POLICY BRIEF

Making African forests fit for climate change

A REGIONAL VIEW OF CLIMATE-CHANGE IMPACTS ON FORESTS AND PEOPLE, AND OPTIONS FOR ADAPTATION

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Foreword

This policy brief is the result of collaboration between the IUFRO-led CPF initiative "Global Forest Expert Panels" (GFEP), the IUFRO Special Programme for Developing Countries (IUFRO-SPDC), key experts from the Forestry Research Network for Sub-Saharan Africa, and on-going international research projects in Africa. It is based on a detailed analysis of relevant information contained in the global assessment report Adaptation of Forests and People to Climate Change (IUFRO World Series Volume 22) and more than 250 additional literature references identified by African experts. These references have been analysed in a separate scientific report "Making African Forests Fit for Climate Change".

We express our sincere gratitude to the following experts for their contributions to the analysis: Louis Bernard Cheteu (Cameroon), Joseph Cobbinah (Ghana), Francis Dwomoh (Ghana), Bernard Foahom (Cameroon), Ernest Foli (Ghana), Steve Makungwa (Malawi), Phanuel Oballa (Kenya), Henry Utila (Malawi), and Monica Idinoba and Johnson Nkem (both of whom were at the Center for International Forestry Research during the implementation of this project). We also thank Pia Katila for assisting in content editing, Alastair Sarre for language editing and the GFEP Steering Committee for both its guidance and its approval of the publication of this policy brief.

We gratefully acknowledge the financial support and expert advice provided by the German Federal Ministry for Economic Cooperation and Development through GTZ, the United States Forest Service, and the Ministry for Foreign Affairs of Finland. Without their generous support this project would not have been realized.

A short publication such as this cannot cover every issue related to the adaptation of forests and people to climate change in Africa. Moreover, the analysis reveals that there are still major gaps in knowledge about the impacts of climate change on forests and people in Africa and about how adaptation measures can best be tailored to local conditions. Nevertheless, it is our hope that this policy brief will contribute to the development of effective adaptation strategies in Africa and facilitate related international efforts.

Michael Kleine
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Chris Eastaugh
Content Editor

TARUN K. BATHIJA

AFRICAN EXPERTS GATHERED IN DECEMBER 2009 AT IUFRO HEADQUARTERS IN VIENNA TO DRAFT THE KEY MESSAGES OF THIS POLICY BRIEF.

Key messages

1) Although climate-change projections for Africa are highly variable, the average increase in temperature on the continent is likely to be higher than the average increase globally. There is a significant risk that the adaptive capacity of many African forest ecosystems to provide vital goods and services will be exceeded.

2) People in Africa are highly dependent on forest goods and services and therefore are particularly vulnerable to the impacts of climate change. Individuals, societies and institutions should be aware of the likely impacts of climate change on forests and forest-dependent people and put strategies in place to adapt to them.

3) Improving the adaptive capacity of forest-dependent communities is important in order to reduce their vulnerability to the effects of climate change. Participatory approaches should be used to obtain a better understanding of local knowledge and perceptions of climate change and to raise awareness about vulnerabilities and related adaptation measures. Moreover, there is a need to develop and reorient educational systems and programmes.

4) Climate change is adding to a range of other pressures – such as agricultural expansion and the over-use of forests – on forest ecosystems in Africa, some of which are currently more pressing than climate change. Measures that reduce non-climatic pressures can help reduce the overall vulnerability of forest ecosystems. Such measures, including forest restoration and rehabilitation, can be implemented in an integrated manner as part of sustainable forest management.

5) The development and implementation of adaptation measures as part of sustainable forest management need to be underpinned by new modes of governance that are sensitive to context, take a broad view of community needs, and respond quickly to policy learning. Governance that enables effective stakeholder and community participation, transparent and accountable decision-making, secure land ownership and tenure, and the equitable sharing of benefits and responsibilities needs to be promoted.

6) Climate-change adaptation planning in Africa is hampered by a lack of information about current and future climate-related impacts and vulnerabilities. Reliable projections of regional and local impacts require investments in research and monitoring infrastructure and increased support for early warning systems and preparedness measures.

7) Forests can play an important role in achieving broader climate-change adaptation goals but may be threatened by impacts from other sectors. Strategies for adapting forests to climate change should be coordinated with those of other sectors and integrated into national and regional development programmes and strategies.

BRUNO LOCATELLI

ALTHOUGH AFRICA CONTRIBUTES LESS THAN 4% OF GLOBAL GREENHOUSE GAS EMISSIONS, IT WILL BE MOST IMPACTED BY CLIMATE CHANGE.

'Climate change does not distinguish between industrialized and developing countries.'

H.E. Ban Ki-moon
United Nations Secretary-General

Why African forests matter

Africa accounts for about one-fifth of the earth's land area. Forests cover more than 635 million hectares, which is more than 20% of the continent's land area. Africa is home to diverse and unique forest ecosystems; the Congo Basin, for example, contains the world's second largest area of dense tropical rainforest after the Amazon. In total, African forests make up about 16% of the global forest area (Figure 1).

African forests are rich in biodiversity. The continent's tropical forests are estimated to harbour 12 000 plant species, including 7500 or more that are endemic. The Congo Basin accounts for more than half of Africa's biodiversity. Other African ecosystems with especially high numbers of endemic species include the Guinean forests of west Africa; the coastal forests of eastern Africa; the eastern Afromontane region, Madagascar, the Indian Ocean Islands, and Maputaland–Pondoland–Albany (on the east coast of southern Africa); and the Succulent Karoo of South Africa and Namibia.

African forests are important carbon sinks. They are estimated to contain over 100 gigatonnes wof carbon, which is, on average, about 160 tonnes of carbon per hectare. In the period 2000–2005, however, about 4 million hectares of forest were lost annually (mainly due to conversion to small-scale permanent agriculture), resulting in the release of large amounts of carbon to the atmosphere. Land-use change was responsible for almost half of the 500 teragrams of carbon emitted in Africa in the period 2000–2005.

Socioeconomic benefits

It is difficult to quantify the supply and value of non-wood forest products in Africa and the extent to which they will be sought in the future. Nevertheless it is clear that African people are highly dependent on forest goods and services for the supply of basic needs, income generation and employment and as a buffer in times of hardship. African households are heavily reliant on woodfuel for energy. Many rural households and increasing numbers of urban communities collect and trade non-wood forest products in order to meet their food and nutritional requirements and other domestic needs. Often it is the poorest groups in rural and urban communities that are most dependent on forests: fruits, seeds and bushmeat are often critically important as foods during periods of famine. The production and sale of gums and resins, medicinal plants, honey and beeswax, bushmeat and other products contribute considerably to local economies.

Forests are also a major source of medicines in the form of leaves, roots, tubers and bark: 70–80% of Africans are estimated to depend on plant medicine for their health care. Forest-dependent communities also derive intangible benefits from forests through their functions as cultural symbols and sacred sites and in the production of ritual artefacts.

FIGURE 1. MAIN CLIMATE ZONES OF AFRICA (DEVELOPED BY THE INSTITUTE FOR WORLD FORESTRY, JOHANN HEINRICH VON THÜNEN-INSTITUT, HAMBURG, GERMANY 2010).


MATTI NUMMELIN


BRUNO LOCATELLI


CASIMIR NEBESSE


CASIMIR NEBESSE

Given their crucial role in supporting peoples' livelihoods, forests are vital to efforts to achieve the Millennium Development Goals in Africa. Climate-induced changes in forest ecosystems, however, could have serious consequences for human well-being. Individuals, societies and institutions should be aware, therefore, of the likely impacts of climate change on forests and should have adaptation strategies in place to address them (Box 1).

70–80% OF AFRICANS ARE ESTIMATED TO DEPEND ON PLANT MEDICINE FOR THEIR HEALTHCARE.

A YOUNG MAN SETS A TRAP FOR FOREST GAME

MILLIONS OF PEOPLE IN THE CONGO BASIN DEPEND ON FOREST BIODIVERSITY AS A SOURCE OF PROTEIN. ALTHOUGH HARVEST RATES ARE DIFFICULT TO DETERMINE, MORE THAN 1 MILLION TONNES OF BUSHMEAT ARE BELIEVED TO BE CONSUMED AS FOOD EVERY YEAR IN THE CONGO BASIN.

Box 1: Defining adaptation, vulnerability and resilience

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation to climate change as 'adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities'. Adaptation can be autonomous, reactive, anticipatory or planned. Many adaptation strategies focus on strengthening the ability of a system to absorb the disturbances caused by climate change and to capture the benefits arising from it (strengthened resilience), or on increasing the degree to which a system is able to cope with climate change (enhanced adaptive capacity, thereby reducing vulnerability). The concepts of resilience and vulnerability are therefore strongly related to adaptation.

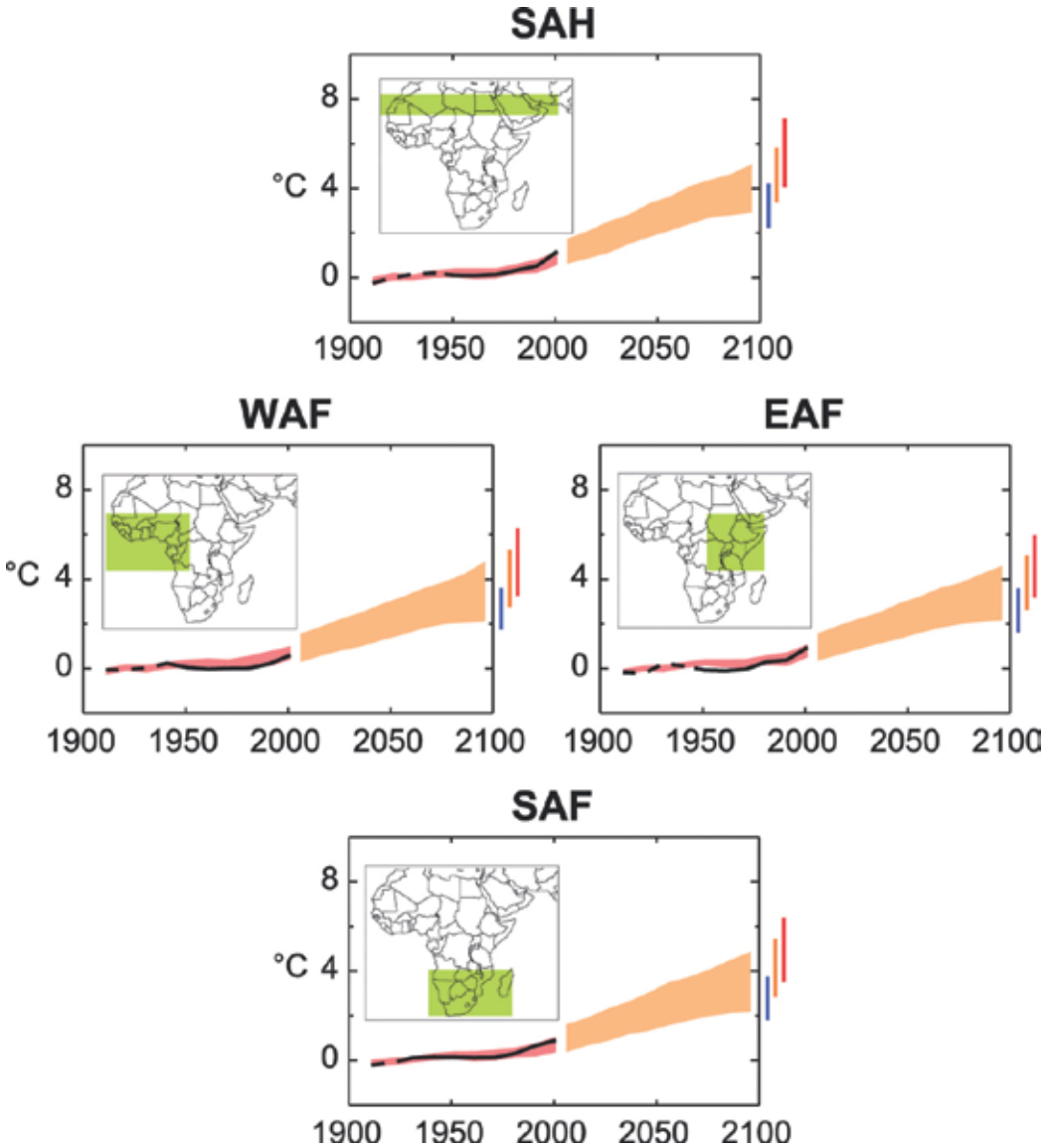
How climate change affects forests and people in Africa

Average annual temperatures in Africa rose steadily in the 20th century: in southern African countries, for example, the rate of warming was approximately 0.7°C and the six warmest years all occurred after 1980. On average, temperature increases are projected to be higher in Africa than they will be globally, with warming greatest in drier, sub-tropical regions (Figure 2). Climate models project a median temperature increase of 3–4°C across the continent by the end of the current century, which would be approximately 1.5 times the global average increase.

In the last 20 years of the 20th century there was a trend towards reduced rainfall in many southern African countries (where drought is often synonymous with famine). Nevertheless, projections show significant regional variation: while rainfall is projected to decrease in southern and West Africa it is expected to increase in eastern Africa. There may also be variations within regions and countries. For example, while southern Africa may become drier overall, some countries in that region may become wetter. Some models of climate change predict rainfall changes that could induce a more humid climate in the Sahel and parts of the Sahara.

Key message: Although climate-change projections for Africa are highly variable, the increase in temperature on the continent is likely to be higher than the average increase globally. There is a significant risk that the adaptive capacity of many African forest ecosystems to provide vital goods and ecosystem services will be exceeded.

FIGURE 2. TEMPERATURE ANOMALIES WITH RESPECT TO 1901 TO 1950 FOR FOUR AFRICAN LAND REGIONS FOR 1906 TO 2005 (BLACK LINE) AND AS SIMULATED (RED ENVELOPE) BY MMD MODELS INCORPORATING KNOWN FORCINGS; AND AS PROJECTED FOR 2001 TO 2100 BY MMD MODELS FOR THE A1B SCENARIO (ORANGE ENVELOPE). THE BARS AT THE END OF THE ORANGE ENVELOPE REPRESENT THE RANGE OF PROJECTED CHANGES FOR 2091 TO 2100 FOR THE B1 SCENARIO (BLUE), THE A1B SCENARIO (ORANGE) AND THE A2 SCENARIO (RED). THE BLACK LINE IS DASHED WHERE OBSERVATIONS ARE PRESENT FOR LESS THAN 50% OF THE AREA IN THE DECADE CONCERNED. SUBREGIONS: WEST AFRICA (WAF), EAST AFRICA (EAF), SOUTH AFRICA (SAF) SAHARAN AFRICA (SAH). CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS. WORKING GROUP I CONTRIBUTION TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, FIGURE 11.1. P.868. CAMBRIDGE UNIVERSITY PRESS, CAMBRIDGE, UK.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Observed environmental impacts and vulnerabilities

Climate change has already affected many aspects of forest ecosystems in Africa, including tree growth and dieback, the distribution of species, seasonal patterns in ecosystem processes, and the population dynamics of forest species (Box 2). In some cases it has been implicated in the extinction of forest species. In Burkina Faso, for example, the local extinction of several species valued for their non-wood forest products (e.g. Adansonia digitata, Diospyros mespiliformis and Anogeissus leiocarpa) has been attributed to a combination of recent recurrent drought and the unsustainable harvesting of these species.

The effects of climate change on forest ecosystems are often indirect, such as through altered fire patterns or changes in the incidence of pests and diseases. Evidence of increased vulnerability of forests to fire as a result of longer dry seasons combined with other disturbances can be seen particularly on the northern fringe of the Congo Basin. During the El Niño years of 1983, 1987 and 1997, fires were particularly devastating in northern Congo and southeastern Cameroon. On the other hand, some models suggest that climate change will lead to reduced fire frequency in some tropical areas.

Interactions between climate-change-related and other factors are particularly significant in Africa. Forests and trees outside forests are under intense pressure due to demand for land for agricultural expansion, the production of fuelwood and charcoal, and timber as a construction material; the combination of these pressures has led to deforestation and forest degradation on a large scale.

Box 2: Iroko

Iroko (Milicia spp) is a tropical timber tree valued for its natural durability and good working properties and its suitability for a wide range of uses. Iroko has declined in abundance in its present range due to a combination of factors including over-exploitation, poor natural regeneration, and the damage caused to seedlings and saplings by the gall-forming psyllid Phytolyma lata. Iroko occurs in low-altitude humid and sub-humid forests, but the discovery of iroko relics in Burkina Faso in the Sahel at sites of fetish worship and former special cemeteries indicates that the species group was once distributed more widely. Historic changes in climate may explain the contraction in range of iroko.

MICHAEL WINGFIELD

CLIMATE CHANGE IS ASSISTING FUNGI AND INSECTS TO INVADE EUPHORBIA INGENS IN SOUTH AFRICA, LEADING TO ITS WIDESPREAD DEATH.

MICHAEL WINGFIELD

IN SOUTHERN AFRICA, BAOBAB TREES PROVIDE A VARIETY OF TRADITIONAL PRODUCTS. THE REGENERATION POTENTIAL OF BAOBAB IS LIMITED BY FACTORS NOT RELATED TO CLIMATE, SUCH AS LIVESTOCK GRAZING, AND BY CLIMATIC INFLUENCES, SUCH AS THOSE AFFECTING THE INCIDENCE AND SEVERITY OF FIRE.

The IPCC has developed global emission scenarios for greenhouse gases and aerosols and corresponding scenarios for climate change. If greenhouse gas emissions decline during the course of the current century and carbon dioxide (CO_2) concentrations stabilize by 2100 (scenario cluster 'stable'), generally benign biome changes are projected for much of sub-Saharan Africa. If, however, emissions continue to grow over the course of the current century at rates similar to those observed in the second half of the previous century (scenario cluster 'growth'), forest decline and changes in forest types are projected to occur.

Under all scenarios in the 'growth' scenario cluster, climate change is expected to affect the distribution of forest types and tree species (Figure 3). The ranges of up to 40% of ecosystems in Africa could change, and many species may need to migrate if they are to avoid extinction or take advantage of new conditions (Box 3). Given the strong anthropogenic pressure on forest resources in most parts of Africa and the associated fragmentation and reduction of forest cover, not all species will be able to do so.

Climate change is projected to alter fire regimes, with the incidence of fire likely to increase in the Sahel and southern Africa and to decrease in tropical Africa. Elevated CO_2 levels can affect tree growth through increased photosynthetic rates and improved water-use efficiency. A number of studies have suggested that this 'fertilizer effect' may encourage the spread of forest at the expense of grasslands because it will enable trees to recover from fire more quickly and to reach fireproof levels more rapidly (Box 4). Some models even suggest that seasonal dry forests could become the dominant biome in southern Africa and that the Succulent Karoo biome, home of the world's most diverse succulent flora, could be lost as a result.

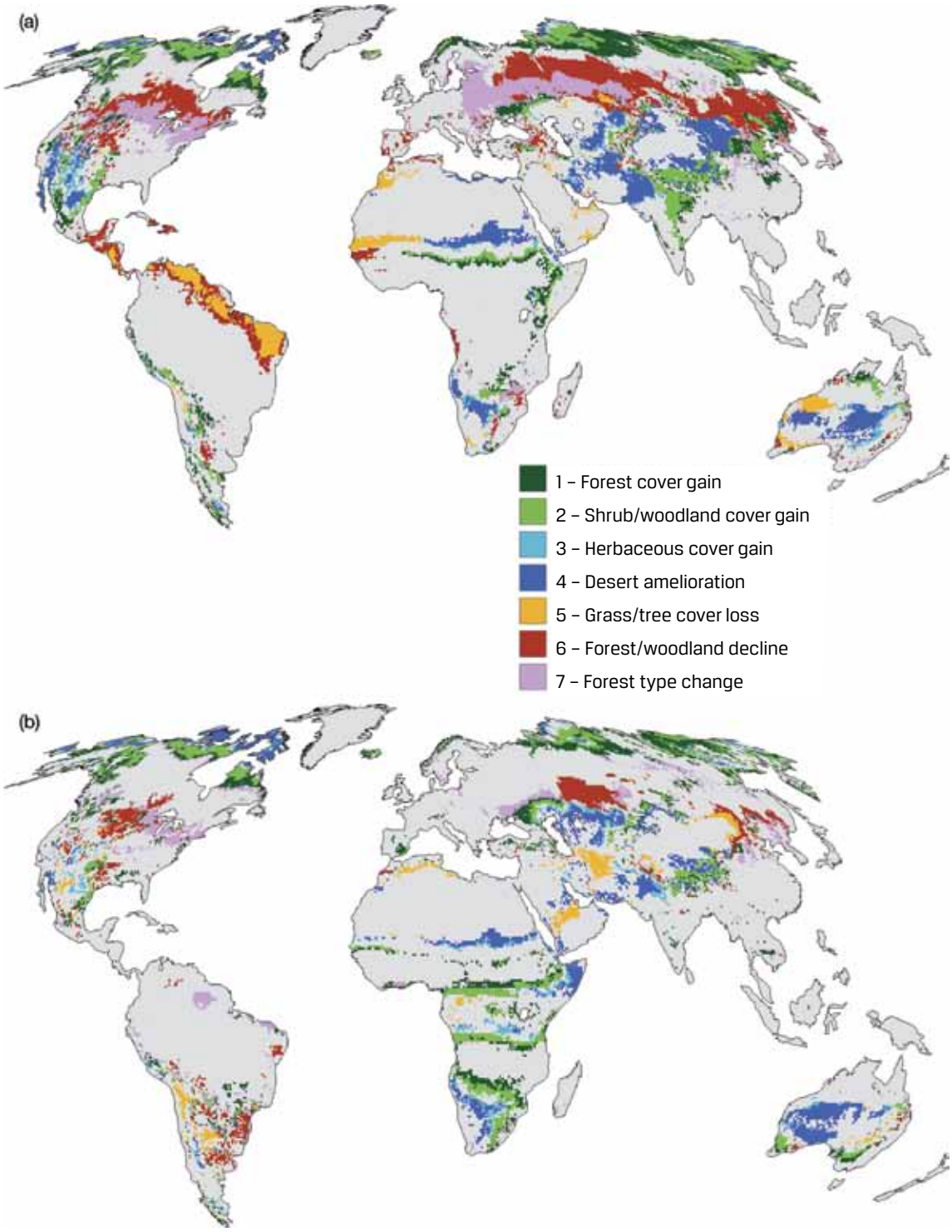
Box 3: Climate change and plant diversity in Africa

A modelling study of 5197 plant species using Hadley Centre climate projections and three distribution models predicted that the areas of suitable climate for over 80% of African plant species would decrease in size and shift to higher altitudes. The current habitats of 25–41% of African plant species would be entirely lost by 2085. Particularly dramatic changes were modelled for the Guineo-Congolean forests of West and Central Africa.

Box 4: Impact of changing fire regimes on species diversity

Climate change is projected to alter fire regimes. In southern Africa, fire-maintained ecosystems have higher species diversity than do ecosystems where fire is actively suppressed. The Cape floral kingdom, fynbos, is a biodiversity hotspot with over 7000 plant species, of which 68% are found nowhere else in the world. The fynbos occurs in winter rainfall areas and would be threatened by any change in rainfall that alters the fire regime and reduces the incidence of fire. With increasing levels of atmospheric CO_2, woody plants will reach fireproof levels more rapidly – the phenomenon of increasing tree density in savanna woodlands has been observed worldwide. If such encroachment of woody plants into fire-dependent grassland systems continues, a major change in grassland biota can be expected.

FIGURE 3. PROJECTED CHANGES IN TERRESTRIAL ECOSYSTEMS BY 2100 RELATIVE TO 2000 FOR TWO SCENARIOS FORCING TWO CLIMATE MODELS: (A) 'GROWTH' SCENARIO CLUSTER, (B) 'STABLE' SCENARIO CLUSTER. CHANGES ARE CONSIDERED APPRECIABLE AND ARE SHOWN ONLY IF THEY EXCEED 20% OF THE AREA OF A SIMULATED GRID CELL. CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY. WORKING GROUP II CONTRIBUTION TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, FIGURE 4.3. P. 238. CAMBRIDGE UNIVERSITY PRESS, CAMBRIDGE, UK.


(a)
1 – Forest cover gain
2 – Shrub/woodland cover gain
3 – Herbaceous cover gain
4 – Desert amelioration
5 – Grass/tree cover loss
6 – Forest/woodland decline
7 – Forest type change
(b)

CAPE PENINSULA NATIONAL
PARK, SOUTH AFRICA.

A warmer, drier climate in southern Africa may lead to increased damage by destructive agents such as termites. Concerns have also been raised about the effect of a drier climate on diseases in South African eucalypt plantations; bioclimatic models indicate that some South African fungal pathogens may move into previously disease-free areas and cause significant damage to commercial plantations. Recent unprecedented insect plagues in Liberia may be attributable to unusual climate patterns, and several other outbreaks have been linked to atypical rainfall patterns (Box 5).

Future socioeconomic impacts and vulnerabilities

Impact models have been used to assess the effects of climate change on vulnerable sectors in Africa such as water resources, agriculture, health, coastal zones and forestry. Recent studies have applied vulnerability-based approaches in which vulnerability is determined by existing sensitivity and adaptive capacity rather than by the projected extent of future impacts. Such studies, while to date done mostly at a coarse scale, confirm that Africa is one of the world's most vulnerable regions to climate change because of a combination of low adaptive capacity and large projected climate-change impacts.

Human activities may limit the potential of forest ecosystems in Africa to adapt naturally to climate change. Many sources agree that, in a bid to avert food crises, affected populations will increasingly depend on available natural resources and that this will lead to an increase in deforestation and forest degradation. The

Box 5: Insect outbreaks

A number of factors influence pest outbreaks in forests. In general the risk of an outbreak is higher in monocultures and forests dominated by a few species with a narrow genetic base. An evaluation of past pest outbreaks in tropical Africa, however, indicates that in a number of cases the trigger for the eruption of pest populations was rainfall – or lack of rainfall – during a critical stage of the development of the host plant, the pest, or the natural enemy of the pest. Build-ups in populations of the defoliator of obeche (Triplochiton scleroxylon) are dependent on the availability of high-quality foliage, particularly during a dry season that follows a good rainy season. On the other hand, outbreaks of the oriental yellow scale insect on neem (Azadirachta indica) in the Lake Chad Basin (which spans Chad, Cameroon, Niger and Nigeria) are linked to periods of low rainfall and prolonged drought. Recent outbreaks of a previously unnoticed defoliator – the caterpillar Achaea catocaloides – in Cameroon and Liberia may be due to a disruption of the balance between the insect and its key natural enemies brought about by changes in rainfall patterns.


BRUNO LOCATELLI


BRUNO LOCATELLI

- HUMAN ACTIVITIES LIMIT THE POTENTIAL OF FOREST ECOSYSTEMS IN AFRICA TO ADAPT NATURALLY TO CLIMATE CHANGE.
- 90% OF WOOD REMOVALS IN AFRICA ARE USED FOR FUEL.
- TIMBER PRODUCTION COULD INCREASE AS A RESULT OF RISING YIELDS DUE TO CO_2 FERTILIZATION.


MATTI NUMMELIN


MARKO KATILA

population in Sub-Saharan Africa is projected to double by 2050, increasing annual agricultural consumption by a factor of 2.0–2.8. Moreover, remaining forest ecosystems are likely to experience increased deforestation pressure due to increasing global demand for land for agro-industry development.

Wood and wood products

The vast majority of rural populations in Africa rely on woody biomass as an energy source: about 90% of roundwood removals in Africa are used as woodfuel, and trade in charcoal is a major source of income for many households. The number of people relying directly on traditional wood energy is projected to rise from 583 million in 2000 to 823 million in 2030; unmanaged, this demand will place severe stresses on forest resources. Projected shifts in vegetation, as well as secondary effects such as changes in fire and pest regimes, will alter the availability of woodfuel, putting further pressure on local resources as well as on human com-

munities. A number of regions already face woodfuel deficits, including the Sudan Sahel, Madagascar, urban centres such as Yaoundé, Brazzaville and Kinshasa, and small mountainous southern countries such as Malawi and Swaziland

In some areas, possible climate-change effects such as CO_2 fertilization and increased rainfall may improve conditions for some species. However, the magnitude of such beneficial effects and the extent to which they would be achieved by specific tree species in varying circumstances are not clear. The few studies available on the impacts of climate change on timber production and its financial returns in Africa suggest that both production and profitability could increase in plantations because of rising yields due to the fertilizer effect.

Non-wood forest goods and services

Given the difficulties in determining the current supply and value of non-wood forest goods and ecosystem services and the extent to which such goods and services will be sought in the future, assessing the influences of climate change on them is a particularly difficult task. Much more research and empirical data are needed on the influences of climate change on the production of non-wood forest goods and services and the potential vulnerabilities of forest-dependent people, and on how such vulnerabilities might be reduced.

Changes in the intensity and frequency of extreme events, such as droughts and floods, are the two most important pathways through which climate change in the region may affect non-wood forest products, although secondary effects, such as increased evapotranspiration, might also be important (Box 6). Non-climatic factors such as deforestation, agricultural expansion and over-harvesting further increase the vulnerability of non-wood forest products to climatic effects.

One of the fastest-growing economic sectors in southern Africa is wildlife-based tourism, almost completely concentrated in subtropical forests and savannas. Climate change could have a negative effect on this industry because of its projected effects on the abundance of iconic wildlife species. Moreover, the predicted increase in extreme weather conditions could restrict recreation opportunities, threaten tourism infrastructure, and deter tourists.

Box 6: Gum arabic

Sudan supplies 80% of the world's gum arabic, which is tapped from planted and naturally occurring trees of the species Acacia senegal and Acacia seyal. This product is considered to be one of Sudan's most important exports. Despite projected increases in precipitation in the gum arabic belt, increased evaporation may cause moisture stress and reduce yields. Projections show a 25% decline in gum arabic production by 2030 and a 30% decline by 2060.

MATTI NUMMELIN

PETER TARASIEWICZ

CLIMATE CHANGE COULD HAVE NEGATIVE EFFECTS ON WILDLIFE-BASED TOURISM.

Impacts on human health

Almost one-third of diseases in sub-Saharan Africa are associated with environmental factors, and concerns have been raised regarding a possible climate-driven rise in the incidence of diseases such as malaria, ebola and nipha encephalitis. Research suggests that, in some areas, 36% of the rise in malaria cases over the last decade can be explained by climatic influences, although topography, human settlement patterns, land use and drug resistance are also important factors. An increased incidence of disease in forest areas, and the return of sick people from cities to their homes in rural villages, will put additional stress on forests because of the resultant increased demand for forest medicinal plants. Other climate-driven social changes, such as conflict over natural resources, may also cause social dislocation and add to pressure on forests.

Influences on water quality and quantity

Most of the world's countries classified as water-stressed are in Africa. A reduction in run-off of up to 40% has been recorded in some major river basins in Africa, with a consequent reduction in reservoir storage. It has been predicted that projected changes in rainfall and temperature will significantly affect surface water supplies over 25% or more of the continent by the end of this century. Anticipated reductions in water availability increase the importance of the service provided by forests in regulating and cleaning water supplies. Human migration (both temporary or permanent) is a common response to environmental pressures; if drier areas are placed under further stress it is likely that large numbers of people will move into forested regions, placing additional burdens on those landscapes (Box 7). For effective adaptation to climate change, explicit attention will need to be paid to managing water conflicts and finding mutually agreed ways to equitably share resources.

Box 7: Migration of herdsmen and cattle in Ghana

In Ghana, the migration of herdsmen and their cattle from the north, where extreme weather conditions have made cattle-raising difficult, to the south, contributes to land degradation in southern areas and the spread southwards of the savanna through an increase in fire and overgrazing. Cattle also damage food crops as the migrant herdsmen move their cattle through farmlands. As weather conditions become harsher, such problems are likely to worsen and to have serious consequences for community livelihoods. A similar phenomenon has been observed in other sub-Saharan African countries.

Key message: People in Africa are highly dependent on forest goods and services and therefore are particularly vulnerable to the impacts of climate change. Individuals, societies and institutions should be aware of the likely impacts of climate change on forests and forest-dependent people and put strategies in place to adapt to them.

ERNEST FOLI

IN GHANA AND OTHER WEST AFRICAN COUNTRIES THE TREE SPECIES KHAYA SENEGALENSIS IS IN DECLINE. AN INCREASE IN DISEASE ASSOCIATED WITH CLIMATE CHANGE IS LIKELY TO INCREASE PRESSURE ON THIS SPECIES BECAUSE OF THE OVER-HARVESTING OF ITS BARK, WHICH IS USED AS A CURE FOR SEVERAL AILMENTS.

CLIMATE CHANGE WILL SIGNIFICANTLY AFFECT SURFACE WATER SUPPLIES AND MAY EXACERBATE CONFLICTS OVER THE USE OF WATER.

RANDY MCCRACKEN

PETER TARASIEWICZ

WIDESPREAD POVERTY REDUCES THE ADAPTIVE CAPACITY OF RURAL AND URBAN POPULATIONS.


BRUNO LOCATELLI

UNPRECEDENTED FLOODING OF AGRICULTURAL LAND IN THE NORTHERN SAVANNA REGION OF GHANA IN 2009 DEMONSTRATED THE NEED FOR APPROPRIATE CLIMATE-CHANGE ADAPTATION.


ERNEST FOLI

Sub-Saharan Africa contains 33 of the world's 49 least-developed nations, as defined on the basis of low per capita gross domestic product (GDP), short life expectancy, high infant mortality, high rates of illiteracy, and a high dependence on the natural resource base. Limited progress has been made in those countries towards the Millennium Development Goals. For example, the income of more than half of the African population is still less than US$1.25 per day. The proportion of people suffering from hunger declined only slightly between 1990 and 2008, from 32% to 29%. In 2006, more than half of all Africans were without regular access to safe drinking water or basic sanitation. This widespread poverty reduces the adaptive capacity of both rural and urban communities.

Climate change poses a significant threat to sustainable development and the achievement of the Millennium Development Goals, especially those related to environmental sustainability and the elimination of poverty and hunger. For instance, the expected increase in extreme weather events such as droughts and floods will place additional strain on local communities in meeting their food and health needs (Box 8). The projected impacts on forest biodiversity and water quality and quantity would pose serious challenges for the achievement of environmental sustainability.

Box 8: Vulnerability of rural communities in northern Ghana

Extreme weather conditions bring untold suffering to the most vulnerable people in rural Africa. In 2009, the unprecedented flooding of large tracts of agricultural land in Ghana's northern savanna region resulted in a significant loss of agricultural crops, hundreds of thousands of head of livestock, and the property of thousands of needy farmers. The plight of people living in the region was worsened by the pollution of the few sources of potable water and a consequent increase in water-borne diseases.

Adaptation options

The future of forests in Africa must be considered in the light of the past influences and future needs of people. Understanding local vulnerabilities to climate change in their ecological and social contexts is essential for the development and implementation of forest-related climate-change adaptation policies and processes.

Many studies of the potential impacts of climate change are available at global or continental scales, but their coarse resolution limits their usefulness for informing decisions on climate-change adaptation measures at a local scale. Vulnerability-based approaches that focus on current social systems and adaptive capacity are potentially more effective in facilitating adaptation, but more capacity and work is needed to assess local vulnerabilities and to integrate assessments at national scales.

The majority of forest-dependent people in Africa are insufficiently aware of climate change as a global and enduring phenomenon and how it might affect their livelihoods in the long term. There is often a lack of urgency because the effects of climate change are assumed to be gradual.

Despite generally low adaptive capacity and limited awareness of climate change, some autonomous adaptation measures have been observed in various parts of Africa, such as the identification of new income-producing activities (e.g. charcoal production), changed grazing patterns (including the use of forests for livestock fodder), and the migration of people to areas with more suitable climates. In most cases, however, these adaptation measures have occurred with little or no planning or institutional support.

With effective stakeholder participation, vulnerability assessments can serve to increase awareness of the need for adaptation and to help integrate perceptions of vulnerability with existing knowledge on adaptation. Stakeholders involved in vulnerability assessments are also more likely to participate in the planning and implementation of adaptation measures. In order to increase awareness of climate change and to address its causes and consequences, the development and/or reorientation of educational systems and programmes, including informal educational systems such as community radio programmes, is also essential.

Key message: Improving the adaptive capacity of forest-dependent communities is important in order to reduce their vulnerability to the effects of climate change. Participatory approaches should be used to obtain a better understanding of local knowledge and perceptions of climatic change and to raise awareness about vulnerabilities and related adaptation measures. Moreover, there is a need to develop and reorient educational systems and programmes.

Sustainable forest management

Forest ecosystems in Africa face a range of deforestation and degradation pressures, some of which are currently more pressing than climate change. Measures to address such pressures – such as forest restoration and forest rehabilitation, the reduction of habitat fragmentation, the establishment of ecological corridors, and forest fire and pest management – can help to reduce the overall vulnerability of forest ecosystems. Such measures can be implemented as part of sustainable forest management.

Sustainable forest management provides an effective framework for addressing forest-related climate-change adaptation in an integrated manner. Its importance in climate-change adaptation has been stressed at a global level, and it is just as important in African forests as it is elsewhere. Although forest management in Africa has been improving gradually, major shortcomings in implementation are reducing the adaptive capacity of forests and their ability to provide forest-dependent societies with ecosystem services in the long term. The specific elements of forest management that need to be applied will vary depending on local ecological, climatic and socioeconomic contexts.

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MEASURES TO ADDRESS NON-CLIMATIC PRESSURES CAN HELP REDUCE THE OVERALL VULNERABILITY OF FOREST ECOSYSTEMS.

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SUSTAINABLE FOREST MANAGEMENT PROVIDES AN EFFECTIVE FRAMEWORK FOR ADDRESSING FOREST-RELATED CLIMATE CHANGE ADAPTATION IN AN INTEGRATED MANNER.

Lessons learned from the restoration and rehabilitation of degraded lands

Land degradation threatens the livelihoods of millions of people in Africa, especially those in rural areas. The restoration and rehabilitation of degraded forest lands offers considerable potential for enhancing the provision of essential forest ecosystem services and reducing the vulnerability of forests to climate change. Lessons learned from various efforts to rehabilitate degraded lands in sub-Saharan Africa include the need for broad community consultation with all partners and stakeholders; the importance of secure and well-understood land-tenure arrangements; the need to establish and support the forest management skills of community participants; the need for compatibility between the objectives of forest rehabilitation and afforestation and community needs and constraints; and a sense of community ownership and control of the project.

Integrated land-use approaches such as agroforestry and silvo-pastoral systems can also play an important role in improving the resilience of local communities to climate change, particularly given rapid rural population growth and the resultant added pressure on agricultural production and natural resources. Agroforestry projects have shown great potential in many areas; these projects need 'scaling up' to broader, more mainstream adoption.

Key message: Climate change is adding to a range of other pressures – such as agricultural expansion and the over-use of forests – on forest ecosystems in Africa, some of which are currently more pressing than climate change. Measures that reduce non-climatic pressures can help reduce the overall vulnerability of forest ecosystems. Such measures, including forest restoration and rehabilitation, can be implemented in an integrated manner as part of sustainable forest management.

Adaptive collaborative management

Local communities in Africa have a vital interest in the continuation of forest ecosystem services and, in many cases, have hundreds of years' experience in maintaining their forests. The benefits that flow to local communities from the sustainable management of the resource reinforce their commitment to it. There are several documented examples in Africa of how the development of custodial attitudes to forests among communities has resulted in better outcomes for both the forests and the people.

With a changing climate and increasing demands on forests, managers need sufficient flexibility in choosing locally appropriate management practices and must work with stakeholders, especially local communities, to systematically improve those practices. Finding new adaptive solutions will entail risks. Mistakes will be made, and it is crucial to properly monitor and document new initiatives so that successes can be replicated and the repetition of failures can be avoided. This is the core principle of adaptive management; it will be even more important where forests are managed under informally structured community arrangements.

Table 1: Examples of climate-change adaptation measures recommended in West Africa. Adapted from Kalame et al. 2009. Matching national forest policies and management practices for climate change adaptation in Burkina Faso and Ghana. Mitigation and Adaptation Strategies for Global Change. Vol. 14(2), pp. 135-151.

Topic	Adaptation measures
Gene management	Reassess the location of conservation areas and seed banks; breed pest-resistant genotypes; determine the adaptability of genotypes and their responses to climate change
Forest protection	Manage forest fire and pests to reduce disturbance; restore destroyed forest; protect trees from disease
Forest regeneration	Use drought-tolerant genotypes; use artificial regeneration; control invasive species
Silvicultural management	Selectively remove poorly adapted trees; reduce rotation periods; manage forest density, species composition and forest structure
Non-wood resources	Minimize habitat fragmentation; conserve wildlife; maintain primary forests and the diversity of functional groups
Park and wilderness area management	Conserve biodiversity; maintain connectivity between protected areas; employ adaptive management

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Policy and governance

A majority of African countries have recently adopted new forest policies and forest laws, and measures are under way to improve forest law enforcement and governance. Yet assessments of existing forest policies indicate that few address the adaptation of forests to climate change, although some contain elements of risk management practices relevant to forest adaptation. A review of national adaptation programmes of action indicates that several African countries have been implementing projects that aim to improve forest management or increase forest area, indicating growing recognition of the need to increase the resilience to climate change of both forest ecosystems and forest-dependent communities.

In the light of current uncertainties associated with climate change, existing top-down governance systems and policy designs are likely to be insufficiently flexible. Moreover, such traditional regulatory approaches have had uneven success in ensuring the sustainability of forest resources due to disparities in power and resources. Adaptation requires new modes of governance that are more sensitive to context, take a broader view of community needs, and respond more quickly to policy learning. Such new modes of governance should enable meaningful stakeholder participation and provide secure land tenure and forest-user rights and sufficient financial incentives. In this context, the various forms of land tenure and ownership – such as community user rights – existing in Africa must be taken into account.

Experiences in the forest sectors of several African countries indicate that decentralization can be a positive force for effective forest governance but is hampered by corruption; a lack of accountability in decision-making; a lack of commitment by local authorities; a lack of resources and expertise; and a lack of coordination and integration with district management plans and operating frameworks. As a consequence, much of the decentralization that has occurred on paper is not yet fully applied.

Key message: The development and implementation of adaptation measures as part of sustainable forest management need to be underpinned by new modes of governance that are sensitive to context, take a broad view of community needs, and respond quickly to policy learning. Governance that enables effective stakeholder and community participation, transparent and accountable decision-making, secure land ownership and tenure, and the equitable sharing of benefits and responsibilities needs to be promoted.

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POLICIES FOR ADAPTATION SHOULD BE DEVELOPED WITH THE EFFECTIVE PARTICIPATION OF LOCAL COMMUNITIES.

Traditional forest knowledge

Traditional forest knowledge can play an important role in adaptation to climate change. A wealth of traditional and indigenous strategies for coping with changes in environmental conditions is available in Africa. Local communities and indigenous peoples have developed effective strategies for, among other things, predicting rainfall, coping with drought, assessing the prospects for seasonal food production, stabilizing and fertilizing soils, and fighting desertification. Traditional and indigenous knowledge and practices can also play an important role in biodiversity conservation. There is a need to evaluate the potential contribution, strengths and limitations of these strategies for successful climate-change adaptation. Efforts to adopt such strategies are becoming increasingly urgent because of the continuing loss of traditional forest knowledge.

Knowledge gaps

Climate-change adaptation planning in Africa is hampered by a lack of information about current and future impacts and vulnerabilities. Predictions of the impacts of climate change in Africa are generally based on global climate models. Regional climate models are needed to provide information at finer spatial and temporal scales that can be used for regional and local impact studies. Adaptation planning is also hindered by a lack of data for modelling, a lack of technical capacity for meteorological and long-term ecosystem monitoring, incomplete or inconsistent data about forest and forest products, and an over-reliance on secondary information sources.

An underlying factor is insufficient support by governments for research and development. Only 0.3% of GDP is currently spent on research in Africa. More research is urgently needed on the impacts of long-term climate change on biophysical productivity, disturbance regimes, ecosystem dynamics, biodiversity, and socioeconomic vulnerabilities.

Key message: Climate-change adaptation planning in Africa is hampered by a lack of information about current and future climate-related impacts and vulnerabilities. Reliable projections of regional and local impacts require investments in research and monitoring infrastructure and increased support for early warning systems and preparedness measures.

Contribution of forests to achieving broader adaptation goals

Adaptation strategies need to address the many drivers of change that originate in other sectors. For example, deforestation and degradation in Africa are driven largely by the conversion of forests to farmland, making agricultural policies a key consideration in forest sustainability. Most wood removals from African forests are for fuel; thus, energy policy is also of vital importance. Effective forest adaptation measures must consider these non-forest drivers in national and regional policies.

At the same time, forests provide ecosystem services that can contribute to reducing the vulnerability of societies to climate change beyond the forest sector. For example, research conducted in Cameroon indicates that the production of non-wood forest products is less sensitive to climate change than agricultural activities and livestock-raising and can therefore provide a safety net during food shortages, an aspect that is also relevant to other parts of Africa. Ecosystem-based adaptation offers opportunities for forest-dependent people because it recognizes the role of forests in providing ecosystem services for society and supports the conservation and sustainable management of forests.

National and international policies should promote inter-sectoral coordination to link the forest sector and other sectors in adaptation policies. Currently there is little consideration of regional-scale climate-change adaptation strategies for the forest sector in sub-Saharan Africa. Regional processes such as the Congo Basin Forest Partnership, the African Forestry Wildlife Commission of the Food and Agriculture Organization of the United Nations, and the African Forest Forum could provide suitable mechanisms for knowledge exchange and the development of cooperative climate-change adaptation strategies.

Forests are such an integral part of life for so many African people that it is impossible to ignore the impacts of climate change on them. Despite the limitations of current knowledge in Africa, climate change is progressing too quickly to postpone adaptation measures pending the outcomes of future studies.

Key message: Forests can play an important role in achieving broader climate-change adaptation goals but may be threatened by impacts from other sectors. Strategies for adapting forests to climate change should be coordinated with those of other sectors and integrated into national and regional development programmes and strategies.

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