North America

The North America region, consisting of 3 countries and 2 areas (Figure 36), has 7 percent of the world's population, 16 percent of its land area and 17 percent of its forest area (677 million hectares). About one-third of the region's land area is forested (Figure 37). The highly varied climate conditions create great diversity in forest ecosystems, ranging from humid tropical to boreal. Some of the world's most productive forests are found in this region.

DRIVERS OF CHANGE

Demographics

North America's population is expected to increase from about 441 million in 2006 to 500 million in 2020 (Figure 38). The annual population growth rate, much influenced by immigration, is 0.9 percent (but declining) in Canada and 1 percent in both Mexico and the United States of America (hereafter "United States").

The region has a low population density of about 21 people per square kilometre, ranging from fewer than 4 in Canada to 54 in Mexico. Nearly 80 percent of the population is urban, and urbanization is expected to continue, with the greatest growth in Mexico. Despite considerable demand for outdoor recreational activities, there is concern that urbanization is disconnecting people from nature. The "More Kids in the Woods" project implemented by the United States Forest Service is an attempt to reverse the situation (ARC, 2007).

The ageing population in Canada and the United States is reducing the size of the labour pool and, hence, the availability of workers for forestry. Immigration is helping to overcome labour shortages to some extent.

Economy

The region accounted for 32 percent of global GDP in 2006, although this share is declining. From 2000 to 2006, GDP growth was about 3 percent. GDP is forecast to increase from US$15 trillion in 2006 to more than US$20 trillion in 2020. The United States accounts for more than 80 percent of regional GDP (Figure 39).

Poverty and income disparity are important issues in the region. About 35 percent of the rural population in Mexico (World Bank, 2004) and about 12 percent in the United States (USDA, 2004) were estimated to be below the poverty level in 2002.

As a result of the shift from an agricultural to an industrial economy in the twentieth century, agriculture now accounts for less than 1 percent of GDP in Canada and the United States. This transition also contributed to the

FIGURE 36 Subregional breakdown used in this report

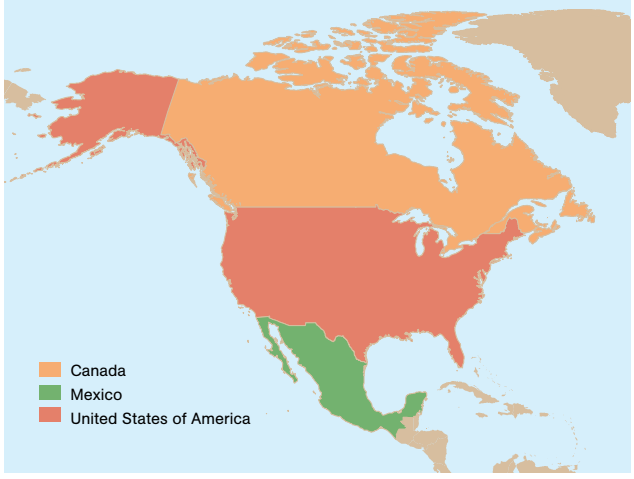
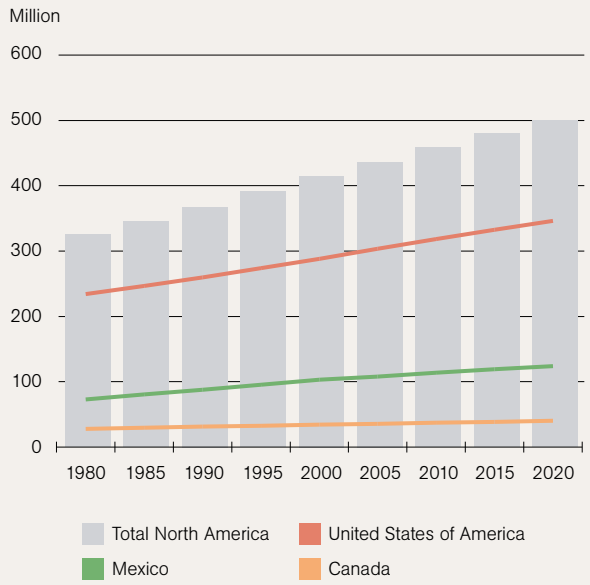


FIGURE 37 Extent of forest resources

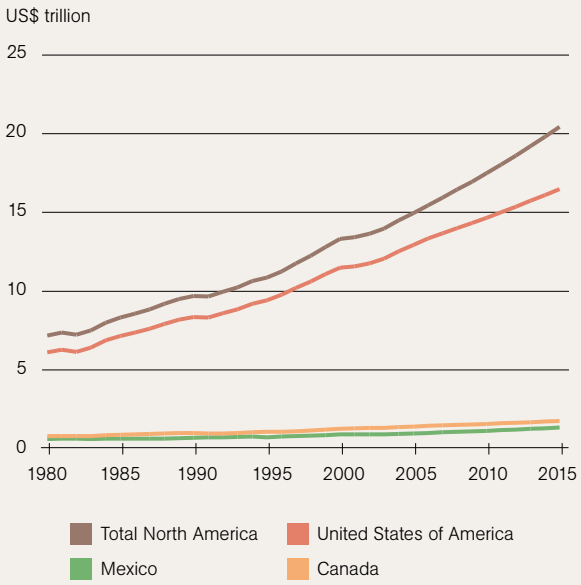
NOTE: See Annex Table 1 for list of countries and areas by subregion.

FIGURE 38 Population



SOURCE: UN, 2008a.

FIGURE 39 Gross domestic product



SOURCES: Based on UN, 2008b; World Bank, 2007a.

stabilization of forest area (MacCleery, 1992). Mexico is still in the transformation phase; agriculture's share in GDP declined from 13 percent in 1970 to 8 percent in 1990 and 4 percent in 2006 (World Bank, 2007a). However, it remains important for employment in the country (19 percent of employment in 2004) (FAO, 2005b). Although commercial agriculture has grown rapidly, subsistence agriculture also remains prominent, particularly under the system of *ejidos* (communally held lands) and other traditional community arrangements. Agriculture-related deforestation remains high.

North America is one of the most actively globalizing regions, with a high level of inflow and outflow of capital, labour and technology. Substantial natural and human resources and a high level of innovation enhance its global competitiveness. However, increasing competition from low-cost producers (especially China) and the inclination to offshore or outsource production in order to remain competitive are transforming some sectors, including forestry (Box 20).

BOX 20 Impact of globalization on the forestry sector in the United States of America

- About one in six pulp and paper mills has closed since the mid-1990s.
- One-third of pulp and paper mill jobs have disappeared since the early 1990s because of consolidation, cost-cutting and productivity improvements.
- The number of large softwood sawmills declined from 850 to 700 in 2004 alone.
- Sales of imported wooden household furniture, primarily from China, increased from about 20 to 50 percent in the 1990s and they have continued to expand.

SOURCE: Ince *et al.*, 2007.

Mexico's export-focused industrialization is being challenged by competition from rapidly industrializing Asian economies in both domestic and global markets – and particularly in United States markets, which absorb more than 80 percent of all Mexican exports.

Since 2006, the United States has been experiencing an economic slowdown, which is also affecting the Canadian and Mexican economies because of the interdependence of the countries in the region. A related slump in the construction sector has influenced the demand for wood products (discussed below). Import liberalization under the North American Free Trade Agreement (NAFTA) has had mixed impacts; while exports have increased, wages and living conditions have declined. Expansion of large-scale commercial agriculture and displacement of small farmers have accelerated poverty-related deforestation (Audley *et al.*, 2004).

Policies and institutions

Public institutions are well developed and have continuously adapted to the larger economic and social changes (MacCleery, 2008). Stakeholder consultation helps to incorporate diverse perceptions in public decision-making.

The private sector has a pivotal role in all economic activities, although this is a recent trend for Mexico and several key nationalized industries remain. Large corporations have been leaders in innovation. Industry is becoming more consolidated through mergers and acquisitions.

Community-based organizations have an important role in natural resource management and have helped indigenous communities, especially in Canada, to cement their rights to hold land and to manage natural resources (Box 21). Mexico has a long history of community management of natural resources under the *ejidos*. Policies promoting privatization and changes in the rural economy (particularly in agriculture and migration) are enabling the *ejidos* to benefit from opportunities for processing and trading wood and other forest products.

Civil-society organizations, especially in Canada and the United States, contribute to shaping policies and strategies in the forest sector and encourage social and environmental responsibility in the corporate sector. Civil action, together with industry consolidation and technological changes, has transformed the forest sector, especially in the western United States. Legal action initiated by civil-society organizations caused a radical reduction in timber supply from national forests in the 1990s. Such organizations are also growing in importance in Mexico.

BOX 21 Indigenous people and Canada's forests

- More than three-quarters of Canada's indigenous communities reside in forested areas.
- The forest products industry employs more than 17 000 indigenous people directly and indirectly, although many are still in lower-skilled, part-time and seasonal positions.
- The forest industry does business with more than 1 400 firms run by indigenous people.
- About 1 000 forestry operations are owned by indigenous people.

SOURCE: Natural Resources Canada, 2007a.

Science and technology

Well-established institutions for science and technology and substantial public and private investments in research have enhanced competitiveness in all sectors, including forestry. In Mexico, investment-linked technology transfer has helped advance forestry (as well as agriculture), although many industries in Mexico, especially the smaller ones, still use old equipment and technology.

The forest industry has continuously improved processing technologies, enhancing productivity in order to withstand global competition. Especially during economic downturns, the industry tends to close plants that are less economically viable and invest in new plants with improved technologies.

High fossil fuel prices and concerns about energy security and climate change are stimulating investments in new energy technologies. The pulp and paper industry is diversifying into biorefining, producing a stream of products, including biofuels, electricity and chemicals (see Box 48 on page 93). Substantial research on producing cellulosic fuels is under way, focusing especially on efficient and cost-effective technologies for breaking down cellulose.

While the United States has long been a leader in science and technology, it is concerned about the possibility of losing this position as other regions (particularly Asia and Europe) accelerate investments in this area (Task Force on the Future of American Innovation, 2005). For example, the number of research scientists employed by the United States Forest Service has declined by about 75 percent in the past 30 years, with progressively more research being funded by the private sector (US Forest Service, personal communication, 2008).

TABLE 16
Forest area: extent and change

Country/region	Area (1 000 ha)			Annual change (1 000 ha)		Annual change rate (%)	
	1990	2000	2005	1990–2000	2000–2005	1990–2000	2000–2005
Canada[a]	310 134	310 134	310 134	0	0	0	0
Mexico	69 016	65 540	64 238	–348	–260	–0.52	–0.40
United States of America	298 648	302 294	303 089	365	159	0.12	0.05
Total North America[b]	**677 801**	**677 971**	**677 464**	**17**	**–101**	**0**	**–0.01**
World	**4 077 291**	**3 988 610**	**3 952 025**	**–8 868**	**–7 317**	**–0.22**	**–0.18**

[a] Because data from previous inventories cannot be compared meaningfully, figures from the most recent inventory are given for all three reporting years (FAO, 2006a).
[b] Regional total includes Greenland and Saint Pierre and Miquelon.
NOTE: Date presented are subject to rounding.
SOURCE: FAO, 2006a.

OVERALL SCENARIO

North America has a generally favourable demographic, political, institutional and technological environment. However, the current economic slowdown in the United States and the larger global economic changes (especially the emergence of Asian economies) pose some uncertainty for the future outlook. If the downturn continues, reduced demand, low investments and declining incomes would lead to reduced consumer spending, loss of profitability and reduced public funding in most sectors, including forestry. Increasing competition and the tendency of the private sector to outsource or offshore production could spur protectionist measures, slowing global trade growth.

On the other hand, economic recovery in the United States (and by association the rest of the region) would boost demand for all products and investments in innovation, accelerating the transition to a knowledge-based economy. This scenario would provide opportunities for continued rapid industrial growth, modernization and poverty reduction in Mexico.

BOX 22 Mountain pine beetle infestation in British Columbia, Canada

Spreading through western Canada, the mountain pine beetle (*Dendroctonus ponderosae*) has infested 13 million hectares of pine forests (mostly lodgepole pine, *Pinus contorta*) and is expected to kill up to 80 percent of all pine stands in the Province of British Columbia. More than 530 million cubic metres of timber had been lost in British Columbia by 2007 and it is predicted that 1 billion cubic metres will be lost by 2018. The loss of trees is releasing more carbon than that from forest fires in spite of efforts to salvage the timber (which continues to store carbon).

The beetle is native to North America, but its range has spread northward and to higher elevations with milder winters. Temperatures below –40 °C on several consecutive nights will kill the larvae, but such cold spells have become rare.

SOURCES: Brown, 2008; Natural Resources Canada, 2007b.

OUTLOOK

Forest area

Forest cover in the region is stable. North America accounted for an estimated 2 percent of annual global deforestation from 2000 to 2005, although the rate of loss has been decreasing. Most of the loss was in Mexico, attributed mainly to agricultural expansion and unsustainable logging, while the United States reported a small net gain in forest area for the period (Table 16).

In the United States, forest area stabilized in the early twentieth century (MacCleery, 1992). A net loss of about 2 million hectares of forest is projected between 1997 and 2020; this estimate includes conversion of forest land to other uses, including urban and suburban development, as well as afforestation and natural reversion of abandoned crop and pasture land to forest (US Forest Service, 2008).

Change in forest area is not statistically significant in Canada. At even the highest estimates, it would take 40 years for Canada to lose 1 percent of its forest area (Canadian Council of Forest Ministers, 2006).

However, climate change may intensify threats to forest health. The intensity and frequency of forest fires have increased in both Canada and the United States, exacerbated by prolonged drought (attributed to climate change) and successful fire control programmes that have inadvertently increased the amount of combustible material. Climate change is similarly exacerbating pest infestations; in the west of Canada and the United States, the mountain pine beetle is causing particularly serious damage and tree loss (Box 22).

The situation in Mexico is more uncertain and depends on the pace of transition from an agrarian to an industrial society and the impact it may have on poverty and land dependence. Higher incomes could improve society's ability to invest in conservation and forest management (Comisión Nacional Forestal, Mexico, 2008). In recent years, the government has increased substantially the allocation to

the forest sector, and this could have a positive impact on sustainable forest management. However, a reduction in economic growth could impede improvements.

Forest management

Differences in forest ownership explain much of the variation in forest management in the region.

In Canada, 92 percent of forests are publicly owned and managed to satisfy multiple needs (social, cultural, environmental and economic) in accordance with the National Forest Strategy, adopted with broad input in 2003 (FAO, 2006a). The Canadian Council of Forest Ministers has developed a national criteria and indicators framework for sustainable forest management at the provincial and local levels. Canada has the world's largest area of third-party certified forest (more than 134 million hectares). Annual harvest levels remain below the increment.

In the United States, private forests dominate in the east and public forests in the west. Overall, 58 percent of forests are private (FAO, 2006a). Wood production from public forests has been scaled down in response to the increasing demand for environmental services. More than 60 percent of wood production comes from non-industrial private lands and 30 percent from industry-managed forests. In the past decade, a major development in forest ownership has been the divestment of woodlands controlled by large forest companies. As a result, millions of hectares of forest land have passed into the hands of newly emerged TIMOs and real estate investment trusts (REITs) as well as families and others (see Box 41 on page 83). This ownership fragmentation increases the unit costs of management and may jeopardize its stability.

In Mexico, 8 500 *ejidos* or other community organizations own an estimated 59 percent of the forests (FAO, 2006a). The effectiveness of community forest management varies depending on the capacities and constraints of the communities and alternative land-use opportunities. In 2002, only about 28 percent of the forest-owning *ejidos* and communities carried out commercial harvesting activities (ITTO, 2005). Some *ejidos* engage in wood processing (e.g. sawnwood, furniture and floorings) and some have obtained certification from the Forest Stewardship Council (FSC) or SmartWood. Government compensation is available to communities willing to set forests aside for provision of environmental services rather than production.

If economic difficulties in the United States persist, forest management could suffer (Box 23), particularly in private forests as the pressures of responding to short-term economic changes may undermine owners' commitment to long-term sustainable forest management. If instead the economy should improve rapidly, the outlook for forestry would be much brighter, especially as the revival of the construction sector in the United States would stimulate demand for wood and, consequently, investment in management.

Wood products: production, consumption and trade

North America is the world's largest producer, consumer and exporter of wood products. In 2006, the region produced 38 percent of the world's industrial roundwood. This share has been generally stable since 1990, with wood production hovering around 600 million cubic metres per year (Figure 40).

BOX 23 Probable consequences if the economic downturn continues in the United States of America

Canada

- Overall decline in wood production because of the drop in demand and closure of manufacturing plants (despite the market being flooded with softwood for several years because of the mountain pine beetle infestation)
- Reduced investment in forest management because of the shrinking market, allowing increases in fire and pest infestations, especially with climate change

Mexico

- Declining demand for timber from managed forests, and consequent decline in the ability of community organizations to manage forests
- Increased illegal logging as a result of loss of jobs in community enterprises and weakening of community control
- Expansion of subsistence cultivation and consequent deforestation and degradation

United States of America

- Slump in housing demand and consequent scaling down of production and employment in forest industries
- Significant reduction in investment in forest management by the private sector leading to further divestment and fragmentation of privately managed forests, which may eventually be converted to other land uses
- Decline in investment in public forests

Sawnwood production in North America increased from 128 million to 154 million cubic metres between 1990 and 2006, while global production declined. The regional increase largely reflects demand from the United States construction sector. However, the recent slump in this sector has reduced demand, although this may be temporary.

Production of wood-based panels rose from 44 million to 62 million cubic metres between 1990 and 2006 (with Canada accounting for most of the increase), but the region's relative share declined as global production doubled in the same period.

North America's share in global production of paper and paperboard also declined, from 39 percent in 1990 to 29 percent in 2006, largely because of the expansion of capacity in Asia and Latin America. This downward trend is unlikely to change in the coming years. Widespread use of electronic media is reducing the demand for paper, particularly in Canada and somewhat in the United States, although it is projected to increase in Mexico.

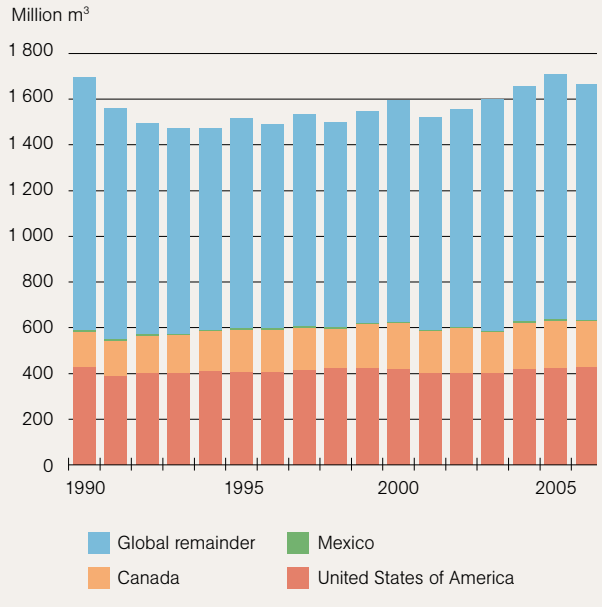
Long-term growth in net imports of wood products in the United States has been a consequence of rising demand from the construction sector (until recently) and declining domestic production. The United States has been a net importer since 1992, with the trade deficit reaching US$37 billion in 2005 (Figure 41). However, the recent slowdown in construction has improved the United States' wood products trade balance.

Canada remains a net exporter of wood products, with a trade surplus of about US$20 billion in 2006. However, exports have declined since 2005 with the construction slump in the United States and also with the appreciation of the Canadian dollar against the United States dollar, which makes Canadian imports more expensive. This decline is forcing a scaling down of Canadian production. An important issue is whether the wood industry in Canada will be able to diversify and become less dependent on markets in the United States, which absorbed 78 percent of Canadian exports in 2006 (Natural Resources Canada, 2008a). In the short term, this may be especially challenging in view of the large supply increases expected from salvage operations in forests infested with mountain pine beetle in western Canada.

Mexico remains a net importer of wood products (with a trade gap of US$6 billion in 2007). The exception is secondary wood products (especially furniture), for which Mexico's exports, mainly to the United States, have reached US$1 billion in recent years. However, in 2007, Mexico's exports of secondary wood products declined and imports increased because of the economic situation in the United States and tightened competition from East Asian countries.

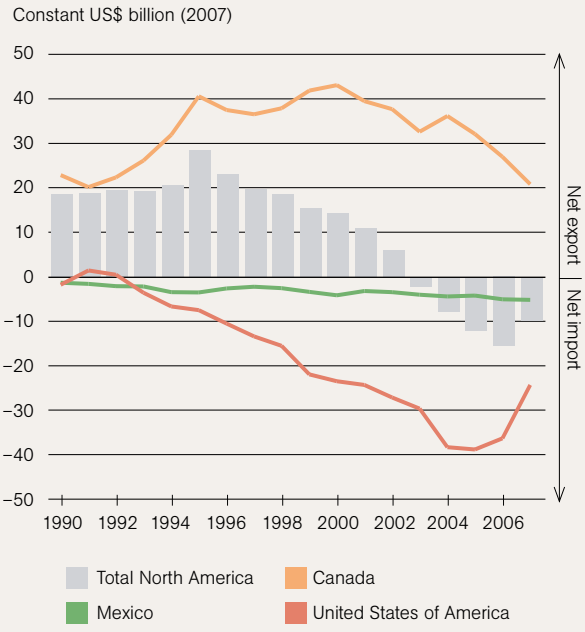
After having long been an attractive market, North America now presents considerable short- and medium-term uncertainties in terms of demand for wood products. Projections based on historical trends suggest a moderate increase in consumption of key products (Table 17) if the current decline is brief.

FIGURE 40 Industrial roundwood production



SOURCE: FAO, 2008a.

FIGURE 41 Net wood products trade, (at current prices)



SOURCES: FAO, 2008b; UN, 2008e.

TABLE 17
Production and consumption of wood products

Year	Industrial roundwood (million m^3)		Sawnwood (million m^3)		Wood-based panels (million m^3)		Paper and paperboard (million tonnes)	
	Production	Consumption	Production	Consumption	Production	Consumption	Production	Consumption
1990	591	570	128	117	44	43	91	87
2005	625	620	156	158	59	70	109	106
2020	728	728	191	188	88	96	141	138
2030	806	808	219	211	110	115	169	165

Woodfuel

In 2005, woodfuel contributed about 3 percent of total energy consumption in the United States, about 4.5 percent in Canada and about 5 percent in Mexico (IEA, 2007). Woodfuel demand in Mexico has been declining because of urbanization and improved access to other energy sources (including fossil fuels), but household dependence on woodfuel remains high in some rural areas; the volume of wood extracted for fuel may be up to four times that of industrial timber production. Most woodfuel is harvested without a management scheme.

In Canada and the United States, the wood products industry leads in the use of energy from biomass, producing its own heat and electricity using cogeneration technology. The pulp and paper industry in Canada derives 57 percent of its energy from forest biomass.

Policy initiatives responding to escalating energy costs and climate change are expected to enhance the use of wood energy (Box 24). The demand for wood pellets for use in heating has increased significantly in recent years. The United States consumed the largest amount of wood pellets for this purpose in 2006, around 1.4 million tonnes (see Box 12 on page 28). In 2006, Canada and the United States produced about 1.5 million and 1 million tonnes of wood pellets, respectively, ranking second and third behind Sweden. Eventual commercial-scale cellulosic biofuel production could have important impacts on the forest sector.

BOX 24 Examples of policy initiatives to promote bioenergy

Canada

- Clean Air Agenda (2006): sets federal emission targets, allocates resources for the ecoENERGY for Renewable Power programme and promotes blended transportation fuel
- Regulatory Framework for Air Emissions: uses carbon credits to encourage renewable power production through cogeneration

Mexico

- Law for the Promotion and Development of Bioenergy (2008): aims to promote biomass energy without compromising food security

United States of America

- Energy Independence and Security Act (2007): sets targets for biofuel use (including wood-derived biofuels) to 2022 and sets a national fuel economy standard of 15 km per litre by 2020
- Biofuels Initiative (2006): aims to make cellulosic ethanol cost-competitive by 2012 and to replace 30 percent of current petrol consumption with biofuels by 2030

Non-wood forest products

Rural communities in Mexico depend on NWFPs for subsistence and income, although their use is declining rapidly because of urbanization, changes in employment and availability of cheaper alternatives. NWFP harvesting in Canada and the United States typically takes place as part of forest recreation and cultural traditions, and it is increasing. Production of the few economically important NWFPs with long-established markets – notably maple syrup and Christmas trees – is highly commercialized. Both markets have been stable since 1994 and are expected to remain so. Canada accounts for 85 percent of the world's maple syrup production and the United States produces the rest. Canada produced 3.2 million Christmas trees in 2005 (Natural Resources Canada, 2008a).

Markets for herbal products, including forest medicinal plants, are expanding as society becomes increasingly health conscious. Large pharmaceutical companies are investing in the production and marketing of herbal plant products, which have become a multibillion-dollar industry in the United States (Alexander, Weigand and Blatner, 2002).

Contribution of forestry to income and employment

Overall, the gross value added by the region's forestry sector has increased from about US$130 billion in 1990 to US$148 billion in 2006 (Figure 42). Most of the increase is attributed to wood processing, while pulp and paper production has marginally declined. However, gross value

added as a proportion of GDP has dropped from about 1.4 percent to less than 1 percent.

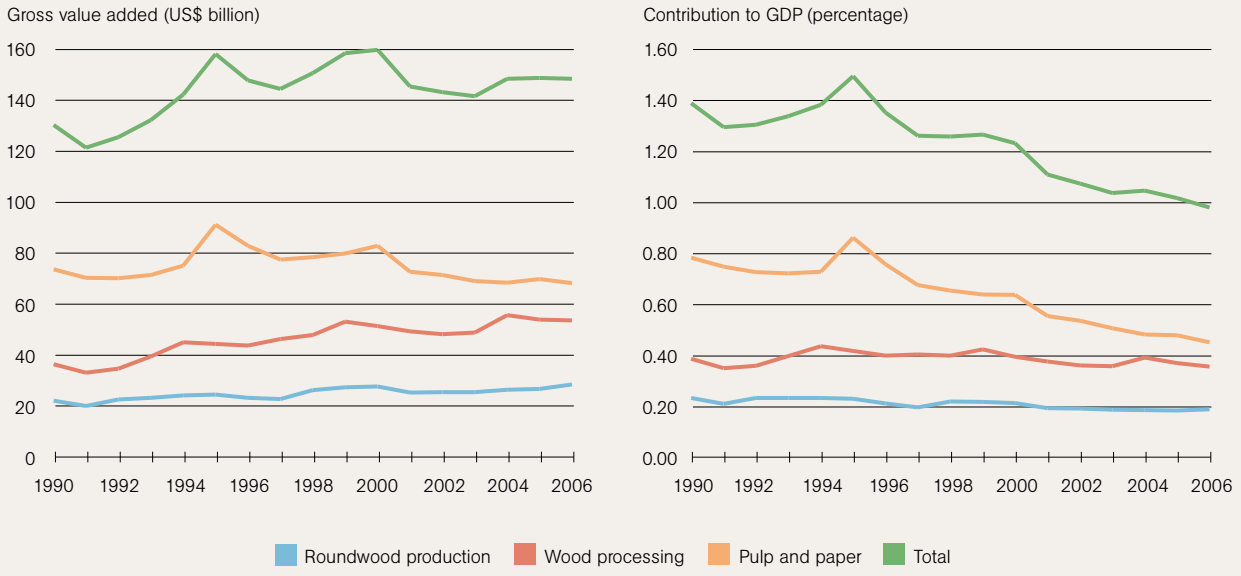
The number of people employed by the sector declined by about 140 000 between 1990 and 2006 (Figure 43), reflecting technological changes and improved productivity. Forestry employment accounted for about 0.8 percent of total employment in 2006.

As more forests are taken out of production, both gross value added and employment in the forestry sector are expected to decline.

Environmental services of forests

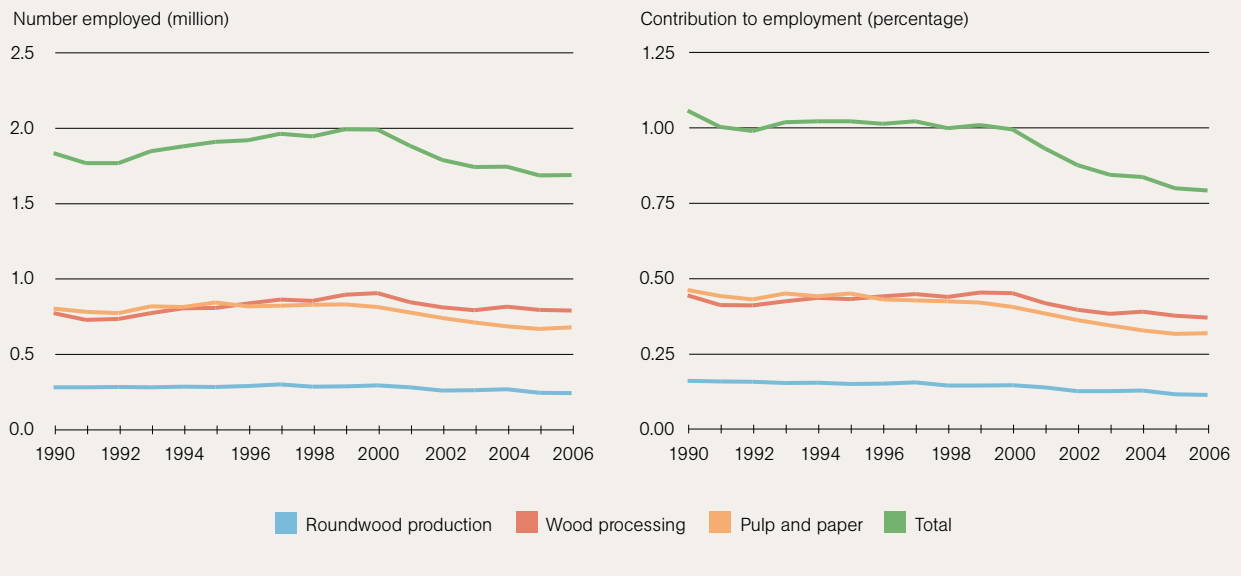
As income increases, society tends to assign greater importance to environmental conservation. Especially in Canada and the United States, a host of institutions – public, private, community and civil society – are involved in issues of climate change mitigation, biodiversity conservation and maintaining water supplies. These countries have a robust political and regulatory framework for environmental protection. Complex political processes have been developed to balance trade-offs between competing objectives and interests.

FIGURE 42 Value added in the forestry sector



NOTE: The changes in value added are the changes in real value (i.e. adjusted for inflation).
SOURCE: FAO, 2008b.

FIGURE 43 Employment in the formal forestry sector



SOURCE: FAO, 2008b.

Mexico is one of the five most biologically diverse countries in the world, but continued dependence on land and consequent forest clearance are challenges to biodiversity protection in the country (Conservation International, 2005).

North America had 360 million hectares of protected areas in 2006, of which more than 70 percent was in the United States (UN, 2008c). A series of legislative and regulatory actions protect wildernesses and exclude large tracts of public land from logging or land-use changes; an example in the United States is the Roadless Areas Conservation Rule of 2001, which establishes prohibitions on road construction and timber harvesting in inventoried roadless areas on National Forest System lands. Arrangements for protecting unique ecosystems include conservation easements – agreements between landowners and government agencies or land protection organizations ("land trusts") restricting development of certain lands.

The role of forests in carbon sequestration is recognized and addressed through market and non-market initiatives involving afforestation and reforestation. In the United States, several states have initiated mandatory emission reduction programmes involving offsets. In Oregon, for example, new power plants can meet emission standards through offsets purchased from the Oregon Climate Trust, under which there were three forestry-related projects in 2008, accounting for 21 percent of offsets (Gorte and Ramseur, 2008). Voluntary markets (e.g. the Chicago Climate Exchange) and reporting and registry programmes (e.g. the California Climate Action Registry) have expanded rapidly and recognize forestry projects. In early 2008, three regional partnerships – Regional Greenhouse Gas Initiative, Western Climate Initiative and Midwestern Greenhouse Gas Reduction Accord – involved 23 states of the United States and 4 provinces of Canada in developing emission caps and offset projects, including some in forestry. These activities suggest continued growth of carbon markets and possibly an increasing role of forestry provided it is seen as an economically viable option.

Forests' role in water provision is important. Mexico has recently initiated a system for payment for water services (Box 25). Similar initiatives exist in Canada and the United States.

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. In the United States, one in five leisure travellers visited national forests in 2006 (ARC, 2006).

BOX 25 Payment for hydrological services in Mexico

Mexico suffers both high deforestation rates and severe water scarcity. In 2003, the Government of Mexico launched a programme to compensate landowners for maintaining forests for watershed protection and aquifer recharge in areas where commercial forestry is not competitive. Funds are collected annually from water users. Between 2003 and 2006, US$110 million was allocated to landowners (both private and community) under agreements covering about 500 000 ha.

SOURCE: Muñoz-Piña *et al.*, 2006.

SUMMARY

Uncertainty in North American forestry is a consequence of the current economic downturn in the United States and, in particular, the consequent declining construction sector demand. If this is part of a cycle leading to eventual recovery, there should be few major surprises in the next 10–15 years. However, the sector will need to address several challenges:

- climate change, the increasing frequency and severity of forest fires and damage by invasive pest species;
- challenges to sustainable forestry posed by the combination of increased global demand for food and biofuels and declining profitability of traditional wood industries;
- loss of competitiveness to emerging producers of wood products, especially Brazil, Chile and China, requiring continued innovation in order to expand exports and capture growing markets in Asia.

In Mexico, the rate of deforestation will continue to decline as urbanization continues and as increasing investments in reforestation and improved management practices result in more sustainable forest management.

While the economic viability of the forest industry may fluctuate and even decline, the provision of environmental services in North America will continue to gain in importance, driven by public interest. Many conservation initiatives will be spearheaded by civil-society organizations, which are able to mobilize substantial public support. Wood will be increasingly demanded as a source of energy, especially if cellulosic biofuel production becomes commercially viable.