

FOREST RESOURCES, SCIENCE AND TECHNOLOGY, AND SUSTAINABLE DEVELOPMENT

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Summary

While forests in industrialized countries are expanding in area and quality, and are highly valued for both their production and the environmental services they provide, tropical forests continue to be cleared or degraded at alarming rates.

These pressures for deforestation and degradation arise from excessive (unsustainable) use, far beyond the forests' ability to grow and regenerate themselves, particularly for industrial timber or for (commercial) fuelwood. But even more important are the pressures to convert forests to other land-uses, to clear the forest so that the land beneath it can be used for agricultural and pastoral uses, sometimes for infrastructure such as roads and dams, and sometimes for settlement and habitations.

Due to declining forest quality and cover, many rural communities in developing countries experience environmental problems including: erosion, siltation and falling groundwater levels; adverse micro climatic change; and the disappearance of important flora and fauna. An increasing number of communities face growing shortages of critical forest products used for housing, agricultural tools, fodder, fuel, medicine, food, ritual, and raw materials for small industries. Due to the very low incomes of millions of households, these necessary products cannot be obtained through outside markets.

Sustainable development involves balancing equity and welfare concerns, within and between generations, with economic development and environmental protection. Sustainable development in forestry does not mean preventing all further deforestation, but rather attempting to find the best balance between use, retention, and clearance of forests.

The global environmental services from forests are at risk, and warrant prompt remedial action. But slowing the deforestation, achieving forest conservation goals, and enhancing the contribution that forests make to the incomes and livelihoods of rural societies, is proving far more difficult than imagined a decade ago. This paper explores the role of science and technology, and improved management institutions, in developing improved forest management practices, in responding to the social, economic and environmental goals of sustainable development.

1. Conservation of Forests is an Essential Component of Sustainable Development

Forests are of fundamental importance to people; the history of our societies is in many ways intimately linked to forests. Our folk tales and culture draw in numerous ways on forests. There is a modern conservation ethic that perceives forests as either being modified, and therefore of low conservation value, or pristine and untouched and therefore of high value. The reality is that virtually all today's forests have achieved their present state as a result of millennia of subtle management actions by people. People have consciously modified forests over centuries, in order to increase the forests' value to them. The perception of forests as being "natural" or "non-natural" is itself an artifact of contemporary western culture. In western culture at least, and probably in many others, there remains a deep belief that nature does not exist simply to meet people's needs, that nature has intrinsic values in its own right and that people do not have the right to use it as they please.

The popular appeal of the worldwide movement in favor of the conservation of forests has its foundations in this belief. And perhaps the origins of this belief lie in tacit recognition even amongst primitive human societies of the adaptive value of retaining areas of "natural" forest. These forests were sources of multitudes of products, they were reserves against times of privation and they yielded what we now call environmental services, such as water, erosion control and local climate mediation.

Formal forestry as a profession had its origins in central Europe in the eighteenth century. Timber at the time was a major strategic material. Countries depended upon their navies to extend their influence beyond their frontiers. Timber, mainly from mature oak trees were essential for building those navies. Many of the famous forests of Europe today were planted as strategic reserves in the eighteenth century to counter threats from other countries or as a basis for future overseas adventures. The rulers of these societies were also interested in hunting in their forests and fortunately for them, management for large timber was compatible with the maintenance of their preferred quarry—deer.

But the objectives of the state, to produce large diameter, straight oak trees and to hunt large game, were sometimes at variance with the needs of local people. The latter

needed firewood and small sized timber of a number of species for immediate local uses. For local people forests were a multiple-use resource. They pastured their livestock and periodically cut areas of forest for swidden agriculture. The origins of formal forestry lie in attempts by the state—as exemplified by the aristocracy—to protect their forest values against the depredations of the peasantry. This tension between multiple-use by local communities and single uses by the state, powerful people, corporations etc is as alive today as it was at the time of the Napoleonic wars. Many of the debates about forest conservation that continue to rage today in the international media can be much better understood if they are seen in this historical context.

Formal forest departments in developed countries inherited the historical role of managing forests primarily as a source of timber for construction. It is only in recent years that we have begun to see the emergence of a “New Forestry” or of “Ecosystem approaches” to forestry, which attempt to mimic natural ecological processes. We see the emergence of state agencies that explicitly recognize that forests are extremely important to the majority of people for a wide diversity of products and services. They are a source of fuel and of traditional foods, fibers and medicines— hunted and gathered, as well as providing countless opportunities for small-scale income-generating activities (handicrafts and artisanal products), amenity and recreation. The balance between these different demands upon forests differs according to the level of economic and social development of the society, the scarcity or abundance of forests and local cultural and social attributes. All that can be said is that, although different people ascribe different values to forests, all people seem to ascribe some value to forests.

But quite apart from all the valuable and useful products that individuals derive from forests, there is increasing recognition of the public values of the environmental services that forests provide. These may be felt at the level of a local community, a watershed, and a nation and in our increasingly globalized world to the life support systems of our planet. Forestry had its origins in struggles for resources between the local aristocracy and the local peasant. Now it has evolved into a multi-dimensional struggle between the rich and powerful and the poor and weak at the local level and at the global level. Many in the affluent developed world are seeking to impose their vision of desirable forest outcomes onto the poor of the less developed world.

Notwithstanding all this there remain enormous pressures and stresses upon all values of forests, especially in the tropics. As a result of these pressures, tropical forests declined at a rate estimated between 1 and 1.6 percent annually between 1981 and 1990. The absolute rate may have declined somewhat in the 1990s but as a percentage of the remaining forest area it remains high. The media tend to focus on deforestation as the principle problem but many more forests are experiencing degradation of various types. They are losing their biodiversity, their biomass is declining and their ability to provide products and services is being depleted. This steady decline in forest extent and quality is causing many communities to experience environmental problems including erosion, siltation and falling groundwater levels, adverse micro climatic change, and the disappearance of useful flora and fauna. An increasing number of communities, especially in poor countries, face growing shortages of critical forest products used for housing, agricultural tools, fodder, fuel, medicine, food, ritual, and raw materials for small industries. Since millions of these

households have very low cash incomes, these necessary products cannot be obtained through outside markets.

These pressures for deforestation and degradation arise from excessive and unsustainable use, far beyond the forests' ability to grow and regenerate, particularly for industrial timber or for commercial fuelwood. But even more important are the pressures to convert forest-lands to other uses. The greatest threats to forests result from pressures to clear the forest so that the land beneath it can be used for agriculture, pasture, plantations or mines, or for infrastructure such as roads and dams, and for settlement and habitations.

Thus there is a three-way tension between:

- The value of a forest for conservation and environmental services;
- The market value of the commodities and products that can be removed from it; and
- The high value of the land under the forest, for alternative uses.

2. The Location, Extent, and Pace of Forest Destruction and Degradation Worldwide

The first attempts to measure the extent of the world's forests and the rate of their destruction date from the 1970s. The Food and Agriculture Organization, FAO, the United Nations body with the mandate to monitor the world's forests, now produces a major assessment at the end of each decade and recently has published a biennial report on the State of the World's Forests with updated statistics and analysis of trends. Surprisingly, given the sophistication of modern satellite-born remote sensing data, there is still great uncertainty about how much forest remains and how fast it is degrading or disappearing. Much of the problem comes from definitions. At present, FAO says 10 percent tree cover constitutes a forest. Other estimates of forest cover and deforestation differ from those of the FAO because a different definition was used. The FAO itself has changed its definitions over the years. A great deal of confusion has resulted from the misinterpretation of FAO figures; people and organizations have used them for purposes for which they were not intended or suitable.

The absolute area of forest is not really a very useful statistic. For instance the analysis of global climate change requires figures on forest biomass. The analysis of timber supplies requires knowing the number and size distribution of commercial species. The analysis of biodiversity requires knowing about the structure, age and species composition of the forest. No single simple statistic can contain all of this information. The reality is that most of those figures that are published that differ from those of FAO do so because they are not measuring the same things that FAO measures. The FAO figures remain by far the best available at a global level for the simple reason that they are the only ones where full explanation is given of what the figures represent and how they were obtained.

FAO's latest figures indicate that in 1995 there were 3454 million hectares of forest worldwide. This figure includes 'natural' forests, heavily modified/managed forests, young regrowth or secondary forests, and plantations. Between 1990 and 1995 the total area of forests declined by 56.3 million hectares—the result of a loss of 65.1 million

hectares in developing countries and an increase of 8.8 million hectares in developed countries. The main causes of these changes were the conversion of forests to agriculture and large infrastructure projects in developing countries and the invasion of abandoned agricultural land by forests in developed countries. Forest degradation was also cited by FAO as a major problem in recent years. It has many causes but important amongst them were over-harvesting of industrial wood and fuelwood, overgrazing, fire, insects, pests and diseases, storms and air pollution. Forest fires have become an increasingly important problem in recent years. The worst two years for forest fires in recent times were 1997 and 1998, coinciding with an extreme el Niño climatic disruption. Millions of hectares of forests burned; all regions of the world and all forest types were affected. Brazil, Mexico, Indonesia and the Russian Federation were the worst affected countries. While the unusually strong el Niño weather pattern contributed to the increased number, size, intensity and duration of fires, poor land-use practices in agriculture and forestry were the major underlying causes that set the preconditions for the huge fires.

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Biographical Sketches

Professor Jeff Sayer is the founding Director General of CIFOR. Before joining CIFOR in 1993 he had been involved in many of the strategic initiatives to better manage and conserve the world's forests over the past 20 years. He has published a number of books and papers on global forestry issues. He has a research interest in forest biodiversity conservation, particularly in the biodiversity of forests that are managed for timber and other products. He has devoted his career to working on forest and nature conservation programs in the tropics. Prior to CIFOR, Jeff worked as a senior environmental advisor to the World Bank in Washington (1993). He has also headed the forest conservation program at the International Union for Conservation of Nature based in Switzerland (1984 to 1992), and acted as an advisor on nature conservation issues on a number of FAO projects in Africa and Asia. He began his career as a research officer in the Department of National Parks in Zambia where he worked on the population dynamics of large mammals. Jeff studied Botany and Zoology at the University of Hull (UK) and Conservation at the Departments of Geography and Botany at University College London (UK). Since 1994, he has been Prince Bernhard Visiting Professor of International Nature Conservation at the University of Utrecht (Netherlands). Nationality: British.

Dr Neil Byron is a Commissioner with Australia's Productivity Commission with special responsibility for Environment and Natural Resources. He has worked as an advisor on forestry economics and development policy in over 30 countries. From late 1993 to mid-1998, he coordinated international economic and policy research, as Assistant Director General of CIFOR, the Center for International Forestry Research, based in Indonesia. In 1992, he was the founding Director of the graduate program in Environmental Management and Development, in the National Centre for Development Studies at the Australian National University. Previously, he was a Senior Lecturer in Resource Economics, and concurrently Executive Director, Centre for Forestry in Rural Development. He coordinated multidisciplinary studies of the role and contribution of various types of forestry activities to rural development, providing consultancy services to national and international agencies, and conducting training courses in environmental planning and management. He was also Deputy Project Director and consultant economist, Nepal–Australia Community Forestry Project (from November 1988 to June 1991). From July 1982 to December 1984, he was seconded to the United Nations Food and Agriculture Organization to be Chief Technical Adviser of an FAO/UNDP Project, Supply and Demand of Forest Products and Future Development Strategies in the Ministry of Finance and Planning, Dhaka, Bangladesh. He advised the Planning Commission and Minister of Agriculture and Forests re development priorities and coordinated international donor assistance. Previously he worked for the Queensland Forest Service (1968–1973), then the Australian Bureau of Agricultural Economics (1978–1980) as head of forestry economics research. Neil has an honours degree in Forestry from the Australian National University in Canberra and a Masters in Economics and Doctorate from the University of British Columbia, Vancouver, Canada.