reserves of the East Usambaras small groups of



miners raid streams at night and remove sediment for processing, and there are also mining activities in Kambai forest reserve in the East Usambara lowlands. In the West Usambaras mining has generally been stopped in Balangai West, and the activities of the prospecting parties have been much reduced. In the Nguu mountains miners are still present, however, with some of these having moved from the East and West Usambaras.

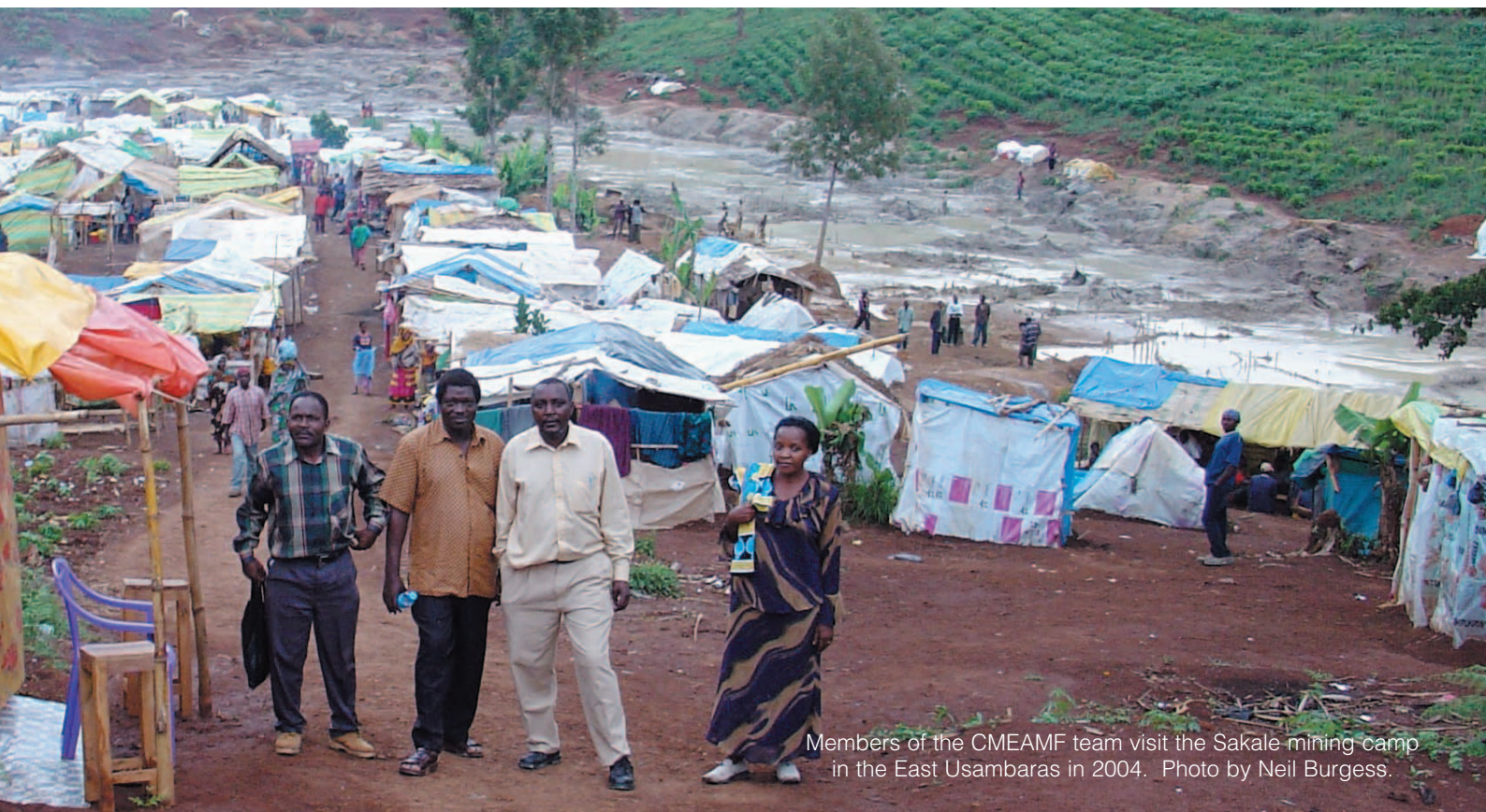
Other forms of mining also pose a threat to the forests of the Eastern Arc. Gemstones such as rubies, sapphires, tourmaline and rhodolite (garnet) are found in the region. Mining for these gems is artisanal, but the large number of people involved can cause significant damage to the forests, generally close to water courses where the gems have become concentrated in alluvial deposits. Forest reserves where gem stone mining is occurring are: Ruvu in the lowland Ulugurus (considerable damage), Mafwomero (little damage), Mangalisa (considerable damage) in the Rubehos, Nguru South (considerable damage). In Mpwapwa the proposed Kiboriani forest is also being mined heavily for gem stones. Kimboza and Wota forest reserves have also been mined for marble and limestone. One issue is that the Ministry of Mines issues licences for mining without knowing where the mining will actually take place, and this can be within forest reserves. There is also no proper monitoring of the impact of the mining. The number of people mining for gem stones in the Eastern Arc forests is not believed to have declined and there has been no special government effort to prevent these activities.

In conclusion, the pressure from illegal gold mining on the forests of the East Usambaras has been significantly reduced from the peak in early 2004. This is also the case in other parts of the Eastern Arc where it was formerly occurring. However, there are still gold miners in the Eastern Arc and the problem is not fully

solved. Continual vigilance will be required to prevent the problem escalating again. Other forms of mining are still occurring in many forests across the Eastern Arc and these pose a considerable threat to forests and aquatic biodiversity as well as resulting in a number of serious social problems for local people.



A forest stream affected by mining in the Amani Nature Reserve. Photo by Neil Burgess.



Members of the CMEAMF team visit the Sakale mining camp in the East Usambaras in 2004. Photo by Neil Burgess.

How well managed are the Eastern Arc Mountain Forests?

The forest at Mazumbai is one of the best managed forests in the Eastern Arc Mountains. Photo by Nike Doggart

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Introduction

The Eastern Arc Mountains contain more than 150 forest sites under differing ownership and management regimes. The majority of the sites (106) are under the management of the Forest and Beekeeping Division through the catchment forestry programme. Other forests are within Local Authority Forest Reserves under the management of the District Council, and there are some Village Forest Reserves under village government control. Two additional forest areas are found within National

Parks under the authority of TANAPA. Some other forest areas are privately owned for example in the tea estates and in the Mazumbai research forest in the West Usambara mountains, and still other areas are not formally protected and are part of the village or general lands.

In order to develop a long term strategy for conservation in the Eastern Arc Mountains, CMEAMF needed to know which management regimes are the most effective at managing forest resources. The project also needed information on the current level of management effectiveness in order to track changes in that issue over time. To provide answers to these questions, the project contracted FORCONSULT, based at the Sokoine University of Agriculture, Morogoro to gather data on the management effectiveness of as large a sample of the Eastern Arc Mountain forests as feasible. This work was

undertaken from January to July 2005.

Collection of management effectiveness data

We used the existing World Bank/WWF management effectiveness tracking tool to capture data on the effectiveness of management in 126 forest sites across the Eastern Arc. This tool was designed as a simple way to capture management data that can be tracked across time and rolled up globally to show the state of management of the worlds protected areas. Data was collected in two phases. First we worked with District catchment and forest officers from each of the 14 Districts covering the Eastern Arc to capture management effectiveness for 26 reserves in the field. Second we convened a meeting in Morogoro for the already trained forest staff from the Districts, and used this event to score the management effectiveness of another 100 reserves across the Arc.

How effectively managed are the Eastern Arc Forest Reserves?

Management effectiveness scores are summarised for 126 forest sites (84 Central Government forest reserve, 18 each for Local Government forest reserve and Proposed forest reserves, four private forests and two village forests). Only Mazumbai private forest (0.8%) was in the "very good" management category of > 60%. Most Eastern Arc forests (81 forests, 64.4%) have 'average' management-effectiveness scores of 31% to 45% (Table 1). These are mainly managed by the catchment forest programme of FBD and by

Table 1. Number of forest sites in each management effectiveness score class in the Eastern Arc Mountains of Tanzania

Forest category	Scores%			
	Poor	Average	Good	Very good
	15-30	31-45	46-60	>60
CGFR	18	60	6	
LGFR	4	13	1	
Proposed	13	5		
Private		2	1	1
Village forests		1	1	
TOTAL	35	81	9	1
Percentage	27.8	64.3	7.1	0.8

the private forests and then in the Village and Central Government catchment forest reserves. They are weakest in the proposed Forest Reserves and the Local Authority Forest Reserves. District Forest Officers managing LAFRs often have no operational budget for forest management, and are mainly tasked to issue licences for forest harvesting to augment the District budget.

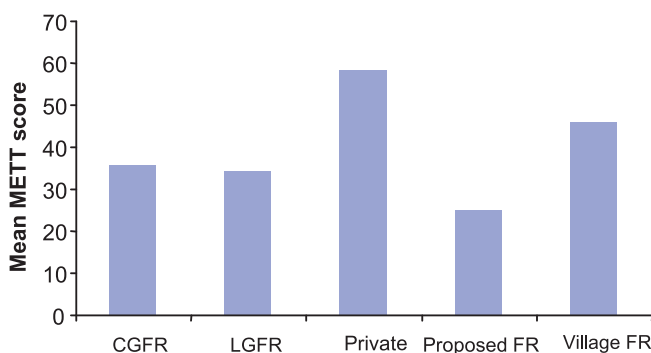
Further reading

Madoffe, S.S and Munishi, P.T.K. (2005). Eastern Arc Mountains : Forest condition assessment. www.easternarc.or.tz

villages. Conversely, four Local Government Forest Reserves and 13 proposed forest reserves have 'poor' management (15% - 30%). No Eastern Arc forests fell in the very poorly managed category (<15%).

From these data private forests have better management effectiveness than the two types of government managed Forest Reserves or village forests, and the proposed forests are the least effectively managed (Figure 1). These results track in general terms of levels of forest disturbance found in these different forest categories.

Figure 1. Mean management effectiveness tracking tool (METT) scores across the various categories of forest in the Eastern Arc. CGFR=Central Government Forest Reserve (n=85), LGFR= Local Government Forest Reserve (n = 18), Private = Private forest (n=2), Proposed FR=Proposed Forest Reserve (n=18), Village FR = Village Forest Reserve (n=2).



How to improve the effectiveness of management of Forest Reserves in the Eastern Arc?

Our impression, not based on analysis, is that the effectiveness of management of Eastern Arc forests is based on two major factors: the degree of ownership and control, and the funds available for management activities. Management and control are strongest in



Further work is needed to determine whether forests such as Chome which are under participatory forest management are better managed. Photo by Neil Burgess.

Is the available funding and staffing sufficient to manage the Eastern Arc Mountain forests?

Neil Burgess
and Felician
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Morogoro

A recent paper in the Arc Journal summarised the available capacity for management within the Eastern Arc Mountains. Here that analysis is updated using data from within Forestry and Beekeeping Division in Dar es Salaam. The potential contribution of the new

Eastern Arc Mountains Conservation Endowment Fund in assisting the Forest and Beekeeping Division with sufficient resources to manage the Eastern Arc Mountain Forest Reserves sustainably is also assessed.

What capacity is available for management?

Staff Numbers

A survey in 2004 indicated that the highest number of foresters is found in the Districts of Morogoro/Mvomero (50), and the smallest number in Mpwapa (5). Staffing rates are much higher in the two national parks managed by TANAPA. Between 2004 and 2005 a number of catchment forest officers have gone for further training at Sokoine University of Agriculture. A few new staff have also been recruited at District level.

District Councils	79 foresters
Regional Catchment Forest offices	9 senior foresters, 50 other staff
District Catchment Forest offices	69 foresters
Other central government staff	11 foresters
Forest attendants	199
TANAPA staff	17 professionals
TANAPA rangers etc	101 supporting staff

Equipment

In 2004 forestry management authorities had the following equipment at their disposal: 24.5 vehicles (1.75/district), 42 motorbikes (3/district), 15 computers (1.1/district) and 4 photocopying machines (0.3/district). The two national parks have a similar number of vehicles, but fewer motorbikes or computers. During 2005 some additional vehicles and motorbikes have been allocated to the regional catchment offices and the Districts through the Tanzania Forest Conservation and Management Project, funded by the World Bank.

Management Funds

The Tanzanian government pays the salaries of all the forestry staff across the Eastern Arc, totalling over 400 million TSH (more than \$400,000) per annum. Funding available to support forest conservation activities on the ground is limited, and came from a variety of sources in 2004.

Tanzanian government funds to District foresters	54 million TSH = \$54,000
Tanzanian government funds to Regional foresters	3.5 million TSH = \$3,000
NORAD support to catchment	60 million TSH = \$60,000
PFM support (DANIDA)	180 million TSH = \$180,000
District support (GTZ)	95 million TSH = \$95,000
Irish Aid support	10 million TSH = \$10,000
UNDP GEF	c.100 million TSH = \$100,000

Contributions to forest conservation activities in Eastern Arc mountains also come from NGOs such as TFCG (Korogwe, Muheza, Mufindi, Mvomero), WWF (Kilombero, Muheza), WCST/DOF (Morogoro) and CARE (Morogoro/Mvomero). Currently the forests of Morogoro and Mvomero Districts, primarily those of the Uluguru and Nguru Mountains, receive the greatest input of funding from all combined sources.



Staff and advisors from the Forestry and Beekeeping Division and Endowment Fund. Photo by Neil Burgess

Are these resources enough?

According to one protected area funding model the likely costs of managing African mountain habitats is around US\$ 364 per sq km per annum. The rough area of reserved land in the Eastern Arc is around 7,400 sq km, of which around 2,000 sq km is managed by the Tanzania National Parks and private landowners. TANAPA and the private landowners have enough funds to manage their lands adequately. This leaves the Forest and Beekeeping Division managing around 5,400 sq km of land, within Forest Reserves. The sustainable funding required to adequately manage the Forest Reserves in the Eastern Arc Mountains controlled by FBD would be in the region of :

**5,400 sq km x US\$ 364 per sq km/annum
= \$1,900,000 per annum.**

The current funding available to FBD for the management of the Eastern Arc Forest Reserves is around US\$ 450,000 from the government sources, with perhaps as much again from donor sources. Hence the government is providing about 25% of the funding needed for adequate management. Donor funding contributes another 25% but this is not guaranteed and a sustainable funding source is required.



Some Eastern Arc districts have no vehicles available for forest management work.
Photo by Neil Burgess.

Adequate management of the Eastern Arc forests probably requires three times more money than is currently available from government sources. An Endowment Fund (the Eastern Arc Mountains Conservation Endowment Fund) has recently been established and is one strategy aiming to increase the funds available for management. The committed capitalization of this fund is US\$ 7,000,000 and the 5-year target is to increase this to US\$ 14,000,000. However, our simple calculations indicate that to generate the required amount of money for forest management this Endowment Fund would have to be capitalised to at least US\$ 20,000,000 (assuming around 10% interest rate, some off-take to manage the Endowment Fund Secretariat, and that the majority of the funds generated will be used to support forest conservation activities).



Water users such as TANESCO rely on the water flowing from the Eastern Arc Mountain forests. How can major water users such as TANESCO contribute directly to the management of the catchment forests? This is the question being addressed in discussions on payments for environmental services within Tanzania and could make a significant contribution to sustainable funding. Photo by Nike Daggart.

Various agencies are actively seeking ways to further capitalise the Endowment Fund. Some of the key approaches are:

- To seek additional capital for the Endowment Fund from donors, Foundations and NGOs, to provide additional funding for forest management and thus provide a long term sustainable solution to the funding issue.
- To support work to make Payments for Water Environment Service Schemes operational in the Eastern Arc, providing an additional source of funding for management.
- Work to influence the Government of Tanzania to recognize the contribution that forests make to the economy of Tanzania and hence increase the amount of money available for management.

In order to achieve the goal of adding capital to the Endowment Fund serious efforts will need to be made by a variety of actors - ranging from locally based NGOs and the government of Tanzania, through to international organisations and financial bodies. Investment into the Endowment Fund to support sustainable forest management would make excellent economic sense for the long term economic development of Tanzania.



Many forest attendants houses are in a state of disrepair such as this building at Bunduki in the Uluguru Mountains. With support from CMEAMF, the house is being renovated. Photo by Neil Burgess

The development of a strategy for improved conservation in the Eastern Arc Mountain Forests of Tanzania



The Eastern Arc Mountains Conservation Centre in Morogoro. Photos by Neil Burgess.



The Conservation and Management of the Eastern Arc Mountain Forests project marks a significant step forwards in securing the long term conservation of the area. Rapid progress by the strategy team has enabled a wide range of stakeholders to share their ideas on how we can secure the future of these unique forests.

Background

Felician Kilahama and Neil Burgess, CMEAMF, P.O. Box 289, Morogoro, Tanzania

Conservation and Management of the Eastern Arc Mountain Forests (CMEAMF) has been formulated as a project within the Forestry and Beekeeping Division (FBD) that aims to develop and assist the implementation of a strategy for the sustainable conservation of the Eastern Arc Mountain Forests. The project is supported by the Global Environment Facility through UNDP. A linked package of GEF funding is provided through the World Bank to a sustainable financing mechanism - the Eastern Arc Mountains Conservation Endowment Fund (EAMCEF). Both CMEAMF and EAMCEF are based in the former Morogoro regional natural resources office that has been renovated to form the Eastern Arc Mountains Conservation Centre.

Expected Outcomes of the Project

CMEAMF has a number of outcomes that provide a platform to develop the proposed Eastern Arc strategy and, at the same time, address critical conservation issues in the Eastern Arc. The four strategy outcomes are:

1. Conservation status of the Eastern Arc Mountains improved as stakeholders use the Eastern Arc strategy as a framework to guide conservation

investments.

2. Eastern Arc forest values reflected in National and District priorities and budgets
3. Eastern Arc Adaptive Monitoring Program contributes to the national monitoring systems
4. Improved support for the conservation of the Eastern Arc at national and international levels

Achievements

1. Conservation status of Eastern Arc Mountains improved as stakeholders use the Eastern Arc strategy as a framework to guide conservation investments.

Strategy development process. The strategy team held stakeholder consultation meetings at village, ward, district and national levels aiming to identify the problems facing the Eastern Arc Mountains. Several thousand people have been consulted. Several hundred stakeholders have also been asked to identify the best solutions to major problems. For the most critical issues - bush fires, unsustainable forest use, payments for water (and potentially carbon) environmental services - specific consultancies will provide further guidance on the way forward.

Developing partnerships. The strategy team is working to build partnerships with all Eastern Arc stakeholders to facilitate the development and implementation of the strategy. The aims are that by 2008 at least 10 conservation projects operating in the Eastern Arc are mainstreamed under the National Forest Programme and are working together to tackle the priority issues identified in the Eastern Arc strategy. Also, that by 2007, the Eastern Arc Trust Fund utilises

the E. Arc strategy as a guiding document for its investments. Considerable progress has been made to develop partnerships to develop and then implement the Eastern Arc strategy. As examples, strong partnerships are developed with the Catchment Forestry Programme and Monitoring and Evaluation Unit of FBD, with the Eastern Arc Mountains Conservation Endowment Fund, with the Critical Ecosystem Partnership Fund (www.cepf.net) and with environmental NGOs.

Enhancing the protected area network. The network of protected sites in the Eastern Arc Mountains is fundamental to conserving biodiversity in this region. CMEAMF aims that by 2007 nine proposed Eastern Arc forest reserves are gazetted, increasing protected area coverage by at least 5,000 ha. It also aims that by 2006 high biodiversity value Eastern Arc forest reserves are officially recognised as protected areas (potentially over 100 reserves covering more than 7,000 sq km). Other elements of CMEAMF work seek to upgrade key forest reserves to the status of 'nature reserve' and to recognize the entire area as a World Heritage Site. As well as improving the protected area networks overall, CMEAMF also aims to improve the management of reserves, especially in the Uluguru Mountains.

Reducing key threats. Various threats face the Eastern Arc Mountains (see elsewhere in this volume). For the key threats (fire, unsustainable use), the project is developing specific strategies to tackle these issues. Other threats, such as illegal mining and logging have already been addressed through project advocacy and awareness raising. The issue of gold mining within Forest Reserves (especially in the East and West Usambara Mountains) has been brought under control since the project started in 2004. This has been possible through lobbying and awareness raising with the mass media playing an active role.

Improving the legal framework. Over the past 10 years, Tanzania has developed a comprehensive Forest Policy, Forest Law and Forest Regulations. However some gaps still remain - for example on regulations on joint forest management, and on the declaration of Nature Reserves. Attempts will be made to address these gaps through project activities starting in 2006.

2. Eastern Arc forest values reflected in National and District priorities and budgets

National and District financing. Limited funding is available from the Tanzanian government to support conservation in the Eastern Arc Mountains. This is one of the major challenges to sustainable conservation. The aim of CMEAMF is that by 2008 Eastern Arc conservation strategy elements should be incorporated into District Development Plans in each of 14 Districts covering the Arc. At the national level significant increases in funding to forest managers is anticipated through the catchment forest programme of the Forestry and Beekeeping Division.

Improving long term sustainable financing.

Establishing a long term sustainable funding mechanism provides a way to add to government and donor contributions to forest conservation. CMEAMF aims that by 2008 calculations of the economic values of the Eastern Arc forests result in at least 20% increased funding allocations from the government of Tanzania. Furthermore, that by 2008, water users are contributing funds to the conservation of the Eastern Arc Mountain forests. Finally, that by 2008 at least \$1 million additional capital has been raised for the Eastern Arc Mountains Conservation Endowment Fund. Work is progressing to achieve these targets; potential sources of additional capital for the Endowment Fund have been identified, and ways to harness water payments to further conservation activities are being explored.

3. Eastern Arc Adaptive Monitoring Program contributes to national monitoring systems

Establishing long term monitoring frameworks. The monitoring programme is focused on collecting natural resource and socio-economic data. By the end of 2005 the CMEAMF natural resources impact monitoring system should be contributing data to NGO databases. Also, by end 2006, this system should be harmonised with and contributing data to the National Forest Programme. Much progress has been achieved, and harmonisation with NGO and the NFP/PO-RALG databases is underway. Some of the information that will form the basis of the monitoring system is reported in this volume, and further data gathering is being undertaken through FBD and through the Critical Ecosystem Partnership Fund project investment.

4. Improved support for the conservation of the Eastern Arc at national and international levels

Changing national attitudes and awareness. The original target for this work was that by 2006 a measurable change is demonstrated in attitudes relating to conservation of Eastern Arc Mountain forests across 14 Districts. TFCG is leading this component and through consultation with a wide range of stakeholders has developed an information, education and communication strategy that is now being piloted.

Promoting the Eastern Arc nationally and internationally. The Eastern Arc Mountains, despite their global importance for biodiversity, and national economic importance are not well known in Tanzania. CMEAMF aims to promote the Eastern Arc as an accepted priority for investment. The project is also actively summarizing and promoting the values of the Eastern Arc - through various media such as written publications, an internet web site, talks, newspapers, television and radio broadcasts.

For further information on the project and a full set of reports and other materials, please visit the internet site: www.easternarc.or.tz.

Where is the Eastern Arc Mountains Conservation Endowment Fund going to make its conservation interventions?



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Background

The Eastern Arc Mountains Conservation Endowment Fund (EAMCEF) was officially registered on 6th June 2001. The EAMCEF is designed to help safeguard the Eastern Arc Mountains of Tanzania. The Fund is a joint initiative of the Government of Tanzania, the Global Environment Facility (GEF) and the World Bank.

The objective of EAMCEF is to provide funding to projects for biodiversity conservation in the Eastern Arc Mountains of Tanzania. A principal mission of the EAMCEF is to ensure that the government, civil society and the private sector are fully engaged in efforts to conserve the unique biodiversity of the Eastern Arc Mountains of Tanzania. A key working principle is to ensure that EAMCEF efforts complement existing strategies and ongoing frameworks established by other players in the Eastern Arc Mountains.

The EAMCEF aims to promote working alliances among diverse groups, combining unique capacities and reducing duplication of efforts so as to forge a comprehensive and coordinated approach to conservation.

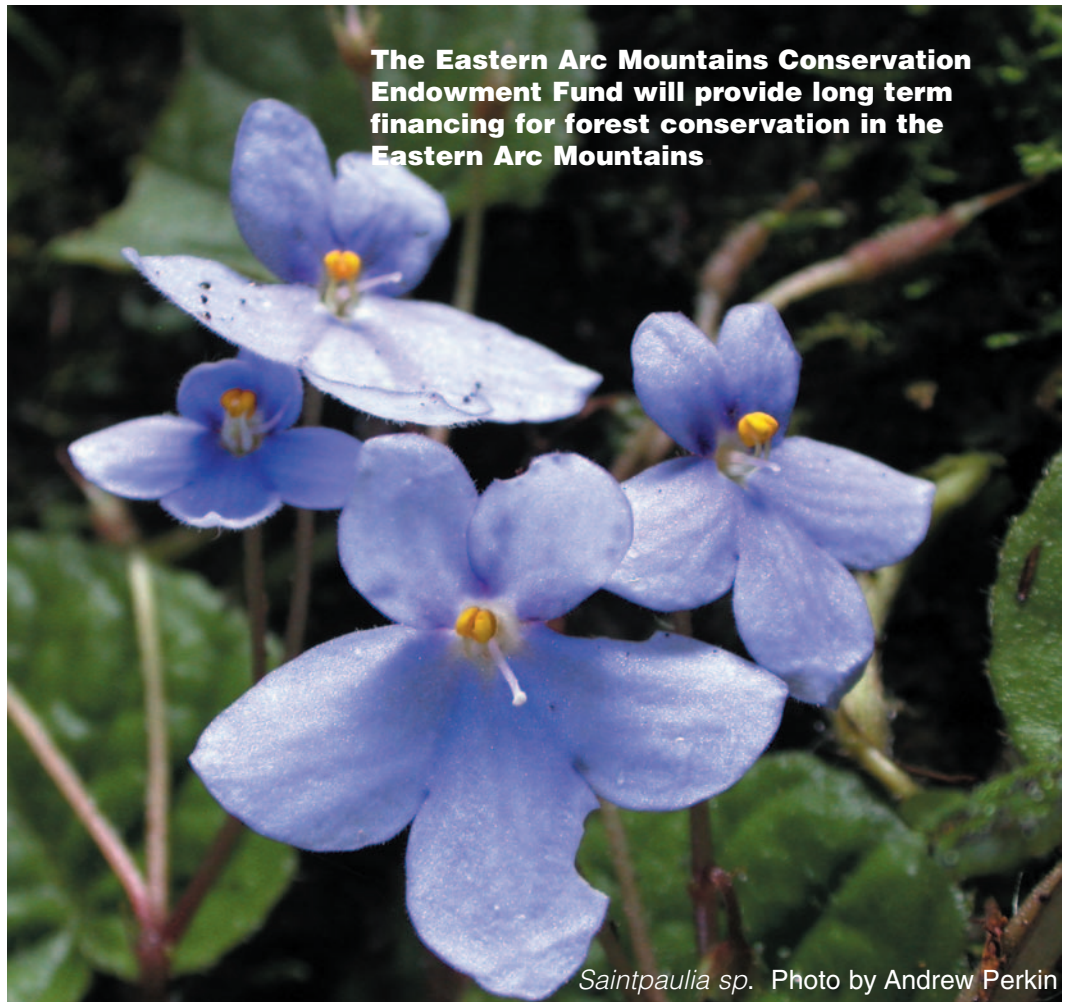
Original site prioritisation for investment

While planning EAMCEF in 2000/2001 a prioritisation of field sites was undertaken among all the mountain blocks of the Eastern Arc. The priority ranking made was done on the basis of biodiversity values, economic values, levels of threats, existing funding levels and issues to be addressed. The results of the analysis at that time ranked the East Usambara,

Uluguru and Udzungwa mountain blocks as priority sites for EAMCEF to invest funds to improve conservation.

In areas where project activities were ongoing, a further assessment was undertaken to determine:-

- Who is where and doing what and since when?
- What is the capacity of each one and what are the future plans and budgets?
- Who are the expected and potential donors?
- What are the funding gaps?



The Eastern Arc Mountains Conservation Endowment Fund will provide long term financing for forest conservation in the Eastern Arc Mountains

Saintpaulia sp. Photo by Andrew Perkin

Recent refinement of these priorities

This prioritisation was further refined during 2004 and 2005. The attributes of the East Usambara, Uluguru and Udzungwa blocks were reviewed in more detail (Table 1). Based on this work it was decided that :

- Current funding from the EAMCEF should be directed to areas in most need and where the

impact will be clearly distinctive.

- The East Usambara block which has a high number of endemics and few external funds is recommended to be considered the first priority followed by the Udzungwa where over 50% of its whole area does not have any funding.
- The Uluguru Mountain block is recommended to be excluded from funding through EAMCEF for the time being as this block currently receives significant donor funding (UNDP/GEF through CARE, \$2.86 million, WCST/DOF, \$1 million). While each hectare of the Uluguru block receives conservation investment of over US\$ 100, each hectare of the Udzungwa Mountains receives less than US\$ 0.18.
- When EAMCEF have built enough capacity and gained sufficient experience the next priority area is the West Usambara Mountains. Other Mountain blocks will be continuously added as dictated by the current circumstances on the ground, and the funds available to EAMCEF.

By the end of 2005, EAMCEF was finalising arrangements to start limited funding of field projects in a few of the critical sites in the East Usambara (Nilo Forest Reserve and Amani Nature Reserve) and Udzungwa (Uzungwa Scarp and Iyondo Forest Reserves) Mountains. It is expected that these investments will become operational on the ground in January 2006. This will represent the first



The Sanje Waterfall in the Udzungwa Mountains. Initially EAMCEF will focus investment on the East Usambara and Udzungwa Mountains. Photo by Andrew Perkin

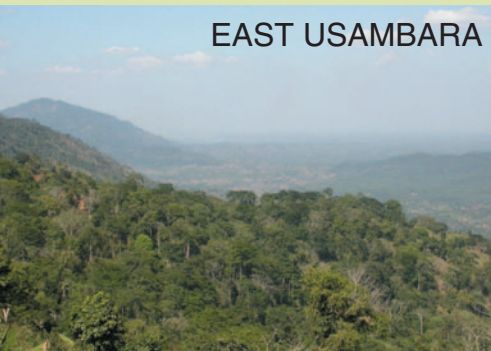
phase of a new stage in funding of conservation activities in the Eastern Arc Mountains, and we hope that it will signal a way forward with sustainable funding for the area.

Table 1: Attributes of East Usambara, Uluguru and Udzungwa blocks used to further prioritise areas for investment

Mountain Block	Total forest area (ha)	Total Number of Forests	Number of Forests with Funding	Total Forest Area with funding (ha)	Number of Forests not funded	Total area (ha) without funding	Biological values of forests not funded	Average Funding (US\$ per ha forest)
East Usambara	32,000	20	1, ANR	8,380	19 (95%)	24,000 (75%)	Very High	4.6
Uluguru	35,650	13	11	35,650	2 (15%)	280 (1%)	Average	112.2
Udzungwa	440,357	45	13	155,125	32 (71%)	285,232 (65%)	Very High	0.18



NORTH PARE



EAST USAMBARA



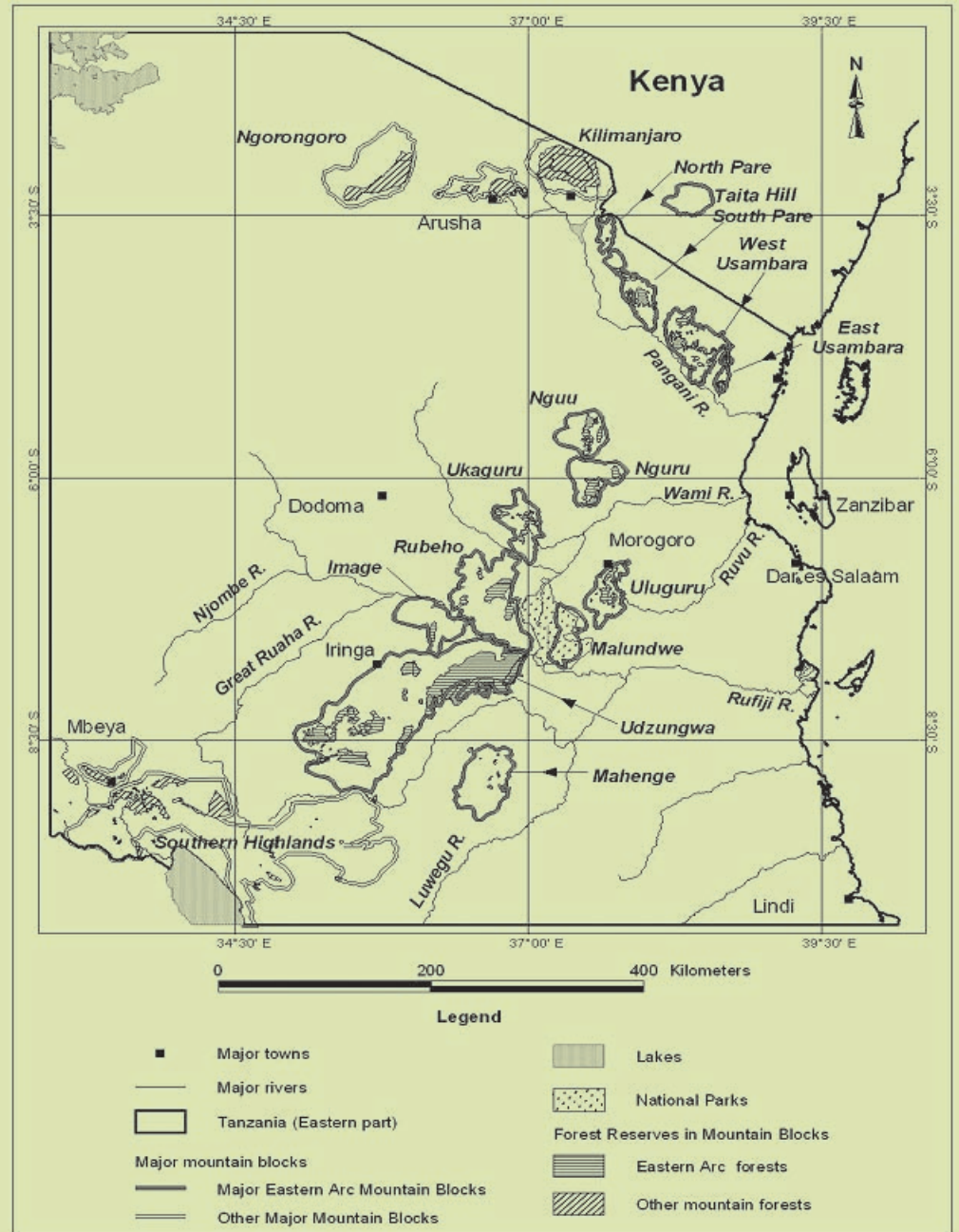
SOUTH NGURU



UKAGURU



ULUGURU



MALUNDWE



UDZUNGWA

What next with monitoring?

This issue of the Arc Journal has outlined the status of the Eastern Arc Mountains. Although incomplete, we hope it provides a basis to monitor changes in coming years. Institutionally the information summarized here will be captured within the national forest database at the Forest and Beekeeping Division in Dar es Salaam. An institutional agreement with the Critical Ecosystem Partnership Fund (CEPF) is also being worked out that will allow data from the Forest and Beekeeping Division to also be shared with the 'outcomes database' being developed for the Eastern Arc and Coastal Forests Hotspot for CEPF by BirdLife International (WCST in Tanzania).

The Eastern Arc data will also make a contribution to measuring the implementation of the Tanzanian National Forest Programme, the Poverty Reduction Strategy (MUKUKUTA) the Millennium Development Goals, and the 2010 targets agreed at the World Environment Summit in Durban in 2002. As such the baselines presented here can also be used as a contribution to Tanzania's reports to various international agreements and conventions.

Of course monitoring also requires information to be collected in the future, otherwise there is only a single static point and changes cannot be deduced and used for management. CMEAMF will retain some of its funding to repeat in part (or in some cases all) of the above work to measure changes and impacts over its 5 year lifespan. Collaboration with CEPF work will also allow further monitoring to be completed and together these two initiatives should be able to track important changes until 2008/09.

Finalising the Eastern Arc Strategy

The Eastern Arc strategy project aims to bring together all that it has learned and to develop a coherent strategy for conservation across the mountains. Key threats have to be addressed and overcome, the status

of the protected areas need to be improved, local people and foresters need to work together to improve conservation, and sustainable sources of funding need to be identified and made to work for conservation. In 2006 key stakeholders will be asked to assist CMEAMF to complete the strategy document, which will be presented to the National Forest Programme Steering Committee for endorsement. Some of the key issues are already funded for implementation, and more practical implementation will commence in 2006. In addition to this, assistance will be provided to the establishment and operationalisation of the Eastern Arc Mountains Conservation Endowment Fund, as that permanent body will increasingly take over elements of the work that CMEAMF has started.

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This special issue of the Arc Journal is also part of implementing the CMEAMF Information, Education and Communication strategy in terms of providing people with information to allow them to appreciate the importance of the Eastern Arc Mountains and to make better management decisions. Electronic versions of this Arc Journal are available on www.tfcg.org and www.easternarc.or.tz

About the Tanzania Forest Conservation Group

Established in 1985, the Tanzania Forest Conservation Group is a Tanzanian non-governmental organisation promoting the conservation of Tanzania's high biodiversity forests.

TFCG's Vision

We envisage a world in which Tanzanians and the rest of humanity are enjoying the diverse benefits from well conserved, high biodiversity forests.

TFCG's Mission

The mission of TFCG is to conserve and restore the biodiversity of globally important forests in Tanzania for the benefit of the present and future generations. We will achieve this through capacity building, advocacy, research, community development and protected area management, in ways that are sustainable and foster participation, co-operation and partnership.

TFCG supports field based projects promoting participatory forest management, environmental education, community development, advocacy and research in the Eastern Arc Mountain and Coastal forests. TFCG also supports a community forest conservation network that facilitates linkages between communities involved in participatory forest management. To find out more about TFCG please visit our website www.tfcg.org

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The Arc Journal: Newsletter of the Tanzania Forest Conservation Group

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This edition was supported by UNDP / GEF through the Conservation and Management of the Eastern Arc Mountain forests project.

The Arc Journal welcomes articles on forest conservation and biodiversity in Tanzania. If you would like to contribute, please send your article to the Editor by e-mail at tfcg@tfcg.or.tz with high resolution digital photos and maps.

Our next edition is due out in June 2006.