Commonwealth Forests 2010

An overview of the forests and forestry sectors
of the countries of the Commonwealth

Commonwealth Forestry Association

The African Development Bank

The African Development Bank (AfDB) has, since the late 1970s, supported forestry interventions in its Regional Member Countries (RMCs). A policy, guiding lending to the sector, has been in place since 1994 and focus has been on arresting deforestation and ecological degradation; promoting sustainable production of timber and non-timber forest products to meet local, national and international requirements; and, more recently, addressing the global issue of climate change.

Dr Donald Kaberuka, President of the African Development Bank.

The AfDB seeks to promote sustainable economic growth and reduce poverty on the continent, and the forestry sector is an important contributor in achieving these goals. Through its efforts to prioritise projects and programmes that promote national and regional cooperation, there are new initiatives encouraging countries to work together where trans-boundary forest resources require joint management action. The Congo Basin Forest Fund (CBFF) is one such initiative. Ten Central African countries are collaborating to address critical conservation and sustainable forest management in the Congo Basin.

Forestry is closely linked to agriculture, food security and sustainable water resources management. These are critical issues in many of the Bank's regional member countries. To date, the Bank has made significant investments in these sectors and remains committed to providing further support to its RMCs.

Increasingly, climate change is becoming a major threat to sustainable economic growth and poverty reduction. This could, ultimately, threaten political stability in some regions as competition over available natural resources increases. Africa is still highly dependent on fuelwood and charcoal as sources of energy and there are no obvious alternatives in the short term. This dependency will continue to exert enormous pressure on forest resources. Addressing this challenge requires both supply-side and demand-side interventions. While more plantations for fuelwood supply will be required, it is clear that more efficient technologies for using biomass will also be required. In addition, adoption of various renewable energy options is imperative in order to meet increasing energy demand.

...at work

The African Development Bank

In most AfDB regional member countries, the forestry sector has been adversely affected by increasing population growth, weak forestry institutions; and significant social, economic and political demands on forest resources. Conflicts and wars have, in some regions, created favourable conditions for illegal exploitation and destruction of ecosystems, exacerbated by the influx of refugees. Private sector operators continue to plunder forest resources without regard to environmental conservation and resource sustainability. Concessions and license holders need to be regulated and encouraged to adopt efficient extraction and utilisation technologies as well as sustainable forest management principles. Furthermore, they should be encouraged to be responsive to the social needs of affected communities as part of their corporate social responsibilities.

Many governments lack financial resources and the technical knowhow needed to implement cutting-edge forestry operations and projects. For countries that are well endowed with forest resources, high indebtedness tends to encourage some of them to overexploit their resource base in order to expand their current income streams. In others, poverty has led to encroachment on the forests for food production. It is imperative that the institution's regional member countries and their development partners work together to ensure that poverty reduction interventions meet environmental sustainability criteria. Financing and technical capacities for the sector should also be enhanced. Other sectoral interventions such as agriculture, infrastructure and irrigation should complement forestry sector investments to ensure sustainability.

Lastly, the Bank has noted emerging positive trends in the sector in some of its regional member countries. Such countries have reorganised their forestry institutions and reformed their forestry policies and laws to make them more responsive to current challenges. Many of them are delegating greater roles and responsibilities to local communities and the private sector in the management of their forestry resources. A greater appreciation of the global values of forests is also observable.

Against this background, the AfDB is optimistic about the sector's future. The Bank is committed to working with other development partners to ensure the sustainable management of Africa's forests.

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The cover pictures are of the Iwokrama Forest in Guyana (upper) and Cathedral Grove, a Coastal Douglas Fir forest on Vancouver Island in Canada (lower).

Contents

CLARENCE HOUSE

It was not so long ago that forests were seen as a source of raw materials; a way to meet our growing demand for timber and pulp. Today, there is a much greater understanding of the value of forests, both as a potential source of renewable natural resources and as an essential life support system.

Indeed, the more we learn about the cycles of Nature, the more we realize that the world's forests are vital to our long-term welfare. Forests store vast amounts of carbon – billons of tonnes – within their living matter and soils, locking it away and out of the atmosphere. Every year, more carbon is absorbed by forests, helping to reduce the effects of fossil fuel combustion. Forests also generate rain which helps to sustain farming and agriculture.

Equally important is the support that forests provide for most of the world's terrestrial biodiversity – that vast array of animals, plants and other life forms that share this small and fragile planet with us. We benefit too; a huge proportion of human cultural diversity is found in the world's dwindling forests. From the moist forests of Papua New Guinea and the dry eucalyptus groves of Australia to the cool temperate rainforests of Western Canada, many of the world's peoples who still live close to Nature rely fundamentally on forests to meet all of their needs, both physical and, of course, spiritual.

The people of the Commonwealth have a long history of forest exploration, documentation and use, all of which has been synthesized in this volume to enable the reader to gain a thorough understanding of our shared forest resource.

Forests form a major element of our common wealth; it is imperative that we continue to work together to find ways to protect, preserve and value them.

HRH The Prince of Wales

Foreword

In the first edition of this excellent volume produced by the Commonwealth Forestry Association just three years ago, we learnt that the Commonwealth's forests are disappearing about 70% faster than the rest of the world's. In this re-evaluation the figures remain broadly the same. Are we doing enough? Clearly not!

It is high time for all Commonwealth countries to listen to forestry professionals and civil society groups, and take action to conserve standing forests, restore damaged forests and plant new ones. It is time to demonstrate the innovation, leadership and forest management know-how of which the Commonwealth is capable. We may never see a better opportunity.

At the November 2009 meeting of the Commonwealth Heads of Government in Trinidad & Tobago, important progress was made in building consensual positions on climate change. Although this did not convert into an agreement on emissions targets at the Copenhagen meeting of the UN Framework Convention on Climate Change (UNFCCC), the Copenhagen Accord did give special mention to forests and recognised their "crucial role of reducing emissions from deforestation and degradation".

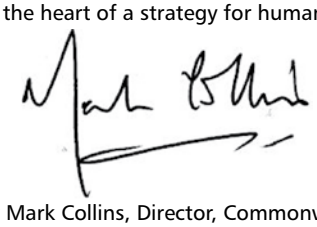
The Accord called for the immediate establishment of a mechanism to reduce emissions from deforestation and forest degradation (REDD+) thereby storing and capturing more carbon and mitigating climate change. Such payments for ecosystem services could halve deforestation by 2030, cut emissions of carbon by 1.5 to 2.7 Gt per year, and provide long-term livelihoods for forest people. The Accord committed developed countries to provide substantial finance for this purpose, including US$30 billion during 2010-12, and five countries committed US$3.5 billion in interim financing to begin the process of building capacity for REDD+ immediately. With long-term benefits of trillions of dollars, this is a worthwhile investment!

Already the Commonwealth has shown its commitment to sustainable forestry in the Iwokrama International Centre, Guyana, where 370,000 ha of forest are under

management for combined low-level logging, ecotourism, research and community engagement under innovative financing schemes. Iwokrama is also pioneering measurement and valuation of forest ecosystem services. Ideas like this need to be multiplied across the Commonwealth.

As I write this Foreword the final preparations are being made for the 18th Commonwealth Forestry Conference in Edinburgh, Scotland. The Conference theme *Restoring the Commonwealth's Forests: Tackling Climate Change* catches the moment precisely and provides an unequalled opportunity for the Commonwealth to act. This book is being offered to participants as an introduction to some of the key issues to be discussed.

The time is right. We have the evidence base; we have international support for action; we have proven models that work, and we have the Commonwealth conference at which partnerships and plans can be laid. Let us all work together and put forests back where they belong, at the heart of a strategy for humankind's future.



Dr Mark Collins, Director, Commonwealth Foundation

Introduction

Commonwealth Forests 2010 is published by the Commonwealth Forestry Association (CFA) to coincide with the 18th Commonwealth Forestry Conference, 2010, held in Edinburgh. The theme of the Conference is *Restoring the Commonwealth's Forests: Tackling Climate Change* and thus the emphasis of *Commonwealth Forests 2010* is related to this, as a contribution to informing the debates of the Conference

The aim of this publication is also to quantify and describe the present state of forestry in the countries of the Commonwealth and, from this, to identify common challenges facing Commonwealth foresters and the opportunities arising from them. It also provides a great many links, not only on technical and policy-related issues but also to the forest services and research and training institutions of Commonwealth countries. This edition, like its predecessor will be put on the CFA website.

The Commonwealth is a voluntary association of 54 independent countries, Rwanda having joined in 2009. The Commonwealth's population has now grown to over 2 billion people, or 31% of the world's population. The countries of the Commonwealth, spread across all the continents, include some of the world's largest both in terms of area and of population, and some of the smallest. Three of its countries are among the most heavily forested in the world and Commonwealth countries have historically been among the pioneers of scientific and sustainable forestry.

The first edition of *Commonwealth Forests* was published in 2007, based largely on 2005 data. This second edition incorporates figures updated from the FAO Global Forest Resources Assessment (FRA) 2010. There are two points to note concerning the new data which affect comparisons with figures from the first edition of *Commonwealth Forests*:

- Countries are the primary source of information; they may revise figures from previous assessments. For example, the figures quoted for a country in a previous FRA may have been extrapolated from an inventory made some years before; when a new inventory is made in or after 2005 the figures for that year will be revised – but will not be available until FRA2010.
- Definitions may change. FAO agrees definitions with countries at regular consultations; the main change that occurred which affects this report was the move from "plantations" to the more comprehensive "planted forest" (*see Chapter 1*).

The Commonwealth Forestry Association, which was founded in 1921, is the world's longest established international forestry organisation. It unites foresters, scientists, students, NGOs, planners and policymakers throughout the Commonwealth and beyond in a unique international network that provides professional support to its members and forms a key element in civil society debates. This new publication of the CFA provides facts and figures and useful contacts and references together with an analysis of the forestry sector and identification of the many challenges facing foresters of the Commonwealth. It is organised in three parts: the text, in eight chapters; the data in Annexes; and country information.

Commonwealth Forests 2010 is a collaborative effort of foresters of many nations, who are recognised in the Acknowledgements. It does not pretend to cover all aspects of forestry, nor every Commonwealth country, and not all readers will agree with the aspects of the forestry sector that have been covered. Inevitably some of the information will be out of date by the time it is published, but we hope that readers will provide feedback to improve the balance and to update the information.

INDIA'S FORESTS AT A GLANCE

INTRODUCTION:

India is one of the 17 mega diverse countries of the world. Despite a high population (17% of world's population) and biotic pressure (18% of world's cattle) and the pressure of economic development, India is one of the few developing countries where the forest and tree cover continues to increase.

STATE OF FORESTS

- The Forest Survey of India, Dehradun has published 11 biennial State of Forest Reports since 1987 based on satellite data supported by ground truthing.
- Scale of interpretation 1:50,000 (SFR, 2009).
- All forest and tree canopy patches down to one hectare are mapped.

INDIA: VITAL STATISTICS:

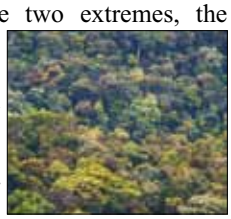
Area	328.7 million ha
Population	1145 million
Livestock population	485 million
Plant species	45,500
Animal species	91,200

FORESTS as per SFR, 2009

Forest Class	Area in million ha.	% of Total Geographical Area
Very Dense Forest (more than 70% canopy density)	8.35	2.54
Moderately Dense Forest (40% - 70%)	31.90	9.71
Open Forest (10%-40%)	28.84	8.77
Total Forest Cover	**69.09**	**21.02**
Tree Cover	**9.28**	**2.82**
Total Forest &Tree Cover	**78.37**	**23.84**
Scrub	4.15	**1.26**
Non Forest	**255.49**	**77.72**
Total Area	**328.73**	**100.0**

FOREST TYPES OF INDIA

The panorama of Indian forests ranges from evergreen tropical rain forests in the Andaman and Nicobar Islands, the Western Ghats, and the north-eastern states, to dry alpine scrub high in the Himalaya in the north. Between these two extremes, the country has semi-evergreen forests, deciduous monsoon forests, thorn forests, subtropical pine forests in the lower montane zone and temperate montane forests.



Forest types	% of total forest area
Tropical /Dry Deciduous	38
Tropical Moist Deciduous	30
Tropical Thorn Forests	6
Tropical Wet Evergreen Forests	5.8
Others	20.2
Total	**100**

FOREST MANAGEMENT

The earliest records of indigenous forest management in India date back to the *Atharvaveda* (12th Century B.C.). The foundation of present day forest management, based on the concept of "sustained yield", was laid in 1864 with the appointment of Dr Dietrich Brandis as Inspector General of Forests in India. The working plans are generally prepared for a period of ten to twenty years, and are generally restricted to selection cum improvement fellings. Clear felling has been given up in most forests except in existing plantations.

CARBON SEQUESTRATION POTENTIAL

India's forests are a significant net sink of CO_2. From 1995 to 2005, the carbon stocks stored in our forests and tree cover have increased from 6,245 million tonnes to 6,662 million tonnes, corresponding to the increase in forest cover thereby registering an annual increment of 38 million tonnes of carbon or 138 million tonnes of CO_2 equivalent worth US$ 120 billion or Rs. 6,000 billion amounting to 11% of the total emissions of the country (Govt. of India brochure, August, 2009, "India's Forest and Tree Cover – Contribution as a Carbon Sink").

INDIAN COUNCIL OF FORESTRY RESEARCH & EDUCATION

ICFRE, an autonomous body of the Ministry of Environment & Forests, Government of India is the premiere forestry research organization of the country. It is mandated to formulate, organize, direct and manage forestry research; transfer developed technologies to States and other agencies; and impart forestry education. ICFRE has its headquarter in Dehradun and has eight institutes and four regional centres to cater to the research needs of the different agro-climatic zones of the country.

FOREST CONSERVATION POLICY

In order to arrest indiscriminate diversion of forest lands for non forest use, the Central Government enacted the Forest (Conservation) Act, 1980, inter-alia requiring prior approval of the Central Government for diversion of any forest land for non-forestry purposes. While approving proposals for non-forest uses of forest land, the schemes like compensatory afforestation, maintenance of safety zone, etc. are mandatory to mitigate the adverse impact of such diversions. The project proponent has to also pay the Net Present Value of lost environmental services, at a rate fixed periodically by the Supreme Court, into a Fund which will be used for improving the forest. Annual deforestation rate was .13 million ha during the 1970's and came down to 0.02-0.03 million ha per year after the Forest Conservation Act was imposed.

NTFP MANAGEMENT

India has more than 3,000 species of Non Timber Forest Products (NTFPs), worth about Rs 42,000 million annually which are of great significance to rural livelihoods. More than half of the revenue of the Forest Department comes from NTFP extractions, and about 70% of the forest export incomes come from NTFP exports.

FLAGSHIP SCHEMES OF GOVERNMENT OF INDIA

• INTENSIFICATION OF FOREST MANAGEMENT

This scheme supports strengthening of forestry administration in the country by way of infrastructure development and technology induction. It also supports area-specific management interventions. The State Forest Departments have used this scheme for developing facilities like camp offices, forest barracks, maintenance and creation of patrolling paths and interior forest roads, better communication through mobile phones, PDAs, wireless, and field vehicles. The outlay for the 11th Five Year Plan (2007-2012) is Rs. 6000 million. The achievements over the last three years include:-

(i) Creation and maintenance of fire-lines – 252,679 km

(ii) Fire Watchtowers – 368 (Nos)

(iii) Construction of Forest Roads – 3019 km.

(iv) Erection of boundary pillars – 269058 (Nos)

(v) Field operational vehicles – 656 (Nos)

• JOINT FOREST MANAGEMENT (JFM)

Drawing from the National Forest Policy of 1988, the country launched an initiative for involving local communities specially women in jointly protecting, regenerating sustainably harvesting and managing the forests. This initiative of JFM has completed 20 years of implementation since the first notification by the Central Government in 1990. The village level committees are entitled to a substantial share of all incremental growth of timber, fuelwood, non-timber products etc. and also get incomes through wages for planting, weeding, cleaning and other operations.

No. of JFM Committees : 106,000

No. of people involved : 24 million

Forest area under JFM : 22 million ha

This initiative has resulted in improving the health of the forest besides improving water conservation, and enhanced livelihoods of millions of people living inside forest and in fringes areas.

• NATIONAL AFFORESTATION PROGRAMME (NAP)

Formulated by the National Afforestation & Eco-development Board (NAEB), this programme operates through a two tier structure of Forest Development Agencies (FDAs) at the district level and Joint Forest Management Committees (JFMCs) at the village level. Another tier has been added from 2010-11 by creating State FDA. Main objectives of the NAP are-

- Increase and/ or Improvement in Forest and Tree Cover (FTC)
- Rehabilitation of degraded forests and adjoining areas through participatory forest management
- Supplementing livelihoods by creating community assets, value addition to forest produce
- Capacity building of the communities for self sustenance of the program
- Various models of regeneration such as added natural regeneration, artificial regeneration silvi pastoral/pasture development etc.

During the first three years (2007-10) of the 11th five year plan, 0.55 million ha. have been proposed to be taken up for plantation. The annual plantation area ranges from 0.7 million ha. to 1.25 million ha. in recent years, totaling to around 30 million ha., of which around 10 million ha. is ascribed to private land.

FOREST CERTIFICATION

Forest Certification has emerged as a voluntary market-driven mechanism in support of Sustainable Forest Management. A National Forest Certification Committee has been constituted to frame the policy guidelines for forest certification for timber and non timber forest products, and also to develop a mechanism to establish an independent National Forest Certification Council.

Timber Trade

Total Industrial demand for wood in roundwood equivalent (RWE) is predicted to increase from 58 million cubic metre in 2000 to 153 million cubic metre in 2020, with over 50% supply coming from non forest sources. The import of timber and timber products has increased substantially from 2.45 million cubic metre in 2001, to 16.7 million cubic metre in 2008, valued at Rupees 759 billion. Out of total production of 68 million cubic metre of wood, the production from state forests amount to only 12 million cubic metre, and 31 million cubic metre wood comes from outside the forest including imports. The contribution of forestry sector to GDP has been enhanced from 0.67% in 2007-08 to 1.70% in 2008-09, by adding the contribution of trees outside forest, estimated around Rupees 430 billion stock value.

WILDLIFE CONSERVATION

India has 2.5% of the world's land area but supports around half of the world population of tiger, Asiatic elephant, one horned rhino, Indian gaur and snow leopard and the only population of Asiatic lion. There is a healthy network of 661 Protected Areas (PAs) encompassing about 4.8% of the geographical area of the country, forming the nucleus of the biodiversity conservation strategy of the country. Two major flagship programmes, namely Project Tiger (1973) and Project Elephant (1991) are being implemented to conserve these species along with their habitats and corridors, and to address man - animal conflict. As per the recent estimation, tiger population is 1411± 246, as against the total world's population of 3200 wild tigers. There is a healthy population of about 27,694 wild elephants.

National Parks	100	
WL Sanctuaries	514	
Conservation Reserves	43	
Community Reserves	4	
Total	**661**	
Project Tiger Reserves	39	Over-lapping with existing PA network
Elephant Reserves	27	
Biosphere Reserves	14	

Wildlife Crime Control Bureau (WCCB)

The WCCB was set up in 2006 to combat wildlife related crimes, and its mandate includes collation and dissemination of intelligence along with setting up centralized wildlife crime data bank etc.

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The Commonwealth Forestry Association offers grateful acknowledgment to the following for invaluable assistance in the production of this book.

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Glossary

Forest

The definition is that used in FAO's Global Forest Resources Assessment 2010[1]:

Land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10%, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.

The definition adds the following explanatory notes:

1 *Forest is determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 metres in situ. Areas under reforestation that have not yet reached but are expected to reach a canopy cover of 10% and a tree height of 5 metres are included, as are temporarily unstocked areas, resulting from human intervention or natural causes, which are expected to regenerate.*

2 *Includes areas with bamboo and palms provided that height and canopy cover criteria are met.*

3 *Includes forest roads, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific scientific, historical, cultural or spiritual interest.*

4 *Includes windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 hectares and width of more than 20 metres.*

5 *Includes plantations primarily used for forestry or protection purposes, such as rubber-wood plantations and cork oak stands.*

6 *Excludes tree stands in agricultural production systems, for example in fruit plantations and agroforestry systems. The term also excludes trees in urban parks and gardens.*

Primary Forest

Forest of native species, in which there are no clearly visible indications of human activity, and ecological processes are not significantly disturbed. (FAO, 2010)

1 FAO 2010 Global Forest Resources Assessment 2010 (in press), FAO, Rome, Italy.

Other Wooded Land

Land not classified as forest, spanning more than 0.5 hectares; with trees higher than 5 metres and a canopy cover of 5-10%, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10%. It does not include land that is predominantly under agricultural or urban land use. (FAO, FRA2005)

Plantations

Forest or other wooded land of introduced species and in some cases native species, established through planting or seeding. May included areas of native species characterised by few species, straight tree lines and/or even-aged stands. (FAO, FRA2005)

Semi-natural Forest

Forest or other wooded land of native species, established through planting, seeding or assisted natural regeneration (FAO, FRA2005). Areas established by planting are described as planted semi-natural forest.

Planted Forests

The concept of planted forests combines the areas of plantations and of planted semi-natural forest, the justification being that planted semi-natural forest has more in common with plantations than with semi-natural forest regenerated by seeding or natural regeneration, in terms not only of regeneration method but also planting stock, tending and management techniques.

Outgrowers and Outgrower Schemes

Outgrower schemes are partnerships between small landowners (the outgrowers) and industrial companies, according to which the outgrowers raise trees on their own land to sell to the companies, usually at an agreed price and sometimes with support from the company.

Acronyms and Abbreviations

AFCS Australian Forest Certification Scheme
AOSIS Alliance of Small Island States
C&I Criteria and Indicators
CBD Convention on Biological Diversity
CBFM Community-based Forest Management
CDM Clean Development Mechanism
CFA Commonwealth Forestry Association
CGIAR Consultative Group on International Agricultural Research
CHOGM Commonwealth Heads of Government Meeting
CIF Canadian Institute of Forestry
CIFOR Centre for International Forestry Research
CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora
COP Conference of the Parties (of CBD, UNFCCC etc.)
CPF Collaborative Partnership on Forests
CSA Canadian Standards Association
CMW Commonwealth
COFO (FAO) Committee on Forestry
EU European Union
FAO Food and Agriculture Organisation (of the United Nations)
FLR Forest Landscape Restoration
FMU Forest Management Unit
FSC Forest Stewardship Council
FRA (FAO) Global Forest Resources Assessment
GHG Greenhouse gases
Gt Gigatonne (10^9)
Ha Hectare
ICF Institute of Chartered Foresters (UK)
ICRAF World Agroforestry Centre
IFA Institute of Foresters of Australia
IFF Intergovernmental Forum on Forests
IMFN International Model Forest Network
IPF Intergovernmental Panel on Forests
IPCC Intergovernmental Panel on Climate Change
ITTO/ITTA International Tropical Timber Organisation/Agreement
IUCN World Conservation Union (International Union for the Conservation of Nature and Natural Resources)
IUFRO International Union of Forestry Research Organisations
JFM Joint Forest Management (India)
JI Joint Implementation
KP Kyoto Protocol (of the UNFCCC)
LFCC Low Forest Cover Countries
M Million
MCPFE Ministerial Conference on the Protection of Forests in Europe
MDG Millennium Development Goals
MTCS Malaysian Timber Certification Scheme
NGO Non Governmental Organisation
NLBI Non-legally Binding Instrument on All Types of Forests
NWFP Non-wood Forest Product
NZIF New Zealand Institute of Foresters
OWL Other Wooded Land (see definition above)
PEFC Pan-European Forest Process
PFE Permanent Forest Estate
PFM Participatory Forest Management
REDD Reduced emissions from deforestation and forest degradation in developing countries
REDD+ As REDD, but with conservation, sustainable management of forests, and stock enhancement in addition
REDD++ As REDD+, but with all terrestrial carbon in addition
RIL Reduced Impact Logging
SCCF Standing Committee on Commonwealth Forestry
SIDS Small Island Developing States
SFI Sustainable Forestry Initiative (North America)
SFM Sustainable forest management
UKWAS UK Woodland Assurance Standard
UNCCD United Nations Convention to Combat Desertification
UNCED United Nations Conference on Environment and Development (1992)
UNDP United Nations Development Programme
UNEP United Nations Environment Programme
UNFCCC United Nations Framework Convention on Climate Change
UNFF United Nations Forum on Forests
WUI Wildland Urban Interface
WWF World Wide Fund for Nature
WSSD World Summit on Sustainable Development (2002)

About Kenya Forest Service

Kenya Forest Service www.kenyaforestservice.org is a State Corporation established in February 2007 under the Forest Act 2005 to provide for the establishment, development and sustainable management, including conservation and rational utilization, of forest resources for the socio-economic development of the country.

The Service has a workforce of 5,358 staff.

The Service's management structure comprises 10 conservancies that are ecologically demarcated, 76 Zonal forest offices, and 150 forest stations; 250 divisional forest extension offices are located countrywide.

The new law allows for joint management and concession arrangements through which the private sector and communities can engage.

Importance of forests in Kenya

Kenya has 3.456 million hectares of forest cover which is equivalent to 5.9% of its land area. Out of these, 1.406 million hectares or 2.4% of total land area comprises of indigenous closed canopy forests, mangroves and plantations in both public and private lands. These forests play an important role in the country's water resource conservation, provide essential environmental services, habitat for diverse flora and fauna, offer cultural, spiritual and recreational opportunities, and provide a variety of food, medicines and wood.

In addition, forests make significant contribution to the economy buttressing the agriculture, tourism, energy and manufacturing sectors.

Kenya's forest products and industries

Timber and wood products: Forests especially those managed for commercial utilization meet the national timber needs. Key species grown for this purpose include *Cupressus lusitanica*, *Pinus patula*, *Eucalyptus grandis*, *Eucalyptus saligna*, and a variety of Eucalyptus clones. Kenya is currently witnessing the emergence of a vibrant private sector driven by the commercial forestry subsector.

Non-wood forest products: These are of critical importance to the livelihoods of rural communities and in sometimes account for a significant share of household incomes. Some include gums and resins, honey, essential oils, frankincense, myrrh, fibres, medicinal and aromatic plants, dying and tanning materials. In addition, some indigenous trees like Prunus Africana and Aloe have the potential to earn Kenya a high income from international markets.

Forest industries: These manufacture products such as construction timber, paper, plywood, block boards, particle boards among others. They provide employment in the manufacturing, construction, transportation, and processing sectors thus contributing to improved livelihoods and incomes.

Forestry and wealth creation: Tree growing improves soil and water conservation, and soil fertility, which contributes to increased agricultural production. Wealth creation and employment opportunities are realized through farm production, development of forest-based industries and promotion of eco-tourism. Intensified farm forestry, commercial production of non-wood products and promotion of out-growers tree schemes supports forest industries and enhance industrialization and employment creation.

Trade in forest products: Trade is limited to the national level, while opportunities for export of forest products exist. Products include timber, paper products, carvings, gums and resins, charcoal and medicines. To facilitate entry into the international markets, KFS is promoting forest products certification and labelling for the wider market acceptability. In addition, the Service is promoting value addition for forest products and developing infrastructure for non-extractive forest uses.

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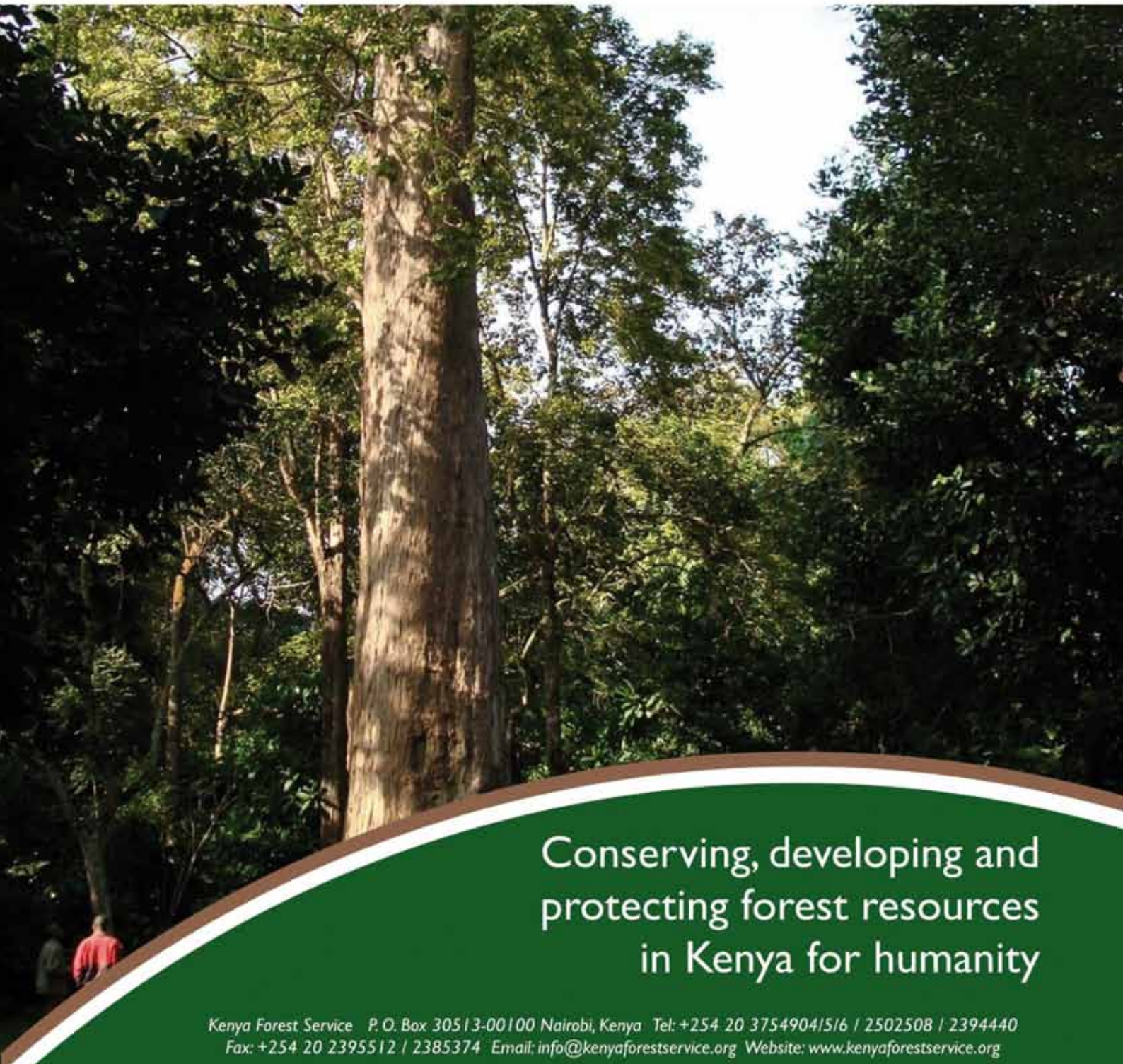
KENYA
Forest Service

Trees for Better Lives



Conserving, developing and protecting forest resources in Kenya for humanity

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The Forest Resource

By Jim Ball, Chair, Commonwealth Forestry Association

Extent of the forest resource

Forests in Commonwealth countries cover over 800 M ha, or just over one-fifth of the world's forest area (*see Annex 2.1* for national data). This figure, which refers to forests with a canopy cover of more than 10% and an area of more than 0.5 ha[1], includes all types of forest from primary, undisturbed forest, through natural and semi-natural forests which have been modified by human activity, to planted forests. It also includes the area of forests in Rwanda (435,000 ha), which was elected to the Commonwealth in 2009.

The total area of forest in the countries of the Commonwealth appears to have increased slightly since 2005 when 808 M ha was reported in the first edition of *Commonwealth Forests*. The African regional total has increased most, largely because of an increase in the figure for Mozambique – possibly through the transfer of what was previously reported as Other Wooded Land (OWL) – but also because of the inclusion of Rwanda. The proportion of forest in Commonwealth countries has remained the same as in 2005 (27%), as has the area of forest per head (0.4 ha).

Three Commonwealth countries: Canada (310 M ha), Australia (149 M ha) and India (68 M ha) are among the world's 10 countries with the largest extent of national forest estate. Other Commonwealth countries with more than 20 M ha of forest include Mozambique (39 M ha), Tanzania (33 M ha), Zambia (49 M ha) in Africa, and Malaysia (20 M ha) and Papua New Guinea (29 M ha) in South-east Asia. Forests also exist in what are not independent Commonwealth countries – *see Box 1.1*.

The importance of forests to a country may not, however, be measured only in terms of area. A different picture emerges when considering the proportion of the land area covered by forest: the Seychelles has 88% of its land area under forest, the Solomon Islands 79%, Guyana and St Lucia have 77% each, followed by Brunei Darrusalam (72%), St Vincent & the Grenadines (68%) and Zambia (67%). A third way of looking at the potential contribution of forests to the country's environment, economy and culture is to consider the area of forest per head: Guyana has 20.6 ha of forest/head of population, Canada has 9.5 ha/head, Australia

1 The full definition is in the glossary.

Forests in Dependent Territories BOX 1.1

Australia, New Zealand and the UK have a number of Dependent Territories, whose forest areas have been excluded from *Table 1.1* and *Annex 2.1*. They are listed in *Annex 2.1*. Some of them, however, have forest or OWL; Niue (NZ), for example, has 19,000 ha of forest (FAO, 2010) and several others have significant areas of forest which may contain endemic species of animals or plants which are often threatened. An example is the Norfolk Island Pine (*Araucaria heterophylla*) which is endemic to the island of the same name, an External Territory of Australia, but whose conservation status according to the International Union for the Conservation of Nature and Natural Resources (IUCN) is vulnerable.

BELOW Canada has the largest extent of national forest estate in the Commonwealth and ranks three in the world.

7.3 ha/head, Botswana 6.1 ha/head, Belize 5.0 ha/head and Papua New Guinea 4.6 ha/head.

But measuring the adequacy of the forest estate to its people's needs has less to do with those countries that have a large forest area, a large proportion of the land's surface under forest, or a high figure for forest area per head. Rather, it is the many Commonwealth countries with less than 10% of the land area under forest, and/or less than 0.1 ha of forest per head, which need to consider how they can meet demand for forest goods and services; the special situations of forests in Low Forest Cover Countries (LFCC), Small Island Developing States (SIDS) and on mountains are described in *Box 1.2.*

Forests in LFCC, SIDS and on Mountains

BOX 1.2

Forests in these three special situations have several features in common: first, the local people are highly reliant on them for products and environmental benefits; second, other people who live beyond the immediate environs of the forests benefit from them; third, the forests themselves are subject to the hazards of extreme climatic conditions; and last, they often represent genetic resources or natural ecosystems that are not found elsewhere.

LFCC have been defined by FAO as those countries with less than 10% of their land under forest. According to this definition there are 55 LFCC countries reported in FRA2005, of which nine are Commonwealth countries (listed in *Annex 2.1)*. A meeting of LFCC in 1999 in Iran accepted FAO's definition; established the Tehran Process; identified the potential roles of NGOs, the private sector, research and training institutions, and the rural poor; and called for increased investment.

Rural people in these countries, especially the poorest, are highly dependent on the forest for products such as fuelwood and non-wood forest products such as fodder. Low rainfall is common to LFCC countries, often combined with high population, and the environment therefore tends to be highly degraded. Periodic droughts may affect not only the local people but the forest on which they depend, while urban populations, often far from the forest, may also source fuelwood or charcoal from the forest.

There is no internationally accepted definition of a Small Island Developing State. Indeed, some are not small, others are not islands and a few are not developing economies. SIDS were, however, given an international political identity with the establishment in 1991 of the Alliance of Small Island States (AOSIS); and 27 of the 39 AOSIS countries are members of the Commonwealth, mostly in the Pacific or the Caribbean – *see Annex 2.1*.

Trees are important in SIDS for the provision of products, coastal protection and in support of tourism. Most Commonwealth SIDS are quite well forested; only two are LFCC (Maldives and Nauru). But forests on SIDS are especially vulnerable to damage and destruction by hurricanes and typhoons, or tidal surges. Climate change threatens unique island tree species and ecosystems, which may have developed in isolation; some endemic species are being conserved *ex situ*. All Commonwealth SIDS import oil as a fuel, which accounts for a high proportion of earnings; alternative and affordable renewable energy sources, such as wood, are required to reduce vulnerability to price rises. Isolation from markets also limits their commercial opportunities.

Mountain forests, found in Commonwealth countries in Africa (Kenya, Tanzania, Uganda, Cameroon), the Americas (only Canada), South Asia (India, Pakistan, Sri Lanka), South-east Asia (Malaysia, New Zealand) and Europe (UK), maintain water supplies and quality, reduce erosion and protect against landslides. They may have greater biological diversity and endemism than lowland forests but are likely also to be more sensitive to changes in climate. They provide essential water to both mountain people and to those living downstream, while the local people rely on the forests for fuel, grazing and non-wood forest products, and outsiders appreciate the scenic beauty and recreational facilities. Mountain forests are often culturally important where they enshrine sacred groves or trees.

Sources:
LFCC – FAO, 2000 and 2003;
SIDS – *International Forestry Review*, Vol. 4 (4), December 2002;
Mountain forests – website of the Mountain Partnership www.mountainpartnership.org.

Forest Area in the Commonwealth, 2010 TABLE 1.1

Region	*Forest*			*Other Wooded Land (OWL)***
	Area (000 ha)	*% land area**	*ha forest/ head**	*Area (000 ha)*
Africa	197,713	26	0.5	149,624
Americas				
– Caribbean	1,243	43	0.2	328
– Central & North America	326,732	35	9.7	95,644
Total Americas	327,975	35	8.4	95,972
South Asia	73,424	19	0.1	5,011
South-east Asia & Pacific	210,993	24	3.3	143,153
Europe	3,058	12	<0.1	234
Total Commonwealth	813,163	27	0.4	393,994
Total World	4,033,060	31	0.6	1,144,687

Source: FAO, 2010.
Notes: * land area and population 2006, from *Annex 1.1*;
** Defined as land not classified as forest, covering more than 0.5 ha, with trees more than 5 metres high and a canopy cover of 5-10% (FAO, 2006a).

Trees are also found outside the areas defined as forests. Pandey (2008), for example, points out that in India trees have been planted outside forests for hundreds of years, but the resource was boosted after the initiation of social forestry programmes from 1980. Up to 40% of the targets were met through the distribution of seedlings to individuals and organisations, but a great deal was also planted by governments. Private wood-based enterprises also became involved, and encouraged farmers to grow timber through outgrower schemes (see below). It was estimated that tree plantations outside forests recently made up more than 70% of the total plantation area. Mango (*Mangifera indica*) comprises 11% of the growing stock, followed by coconut (*Cocos nucifera*) 5%, *Syzygium cumini* and *Azadarichta indica* (both 4%), suggesting that the main reason for planting trees was not for timber but fruit, shade or firewood.

Pandey (2008) discusses the ways in which Indian estimates of trees outside forests are obtained, but states that methods are still based on tree numbers and there is no standardisation of methodology or ground checking. The resource is highly difficult to classify and inventory because it is so heterogeneous, and hence it is often difficult to develop policies for promoting tree planting or conserving what exists.

Due to the absence of a standardised methodology the estimates of trees on OWL are not as complete or reliable as on forests, but it is likely that OWL covers nearly 400 M ha in Commonwealth countries (*Table 1.1*). Such woodland may be unmanaged relicts of cleared forest, or may be systematically managed stands in agroforestry systems, among other forms. All may serve a number of environmental and economic functions, which may be similar to forests in principle if not in extent. But the regional totals, especially that of Africa, show the potential contribution of this resource to forest goods and services, which is often especially important to rural people, and to the poor in particular, who may rely on a wide range of non-timber forest products for their domestic energy and livelihoods.

Forest characteristics and forest types

Most forests in Commonwealth countries have been more or less modified by human activities but some primary[2] forest remains – *see Annex 2.2*.

It may seem encouraging that 28% of the Commonwealth's total forest area in 2010 is primary forest, but most of that lies in Canada (over 165 M ha). Figures from those Commonwealth countries which reported on primary forests show that in Africa most of the primary forest was in South Africa, Malawi, Kenya and Ghana, while in South Asia India reported over 15 M ha and in South-east Asia and the Pacific significant areas were reported by Papua New Guinea (26 M ha),

2 Defined as forest of native species, in which there are no clearly visible indications of human activity, and ecological processes are not significantly disturbed (FAO, 2010).

Australia (5 M ha), Malaysia (3.8 M ha) and New Zealand (2 M ha). But large areas have been lost even since 2005 in Malawi, Sri Lanka, Australia and Papua New Guinea, as *Annex 2.2* shows, while it appears that Nigeria lost its final 300,000 ha between 2005 and 2010.

Commonwealth forests cover a wide range of natural forest types, from montane to mangrove and from boreal to tropical moist forest. *Annex 2.3* illustrates the importance of the forest ecological zones recognised by FRA2000 to the countries of the Commonwealth by ranking the three most represented in each country. This has led to some omissions – the small proportions of tropical rain forest (2%), temperate oceanic and montane forest (both 4%) in Australia do not feature, nor the 7% of tropical montane forest in India, or the temperate montane forest of Canada (12%) or the UK (2%), and boreal montane forest (9%) of Canada. Nevertheless, as discussed below, it shows the forest types most important to Commonwealth countries.

It is no surprise that the forest types of importance to most Commonwealth countries are tropical, which accords with popular perception. *Box 1.3* describes mangrove formations, one of the most widespread and important in the rain forest zone. But the importance of dry tropical forest types is less well appreciated. They represent the highest proportion of the forest of 13 Commonwealth countries, including some where moist forest types might be expected to dominate – Mozambique, Nigeria, Tanzania, India and Sri Lanka, for example. Savanna woodland – and other dry formations – are of crucial importance for the livelihoods of many people, yet their conservation, research and the development of management practices for them lag behind.

Despite the 2002 International Year of Mountains, the importance of montane forests is also less well appreciated. The goods and services they provide to the people who live near them, and essential services in maintaining water supplies to the people living downstream, are described in *Box 1.2*. In common with other fragile ecosystems, montane forests are vulnerable to the very natural disasters against which they provide protection.

Temperate forests are less well represented in the Commonwealth, but Canada's boreal forests are of global importance (*see Box 1.3*).

Change in the extent of forest – and forest degradation

Change in the extent of forest, often called, deforestation, refers to the loss of forest area from one period to another. It mostly occurs due to the conversion of forests to agricultural land, especially in the tropics. If the total national forest area is (erroneously) thought to be indicative of the contribution of a country's forests to its and the world's environmental, social, cultural and economic wellbeing, then the loss of forest is thought to indicate the opposite.

Forest loss in the countries of the Commonwealth appears to have increased in the period 2005-10, having been more or less stable since 1990. The absolute area cleared in that period was nearly 3 M ha/year, or 0.36%, concentrated in Africa and South-east Asia and the Pacific. The figures may, however, be revised in subsequent assessments, since the current numbers have been affected by the figures from Australia, where remote sensing imagery has not distinguished between tree deaths and trees defoliated in large areas affected by the prolonged drought. If the figures for Australia are omitted the annual area lost from 2005 to 2010 falls to 2.015 M ha/year, at a rate of 0.3% – still an increase over 2000-05, but much less so.

There are, however, some more encouraging signs. The area lost in Africa seems to have continued to fall

Two Climatic Extremes – Mangroves and Boreal Forest

BOX 1.3

Mangroves

The figures from the recent Global Forest Resources Assessment (FAO, 2010) showed that there are over 14 M ha of mangroves worldwide, of which Commonwealth countries account for nearly 6 M ha, or 40% of the world's total.

Region	*Area (000 ha)*				*Main countries (>100,000 ha)*
	1990	*2000*	*2005*	*2010*	
Africa	2,091	1,987	1,963	1,948	Nigeria, Mozambique, Cameroon, Tanzania, Kenya, Sierra Leone
Americas	406	399	396	393	Bahamas, Belize
South Asia	1,102	1,093	1,090	1,129	India, Bangladesh (Sunderbans), Pakistan
South-east Asia & Pacific	1,302*	2,309	2,021	2,277	Australia, Papua New Guinea, Malaysia, Fiji
Total Commonwealth	4,901	5,788	5,470	5,747	

Source: FAO, 2010.
Note: * no figures given for Australia in FRA1990, whereas in 2000 it reported over 1 M ha.

The many wood products obtained from mangroves range from timber, poles and posts to firewood, charcoal and tannin, while non-wood products include thatch, honey, wildlife, fish, fodder and medicine. An important service provided by mangrove forests is coastal protection against tidal surges and tsunami. Unfortunately, many mangrove forests have been converted to salt pans, aquaculture ponds or agriculture, although several Commonwealth countries, including Bangladesh, India and Malaysia have shown increases in the area of mangrove forests in recent years.

Commonwealth countries possess a significant part of the world's mangrove forests, which form an important resource for the livelihoods of coastal people.

Canada's Boreal Forest

Canada's boreal forest covers 310 M ha, or 77% of Canada's total forest area and nearly one-third of this forest type in the world. The boreal coniferous forest occurs in a mainly continental climate. There are large areas of closed stands of conifers composed of white and black spruces *Picea glauca* and *P. mariana*, balsam fir *Abies balsamea*, and tamarack *Larix laricina*, but there are also deciduous species such as white birch *Betula papyrifera*, trembling aspen *Populus tremuloides* and balsam poplar *P. balsamifera*.

The boreal tundra woodland is influenced by cold arctic air and is more open. The better-drained sites support black spruce and tamarack and some white spruce, with balsam poplar, white birch and alder *Alnus incana* along rivers.

While there have been small losses of Canada's boreal forest in the recent past due to man's activities (agricultural clearing, hydro-electric development, oil and gas exploration etc.) the greatest threat now comes from climate change. Global warming may shift the geographic range of many of the boreal forest species northwards by 300 to 500 kilometres, replacing them with species of temperate forest. At the same time the occurrence of natural disturbances such as fire, insect and disease infestations, and extreme weather events may increase; global warming is contributing to the outbreak of Mountain Pine Beetle in British Columbia, Canada (*see Chapter 2*).

Boreal forest is very important as a reservoir of carbon, which is stored not only above ground but also in the roots and especially the soil. The consequence of global warming will be reduction in area, or even loss, of some of the boreal forest and the release of greenhouse gases, including both carbon dioxide and methane – the latter is a greenhouse gas with a global warming potential more than 20 times greater than carbon dioxide. The boreal forests as a sink and potential source of greenhouse gases is, however, often overlooked; it has been called The *Carbon the World Forgot*, the title of an article by Carlson *et al*. (2009) which also describes the Canadian Boreal Forest Conservation Network under which, since 2001, nearly 50 M ha of boreal forest have been protected as parks and wildlife refuges.

Sources:
Mangroves – FAO, 2003, 2006(a) and 2010;
Boreal – FAO, 2002 and Canadian Forest Service, 2003.

LEFT
Deforestation and land use change have important implications for climate change and the loss of diversity.

slightly while the figures for the South Asia region continue to increase. Country details are in *Annex 2.3*. There has too been evidence of a commitment to tackle illegal encroachment, including Uganda where the eviction of encroachers has been ordered by Presidential directive, and Kenya where the long-running dispute over illegal logging, charcoal burning and agriculture in the Mau Forest will be resolved through the relocation of about 30,000 families (*CFA Newsletter,* No. 47 of December 2009).

In addition, Mather (2007) draws attention to the recent net gain of forest in three Asian countries, including India, or a "forest transition" from net deforestation to net reforestation. In the cases of India the article draws attention to changes made in national forest policy to promote Joint Forest Management since 1990 (*see Chapter 2*) as being one of the significant means of facilitating that transition. Forest transition may have occurred in many developed economies in the 19th century, possibly related to increasing national wealth, and countries such as the UK and New Zealand still show net forest gains. Increasing income per head, however, does not now satisfactorily explain the reasons for forest transition; India had a GDP/head of US$2,670 in 2002, and Malaysia US$9,120, but Malaysia's rate of forest loss increased, not decreased. On the other hand, *Chapter 2* shows that Malaysia scored well in many of the attributes of sustainable forest management.

Annex 2.2 and *Table 1.2* show the change in the area of primary forest from 1990-2010 and 2005-10 respectively, i.e. forest of native species, in which there are no clearly visible indications of human activity and ecological processes are not significantly disturbed.

Area and Change in Extent of Primary Forest, 2005-2010 TABLE 1.2

Region	*Area (000 ha)*		*% regional forest area 2010*	*% change, 2005-10*
	2005	*2010*		
Africa	3,607	3,053	1.5	-15
Americas	172,928	172,928	52.7	0
South Asia	16,304	16,304	22.2	0
South-east Asia & Pacific	40,266	37,927	18.0	-5
Europe	13	13	0.4	0
Total	233,118	230,225	28	-1.2

Source: FAO, 2010.

Canada, with over 165 M ha (53% of its total forest area), has the most primary forest and this total has remained unchanged since 1990. The greatest absolute loss of primary forest has occurred in Papua New Guinea, where over 274,000 ha were deforested yearly between 1990 and 2000, a further 250,000 ha yearly between 2000 and 2005, and over 400,000 ha yearly between 2005 and 2010. Nigeria lost all of its remaining 300,000 ha between 2005 and 2010. Losses of primary forest appear to be continuing in Africa, but the evidence suggests that the rate of loss elsewhere has slowed (except for Papua New Guinea) or even stopped.

Deforestation has important implications for climate change. Forests play an important role in the climate system since they are a major reservoir of carbon, containing some 80% of all the carbon stored in land vegetation, and about 40% of the carbon in soils. It is often assumed that global warming is being mainly caused by the burning of oil and gas. But in fact the cause of between 25% and 30% of all greenhouse gases released into the atmosphere each year – 1.6 billion tonnes – is from deforestation (workshop of the UNFCCC with FAO in August 2006, Rome, report on http://unfccc.int).

But the figures on deforestation do not reflect degradation of existing forest whose negative impact on forests (and the climate) has been increasingly appreciated in recent years; for example, degradation causes the loss of biological diversity and a decline in biomass as well as soil erosion, it leads to economic losses of valuable timber species, it reduces recreational and cultural values, and is a major source of CO_2 and other greenhouses gases. Estimates vary of the extent of forest degradation: the International Tropical Timber Organisation (ITTO, 2002) considered that the total area of degraded forests and forest land in 77 tropical countries was 800 M ha, of which degraded primary and secondary forest covered 500 M ha, while Lambin *et al*. (2003) estimated that the rate of forest degradation for Africa could be almost 50% of the annual rate of the continent's deforestation.

Degradation is the second "D" in REDD – reducing emissions from deforestation and degradation – and could thus be of great significance both for climate change mitigation and as a new source of forest funding for developing tropical countries. But if REDD is to be implemented under the revised Kyoto Protocol then degradation will have to be monitored; its definition, however, is proving difficult since different users have different objectives and perceptions which also complicate its measurement. The challenge was most recently addressed in a meeting of interested parties in 2009 which compared and analysed the various definitions from ITTO, the Convention on Biological Diversity (CBD), the UNFCCC and IPCC, the International Union of Forestry Research Organisations (IUFRO), as well as FAO (the hosts) and its Global Forest Resources Assessment (FAO, 2009). A generic definition, "the reduction of the capacity of a forest to provide goods and services", provides for the meantime a common framework for all of the definitions of international stakeholders and is also compatible with the ecosystem approach but clearly there remains more work to be done to harmonise the definitions.

It should be remembered that degradation can usually be reversed, since forests are a renewable resource, and thus there are links between forest degradation and the process of forest landscape restoration (discussed in *Chapter 2*).

Planted forests

The concept of planted forests combines forest areas formerly called plantations and planted semi-natural forest respectively, which were considered separately before 2005 (FAO, 2006c). Both plantations and planted

semi-natural forest establish similar species (often using improved seed or clonal material), both use intensive establishment and management methods which often include thinning and pruning and, where the objective is wood production, both aim to grow material of uniform size and technical specifications.

Forest plantations were originally established to provide industrial timber, mainly in those countries such as South Africa or the United Kingdom, which had a small natural forest estate. But since the mid-1980s forest plantations have assumed greater importance as a source of wood in nearly every country, whatever their forest cover, and also for the provision of protective functions. Evans (2009) sounds a note of warning, however: "Planted forests, in all their variety, offer major opportunities but are no panacea to the ills that beset the world's forests at large...Tree planting and planted forests have a role to play and are part of the solution to these ills".

The total reported area of planted forests in the Commonwealth in 2010 was 32 M ha (*see Table 1.4* and country details in *Annex 2.6*). The Commonwealth total for plantations alone in 2005 was 14.2 M ha, so the increase of over 15 M ha due to the inclusion of planted semi-natural forest is considerable; it is largely explained by the new figures from Canada.

Planted forests make up 3.9% of the 2010 Commonwealth forest estate, compared with a global average of 6.5%, but the rate of increase in the Commonwealth planted forest area appears to be growing slightly in recent years. Most Commonwealth planted forests lie in South Asia (34% of the total), followed by the Americas (28%), nearly all of which lies in Canada (slightly less than 9 M ha). There is 18% of the total in South-east Asia and the Pacific, 12% in Africa and 7% in Europe.

Planted forest data should be treated with some caution since not all countries reported their plantation area – the anomalous and low figures for Canada in 1990 being an example. Note too that rubber (*Hevea brasilensis*) is included in planted forest areas above; the use of rubber wood for saw timber has been pioneered in Malaysia.

Commonwealth countries with the most planted forest are India (10.2 M ha), Canada (8.9 M ha), the United Kingdom (2.2 M ha), Australia (1.9 M ha), New Zealand and Malaysia (1.8 M ha) and South Africa (1.7 M ha).

Change in Extent of Forest in the Commonwealth, 1990-2010 TABLE 1.3

Region	*1990-2000*		*2000-2005*		*2005-2010*	
	000 ha/yr	*%*	*000 ha/yr*	*%*	*000 ha/yr*	*%*
Africa	-1,889	-0.83	-1,868	-0.88	-1,854	-0.91
Caribbean	-1	-0.08	-1	-0.10	-1	-0.11
North & Central America	-10	n.s.	-10	n.s.	-10	n.s.
South Asia	75	0.11	389	0.54	85	0.12
South-east Asia & Pacific	-121	-0.06	-474	-0.22	-1,165	-0.54
Europe	19	0.67	11	0.36	7	0.24
Total Commonwealth	-1,927	-0.23	-1,953	-0.23	-2,939	-0.36

Source: FAO, 2010.
n.s. = not significant.

Area of Planted Forests in the Commonwealth, 1990-2010 TABLE 1.4

Region	*Area of planted forests (000 ha)*				*% change/year 2005-10*
	1990	*2000*	*2005*	*2010*	
Africa	3,021	3,308	3,684	3,941	1
Americas:					
Caribbean	25	25	26	26	0
Central & North America	1,359	5,822	8,050	8,965	1
Total Americas	1,384	5,847	8,076	8,991	1
South Asia	6,431	7,955	10,277	10,973	1
South-east Asia & Pacific	4,441	4,918	5,362	5,848	1
Europe	1,989	2,173	2,218	2,250	0
Total Commonwealth	17,266	24,201	29,617	32,003	1
Total World				264,001	

Source: FAO, 2010.

ABOVE
Forest plantations such as Kielder in the UK were originally established to provide industrial timber.

Globally, planted forests constitute about 7% of the world's forest area, but may contribute up to 70% of the world's industrial wood and fibre (Evans, 2009). Within the Commonwealth there are several countries where planted forests are highly important in the provision of goods and services. In Africa they include Rwanda (86% of the forest estate), Mauritius (43%), Swaziland (25%), Lesotho (23%) and South Africa (19%). In Swaziland the planed forests are of great importance for the provision of timber, but in neighbouring South Africa they have a protective role on watersheds, as well as a productive function.

In Bangladesh planted forests make up 16% of the forest estate, where they are important for protection as well as the production of firewood, but in India, despite the large area and high demand for all sorts of wood products, they only make up 15% of the forest estate. Some 99% of New Zealand's industrial wood came from plantations in 1997 (FRA2000) which made up 22% of the forest area, and industrial wood products are the third largest export, after dairy products and manufacturing. It is a country which created a strong plantation programme, whose rate of expansion has now strongly slowed as land is converted back into uses such as grazing which have become more profitable again. The UK, with a similar area of plantations, is also converting some of its plantations back to their original native species composition, but for environmental and conservation reasons.

A very wide range of species are used for planted forests in Commonwealth countries. *Eucalyptus* species are the most common in the tropics and sub-tropics, where they meet a wide range of needs, from firewood to sawtimber, but another increasingly common species, also of Australian origin, is *Acacia mangium*, which is a major component of the saw timber and pulpwood programmes in Malaysia. Teak (*Tectona grandis*) is important in India where it is grown for premium saw timber and peeler logs, and is increasingly being promoted as an investment by the private sector. Teak is grown to a lesser extent in Malaysia and Sri Lanka. Pines are grown in several countries, especially *Pinus patula* (in countries of eastern, central and southern Africa), *Pinus radiata* (in eastern, central and southern Africa and in Australia and New Zealand). Poplar species, hybrids and cultivars are grown in many countries such as India where they provide veneer logs for the match industry as well as fodder and services such as shade; *Populus tremuloides* is planted in Canada. Rubber (*Hevea brasiliensis*) is grown in Malaysia not only for latex but also for saw logs.

There are three issues being debated regarding the selection of species. The first concerns the use of exotic

species, or species planted outside their native range. They include the eucalypts in many African countries, where they have grown so long they are almost naturalised. Others include *Acacia mangium* and, in the UK, major components of the industrial wood supply such as Sitka and Norway spruce (*Picea sitchensis* and *P. abies*). The second issue is genetic modification, which is mainly being done on poplar species, and which has attracted adverse attention in the UK. The third issue is invasiveness, which refers not only to introduced tree species but also insects and diseases – discussed further in *Chapter 2*.

Evans (2009) discusses some of the other issues related to planted forests. They include:

- Sustainability questions, including their impact on the site and long-term productivity in later rotations. Good management, it is concluded, should reduce the threat of the former while there is no evidence, so far, of loss of productivity in subsequent rotations – again, with the proviso of sound management practices.
- Risks to planted forests from pest and diseases and fire (discussed in *Chapter 2*), from droughts and extreme weather events, and from climate change (which may lead to increases in all of the previous risks). Again, good management and not putting all of one's eggs in the same basket are essential for reducing the chances of suffering devastating loss.

Planted trees have long been established through agroforestry, a form of sustainable land use that combines natural or planted trees and shrubs with crops and/or livestock on the same unit of land, in ways that increase and diversify farm and forest production while also conserving natural resources. Now this practice is being further developed into partnerships between small landowners and industrial companies – long used on tea estates – and known as outgrower schemes. The forest companies benefit from access to land, diversification of supply and increased cooperation with local communities, while the farmers have an alternate and additional source of income, a guaranteed market, reduced risk, and, in some cases, financial support for development. Commonwealth examples include (FAO, 2006b):

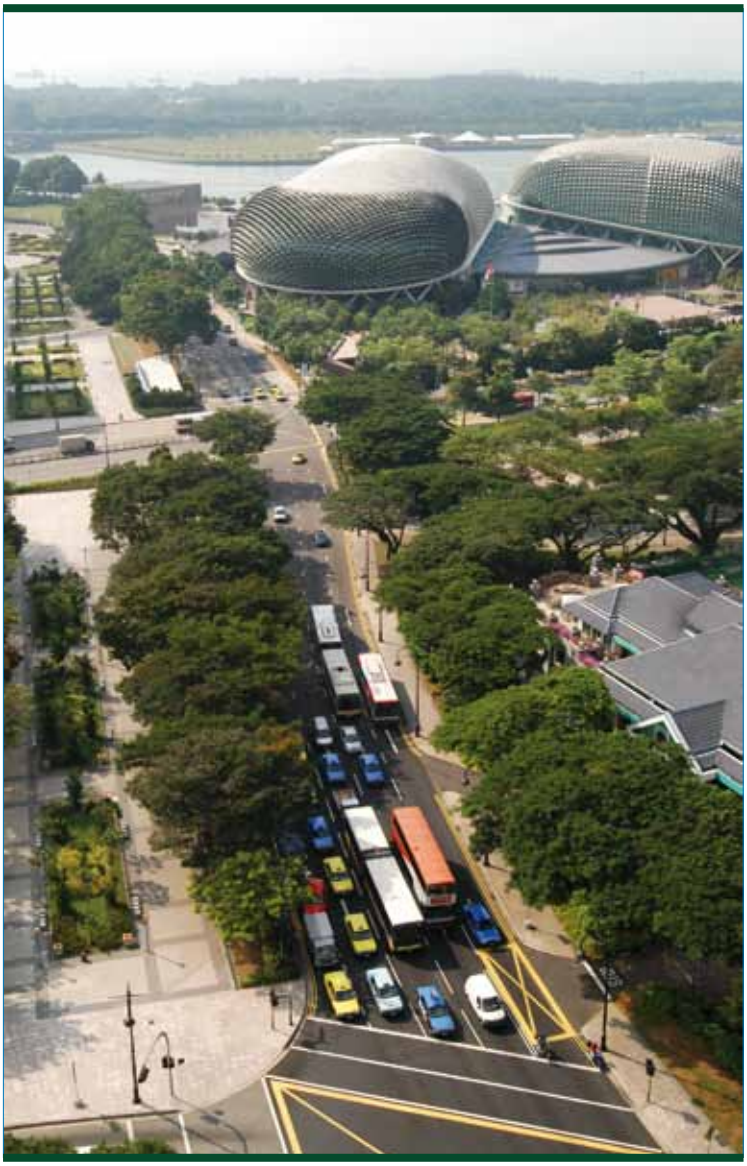
- India, Bhadrachalam Paperboards, eucalyptus pulp, 3,210 ha and 1,375 growers;
- Solomon Islands, Kolombangara Forest Products, sawlogs, 200 ha, 100 growers;
- Vanuatu, Melcoffee Sawmill, sawlogs, 100 ha, 50 growers;
- South Africa, Mondi Ltd, pulpwood, 5,900 ha, 2,854 growers;
- South Africa, wattle bark, 436 ha, 430 growers;
- Ghana, Swiss Lumber Co. 150 ha, 25 growers;
- New Zealand, Tasman Forest Industries, pulpwood, 11,000 ha, 27 Maori Land Scheme groups.

The increase in outgrower schemes reflects also the recent increase in ownership of planted forests by small holders, a trend noted in a FAO publication (FAO, 2006c).

Trees are also being increasingly used to rehabilitate or to protect sites. Typically trees have been used to rehabilitate land affected by erosion or by mining – either surface mining, or the dumping of mine spoil, but now trees are used to rehabilitate many other types of degraded site and on sites irrigated with waste water. *Unasylva* (2001) is devoted to this topic.

Urban forestry

Trees have been planted in towns and cities along roads and in parks to add to the landscape, for ornamentation and to give shade in every Commonwealth city for many years. More recently their role in reducing pollution, both from the noise of vehicles and from air-borne particles has attracted attention, while the need for peri-urban forests has been recognised.



ABOVE
Street trees in Singapore – with half of the world's people now living in cities the need for urban tree planting is growing.

Half of the world's people now live in cities – even in forest-rich Canada 78% of the people live in urban centres – and it is projected that within the next 50 years, two-thirds of the world's population will do so (World Urban Forum 2006). All of the population of Singapore and Nauru live in urban areas, 95% of the people of Malta do, 90% of the UK population, 88% of Australia's and 86% of New Zealand's (see *Annex 1.2*).

Many developing economies have at present low proportions of their people living in urban areas, but a rapid rate of urban growth: Uganda has an urban population of only 13% but a rate of urbanisation of 4.2%/year, while Malawi has 17% of its people living in towns and cities but a rate of urbanisation of 4.8%/year (*Annex 1.2*). More parks and other open public spaces will be required for recreation – which implies more urban trees.

More than half the developing world's urban population lives in slums and sadly, since this proportion is unlikely to decrease greatly as the cities expand, this will offer urban trees the opportunity to fulfil more than their traditional functions. They could, for example, provide wood for construction and domestic energy, stabilise hillsides, drain swamps and rehabilitate sites, even generate income.

Introduced species were formerly used in urban tree planting – the jacaranda on Uhuru Highway in Nairobi or the plane trees in London streets – but now there is a move towards the planting of indigenous species in some cities. Urban tree planting in colonial days was often initiated by the forest service, but this role was soon taken over by city authorities who have given increasing responsibility to the units responsible for urban parks and gardens. The three temporal phases of urban tree planting in Malaysia are described in *Box 1.4*.

The challenges will be, and are, to make adequate provision for the maintenance of ambitious urban forestry projects, not just their implementation. Tree species must be matched not only to the site characteristics but to their likely influence on roads and buildings as they develop. Greater numbers of trained professionals will be required, with skills in multi-disciplinary urban planning and management, as well as training in the social sciences.

Connecting urban societies with the natural world, the theme of the 2006 National Conference of the UK's

Institute of Chartered Foresters, sums up the opportunities to link urban people to nature through urban forestry. The practice of urban forestry and of arboriculture, formerly the poor relations of the forestry profession, are now assuming greater importance.

Forest ownership

Ownership of forests in the Commonwealth is predominantly public, with the exception of forests in Caribbean countries. *Annex 2.6* shows that the countries with significant proportions of private forest in 2005 were:

- Africa – Uganda (70%), Mauritius (47%) and South Africa (34%);
- Caribbean – Barbados (96%), Jamaica (65%), Saint Lucia (53%), Grenada (31%), Trinidad & Tobago (25%) and Bahamas (20%);
- South Asia – Pakistan (34%);
- South-east Asia and the Pacific – Papua New Guinea (97% "other"), Fiji (93%) and New Zealand (37%);
- Europe – United Kingdom (64%) and Cyprus (39%).

In Fiji, Papua New Guinea and Vanuatu most of the forest is owned by customary landowner groups.

The ownership of OWL follows a similar pattern.

Many Commonwealth countries have been privatising planted forests which were formerly owned by the State. New Zealand and the UK have been among the first to do this, since the mid-1980s. New Zealand's experience has been that internationalisation followed privatisation – all major plantation areas are owned by non-New Zealand owners. In South Africa, on the other hand, the privatisation programme stalled in the late 1990s following democratisation since it was felt, among other reasons, that it would not contribute to addressing social problems. In the end, learning from the New Zealand model, some sales of publicly-owned plantations did go ahead, but with provisions for sales of 10% of shares to black groups, 9% to employees and the land would be leased in the long term but the State would retain ownership (Bethlehem and Dlomo, 2003). Mozambique is actively promoting large-scale commercial afforestation tax and other incentives and has set aside 6 M ha of degraded savanna for this purpose. The target is South African forest industries which are running out of suitable sites in their own country (ICF, 2009).

Summary

The forests of Commonwealth countries account for more than one-fifth of the world's forest area or over 800 M ha; the Commonwealth has the resource base to play a major role in the international dialogue on forests and forest-related issues.

Urban Tree Planting in Malaysia

BOX 1.4

Urban tree planting has gone through three phases in Malaysia, a process similar to many other countries:

- Pre-independence. *Pterocarpus indicus* is reported to have been planted in Malacca (1778) and Penang (1802); Kuala Lumpur Lake Gardens (1888) and Penang Botanical Gardens established; widespread urban tree planting in the 1920s and 1930s.
- Greening programmes, starting with Kuala Lumpur (1973); Landscape Unit established in Dept of Town & Country Planning (1981); rules and regulations for the planting, cutting and conservation of trees; greater emphasis on urban tree planting in the Structural Plan for Kuala Lumpur.
- Landscaping the Nation programme (1995), and a Prime-ministerial nationwide Garden Nation campaign (1997), both supported by growing public interest in the environment and demand for attractive surroundings; local government nurseries established to meet the demand for plants; Landscape Master Plans for every town or city council.

From Sreetheran *et al*., 2006.

For example, three Commonwealth countries (Canada, Australia and India) are among the world's 10 most forested countries while five more have forests covering more than 20 M ha each. Some 28% of the Commonwealth's forests are classified as primary forest, mainly in Canada but with significant areas in Africa and South-east Asia and the Pacific. All Commonwealth forests cover a wide range of natural forest types and represent a very high level of biological diversity.
Two forest types of particular importance not only in ecological terms but also in terms of environmental, social and economic benefits are the boreal forests of Canada and the mangrove forests of the coastline of many Small Island Developing States and other low-lying countries; both are under threat from the effects of global warming.

The importance of forests and woodland to rural people in low forest cover countries and in montane zones is often not appreciated by policymakers. Other wooded land is another resource that is often omitted from national planning; it covers nearly 400 M ha in Commonwealth countries. It makes a significant contribution to the livelihoods of many rural people but more studies are required to quantify it and the benefits it provides, especially to the poorest.

Loss is continuing in Commonwealth forests, apparently at a faster rate than in the period 2000-05 – whereas the world's deforestation has probably slowed slightly since then. Most of this loss has occurred in certain African and South-east Asian countries. The loss of primary forest continues too, in South-east Asia but to a lesser extent in certain African countries.

The outlook is, however, not entirely pessimistic. There has been a net gain of forest in some Asian countries, a transition from net deforestation to net reforestation. Commonwealth countries have a long history of planting trees and planted forests in now cover 32 M ha, or 3.9% of the Commonwealth forest estate compared with the global proportion of 6.5%. Several Commonwealth countries rely heavily on planted forests for the provision of forest goods and services and there is a move towards "outgrower" schemes by smallholders in many countries, reflecting a global trend. Such schemes can contribute to the

RIGHT
The mangrove forests of many SIDS such as the Maldives are under threat from the effects of global warming.

livelihoods or rural people, but there implications for policymakers, who should bear in mind the impact on wood supplies of sudden changes in facilitating policies. Tree planting in towns and cities is attracting increasing recognition and support.

Most forests in Commonwealth countries are publicly owned, but some countries have communal ownership and several others predominantly private ownership. Some Commonwealth countries have been pioneers in the privatisation of forests.

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Volvo Forestry Solutions

Demonstrating its commitment to forestry customers around the world, the Volvo forestry equipment range now includes four tracked carriers – FC2121C, FC2421C, FC2924C and FC3329C – and, introduced in September, 2008, initially into the North American market, three feller bunchers – FB3800C, the short tail swing FB2800C and the zero swing FBR2800C.

Developed from Volvo standard excavators, the tracked forestry carriers are designed as versatile, all-purpose machines. The great advantage of this design is that, depending on seasonality and weather conditions, these machines can tackle a variety of forest applications when not being used for harvesting; from forest road building, shovel logging, log loading, processing, stump harvesting for bio-energy to reforestation, and so the process starts all over again.

Designed for the tough demands of forestry work, Volvo heavy-duty tracked forestry carriers include protection for both the upper and lower structure, a purpose-built, "high-walker" undercarriage to manage difficult terrain and protection for all major components. The FC2421C can also be supplied with an optional "gull wing" panel opening system, providing unimpeded, easy access to the engine and components, for easy service and maintenance, ensuring maximum machine availability.

The more powerful and purpose-designed feller buncher carriers feature a well-matched, forestry hydraulic system with a dedicated pump to power the hot saw. Whilst these machines normally carry a heavy-duty felling head, they can also be equipped with a harvester head for cut to length operations. In addition to felling and processing applications, they can also serve as shovel loggers when working with large trees.

With operator safety never underestimated, all Volvo dedicated forestry machines feature a Volvo Forestry Care Cab, approved to OSHA, WCB, SAE and ISO standards. On the feller bunchers, the larger cab also provides sufficient space for the occasional trainer or trainee to be in the cab alongside the operator.

Alongside quality and safety, as Volvo core values, environmental care is never off the agenda, and perhaps never more appropriate than to the environment that is the forest. Volvo adapts a multi-pronged approach to fuel efficiency through the development of alternative fuels, engine development to continue to meet the ever more challenging emissions regulations, eco-operating programmes for machine operators, the development of systems that deliver fuel savings and, of course, hybrids.

As just one example of Volvo's quest for ever more environmentally friendly solutions, Volvo's Technology Transfer division has been the major investor in the Swedish company El-forest AB, in the development of the world's first hybrid forwarder, which was demonstrated on the Volvo stand at the last Elmia Wood dedicated forestry exhibition in Sweden.

Volvo's strength in the forestry segment is derived not only from the provision of specialist forestry equipment, but also from the extensive range of products offered in the Volvo Construction Equipment product portfolio – wheeled and tracked excavators, wheel loaders, with an extensive range of wood handling attachments, haulers, graders, compact equipment and, of course, superior Volvo, Renault and Mack trucks – all of which have an important role to play in some part of the forestry process, from building forest access roads and harvesting, right through loading, transportation to mills and the handling of finished products for onward transportation.

For forestry customers around the world, this "total solutions" capability gives Volvo the opportunity to offer everything needed in mobile equipment and related services, both in terms of financial support from Volvo Financial Services to customer after-sales support. The focus of the "total solutions" concept is the best overall result on the customer's bottom line, year after year.

Perfect partners – a Volvo tracked harvester and (background), one of the latest feller bunchers, which can also be equipped with a harvester head, for added versatility.

For stacking or loading, Volvo's L180F High Lift offers an 8.6 tonne working load and 5.8 metre lift height under the closed grapple.





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