



Chapter 3

Forests, forestry and forest products for a sustainable future



Forestry and agriculture in the mainstream of a sustainable future

For the past two decades, expansion of the global economy has provided benefits to many countries, helping many developing countries advance towards middle-income country status. However, too much of this economic growth comes at the expense of natural resource sustainability and relies heavily on fossil fuels, while too little provides benefits to large segments of the world's population, especially people living in rural areas. With world population expected to reach 9 billion by 2050, continuing reliance on increasingly scarce fossil fuels and the degradation and depletion of natural resources is not sustainable. Agriculture and forestry can assist in both expanding economic growth into rural areas and increasing reliance on renewable resources. Agriculture and forestry can be building blocks for an economically and environmentally sustainable future because both are natural production systems based on photosynthesis and, when sustainably managed, both can provide a steady flow of readily adaptable products and services. Strategies for realizing forests' potential contribution to a sustainable future include improving the quality and quantity of forests by planting trees and investing in ecosystem services; promoting small and medium forest-based enterprises to reduce rural poverty and improve equity; increasing the long-term value of wood products by reusing and recycling them and using wood for energy; and enhancing communications and linkages across the physical and institutional landscape.

Forests and forest industries in a global economy

Sustainable development is not an option! It is the only path that allows all of humanity to share a decent life on this, one planet.

◆ Zukang, 2011

The idea of sustainable development – a vision in which prosperity is increased and shared without exceeding the carrying capacity of the earth's ecosystems – stimulated unprecedented excitement and hope at the historic Earth Summit held in Rio de Janeiro in 1992. Two decades later, an assessment of progress in sustainable development reports mixed results (UNCSD, 2010). In these two decades, the world economy has almost tripled, growing from USD 24 trillion to 70 trillion between 1992 and 2011 and benefiting hundreds

of millions of people in many ways. However, global economic growth continues to place unsustainable pressure on the earth's forests and other natural systems.

Economic context: growth but little gain

Economic growth in the past two decades has relied on technological change, trade, increased productivity, and greater utilization of renewable and non-renewable resources. Looking back, too much of this growth has had negative impacts on the health of natural resources and ecosystems. According to the Millennium Ecosystem Assessment (MEA, 2005), more than 60 percent of the world's major ecosystems are now degraded or used unsustainably. More than 50 percent of all types of forest, agricultural land and wetlands surrounding urban and semi-urban areas have been lost through conversion to other land uses. In the past decade alone, about 130 million hectares of forest were lost, of which

40 million hectares were primary forests (FAO, 2010b). This forest loss and degradation are estimated to cost the global economy between USD 2 trillion and 4.5 trillion a year (Sukhdev, 2010). Unfortunately, such costs are not captured in traditional measures of economic progress such as gross domestic product (GDP) (World Bank, 2011c).

In addition, the benefits of economic progress have not been equitably shared. The absolute number of people living in extreme poverty rose by 36 million between 1990 and 2005.⁸ The number of undernourished people increased from 817 million in 1990 to 830 million in 2007 (UN, 2010) and has continued to climb (FAO, 2010b). A fifth of the population in the developing world still lacks access to sufficient clean water (UNICEF/WHO, 2012) and a quarter lack modern energy services (IEA, 2010). Non-inclusive, rapid economic growth that undermines people's livelihoods through resource depletion has become a major cause of political and social unrest in many parts of the world. The need to feed a growing population and the effects of global climate change are expected to put further pressure on natural resources (FAO, 2011b). The promise of a sustainable future – where economic prosperity is shared broadly and achieved without compromising natural capital – is still to be realized.

Solving old and new challenges will require human ingenuity and creativity. It will also need an approach that makes better and greater use of renewable resources, increases the resilience and diversity of production systems, and provides for broader sharing of economic wealth. Although most of the world's population now lives in urban areas, most of the world's poor people live in rural areas, so a greater focus on rural inclusion and rural development is essential. Forests, forestry and forest products are uniquely positioned to complement other agricultural activities in contributing to a sustainable future that will address the needs for both sustainable economic growth and economic and social justice.

Globalization and other factors

The forest sector, including forest management, timber harvesting and industries manufacturing timber-based products, represents a small component of most national economies. At the global level, the sector contributes about 1.0 percent of GDP and employs about 0.4 percent of the total labour force (FAO, 2008).

⁸ Excluding data from China, where there have been significant gains in poverty reduction.

- Mangrove forest destroyed by tin mining activities, Thailand. More than 60 percent of the world's major ecosystems are now degraded or used unsustainably



However, the aggregate data mask considerable differences among regions and among countries in each region; in some developed as well as developing countries, the forest sector accounts for a larger share of the national economy,⁹ and in rural areas in several countries it accounts for significant shares of economic activity and employment. Unfortunately, these data do not take into account the provision of ecosystem services such as watershed protection and erosion prevention, or the contribution of informal activities such as the production of woodfuel and non-wood forest products (NWFPs). At least ten million people are employed in forest management and conservation (FAO, 2010b), and an estimated 1 billion people depend on forests for subsistence, as an economic safety net or as a direct source of income (Scherr, White and Kaimowitz, 2004).

Forest industries face a variety of significant challenges arising from the lingering effects of the global economic crisis and the slow recovery in demand for construction materials, packaging material and furniture.¹⁰ Many of these challenges reflect long-term, broad-scale trends in the sector, in addition to the issues that face all industries, such as increasingly integrated and competitive international markets (globalization), excess production capacity and competition for resources. Although the environmental attributes of wood products present opportunities to produce and market environmentally

⁹ For example, the contribution of the forest sector to GDP in Canada is 2.7 percent, in Malaysia 3.0 percent, in Finland 5.7 percent, in Papua New Guinea 6.7 percent, and in Liberia 17.7 percent.

¹⁰ There is an extended discussion of these issues in SOFO 2011 (FAO, 2011d).

friendly products, firms in many countries have been slow to adapt, as have public policies (FAO, 2011c).

Regions of the world interact more frequently and intensively than ever before. Increased interaction and integration among people, companies and governments are driven by international trade, cross-border investment and the rapid pace at which information moves around the world. Markets respond quickly, leading to rapid expansions (or contractions) in associated flows of capital, goods and services. Although external forces – such as broad trends in the economy, and demographic and social change – have always had a far greater impact on the forest sector than have changes within the sector itself, the current speed and complexity of these externally driven changes are unprecedented. Increasingly, the businesses that benefit from globalization are those that understand the dynamics of global markets and learn to use their basic communication tools.

Turning the corner on how progress is perceived

↳ *Many poor countries possess natural capital in their farms, forests, and ecosystems that can be a primary source of their prosperity. Capitalizing on those riches while, at the same time protecting or enhancing the environment, is not mutually exclusive.*

◆ World Bank, 2011a

Economic success is typically measured by calculating the value and quantity of outputs, regardless of the waste that is generated, the impact on the environment, or the non-renewable resources that are exploited. The World Bank is among those calling for a new way of thinking about economic development (Box 3).

Jeffrey Sachs, special adviser to the United Nations Secretary-General, also argues for new approaches and identifies six sectors that require a “fundamental, technological overhaul” for achieving global sustainability: forests, agriculture, power, transport, buildings and industries. He stresses that reliance on unregulated markets alone is not enough to solve global problems; more effective public–private partnerships must be implemented. Sachs emphasizes the importance of regulatory systems, research and development, public awareness and education, and calls on world leaders to develop a long-term strategy for achieving global sustainability (Sachs, 2011).

The economist Herman Daly argues for pursuit of a steady-state economy rather than a growth economy, noting that infinite economic growth is incompatible with a finite biosphere. He suggests that recurring “bubbles” in the global economy are the result of exceeding the steady-state capability of the planet. Daly concludes by observing that policies intended to re-establish the growth economy are self-destructive (Daly, 2011).

The late Buckminster Fuller provocatively argued that humans will be able to solve all the physical problems of existence because the real wealth of the world is information and energy, both of which are increasing without limits. He pointed to continual technological changes that allow people to do more with less. Fuller argued that exponential improvements in technology could outpace the physical constraints of the world’s limited resources. The real obstacle to human progress is therefore people’s inability to solve political and distribution problems, resulting in unnecessary poverty and inequality, which in turn lead to riots and wars (Fuller, 1969).

Sachs, Daly and Fuller all underscore the need for public policies and private decisions that steer global production and consumption systems towards a more sustainable economic path. Such a path will necessarily be more protective of nature and more equitable. Transition to this path is likely to be stimulated by the rising economic and environmental costs of using fossil fuels and other resources that are limited in supply and increasingly scarce.

Photosynthesis captures solar energy and carbon dioxide (CO₂), converting them into stored carbon and releasing water and oxygen; despite the world’s current reliance on fossil fuels, photosynthesis is the basis for the survival and prosperity of humans on earth. According to global estimates, photosynthesis still captures energy six times as rapidly as human civilization consumes it in the form of power. The human economy will become stronger and more resilient when the “engines” of photosynthesis (plants) are sustainably managed and when renewable, photosynthesis-based products (such as wood products) have a more prominent role in production and consumption. When crops are harvested, they are replaced by new crops to grow food for the future. The same principle applies to forests. Forests “are unique because they are a potentially sustainable source of resource rents – truly a gift of nature” (World Bank, 2006).

Box 3: Alternative ways of measuring wealth and human well-being

Traditional measures of economic success focus on aggregate outputs such as growth in GDP. Alternative measures include the following:

- The Human Development Index (HDI) was first developed by the United Nations Development Programme (UNDP) in 1990 as a comparative measure of life expectancy, literacy and education, and standard of living. The related Human Poverty Index concentrates on deprivation in the three essential elements of human life reflected in the HDI.
- A measure of total wealth developed by the World Bank includes the value of natural capital – minerals, timber assets, non-timber forest assets, cropland wealth, pastureland and protected areas – in estimates of a country's wealth. Total wealth includes produced capital (infrastructure), natural capital (forests, fish stocks, etc.) and human resources (World Bank, 2011b).
- “Adjusted net saving”, also developed by the World Bank, is an indicator of an economy's sustainability; it measures changes in wealth from year to year by comparing changes in produced capital, depletion of natural resources, investments in human capital, and damages to health caused by pollution (World Bank, 2011c).
- Although income inequality is not typically reported in official national or global statistics, there are several ways of estimating it, such as by comparing the wealthiest and poorest 10 percent (the R/P 10 ratio), or through the Gini index, which measures the extent to which income distribution varies from an equal distribution. In Bhutan, the official government policy is to promote “gross national happiness” ahead of “gross national product”. This is more than a slogan; emphasis is placed on maintaining traditional culture and promoting social goals, rather than on simply trying to maximize production or consumption.

This chapter illustrates four fundamental ways in which forests and forest-based industries can contribute to a sustainable future: i) as a source of energy; ii) as ecosystems that provide people with goods, services, resilience and ecosystem health; iii) as rural economic activities that benefit local development through increased employment and income; and iv) as the source of products that contribute to economic growth, livelihoods and well-being. Forests could make a significant contribution to a more sustainable future, but realizing this potential requires better strategies and communication. The last section of this chapter highlights selected strategies to help achieve that future.

Forests as renewable sources of energy

The development of civilization has been powered by wood energy. Today wood is still the most important single source of renewable energy, providing more than 9 percent of the global total primary energy supply. Energy derived from wood is estimated to represent more than 1 100 million tonnes of oil equivalent each year. Wood energy is as important as all the other renewable energy sources put together (hydro, geothermal, waste, biogas, wind, solar and liquid biofuels) (Figure 3).

More than 2 billion people depend on wood energy for cooking and/or heating, predominantly in households in developing countries. Household cooking and heating with woodfuels accounts for one-third of global consumption of renewable energy sources. Woodfuel is not only a globally

important source of renewable energy, it is also the most decentralized source of energy in the world.

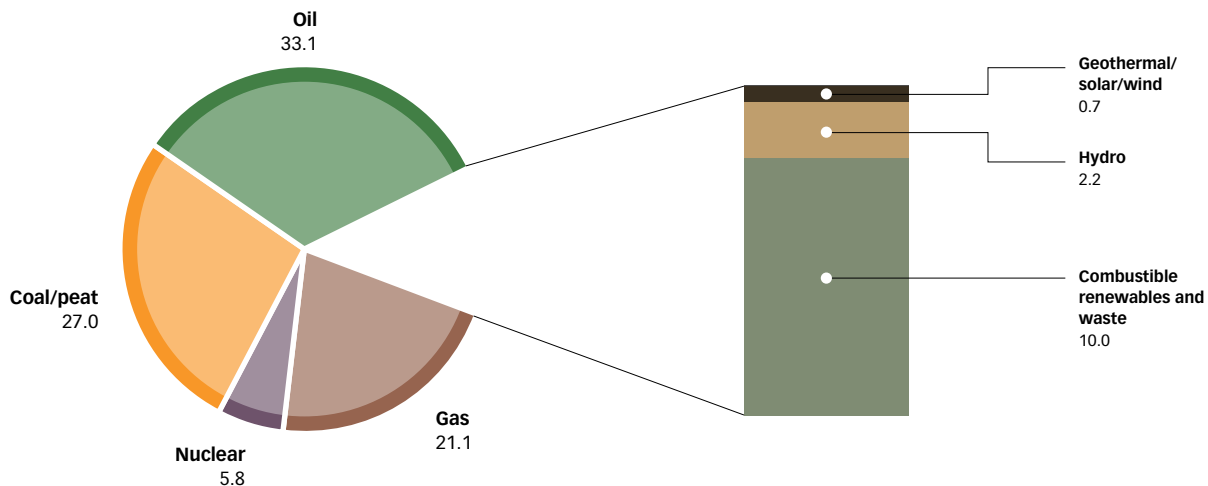
As the attention on climate change and energy security has increased, wood energy has become far more important and visible. Wood energy is considered a climate-neutral and socially viable source of renewable energy when:

- it is harvested from sustainably managed forests and trees outside forests;
- it is burned using appropriate technologies to maximize efficiency and minimize indoor and outdoor emissions.

Forests providing for people

About 350 million of the world's poorest people, including 60 million indigenous people, use forests intensively for their subsistence and survival. These populations include the most disadvantaged and vulnerable, and often the politically weakest parts of society; forests are their main means of meeting contingencies and mitigating risks from unforeseen events. These populations are extremely talented, creative and innovative in their use of forests and their products and ecosystem services. Many forest users have rich traditions and knowledge. For example, hundreds of millions of people rely on traditional medicines harvested from forests, and in 60 developing countries, hunting and fishing on forested land supply more than a fifth of the population's protein requirements. A further 1 billion people depend on woodlands, homestead trees and agroforestry for many of their day-to-day needs. For more than 2 billion

Figure 3: Shares of total primary energy supply in 2008 (percent)



Notes: Share of total primary energy supply – 12 267 million tonnes of oil equivalent – excludes the electricity trade.

Woodfuels constitute 90 percent of combustible renewables and waste (FAO estimate).

Shares under 0.1 percent are not included; the total may not add up to 100 percent.

Source: IEA, 2010.

people, wood energy is critical for cooking, heating and food preservation (FAO, 2010a).

At the same time, forests are important components of ecosystems at all scales, providing a wide range of services and functions: regulating water supplies, buffering floods and droughts, mitigating the adverse effects of GHG emissions, and harbouring biodiversity. Forests are estimated to store about 289 gigatonnes of carbon in their biomass alone; they therefore play a central role in the earth’s carbon balance and hold significant potential to mitigate climate change (FAO, 2010b). Because forests contain more than 80 percent of the world’s terrestrial biodiversity (plants, animals,

- Wood charcoal production, Liberia. For more than 2 billion people, wood energy is critical for cooking, heating and food preservation



FAO/A. Lebedevs/FC-6968

birds and insects), they will be an important resource in the development of new medicines, improved plant varieties and countless other products.

An increased emphasis on forests, forestry and forest products is therefore not simply for meeting the world’s increasing demand for timber and fibre but also for providing ecosystem services and sustaining livelihoods. Managing forests sustainably and enhancing their contribution to people and the planet lie at the heart of a sustainable future.

Realizing the value of forests

Many of the products and most of the ecosystem services provided by forests are not bought and sold through formal markets. As a consequence, forests are frequently undervalued and too readily destroyed, inadequately managed or abandoned. Trees can be sold for fibre or energy, but markets do not exist (yet) for the carbon stored in forests, the ability to conserve diverse flora and fauna, or the ability to provide clean water.

Major efforts are being made to focus attention on this issue. For example, the motto of the Prince’s Rainforest Project, led by Prince Charles in the United Kingdom of Great Britain and Northern Ireland, is “Working to make the forests worth more alive than dead”.¹¹

Considerable progress has been made in developing markets, including international ones, for a wide variety of

¹¹ Additional information at www.rainforestsos.org.

renewable NWFPs (such as nuts and fruits), with resulting benefits for forest-dependent communities.

A resilient and durable economy will incorporate a broader range of forest values in decision-making processes. Where markets are non-existent or underdeveloped, public policies can play an essential role in identifying and promoting recognition of these forest values. Current actions by governments, civil society and the private sector to ensure greater attention to forest values include efforts to create markets that underpin Reducing Emissions from Deforestation and Forest Degradation (REDD) (Box 4). As a consequence, there is broad consensus that sustainable management of forests is an important goal for all countries, and that it should include a greater emphasis on conserving and enhancing forest-based carbon stocks. In moving to a sustainable economy, deforestation and forest degradation must be significantly reduced and net global forest area increased.

Forestry in a sustainable future

Forestry is the art and science of creating, using and conserving forests. The forestry profession was a pioneer in developing techniques for sustainable management and, later, techniques for the multiple use of forests. More recently, broad holistic concepts such as ecosystem management and landscape management have been developed, tested and applied. These are all elements of the sustainability and sustainable management of a wide variety of renewable resources. However, forestry is embedded in a changing, predominantly urban society that has limited direct experience of nature and is frequently sceptical of resource managers. Although the term “sustainable

forest management” is synonymous with “good forestry”, forestry and forest management are sometimes viewed as potentially damaging to the environment. This fear is justified where unscientific or illegal forest practices are used, but the argument that there is a need to “green the forest sector” appears to give too little credit to forestry’s core concepts (see, for example, UNEP, 2011). Nevertheless, if forestry is to contribute effectively, it must continue to evolve.

Forestry is “sandwiched” between two extreme and conflicting views: on one side are the superficial, mainly urban, perceptions of the felling of a tree or the hunting of forest wildlife as environmental offences; and on the other side are the poor practices and negative impacts on forests that generally come from outside forestry (fires, pollution, etc.) or from mining and other interests that perceive forest lands as reservoirs of land for mineral extraction, agriculture, etc. The tools for dealing with these extremes are effective communication for the first and land-use planning and enforcement for the second.

A significant challenge for the forestry profession is to communicate and demonstrate the simple idea that one of the best ways of saving a forest is to use it. When looking for ways to stimulate economic development, politicians and planners seldom see all the dimensions and potential of the forest sector. Forests are viewed as either a feature of the environment to be preserved or, in stark contrast, a source of land to aid the expansion of agriculture. A balance should be found in which forests contribute to achieving all of these goals: sustainable forest management adds value to a forest by using

Box 4: Is REDD a “game changer”?

In *The Future of the World's Forests*, Jim Douglas and Markku Simula suggest that the opportunity to receive payments for reduced deforestation through carbon emission trading is a “game changer” because it represents the international community’s first attempt to develop a global mechanism that recognizes non-market values from forests – in this instance the contribution to mitigating climate change through carbon sequestration.

The authors acknowledge that carbon storage is only one of several forest ecosystem services that are not valued by markets, but it is the first such value that people are

addressing formally by seeking to create a global market. Noting that deforestation is caused mainly by economic forces outside the forest sector, the authors conclude that “it will not be easy to use broad based economic reform as a primary means of implementing a revaluation of existing rainforests: it is simply too blunt an instrument.”

The authors therefore describe themselves as “REDD optimists” in their hope that payments for reducing deforestation will be a significant accomplishment in efforts both to mitigate climate change and to finance sustainable forest management adequately (Douglas and Simula, 2010).

forest products for energy, construction materials, packaging and a wide variety of other consumer products while preserving the pieces and functions of a healthy forested ecosystem. When sustainable forest management is practised, the values of the natural forest can largely be maintained.

The global economy is driven by many forces. Frequently cited large-scale trends include population growth, unsustainable production and consumption systems, and climate change. Internet-based communication and consumer products, digital devices and technological advances have changed the ways in which information is read and obtained. Social networking has changed the dynamics of information exchange and facilitated new forms of social interaction, protest and political change. These changes and trends around the world have a massive impact on forests and the forest sector.

Although forestry offers significant potential for investment, many people hesitate to enter the business because of inherent risks, including the long gestation period involved in establishing, tending and ultimately harvesting forest products. Other challenges include market uncertainty (the forecasting of prices for forest products and forest land in the short or long term), environmental risks (forest fires, insects, disease) and policy risks (unclear forest tenure, an unstable political environment, unpredictable changes in policies). Promotion of investments in forestry thus requires improved institutions and governance, and policies and market-based tools that help mitigate some of these risks.

The world is large enough to allow different forests to be managed for different values and outputs: some forests can be protected; others can be intensively managed for wood; and others can be managed for multiple uses. Decisions about the type of management appropriate for each forest should be made through participatory processes that engage all levels of society. Both developed and developing countries now understand the importance of involving local people and forest-dependent communities in decisions about forest management and use. It is essential to construct a decision framework for forests that incorporates the best science, local experience and traditional knowledge.

Forestry already plays a significant role in sustainable local economies. This contribution to a sustainable future

will increase if the principles, policies and practices of sustainable forest management are applied and if forest products and ecosystem services assume more importance in the global economy.

Carving out a better future

International debate about forests looks at the big picture from the top down; while governments argue about multi-billion-dollar investments to reduce tropical deforestation, bottom-up solutions are often overlooked. Too little attention is paid to important segments of developing economies that already use wood to make a significant contribution to social, economic and environmental well-being: through furniture making, woodcarving, handicrafts, and other small or medium-scale enterprises.

Hand-crafted products made primarily of wood and other forest products are the source of livelihoods for at least 100 million artisans and their families in rural communities (Scherr, White and Kaimowitz, 2004). More effective development of these businesses and marketing of their products could help ensure more stable and sustainable rural development. For example, woodcarving generates more money and jobs per unit of wood than does any other part of the forest products industry. In many areas, woodcarving also serves as a safety net when other opportunities are limited, and is particularly helpful to women and other economically marginalized sections of society.

Despite growing economic opportunities in many countries, severe inequalities persist, and poverty remains widespread in rural areas. Because forests are in the poorest regions of many developing countries, including in countries with rapidly emerging economies, stimulating investment in local eco-entrepreneurship and green enterprises can serve as an engine of rural economic development (Matta, 2009).

Wood as an integral part of culture and tradition

Throughout human history, woodcarvings and handicrafts have played an important role in art and aesthetics that goes well beyond function and extends into the realm of happiness and fulfilment. Through creative designs, intricate ornamentation and expert craftwork that appeals to the senses, woodwork became an integral part of culture and tradition in many societies. Patronized by monarchs and commoners, scholars and religious leaders, these art forms were integrated into virtually every aspect of life throughout the world.

A beautifully carved main door inlaid with wood is a sign of welcome in many parts of India, where carved wooden lintels, brackets and balconies are found in many traditional homes. While features such as intricately carved furniture, architectural features and decorative elements served to enhance the aesthetic appeal of the places where people lived, they also demonstrated a person's relative socio-economic status and well-being.

In many cultures, the most talented woodcarvers and artisans enjoyed special status. In certain stratified societies, the right to create wooden art was considered a privilege of specific families or ethnic groups, and the necessary skills were imparted through hereditary channels (Jha, 2009).

Even amid poverty, there is more to life than acquiring basic necessities or producing objects solely for their utilitarian value. People of all cultures admire art and aesthetics – those things that appeal to the eye, the ear, the heart, the touch and the taste. These feelings stimulate emotions and happiness and generate imagination and creativity.

In modern life, however, consumer goods are typically based on mass production, and woodworking artisans have gradually lost social importance in many countries. Competition from inexpensive, easily mass-produced products made of steel and plastic has undermined appreciation of the artistic and aesthetic values of wood.

Artisans and craftsmen have been relegated to the status of a “backward” community.

A challenge for the proponents of a green economy is to find ways of equitably rewarding the skills and creativity of rural people who carve wood and make handicrafts. These often informal industries provide full or partial employment to an estimated 100 million artisans and semi-skilled labourers. Although the figures vary from country to country, many of these craft producers and artisans are women and ethnic minorities, residing in remote areas where they are disproportionately affected by poverty (Scherr, White and Kaimowitz, 2004).

The collection and processing of raw material and the production of wooden items and handicrafts constitute the most important sources of income for many rural families. In some societies, farmers carry out this work during the agricultural off-season; the additional income derived from wood handicrafts often decides whether or not an artisan family can rise above the national poverty line (World Bank, 2006). In recent years, the plight of these families has worsened in countries that have restricted the collection of wood and other raw materials from forests.

Winds of change

There is some basis for optimism that the situation is changing for the better. Emerging economies could become the world's leading economies and the trend-setters for transformation in the twenty-first century.

- Wooden choir stalls in the church of Paramaribo, Suriname. Through creative designs, intricate ornamentation and expert craftwork, woodwork is an integral part of culture and tradition in many societies



FAOM, Neuberger/FO-0781

Included in this economic group are countries that are major producers and consumers of handmade wood products: Brazil, China, Egypt, India, Indonesia, the Islamic Republic of Iran, Mexico, Pakistan, Turkey and Viet Nam. These countries account for more than half of the world's population and most of its recent economic growth.

The rapidly expanding urban middle classes in these emerging economies will have growing incomes, more disposable money and higher aspirations. They constitute a huge potential market for new and innovative products, including those made of wood. People who acquire new wealth often develop an interest in art and aesthetics, and the demand for higher-value niche wood products is likely to increase accordingly. The increasing popularity of wooden toys is a notable example, which connects children to nature. Toy manufacturers have started to realize this potential.

Although urbanization is accelerating, large populations in emerging economies will continue to live in rural areas. This mix of rural and urban populations will be conducive to an optimal supply and demand balance for promoting woodcarving and handicrafts.

With increasing wealth and leisure, people in many cultures look fondly on the past and develop an interest in reviving old traditions. With longer life expectancies and ageing populations in many countries, the proportion of people with such feelings will continue to increase. Intricately carved, light and durable wooden items and traditional artefacts with deep cultural significance are becoming increasingly sought after

- Traditional wooden toys from Channapatna, Karnataka, India. The demand for higher-value niche wood products is likely to increase with the rapidly expanding urban middle classes in emerging economies



FACOL/Animon

as gifts and decorative items for the home. The revival of cultural festivals, performances and rural markets can be interpreted as a search for the continuity of tradition in a rapidly changing world. Hand-crafted wood products can play an important role in meeting demands stimulated by nostalgia for the past. Wooden art and decorative forms of wood define the cultural identity of many countries, and woodcraft entrepreneurs can learn from the people who have generated new income streams from other local and regionally branded products such as wines and cheeses. Moreover, sustainable forest management and, in particular, the jobs generated by small and medium forest enterprises, offer a viable way of retaining rural youth in their local communities and harnessing their energy, ambitions and capacity to innovate in the sector.

Hurdles to overcome

Despite the potential for helping to transform rural areas, small wood-based industries face significant challenges. Many of these businesses are characterized by low productivity, inadequate processing, poorly integrated markets and high vulnerability to external shocks. Most artisans and craft producers draw on local resources and cater primarily to local markets.

The woodcarving industry typically consists of small production facilities – households and small enterprises – many of which are informal (not registered with the State) and in the unorganized part of the sector (Jha, 2009). Although the production of goods for sale requires a great deal of skill, creativity and artistry, artisans frequently lack business skills, so may not get their fair share of profits. Most of the value is captured by those at the top of the market chain; this raises concerns regarding equity and may also act as a disincentive for sustainable management.

Rural entrepreneurs have limited access to credit, external markets and technology, leaving them with limited capital and capacity for upgrading technology or improving production efficiency (Macqueen, 2008). Access to raw material is frequently another major constraint. In many countries, rural entrepreneurs also lack an enabling environment for organizing, networking and improving their entrepreneurial skills, although modern communication technology is helping to change this situation. Faced with these challenges, the prospect of industry decline is ever present, bringing with it the risk of losing livelihoods, indigenous knowledge and traditional beliefs associated with the production and use of these materials.

Realizing the benefits of small wood product enterprises

Wood and wood products will make increasingly important contributions to a greener economy and more sustainable development. As societies grow and prosper, they increasingly value goods and services that contribute to health, education, culture, heritage and tradition. Particularly in emerging economies, markets for traditional wooden works of art, woodcrafts, home décor and furnishings show signs of resurgence and offer excellent potential for growth. Recognizing these trends and acting on them as development and business opportunities could be productive and profitable.

Increased investment in wood-based enterprises will generate additional employment, create real and durable assets, and help revitalize the lives of millions of poor people in rural areas. At a broader scale, this green economy approach (low-carbon, resource-efficient and socially inclusive) can open up new possibilities for disadvantaged segments of the global economy. There are especially good opportunities for rural people in emerging economies.

Realizing this potential requires overcoming several hurdles:

- Misinformation about the destruction of tropical forests caused by the increased use of wood must be overcome.
- Local entrepreneurs need to learn how to obtain access to global markets. There must be more involvement further up the value chain, with greater production of quality wood materials for niche markets. It may be necessary to organize this highly decentralized industry on a country-by-country basis, through such approaches as product standardization, segmentation and market development.
- There is a need for policies that support and encourage improved marketing, including the development of cooperatives.
- Proactive policies that promote tree growing on private lands and sustainable forest management practices on all lands are also necessary.

Forest products in a sustainable future

Projections of future population foresee a world of 9 billion people by 2050; much of this population growth is expected to occur in cities in the developing world. If current practices continue, the building of these cities will produce millions of tonnes of GHGs; however, increasing

the use of sustainably managed wood products in construction will store carbon and offset some of the emissions from manufacturing concrete and steel. This is just one aspect of the compelling case for making greater use of wood products as part of a sustainable future.

Connecting consumption and production in a closed cycle is another important aspect of a sustainable future. In an effectively integrated cycle of production and consumption, positive economic, environmental and social benefits can be sought and negative consequences avoided. Products and services from productive natural ecosystems, such as forests, grasslands, agriculture and aquatic systems, are ultimately based on photosynthesis, so their production and consumption can be repeated in a cycle. When managed under thoughtful stewardship, forest ecosystems generate a host of products and services that can be perpetuated. Forest products will therefore play an important role in a sustainable future in which sustainable consumption and production are linked in a closed cycle.

Wood products

Wood products are manufactured from renewable raw material; they are reusable and biodegradable, and they continue to store carbon throughout their lifetime. These characteristics make wood an excellent alternative to many of the materials that are now widely used in construction and consumer goods, which leave a much larger “carbon footprint” and include concrete, steel, aluminium and plastic. Increasing production and consumption of wood products will therefore be part of a sustainable future. However, a sustainable future will also require greatly improved efficiency and reduced waste

- Sawmill converting tropical hardwoods into parquet flooring, Lao People’s Democratic Republic. Wood products are manufactured from renewable raw material; they are reusable and biodegradable, and they continue to store carbon throughout their lifetime



J. Broadhead/IC-5938

in timber harvesting, manufacturing and consumption. There is already evidence of considerable progress in wood product industries. Examples include:

- use of small-scale equipment and low-impact practices in logging operations;
- wood-saving manufacturing equipment (thin blades) and technologies (laser guides), and complete utilization of wood raw materials, including through the use of waste to generate heat and power;
- product developments that utilize smaller, lower-quality trees while improving the performance of engineered wood products, such as laminated beams and flooring;
- use of recovered and recycled paper, paperboard and wood.

Wood product manufacturers face many challenges, including changes in consumer preferences and global demographics, competition for resources, competing materials, and changes in the ownership of the forests that provide raw material. Forest industries typically require large capital investments and it is difficult for them to adjust rapidly to changing economic conditions. Nevertheless, the overall outlook for the forest industry is generally good. Production and consumption are expected to grow, while new investment and production are expected to continue shifting towards the more rapidly growing emerging economies. In developed country markets, wood products will benefit from a greater focus on meeting high environmental performance standards, and new wood-based products such as bioenergy, biochemicals and biomaterials will be a basis for overall industry growth (FAO, 2011c).

Innovations in forest products

The rate of innovation in global telecommunications is widely known. However, too few people are aware that manufactured forest products are also undergoing a transformation, which is leading the transition of the forest sector in the green economy (Tissari, Nilsson and Oinonen, in press). Innovations in forest products tend to fall into two broad groups: subtle, evolutionary innovations involving gradual changes to processes that are well established; and abrupt, revolutionary innovations creating new products and processes that have never been seen before, such as using wood in the manufacture of electronics.

Composite or “engineered” wood products are changing rapidly. Among the engineered wood products that are substitutes for solid wood are glulam beams, laminated veneer lumber, parallel strand lumber, I-beams with oriented strand-board webs, and edge-glued, solid wood

panels. One of the most recent innovations, cross-laminated timber, is producing wood products with superior strength and dimensional stability, enabling the development of new construction techniques for high-rise buildings.

Production technology in the plywood sector is also changing rapidly – especially in Asia – enabling the use of smaller logs, including from planted forests. New manufacturing processes are faster, more fully automated and capable of greater quality control. Innovations include laminated veneer board and long-stick board. The most recent type of plywood contains a flexible core layer, creating a wood-based panel that can easily be bent into a variety of shapes and used in new processes and products.

- Wood technology laboratory. Innovations in forest products fall into two broad groups: subtle, evolutionary innovations involving gradual changes to well-established processes; and abrupt, revolutionary innovations creating new products and processes



FAO/IFL/CIH/0002/15

Indonesia, the world’s largest exporter of hardwood plywood, has invested in improved processing that adds value to end products, for example by using direct coating to produce “colour-tone plywood” and moulded or curved plywood products. Plywood is also being used for large-scale structures such as tank supports on the large commercial vessels that transport liquefied natural gas.

Many advances are being made in reconstituted panels, especially oriented strand board in North America and medium-density fibreboard in Europe. Improvements include increased strength, a wider range of densities, improved packaging, and greater product diversification through a larger variety of surface treatments.

One of the more interesting technological developments is the increased manufacture of products that mix wood fibres with other materials, including flax, cotton, straw, paper and plastics, to produce wood composite boards. Wood–polymer composites are beginning to penetrate markets owing to their ease of use and durability. Research in this area focuses on using wood resources more efficiently, optimizing the physical properties of raw materials, making products with special properties such as resistance to fire or fungi, reducing manufacturing costs, and recovering waste when products are no longer useful.

Technology and core products in sawmilling are not changing as rapidly as they are in composite products. The most important transition is that more timber comes from planted forests, and a higher percentage of logs are small by traditional standards. There have been improvements in log sorting, sawing yields, the speed of processing, the speed and quality of drying, and surface treatment and non-toxic preservation. Many of the natural defects of sawnwood can be removed by means of optical scanners, automated off-cutting and finger-jointing. Relatively new “hew-saw” technology is well suited to the rapid processing of small logs into bulk grades of lumber, simultaneously hewing slabs into chips that are suited for pulp.

Forest industries are also at the forefront of innovation in the use of renewable sources of energy. Combined heat and power units are the norm at forest product manufacturing sites in Europe and North America, and are becoming more common in developing countries. Pulp and paper plants derive most of their energy from wood bark and the black liquor that is produced in the pulping process. Energy consumption per unit of output is declining throughout the pulp and paper industry.

Non-wood forest products

As well as being a source of essential food, NWFPs are also an economic foundation for millions of families (CIFOR, 2012). Worldwide, the estimated value of NWFP removals in 2005 was USD 18.5 billion (FAO, 2010c), but this estimate is conservative because NWFPs are rarely reflected in official national economic statistics. NWFPs are an important complement to agricultural income, and they serve as safety nets during calamities such as drought and civil unrest (Scherr, White and Kaimowitz, 2004).

Forests and trees on farms represent a vital source of food for many of the world’s poorest people, providing

both staple foods and supplemental foods such as fruits, edible leaves and nuts; fodder and browse for livestock; and fuel for cooking and food processing. It is often the poorest people who depend the most on forests. Households living on the margins of poverty are exposed to food insecurity at certain times of the year, when income levels drop. This may be during the lean season (when crops are still growing in the fields and stocks from the previous harvest are exhausted) or in times of famine or food shortage. Forest foods are particularly important during these periods. Plants and animals found in forests provide a critical source of protein and important vitamin- and nutrient-rich supplements for rural households, adding variety to diets and improving the taste and palatability of staples. NWFPs often form a small but critical part of otherwise bland and nutritionally poor diets (FAO, 2011a).

There are significant challenges to the continued use of NWFPs as a source of rural income and employment. Most of the livelihoods supported by NWFPs are characterized by low productivity, inadequate processing and value addition, and poorly integrated markets. NWFPs’ potential value to local people is hindered by factors such as the remoteness of forests, poor infrastructure, unclear tenure rights, and limited access to financial and market services. Low returns and unfavourable market conditions often lead to unsustainable exploitation of NWFPs. To enhance the many benefits that NWFPs provide, there is need to raise awareness of the contributions that forests and trees make to nutrition and food security strategies and policies; increase support for adequate and locally controlled forest management and use; give greater attention to pro-poor forestry measures; and support the development of economically, socially and environmentally sustainable small and medium forest enterprises.

Investing in NWFPs provides an opportunity to strengthen the livelihoods of forest-dependent people, contribute to their nutrition and food security, and help conserve their resource base. Enhancing the entrepreneurial capacities of people engaged in NWFP collection would result in increased income and provide an incentive for better forest protection and management. Areas for investment include improving technical knowledge and information on sustainable harvesting, collection, storage, processing and value addition; overcoming the isolation of small and medium forest enterprises by connecting them to each other and to markets, service providers and

- Intermediary who links producers and processors of shea nut (*Butyrospermum parkii*), Central African Republic. Investing in non-wood forest products provides an opportunity to strengthen the livelihoods of forest-dependent people, contribute to their nutrition and food security, and help conserve their resource base



FAO/J. Masuich/ FO-7233

decision-makers; and providing policy and institutional support to ensure clear commercial use and/or tenure rights, a fair and simple regulatory environment, cost reductions, and the promotion of collective action and partnerships among NWFP entrepreneurs.

Forest-based enterprises

The livelihoods of millions of rural people, including a high percentage of rural women, can be enhanced through investments in small and medium forest-based enterprises that use wood and NWFPs to meet demand from local and non-local markets. For example, the value of woodcraft exports (primarily from developing countries) increased from an estimated USD 500 million in 2002 to USD 1.5 billion in 2010.

As another example, in recent decades shea butter and argan oil – both derived from tree nuts grown in the arid regions of northern and western Africa – have demonstrated the economic potential of NWFPs and their integration into global as well as lucrative niche markets.

In Burkina Faso, exports of shea butter and unprocessed shea kernels generated USD 7 million in 2000, making these products the country's third most important export, after cotton and livestock (Ferris *et al.*, 2001). Forest-based tourism is another increasingly important source of revenue for many developing countries.

Increased investments in sustainable forest-based enterprises will result in economic growth and higher employment while meeting the demand for forest products of an expanding global population. It will also contribute to the achievement of social development objectives by building capacities, particularly of rural women, through increased income opportunities, a stronger voice in communities, and the reinvestment of profits in communal infrastructure and services.

Investments in small and medium forest enterprises should take into account the entire value chain, by including the suppliers, producers, processors and buyers of a product, and the technical, business and financial service providers that support them. Such a system will create sustainable self-dynamism and independence from external support mechanisms.

Green buildings and infrastructure

Wood is an important material for ensuring a sustainable future; it has a neutral carbon footprint, it is renewable, and the manufacture of wood products has a smaller environmental impact than that of competing building materials. Wood is versatile and can be used both in new housing and in upgrading old buildings. Although wooden buildings have traditionally been limited to only one or two storeys, innovative and engineered wood products are increasingly recognized as having potential for buildings of up to 20 or 30 storeys.

It is very difficult to produce evidence of the direct environmental and GHG-mitigation benefits of using wood in building and construction. However, focusing on specific building products enables comparisons of the environmental impacts of wood and competing materials. This “material life cycle” approach measures the environmental impacts of building products at four stages:

1. extraction, refining and transportation of the raw material;
2. manufacture of the product;
3. utilization and maintenance of the finished product throughout its service life;
4. recycling, reuse and disposal of the product after use.

Using broad-scale indicators and the life cycle assessment approach, a comparison of wood and other construction materials can be summarized as follows:

- *Global warming potential, measured in CO₂ emissions:* Wood is CO₂-neutral and has a negative global warming effect – wood products provide net storage, rather than release, of CO₂. The precise score depends on the boundaries of life cycle analysis, but wood easily outperforms concrete, brick, stone and metal, all of which are sourced from extractive industries and require intensive energy use throughout their mining and processing chains.
- *Photochemical ozone creation potential (ethane emissions):* Wood products emit far less ethane than aluminium, and significantly outperform PVC plastics.
- *Acidification potential (sulphur dioxide emissions):* The sulphur dioxide emissions associated with wood products are only 40 to 50 percent as large as those associated with aluminium and PVC.
- *Eutrophication potential (enrichment of dissolved phosphate):* Wood products are associated with approximately two-thirds of the eutrophication potential associated with aluminium and PVC.

Globally, existing buildings account for more than 40 percent of total primary energy consumption and 24 percent of CO₂ emissions (IEA, 2006). The rapidly expanding construction sector that is needed to meet the needs of an ever-increasing population is likely to exacerbate this energy and climate impact. Energy savings from buildings that are resource- and energy-efficient throughout their life cycles will therefore

- Kooraste hunting house, southeast Estonia. Although wooden buildings have traditionally been limited to only one or two storeys, innovative and engineered wood products are increasingly recognized as having potential for buildings of up to 20 or 30 storeys



J. Pere

be critically important. This situation presents an opportunity for increasing the use of wood products: wood's lower carbon footprint makes it a rational and natural choice for a greener building sector.

Strategies for the future

Strategies for realizing forests' potential contribution to a sustainable future include improving the quality and quantity of forests by planting trees and investing in ecosystem services, promoting small and medium forest-based enterprises to reduce rural poverty and improve equity, increasing the long-term value of wood products by reusing and recycling them and using wood for energy, and enhancing communication and linkages across the physical and institutional landscape.

Planting trees and investing in ecosystem services

Planting trees is often the quickest and most effective way of producing new biomass, thus helping to offset the loss of carbon resulting from deforestation or forest degradation on another plot of land. Investing in new carbon stocks has great potential to make a significant, fast and measurable impact on climate change without requiring sweeping changes in policies, cultures or national economies. Several developing countries, notably in Asia, have demonstrated that major investments in planted forests can reverse the trend towards deforestation and result in a net increase in forest area.

The UNEP report *Towards a green economy: pathways to sustainable development and poverty eradication* (the Green Economy Report; UNEP, 2011) calls for investments in reforestation of USD 22 billion per annum over the next 40 years. This level of reforestation would certainly increase the sequestration of carbon in woody biomass, and may be large enough to have an impact on climate change. However, considerable hurdles would need to be overcome: it is not clear where the funds would originate, where the trees would be planted, or how a global programme of this magnitude would be administered. Planted forests must be designed for local conditions; the trees must be appropriate, ideally native species; and planting programmes must take local cultures and economic conditions into account. Planted forests are not a simple one-time investment; they must be properly nourished and managed to ensure their long-term success. Nevertheless, the planting of new forests on a massive scale could result in zero net deforestation on the global scale, with or without REDD.

- Teak (*Tectona grandis*) plantation in limestone zone, Thailand. Major investments in planted forests can reverse the trend towards deforestation and result in a net increase in forest area



FAO/M. Kasahor/FO-6628

The challenge lies in working at the local level, but with large enough investments to make a difference at the global level.

Trees sequester carbon, regardless of their location, so they may be planted on farmland and rangeland and in cities: outside the “forest” as officially defined by FAO. Agroforestry – incorporating trees into farms – is an essential component of global efforts both to enhance rural livelihoods and to mitigate climate change. A total of more than 1 billion hectares of agricultural land – half of the world’s farmland – currently has tree cover of more than 10 percent. Farm forestry contributes up to 40 percent of farm income through the harvesting of wood, fruits, oils and medicines from trees. Trees can also provide fodder for livestock, help enhance soil fertility, and provide environmental benefits such as clean water, soil health, carbon sequestration and biodiversity. Trees add both market and non-market value to rangelands. In cities, they provide ecosystem services: shade from heat, shelter from wind, absorption of pollution, and creation of urban biodiversity. Urban trees also have aesthetic benefits and add value to property.

Successful programmes for increased tree planting require realistic goals established at the local and national levels, effective partnerships between the public and private sectors, and a business environment in which planted forests represent a good financial investment.

Protecting and enhancing ecosystem services from existing forests can be a powerful complement to establishing new forests and planting trees outside forests. Forest landholders can be rewarded for maintaining healthy forests and encouraged to restore other forests through payments for forest-based ecosystem services, such as carbon sequestration, providing clean water or conserving biodiversity. Several countries have implemented small-scale programmes that demonstrate the effectiveness of such efforts. In one example, forest owners receive payments for managing forested watersheds in ways that reduce the cost of generating electricity from hydropower. Payments for the ecosystem services of forests can be used to create new forests and enhance the quality of existing forests.

REDD is one of the most widely discussed and promising examples of such payments. It is well known that sustainable forest management can reduce emissions of GHGs by reducing deforestation and forest degradation. However, before REDD or other payments for the ecosystem services of forests can have a significant impact, many practical problems need to be overcome, including establishing a clear, stable policy environment; clarifying tenure for forest land and forest carbon; ensuring that payments are linked to the services provided; ensuring sustainable sources of funding; and addressing governance issues where institutions are weak.

Promoting small and medium forest-based enterprises and gender equity

Forest-dependent people and communities continue to be among the poorest in the world; however, small-scale projects that help to promote small and medium forest enterprises have been successful in reducing poverty, improving equity and helping to protect forests and other natural resources. Undertaking these approaches on a larger scale could therefore contribute to national efforts to stimulate employment and strengthen livelihoods; at the regional and global scales, these efforts could play an important role in combating deforestation and forest degradation and slowing the pace of climate change.

Many countries will require policy, legal and institutional reforms to create an enabling environment that ensures access to forest resources, equitable distribution of benefits and support to innovation and entrepreneurship. A policy and institutional environment that is “friendly” to

the rural poor will provide these important stakeholders with the opportunity, knowledge and capacity to participate actively in the decisions that affect their lives; national forest programmes have proved to be effective mechanisms for achieving this objective in countries with limited institutional capabilities. Sustainable forest management and the successful enterprises that rely on it require long-term investments, which in turn require transparent, fair and stable rules, starting with clear tenure arrangements.

Across many regions and countries, women make significant contributions to rural economies but, compared with men, they have consistently less access to resources and fewer opportunities for enhancing productivity. Increasing women's access to land, livestock, education, financial services, extension, technology and rural employment would boost their productivity and generate gains for agricultural production, food security, economic growth and social welfare. Closing the gender gap in agricultural inputs alone could lift 100 million to 150 million people out of hunger (FAO, 2011d). Similar gains are possible in the forest sector.

Although there is no blueprint for closing the gender gap, some basic principles are universal: eliminate discrimination under the law; promote equal access to

resources and opportunities; ensure that agricultural, forestry and rural development policies and programmes are gender-aware; and allow women to be equal partners in sustainable development. Obtaining these results will require cooperation among governments at all levels, the international community and civil society. Achieving gender equality and empowering women in agriculture and forestry is not only the right thing to do, it is crucial for a sustainable future.

Using wood for energy and reusing and recycling wood products

The energy sector is responsible for more than half of anthropogenic GHG emissions; however, when managed properly, the production of electricity by burning wood instead of coal can reduce GHG emissions by up to 98 percent when the entire life cycle is taken into consideration. Increasing the use of renewable energy, including wood-based fuels, relative to fossil fuels may therefore be one of the most important components of a global transition to a sustainable economy. To be fully successful, this will require careful attention to existing patterns of wood energy dependence, the use of sustainable forest management practices in the harvesting and planting of trees, and the adoption of efficient technologies for converting biomass into heat and electricity.

- Meeting inaugurating project activities for capacity building in marketing of non-wood forest products among village communities of southern Cameroon. Small-scale projects that help to promote small and medium forest enterprises have been successful in reducing poverty, improving equity, and helping to protect forests and other natural resources



FAO/I. Tokou Saliam/PO-7154

Combustible renewables and waste currently account for about 10 percent of the world's energy production. This includes the wood energy used by households in developing countries, and the wood used in developed countries in efforts to meet ambitious energy policy targets, such as in Europe. The 10 percent share could be increased through the application of carefully targeted policies and programmes. In developing countries, these policies and programmes will include promoting the use of efficient and clean burning devices and providing training in efficient, sustainable and legal charcoal production, to improve energy efficiency and reduce pressure on natural resources. Sustainable energy production from wood will create local employment and can be used to redirect expenditures from imported fossil fuels to investments in domestic sources of energy, with employment and income benefits.

- Wood briquettes packed for delivery to customers in a local market, Lithuania. Combustible renewables and waste currently account for about 10 percent of the world's energy production, including the wood used in developed countries in efforts to meet ambitious energy policy targets, such as in Europe



FAO/A. Lebedys/FO-7295

In developed countries, woodfuel technologies enable some of the highest levels of energy and carbon efficiency, particularly in generating heat or combined heat and electricity. Wood is increasingly recognized as a core component of national strategies for making the transition from an economy based on fossil fuels to one based on renewable energy. However, the increased use of wood for energy will also present challenges to existing users of forests and forest resources. Policies for increasing the demand for woodfuels must therefore be accompanied by good forest policies and effective institutions to implement them.

Governments can also pursue climate- and forest-friendly policies by encouraging greater recycling of wood-based products. Wood products, notably paper and paperboard, have been recycled for decades; every year more than 200 million tonnes of paper is recovered and recycled, accounting for roughly half of total consumption. These efforts have been fostered by government policies and consumer preferences. Additional progress is possible, including through the reuse and recycling of solid wood products such as in the restoration of old houses and antique furniture. In some circumstances, solid wood products can be used for energy. When wood and paper products are recycled, they continue to store carbon. Every improvement in the percentage of wood that is used and not wasted in production processes reduces GHG emissions.

Enhancing communication and coordinating development

Sustainable forest management is first and foremost a local and national responsibility. Nevertheless, there is much to be gained from international cooperation, and many developing countries continue to rely on foreign assistance, including in supporting the sustainable management of forests and other natural resources. However, forests (and other development objectives) often suffer from competing and overlapping priorities both among donors and between donors and national governments. Ensuring effective collaboration among donors and government agencies in developing countries is a prerequisite for improving the governance, monitoring, assessment and management of forests. Developed countries also face challenges associated with competing domestic policy goals that undermine efforts to achieve sustainable forest management. Therefore, more effective communication and coordination across sectors and countries is needed for a sustainable future.

To maximize forests' contributions to a sustainable future, policies, programmes and investments in forests must take into account – and be taken into account by – actions in other sectors. Better communication and greater use of partnerships will also be required, including partnerships among government agencies, between government agencies and the private sector, and among private-sector stakeholders (civil society and commercial interests). Notable areas for better communication and partnerships include the following:

- *Finance:* For the banking sector, pension funds, endowments, foundations and insurance companies, forests and forestry are increasingly attractive assets in which to invest. In many countries, the number and diversity of timberland owners and investor-managers have grown rapidly in recent years; new institutional owners include sovereign wealth funds, pension funds and endowment funds. A recent FAO-sponsored survey (Glauner, Rinehart and D'Anieri, 2011) concludes that the outlook for forestry investments in emerging markets is positive. Hence, dialogue with the investment community should be expanded and cultivated. Increasing access to credit is considered one of the most effective ways of improving productivity in the agriculture sector (FAO, 2011b). Dialogue with the banking sector should therefore also be improved to increase access to credit for forest economic activities by communities and smallholders.
- *Other sectors within the landscape:* Traditionally, foresters have focused on sustainable management

of the forest estate. However, there is increasing recognition that forests must be managed as part of the broad mosaic of land uses in the social, environmental and economic landscape. For example, in an integrated landscape approach, forests, water and energy would be considered holistically, rather than being treated as discreet economic sectors. Integrated landscape approaches are needed not only to meet the emerging challenges of food insecurity and climate change, but also to address the long-standing challenges of using the natural environment as an engine of growth rather than simply as a fuel.

- *Research and education:* Agricultural research in low-income economies continues to be the most productive investment in support of the agriculture sector, followed by education, infrastructure and input credits (FAO, 2011b). Public and private investment in forestry research is also needed, and will also yield high returns.

To achieve wider recognition and acceptance of the role of forests in building a sustainable future, much needs to be done to spur changes in the ways in which policy-makers and the general public view forests and forest-dependent people. Advocating for and guiding these transformations effectively will require strong local, national and international leadership and concerted action on several fronts, including communication, knowledge sharing, networking and capacity building.

