3 ECONOMIC, SOCIAL AND ENVIRONMENTAL FUNCTIONS OF FORESTS

Forests in Asia and the Pacific produce a range of goods and services; the balance of which may be altered by changes in policy objectives or in response to rising or falling demand. Recent years have seen a greater thrust on ecosystem services, especially as society becomes increasingly concerned about the impacts of climate change, loss of biodiversity and declining supplies of water. Social and cultural functions of forests are also garnering increasing attention. This chapter provides an overview of the economic, social and environmental roles of Asia-Pacific forests.

WOOD AND WOOD PRODUCTS

Although provision of ecosystem services is gaining importance, wood production remains a major thrust of forest management in most Asia-Pacific countries. However, a paucity of reliable data remains a major challenge in assessing overall trends in production and consumption of forest products. Official statistics seldom provide a complete picture, especially in view of the significant share of unrecorded production and trade taking place in the informal sector. In some countries, production through illegal logging is estimated as high as 50 percent of legally procured timber. Furthermore, as the source of wood supplies shifts towards trees grown outside forests, especially by smallholder farmers, collection of statistics on actual supplies becomes more complex. Hence, estimates of production and consumption provide, at best, a partial indication of the overall situation.

The Asia-Pacific share of global consumption of key wood products varies between 20 percent (for industrial roundwood) and 40 percent (for wood-based panels). Total wood product consumption in Asia and the Pacific is generally equivalent with total consumption in North America and Europe. However, in per capita terms the region's share in the consumption of various products remains relatively low (**Table 3.1**). In view of the limited forest resources in some key countries, the region is a net importer of most wood products. Trends in the production and consumption of key products are discussed in the following sections.

Table 3.1. Production, consumption and trade of key industrial wood products, 2008

Product	Production ('000)	Exports ('000)	Imports ('000)	Consumption ('000)	Share of global consumption (%)	Asia-Pacific per capita consumption (m^3/ tonnes)	Global per capita consumption (m^3/ tonnes)
Industrial roundwood (m^3)	278 824	19 418	52 692	312 098	20	0.084	0.23
Sawnwood (m^3)	91 537	7 166	18 574	102 945	26	0.028	0.06
Wood-based panels(m^3)	114 117	25 280	13 263	102 100	40	0.027	0.04
Pulp for paper (tonnes)	46 374	3 964	16 862	59 272	31	0.016	0.03
Paper and paper board (tonnes)	147 047	16 056	17 467	148 457	39	0.040	0.06
Newsprint (tonnes)	12 585	1 693	2 898	13 790	37	0.004	0.01

Source: FAO (2010a).

Industrial roundwood

Demand for industrial roundwood is contingent on demand for various secondary products, in particular sawnwood, wood-based panels and paper and paper products. Changes in processing technologies and availability of substitutes affect industrial roundwood demand. At the regional level, industrial roundwood production and consumption have remained relatively stable since 1980, with production marginally increasing from about 248 million m^3 in 1980, to 279 million m^3 in 2008 (**Figure 3.1**). Wood production increased until about 1989, then remained relatively stable till about 1997. The Asian economic crisis led to a decline in industrial roundwood production between 1997 and 2001, but it has been increasing slightly since then. Industrial roundwood consumption has increased from 276 million m^3 in 1980, to 312 million m^3 in 2008 increasing the region's dependence on log imports by approximately 16 million m^3. However, trends in production and consumption differ significantly between the various subregions:

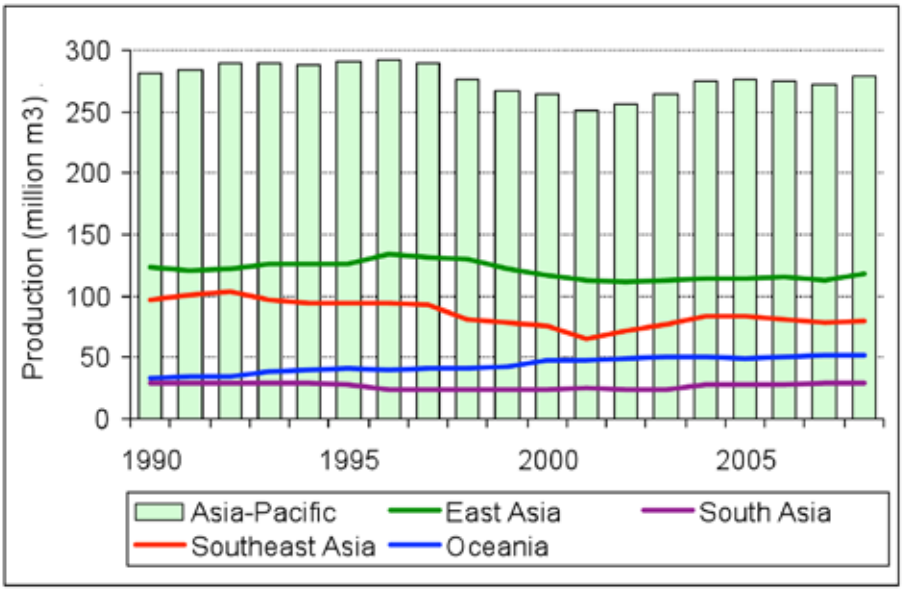


Figure 3.1. Asia-Pacific industrial roundwood production 1990-2008
Source: FAO (2010a).

- East Asia, which in 2008 accounted for about 42 percent of the region's industrial roundwood production and 53 percent of consumption, reflects some interesting national trends. While the subregion's overall production-consumption gap has remained unchanged, there has been a major shift in consumption from Japan to China. Between 1980 and 2008, Japan's consumption of industrial roundwood declined from 72 million m^3 to 24 million m^3, while that of China increased from 87 million m^3 to 133 million m^3. During this period, China's industrial roundwood production increased from 79 million m^3 to 96 million m^3 while that of Japan declined from 34 million to 18 million. China's production-consumption gap increased from 8 million m^3 to 37 million m^3, making it one of the world's major industrial roundwood importers. Meanwhile, Japan's role as an important producer of primary wood products has declined in the context of its larger social and economic changes.
- Southeast Asia is also an important industrial roundwood producing and consuming region. Industrial roundwood production in Southeast Asia has declined since 1980, especially from a peak in the period 1988 to 1993 when about 100 million m^3 were produced *per annum*, to 79 million m^3 in 2008. This is largely due to output reductions in the two main producer countries: Indonesia and Malaysia. Some of the apparent decline in production is due to unreported production, particularly in Indonesia. This is not necessarily all illegal production,

but often reflects data anomalies caused by a transition from natural forests to plantations, and especially from forests managed by government agencies to forests managed by the private sector. During the 1980s and 1990s, Southeast Asia was one of the world's most important industrial roundwood exporting areas. However, as the gap between roundwood production and consumption in Southeast Asia has narrowed, the subregion has become a much less prominent log exporter.

- Oceania is another significant industrial roundwood producing subregion, with Australia and New Zealand accounting for about 90 percent of the subregion's wood production. Between 1980 and 2008, wood production in Oceania expanded from 28 million m^3 to about 52 million m^3, largely due to wood supply from maturing forest plantations. Industrial roundwood consumption has also increased in Oceania, but at a much lower rate than production, making the subregion (especially Australia and New Zealand) an important source of industrial wood supplies.
- South Asia accounted for only about 10 percent of the region's industrial roundwood production in 2008. Obviously, as elsewhere, official statistics provide only a partial picture in view of the preponderance of unreported production in the informal sector. With increasing consumption (mostly by India), the production-consumption gap is widening, increasing the subregion's dependence on imports.

Sawnwood

No clear pattern is evident as regards production and consumption of sawnwood in the region, quite possibly on account of data deficiencies. Data show production increasing through to 1990, declining between 1990 and 2000 and increasing again between 2000 and 2008 (**Table 3.2**). Changes in production and consumption are particularly erratic in East Asia and South Asia, in part reflecting weaknesses in the systems of collecting information.

Table 3.2. Production and consumption of sawnwood in the Asia-Pacific region (million m^3)

Subregion/ region	Production				Consumption			
	1980	1990	2000	2008	1980	1990	2000	2008
East Asia	62.1	58.0	29.6	45.1	67.5	68.7	45.0	60.0
South Asia	11.5	19.6	9.7	17.3	11.6	19.7	9.8	17.5
Southeast Asia	15.9	21.5	16.3	19.5	11.0	16.9	13.8	17.5
Oceania	5.9	5.6	8.2	9.6	6.1	6.5	7.68	8.0
Asia-Pacific total	**95.3**	**104.8**	**63.8**	**91.6**	**96.2**	**111.6**	**76.1**	**102.9**

Source: FAO (2010a).

Although it is difficult to provide definitive analysis in view of data constraints, the broad trends in sawnwood production and consumption in the region are:

- Overall, sawnwood production has remained lower than consumption, making the region a net importer of sawnwood. East Asia accounts for a major share of the regional gap between production and consumption.
- From being one of the world's largest producers of sawnwood, both production and consumption of sawnwood in Japan have declined markedly since 1980. Japan's current sawnwood production is less than one-third its 1980 production; a reflection of the larger socio-economic changes that the country has witnessed.

- China is currently the region's largest producer and consumer of sawnwood. Since 2000, Chinese production of sawnwood has been growing rapidly, but at a much slower pace than consumption. Consequently, Chinese imports of sawnwood have also accelerated during the past decade.
- Considerable inconsistency is observed in sawnwood production statistics from South Asia, which are dominated by India's production and consumption. Both production and consumption declined sharply between 1990 and 2000, recovering through to 2008. With many small-scale sawmills operating in the informal sector there are obvious difficulties in capturing the full extent of production and consumption in the subregion.
- In Southeast Asia and Oceania sawnwood production exceeds consumption and both subregions are net exporters. Between 1980 and 1990 the surplus of production over consumption of Southeast Asia dropped significantly, but has been relatively stable since 1990. Oceania has become a major net exporter of sawnwood in view of rapid increases in production over consumption. The increases are almost entirely accounted for by Australia and New Zealand and are largely driven by increased supplies of wood from planted forests.

On a per capita basis there has been a significant decline in sawnwood consumption in the region, notwithstanding increases in housing construction rates. Some of this decline appears to be accounted for by the substitution by other building materials including panel products.

Wood-based panels

In contrast to declining sawnwood production and consumption, wood-based panel production has increased significantly during the past three decades. Overall production increased from 27 million m^3 in 1990, to more than 114 million m^3 in 2008. East Asia registered a production increase from 13 million m^3 to 88 million m^3 between 1990 and 2008, with the bulk of the increase attributable to China. While there was an increase in panel production in Southeast Asia till 1997, this has since fallen with the subregion's relative share of Asia-Pacific production declining much faster in view of the rapid expansion in China's production (**Figure 3.2**). To some extent China's increased wood panel production stems from better statistical accounting, especially resulting from a shift from small-scale production (which often may not be fully accounted) to more organized medium and large enterprises.

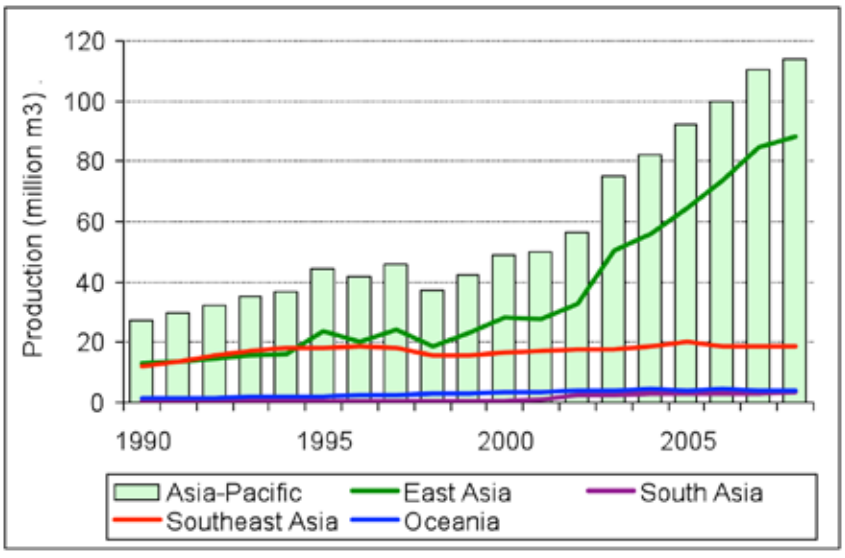


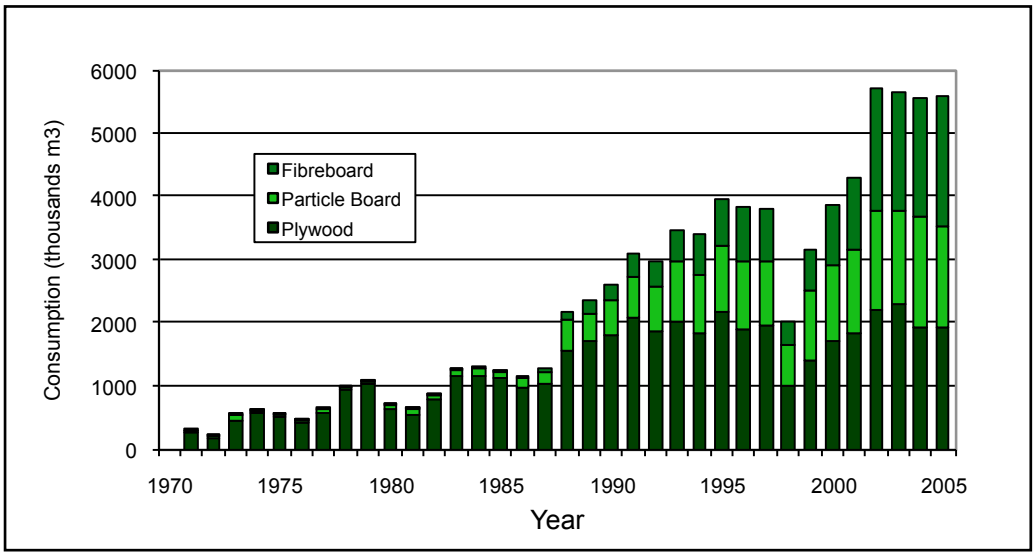
Figure 3.2. Asia-Pacific wood-based panel production, 1990-2008
Source: FAO (2010a).

Within the wood-based panel industry, there has been a shift away from the production and consumption

of plywood to the more value added, but less wood-intensive, particle board and fibreboard. This has had a significant impact on the demand for wood, to some extent reducing the need for large-sized veneer logs, and enabling a focus on fibre production rather than solidwood. The experience of ROK's panel industry typifies the nature of transition from low- to high-valued products (**Box 3.1**).

Box 3.1 | **Republic of Korea (ROK): changes in the wood-based panel industry**

Changes in the ROK wood-based panel industry are indicative of some of the broad trends in wood-processing industries in the context of technological changes and the emergence of new products. Consumption of wood-based panels in ROK increased from 40 000 m^3 in 1970 to 5.5 million m^3 in 2005. However, within the wood-based panel sector plywood is being replaced by other panel products, namely particle board and fibreboard. Until the mid-1980s, plywood accounted for most of the consumption of wood-based panels. In 2005 the share of plywood in the consumption of panel products declined to 34 percent with the remainder being accounted for by fibreboard (37 percent) and particle board (29 percent). Production of particle board and fibreboard started to increase from the mid-1980s to meet rapid growth in domestic demand. The figure below indicates the changes in consumption of three different panel products.



Consumption of wood-based panels in ROK, 1970-2005

This change in the share of different panel products has a close link with the nature of raw materials used and their sources of supply. In the 1970s and 1980s ROK's plywood industry was largely dependent on imported veneer logs, especially from Indonesia and Malaysia. Declining log supply (in the context of log export bans by Indonesia and some other Southeast Asian countries) has led to drastic scaling down of plywood industry capacity. On the other hand, particle board and fibreboard rely on waste wood. For example, about 50 percent of the raw materials for fibreboard comes from softwood waste from sawmills, and the other half comes from domestically produced Pitch pine *(Pinus rigida)* roundwood. The particle board industry is almost entirely dependent on wood residues, with 75 percent from the construction sector, 10 percent from sawmilling and the rest from industrial and household waste wood.

In the 1980s ROK was a major exporter of plywood with the United States as an important market. Reduced log supplies and increased production in countries like Indonesia and Malaysia reduced ROK's competitiveness. In fact ROK became an importer of plywood, especially from countries that were earlier its sources of veneer log supplies. ROK also continues to import fibreboard and particle board to meet its domestic demand.

Source: Rin Won Joo *et al.* (2009).

Paper and paper board

Paper and paper board is another product group that has witnessed significant expansion in production and consumption. Overall production in the Asia-Pacific region increased from about 58 million tonnes in 1990 to 147 million tonnes in 2008, with most of the increase in production attributable to East Asia (**Figure 3.3**), mainly China. There has been some expansion of paper and paper board production in Southeast Asia and a very modest increase in South Asia. Growth in consumption in South Asia has been significant resulting in a substantial increase in imports since 1990.

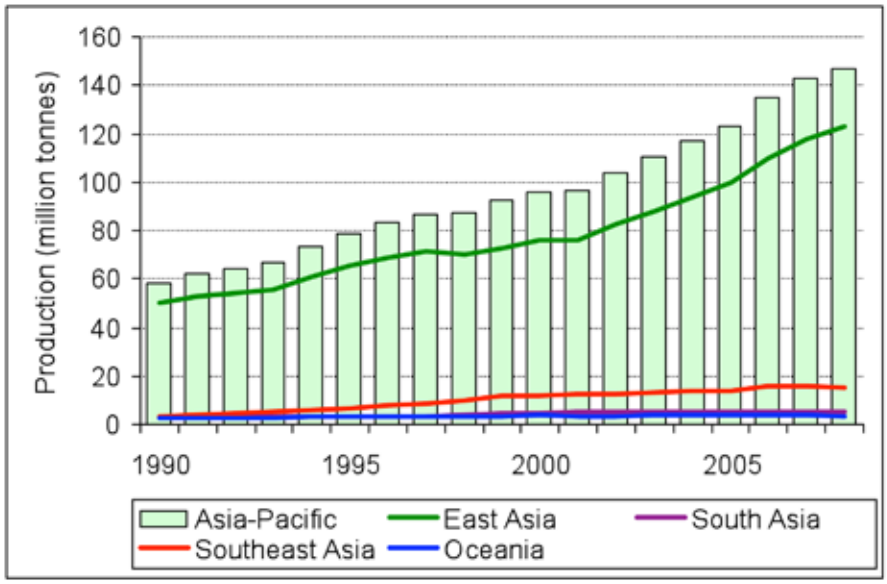


Figure 3.3. Asia-Pacific paper and paper board production, 1990-2008
Source: FAO (2010a).

Of the three main paper types, newsprint accounts for a very small share of total production and consumption (about 10 percent), and growth in Asia-Pacific markets has stagnated. With the expansion of other types of media (television and the Internet) growth in newspaper circulations has slowed and this trend is likely to persist. However, newspapers retain significant popularity in Asia, with China, India and Japan having the world's highest daily newspaper circulations. Printing and writing paper is the second largest part in this market, with production and consumption comprising about 25 percent of the total paper and paper board sector. Production of printing and writing paper has increased markedly in the region, doubling since 1994, from 19 million tonnes to 39 million tonnes in 2008. The region, as a whole, is a net exporter of printing and writing paper, with most exports coming from East Asia and Southeast Asia. Other paper and paper board accounts for the remaining 65 percent of the paper and paper board market (Jonsson and Whiteman 2008). A large share of the demand for other paper and paper board is dependent on growth in the industrial and services sectors (especially demand for packaging materials). Asia-Pacific production of other paper and paper board has also increased markedly in recent times, doubling since 1994 to 95 million tonnes in 2008. The global economic downturn and consequent reductions in trade during 2008 to 2009 affected paper board consumption, but demand is expected to rebound as growth and trade recover. Ease of recycling is a major advantage of paper board over competing alternatives based on plastics.

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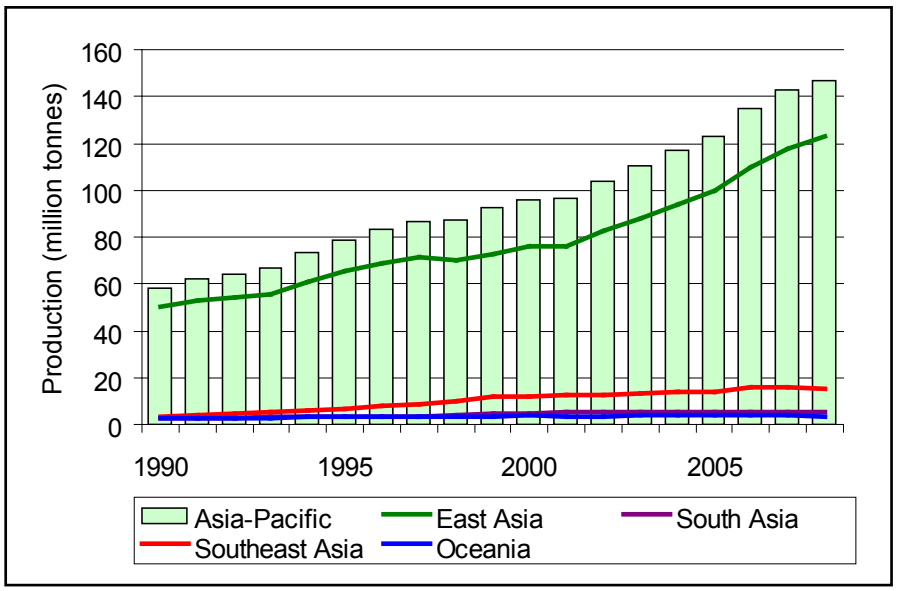

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Forest product trade

Trade is a crucial driver of forestry change in the Asia-Pacific region due to the enormous volume and value of goods traded. In 2008, the total value of imports of primary forest products[1] to Asia-Pacific countries amounted to US$63.3 billion.

Globally, the value of imports of primary wood products increased from about US$113 billion in 1990 to US$243 billion in 2008. Although Asia and the Pacific's share in primary forest product imports remained relatively constant between 1990 and 2008, at about 25 percent, their absolute value has more than doubled (**Table 3.3**).

Table 3.3. Value of imports of primary forest products

	1990 (US$ billion)	Share of global trade (%)	2008 (US$ billion)	Share of global trade(%)
East Asia	21.4	19.0	47.4	19.5
South Asia	0.8	0.7	4.4	1.8
Southeast Asia	3.1	2.8	8.6	3.5
Pacific	1.7	1.5	2.8	1.2
Asia-Pacific	27.1	24.0	63.3	26.0
World	112.6	100.0	243.4	100.0

Source: FAO (2010a).

The value of primary forest product exports from Asia-Pacific countries totaled US$33.7 billion in 2008, making the region a net importer of primary forest products. Net forestry imports sourced from outside the region amount to almost 40 percent of the total value of imports. However, Asia and the Pacific's share of global forestry exports grew from 12.5 percent in 1990 to 14.3 percent in 2008 (**Table 3.4**).

Table 3.4. Value of primary forest product exports

	1990 (US$ billion)	Share of global trade (%)	2008 (US$ billion)	Share of global trade (%)
East Asia	3.6	3.5	14.9	6.3
South Asia	0.1	0.1	0.5	0.2
Southeast Asia	7.6	7.5	13.7	5.8
Pacific	1.4	1.4	4.5	1.9
Asia-Pacific	12.6	12.5	33.7	14.3
World	100.2	100.0	235.1	100.0

Source: FAO (2010a).

The importance of forestry trade differs among the various subregions and countries.

- The East Asia subregion is both the largest importer and exporter of primary forestry products, with China, Japan and, to a lesser extent, ROK accounting for most of the trade. East Asia is the major net importing subregion, with the value of primary forestry imports

[1] Primary forest products include industrial roundwood, sawnwood, panel products, wood pulp and paper products.

exceeding the value of forestry exports by nearly US$30 billion in 2008. Japan's share in global primary forest product imports declined from 11.7 percent in 1990 to 5.1 percent in 2008, while China's share increased from 4.8 percent to 12.1 percent of the global value of imports during the same period. China's importance as a processor and re-exporter of forestry products is reflected in its growth in value of primary forestry exports, from 1.5 percent of global exports in 1990, to 4.1 percent in 2008.

- Despite the generally scarce forest situation in South Asia, the subregion is a relatively modest net importer of forest products. In part, this reflects the lower per capita use of processed wood and paper products largely stemming from low incomes and, historically, high tariffs and taxes on imports. Exports of primary wood products from South Asia are also relatively insignificant, considering the limited resource base. However, since 1990 imports of primary wood products into the subregion, particularly to India, have increased markedly. In 2008, South Asia accounted for 1.8 percent of global imports of primary wood products.
- With greater endowments of forest wealth, Southeast Asia is a major forest product net exporting subregion in Asia and the Pacific. Exports of forest products from Southeast Asia totaled US$13.7 billion in 2008, with Indonesia (48.7 percent), Malaysia (27.9 percent) and Thailand (13.4 percent) being the largest exporters, accounting for 90 percent of the subregion's exports. These three countries are also the subregion's largest importers of forest products, collectively accounting for 75 percent of the value of Southeast Asia's imports. Viet Nam, Singapore and the Philippines are also significant importers of forest products. Paper and paper board form the largest component of the subregion's imports.
- The Pacific subregion is also a significant net exporting region, particularly given the relatively low population (implying low domestic demand and a more favourable resource situation). In 2008, exports of forestry products from the Pacific totaled US$4.5 billion, while the value of forest product imports totaled US$2.8 billion. New Zealand (48.6 percent) and Australia (38 percent), and to a lesser extent Papua New Guinea (PNG) (10.1 percent) form the major exporters in the subregion. Industrial roundwood, including logs from New Zealand, PNG and Solomon Islands, and woodchips from Australia, is the most significant exported item. Imports of paper and paper board account for approximately two-thirds of the subregional total.

Although trade in forest products has expanded proportionately more rapidly than production globally, there is considerable variation between regions, subregions and countries, depending on the state of resources, domestic demand, competitiveness of domestic production and trade policies. With more production being exported and the share of imports in consumption also increasing, it appears that local value chains are increasingly being replaced by global value chains. A disaggregated analysis of exports and imports provides an indication of key changes in the nature of products traded.

Trade in industrial roundwood

In 2008, the four largest importers of industrial roundwood in the Asia-Pacific region were China (38 million m^3), Japan (6.8 million m^3), ROK (4.9 million m^3) and India (1.8 million m^3). Additionally, Japan (19.8 million m^3) and China (3.6 million m^3) imported significant volumes of woodchips.

A major change in the mix of imports of industrial roundwood (and woodchips) has resulted from a shift in sources of supplies. For example, the Russian Federation has emerged as the most important source of industrial roundwood supply to China and Japan. In 1997, Russia accounted for only 22 percent of Chinese industrial roundwood imports, but its share has increased – to 55 percent in 2002 and 77 percent in 2007 (**Figure 3.4**).

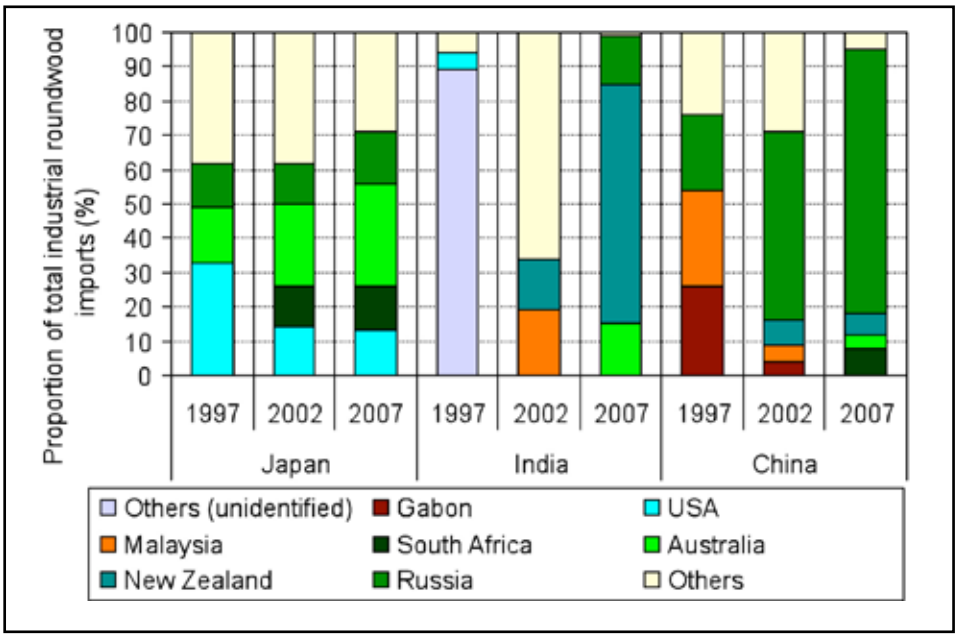

Figure 3.4. Trends in industrial roundwood imports to Japan, India and China
Source: FAO (2010a)

Russia's increased share of roundwood exports is matched by a corresponding reduction in the share of imports from a number of tropical countries (for example, Malaysia, Cameroon and Gabon).

In the case of Japan, the major sources of roundwood and woodchip supply are Australia, Russia, South Africa and the United States. Changes in the suppliers of industrial wood to India are even more dramatic. In 1997, 95 percent of India's roundwood supplies were obtained from many countries (in view of the small quantity sourced from each, these countries were aggregated in statistics as 'others'). However, by 2007, New Zealand and Australia collectively supplied 85 percent of India's roundwood and chip imports, while the share of 'others' declined to about 1 percent. Russia has also become an important supplier of industrial roundwood to India, accounting for 14 percent of imports in 2007. A significant trend is that major wood-importing countries are increasingly focusing on assured and stable supplies, reducing their reliance on diminishing tropical sources.

Within the Asia-Pacific region, the most significant exporters of industrial roundwood include Malaysia, Myanmar, New Zealand and PNG. **Table 3.5** shows trends in industrial roundwood exports in major exporting countries.

Table 3.5. Principal industrial roundwood exporting countries in Asia and the Pacific 1992-2007 (million m^3)

Country	1992	1997	2002	2007
Malaysia	17.86	6. 68	5.18	4.94
New Zealand	4.28	5.95	7.88	5.98
PNG	1.82	3.01	1.86	2.72
Myanmar	1.34	0.45	1.14	1.48
Australia	0.18	0.69	1.28	1.06
Solomon Islands	0.51	0.70	0.40	1.01
China	0.80	0.66	0.69	0.69

Source: FAO (2010a).

Australia's regional significance as a supplier of raw material increases markedly if woodchip exports are added to industrial roundwood (log) exports. In 2007, Australia exported 9.7 million m^3 of woodchips, 68 percent of the regional total.

Trade in sawntimber

The Asia-Pacific region is a significant net importer of sawnwood. In 2008, the region's largest sawnwood importers were China (8.7 million m^3), Japan (6.5 million m^3), ROK (0.56 million m^3) and Viet Nam (0.56 million m^3). These countries collectively accounted for 84 percent of the region's imports of sawnwood.

Many of the region's largest sawnwood importers are also among the largest sawnwood exporters. In 2008, Malaysia (2.5 million m^3), New Zealand (1.8 million m^3), China (0.9 million m^3) and Thailand (0.4 million m^3) accounted for about 78 percent of the region's total sawnwood exports.

Nonetheless, intra-regional trade accounts for less than 35 percent of the region's total imports. Sawnwood is imported from many countries outside the region; from North and South America, Europe and Africa. However, the majority of imports come from Canada, the Russian Federation, the United States and Finland.

Trade in wood-based panels

Trade in wood-based panels largely comprises plywood, medium density fibreboard (MDF) and particle board. The overall Asia-Pacific trade is dominated by plywood, which in 2008 comprised 63.3 percent of regional wood panel exports and 51.3 percent of imports (**Figure 3.5**).

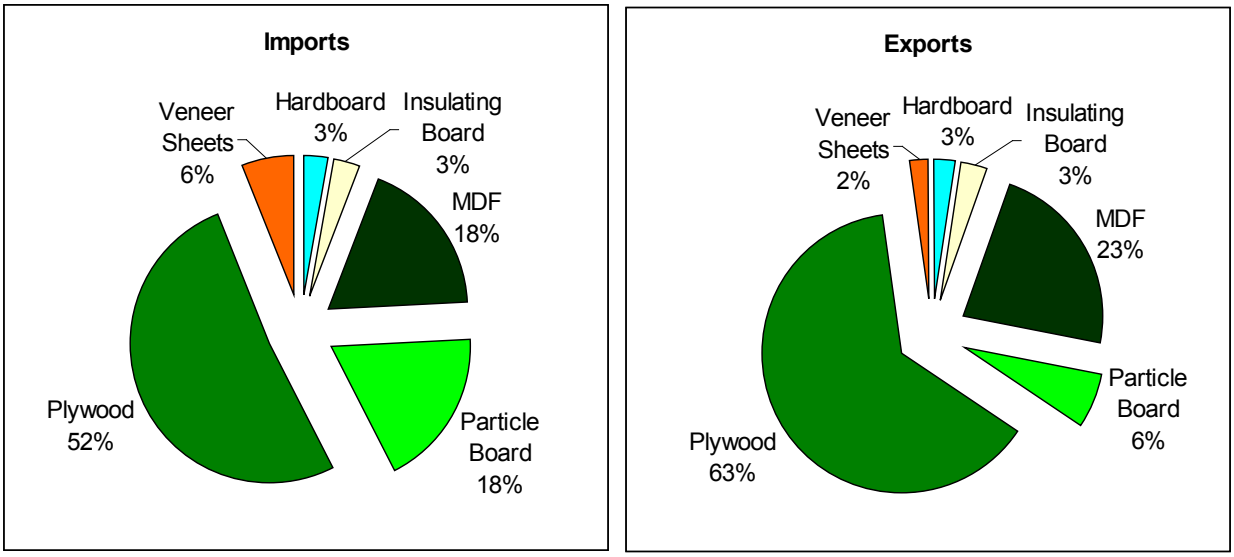

Figure 3.5. Asia-Pacific trade in wood-based panels, 2008
Source: FAO (2010a).

Until the early 2000s, Indonesia and – to a lesser extent – Malaysia, were the world's predominant plywood-exporting countries. However, in recent years, a sharp decline in Indonesia's plywood industry has been matched by rapid growth in China's plywood industry, and China is now the pre-eminent plywood producer and exporter in the region. In 2008, China exported 7.5 million m^3 of plywood, while Malaysia and Indonesia exported 5.5 million m^3 and 2.6 million m^3 respectively. Japan is the region's largest plywood importer, accounting for 53 percent of plywood imports, while China (19 percent) and ROK (12 percent) are the other major importers.

With 47 percent of the region's exports, China is also the region's largest exporter of MDF. Other significant MDF exporters in the region in 2008 were Thailand (22 percent) and New Zealand (9 percent). Particle board trade comprises a lesser proportion of trade in wood-based panels, with Thailand (65 percent) being the region's largest exporter and China (30 percent) the largest importer in 2008.

Overall, the Asia-Pacific region is a significant net exporter of wood-based panels. In 2008, wood-based panel exports comprised 25.3 million m^3, while imports totaled 13.2 million m^3. North America and Europe are key external markets.

Trade in paper, paper board and wood pulp

In 2008, the Asia-Pacific region was a modest net importer of paper and paper board. Imports of paper and paper board totaled 17.4 million tonnes, while exports of paper and paper board totaled 16 million tonnes. East Asia and Southeast Asia were net exporters of paper and paper board, while South Asia and the Pacific were net importing subregions.

In 2008, China (5.4 million tonnes), Malaysia (2 million tonnes), India (1.7 million tonnes), Japan (1.5 million tonnes) and Australia (1.5 million tonnes) were countries that imported more than 1 million tonnes of paper and paper board. The largest exporters of paper and paper board were China (4.9 million tonnes), Indonesia (3.6 million tonnes) and ROK (2.7 million tonnes).

Overall, the Asia-Pacific region is a major net importer of wood pulp, reflecting the raw material deficit situation. Imports of wood pulp in 2008 totaled 18 million tonnes, compared with exports

of 4 million tonnes. Imports of wood pulp to China, ROK and Japan collectively account for 82 percent of the regional total. Indonesia (2.7 million tonnes) and New Zealand (0.8 million tonnes) are the main pulp exporters in the region, collectively accounting for 88 percent of the region's wood pulp exports.

In addition to wood pulp, the region is also a major net importer of recovered paper. In 2008, recovered paper imports totaled 32.8 million tonnes, while regional exports of recovered paper amounted to 5.8 million tonnes. China is the dominant importer of recovered paper. In 2008, China imported 25 million tonnes of recovered paper, 77 percent of the regional total.

Trade in other forest products

Other forest products include a wide range of manufactured and finished products, including wooden furniture and furniture parts, mouldings, manufactured wood products such as flooring, doors and window frames, manufactures of paper and paper board, as well as fuelwood, charcoal and wood pellets, and non-wood forest products. Of particular interest is the emergence of the Asia-Pacific region (led by China) as a major producer and exporter of wooden furniture. Production is mostly by small- and medium-sized enterprises, many of which operate in the informal sector; consequently, obtaining reliable production statistics is difficult. The surge in production is evident from a rapid increase in the value of furniture exported from the region, which increased from about US$1.56 billion in 1990 to about US$17.7 billion in 2007 (**Figure 3.6**). In 1990, the region's share in exports was about 9 percent of total global exports but, by 2007, the Asia-Pacific's share of the global furniture trade had reached about 33 percent.

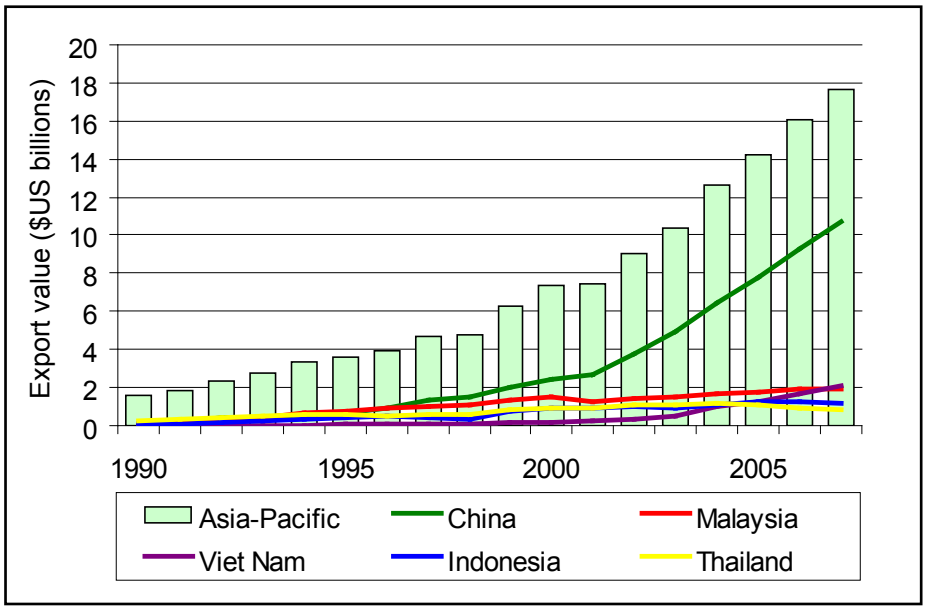

Figure 3.6. Value of wooden furniture exports, (US$ billion)
Source: Lebedys (2008).

Much of the increase in furniture production is the result of rapid expansion in export-oriented production in China, whose exports increased from about US$111 million in 1990 to US$10.68 billion in 2007, thus making it the largest exporter of furniture in the world. In 2007, China had more than 2 300 furniture-producing enterprises, employing about 530 000 workers (UNECE and FAO 2008). Other countries that have expanded production and exports are Indonesia, Malaysia and Viet Nam. A notable feature is the expansion of rubberwood furniture production, particularly from Malaysia.

Wooden furniture production is highly labour intensive; low wages in many Asian countries provide competitive advantage. Low labour costs combined with improved design and access to world markets facilitated by global retailers has enhanced the competitiveness of Asian furniture production. Domestic furniture demand has also increased significantly, especially in emerging economies such as China and India, attracting investments in retail outlets by transnational producers and retailers.

Emerging patterns of trade

In general, globalization has led to expansion of trade in most products, including many 'other forest products', although comprehensive trade data for several of these are not readily available. Key drivers of increased trade include:

- Exporters of primary products adding value to improve profitability and avoid strong cyclical movements associated with commodity products.
- Shifts in manufacturing location reflecting differences in competitiveness, especially lower wages, better productivity and easy access to markets and raw materials.
- International agreements reducing tariffs and other trade barriers creating new trading opportunities (UNECE Timber Committee).

In relation to exports, the share of industrial roundwood in the total value of exports has declined, while the share of value-added products, especially wood-based panels, paper and paper board and secondary wood products has increased significantly. On the import side, industrial roundwood, pulp for paper, and sawnwood remain major items (**Figure 3.7**). Although there are intercountry differences, on the whole the Asia-Pacific region is increasingly becoming a producer and exporter of value-added products, relying on imports of lower value-added items. Developments in China and a few other countries – especially Indonesia and Malaysia – account for the major part of this shift in production and trade in forest products in the region. While increasing domestic demand has led to higher investments in processing capacity (especially for panel products and paper and paper products) low wages and access to technology have spurred export-oriented production (in particular for secondary and finished wood products).

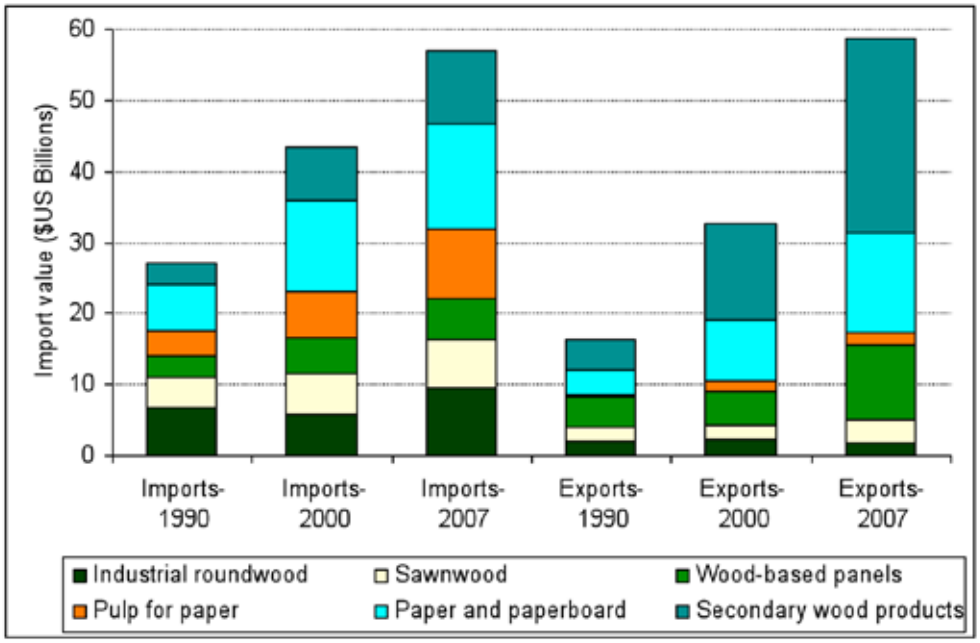

Figure 3.7. Trends in the value of Asia-Pacific wood products imports and exports

Source:FAO (2010a); Lebedys (2008).

Key trade issues

Perhaps not surprisingly, the key issues pertaining to forest product trade relate to access, especially access for products to markets and access by manufacturing countries to raw materials.

Market access issues are centred on tariff and non-tariff barriers. Tariff barriers for forest products are generally low in Asia-Pacific countries, with a number of (especially developed) countries having eliminated tariffs on many products. In addition, several regional free-trade agreements are in place, including the ASEAN Free Trade Agreement, the South Asian Association for Regional Cooperation (SAARC) and the South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA), as well as bilateral trade agreements, for example, between Australia and New Zealand (Australia and New Zealand Closer Economic Relations Trade Agreement [ANZCERTA]) and between ASEAN and several other Asia-Pacific countries (including China, India and the two ANZCERTA countries). Although tariffs have been reduced, a number of countries maintain significant tariffs on wood products (**Box 3.2**).

Box 3.2	Tariff reforms in India

Until the early 1990s, India applied extremely high tariffs to forest products. For example, the 1986 base tariff rates for panel products ranged from 105 percent to 145 percent. Actual rates applied immediately prior to the conclusion of the GATT Uruguay round were considerably lower, though escalatory, reaching 35 percent for some carpentry and furniture, 30 percent for fine papers and plywood, and 20 percent for other panel products.

"The domestic supply of timber has been dramatically reduced over the past few years and the wood products industry is now, and will continue to be, heavily dependent on imported timber. In recognition of this, the Indian government is continuing to adopt policies to encourage timber imports. Tariff reductions on imports of logs and wood chips have eased, compensating for some of the shortage in raw materials that the Indian wood-based industry was facing. India's imports of wood and wood-based products doubled between 1999 and 2005, nearing US$ 1 billion in 2005. India currently is importing mostly commodity products as raw materials to supply the wood based industry.

Import statistics show that over 90% of India's forest product imports are logs. The plethora of import duties, taxes, tariffs and fees, continue to represent a significant barrier to exporters of wood products, particularly value-added wood products. However, despite the high tariff rates, the imports of engineered wood products tripled between 2000 and 2005."

Source: Ganguly and Eastin (2007).

Tariff escalation – i.e. a tariff structure that applies higher import duties to more processed products – remains a core feature in many countries where forestry tariffs persist. As part of the WTO Advanced Tariff Liberalization (ATL) initiative, a global free trade agreement on forest products is being advocated.

A range of non-tariff measures (NTMs) also affects market access for wood products, including import taxes, quotas, bans, sanitary and phytosanitary measures, technical barriers to trade (e.g. building standards) as well as voluntary measures such as certification and labeling. Provisions relating to illegal logging and associated trade, such as the amended Lacey Act (discussed elsewhere) may also have significant trade implications.

Conversely, forest policies in most countries stipulate a desire to further develop domestic wood-processing industries. However, many less developed countries struggle to access capital and expertise to establish internationally competitive processing facilities. During the past 40 years, a number of forest-rich developing countries have seen their forests exploited and depleted through exporting logs to more developed countries. Many of these countries have resorted to log export bans as a means of establishing and supporting domestic processing industries.

WOOD AS A SOURCE OF ENERGY

Despite the increasing use of fossil fuels, wood from trees outside forests and from forests and other woodlands remain an important source of energy in many Asia-Pacific countries. A major challenge in assessing the current situation and long-term outlook is the absence of reliable statistics, especially relating to quantities collected and sources of supply. Available information indicates that wood accounts for a significant share of total energy consumption in developing Asia-Pacific economies. There are several countries where wood provides more than half of the energy needs (**Figure 3.8**). In particular the dependence on wood as a source of energy is very high among low income countries, suggesting a strong linkage between income and type of energy used. As economies grow and consumption of energy in industrial and service sectors increases, the share of wood energy declines. As more households switch to other sources of energy, dependence on wood – and hence pressure on forests – declines

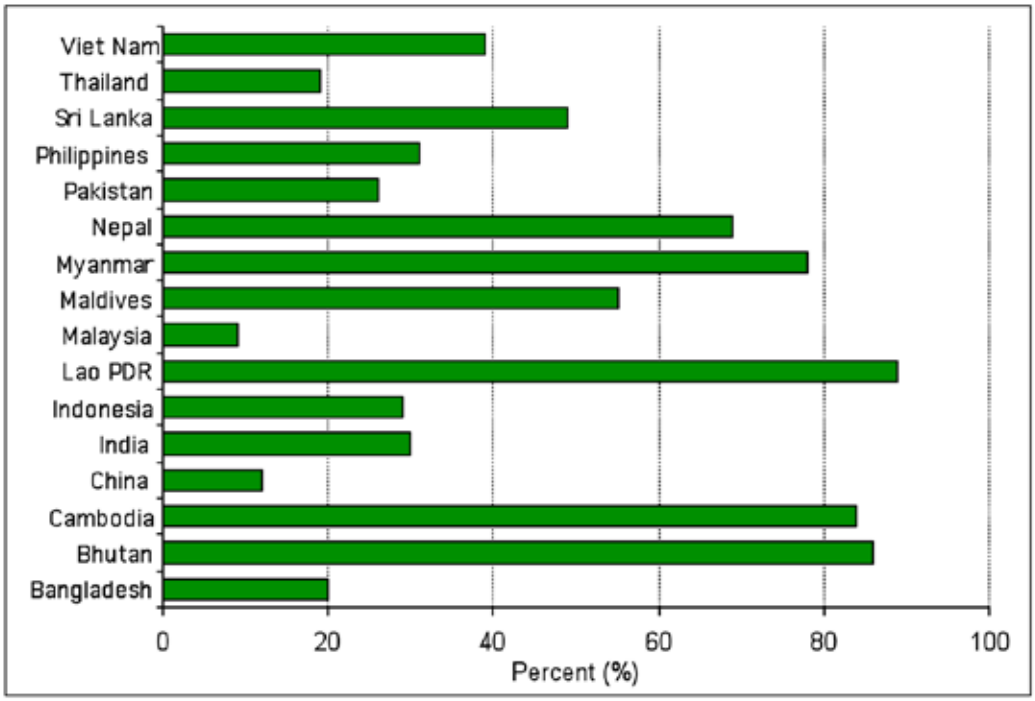

Figure 3.8. Share of wood energy in total energy consumption in selected Asia-Pacific countries
Source: FAO (1997).

General trends in the use of wood energy

In view of differences in the nature of wood energy use between domestic (household) and industrial uses, trends in consumption diverge among the region's countries. Higher household incomes and urbanization are associated with declines in per capita household use of wood energy. However, population growth keeps aggregate national consumption relatively stable. As regards industrial use, there is renewed interest in biomass energy, especially in the context of escalating fossil fuel prices, energy security and climate change policies.

Production and consumption of woodfuel have remained more or less unchanged in the Asia-Pacific region during the past two decades, with a marginal decrease in production from about 781 million m^3 in 1990 to 762 million m^3 in 2008 (**Figure 3.9**). Almost three-quarters of the wood produced in Asia and the Pacific is burned as fuel. In South Asia, fuelwood accounts for 93 percent of total wood production, while in Southeast Asia, fuelwood's share in total wood production is 72 percent. In contrast, woodfuel accounts for less than 1 percent of roundwood production in Japan. A major challenge in assessing long-term trends in woodfuel production and consumption is the preponderance of informal collection and trade. This is particularly the case in most developing countries, where subsistence consumption is high and official statistics tend to be estimates rather than actual data based on surveys of production and trade.

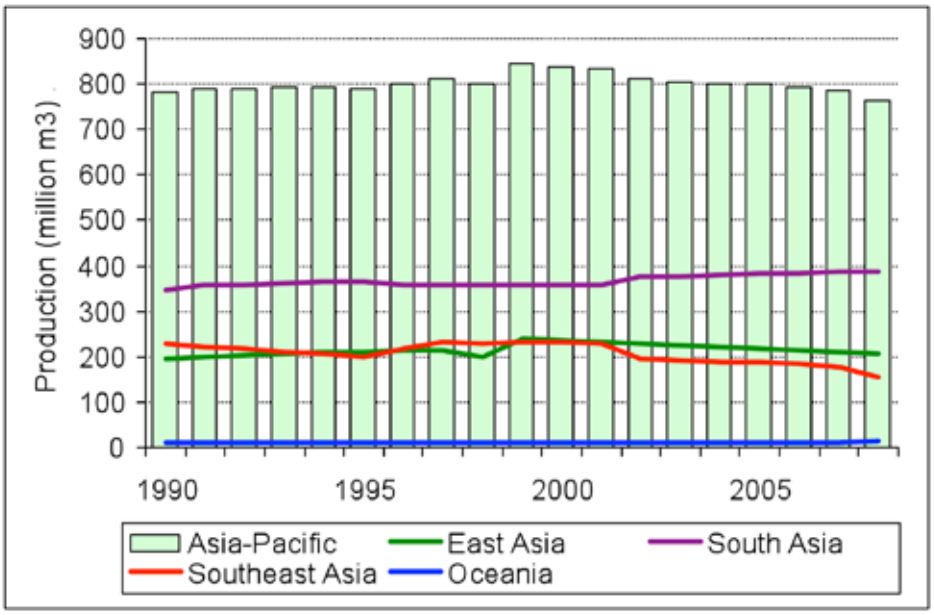

Figure 3.9. Trends in woodfuel production in Asia and the Pacific, 1990-2008
Source: FAO (2010a).

Some general trends in the production and consumption of woodfuel include:

- South Asia accounts for nearly half of the Asia-Pacific region's woodfuel consumption and is the subregion that accounted for most of the region's increased consumption since 1990. However, there are signs that wood energy use is reaching a plateau, and even declining in some parts of South Asia, especially as alternative energy resources become more accessible. With India accounting for about 79 percent of South Asia's woodfuel consumption in 2008, changes in the energy mix in India will have a significant impact on the subregional and regional wood energy situation.
- In all the other regions, consumption is plateauing and, in some cases, declining, as in the case of most countries in East Asia (**Box 3.3**).

Box 3.3	**Woodfuel consumption in Japan**
Woodfuel consumption accounts for less than 1 percent of wood produced in Japan. However, utilization of wood biomass is being promoted as part of a government initiative to assist in meeting climate change goals. According to a 2008 report, Japan used about 8.6 million m^3 of wood biomass as fuel, primarily in the form of waste wood to generate electricity and in pellet stoves. Waste materials from sawmills comprised more than half of the total, with waste material from construction sites providing the remainder. Source: MAFF, Japan (2008).	

- Declining woodfuel use is largely related to increases in income, relative costs of various fuels and their availability and accessibility. The price of fossil fuels will be an important determinant as to whether there will be a progressive reduction in woodfuel use through substitution by commercial energy. However, price volatility of fossil fuels – for example, as witnessed during 2008 to 2009, when oil prices rocketed to US$148 per barrel in July 2008, then plunged to about US$40 by March 2009 – makes it extremely difficult to predict changes in the energy mix, including changes in the importance of wood as a source of energy.

Wood energy systems

Two distinct wood energy subsystems exist in the Asia-Pacific region (Perley 2008), namely:

- A highly localized and well-established 'traditional' wood energy subsystem focused on households and small industry, especially in rural areas of developing countries.
- An industrial wood-sourced bioenergy subsystem with emerging potential to substitute for fossil fuels.

Each of the above subsystems has unique characteristics, in terms of end users, end uses, production and processing. Traditional household fuel use, largely focused on cooking and space heating, accounts for most woodfuel use in developing and emerging economies. Efficiency improvement has been a key thrust in past efforts to enhance woodfuel security, with considerable attention being given to development and popularization of improved cook-stoves (**Box 3.4**). However, the uptake of improved technologies has been extremely varied, largely due to economic and institutional constraints. Nonetheless, there are indications of change, especially due to increasing awareness of health implications of inhaling smoke from traditional stoves, encouraging the use of improved stoves.

Box 3.4	**Adoption of energy efficient cook-stoves in Asia and the Pacific**

Efforts to develop and promote improved cook-stoves have a long history. As far back as the 1950s, such stoves were under development in countries such as India, Indonesia and Sri Lanka. However, it was the energy crisis in the 1970s – including a perceived wood energy crisis – that drew widespread attention to the issue, leading to concerted efforts, often with the support of international organizations, to improve the design and dissemination of simple, low-cost, energy-efficient cook-stoves. China and India have led these efforts, with millions of households now using improved cook-stoves. Many governments in the region actively support the dissemination of these higher efficiency stoves.

Despite more than 50 years of efforts, experiences in adoption of improved cook-stoves remain mixed, largely on account of inadequate consideration of social, economic and cultural dimensions of household energy use. In many rural areas, biomass energy is collected free-of-cost (excepting the opportunity costs associated with time spent in collection); hence, there is little incentive to adopt more efficient stoves, even when the costs of the devices are low. However, increasing awareness about health implications of using inferior stoves, especially respiratory illnesses stemming from in-door pollution, could trigger wider adoption of energy-efficient stoves that could incidentally reduce woodfuel demand.

There were efforts in the Asia-Pacific region through the 1970s and 1980s to produce wood-based energy on an industrial scale, especially through dendrothermal power plants based on dedicated woodfuel plantations. The viability of dendrothermal power generation has fluctuated in line with changes in fossil fuel prices. Energy production through gasification of biomass is another option that has received considerable attention. China and India are at the forefront of biomass gasification technologies, with several units established in rural areas using a wide array of biomass inputs, including crop residues and wood. Use of wood and other forms of biomass to make wood pellets for fuel is also receiving attention and wood pellet production is likely to expand, especially in the context of climate change mitigation policies and changes in fossil fuel prices (**Box 3.5**).

Box 3.5	Wood pellet markets in Asia and the Pacific

Global demand for wood pellets is increasing as consumers (especially in Europe and North America) search for alternative energy sources. High density, convenience in transport and use and renewability are making wood pellets an attractive source of energy especially in the context of climate change policies. Although still nascent, demand for wood pellets is expected to increase in the coming years, which may have both positive and negative implications on forest resources in the region, depending on whether wood for pellets is sourced from sustainably managed forests.

A major initiative in wood pellet production is the lease of Indonesian forest land by ROK. The Republic of Korea Forest Service signed a Memorandum of Understanding with the Indonesian Ministry of Forestry entailing a lease of 200 000 hectares of forest land to produce wood pellets and to develop export-focused wood pellet plants in Indonesia. Already an ROK company has established a wood pellet plant in Central Java. This is being done as part of a 'green economy' policy in ROK, to reduce dependence on greenhouse gas-emitting, coal-based power generation.

Wood pellet production is also emerging in other countries; for example, Australia, China, New Zealand, Singapore and Thailand (where some pellets are being made from bamboo). At present, the wood pellet market in Asia and the Pacific remains relatively small. However, wood pellets are presently the world's fastest growing means of accessing bioenergy; hence, rapid growth should also be anticipated in the Asia-Pacific region. Increasing investments in local pellet production facilities and in making pellet stoves affordable will boost the use of wood pellets.

Source: Thaindian (2009); IEA (2007).

High fuel prices have also encouraged investments in biofuel crops, for production of biodiesel. Although this focuses on a very different market segment – mainly production of transport fuel – there are potential implications on woodfuel supplies. *Jatropha* and *Pongamia* are two species that are being planted extensively, with large-scale plantations of *Jatropha* established in a number of countries (including China, India, Philippines, Thailand and Viet Nam). *Jatropha*'s popularity is based on its purported ability to grow on marginal or degraded lands. However, there is increased concern about land-use conflicts as some so-called 'waste lands' being planted with *Jatropha* provide a number of products and services required by local communities. Projected yields (often based on trials in small areas) could be unrealistic, especially in degraded marginal lands and there is concern about the net energy yield. Environmental issues are also under the spotlight in the case of crops like oil-palm, especially when their planting replaces natural forests and peat lands as is happening in Malaysia and Indonesia. Increased carbon emissions from peat land cultivation negate many of the potential mitigation advantages of substituting petro-diesel with palm oil-based biodiesel.

Economies of scale versus economics of location

A wide array of wood energy technologies is available and more are likely to emerge as society addresses issues like energy security, climate change and human health. Adoption of these technologies will largely depend on: (a) incomes of households and affordability of technologies; (b) economies of scale in production and distribution of energy; and (c) economics of supply of wood and other biomass.

Traditionally, rural communities have been dependent on highly dispersed supplies of biomass from divergent sources, requiring very little financial investment, and collected and used largely utilizing labour with very low opportunity costs. Unless the costs of such energy increase significantly, or new technologies reduce costs significantly, there will be little incentive to switch to new technologies (including improved cook-stoves) or fuels.

Improved wood energy technologies, including pelletization, gasification and cellulosic biofuel production, will have to address challenges of scale in the production and processing of wood. Although efforts are being made to develop smaller-scale production units, which could be sustained from smaller areas dedicated to wood (and other raw material) production, the economic viability of most energy production technologies is highly scale-dependent. Often these facilities require large-scale production of wood, either from natural forests or forest plantations. Long-term economic viability thus depends on unit costs of production and processing, which to a large extent depend on land availability. Establishing a balance in trade-offs between competing land uses will be particularly challenging in the most densely populated Asia-Pacific countries, especially in view of competition for land and water.

Wood energy overview

The overall situation in regard to wood energy can be summarized as:

- The use of wood as a traditional source of energy will continue in many countries especially among low income rural households, whose access to commercial energy is limited.
- Awareness of health hazards caused by smoke from the use of wood and other biomass in traditional stoves is encouraging the introduction of better technologies that also enhance energy efficiency.
- Increases in income, improved access to liquefied petroleum gas, rural electrification programmes and urbanization are encouraging a switch away from wood energy.
- Climate change policies will encourage increased use of wood as a source of energy in wealthier countries. The use of wood pellets is already receiving attention and several countries are installing biomass gasifiers to enhance energy supplies, especially to rural areas not connected to electricity grids.
- More refined technologies such as cellulosic biofuel production may take some years before becoming commercially viable and widely adopted. In the future, these technologies can be expected to have significant implications on the way wood is used.

NON-WOOD FOREST PRODUCTS

Non-wood forest products (NWFPs) are a broad ‘group’ of products that encompass all plant and animal resources produced by forests, excluding wood. They can be defined as ‘goods of biological origin other than wood’. Most NWFPs are gathered, rather than cultivated, and there is usually limited value addition at the source. Estimates of the extent of people’s dependence on NWFPs vary; often extrapolation of local level studies fails to provide a realistic picture of the overall importance of NWFPs in the livelihoods of people at larger scales. Certainly NWFPs are critical to the livelihoods of forest-dependent people, but such dependence declines when agriculture and other activities become major sources of income.

NWFPs produced in the region are diverse, reflecting ecological diversity, and include foods, medicines, fibres, gums, resins, cosmetics and cultural products. The diversity of NWFPs in the region, in tandem with varying levels of socio-economic development, results in highly divergent patterns of production, processing, consumption and trade (**Table 3.6**). Subsistence use of many NWFPs often declines in the context of social and economic development, especially as many are considered to be ‘inferior goods’. However, there are several products that have gained ground with the discovery of new uses largely due to developments in science and technology.

Table 3.6. Types, characteristics and end uses of representative NWFPs from Asia-Pacific countries

Category	Examples of NWFPs within the category	Characteristics
Subsistence use	• Mahua *(Madhuca latifolia)* flowers and fruits, sal *(Shorea robusta)* leaves (India, Bhutan, Sri Lanka, Nepal, Myanmar) • Rattan *(Calamus* spp.*)* (Lao PDR, Myanmar, Sri Lanka) • Locally collected medicinal plants (those related to traditional health care in most countries) • Lard fruit *(Hodgsonia macrocarpa)* for oil-seed (Indonesia, Thailand, Viet Nam and Lao PDR) • Jujube *(Zizyphus jujuba)* (China) • Sago *(Metroxylon sagu)* (Indonesia) • Illipe nuts, Pili nuts *(Canarium ovatum)* (Philippines) • Polynesian chestnut *(Inocarpus fagifer)*, Galip nuts *(Canarium indicum)*, Okari nuts *(Terminalia kaernbachii),* Pao *(Barringtonia procera)* in Pacific Island Countries	• Low economic importance (cater only to small markets) • Crucial for basic food, clothing, shelter and health needs and based on traditional knowledge • Typically bulky and low value per unit volume that makes long distance transport uneconomical
Traded for consumption in regional and national markets	• Harra *(Terminalia chebula)* • Baheda *(Terminalia bellerica)* • Aonla *(Emblica officinalis)* • Tendu *(Diospyros melanoxylon)* leaves • Resins *(Dipterocarpus alatus, Pinus* spp.*)* and gums *(Sterculia urens)* • Shellac and latex (especially *Hevea brasiliensis*) • Edible insects	• Industrial applications in both food (confectionery, beverage industries) and non-food industries (paint and varnish industries) • Natural health care products • Synthetic substitutes either not available or use of products from natural sources preferred for cost and quality reasons
Traded at the global level	• Mushrooms (e.g. shiitake and matsutake) • Sandalwood oil *(Santalum* spp.*)* • Agarwood oil *(Aquilaria* spp.*)* • Medicinal and aromatic plants (ginseng, senna leaves) • Rattan- and bamboo-based speciality products • Gums and resins	• Value per unit of volume generally high • Mostly country-specific • Rising incomes and changing societal preferences are key drivers for such products to reach global markets

Source: Hansda (2009).

While most NWFPs are consumed as subsistence items or sold primarily in local markets, an increasing number of items are traded in response to growth in national, regional and global demand. A shift to national and global value chains will require significant improvements in production, processing and trading arrangements. There are more than 150 NWFPs from the Asia-Pacific region that are traded internationally, usually in small, unstable quantities. Bamboo and rattan are significant exceptions, traded in large volumes. Perceived health advantages of natural products are drawing increased attention to a number of NWFPs, increasing their trade.

For example, rapid growth in the demand for traditional medicines has boosted the trade – both legal and illegal – of NWFPs. Illegal trade, especially of endangered plants and animals and their parts, is flourishing despite various national and international efforts.

In view of the preponderance of subsistence use and large share of informal transactions, trade statistics seldom capture the actual contribution of NWFPs to national economies. The value of exports of NWFPs has increased significantly during the last decade, especially due to the emergence of niche markets (**Table 3.7**). The global value of NWFP exports in 2005 was approximately US$12.9 billion, or about 7 percent of the value of primary forest product exports. The Asia-Pacific region's NWFP exports accounted for about 19 percent of the region's total export value of forest products. East Asia, especially China, has emerged as a major exporter of NWFPs, accounting for about 64 percent of regional exports (**Figure 3.10**).

Table 3.7. Global and regional NWFP exports

	1996 (million US$)	2000 (million US$)	2005 (million US$)
Total global exports	7 082.2	8 001.6	12 873.8
Exports (Asia-Pacific)	3 466.6	3 487.9	5 186.5
Share of Asia-Pacific in global exports	49%	44%	40%

Source: Hansda (2009). Based on UN Comtrade data as of 31 August 2007.

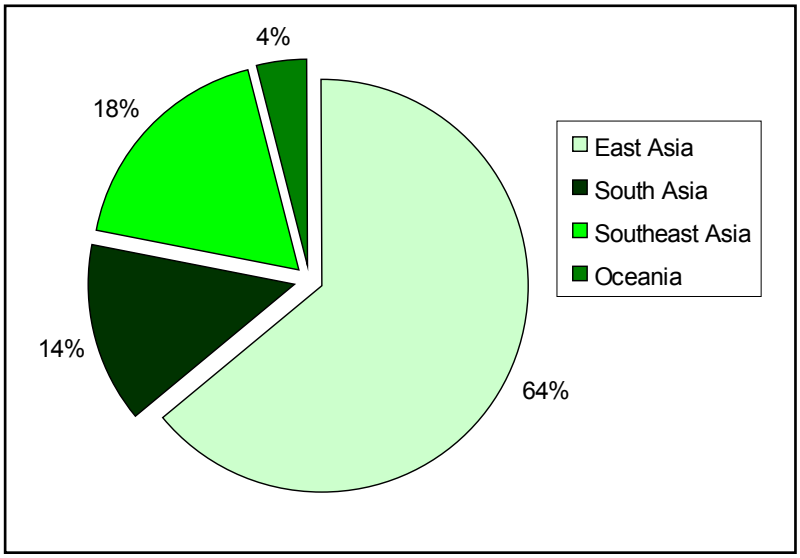

Figure 3.10. Subregional proportions of NWFP exports by value (2005)
Source: Hansda (2009) (based on UN Comtrade data as of 31 August 2007).

A wide range of production systems are used for NWFPs and these can be broadly grouped as:

a) collection from the wild;
b) cultivation integrated with other agricultural crops; and
c) monocultural production.

Collection from wild sources is carried out on a small scale and forms the mainstay of livelihoods for many forest-dependent communities. While many NWFPs, especially food items, are consumed locally, others are bartered or sold in local markets to supplement household incomes.

In some situations, more than 50 percent of household income (in kind and cash) is derived from NWFPs. Typically, forest-dependent communities collect a wide array of products using traditional technologies. Because production is entirely dependent on natural factors, collection is usually carried out across large areas. In addition to local subsistence use several products collected from the wild are traded nationally and internationally, involving a number of intermediaries. Subsistence use rarely results in resource depletion; but this is not the case of products that are traded. With trade, the disconnect between producers and users can cause significant imbalances between demand and supply, leading to overexploitation and depletion.

In the case of integrated agriculture, NWFPs are among many commodities cultivated with other crops. Most of the production is sold in local and intermediary markets. Enhancing income is usually the primary objective of cultivation; hence many producers also undertake some primary processing.

In the case of monoculture production, substantial resources are invested and cultivation is more systematic. Most cultivators have a relatively strong degree of economic security and are likely to be less risk averse than subsistence farmers. Production is invariably geared towards national and international markets.

Two broad patterns of change can be observed in systems for production of NWFPs in the Asia-Pacific region:

a) shifts from subsistence use to commercialization; and
b) changes in production systems, from collection in the wild to domestication and cultivation.

Improvement in income generation opportunities is a major driver of shifts from subsistence use to commercial production. Commercialization is often an outcome of a chance discovery of certain properties, as in the case of wattle seed (*Acacia* spp). The production of flour from dried wattle seeds has contributed to the creation of a new cottage bush food industry in Australia. The growth in popularity of bush food in some countries indicates a change in society's preferences and a willingness to pay premiums for products that were earlier considered as 'inferior'. Another example of NWFP commercialization is edible insects, for example, in Thailand (**Box 3.6**)

Box 3.6	**Edible forest insects**

Insects have been an important source of nutrition for human beings for a long time. More than 1 400 insect species are used, worldwide, as human food; in the Asia-Pacific region entomophagy (the practice of eating insects) is reported in 23 countries. Some insects contain as much protein as the same weight of fish and meat. Most are harvested from natural forests. Bamboo caterpillars, sago grubs, grasshoppers, dung beetles, silkworms, giant water bugs, Vespa wasps, green tree ants, Hymenoptera brood, cicadas and crickets are considered to be the most important food species in the Asia-Pacific region. In February 2008, FAO in collaboration with Chiang Mai University organized a workshop on Forest Insects as Food: Humans Bite Back to assess the state of knowledge on edible forest insects and to review what needs be done to improve their sustainable production and marketing. While traditionally edible insects were collected from the wild, in countries such as Thailand they are now being reared systematically. In Khon Khaen Province of Thailand, 15 000 farmers are involved in the production of edible insects; these are processed and marketed commercially. Cricket-raising and production of bamboo worms have become major cottage industries in Thailand.

Source: FAO (2009a).

Once products are domesticated and cultivated on farms, they are no longer classified as forest products, but rather become agricultural products. Examples of previous subsistence-use products that are now produced commercially include sago in Southeast Asia (Indonesia,

Philippines, Malaysia and Thailand); wattle seed and quandong fruit in Australia; mushrooms, truffles, and bamboo in China; and yaquona (from which kava is made) in Fiji. Shifts in production and use have evolved differently for various NWFPs and patterns of change are not uniform among countries.

Increasing demand and uncertain supply from wild sources have led to the domestication of some commercially important products. The demand for health and beauty products (in particular medicinal plants) and food items (for example, mushrooms) have led to more organized, farm-based cultivation. Increasingly, NWFP-processing companies are encouraging farmers to cultivate profitable items, through provision of technical support and product buy-back arrangements. An example of this is the efforts by Dabur Limited (a leading Ayurvedic health care and food company based in India) in Nepal and India.

A major issue in large-scale cultivation of NWFPs is price volatility due to cyclical booms and busts (see **Box 3.7**). The quantities of many NWFPs demanded in markets tend to be small. A spurt in prices encourages a rapid expansion of cultivation leading to oversupply and subsequent crash of prices in some instances.

Box 3.7	**Price volatility of safed musli in India**

Safed musli *(Chlorophytum borivillianum)* – also known as Indian ginseng – is a crop that has impacted many farmers in different ways in India. Some have been made rich in a short period of time, while others have been frustrated by frequent price fluctuations.

Markets for safed musli have typically been very volatile. Madhya Pradesh, one of the leading states in safed musli cultivation, saw prices crash from US$50/kg in 2001-2002, to US$15/kg in 2003. Reports of many farmers suffering losses under contractual buy-back arrangements for safed musli by individuals or organized institutions are unsurprising, yet people continue to cultivate this 'wonder crop' without due regard for market conditions. Demand for the several musli-based products in the market does not match the extent of production. However, there are no official estimates available to indicate supply-demand balances. Indications are that large-scale plantation of high-input safed musli occurring after 2000 has been more subsidy-driven than based on actual market demands.

Source: Hansda (2009).

Development of new processes and products

New value addition technologies are bringing about major changes in the NWFP sector. For example, bamboo, which was considered a 'poor man's timber' is now being transformed into a number of high value added products (**Table 3.8**). Significant developments in value addition are also taking place in the case of beauty and health care products. Technologies for extraction of active ingredients have improved significantly and a wide array of products combining desirable characteristics is being marketed.

Trophy hunting is a high-revenue NWFP industry that is increasing in several countries in the region. Driven by demand from wealthy hunters worldwide, hunting is a major source of income for Mongolia, although reliable estimates of revenues are not available. Generally, regulation of the trophy industry appears weak, with laws that specify the reinvestment of natural resource-use fees for conservation and restoration of natural resources not broadly implemented and rare species such as the argali sheep *(Ovis ammon)* suffering significant population declines. Another rapidly growing NWFP industry based on forest animals is trade in animals and animal parts, often controlled by criminal networks, undermining conservation efforts.

Table 3.8. The emerging bamboo-processing industry and its characteristics

Processing industry	Type of products	Characteristics	Likely impact
Low-value and bulk-processing industries	Charcoal	Industry achieves only marginally higher levels of income compared to those selling unprocessed raw bamboo culms. Industry can utilize low quality bamboo, leftovers and processing waste from other industries, and various species	Large-scale livelihood opportunities for the poor; however, impacts are marginal on a per capita basis because incomes from employment are low
Medium-value processing industries	Chopsticks, bamboo vinegar, bamboo juice, mat boards, and handicrafts	Industries are able to use lower grades of bamboo than in premium processing industries	Employment opportunities for relatively higher skilled people, rates of employment moderate
Premium processing industries	Bamboo flooring and ceilings, high quality yarns and fabrics	Premium quality bamboo is required. Industries' economic impacts are twice the level of medium-value processors and five times the level of low-value and bulk processors	Livelihood opportunities for relatively fewer people; high rates of employment

Source: Hansda (2009).

New institutional arrangements

The widespread interest in NWFPs has generated a proliferation of institutions and projects involved in supporting and advising on their production, processing and marketing. Of particular significance are cooperatives and similar arrangements that help to empower growers and collectors (**Box 3.8**). With improved access to information, these institutions are able to provide timely advice to producers and, more importantly, help to improve economies of scale, thereby overcoming some of the inherent problems of small-scale production.

Box 3.8	Grama Mooligai Company Limited: scaling up through collective action in India

Established in 2000, the Grama Mooligai Company Limited (GMCL) successfully created a structure to bring together collectors and cultivators of medicinal plants. The establishment of GMCL was promoted by the Foundation for Revitalization of Local Health Traditions (FRLHT), an NGO based in Southern India.

GMCL is a member-owned enterprise with shareholding restricted to medicinal and aromatic plant (MAP) gatherers and cultivators. At present, its shares are held by 30 groups representing 1 200 members. GMCL has collaborated with 13 NGOs in seven states, to involve local community-based organizations in activities to increase the scale of operations.

GMCL has linked with 1 200 retail outlets and several large pharmaceutical companies to market processed raw herbs and finished products, mainly honey. The company's turnover increased from a modest US$60 000 in 2001 to 2002 to US$170 000 in 2003 to 2004.

GMCL is attempting to link producer groups in national and global value chains, to increase market power and ensure fair prices. The members, mostly women, have been trained in simple value-addition techniques including sorting, grading and packing produce, as well as sustainable harvesting techniques, and skills to handle most aspects of trade. GMCL has launched a set of specialty herbal remedies for primary health care under the brand name 'Village Herbs.'

A major issue with regard to NWFPs is quality assurance. This is particularly important in the case of ingredients required for health and beauty care products. Certification and fair trade arrangements are gaining increased attention, especially in the context of increased demand for natural products. Nepal has used its local community forestry organization to implement a certification programme to improve NWFP collection (**Box 3.9**). Such a shift towards greater local involvement has helped in the 'formalization' of the informal sector. NWFPs are increasingly recognized as being vital to employment and income for rural people.

Box 3.9	NWFP certification in Nepal

In Nepal's Himalayan highlands, the collection and sale of NWFPs represent an important source of income for local villagers. However, the villagers typically sell their goods to intermediaries and traders, who encourage them to harvest as much as they can, while paying them poorly for their products.

The growing demand for environmentally friendly products in Europe and North America has created an opportunity for NWFP producers through sustainable, certified harvesting of NWFPs. Certification, supported by the Forest Stewardship Council (FSC), is aimed at creating a new market niche that encourages sustainable practices in the collection and processing of NWFPs. FSC certification in Nepal has required extensive capacity building for stakeholders. In 2005, the Rainforest Alliance and SmartWood awarded FSC certification to the Federation of Community Forestry Users Nepal (FECOFUN). FECOFUN's members practice sustainable harvesting of local non-wood resources; processing and marketing products including handmade (lokta) paper, essential oils, Ayurvedic medicines and supplements, herbal teas, pain relief oil, personal care products and raw herbs. According to FECOFUN, 23 species of NWFPs have been certified by the FSC.

Source: Rainforest Alliance Newsletter (2009).

ECOSYSTEM SERVICES

Society has become increasingly aware of the ecosystem services provided by forests and trees and in some countries such services have become more important than production of wood and non-wood products. The setting aside of large tracts of forests as protected areas allied with changes in management objectives including, in some cases, a total ban on logging, reflect the changes in society's priorities. Conservation of biological diversity, maintenance and improvement of watershed values, combating desertification and land degradation, and climate change mitigation and adaptation are some of the key ecosystem services provided by forests. With climate change becoming a key global issue, the role of forests in climate change mitigation and adaptation has become a high profile issue in recent times. Provision of recreational services has also garnered significant attention and in many countries ecotourism, domestic and international, is already an important source of income.

Flows of ecosystem services are adversely affected by deforestation and degradation in most Asia-Pacific countries. However, measurement and valuation remain a major constraint in assessing impacts on ecosystem services. Often, slow changes will go unnoticed, delaying action to arrest declines. Establishing trade-offs between competing uses remains a major challenge; often resulting in the provision of ecosystem services being assigned a low priority in resource-use decision-making. The following provides an overview of the current state of provision of forest-linked ecosystem services including measures being taken to enhance these services in the context of increasing demands.

Biodiversity conservation

While the Asia-Pacific region is extremely rich in biodiversity, it is also a region where biodiversity is under threat, having 13 of the world's 34 identified biodiversity hotspots (**Box 3.10**). Despite a long history of conservation efforts, the threat of major losses of biodiversity persists in view of intense human pressures. Rapid growth of economies and associated direct and indirect impacts on land use have led to significant erosion of biodiversity. To counter this, almost all countries are signatories to the Convention on Biological Diversity and many have prepared national biodiversity strategies and action plans. Management of sanctuaries and national parks, many of which were initially established as hunting or game reserves, has been broadened with greater thrust on managing ecosystems in their totality. Further, there has been a shift in the approach to protected area management, with more thrust being given to involve local communities in conservation efforts.

Box 3.10	Biodiversity hotspots in Asia and the Pacific

A biodiversity hotspot is a geographic region with a significant reservoir of biodiversity that is threatened with destruction. To qualify as a hotspot a region must meet two strict criteria: it must contain at least 1 500 species of vascular plants (0.5 percent of the world's total) as endemic species and it must have lost at least 70 percent of its original habitat. The Asia-Pacific region is home to 13 of the world's 34 hotspots.

East Melanesian Islands: Comprising 1 600 islands, this hotspot contains 3 000 endemic plant species in a geographically complex area. However, biodiversity is threatened due to excessive mining and logging activities, and agricultural encroachment.

Himalayas: Due to variations in altitude, this hotspot is extremely diverse; ranging from alluvial grasslands to subtropical broadleaf forests. Agricultural encroachment, overgrazing and logging are among the key threats to this hotspot.

Indo-Burma: This region is considered a 'biological treasure' with a high number of endemic species found in tropical forests. This includes 7 000 endemic plant species, 1 300 bird species and six large mammals discovered in the last decade. Indo-Burma is one of the most threatened biodiversity hotspots, due to the rate of resource exploitation and habitat loss. Only about 5 percent of natural habitats remain in relatively pristine condition.

Japan: Urban development has significantly affected biodiversity in Japan. However, a quarter of vertebrae species found in the Japanese Archipelago are endemic, including a large diversity of endemic amphibians.

Mountains of southwest China: Similar to the Himalayas, biodiversity in this area is also diverse due to variations in altitude. Forest flora in this area is considered the most endemic species-rich in the world. However, biodiversity is threatened due to the building of the enormous Three Gorges Dam, as well as illegal hunting, overgrazing and fuelwood collection.

New Caledonia: A small island in the South Pacific, New Caledonia is nonetheless home to more than 5 000 endemic plant species. However, nickel mining, forest destruction and invasive species are threats to biodiversity.

New Zealand: Biodiversity in New Zealand is unique with high levels of endemism due to geographic isolation. However, many species, especially birds, are threatened; primarily by invasive species.

Philippines: Comprising an archipelago of more than 7 100 islands, this hotspot is one of the most biologically rich. A combination of mining, logging for timber, newly constructed roads to service these activities, as well as population pressures and conversion of forests to agricultural land have threatened biodiversity in this area.

Polynesia-Micronesia: This area is considered the 'epicentre' of the current global extinction crisis due to introduced invasive species and excessive hunting of birds and animals.

Southwest Australia: Forests, woodlands and shrub lands and heath constitute a hotspot that is characterized by a high level of endemism in plants and reptiles. Agricultural expansion and invasive species pose the key threats to biodiversity in this area.

Sundaland: Consisting of 17 000 islands and two of the world's largest islands – Borneo and Sumatra – this hotspot is home to the orangutan, found nowhere else on earth. However, this hotspot is subject to forest degradation due to logging, conversion to rubber and palm oil production and the international trade in animal products.

Wallacea: The islands that make up this mainly Indonesian hotspot are home to the Komodo Dragon and have the second-highest number of endemic bird species in the world. This area is threatened due to overpopulation, transmigration and deforestation.

Western Ghats and Sri Lanka: Forests with rich endemic plant and animal species are under threat due to high population pressures, logging and agricultural encroachment.

Source: Conservation International (2007).

Despite these efforts, biodiversity conservation faces the following challenges:

- While parks and reserves are easily established, funds and capacity to manage them generally remain deficient, defeating the purpose of protected areas. There are several examples of such 'paper parks' in the Asia-Pacific region.
- Often conservation efforts are focused entirely on land (or forests) earmarked as protected areas and biodiversity outside such areas gets very little attention, even though 'unprotected' areas may harbour high levels of diversity.
- Rapid expansion of infrastructure, mining, etc. has increased the vulnerability of many protected areas. In many cases, short-term economic interests dominate decisions, notwithstanding the various policies and legislation relating to biodiversity conservation. Although a number of countries undertake environmental impact assessments as part of project feasibility studies, these seldom tilt the balance of decisions to abandon 'development' projects in favour of leaving the land and forests intact.
- Encroachment of agriculture – both commercial and subsistence.
- Increasing infrastructure development in previously remote areas.

In establishing trade-offs between competing uses, particularly where poverty is a major issue, identifying economic benefits deriving from biodiversity becomes critical. In recent times, much hope was pinned on bioprospecting as a means of ensuring biodiversity conservation; however, hitherto there are only a handful of examples of successful bioprospecting initiatives (**Box 3.11**). Benefits from biodiversity conservation today, will largely accrue in the future; in the meantime, maintaining species diversity is an issue of intergenerational equity and preserving the wealth of nature for the benefit of future societies. This limits the scope for market-based approaches to management, requiring the public sector to play leading roles in biodiversity conservation.

Box 3.11	**Biodiversity hotspots in Asia and the Pacific**

'Bioprospecting' is the practice of searching for useful biological materials in the natural environment to develop or improve products such as medicines, cosmetics and food. The Bonn *Guidelines of the Convention on Biological Diversity* provide a framework for establishing contractual arrangements relating to various aspects of bioprospecting, with particular emphasis on access to genetic resources and equitable benefit sharing. Bioprospecting generally occurs in two forms:

- The 'prospecting' and then wider spread of already existing knowledge and practices; or
- New discoveries generated by independent exploration.

Bioprospecting potentially represents a means of generating income – particularly for highly biodiverse areas – and may provide an economic justification for protecting biodiversity. However, substantial hype in the 1990s surrounding potential revenues from bioprospecting has been found to be unrealistic and incomes actually accruing to resource owners have remained very limited.

A wide array of technical, policy, legal and institutional issues affect bioprospecting, including issues relating to development of new products and sharing of income. Several countries – both globally and in Asia and the Pacific – have devised rules and regulations governing bioprospecting; nonetheless, there are ambiguities, especially with regard to rewarding the owners of the resources and the keepers of traditional knowledge. Although the pharmaceutical industry relies heavily on plant-based ingredients, their identification, development, testing, approval and production is a time-consuming process with considerable uncertainties. Often new product development has drawn heavily on traditional knowledge of local communities, helping to narrow the focus of bioprospecting. This raises questions about intellectual property rights and rewarding the keepers of traditional knowledge. Bio-piracy, whereby prospectors appropriate knowledge and materials without recognizing, acknowledging or rewarding owners of resources and knowledge remains a major challenge.

There are very few instances of systematic bioprospecting in the Asia-Pacific region. One example occurs in Locally Managed Marine Areas in Fiji, enabling local communities to regulate access to biodiversity through contractual arrangements between private companies and local communities. The arrangements for bioprospecting initiatives in Fiji are government-regulated with benefits channeled to traditional marine resource owners. As of mid-2008, two agreements have been signed involving a Scottish-based research institute.

Another well-publicized example is the development of 'Jeevani' – an energy and stamina boosting anti-stress product derived from *Trichpsis zeylanicus* – based on the traditional knowledge of the forest-dwelling Kani community in the Indian state of Kerala. Although upheld as a success story of bioprospecting, loopholes in intellectual property regulations have led to a failure to realize the potential benefits for local people. Jeevani is now manufactured and marketed in the United States, without any reward accruing to the local community, whose knowledge formed the basis of product development.

The absence of a real surge in bioprospecting has led to increased questioning of its true economic viability in view of the low probability of identifying new ingredients and developing them commercially. Developments in combinatorial chemistry are reducing dependence on sourcing biologically active molecules from natural organisms, undermining the scope for income generation through bioprospecting. Further, most pharmaceutical companies prefer to have total control over the production process and thus prefer synthetic production routes rather than rely on supplies from less certain natural sources.

Source: Aalbersberg (2008).

Combating desertification

The Asia-Pacific region has large tracts of highly fragile, dry lands. Traditional agriculture in these areas has evolved into complex production systems to minimize degradation threats. However, increased human pressure, especially on account of population growth and intensive use of marginal lands for cultivation and livestock production, has led to dryland degradation and desertification. Political, social and economic changes have undermined traditional community resource management systems, leading to overexploitation of dry lands. In tandem with climatic variations, this has contributed to desertification. As elsewhere, agriculture, overgrazing and woodfuel collection have been some of the important causes of dryland degradation and desertification.

Several countries in the Asia-Pacific region have high levels of desertification risk, which is calculated on the basis of two indicators: (i) the area of dry lands as a percentage of productive agricultural land; and (ii) the population occupying dry lands as a percentage of population on agriculturally productive land. Countries with more than 50 percent risk of desertification include Australia, China, India, Mongolia and Pakistan (**Table 3.9** and **Box 3.12**).

Table 3.9. Calculated desertification risk in Asia and the Pacific

Country	Desertification risk (%)
Australia	77
Bhutan	9
China	57
India	72
Indonesia	1
Japan	4
Korea, DPR	31
Lao PDR	1
Mongolia	100
Myanmar	1
Nepal	42
Pakistan	100
Sri Lanka	6
Viet Nam	2

Source: FAO (2003).

There are several national and international initiatives to combat land degradation and desertification. All countries in the Asia-Pacific region are signatories to the United Nations Convention to Combat Desertification (UNCCD), with some 13 countries implementing national action plans to combat dryland degradation and desertification. Forests and forestry play important roles in ameliorating the situation and tree growing is an integral part of arresting degradation and desertification and the rehabilitation of affected areas. Establishment of windbreaks and shelterbelts has been a standard practice in arid zones in most countries, especially to protect agricultural land and habitations from desertification. A substantial wealth of knowledge exists on technical aspects of desertification control and several countries are implementing major initiatives to control desertification. For example:

- In China, three of the country's Key Forestry Programmes (KFPs) directly focus on controlling desertification: (i) Combating Sandification around Beijing and Tianjin Programme; (ii) Key Regions' Shelter Forest Programme (the fourth phase of the Three Norths Shelter Forests); and (iii) Conversion of Cropland to Forest and Grass Programme.
- In Mongolia, a 'Green Wall' programme has been initiated, which aims to afforest and reforest transitional areas between the Mongolian Gobi desert and steppe regions, in an effort to reduce loss of forest reserves, desertification, sand movement and dust and sand storms, caused by climate change and inappropriate anthropogenic activities (**Box 3.12**).

Box 3.12	Desertification in Mongolia

Mongolia's location – as a landlocked continental country at the heart of Central Asia – combined with low precipitation and average elevation of about 1 500 metres above sea level, makes it highly susceptible to desertification. The Gobi Desert region constitutes 42.5 percent of the country's territory.

Over the past 60 years, the annual average air temperature in Mongolia has increased by 1.56º Celsius. The increase is attributed to global warming and climate change. Surveys show that droughts that encompass at least 25 percent of the country's territory occur with a frequency of 2-3 years; droughts encompassing 50 percent of the territory happen every 4-5 years. In comparison with the 1960s, dust storms on the steppes and in the Gobi Desert region are now three to four times more frequent.

Intensification of the desertification process, in the wake of climate change, has resulted in the melting of previously perpetual snow, drying up of lakes, rivers and streams, a sharp decline in the yield of pastures, salinization of soil and water, soil erosion, land degradation, loss in fertility, acceleration of sand movement and an increase in the frequency of natural disasters. A Green Wall programme is being initiated to help combat this desertification.

Source: Ykhanbai (2009).

Recognizing the limitations of sector-focused approaches to combating desertification, more thrust is being given for the adoption of integrated approaches to land use. As regards institutional arrangements, considerable attention is being given to fully involve local communities in land management. However, eventually all these efforts boil down to tackling fundamental policy, legal and institutional issues, which are extremely difficult (**Box 3.13**).

Box 3.13	Local level efforts to combat desertification in Pakistan

Pakistan is under threat from desertification; it is estimated that the area desertified is expanding at a rate exceeding 1 percent per annum. Increased extraction of woodfuels and monoculture agricultural practices are the main causes of land degradation. A number of initiatives to combat desertification are being implemented; many being focused on improving resource management by involving local communities. An example of such efforts is in Morkhoon village in the far north of Pakistan where, supported by the Aga Khan Foundation (AKF), several women's organizations have been established to provide institutional support to run a credit and savings programme to better manage natural resources. The AKF has promoted forest plantations on the boundaries of fields, communal land, private land and any other areas where original vegetative cover has disappeared. This has helped to overcome fuelwood and fodder shortages. The women have created committees to monitor forest use and grazing. Women have also planted trees on family land and have switched from monocultural practices to crop rotation to prevent degradation.

Source: UNCCD (2007).

Forests and climate change

With climate change becoming one of the most critical environmental issues, forests and forestry are gaining increasing attention in mitigation and adaptation strategies; deforestation and forest degradation account for about 17 percent of carbon emissions. Forestry's role in climate change mitigation largely depends on progress in implementation of sustainable forest management, thus arresting deforestation and degradation (reducing carbon emissions) and increased afforestation and reforestation efforts (increasing carbon stocks).

Reducing carbon emissions and improving sequestration are global public goods; hence, much of the thrust of climate change mitigation is to develop a globally acceptable policy framework that encourages significant emission reductions. The Kyoto Protocol was an important step in this direction, providing a framework for climate change mitigation and adaptation till 2012. An outcome of the Kyoto Protocol

and other climate discussions has been the development of cap and trade systems, helping to develop carbon markets. All Asia-Pacific countries (with the exception of Brunei Darussalam and a handful of Pacific Island Countries) are signatories to and/or have ratified the Kyoto Protocol. Despite concerted efforts, the development of a post-Kyoto arrangement on climate change mitigation and adaptation has remained elusive, especially in view of the failure to articulate a legally-binding agreement during COP 15. Narrow short-term interests have undermined a binding legal agreement on reducing emissions and much depends on how the major emitters of CO_2 will deal with the problem.

Forestry under the Kyoto Protocol

Under the Kyoto Protocol three flexible mechanisms were created:

(i) the Clean Development Mechanism (CDM);
(ii) joint implementation; and
(iii) emission trading.

Under the CDM, Annex I countries may offset a certain part of their emissions through investment in carbon sequestration or substitution projects in non-Annex I (developing) countries, thus acquiring tradable certified emission reductions. Afforestation and reforestation projects were included in the CDM as one of several carbon sequestration options.

While the appeal of afforestation and reforestation as a climate change mitigation strategy is considerable, forest-based carbon offset projects face several challenges, including setting baselines, ensuring permanence in reductions achieved, and leakage prevention (whereby emissions reductions in one country prompt increased emissions in another). Rigorous stipulations and complex processes have marginalized forestry participation in the CDM, which is largely dominated by less complex projects in the energy sector. Thus, although there were about 2 100 registered CDM projects by March 2010, only 13 of these accounting for just 0.51 percent deal with afforestation and reforestation. Of these, six are in the Asia-Pacific region (China (two projects), India (three projects) and Viet Nam (one project)) (**Box 3.14**). It is worth noting that these three countries are at the forefront of afforestation and reforestation efforts, even without support under the CDM.

Box 3.14 | **CDM afforestation and reforestation projects in the Asia-Pacific region***

China

China has two registered CDM afforestation and reforestation projects:

1. Facilitating reforestation for Guangxi Watershed Management in Pearl River Basin, registered in 2006, aims to:

    - Afforest 4 000 hectares through establishment of new plantations and multiple-use forests on degraded lands.
    - Sequester CO_2 through forest restoration (it is expected that plantations could sequester around 0.34 million tonnes by 2012 and 0.46 million tonnes by 2017).
    - Connect fragmented forests to create biodiversity corridors, reduce soil erosion, improve hydrological flows and reduce risks of flooding and droughts.

2. Afforestation and reforestation on degraded lands in Northwest Sichuan, China, registered in 2009, aims to:

    - Establish 2 250 hectares of multiple-use forests by direct planting on degraded lands in five counties.
    - Sequester 23 000 tonnes CO_2 equivalent *per annum*, with an operational lifetime of 60 years.

India

India has registered three afforestation and reforestation projects under the CDM, namely:

1. The Small scale cooperative afforestation CDM pilot project activity on private lands affected by shifting sand dunes in Sirsa, Haryana, approved in 2009. This project will improve degraded croplands surrounding eight villages. The croplands comprise 370 hectares belonging to 227 farmers. These have been planted with a number of indigenous and exotic species to sequester 11 600 tonnes of CO_2.
2. The Reforestation of severely degraded landmass in Khammam District of Andhra Pradesh, India under ITC Social Forestry project, approved in 2009. This project covers an area of about 3 000 hectares of severely degraded wasteland and is expected to sequester about 57 800 tonnes of CO_2. At the same time, the project will provide income security to the local community.
3. The International Small Group and Tree Planting Program (TIST), Tamil Nadu, India, approved in 2010, is a small-scale project for the reforestation of degraded grasslands and croplands, that expects to sequester 107 800 tonnes of CO_2 equivalent by 2033 (planting began in 2004).

Viet Nam

Viet Nam secured registration for the Cao Phong Reforestation Project in 2009, which plans to establish 365 hectares of tree plantations on degraded grasslands and shrublands in Xuan Phong and Bac Phong communes in Cao Phong District. Plantations of *Acacia mangium* and *Acacia auriculiformis* will be planted on a 15 year rotation for wood production, in the process sequestering 42 650 tonnes of CO_2 during the first credit period.

*As of 17 March 2010.

Source: UNFCCC (2010).

Exclusion of afforestation and reforestation by most major emission trading schemes linked to the compliance market has been an important factor contributing to the low share of forestry in carbon trading. For example, the European Emission Trading Scheme, which in 2008 accounted for over 60 percent of the volume and close to two-thirds of the value of all carbon markets, does not recognize offsets generated through afforestation and reforestation. Some of the inherent technical and institutional problems (especially to demonstrate that sequestration is additional and that there will be no leakages) along with the protracted and complex process of CDM approval makes afforestation/reforestation less attractive in comparison with other projects, especially energy conservation. The New Zealand Emissions Trading Scheme is exceptional in that it incorporates forestry within its provisions (**Box 3.15**). Forestry projects have garnered greater prominence in the less regulated, voluntary carbon markets. Although voluntary markets have grown rapidly during the last few years, their overall share in the carbon offset market remains very low.

Reduced Emissions from Deforestation and Degradation (REDD)

Since deforestation and forest degradation have been identified as major sources of carbon emissions, providing incentives to promote forest conservation has become an important thrust of the post-Kyoto climate change mitigation arrangements. The issue was discussed and included under the Bali Action Plan agreed during the 13th Conference of the Parties (COP 13) in December 2007. Although there has been a broad agreement during COP 15 on REDD under the post-Kyoto arrangements with some countries pledging financial support, several issues are yet to be resolved. Better clarity on REDD implementation is expected from COP 16 to be held in Mexico in December 2010.

The thrust of REDD programmes is to pay compensation to forest owners and other involved parties for potential income losses and costs accruing as a result of maintaining forests intact and forgoing alternative land-use options that involve forest clearance. Anticipating international arrangements, preliminary efforts are underway to develop baseline information and methodologies for effective monitoring, assessment, reporting and verification. Currently in the Asia-Pacific region, Cambodia, Indonesia, Lao PDR, Nepal, PNG, Thailand, and Viet Nam are developing 'REDD-readiness' under the UN-REDD Programme and several other countries are in the process of joining this initiative. Several other countries' REDD-readiness is being supported by other initiatives. In addition to the technical challenges of development of baseline information, implementation of REDD will require overcoming major policy, legal and institutional hurdles. Uncertainty in carbon markets (especially volatility of carbon prices) could adversely affect financial support to REDD.

Country-level action

Notwithstanding some of the uncertainties, a number of countries in the Asia-Pacific region have included forests and forestry as important components of climate change strategies. Some of the notable national programmes include:

- Tree planting and forest restoration and protection form the central focus of China's National Climate Change Programme.
- India's Climate Change Strategy envisages afforestation of 6 million hectares within the next decade.
- Japan and ROK have included forests as a central part of climate change mitigation efforts to enhance carbon sinks. Considering the relatively high proportion of land under forests in these countries, much of the thrust is towards improved tending to enhance carbon sequestration by existing forests. Other initiatives being implemented include promotion of urban tree planting, prevention of forest degradation and increasing the use of biomass as a source of energy.

- New Zealand enacted an initial Emission Trading Scheme in 2008 with forestry the first sector to apply the scheme (**Box 3.15**). Following a change in the government at the end of 2008, the scheme has been revised, with several substantive changes to forestry provisions. New Zealand has also implemented an Afforestation Grant Scheme, which offers grants to plant forests on land that was not forested on 31 December 1989 (the Kyoto compliance date); and a Permanent Forest Sink Initiative, which enables private forest owners to receive carbon credits in the form of Assigned Amount Units when they establish new permanent forests (i.e. forests that will never be harvested).

Box 3.15	The New Zealand Emissions Trading Scheme (ETS) and forestry

The New Zealand ETS follows many of the Kyoto Protocol rules although it does contain additional restrictions for pre-1990 forest owners. It treats forests differently depending on when they were first established and also, if they have been on-sold. Under New Zealand's implementation of the Kyoto Protocol, forests first established before 1990 (called pre-1990 forests) are treated differently from post-1989 established 'Kyoto' forests.

Owners of pre-1990 forests will receive a carbon credit allocation of 60 New Zealand Units (NZUs) for each hectare of forest owned, if they established their forest or purchased the forest prior to 2002. If the forest was purchased since 2001, the owner will receive only 39 NZUs. If pre-1990 established forest land is deforested (i.e. harvested and converted to another land use) the owner will be liable for the total amount of carbon contained in the forest at maturity. Participation in the ETS is mandatory for pre-1990 forest owners who deforest their land.

Owners of post-1989 forest land can choose to enter the ETS. Owners who enter the scheme receive all of the credits and associated liabilities linked with this forest land: they receive NZUs if their forests' carbon stocks increase as a result of tree growth and they must surrender NZUs if those stocks decrease (for example, due to harvesting or fire). Where owners opt not to enter the ETS, the Crown takes responsibility for changes in carbon stocks and for the associated credits and liabilities.

Source: NZMAF (2009); NZFOA, personal communication.

- In April 2010, the implementation of Australia's Carbon Pollution Reductions Scheme (CPRS) was deferred until 2013. The proposed Australian scheme would sell licenses to emit carbon. The Australian forestry industry has strongly advocated for forestry to be included in the CPRS, similar to the New Zealand scheme and the Australian Government is still considering whether and how credits from carbon offsets offered by sectors such as forestry would be included in the scheme.

  Other Australian initiatives that encourage establishment of forests as carbon sinks include the Greenhouse Challenge Plus initiative, which allows companies to offset carbon emissions through the establishment of forest sinks. Various state governments have also implemented schemes incorporating carbon sinks, such as the New South Wales Government's Greenhouse Gas Abatement Scheme.

- Perhaps the most proactive developing country on climate change issues has been PNG, which has championed the cause of REDD through the Coalition of Rainforest Nations. The Coalition aims to have emission offsets related to deforestation (in addition to afforestation and reforestation) incorporated into global carbon emissions markets. The Papua New Guinea Government has also made progress in developing a carbon trading policy incorporating forestry, designation of potential CDM project areas in provincial and national forest plans, and established a Climate Change and Environmental Sustainability Office (though this was subsequently closed due to alleged improprieties).

[2] In steep areas with wet climates, unpaved roads commonly associated with logging operations can cause a 10-300-fold increase in landslide erosion rate in forested catchments (Dolidon *et al.* 2009).

Potential challenges

While forests play an important role in climate change mitigation, there are various challenges that countries must overcome if they are to take advantage of the emerging opportunities, as is already evident from the marginalization of afforestation and reforestation under the CDM. There is also increasing criticism of the effectiveness of the cap and trade system in addressing climate change and, already, efforts are being made to introduce more direct approaches such as taxes on carbon. The success of initiatives like REDD is primarily dependent on improving policy and institutional environments, which continues to be extremely challenging, especially in countries where the problems of deforestation and degradation are severe. There are also increasing concerns that credits generated by REDD could drastically reduce carbon prices, thus undermining any meaningful efforts to reduce emissions through improved technologies. Along with uncertainties related to international transfers of resources, these issues pose major challenges to forestry-based climate change mitigation efforts.

Forests and water

Several countries in Asia and the Pacific suffer from severe water scarcity and this is expected to worsen in the context of climate change and increasing populations. Continued growth of the region's economies will depend on sustained supplies of freshwater. The role of forests in minimizing erosion and maintaining water quality is of particular importance in:

1. hydroelectric schemes where sediment can reduce reservoir capacity and wear down turbine blades;
2. maintaining aquatic habitats and river navigation by preventing excessive sedimentation and sediment deposition; and
3. maintenance of water quality for drinking (Hamilton 2008).

Because fertilizers and pesticides are seldom used in natural forests, forests are preferable to other land uses in the context of providing drinking water supplies. Riparian buffer zones are particularly important in preventing sediments and pollutants from entering rivers and in stabilizing river banks. Erosion control and entrapment of sediments is also of relevance in coastal ecosystems where removal of mangroves can lead to loss of land, saline intrusion and exposure of coastal populations and assets to increased risk from coastal hazards.

Trees also play an important role in averting landslides under less extreme conditions, although deep landslides resulting from continuous heavy rainfall or earthquakes are unlikely to be affected (Hamilton 2008). Deep-rooted trees and shrubs strengthen shallow soil layers and improve drainage, thereby reducing the occurrence of shallow landslides. Transpiration from extensive tree canopies can also decrease soil water content and reduce landslide risk. Conversion of forests on sloping land reduces rooting strength for up to two decades even with subsequent regeneration and increases landslide risk. Maintenance of forest cover in slip-prone areas where slopes are greater than 45 percent, where slopes are concave or soils have low cohesion, or are shallow and cover bedrock, is particularly important.

Land uses that increase surface erosion and slope instability in tropical uplands include logging[2], road and trail construction and forest conversion, while surface erosion is usually low in undisturbed forest catchments. Increased occurrence of storms and increased logging and infrastructure development in sloping areas are likely to raise the incidence of erosion and landslides in the coming years. Although regulations preventing logging in riparian zones and on steep slopes are generally included in forest harvesting guidelines in most countries, they are often not strictly adhered to nor enforced.

Lack of certainty regarding the precise nature of the hydrological functions of forests, particularly in relation to flooding and droughts, has brought some uncertainty to forest protection for watershed management. Water-related issues have, however, been perhaps the most significant driver of forestry-related policy change in the Asia-Pacific region. Landslides following heavy rains in southern Thailand in 1988 were linked to deforestation of steep slopes, leading to a ban on logging. Similarly, recurrent devastating floods and landslides in the Philippines were attributed to illegal logging and led to the pronouncement of logging bans, most recently in 2004. Pakistan is another country that imposed a logging ban in the aftermath of catastrophic floods in 1992. Although links between forestry activities and erosion, floods and droughts are sometimes imprecise, natural disasters are likely to remain a key driver of forest policy in the coming years.

Almost all countries in the region are paying increased attention to watershed management with particular focus on forest conservation and afforestation/reforestation (**Box 3.16**). Forests and trees occupy a prominent place in watershed management regimes and the emphasis is on adoption of integrated approaches taking into account the linkages between different uses and adopting landscape-scale approaches. Key issues relating to forests and watersheds include:

- Improved assessment of the roles of forests in upland areas and adoption of locally appropriate, integrated approaches to watershed management.
- Reviewing forestry practices, including afforestation, specifically taking into account water requirements. Species and practices that are water-demanding may have to be phased-out as competition for water becomes intense. This will be of particular importance for large scale industrial plantations using fast-growing species.

Box 3.16 | **'Green dams' for water conservation in Republic of Korea (ROK)**

ROK has a long history of managing forests for water conservation with particular focus on maintaining water quality. A system of water conservation forests was provided in the Forest Decree of 1911. Additional provisions to this decree were incorporated in the 1961 Forest Act and subsequently into the Act to Create and Manage Forest Resources 2005. Seven types of protected forests, including types such as erosion control forests and fish shelter forests, are designated by the Act.

There are three types of water conservation forests:

- Type I is forests designated around reservoirs, which are critical for water supply for agriculture, power generation and industrial uses. Forests within 1 000 metres of maximum reservoir water levels are included under Type I.
- Type II is forests located in the zone of upstream water resources. Forests whose valleys are steep or where tree growth is poor presenting challenges due to the natural environment are included in Type II.
- Type III water conservation forests are publicly-owned forests which are managed for the quality of upstream water resources and are designated within five kilometres from each bank of the watercourse boundary.

In 2005 the extent of water conservation forests under Type I, II and III was 135 700 hectares, 15 711 hectares and 155 267 hectares respectively.

There is considerable public awareness about managing forests, often called 'green-dams', to provide clean and abundant water supplies.

The Korean Forest Service, in collaboration with the Korea Water Resources Corporation, is also implementing a green-dam project to manage upstream forests surrounding large reservoirs. By 2006 the green-dam project was completed in four forest regions and new green-dam projects will be implemented in 16 forest regions.

Source: Rin Woo Joo *et al.* (2009).

Watershed management in most Asia-Pacific countries is publicly funded. Because water is considered as 'god-given', development of markets for water, including privatization, finds very little public support. However, increasing water shortages are paving the way for market-driven approaches, including for watershed management through payments to upland owners by downstream water users; although most are still in the pilot stages of implementation. Demand among potential ecosystem service buyers is limited due to lack of awareness of the concept; absence of information on clear linkages between land use, water yield and its quality; and resistance to additional taxes or fees. The highly fragmented nature of land use and ownership in upland areas, the lack of sellers' bargaining power, high transaction costs, unclear land tenure and low capacities of local institutions to act as intermediaries are other impediments. Absence of policies and laws supportive of payments for ecosystem services (PES) is another factor constraining wider adoption of PES.

If payment schemes for watershed services are to be successful, acceptance from water users must increase and for this to happen, better evidence of the benefits of watershed protection and the effects of payments on the flow of benefits is needed. In most cases, payment for watershed services is likely to remain 'government directed' levying additional taxes on electricity or water used, rather than true markets where payment is directly linked to the service provided.

Amenity values – ecotourism and urban forestry

Increasingly, the amenity values of forests are receiving greater recognition – for example, ecotourism and urban forestry (**Box 3.17**). Ecotourism is a rapidly expanding segment of the wider tourism industry. Based on information from countries with data available, the worldwide contribution of tourism, including international passenger transport, amounted to US$1.1 trillion in 2008, or over US$3 billion a day. Tourism's contribution to employment is estimated at 6 to 7 percent of the overall number of jobs (direct and indirect), Receipts from international tourism in the Asia-Pacific region were estimated at about US$206 billion for 2008, with total international tourist arrivals of 184 million visitors in the same year (UNWTO 2009). No precise information is available on how much of this can be categorized as ecotourism (nor can the share of forests in overall tourism activities be quantified). However, anecdotal evidence suggests rapid expansion in ecotourism, especially as society accords greater value and importance to natural landscapes. Rapid economic growth and a burgeoning middle class are important factors in the expansion of domestic ecotourism. Expanding partnerships between communities, governments and private investors has helped to boost ecotourism in many Asia-Pacific countries.

Box 3.17	**Some examples of urban greening in the Asia-Pacific region**

Urban greening is receiving increased attention in most Asia-Pacific countries, in the context of the rapid urbanization, as higher incomes generate demand for healthier and more attractive urban landscapes. Urban forestry has a long history in the region and there have been substantial efforts in some countries to develop and manage urban green spaces for environmental and recreational purposes. Examples include:

- Sanjay Gandhi National Park is the world's largest urban forest and one of Asia's most visited national parks. The park has an area of 104 km^2 and is surrounded on three sides by Mumbai – the world's most populous city.
- In ROK, urban parks are an integral component of healthy urban living. The Seoul metropolitan area hosts six major parks including Seoul Forest – a park somewhat modeled on New York's Central Park. Seoul Forest opened in 2005 and contains 400 000 trees. The Seoul National Capital Area also contains a green belt aimed at preventing urban sprawl.
- The Philippines hosts an impressive green belt in Makati City, as does Adelaide's Central Business District in Australia, which is enclosed by the Adelaide Parklands.
- Parks and green belts are outstanding features in all New Zealand cities. Christchurch, 'The Garden City', is a notable example, with Hagley Park occupying 164 hectares adjoining the central business district, one of numerous urban parks.
- Sri Lanka's 'Greening Package' under the multi-stakeholder Urban Greening Partnership Program has used community initiatives in urban greening as a strategy to reduce poverty and enhance the environment in Moratuwa, Badulla and Matale cities.
- Singapore and Kuala Lumpur have ambitious greening programmes, notably utilizing rooftops of many public and private buildings.
- Bamboo is widely used for urban greening across Asia. In China and the Philippines, for example, bamboo is planted in parks and along walk-ways and the verges of highways to prevent erosion and improve the landscape.

However, given the rapid pace of urbanization, especially in South Asia and East Asia, investments in urban greening have fallen far short of what is required. Most greening is limited to high income areas, where the more affluent residents are able to exert pressure on governments. Conversely, shanty towns and informal housing settlements are usually left without much investment of any kind, least of all for aesthetic and ecological improvements.

Major challenges in managing ecotourism in the context of increasing demand are:

- Preventing environmental degradation due to rapid growth of tourism undermining long-term sustainability.
- Managing tourist numbers and competing ecobusinesses to maintain the quality of ecoexperiences.
- Resolving tensions between ecotourism and other productive sectors.
- Enhancing revenues accruing to local communities and thus generating long-term interest among communities to protect and manage tourism assets (**Box 3.18**).

Bhutan provides an example of a country that has adopted policies to ensure that the country does not become another mass tourism destination, undermining its cultural and social traditions. Greater involvement of stakeholders, in particular civil society organizations, is helping to avoid the pitfalls that mass tourism has faced in several countries. In some cases, former poachers have changed roles to become actively involved in forest and wildlife protection, as seen in the Kaeng Krachan National Park in Thailand and in the Periyar Tiger Reserve in India.

Box 3.18	Some examples of pro-poor community-based tourism

Mongolia

In order to improve conditions for poor, rural communities in Mongolia, the government has attempted to promote tourism by linking nomadic groups to the public and private sectors. At present, 12 communities are participating in nomadic community-based tourism through which they not only earn incomes from tourism, but are gaining valuable knowledge and skills on how to work with the public and private sectors to develop sustainable sources of income. Fifty-five percent of the revenues earned go directly to participating families and an additional 10 percent of revenues accrue to community environmental funds. These initiatives have empowered participating nomadic groups – economically and socially – while enabling the communities to invest in sustaining the landscapes they depend upon.

Source: UNESCAP (2007).

Malaysia

The Model Ecologically Sustainable Community Tourism (MESCOT) project funded by the World Wide Fund for Nature in Malaysia is offering communities an alternative source of livelihood – through community-based tourism –rather than engaging in palm oil production and logging. The project builds capacity at local levels by offering training in hospitality, finance, marketing, computer skills and English; local communities have thereby been able to prevent further deforestation along the lower reaches of the Kinabatangan River. Participation in such pro-poor tourism activities has encouraged clearance of rubbish, local landscape improvements, and a forest rehabilitation programme.

Source: WWF (2001).

Tourism in general – and ecotourism in particular – is one of the fastest growing sectors in the Asia-Pacific region, especially in view of rapid growth in incomes. Ecotourism provides unique opportunities to protect and manage rural landscapes, including forests, and to revitalize local economies. Most countries have developed national policies and strategies to promote ecotourism (**Box 3.19**). While ecotourism has significant potential for livelihood enhancement and sustainable development, its effectiveness will vary depending on location-specific conditions. Many popular ecotourism areas are suffering from large inflows of visitors, far exceeding carrying capacities, significantly undermining the quality of assets.

Box 3.19	Ecotourism develpoment in Asia and the Pacific

The tourism industry is an important source of revenue for many countries in Asia and the Pacific, with revenues expected to top US$4.6 trillion by 2010 and tourist arrivals growing at around 6 percent annually. China, Lao PDR and Viet Nam are among the ten countries with the fastest growing tourism industries in the world. Ecotourism is growing in popularity as local and international travelers demand nature-based experiences that help to conserve the environment and generate revenues for local communities. In some countries, including Indonesia and China, ecotourism is now an official conservation strategy. The region has more than 20 national and regional ecotourism associations.

Source: PATA (2008); UNWTO (2008); TIES (2007).

Payments for ecosystem services

Payments for ecosystem services (PES) (**Box 3.20**) are potential tools for environmental protection as well as poverty alleviation. Increasing areas of forests are being excluded from wood production (especially in the context of logging bans and other restrictions) to enhance provision of environmental benefits. This is resulting in declining incomes from forests in many countries. Making forest management more environmentally friendly involves additional costs, especially opportunity costs of incomes foregone from the production of wood and other products. Charging fees for ecosystem services is seen as an option to mobilize additional resources to finance sustainable forest management. Poverty alleviation has also become an objective of PES, especially when the rural poor can be compensated for the ecosystem services provided by the lands they own; although in many cases poverty is caused by lack of ownership of any assets.

Box 3.20	Definition of payments for ecosystem services

A payment for ecosystem services is defined as “a voluntary transaction where a well-defined environmental service (or a land use likely to secure that service) is being bought by a minimum of one environmental-service buyer from an environmental service provider and the service is provided continuously.” PES constitute commercial transactions whereby payments are made periodically so that providers have ongoing incentives to provide the services and adhere to contractual obligations.

Source: Wunder (2005).

Globally and regionally, PES have been applied for securing watershed protection, carbon sequestration and, to some extent, biodiversity conservation. PES in the case of watershed management typically involve payments to upstream land users for improving or stabilizing land use in catchments (often through encouraging land users to forego certain resource-use options that adversely affect water quality, quantity and stability of flows). This has been particularly the case where payments have been made by irrigation and hydroelectric utilities. Most of the examples of payments for watershed services relate to financial transfers from utility companies (those managing water supplies for municipalities or generating electricity) to land users who have refrained from actions that may jeopardize the quantity and quality of water available and to enhance conservation efforts. Viet Nam has been a leader in establishing PES schemes in the Southeast Asia subregion (**Box 3.21**).

Box 3.21 Lessons from Viet Nam's experiences with creating successful PES schemes

Towards the end of the 1990s, the Vietnamese Government enacted a number of laws – including the Law on Water Resources (1998), Law on Land (2003), Law on Forest Protection and Development (2004) and Law on Environmental Protection (2005) – that recognized ecosystem services provided by ecosystems such as biodiversity conservation, watershed protection, carbon sequestration and landscape beauty. Several resolutions were endorsed as economic instruments for environmental management, notably the Law on Environmental Protection and Law on Water Resources, which specify taxes be paid by users of ecosystem services. PES projects that have been developed under this legislation include:

- Maintaining the Tri An Watershed through a collaborative scheme between water supply companies and upstream groups that were previously polluting the river.
- A sustainable financing model for landscape beauty in Bash Ma National Park in central Viet Nam, covering about 37 500 hectares, of which about 32 000 hectares are upland forests.
- A carbon sequestration project in Cao Phong District, located in the northwest region of Viet Nam, and undertaken by the Department of Forestry, Japan International Cooperation Agency, Vietnam Forestry University and the Research Center for Forest Ecology and Environment. It is estimated that about 60 000 to 80 000 carbon credits will potentially be obtained through certified emission reductions (CERs). Beneficiaries include 300 local households that will benefit from sale of carbon credits and from the rehabilitated forests. Several lessons can be drawn from the pilot PES initiatives in Viet Nam, including the importance of:
- Clearly identified costs and benefits of watershed protection for relevant stakeholders. Technical studies that link upstream land uses and downstream water quality are vital.
- Enabling government policies and the voluntary involvement of buyers and sellers. Microcredit can be instrumental if farmers have to modify their current land uses to adopt the PES scheme.
- Formal contracts between buyers and sellers.
- Demonstrated quality of ecosystem services. For example, visibly improving services is a key to attracting visitors that subsequently help raise revenues to finance conservation and reward local people for the ecosystem services they provide.
- Clear and transparent benefit-sharing systems with a strong equity component.
- Support from government agencies in the area of capacity building and technical assistance, as well as to ensure sound policies, community-wide benefits and the enforcement of contracts.

Source: Hoang *et al.* (2008).

Recent reviews of experiences in the Asia-Pacific region (FAO 2006d; Adhikarai 2009; Huang and Upadhyaya 2007) highlight a number of issues relating to the development of PES. Some of the important conclusions drawn include:

- Development of ecosystem markets is largely related to overall social and economic development. Consequently, these markets are relatively better developed in industrial and post-industrial societies, where willingness and ability to pay for ecosystem services is high. In view of this, PES may take a long time to find wider adoption in many developing countries. For the foreseeable future, PES in most developing countries is more likely to be funded through international transfers, mostly through proto-markets.
- Development of systems for PES will involve high transaction costs, including investments in strengthening legal and institutional capacities and to provide reliable information on the complex biophysical processes underlying the provision of most ecosystem services.

- Since ecosystem markets are in the very early stages of development, their potential to become an important source of financing for sustainable forest management remains doubtful. Similarly, the potential of ecosystem service markets to alleviate poverty is relatively low. Most rural poverty is to due to absence of ownership of land and other resources; consequently, the poor are unlikely to become key providers of ecosystem services.

FORESTRY AND POVERTY REDUCTION

Although the Asia-Pacific region has made impressive strides in reducing poverty, it is still home to more than two-thirds of the world's poor. The total number of poor (based on a poverty line of US$1.25 per person per day) in the Asia-Pacific region is estimated at 912 million (ICOMP 2009) with South Asia having 600 million of the poor. Further, forested areas have very high incidence of poverty, often attributed to their remoteness as well as low levels of investments in infrastructure, education, health care, etc. More importantly, most of the resources are seldom managed to give due consideration to the well being of local communities. Often resource exploitation undertaken in the name of development curtails access to resources accentuating poverty. The attendant social problems, including conflicts, are drawing attention to how forests could be managed to help in poverty reduction and alleviation.

The pros and cons of poverty reduction through forestry have been discussed at length (see RECOFTC 2009a). Traditionally, much of the thrust of poverty reduction efforts in forested countries has been to alter land use, by converting forests to more intensive uses, thereby enhancing incomes and production of food and other necessities. Harvesting wood and reinvesting timber revenues in education, health and infrastructure has been another approach that many countries continue to pursue – at least, in principle. As discussed earlier, there are also a number of initiatives to enhance incomes from the provision of ecosystem services, for example ecotourism and payments for watershed protection.

Several studies (for example Banerjee 2007; Vedeld *et al.* 2007) have shown that the poor households often derive 30-50 percent of their incomes from forests (including wage employment in logging, and NWFP collection and trade). Most studies also conclude that as incomes increase, there is a significant drop in the share of income derived from forests and forestry. In general high dependence on forests by the poor is symptomatic of a larger problem of absence of better alternative livelihoods. Changes in opportunities (that enhance human capital, improve access to resources, or strengthen bargaining power) can increase incomes, enabling people to move out of poverty and thus reducing forest dependency.

Poverty reduction efforts under forestry have given impetus to:

- Strengthening forest tenure arrangements and thereby enhancing the asset base of the poor.
- Improving the management of resources, with greater emphasis on producing goods and services – and providing employment – that directly and indirectly enhances the incomes of the poor.
- Strengthening policy, legal and institutional frameworks (including market and non-market mechanisms) to increase the share of benefits accruing to the poor.

During the past few years, there have been considerable efforts to confer rights to land, forests and forest products to local communities through various community forest management initiatives; as in the case of Forest User Groups (FUGs) in Nepal, Joint Forest Management (JFM) in India, and Community-Based Forest Management (CBFM) in the Philippines. A number of countries, including China and Viet Nam, have assigned rights to state-owned land to communities and individuals. However, strong evidence showing significant contributions to reducing poverty through devolution of forest management responsibilities is lacking (**Box 3.22**).

Box 3.22 Why devolution has not reduced poverty

Empirical evidence that devolved forest management has contributed to reaching the MDG of eradicating poverty, is lacking. According to Edmunds and Wollenburg (2004) the effects of decentralization in forestry are:

- **Limited transfer of authority with limited pro-poor effects:** Devolution appears to be transferring little or no authority to local forest users and is having, at best, no significant positive impact on the livelihoods of the poor.
- **Lack of local accountability:** Local institutions set up under devolution have often been accountable to forest departments and other government offices, rather than to local people with the possibilities of genuine co-management being quite limited.
- **Disadvantaging the marginalized:** Not proportionately benefiting women, ethnic minorities or the very poor (i.e. those groups who are generally politically disadvantaged who were often unaware of the implications of policy reform or unable to affect policy implementation to protect their interests).
- **Small income improvements:** Gains in income have been relatively small for most people and often overshadowed by negative trade-offs in resource access and control.
- **Undermining local institutions:** Pre-existing local institutions have been undermined by their lack of legal standing and clear property rights relative to institutions that are newly created or sponsored by government.
- **Trade taken over by elites:** Under policies that expanded opportunities for locals to sell forest products directly, poor and minority men and women often lost their place in the trade to elites within and outside the local community.
- **Regulatory frameworks:** Serving as major barriers, states impose excessively burdensome regulatory frameworks making it difficult (time and financial costs) for the poor to enter markets.
- **Increased state penetration** – territorially and in terms of decision-making: The state retained control over management decision-making (India); through JFM arrangements it extended its control into local areas, building alliances with local elites to control decision-making.

Source: RECOFTC (2009a).

Once ownership and access issues are settled, an increase in income depends on how assets are managed and what products and services are produced. Security of tenure is a necessary, but not sufficient, condition to enhance incomes and lift people out of poverty. Technical and managerial skills of owners, entrepreneurship, adequate financing and access to resources, a supportive regulatory environment and access to markets are among other critical factors; most of which are scarce or unfavourable in many impoverished areas. Substantial increases in incomes through low intensity management would require access to vast tracts of land (as in the case of extractive reserves in the Amazon region). Such an option is unavailable to the more densely populated Asia-Pacific countries, especially in South Asia, which accounts for about two-thirds of the poor in the Asia-Pacific region. Consequently, it becomes imperative to intensify land use, including agroforestry as well as cultivation of agricultural and horticultural crops. While this could reduce poverty, it is unlikely that much impact would be attributable to forests and forestry.

Significant increases in incomes depend on the volume and value of products and services sold. Market imperfections, including lack of direct access to lucrative retail markets and limited access to market information, affect the share that accrues to the poor. Efforts to reduce exploitation by intermediaries have led to the development of alternative institutional arrangements like corporations and cooperatives. However, experiences in this regard have still been mixed.

PES, especially for watershed protection, ecotourism and, more recently, carbon sequestration, are often seen as means of poverty alleviation. However, since PES are still in the early stages of development (and many PES schemes have been developed with substantial external support), this is yet to be widely demonstrated. The ability to provide ecosystem services is largely dependent on ownership of natural resources and a host of other policy and institutional factors. Considering the fundamental issues that underlie poverty, ecosystem markets may have, at best, a limited role in poverty alleviation. Contrarily under certain circumstances, PES could have negative impacts: for example, where markets for ecosystem services serve those with better willingness and ability to pay, marginalized community members and landless farmers could lose access to common lands and experience declining livelihoods (Huang and Upadhyaya 2007).

CONTRIBUTION OF FORESTRY TO INCOMES AND EMPLOYMENT

Gross value added

Gross value added is an important, although imperfect, measure of the economic importance of a sector. The total value added by the Asia-Pacific forest sector, consisting of wood production (including logging), wood processing (in particular production of sawnwood and panel products), pulp and paper and furniture manufacturing, has increased from about US$110.7 billion in 1990 to US$116.9 billion in 2000 and to US$141.0 billion in 2006 (**Table 3.10**). Between 1990 and 2006, the Asia-Pacific region's share in global forest sector value added, increased from about 20.5 percent to 24.4 percent. The Asia-Pacific region has increasingly emerged as an important region as regards forestry value addition. Most of the growth has been in the pulp and paper and wood processing subsectors, while increases in the value added in forestry (mainly wood production from natural and planted forests) have been relatively modest.

Table 3.10. Value added* by the forest sector and share of Asia and the Pacific in global value added, by item

Sector/subsector	Gross value added (in US$ billion at 2006 prices and exchange rates)					
	1990		2000		2006	
	US$ billion	(%)	US$ billion	(%)	US$ billion	(%)
Forestry (wood production)	28.6	29.2	30.4	28.2	32.8	27.9
Wood processing	21.5	17.4	22.0	15.9	30.0	20.0
Pulp and paper	39.9	19.8	46.9	21.6	56.2	28.0
Asia-Pacific forestry sector subtotal	90.0	21.2	99.3	21.4	119.0	25.4
Furniture	20.7	17.6	17.6	14.0	22.0	18.4
Total Asia-Pacific including furniture	110.7	20.5	116.9	19.8	141.0	24.4
World total (forestry sector gross value added including furniture)	540.9		589.0		577.4	

* Percentage figures relate to the Asia-Pacific region's share in total value added globally.
Source: FAO (2010b).

Despite the absolute value added in Asia and the Pacific registering a significant increase, the share of the forest sector in the gross regional product declined from about 1.4 percent in 1990 to 1.0 percent in 2006 due to the much faster growth of other sectors. A similar decline in forestry's contribution to GDP has taken place at the global level. However, it should be noted that national income statistics have a number of limitations. In particular, they fail to fully capture non-market transactions, which are particularly significant in the forest sector (**Box 3.23**).

Box 3.23	**Contribution of forestry to gross domestic product (GDP)**

According to official statistics, forestry's contribution to Gross Domestic Product in the Asia-Pacific region was about 1 percent in 2006. There are only a few countries where forestry's share of GDP exceeds 2.5 percent; these include Bhutan, Cambodia, DPRK, Fiji, Indonesia, Lao PDR, Malaysia, Nepal, PNG and the Solomon Islands. In almost all countries, the share of the forestry sector has been on the decline, largely on account of faster growth of other sectors. However, official statistics have a number of limitations.

A significant share of activities in the forest sector – especially collection of woodfuel and NWFPs – takes place in the informal sector and is, consequently, excluded from national income statistics. Further, illegal logging and trade are also not registered in official statistics and can be of considerable importance.

Misclassification or ambiguities in attribution of activities are also problems (for example, income from forest-based ecotourism is usually attributed to the tourism sector). Many of the problems stem from overall weaknesses in data collection and analysis. Misunderstanding of terminologies is also not uncommon and often contributions from the forestry sector are incorrectly estimated, based on sale price and not the 'value added' (which is sale price minus costs of material inputs).

Assessing the value of forest-derived ecosystem services and incorporating this into income statistics is a contentious issue. In the absence of an economy-wide approach to ecosystem accounting, a sector-focused approach is unlikely to find much acceptance. Estimating the technical coefficients and calculating a valuation remain major challenges.

Disaggregation of value-added components of production provides useful insights into intra-country changes as outlined below:

- Gross value added in forestry (especially logging) (**Figure 3.11**) in China increased from US$7.4 billion in 1990 to US$ 13.7 billion in 2006.
- In Japan, the trend is in the opposite direction: gross value added in forestry declined from US$5.4 billion in 1990 to US$0.9 billion in 2006. All other segments of forestry in Japan (including wood processing, pulp and paper and furniture) also registered significant declines in value added during 1990 to 2006.
- Both India and Indonesia registered increases in gross value added during 1990 and 2006, each by approximately US$1.0 billion.
- Malaysia has also experienced a decline in the gross value added in wood production from US$2.9 billion to US$2.4 billion, but value added in other segments (wood processing, pulp and paper and furniture manufacturing) registered significant increases.

An increase in value added in wood production reflects one or more of the following, namely:

a) an increase in the quantity of wood produced;
b) a reduction in the costs of production; and/or
c) an increase in the unit sale value.

Total gross value added in forestry and logging tends to increase when countries switch from low productivity natural forests to high productivity plantations, due to significantly increased volumes of wood produced.

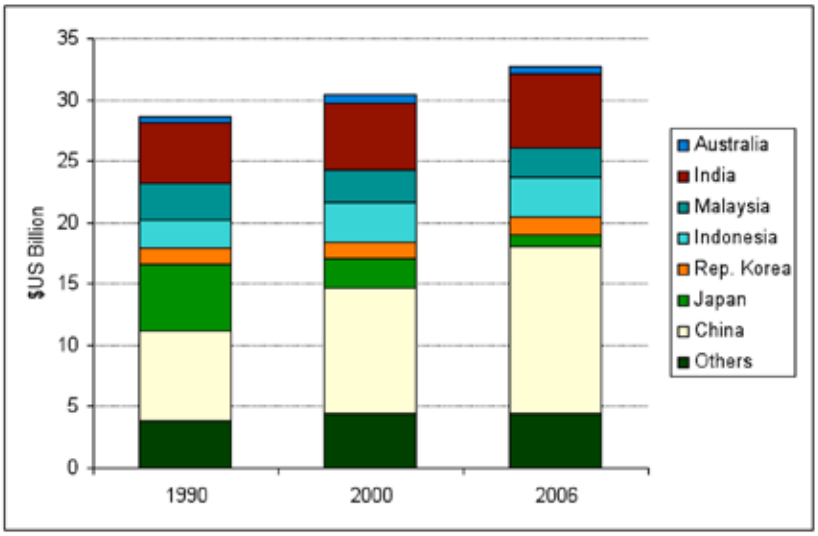

Figure 3.11. Gross value added in forestry and logging in 2006
Source: FAO (2008).

- Gross value added in wood processing has registered a significant increase, especially between 2000 and 2006, largely due to significant increases in China's production. China's share in Asia and the Pacific's gross value added increased from about 11 percent in 2000, to more than 26 percent in 2006. The shares of other major wood industry players have largely declined proportionately.
- The pulp and paper industry has undergone the most dramatic change in gross value added, with China accounting for most of the increase (**Figure 3.12**). Gross value added by the Chinese pulp and paper sector increased from US$2.7 billion in 1990 to US$17.4 billion in 2006. Indonesia and ROK also registered significant increases in gross value added in the pulp and paper sector. Japan is still the region's largest pulp and paper producer, but its gross value added declined by about US$5.0 billion between 1990 and 2006.

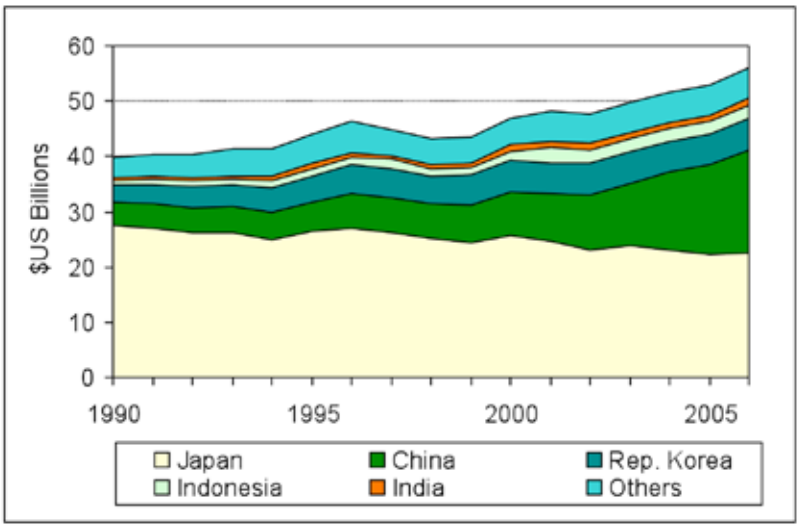

Figure 3.12. Changes in the share of value added in the pulp and paper subsector (US$ billion)
Source: Lebedys (2008).

- The furniture industry has also experienced major intra-regional and intercountry shifts in value added (**Figure 3.13**). Growth in China's furniture industry has been phenomenal, from US$0.6 billion in 1990 to US$6.3 billion in 2006.
- During the same period, Japan experienced a decline in furniture value added from US$14.4 billion to US$6.5 billion.
- Other countries that have increased furniture value added include Indonesia, ROK, Malaysia and Viet Nam. Viet Nam's emergence as a furniture producer has been particularly dramatic. In 2000, gross value added of Viet Nam's furniture production was just US$54 million; by 2006 this had accelerated to almost US$900 million.

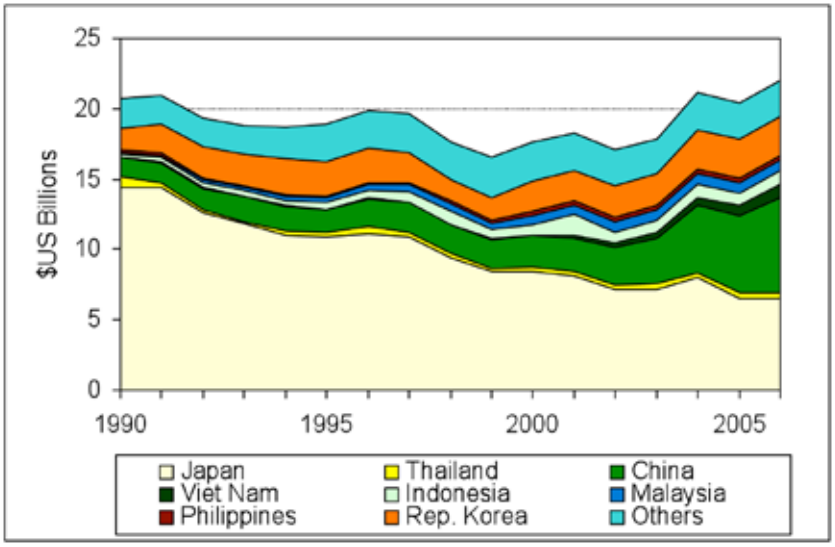

Figure 3.13. Changes in the share of value added in the furniture sector
Source: Lebedys (2008).

The emergence of China and several other countries as key producers of wood and wood products stems from their competitiveness, especially low costs of inputs, in particular labour, and possibly raw materials (partly on account of increased shares of wood from plantations or ability to procure wood at low costs from distant sources. This may include illegally-procured wood, which tends to be cheaper than that produced from legal and sustainably managed areas). In the long run, increases in wages and/or transport costs (especially in the context of rising fuel costs) could significantly reduce the competitive advantage of some countries.

Employment in the forest sector

Forestry's significance in generating rural employment has been highlighted in a number of studies. However, data limitations make it difficult to provide a clear indication of the actual magnitude of employment in the sector. Partly, these difficulties stem from definitional problems, especially as employment statistics are often ambiguous in terms of measurement units. In some developing countries, the thousands (or millions) of people reported to be employed in aspects of forestry (for example, in the collection of NWFPs and woodfuel) are actually in part-time, seasonal employment for only a few days or weeks in a year. When converted into full-time equivalents, the number of people employed is often much lower than reported.

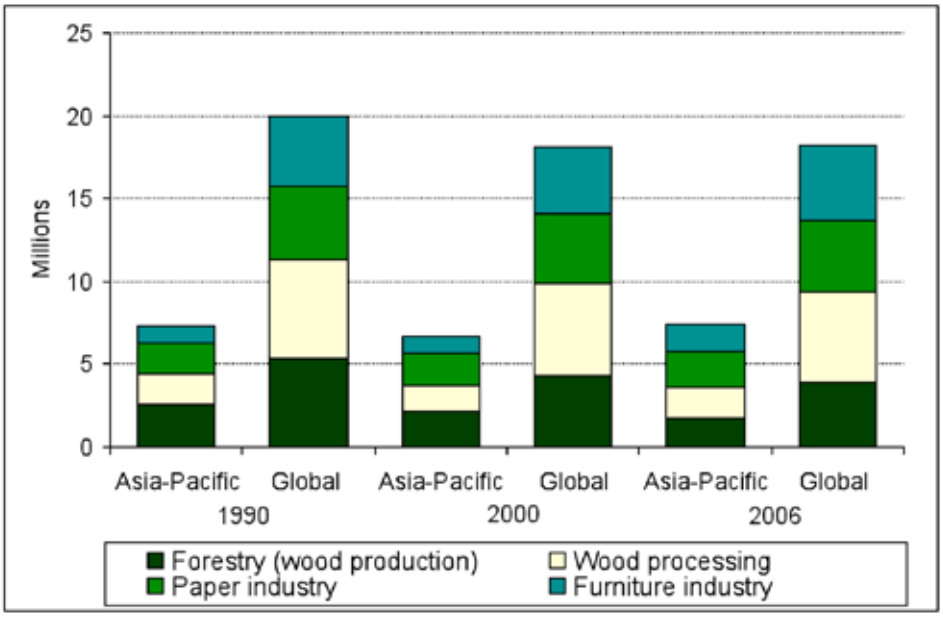

Figure 3.14. Employment in the forest sector including furniture (full-time equivalent)
Source: Lebedys (2008).

On a full time equivalent basis, forest sector employment in the Asia-Pacific region was estimated as about 5.8 million people in 2006. If employment in the furniture sector is included (1.6 million people in 2006), then total forestry employment was about 7.4 million people (**Figure 3.14**). However, growth in employment in the forest sector in the Asia-Pacific region between 1990 and 2006 was relatively negligible. Globally, employment in the forest sector declined from about 20 million to 18.2 million during the same period. However, two caveats need to be considered:

- Official statistics rarely capture the full extent of employment, especially in the context of the preponderance of informal sectors. In many cases, many small and medium enterprises are excluded from national employment surveys. According to a study by the International Labour Organization (Poschen 1997), formal sector employment accounts for only about 37 percent of the employment in the forestry sector, while the remaining 63 percent comprises the 'invisible sector', including woodfuel production and industries that operate in the informal sector. Quite possibly, the share of the invisible sector in the Asia-Pacific region could be much larger than the global average. A conservative estimate – adopting the global average – of forestry employment in the Asia region is about 20 million people.

- A comparison of employment and value added (**Figure 3.15**) indicates some contrasting trends. While value added in the forest sector, including furniture, increased by 27 percent between 1990 and 2006, the increase in employment has been a relatively negligible 0.6 percent. There are also significant differences between industry sectors. For example, the value added in wood production has increased by about 14.6 percent, but employment has declined by about 30 percent. This suggests either:

  (a) improvement in the efficiency in wood production, possibly due to an increase in the share of productive planted forests; or

  (b) an increase in the share of wood produced by those employed in informal activities (including illegal logging).

One of the most dramatic changes is in the furniture subsector, where value added increased by about 6 percent, while employment increased by about 52 percent. This largely reflects a shift in the location of furniture manufacturing towards low wage countries including China and Viet Nam.

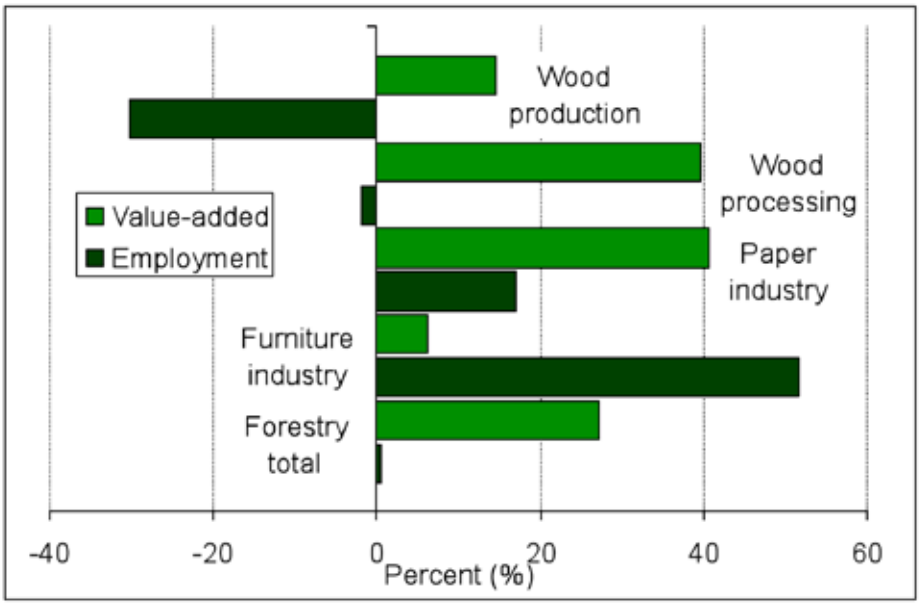

Figure 3.15. Relative changes in employment and value added, 1990-2006
Source: Lebedys (2008).

On the whole, the forest sector in the Asia-Pacific region is characterized by 'jobless growth'. In some countries demographic changes are resulting in twin problems for forestry employment, namely: (i) a decline in the number of available workers; and (ii) ageing of the existing workforce. This is particularly the case for some of the developed economies (**Box 3.24**). Employment decline is also due to rapid increases in the share of value added of the capital-intensive pulp and paper sector and technological advancements in processing, reducing labour demand.

Box 3.24	**Changing employment situation in Japanese forestry**

"The number of workers engaged in forestry has been decreasing for the long term due to the stagnation of forestry production. Over the recent 10 years, the number of workers engaged in forestry has decreased from about 90,000 persons in 1995 to about 50,000 persons in 2005. Also, the ratio of workers over 65 years accounts for more than 25% of the total and the aging of workers has been advancing."

Source: Ministry of Forestry, Japan (2009).

OVERVIEW OF ECONOMIC, ENVIRONMENTAL AND SOCIAL BENEFITS FROM FORESTS

The pressure on forests in the Asia-Pacific region to produce more products and services has increased enormously. As demands for wood and other products are increasing, so too are demands for ecosystem services. With countries at different stages of development, there are major inter-country shifts in demand for wood and wood products. Although there has been a reduction in demand for wood and wood products in some developed countries such as Japan, this has been more than balanced by rapid growth of demand in China. Demand from India is also increasing rapidly and there are indications that the Indian market will burgeon in coming years. There has also been a shift in wood industries in favour of more value-added products. To some extent this is enabling higher wood recovery, reducing the demand for wood raw material.

Demand for wood and wood products is increasing and at the same time the overall forest resource situation, outside a few countries, has deteriorated. While increasing incomes are resulting in increased demand for products, affluent segments of society are more conscious of the important roles of ecosystem services. This has led to the setting aside of more forests as protected areas, and more drastic actions such as logging bans in response to natural calamities such as floods and landslides. Many key wood-producing countries have scaled down production, often on account of depletion of forests or shifts in priorities that place greater emphasis on the provision of ecosystem services. An important trend has been towards an increased dependence on imports from forest-rich countries, both from within the Asia-Pacific region and outside.

Dependence on wood as a source of energy is very high in the region, in particular in the South Asia subregion. Economic growth and improved access to alternative fuels are resulting in fuel-switching. Climate change concerns and growing interest in renewable energy sources are reviving interest in wood energy. While there is uncertainty over the future of new technologies such as ligno-cellulosic biofuel production, there are increased efforts to enhance the efficiency of use, including through wider adoption of more efficient biomass-burning stoves, gasification and co-generation.

An important challenge will be to establish the trade-offs between competing uses for forests and wood, especially to weigh immediate economic benefits against the longer term provision of ecosystem services. With climate change becoming a major environmental issue, forests and forestry are receiving considerable global attention, while other forest-linked environmental issues including watershed protection, conservation of biodiversity and arresting land degradation and desertification are key issues at local and national levels. Forest-based recreation is particularly gaining importance in the context of higher incomes and urbanization.

Adding to the complexity of managing forests for the provision of goods and services are the social dimensions of forestry, especially the high level of subsistence and semi-subsistence dependence of the poor on forests. Although forests and forestry have serious limitations in raising standards of living for impoverished people above the poverty line, forestry decision-makers must still take account of the needs of the poor, and often, in particular, the needs of indigenous communities.

Forest management in the Asia-Pacific region has become significantly more complex in the past 30 years. The situation continues to change and the state of forests and forestry and the flows of goods and services in the next decade and beyond will be very different from today. The manner in which the sector evolves will depend on the collective impacts of a number of drivers of change. These are discussed in the next chapter.