

THE ROLE OF ECOSYSTEM SERVICES IN FORESTS OF DEVELOPING AND DEVELOPED COUNTRIES

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Preface

- This study assessed the flow of ecosystem services and the role these services provide in both poor and rich countries.



Preface

- 45°28′ - 48°30′ northern latitude, 26°30′ – 30°05′ eastern longitude
- Highest altitude 1409 feet (429.5 m)
- Annual average temperature 46-50 °F (8–10 °C)
- Precipitation 15 in (380 mm) south – 22 in (560 mm) north
- 3.6 million inhabitants or 308 people per sq mi (119 people per km²)
- **Principal resources are people and soil**
- **Economy depends on fruits, vegetables, wine and tobacco**



Preface

Land structure of Republic of Moldova (total area 13067 sq mi or 33846 sq km)

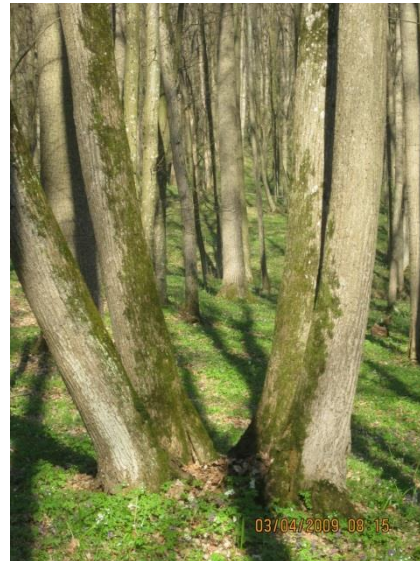
agricultural	57.60%
localities	9.10%
pastures	18.64%
communications	1.80%
forest	11.40%
protected area	0.06%
water	1.40%
Total area	100%



Preface

A glance over forests in Republic of Moldova

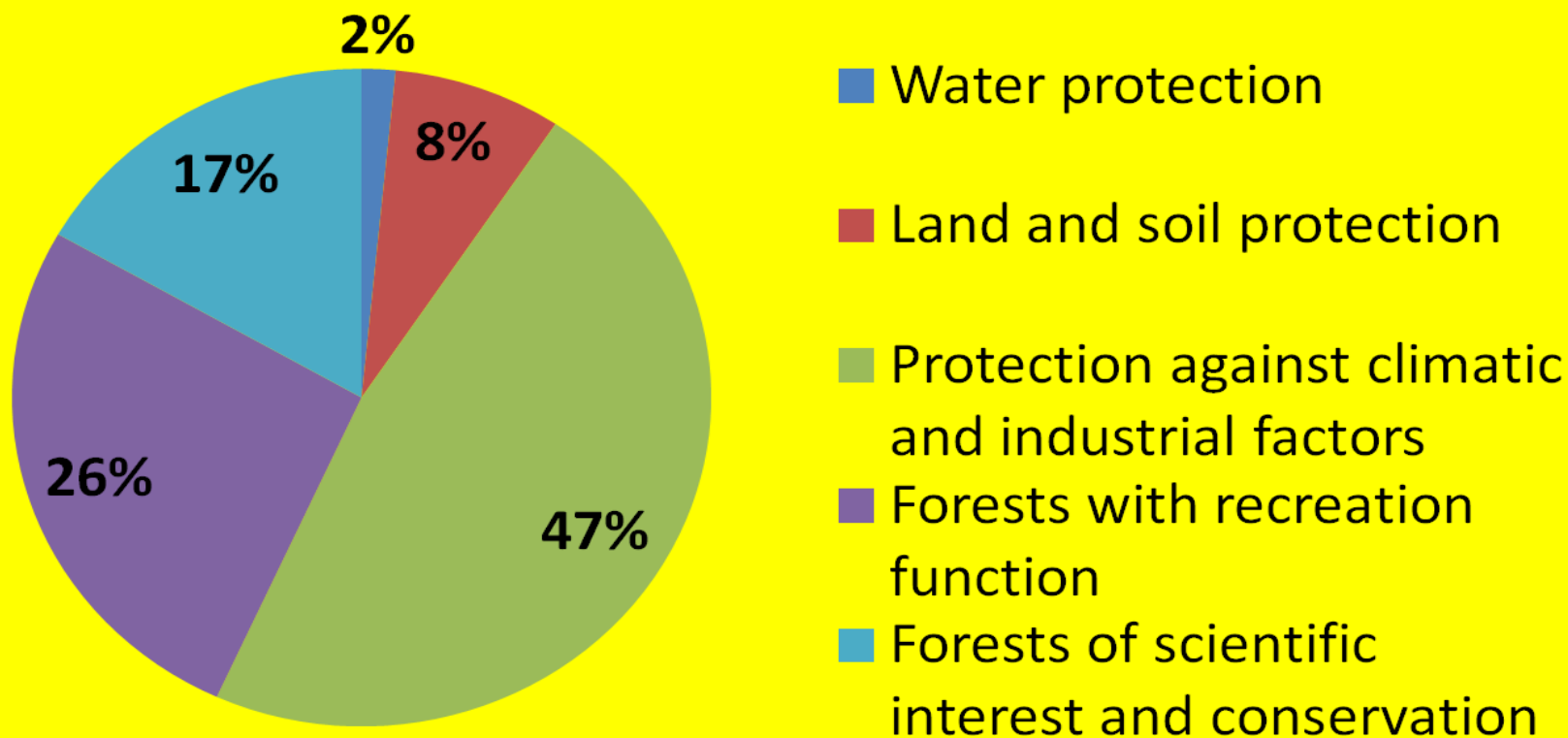
- Forest cover 325000 ha (9.6%).
- Main species: oaks (43.2 %), black locust (38.1 %), ash (5.1 %), hornbeam (2.9 %), poplar (1.8 %).
- **Ownership: state (84.1%), local government (15.7%), private (0.2%).**
- Most of the forests are pure and even-aged.
- Average forest age 40 years.
- The total growing stock is 35.14 million m³ or 8.1 m³ per capita.
- Non-wood products: medicinal herbs, berries, hay and honey.



Preface

Functions of the forests in Republic of Moldova

Structure of forests by functional subgroups



All forests belong to the First functional group, having exclusively environment protection functions (services)

Overview

- **Primary objectives**
- **Introduction**
- **Site and the methods**
- **Definition of forest ecosystem services**
- **Emerging international issues relating to ecosystem services**
- **The role of forest ecosystem services in different regions of the world**
- **Differences and similarities in utilization of forest services between poor and rich countries**
- **Recommendations to conserve and maintain ecosystem services**
- **Discussion**

Primary objectives

- **To assess losses of ecosystem function from disturbances including flooding and droughts, wildfire, ice-storms, insects and invasive species.**
- **To assess the effect of forest restoration and the positive role that the creation of new forests could provide for a broad suite of forest ecosystem services.**

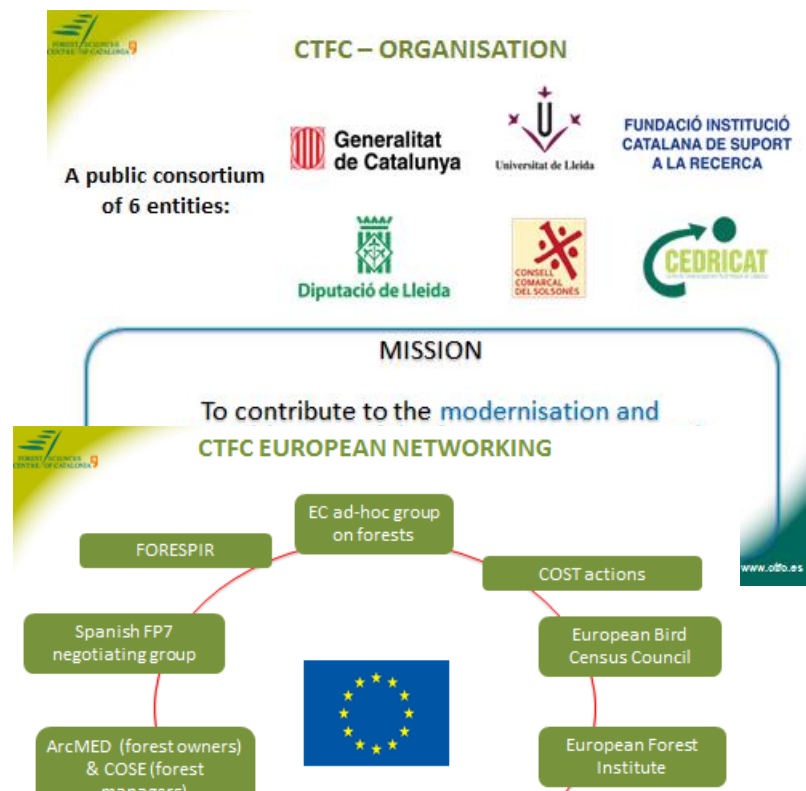
Introduction

The World Summit on Sustainable, which took place in Johannesburg, South Africa in 2002, acknowledges the multiple and varying outputs from forests for poverty alleviation, as raw material and energy resources, and as natural habitats and environment



Introduction

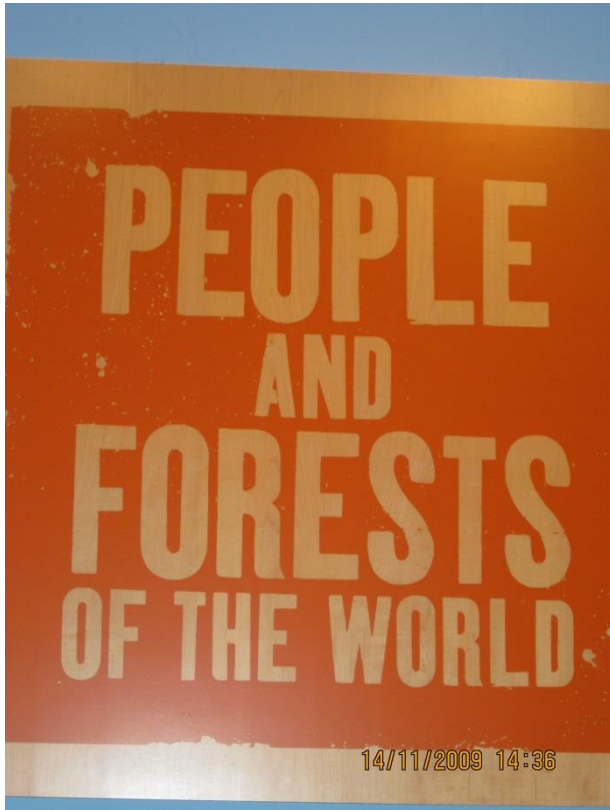
- Achievement of sustainable forest management, nationally and globally, through partnerships among interested governments and stakeholders, are essential goals of sustainable development.



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Introduction

Awareness of the differences and similarities between regions and countries is important for understanding the variations in current situations and possible effects of various initiatives discussed in regional and international processes.



Introduction

- We also have become more aware of the way in which we are part of a global environment.



Definition of forest ecosystem services

- Forest ecosystems can be thought of as a type of "natural capital", which is defined as the functions, goods and services provided by the environment (Turner, 1999 quoted by Lipper, 2000).
- The diverse nature of forest ecosystems means that they are physically able to supply an abundant assortment of goods and services, which in turn are capable of satisfying an equally diverse collection of human needs (Ellefson, 1992).

Definition of forest ecosystem services

According to (UNECE, 2005...

Non-wood forest products (NWFP) have been divided into the following groups:

- edible plant products like fruits, nuts, mushrooms, herbs, and saps;
- animal products like honey, game meat and pelts;
- medicinal plants;
- bark, foliage and vegetation (including cork and cork products);
- Christmas trees;
- and other non-food products like gums, resins and oils.

Forest services comprise:

- recreation;
- mitigation of climate change;
- conservation of biodiversity;
- protection of soil, water and infrastructure;
- and cultural aspects



Definition of forest ecosystem services

“Ecosystem services” is term used to describe environmental values desired by the public and traditionally provided by forests without compensation to landowners (OFRI, 2008)

According to the Millennium Ecosystem Assessment (MEA, 2007) four broad categories of ecosystem services :

- *provisioning*, such as the production of food and water;
- *regulating*, such as the control of climate and disease;
- *supporting*, such as nutrient cycles and crop pollination;
- and *cultural*, such as spiritual and recreational benefits



Emerging international issues relating to ecosystem services

World Resources Institute working closely with African partners in Kenya and Uganda highlights the strong association between poverty and damaged ecosystems (MEA, 2007).

Even in United States forests face development pressure, invasive species, and the imminent transfer of forestland to a new generation of owners (Pinchot Institute for Conservation, 2009 quoted by Brooke, 2009).

Emerging international issues relating to ecosystem services

- **Countries and societies with higher incomes tend to be more willing to pay for environmental services.**
- **Low-income countries may have difficulty giving priority to provision of environmental services, especially when they face more economically attractive development options.**
- **There are some indications that the poor may not benefit particularly from ecosystem markets (FAO, 2004).**

Emerging international issues relating to ecosystem services

- **Growth in income coupled with greater awareness will usually strengthen demand for environmental services as well as the ability of a society to meet the costs of environmental protection.**
- **However, increased income often reduces environmental services as more goods and services are produced.**
- **In particular, countries with rapidly growing economies often go through a period when forest resources are exploited or converted to other uses, resulting in a decline in environmental services (FAO, 2009).**

Emerging international issues relating to ecosystem services

- **The concern is to ensure that the payments for the environmental services actually go to the farmers who provide the services by adopting appropriate land use.**
- **However, their ability to provide the services depends largely on rights to and ownership of the land, as well as other policy and institutional factors that determine the transaction costs (FAO, 2009).**
- **Furthermore, opportunities for silvicultural entries are becoming more limited due to increased economical, ecological, and social constraints (Puettmann, 2009).**

Emerging international issues relating to ecosystem services

- **According to Brooks (1993), in developed countries, predominant forestry policy issues for the future include: managing forests to maximize value measured across a broad range of goods and services; and providing environmental services at the local, regional, national, and global scale.**
- **However for developing countries, in trying to balance concern for environmental conditions with critical, short-term, economic needs issues are: identifying an appropriate and sustainable role for forest resources; establishing a more equitable distribution of resources, a more stable set of property rights, and a system of incentives and rewards; strengthening institutions for resource management.**

Emerging international issues relating to ecosystem services

- **Many factors, including institutions and legal frameworks, will have an impact on the ability of a country to manage its forests in such a way as to provide stable or increasing environmental services (FAO, 2009).**
- **The use of forests for wood and non-wood products, goods and services, and in tourism (ecotourism, nature-based tourism, and environmental education) offers new opportunities to generate local income through market-based instruments and/or to reduce poverty across the world (IUFRO, 2010).**

The role of forest ecosystem services in different regions of the world

- The **African** continent, consisting of 58 countries and areas and accounts for 14 percent of the global population.
- Although **Africa** holds only 16 percent of the global forest area, from 2000 to 2005 it lost about 4 million hectares (ha) of forests annually, close to one-third of the area deforested globally (FAO, 2009)

The role of forest ecosystem services in different regions of the world

- Rural people in **Africa** are heavily dependent on non-wood forest products (NWFP) as gums and resins, honey and beeswax, dying and tanning materials, bamboo and rattan, bushmeat, fodder, bark (*johimbe*, *Pausinystalia johimbe* in Cameroon), wild mushrooms (various species in Malawi), quinquelibia leaves (*Combretum micranthum* in Benin), baobab fruits (*Adansonia digitata* in Kenia), leaves of the liana (*Gnetum buchholzianum* in Central African Republic) and a considerable number of medicinal plants for a wide range of needs including food, medicines and construction materials (Killmann et al., 2004a).

The role of forest ecosystem services in different regions of the world: Africa

- In Burkina Faso, karite is the second-largest export item after cotton.
- In Kenya, the United Republic of Tanzania and Zimbabwe, among others, local communities are involved in managing protected areas or tourism facilities for a share of the income.
- Interest in a market approach for provision of watershed services is just beginning to grow. The rich wildlife is a major source of income and employment (FAO, 2009).
- The livestock industry is a major export earner for Namibia and Sudan,
- while in Senegal and the savanna ecozone of Nigeria have a culture closely linked with livestock production (FAO, 2003).
- Gabon like other African countries in the humid high forests of equatorial Africa rely heavily on bush meat as a source of animal protein in the diet of its populations (FAO, 2003).

The role of forest ecosystem services in different regions of the world: Asia and the Pacific region

- **The Asia and the Pacific region, consisting of 47 countries and areas, is home to more than half of the world's population and has some of the most densely populated countries in the world.**
- **It has 18.6 percent of the world's forest area in a wide array of ecosystems including tropical and temperate forests, coastal mangroves, mountains and deserts (FAO, 2009).**
- **More than 150 NWFPs from Asia and the Pacific are traded internationally, although apart from bamboo and rattan the quantities are usually small.**
- **Asia is by far the world's largest producer and consumer of NWFP, not only because of its population size but even more because of traditional use of a vast variety of different products for food, shelter and cultural needs (FAO 2002a in Killmann et al., 2004b).**

The role of forest ecosystem services in different regions of the world: Asia and the Pacific region

- **China dominates world trade in NWFP. It is closely followed by India, and then by Indonesia, Viet Nam, Malaysia, the Philippines and Thailand (Killmann et al., 2004b).**
- **Of nearly 170 million people living in and around forests in India, more than half of them are tribal and their livelihoods largely depend on NTFP (Basu, 2010).**
- **Medicinal plants are of major importance in continental Asia, particularly for the higher-elevation regions of Nepal, Bhutan, northern India and Pakistan and southeastern China (Killmann et al., 2004b).**

The role of forest ecosystem services in different regions of the world: Asia and the Pacific region

- **Nepal has a rich medicinal plant resource base, but increasing commercial demands are exceeding supplies (Bhattarai and Karki, 2004).**
- **Bamboo is by far the most commonly used NWFP in Asia (harvesting in forests is still important in Myanmar, Lao People's Democratic Republic, India, China, Viet Nam), although its international trade is less important than trade in rattan or medicinal plants.**
- **National policies and strategies are focusing increasingly on environmental services of forests, and several countries have imposed logging bans in response to catastrophic events such as flooding and landslides.**

The role of forest ecosystem services in different regions of the world: Asia and the Pacific region

- **Many countries (e.g. China, India, Mongolia and Pakistan) implement tree planting and integrated land-use systems to combat degradation and desertification, including windbreaks and shelterbelts to protect agricultural land.**
- **Water scarcity is critical in some countries (especially Australia, China, India, Mongolia and Pakistan), affecting key sectors including agriculture and industry.**
- **China, the Lao People's Democratic Republic and Viet Nam are among the ten countries with the fastest-growing tourism sectors in the world.**
- **The main challenges arising from the growing demand for ecotourism are preventing environmental degradation and enhancing the income accruing to local communities, thus providing them with incentives to protect and manage natural assets (FAO, 2009).**

The role of forest ecosystem services in different regions of the world: Europe

- **Europe, consisting of 48 countries and areas, accounts for about 17 percent of global land area but has one-quarter of the world's forest resources.**
- **Europe has a long tradition of multiple-use forest management with substantial emphasis on the provision of social and environmental services.**
- **The major threats to forest resources in Europe are environmental (fires, pest outbreaks and storms); some of these could increase with climate change.**
- **Switzerland's mountain forests protect hundreds of settlements and transport routes against hazards such as avalanche and rock fall (Fitze, 2007).**

The role of forest ecosystem services in different regions of the world: Europe

- **Although not a major activity in Europe, the collection of NWFP is a common form of recreation.**
- **Key commercial products include Christmas trees, game meat, cork, mushrooms (including truffles), honey, nuts and berries. Most of these have limited but well established (and sometimes highly profitable) markets.**
- **Integrated management of upland watersheds and the linkages between forests and water are receiving increasing attention in the region. More than 90 percent of European forests are open to public access and the area of forest available for recreation is increasing. Ecotourism is popular.**
- **The transition to a green economy requires strong demand, and willingness to pay, for forest environmental services (FAO, 2009).**

The role of forest ecosystem services in different regions of the world: Latin America and the Caribbean

- **consisting of 47 countries and areas, accounts for 22 percent of the global forest area, 14 percent of the global land area and 7 percent of the world's population.**
- **The most important NWFP in Latin America are edible products (nuts, fruits and palm hearts, mushrooms and maté), reins, latexes and essential oils (pine resins, natural rubber and eucalyptus oil), medicinal plants, fibers and construction materials (palm fibers, bamboo), fodder, colorants and tannins (FAO, 2002b in Killmann et al., 2004b).**

The role of forest ecosystem services in different regions of the world: Latin America and the Caribbean

- **Most NWFPs in the region are for local subsistence use, although some are sold in national and international markets as ingredients for health and beauty care products and medicines.**
- **Brazil nuts (*Bertholletia excelsa*) are an important source of income for indigenous groups in Bolivia, Brazil and Peru and are also the most important commercial NWFP. Brazil nuts constitute 45 percent of Bolivia's forest-related exports (CIFOR, 2008a quoted in FAO, 2009).**

The role of forest ecosystem services in different regions of the world: Latin America and the Caribbean

- In Argentina, Uruguay, Paraguay and southern Brazil, the leaves of *Ilex paraguariensis* are an extremely popular tea-like beverage.
- Brazil, Argentina (*Pinus elliottii*), Honduras and Venezuela (*P.caribea*) are important commercial exporters of pine resin.
- Mexico, Guatemala (Petén) and Belize are major producers of Chicle, which is a latex tapped from the sapodilla tree (*Manilkara zapota*) and is used for making chewing gum.
- Important producer countries of quinine bark are Brazil, Bolivia and Columbia.
- Quebracho colorado (*Schinopsis* sp.) is a source of tannin in Argentina and Paraguay (Killmann et al., 2004b).

The role of forest ecosystem services in different regions of the world: Latin America and the Caribbean

- **Brazil, Colombia, Ecuador and Peru rank among the world's ten most biodiverse countries, while the eastern slope of the Andes is the most biologically diverse area in the world.**
- **Water scarcity is particularly acute in the Andes and in some of the Caribbean islands. With its high deforestation rate, the region has great potential for reducing greenhouse gas emissions through slowing deforestation and degradation.**
- **The highly diverse ecosystems make the region one of the most popular ecotourism destinations.**

The role of forest ecosystem services in different regions of the world: Latin America and the Caribbean

- **For example, Costa Rica has taken advantage of its natural attractions and made ecotourism the backbone of its economy. Today, Costa Rica is a pioneer in recognizing the vital importance of ecosystem services. This is accomplished through direct payments to landowners, which are funded through a nationwide tax on fossil fuels, international donations, and fees for the forests' environmental services (MEA, 2007). Costa Rica had 72 percent cover in 1950, it went down to 21 percent in 1987 and it has now recovered to 51 percent in 2005 (Umana, 2009).**

The role of forest ecosystem services in different regions of the world: Latin America and the Caribbean

- **Ecuador earns more than US\$100 million per year from nature-based tourism in the Galapagos Islands.**
- **Managing tourism sustainably and enhancing its benefits to the poor will remain the major challenges.**

The role of forest ecosystem services in different regions of the world: The North America

- **The North America region, consisting of 3 countries and 2 areas, has 7 percent of the world's population, 16 percent of its land area and 17 percent of its forest area.**
- **In Canada and the United States, outdoor recreation is a major use of forests and woodlands and has become an important source of income in many forested areas.**
- **Private forestlands dominate the landscape of the northeastern USA, providing economic activity, recreational opportunities, open space, clean water, and wildlife habitat (Pinchot Institute for Conservation, 2009 quoted by Brooke, 2009).**

The role of forest ecosystem services in different regions of the world: The North America

- **The NTFPs are fundamental to many botanical, floral, and woodcraft industries and are important to medicinal and natural food industries as well (Donnegan et al., 2008).**
- **More than three-quarters of Canada's indigenous communities reside in forested areas.**
- **Rural communities in Mexico depend on NWFP for subsistence and income, although their use is declining rapidly because of urbanization, changes in employment and availability of cheaper alternatives.**
- **With a few exceptions, medicinal and spiritual use of plants by Alaska Natives has not been well documented or described (DeLaguna, 1972 quoted by Pilz et al., 2006).**

The role of forest ecosystem services in different regions of the world: The North America

- **Payments for forest carbon sequestration are an emerging opportunity for small forest owners to earn additional income, and in turn to sustain both the economic and ecological values of the Northern Forest in USA (Brooke, 2009).**
- **Such owners often take great pleasure in personal use of recreational opportunities of their forests, such as hiking, picnicking, skiing, snowmobiling, and living in recreation homes, while others find their pleasure in providing host of recreational opportunities, such as hunting, for consumption by others (Ellefson, 1992).**

The role of forest ecosystem services in different regions of the world: The North America

- **Data from the Forest Service's National Woodland Owner Survey (NWOS) show that in United State the dominant reasons for family forest owners (these people represent 35 percent of all forest land) to own land are related to aesthetics (64%), family legacy (62%), privacy (54%), nature protection (52%), part of home (51%), land investment (48%), hunting and fishing (45%), part of farm (41%), other recreation (34%), timber production (31%), firewood production (15%), nontimber forest products (10%) (Smith, 2007).**

The role of forest ecosystem services in different regions of the world: **The North America**

- In Oregon (USA) federal owners must consider multiple management objectives including water, wildlife, recreation, conservation, biological diversity, and wood products, whereas corporate and other private owners often focus on more specific outcomes, such as aesthetics, wood production, or real estate investment (Donnegan et al., 2008).
- Oregon is known for its outdoor amenities and Oregonians often cite natural beauty and recreation opportunities as the attributes they most value about living in the state (Oregon Business Council, 1993 quoted by Kline and Alig, 2005).



The role of forest ecosystem services in different regions of the world: **Western and Central Asia**

- **Western and Central Asia consisting of 25 countries and areas, is the least forested region in the world, with only 4 percent forest cover.**
- **About 75 percent of the region is arid, with low biomass productivity. Overall, forestry has low priority in the region and the sector receives minimal investment.**
- **Except in Cyprus, Lebanon and Yemen, most of the forests in the region are publicly owned.**

The role of forest ecosystem services in different regions of the world: **Western and Central Asia**

- **Date-palm cultivation in several Western Asian countries has turned deserts into oases. In the United Arab Emirates, extensive date plantations have improved the landscape while generating substantial income (FAO, 2008f in FAO, 2009).**
- **Afghanistan, Georgia, the Islamic Republic of Iran, Kazakhstan and Turkey account for most of the region's wood production. As in other regions, the pattern of NWFP use consists of many subsistence products and a few commercially important ones, many of which are domesticated and cultivated systematically (FAO, 2006e; FAO, 2007c in FAO, 2009).**

The role of forest ecosystem services in different regions of the world: Western and Central Asia

- Subsistence use of and trade in NWFP are particularly significant for low-income rural communities. In many countries, NWFP provide more income than wood production.
- Commercial products include honey, mushrooms, medicinal plants, pine nuts, walnuts, pistachio nuts, bay leaves, thyme and fodder. In the more diversified economies, commercially important NWFP have been systematically developed with private-sector involvement.
- Lebanon's privately owned pine (*Pinus pinea*) plantations are managed primarily for nut production.
- The production and processing of, and trade in, bay leaves from Turkey have improved largely because of private-sector investments.

The role of forest ecosystem services in different regions of the world: Western and Central Asia

- **Considering the limited potential of commercial wood production, the provision of environmental services – especially arresting land degradation and desertification, protecting water supplies and improving the urban environment – will remain the principal function of forests and woodlands in Western and Central Asia.**
- **In Israel, it was observed that planting trees on farms may yield more benefits than large-scale afforestation programmes (Malagnoux, Sène and Atzmon, 2007 in FAO, 2009).**
- **Water sharing among the countries is a politically sensitive issue and a primary cause of conflicts in the region.**
- **Most low-income countries lack the institutional arrangements to ensure that income from ecotourism accrues to the poor.**

Differences and similarities in utilization of forest services between poor and rich countries

Based on per capita income as an indicator of economic development and per capita forest cover as indicator of forest endowments, it is possible to recognize 'four realities' in the world (Maini, 2003):

- *forest-rich developing countries,*
- *forest-rich industrialized countries,*
- **forest-poor developing countries,**
- *forest-poor developed countries,*

Differences and similarities in utilization of forest services between poor and rich countries

- *forest-rich developing countries*, such as Brazil, Indonesia, Malaysia, Gabon, and Papua New Guinea, those view forests as an important instrument for economic development

Differences and similarities in utilization of forest services between poor and rich countries

- *forest-rich industrialized countries*, such as Canada, USA, Norway, Sweden, and Finland, which recognize both the economic and environmental value of forests and have the economic and technical means, as well as political and public support, to practice sustainable development

Differences and similarities in utilization of forest services between poor and rich countries

- *forest-poor developing countries*, such as India, Kenya, Philippines, Somalia and China, those have nearly 400 million people living in and around forests who depend on forests for their subsistence and their daily needs for food, forage, fuelwood, shelter and medicinal plants;

Differences and similarities in utilization of forest services between poor and rich countries

- *forest-poor developed countries*, such as Netherlands, Denmark, Iceland, Germany, Japan, and United Kingdom, which rely on forest-rich countries to meet their high demand for forest products and services

Differences and similarities in utilization of forest services between poor and rich countries

- The forest situation in Africa presents enormous challenges, reflecting the larger constraints of low income, weak policies and inadequately developed institutions. Obstacles include: high dependence on land and natural resources and scant investment in development of human resources, skills and infrastructure; the low level of value addition in the economy, including the forest sector; the vastness of the informal sector, stemming from the weaknesses in the public sector and market mechanisms (FAO, 2009).
- In the emerging industrial economies although a growing environmentally conscious segment of the population will spearhead environmental protection initiatives, continued pressures of industrialization and the needs of marginalized people will strain the environment, particularly in China, the Lao People's Democratic Republic and Viet Nam (Prasad and Mishra, 2001).
- High levels of education and access to information contribute to great concern for protection of the environment in Europe, and high incomes contribute to willingness to pay for environmental services. Land use is highly regulated and forest clearance is virtually prohibited in most of the region, particularly in Western Europe (FAO, 2009).

Recommendations to conserve and maintain ecosystem services

- We need to do small things at the community level and to meaningfully incorporate and truly listen to all levels of knowledge. The knowledge we get from western science, local people and aboriginal people, when combined, is very powerful and respected (Wolfrum, 2009)**
- The rural development worker essentially said that forestry affects many more people than just those who own the land and, that being the case, forestry decisions should be made in consultation with larger community (Blackmon, 2010).**

Recommendations to conserve and maintain ecosystem services

- **The Millennium Assessment asks us to think holistically about natural resources, to evaluate the varied services they offer, and to acknowledge that intelligent resource management involves trade-offs. For example, protecting a forest may cost revenue from logging and other extractive industries, but those losses can be offset by improved ecosystem services such as flood control, and improved water quality (MEA, 2007).**

Recommendations to conserve and maintain ecosystem services

To encourage, facilitate and support the sustainable utilization of NTFP on Northern Vancouver Island and the Central Coast of British Columbia, Mt. Waddington NTFP Innovation Centre has identified five priority areas (Mitchell, 2004):

- business development,**
- research and information development,**
- training and education,**
- community development/discussion forum,**
- coordination of First Nations' interests, Center for Nontimber resources.**

Discussion

- **An understanding of the process by which forest resource policies are developed and carried out is of limited value if the citizens, organizations, and institutions that actively participate in the process are ignored;**
- **Poor people living in or near forests often lack formal rights to access, manage and use the resources;**
- **There is however a big job to be done to convince the general public and policy makers of the environmental benefits of wood products;**
- **The will to continue on our chosen path together, in spite of linguistic and cultural differences;**
- **Personal responsibility is of course crucial, but it is only united that we are strong. It is essential that we stand together and jointly search for solutions to achieve our objectives.**



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