

1 Globalization of Forests, Societies and Environments

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1.1 PURPOSE AND SCOPE OF THE BOOK

This book addresses current global and regional issues concerning world forests, societies and environments. The independent and non-governmental point of view of the book is a response to increased demand for global research-based forestry information in an easily readable form.

By examining the contents of this book one will observe that a wide range of topics, geographical areas, cultures and environments, is covered. The complex issues relating to the threats and opportunities facing the world's forests, environments and societies do not allow us the luxury of a simple solution. Indeed, the intention is not to give the impression that there is a single truth. But instead, the aim is to bring together the diversity of views and perspectives presented by the 68 contributors with a wide range of backgrounds and cultures.

This diversity of perspectives will, we hope, lead to the realization that many, if not all, of the issues presented can no longer only be addressed at the local level. During the historical period, some of the effects of local deforestation or degradation could be offset by migration, colonialism, or trade. Today, such mechanisms are less and less applicable. Forest resources are becoming scarce, and those which remain or are being established need to fulfill increasing and conflicting functions, ranging from the provision of livelihoods for local communities, to the production of raw material for the world's forest

industries and ultimately, to the protection of the global environment.

To date, a few studies on global forest sector problems have been undertaken. For example, the International Institute of Applied Systems Analyses (IIASA) in Austria conducted a major research project and produced an analytical perspective on the global forest sector (Kallio et al. 1987). The World Bank was involved in a global forest sector study for The United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro (Sharma 1992). The Food and Agricultural Organization of the United Nations (FAO) has been commissioning global research on the demand for and supply of forest products (e.g., FAO 1997b). An early accomplishment giving a comprehensive view of the world's forest resources is Ilvessalo and Jalava (1931).

The main message that can be drawn from the articles in this book is that cooperation on a global scale is not only commendable, but essential if solutions to the problems facing the world's forests are to be found. Concomitant with this, modern science needs to produce an ever clearer and increasingly global picture of the relationship between human activity and the environment, and of the consequences of environmental change on the ability of societies to survive. Thanks to modern communications technologies people around the world have a wider awareness of global events. This awareness is sometimes called "globalization" – a term referring to the process by which more and more aspects of human life are becoming exposed to

worldwide influences, be they political, economic, cultural or environmental.

This introduction to the book briefly elaborates on this theme of globalization, in order to help the reader place the articles in the context of the events and processes which, even on a local scale, are today directly linked to global processes. Indeed, the very process of producing this book, reflects the fact that the issues related to world forests, societies and environments are becoming global.

Before continuing the theme of globalization, a summary of the structure of this book is appropriate. Part II, *Society and Environment*, reviews some worldwide trends which may have considerable significance for forests and forestry in the future. The main lesson is that to some extent world trends are influenced by forest sector issues but that to a much larger extent, the forest sector is being influenced by external factors. For example, demographic changes such as population growth, developments in age-distribution and family-size reduction, as well as urbanization, all have a strong bearing on how much pressure will be placed on different services of forests, the extent of utilization of forests, how forest values will be perceived and which management regimes will be preferred.

In Part III, *Importance of Forests*, various goods and services of forests are discussed. It has proven useful to measure the values of forest tangibles and intangibles alike in monetary units, as monetary value provides a common measure for the assessment of the perceived value to society of these goods and services, and so advances sound policymaking.

The monetary value of the marketable production of forestry and the forest industries can be estimated relatively easily at local, national and global levels. However, it is difficult to measure the volume and value of those forest-based goods not entering the markets. It is even harder to monetarize the various non-tangible services provided by and linked with forests, even if it is possible to agree that these services have strong economic, financial and monetary implications.

A serious consequence of ignoring the full value of forests, in many parts of the world, is the strong tendency to undervalue sustainable forest management and conservation while overvaluing forest conversion. This under-representation of the value of forests in economic accounting and political decision-making is one of the crucial impediments to sustainable development. Ideally the scientific world should be given adequate resources to investigate effectively the full value of the world's forests.

In Part IV, *Global Forum*, scientists write about

themes of global importance, such as deforestation and institutions, timber trade and environment, forests and climate change, and forest biodiversity. This part serves also as a discussion forum for the respective topics. The intention is for the writers and their discussants to present facts and views that will generate a wider discussion.

Part V, *Regional Forum*, focuses on pertinent regional issues of current global concern to the forest sector. Such themes include farm and agroforestry in Africa, corruption and concessions in Asia-Pacific, urban forestry in Latin America, and environmental forestry conflicts in North America and Europe. Each regional review has a country case study analyzing forest sector development at the national level. One of these assesses Finland's success in forest-based development.

Part VI, *Special Theme*, introduces forest sectors in transition economies. Here, teams of Russian and Chinese scientists and experts focus on the implications of the economic and social transition on the forest sector. Russia has the largest area of natural forests while China has the largest area of plantation forests in the world. The transition paths followed by these two countries are quite different from each other. In Russia, the overhaul of the political and economic systems took place during a dramatically short period of time. These events have been followed by drastic declines in the forest sector. On the other hand, China's political system has not changed much, but the economy is gradually being transformed into a market system. China's forest sector production has shown some increases.

1.2 GLOBALIZATION OF FOREST ISSUES

What is a Forest?

Before addressing the question of globalization and its implications for the world's forests, it is useful to address the question of "what is a forest". The question is pertinent, as one of the controversies in dealing with the increasingly global forest and forestry challenges is precisely one of definition. Moreover, the political and other implications of a specific forest definition are only rarely discussed and worth reviewing.

The Food and Agriculture Organization of the United Nations (FAO) was established in 1945. Almost since its inception, FAO has been publishing a periodical called *Unasylva*. This Latin word means

“one forest”, carrying the connotation of “one forest for one world”. As Laarman and Sedjo (1992: 1) observed: “the name was well chosen. The word lends itself to imagery of the earth’s forests as one great biophysical system, with transitions connecting temperate and tropical, wet and dry, fertile and infertile, highland and lowland. At the same time, we are given an implicit philosophy which aims at world scope and global mission. A name which calls attention to the unity of forests inspires grand achievements, and reminds us of present shortcomings.”

Since the first issues of *Unasylva* were published, FAO has been making periodic assessments of world forest resources. These assessments have proven to be extremely difficult undertakings scientifically, practically and politically. Monitoring and estimating the changes in forest area and the growing stock of trees, let alone assessing the carbon content and biological diversity of forests and their ecosystems, have turned out to be a highly demanding effort. Particularly, to accomplish all this in a globally consistent fashion across geographic and political regions has been close to a mission impossible. Knowledge of *unasylva* has therefore remained rather poor, especially for temporal changes and for providing data suitable for research purposes at the national and subnational levels (Lund, article 5 and Palo, article 6 in this Volume). This knowledge deficiency has also had consequences for political decision-making processes.

The Global Forest Resources Assessment of 1990 (FAO 1995b) provides the most reliable and valid overview of global forests, even though a common forest definition was not found for developed and developing countries. For the developed countries, forest was defined as land with tree crown cover (stand density) of more than 20% of the area; whereas for the developing countries, a forest was defined as an ecosystem with a minimum tree/bamboo crown cover of 10% (Palo, Box 1.1 in this Volume).

Even the weaker forest definition chosen for the developing countries leaves large tracks of wooded land outside the forest category. This is particularly so in Africa, where open forests are a predominant forest type (Kaoneka, article 13 and Semesi, article 16 in this Volume). The definition also has implications for estimates of the deforestation which occurred during the period 1980–1990. In the developing countries it was estimated that the average annual deforestation during that period was 15 mill. ha. Had the crown cover rule been 20% also for the developing countries, the annual deforestation estimate would have been much higher.

Contributing to the unfocused vision on *unasylva* is that the data on forest resource changes in Europe, Russia and North America are to a large extent either unreliable or missing. For several developed world countries, these change estimates have never been systematically assessed.

Other wooded land is a concept which has been introduced by FAO. Other wooded land is defined as land which has some woody characteristics but is not forest as defined above (FAO 1995b). The concept, again, has different definitions for the developed and developing countries. The combined term “forests and other wooded land” can be criticized in fact for creating a blurred vision of forest areas and their changes. Yet, this term is frequently used around the world in political forums relating to world forests.

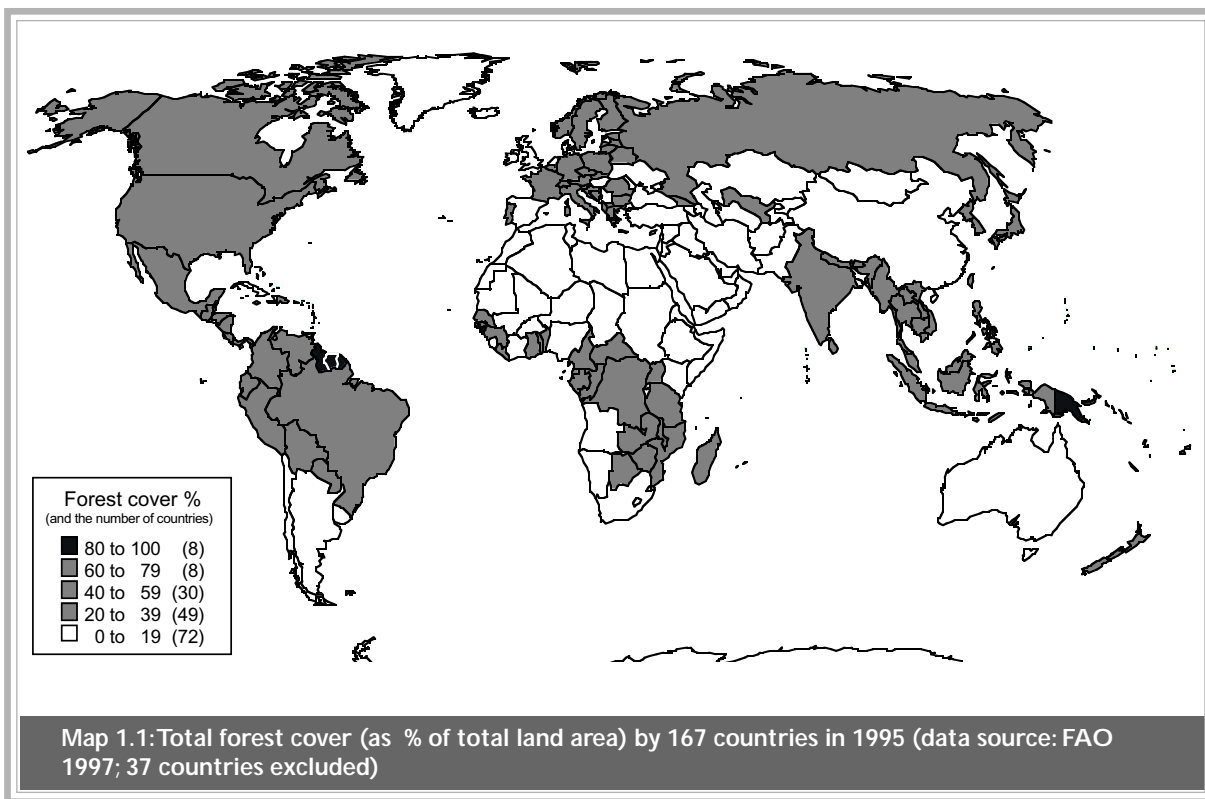
The world forest resources assessment for the year 2000 aims at finally creating *unasylva* by employing a single forest definition, which will be based on the 10% crown cover criterion, a minimum height of 5 m for mature trees in situ, and a minimum area of 0.5 ha (Palo, Box 1.1 and Lund, article 5 in this Volume). The new global forest concept still has weaknesses, such as being too wide and ignoring ecosystem characteristics. This latter weakness is all the more regrettable, recalling that forest ecosystem management is being adopted globally as a cornerstone of a new forestry paradigm.

World’s Forest Resources

Worldwide some 3.5 bill. ha, or 27% of the earth’s land area, were under forests in 1995. These figures exclude other wooded land, as defined above, and trees outside forests. Of world’s regions, Latin America and the Caribbean has the largest area of forests, followed by the former Soviet Union, Asia and Oceania, Africa, North America, and Europe (Map 1.1).

The seven countries with the largest forest areas (the so-called F7) contained 61% of the world’s total forest area in 1995. These countries are – in a descending order – Russia, Brazil, Canada, the United States, China, Indonesia, and the Democratic Republic of Congo (formerly Zaire) (FAO 1997a). Russia has the largest volume – in cubic meters – of standing trees followed by Brazil, but the latter has by far the largest tree biomass in tonnes. Indonesia has the richest biological diversity in its forests (FAO 1995b).

The “F7” countries are therefore in a crucial position concerning the fate of the world’s forests. A project to develop the forest assessments in these



countries could be organized to achieve a timely and cost-efficient monitoring system for the majority of world's forest resources. Perhaps the newly formed Intergovernmental Forum on Forests (IFF) could take this issue on its agenda. The primary focus should be on the forests and forest management of these seven countries, representing the North and the South. The IFF could investigate methods for improving the quality of forest management and the effectiveness of forest policies under various conditions.

In order to meet the increasing world demand for forest products high expectations are placed upon plantation forests (Nhantumbo, article 14, Monela and Kihyo, article 15 and Zhang and Buongiorno, article 19 in this Volume). Developing countries had a total of some 80 mill. ha of plantation forests in 1995. The respective estimate for the developed countries was 80–100 mill. ha. From 1980 to 1995 the area of plantation forests in the developing countries was doubled. Asia and Oceania had some 82% of these forests, and China had the largest area of plantation forests of all countries in the world.

The wood production potential of many of the high-yield plantation forests does seem impressive. Based on simple calculations, it would appear that

on a global scale a relatively small area of high-yield plantation forests could easily support the increasing demand for wood fiber. However, what seems straightforward at the global level, may, at the local level, meet complex land use and ecological constraints (de Camino, article 24 in this Volume). Solutions addressing a variety of local situations are needed to tackle global challenges.

Forest Policies

FAO's 1980 assessment of tropical forest resources applied a new approach to data gathering – a shift from questionnaires to personal visits. The annual average tropical deforestation for the latter part of the 1970's was subsequently assessed to be 11 mill. ha. This alarming information raised widespread environmental and political concern and deforestation's place on the international agendas jumped upwards (Palo, article 6, Bromley, article 9 and Kaimowitz and Paupitz, article 26 in this Volume).

One response to the new global concern over the fate of tropical forests was the Tropical Forest Action Plan (later Program) of the World Resources Institute, the World Bank and the FAO. The Plan was mobilized in 1985 and its implementation has since

been expanded to more than 100 countries. Furthermore, in 1995 FAO invited state government forestry ministers to their first meeting in Rome. FAO also became more actively involved in global information dissemination by publishing the State of the World's Forests (FAO 1995c, 1997a).

UNCED in Rio de Janeiro in 1992 produced several documents addressing forests and forestry – the Forestry Principles, Agenda 21, Chapter 11, the Rio Declaration, the global Conventions on Biological Diversity and Climate Change, and a promise to negotiate a convention on desertification.

The Rio conference with the subsequent sharp division and schism between the developed and developing world has in fact acted as catalyst for more *global* forest policies. It was a historical turning point in the development of international and national forest policies. The Forestry Principles widened the traditional sustained yield concept in forestry: social, economic, environmental, cultural and spiritual aspects of forests were included in the concept of sustainability. Sustainable forest development refers to an intergenerational perspective with non-decreasing production of goods and services in the above aspects (Michie et al., article 7 and Mather, article 8 in this Volume).

In an attempt to identify criteria and indicators for the newly broadened concept of sustainable forest management, a number of initially uncoordinated regional intergovernmental initiatives have appeared. For example, the International Tropical Timber Organization (ITTO) first developed criteria and indicators for its producer countries in 1992. It was followed by the Second Ministerial Conference on the Protection of Forests in Europe in Helsinki in 1993. The Montreal Process under the aegis of the Organization (formerly Conference) on Security and Cooperation in Europe covered the non-European boreal and temperate forests. The remaining forests in the world were linked to such processes as the Amazon Cooperation Treaty, African tropical forests, Dry-Zone Africa, and the Near East (Granhölm et al. 1996; Grayson and Maynard 1997).

Despite these efforts, no global criteria and indicators for the monitoring of sustainable forest management have yet been developed. Nevertheless, in the plan for FAO's World Forest Resources 2000 Assessment, some 15 environmental indicators, out of 80 national-level indicators, have been accepted as being globally relevant, and will be included in the assessment. Hence, even considering the vast diversity of the world's forests, it is the sustainability concept itself which has worked for *unasyuva*.

The United Nations established a Commission

on Sustainable Development (CSD) to follow up the implementation of the Rio UNCED decisions. In 1995, the CSD set up the Intergovernmental Panel on Forests (IPF) to address the main global forestry issues, including further advancement of the initiative for a global forest convention. This panel produced more than a hundred proposals and an agenda for their implementation (IPF 1997).

The IPF agenda covers such topics as the underlying causes of deforestation, the role of national forestry planning, national forest resources monitoring, identification of the countries with the least forest cover, and the role of research and development in solving important forest related problems. Both the CSD and the United Nations General Assembly Special Session (UNGASS) discussed the IPF agenda, and the Intergovernmental Forum on Forests (IFF) was established to implement the agenda during the period 1997–2000 (Grayson and Maynard 1997).

The IPF discussed the feasibility of a legally binding global convention on forest, but no agreement was reached. The IFF will continue seeking a consensus on the premises a possible agreement could be reached. One idea for such a convention would be an attempt to stop deforestation and forest degradation both in the southern and northern hemispheres. However, the effectiveness of a global forest convention would depend on its structure, contents, and mandate. For example, what kind of financial incentives are needed, and how substantial would they need to be to be effective. Furthermore, the convention's implementation agency would play a key role in its success (Glück et al. 1997).

Indeed, inasmuch as the causes of deforestation remain national, a global convention alone may never become an effective instrument. Nonetheless, the benefits of ending deforestation are global, not just local or national; a natural justification for international cost-sharing schemes. A possible legally binding global forest convention, along with such measures as increasing radically the timeliness, validity and reliability of national and global forest resources monitoring systems would increase the transparency of progress towards sustainable forest management. Creation of competitive stumpage markets through controlled and equitable privatization of forests, or through other means, might also be an effective complementary instrument. Therefore, not only regulation, but greater global information and development of competitive markets are needed.

Moreover, the G7 countries have, since 1987, repeatedly incorporated forest policy issues in the

G7 summit resolutions (Wardle and Kaoneka, article 4 and Sheppard, Box 4.1 in this Volume). This is another indication of the key role of forestry issues on the agendas of contemporary global politics. It should be realized that the unprecedented attention that forests have drawn, in meetings like the G7 summits or the UNGASS 1997, may create unique opportunities, e.g., to increase international financing for research on global forest issues, and for funding of global forest resources assessments.

Forest Industries and Consumers

In the corporate world, forest products industries have been latecomers in participating in the ongoing concentration and globalization processes. A comparison of the sales of the top five companies as a percentage of the global industry totals was made in 1992. The five largest forest products companies had a share of 20%. This is less than the comparable share in the sectors of consumer durables, the automobile industry, airlines, aerospace, electronics, steel, oil, personal computers, the media, chemicals, and insurance (Diesen 1998). The corporate world of forest industries has since become more concentrated (Mery et al., article 28 in this Volume).

In the expansion and globalization strategies of forest industries, important means have not only been traditional mergers and acquisitions, but also corporate alliances of various degrees. For example, UPM-Kymmene, a Finnish firm with a diversified production on a global scale, expresses its motives as follows:

- the forest industry and its clients are increasingly international in scale;
- improved access to emerging and fast-growing markets;
- expanding market shares in core business areas;
- economies of scale; and
- domestic wood supplies are already efficiently used (Henriksen 1998).

The companies in the largest consumer countries – the United States and Japan – have not been as motivated to become globalized as their rivals in Europe. The North American forest industries, and indeed the entire North American forest sector, have shown remarkable flexibility in adapting to new markets and changing conditions within their own continent (Ince, article 31 in this Volume); a factor that may actually have lessened the need for North American forest companies to seek markets elsewhere.

The effects of globalization on the role and composition of international trade in forest products remain largely unknown. Traditionally, the share of

internationally traded forest products out of the total value of forest product output has been larger than the comparable share in many other industrial sectors in the world (Michie et al., article 7 in this Volume). It is partly this traditional trade and especially the expanding trade via the Internet that act as catalysts for the globalization process (Bacchetta et al. 1998).

Consumers of forest products have profoundly changed their attitudes in recent years. NGOs have been a fundamental driving force for this change. The operations of the leading international NGOs have also become globalized during the last decades of the 20th century. Greenpeace, the World Wide Fund for Nature (WWF), and Friends of the Earth are examples of these new politically and, to some extent, financially powerful lobbying bodies. In forestry, NGOs first reacted against tropical deforestation in the 1980's. During the 1990's, NGOs shifted their campaigning more against degradation of boreal and temperate natural forests, and plantation forest monocultures.

The environmental NGOs use the media, the Internet, and other modern communication technologies in influencing the values and attitudes of citizens, and consumers of forest products. They continuously monitor the purchasing policies of publishing and printing houses as well as retail chains. Through influencing the behavior of major forest product customers, and through environmental conflicts and the media, the messages have been conveyed to the forest product companies in an attempt to change their logging practices and to make forest management more environmentally friendly (Hellström, article 29 in this Volume). The Forest Stewardship Council (FSC) was established by WWF. The council has become a key factor in the worldwide forest and timber certification developments, as forestry and forest industries have sought schemes to enhance public impressions of their forest management (Barbier, article 10 and Ingram and Enroth, article 30 in this Volume).

1.3 GLOBALIZATION OF SOCIETIES

Socio-economic Prospects

The total world human population was estimated to be 5.7 bill. in 1995. According to the medium scenario of the United Nations forecast, world population is expected to reach nearly 11 bill. by 2150. With this scenario, population will have almost quadrupled in Africa, and nearly doubled in Asia and in

Latin America, as compared to the 1995 population figures (Della Senta and Park, article 2 in this Volume).

Robert Malthus, one of the classical economists, introduced the idea that population grows exponentially while food production grows only linearly. At the end of the road, he foresaw an obvious disaster for mankind which, however, has not materialized on a global scale. The reasons for this have been intensification of agriculture via technological progress, industrialization, as well as urbanization, and rising per capita incomes in many parts of the world.

Several “neomalthusians” have repeatedly reminded us about the doomsday effects of population growth on human welfare and mankind’s future. On the other hand, a number of development economists have regarded population as either neutral or beneficial to economic development. This view has actually been supported to some extent under conditions in which operational property rights, competitive markets and social institutions do prevail, but, unfortunately, not in developing countries where weak property rights, market and government failures are prevalent (Birdsall 1988; Bromley, article 9 in this Volume).

Some observers have identified a vicious circle between population growth, weak property rights, poverty and deteriorated environment in Sub-Saharan Africa and the Indian subcontinent. “As the communities’ natural resources are depleted, more hands are needed to gather fuel and water for daily use. More children are then produced, further damaging the local resource-base and in turn providing the household with an incentive to enlarge. When this happens, poverty, fertility, and environmental degradation reinforce each other in an escalating spiral” (Dasgupta 1995: 1897).

The role of globalization in future societal development has been intensively debated (Bonvin 1996; Yearley 1996). The globalization of business is likely to increase the diffusion of innovations, know-how and new technology and to promote economic growth, especially in the advanced economies as well as in the higher-income developing countries. On the other hand, the low-income developing countries with unstable political regimes, poor physical and juridical infrastructures, and poor human and social capital will remain outside this progress. However, research needs on this front are urgent.

The global gross domestic product grew annually by 2.5% from 1986 to 1995. The estimates for 1996–2005 are somewhat higher, but the continued and aggravated economic crisis in 1998 has lowered

these expectations. However, most likely, world economic growth will continue although at distinct rates by continents and economic and trade blocks (Della Senta and Park, article 2 in this Volume).

The future demand for most forest products will continue to be closely related to increases in per capita incomes (Zhang et al., article 19 in this Volume). However, some indications show that this longheld relationship may be changing into one where economic growth does not always lead to increased paper demand (Hetemäki, article 3 in this Volume). Both population growth and economic growth have been identified as underlying causes of deforestation, although the role of economic growth may, at a certain point, turn to one of slowing down deforestation (Palo, article 6 in this Volume).

Political Prospects

The collapse of the Soviet Union and Yugoslavia, and the breakdowns and changes in the political systems in the former socialist countries in Central and Eastern Europe have radically changed the political map of the world. For example, FAO now recognizes 178 individual countries and territories (FAO 1997a). Many countries in the 1990’s have undergone a transition from planned to market economies and from dictatorship to democracy. In the long run, these changes have to be regarded as being good news for attaining worldwide sustainable forest management, although in the short run, political turmoil and social unrest usually work against natural environments (articles 37 and 38 in this Volume).

Political instabilities and armed conflicts – both internal and international – increase risks and shorten planning horizons in natural resources utilization. In many occasions, political instabilities and armed conflicts aggravate deforestation and forest degradation. On the other hand, globalization of politics and business may promote peace and political stability. But also conversely; political stability and peace create conditions favorable to globalization processes. This takes place many times through transnational and regional economic integration processes (Della Senta and Park, article 2 in this Volume).

The roles of the state and the market are being re-evaluated. The central planning function of the state has collapsed along with the socialist state, even in China where the socialistic political system has officially survived (Zhang et al., article 40 in this Volume). Still, about four fifths of the world’s forests are under public ownership, which, in a majority of cases, hinders the emergence of stumpage and

other respective markets; thus contributing to obstacles on the road towards sustainable forest management (Palo 1997).

China is carrying out a large-scale user right transformation. User rights on 34 mill. ha of plantation forests have been transferred to private hands or local communities (Zhang et al., article 40 in this Volume). The prospects of this are promising. On the other hand, Latin America abounds with unsuccessful cases of state forest privatization which often have led to unequal income distribution, deforestation and forest degradation (Laarman 1996; Mery, article 23 in this Volume).

The problem is how to follow a well-chosen privatization strategy – how to announce the transformation, who would be eligible to participate, how fast to proceed and how to establish a juridical infrastructure and effective implementation policies in support of sustainable forest management (Hurskainen 1996). Not only does this concern the former socialist countries; but the other largest forest-owning countries, such as Brazil, Canada, Indonesia, the Democratic Republic of Congo and many others also face fundamental problems.

However, we do not advocate *laissez-faire* or a minimalist role for government in forest sector issues. In fact, the successful cases of sustainable forest management suggest that forest-based development requires effective and coordinated state policies on forestry, agriculture, colonization, environment, industries, energy, fiscal matters and foreign trade. However, we should not rely on state control, but find the best applications for competitive markets in forestry. Optimally, an effective state plays a catalytic and facilitating role, encouraging and complementing the operations of markets run by private businesses and individuals (World Bank 1997; Semesi, article 16 in this Volume). In these fields of forest tenure, property and usufructuary rights, state forestry and the role of markets and policies, research has been inadequate, although we think these issues are of central global importance.

1.4 GLOBALIZATION OF ENVIRONMENTAL ISSUES

Increasing Global Awareness

In the last two or three decades, environmental goods and benefits provided by forests have received more and more attention, particularly in a global context. It is now commonly recognized that,

for example, the biodiversity of tropical forests, or the atmospheric carbon sequestered by boreal forests, does not just benefit people living in or close to these forests. Rather, there is a broad awareness of mankind's shared dependency on the well-being of these forests. "Increasingly people are aware of themselves and of humanity as inhabitants of the one globe" (Yearley 1996: 1).

Along with the recognized regional and spatial interdependencies in environmental issues, there is also an invigorated awareness of the need for an intergenerational solidarity in regard to natural environments. The current generation places greater value on leaving options for future generations than the previous one (Sharma 1992; FAO 1997a; Wardle and Kaoneka, article 4 in this Volume).

Global Warming

The 1995 Assessment of the Intergovernmental Panel on Climate concluded that atmospheric warming is, most likely, occurring and that human activities are a likely contributor to the process. This is a much stronger conclusion than the one in the 1990 assessment. The costs of mitigating global warming are nevertheless high, and this makes it difficult to formulate any national or international long-term action plan. If these costs are generally accepted by societies and mankind, then the value of forests as carbon sinks and reservoirs will also be seen to be high, perhaps much higher than the value of forests derived by using current timber prices in developed economies (Kauppi and Solberg, article 11 in this Volume).

In the Kyoto Protocol (1997) to the United Nations Framework Convention on Climate Change, 33 industrial nations agreed to reduce emissions of greenhouse gases, although controversies still remain concerning the appropriate standards and methods for measuring CO₂-fluxes. The Kyoto Protocol also recognizes the role of forests. In an example of how globalized markets may be a cost-effective means of combating environmental threats, the Protocol opens up prospects for instigating transferable emission permits worldwide.

Forests and Biodiversity

The value of forest biodiversity – at the ecosystem, species and gene levels – is related to the unique ecological value of forest ecosystems as well as to tree species and non-wood forest goods, and not only to the concepts of option and existence value (Wardle and Kaoneka, article 4 in this Volume). Too

little is still known about the full range of the flora, fauna, microbes and other biota of the world's forests. Even less is known about the changes in forests' biological diversity or the implications of these changes.

Effective biodiversity management can only be built on solid knowledge of the functioning of forest ecosystems. Therefore, much greater precision is required to determine the extent and type of forest that is necessary for sustaining biodiversity either by "green" management and logging or by protection of forests (Sayer and Iremonger, article 12 in this Volume).

Knowledge of biodiversity's value for economies and societies is still too vague to serve as a solid basis in political decision-making. However, given the opportunity and adequate resources, research can produce informed assessments on the key issues.

Forests and Water

The rapid growth of the world's population, and the process of desertification and salinization, have raised worldwide concern over possible future water shortage. It is now recognized that the sustainable management of the world's forests has profound implications for the ability of the international community to meet the growing demand for water (Della Senta and Park, article 2 in this Volume).

The essential role played by forests in watershed management is multiple. Forests collect water, and they prevent floods and soil erosion. In 1998 world attention focused on the extensive flooding of China's main river basins. Excessive deforestation has been mentioned as a contributing factor to these floods (Lu 1998).

There is a likelihood that the relationship between forests and water will be among the major global issues, and perhaps a source of increasing political conflicts in the 21st century. Again, this issue should be in the focus of increased research. As a research topic, the relationship between forests and water, along with the other research areas identified above, should be quite eligible for greater public funding, because of the many externalities and global-common characteristics involved.

1.5 EDITORIAL PERSPECTIVE

In the past millennium, most of the world as we know was discovered. Today, we know more about its geography, natural resources and human cultures than ever before. One notable phenomenon is that –

perhaps already for centuries – the world has been going global, that is, from an earlier focus on local matters to a global perspective. Without doubt, the world's forests, societies and the environment are integral parts of this globalization process.

Globalization is, however, demanding – and likely to treat people and nations inequitably. To cope with this and other challenges of globalization, people and societies need knowledge and information. But these alone are not sufficient. As the ancient Greek philosophers held truth, goodness, and beauty as their greatest ideals, today's people and societies need cognitive, ethical, and aesthetic values to be able to work together and face their common challenges. This book contains many facts, and much knowledge and information on world forests, societies and environments. But – just as importantly – it also offers a wide array of personal, societal, and cultural values on forests and their use. Indeed, understanding how to combine and balance facts and values will help us create a clearer vision of *unasyva*.

BOX 1.1

WHAT IS FOREST – CONCEPTS AND ETYMOLOGY

By Matti Palo

Why forest has to be defined

■ In English language the word *forest* is often synonymous to wood, woods, woodland, bush, etc. For professional forestry and especially for scientific and statistical purposes a general definition is needed, although forests vary by their appearance and composition a great deal over space and time. A valid definition demarcates forest from other land cover formations.

■ For a valid and reliable assessment of deforestation, it is fundamental to apply the same definition of forest among the observation units (e.g., countries) and at least at two points in time (e.g., 1980, 1990), which rarely occurs. Most countries are applying varying definitions of forest for national purposes (Lund 1998).

■ Here we first introduce the definitions of forest applied in the 1990 and planned for the 2000 World Forest Resources Assessments. Then a few dictionary definitions are cited, and finally an etymology of the word *forest* is given.

Definitions for the World Forest Resources Assessment 1990 (FAO 1995: 41–42)

■ "Within, the work of the forest resources assessment is currently being shared between the former FAO/ECE Agriculture and Timber Division, Geneva, which covers the developed countries; and the Forest Resources Division at FAO headquarters, Rome, which is responsible for the developing countries."

Developed countries

■ "*Forest Land*: with tree crown cover (stand density) of more than about 20% of the area. Continuous forest with trees usually growing more than about 7 m in height and able to produce wood. This includes both closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground and open forest formations with a continuous grass layer in which tree synusia cover at least 10% of the ground."

Developing countries

■ "*Forests* are ecological systems with a minimum crown coverage of land surface (here assumed as 10 percent) and generally associated with wild flora, fauna and natural soil conditions; and not subject to agronomic practices. For the present assessments, a tree is defined as a woody perennial with a single main stem (except in coppice crops where multiple stems replace a single stem), a more or less definite crown and a minimum height of more than 5 meters on

maturity. Only forest areas more than 100 ha (minimum area) are considered."

■ "Forests are further subdivided according to their origin into two categories:

- i) Natural forests are a subset of forests composed of tree species known to be indigenous to the area.
- ii) Plantation forests refer to:
 - a) Forest established artificially by afforestation on land which previously did not carry forest within living memory.
 - b) Forest established artificially by reforestation of land which carried forest before and involving the replacement of the indigenous species by a new and essentially different species or genetic variety."

World Forest Resources 2000 Assessment – first global forest definition (UN-ECE/FAO 1997: 3)

■ "Land with tree crown cover (or equivalent stocking level) of more than 10 percent and area of more than 0.5 ha. The trees should be able to reach a minimum height of 5 m at maturity in situ. May consist either of closed forest formations where trees of various storeys and undergrowth cover a high proportion of the ground; or open forest formations with a continuous vegetation cover in which tree crown cover exceeds 10 percent. Young natural stands and all plantations established for forestry purposes which have yet to reach a crown density of 10 percent of tree height of 5m are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention or natural causes but which are expected to revert to forest."

"*Includes*: Forest nurseries and seed orchards that constitute an integral part of the forest, forest roads, cleared tracts, firebreaks and other small open areas within the forest, forest in national parks, nature reserves and other protected areas such as those of special environmental, scientific, historical, cultural or spiritual interest; windbreaks and shelterbelts of trees with an area of more than 0.5 ha and a width of more than 20 m. Rubberwood plantations and cork oak stands are included."

"*Excludes*: Land predominantly used for agricultural practices."

Forest science dictionary definition (Ford-Robertson 1971: 107, 298)

Forest

- "i) (ecology): Generally, an ecosystem characterized by a more or less dense and extensive tree cover.
- ii) (ecology): More particularly, a plant community predominantly of trees and other woody vegetation, growing more or less closely together.
- iii) (silviculture/management): An area managed for the production of timber and other forest produce, or maintained under woody vegetation for such indirect benefits as protection of catchment areas or recreation. Note: Connotes a larger area than a wood.
- iv) (law): An area of land proclaimed to be forest under a Forest Act or Ordinance."

Wood

- "i) A community of trees growing more or less closely together, of smaller extent than a forest and generally larger than a coppice. Note: It may or may not constitute a stand, depending on its degree of homogeneity in one or more respects.
- ii) An area of woodland."

General dictionary definition (Webster 1989: 483, 1357)

Forest

- "i) A tract of wooded land in England formerly owned by the sovereign and used for game,
- ii) a dense growth of trees and underbrush covering a large tract."

Wood

- "ia) a dense growth of trees usually greater in extent than a grove and smaller than a forest – often used in plural,
- ib) woodland,
- ii) the hard fibrous substance basically xylem that makes up the greater part of the stems and branches of trees or shrubs beneath the bark and is found to a limited extent in herbaceous plants,
- iii) wood suitable or prepared for some use (as burning or building),
- iiii) something made of wood."

Etymology of the word "forest" (Makkonen 1974: 18–19)

■ "When the Franks had conquered Gaul, their kings, in accordance with ancient Roman-Gallic provincial right, considered all uninhabited land as belonging to crown; contrary to the Roman emperors, however, they reserved the right of hunting and fishing for themselves. As the concept *saltus* did not originally include a prohibition against outsiders' right to hunt and fish, and as among the people *saltus* still meant forest-covered wilderness in general, a new term was

obviously needed for description of uninhabited areas belonging to the king including all rights of using them. The new term which was introduced to fill the gap was *forestis*, and it appears the first time in writing in 648 A.D., in a deed of gift of King Sigibert III, on the basis of which the monastery at Stavelot-Malmédy was donated a forest area in the Ardennes. After this the word *forestis* occurs every now and then in official documents, the term *saltus* gradually disappearing from use. *Forestarius*, correspondingly, replaces *saltuarius*."

Conclusion

■ The above definitions and etymology improve our understanding that terms, definitions and words are changing over time. We are not suggesting that the forestry world should share just one definition of *forest*. Each planning situation and its context may require some flexibility in forest definitions by country and ecological zone. However, the 2000 World Forest Resources Assessment requires one single definition which now is available for the first time. Unfortunately, it can be criticized for being too widely defined by tree height, crown cover and minimum size in comparison to the dictionary definitions. Scientifically it is also too vague and has no characteristics of the concept of a forest ecosystem. The situation could be improved by reintroducing the term *closed forest* with a minimum crown cover of 70%, as FAO's application for the tropics was still in November 1993 (Päivinen 1994: 43). Forest scientists have a challenge in reformulating the global forest definition to match the new paradigm of forest ecosystem management (e.g., Perry 1994).

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